CAUTIONS

Most of accidents occur due to wrong installation, operation, inspection or maintenance without understanding or reading operation manuals. It is very important to read this operation manual carefully before starting the machine. In other words, do not install, operate, inspect, maintain the machine without reading this operation manual.

BEFORE YOU START

Carefully read and understand this operation manual and warning labels adhered to the unit.

- Keep the warning labels on the machine clean and visible.
- Replace with new labels if labels are peeled or become invisible.
- Study and memorize correct operation methods.
- Keep the machine always in normal condition.
- Do not modify the machine without prior consent of the manufacturer's recognition.
- A fully qualified operator or maintenance engineer should only operate or service this type of equipment.
- When a third person touches or operates the machine, the original user must instruct operation of the machine and give this operation manual to the third person.

PRECAUTIONS FOR INSTALLATION

- Install the machine horizontally. The maximum gradient is 5°
- In order not to block the air inlet and outlet, install machine at least 30 cm away from the wall. Also check if there are any obstacles blocking air inlet and outlet. If those are blocked, engine may be over-heated.
- When you operate the machine on sandy soil, put wooden plate etc, on the ground to avoid sand coming into the machine. The sand may give alternator some insulation troubles.
- Engine exhaust gas has poisoning ingredient to people or animals. Do not operate the machine in bad air ventilated area such as small workroom or tunnel, which may kill people or animals.
- This machine is not water-proof type, so do not install it in rainy weather or under any other wet conditions.

- Do not put any inflammables such as matches, cigarettes or oil etc, near the machine.

PRECAUTIONS FOR OPERATION

- Wear proper protective clothes such as leather gloves, protective glasses, etc. for your safety.
- Connect all necessary cables before you start engine.
- Do not use damaged or old cables. Please repair or replace such with new cables.
- Check the amount of fuel oil, and add if necessary before operation. After refueling, spilled fuel on the machine must be wiped off, be sure to keep the machine dry and clean.
- Inspect all points defined in the later chapters of the present operation manual. Repair or replace if there are any defective parts.

PRECAUTIONS DURING OPERATION

●During operation or right after engine stops, exhaust muffler and its room become very hot. Never touch those parts during operation.

●Do not operate the machine in rainy weather, on the muddy ground nor under any other wet conditions. Do not touch the machine with wet hands. Those cause earth leakage or electric shock to your body (others' as well) and also damage to the machine.

●Do not touch receptacles and/or output terminals during operation. Electric shock can kill people.

PRECAUTIONS FOR THE CUSTODY OF MACHINE

- When you wash the machine, do not soak the electrical parts such as control panel or alternator. Cover the machine with water-proof sheet on the electrical parts when you wash the machine.
- The storage room for the machine should have no dust, less humidity, flat and horizontal floor and ceiling.
- When you put the machine in storage for a long time, remove battery from the machine and repair all necessary parts for the next operation.
- Conduct maintenance operation (run engine) at least once for 3 months.

CONTENTS

1. FOR SAFETY

Read and understand following cautions for the safe and effective operation.

Following labels are used depending on the degree of danger such

⚠CAUTION ⚠WARNING and IMPORTANT!

In case you find these labels, note the message, and be sure to follow the instruction stated on.

⚠WARNING Mis-operation may cause serious injury as well as death to the operator.

⚠CAUTION Mis-operation may cause medium or slight injury to the operator and/or cause trouble, breakdown etc. of the machine.

IMPORTANT! This label calls the operator' s attention concerning the performance and life of the machine itself, regardless of accident and/or trouble.

Observe the above instructions. However, this manual is not almighty for the safety operation. Please note it is fundamental for all who are in charge of operation and/or maintenance to pay full attentions to the safety by yourselves.

1.1 CAUTIONS BEFORE OPERATION

⚠WARNING ***PAY ATTENTION TO THE ELECTRIC-SHOCK AND/OR LEAKAGE***

- Never connect receptacles and/or output terminals of the machine to commercial source. It is prohibited by the law, and may cause electric-shock, trouble of machine and fire.
- Be sure to ground machine itself and load. Installing on damp ground, iron-frame and iron-plate may cause electric- shock.
- For the connection of load, be sure to use new covered- wire and properly insulated cable against voltage. Connect cable firmly, unless otherwise may cause electric-shock and/or fire.

⚠WARNING ***PAY ATTENTION TO THE VENTILATION***

- Engine exhaust gas is poisonous. Take special care of ventilation and do not use machine in ill ventilated place such as small work-room and/or tunnel, which may kill people and animals, as well.

⚠WARNING ***HANDLING OF BATTERY***

- Keep off fire. Do not smoke and spark, because battery generates hydrogen-gas etc, which may be in danger of explosion. Be sure to charge battery in well-ventilated place. Never check battery by short-circuiting both terminal by metal fragment.
- Never charge frozen battery to avoid explosion. In case of charging frozen battery, warm battery unto about 16~30℃, then charge battery.

- Battery liquid is dilute sulphuric acid. Handle with care, otherwise you may be burnt. Wear protective gloves and glasses, should battery liquid be splashed on cloth and/or skin, wash off immediately with large amount of water. In case the liquid may splash into eye, wash off immediately and have examined by doctor. Delay of proper treatment may lose of eye-sight.
- In case of disposing battery, follow the instructions of concerned regulations.

⚠CAUTION ***OBSERVE SAFETY INSTRUCTION***

- Read this manual and caution labels and understand the instructions.
- Keep caution able always clean, if these should be broken and/or peeled off, renew the label(s) immediately.
- Never modify and/or alter the machine without prior manufacturer's recognition and authorization.
- Do not use this machine other than for the electric power supply, using for other propose may cause serious trouble and danger.

⚠CAUTION ***MAINTAIN GOOD PHYSICAL AND MENTALCONDITIONS***

- Operating the machine in exhausted conditions or sickening conditions may cause unexpected accident or trouble.

⚠CAUTION ***DURING TRANSPORTATION***

- Use lifting hook fitted at the center of bonnet ceiling for lifting up and down. Don't use rope for hanging, because it cannot sustain the weight of machine, which may be in danger of dropping the machine and may cause serious accident.
- Tie the machine firmly to the platform when transporting on a vehicle(truck).
- Be sure to stop the machine before lifting up, otherwise may be in danger to cause not only fatal damage to each part of machine but may bring serious accident.

⚠CAUTION ***INSTALLATION***

- Place and/or install the machine on a fiat and level place.
- Do not incline the machine, should the machine be inevitable to use on a slope, be sure to keep the slant smaller than 5.
- Never install the machine in a wet place where rain can wet the machine.
- In case of installing on the ship and/or sea-shore, be sure to avoid sea water to splash directly on the machine.
- In case the machine be used on sandy soil, be sure sand be never sucked into generator and/or radiator.

⚠CAUTION ***PUTTING A MACHINE ON A MACHINE***

- In case piling a machine on a machine, be sure upper machine is lighter than the based one,

and never put 2 machines on one machine.

- In case piling a machine on a machine be sure the floor is fiat and has enough strength to sustain the weight of 2 machines.
- Before piling a machine on a machine, be sure that each bottom timber block is sharing equal weight of upper machine, and is not inclined and/or slipped aside.
- Never operate the machine under the above-piled condition.
- Piled machines should be in danger of fall down in case of earth-quake etc. Pay full attention to the storage location.

⚠ CAUTION ***SAFETY DURING OPERATION AT SITE***

- Avoid any obstruction such as unnecessary tools, cables, sheets, timbers, which may cause accident by stumbling or being caught one's leg on such obstruction.

⚠ CAUTION ***PRECAUTION FOR OPERATION***

- Inspect and confirm the following instruction before starting the machine. If anything wrong may be found, be sure to repair and operate the machine.
- If you neglect proper inspection before operation and start machine not being aware of any abnormal, it may cause burning of component or unexpected damage to the machine.

⚠ CAUTION ***SAFETY CLOTHES***

- Be sure to ware safety clothes. Too large clothe, unbuttoned cuff, drooped neck-tie and scarf, etc. may be caught in rotating part of machine and are very dangerous.

⚠ CAUTION ***USE SAFETY APPARATUS***

- When operating the machine wear proper helmet, protecting goggle, earplugs, safety shoes, a pair of glove and mask, etc.

⚠ CAUTION ***SAFETY EQUIPMENT***

- Prepare fire extinguisher and first-aid kit in case of emergency. Make notes of telephone number of emergency-doctors, fire station, and communication-chart of each operator for prompt communication.

1.2 CAUTIONS DURING OPERATION

⚠ WARNING ***NEVER TOUCH TERMINALS***

- Do not touch the output terminals and/or receptacles to avoid electric shock caused by high voltage.
- Be sure to switch 'OFF' the circuit breaker, stop machine and pull starting key off, then connect and/or detach cables in case of changing load etc. Starter key has to be kept in hand by the operator to avoid the third person from reaching the machine to start. If unskilled and/or non experienced person operates the machine, there is a fear of an electric shock, etc. resulting with the serious damage to the body.

⚠ WARNING ***NEVER TOUCH CONTROL PANEL***

- Do not touch inside the control panel components, which have hundreds of high voltage and very dangerous.
- In case of inspecting inside the control panel, be sure to stop machine and pull starting-key off. Starting-key has to be kept in hand by the operator to avoid any third person from starting the machine.

⚠ WARNING ***NEVER TOUCH ROTATING PART AND V-BELT***

- Avoid reaching the rotating parts and/or v-belts by hands or fingers from getting caught by the machine resulting with serious injury.

⚠ WARNING ***NEVER TOUCH COOLING FAN***

- Don't get hand near cooling fan, if hand is caught inside, you may be in danger to lose your finger.

⚠ CAUTION ***DO NOT DETACH RADIATOR CAP***

- Do not open radiator cap during operation, otherwise steam of high temperature may spout out and burnt.

⚠ CAUTION ***PAY ATTENTION TO HIGH TEMPERATURE REGION***

- Do not inspect near high temperature region during operation. Engine, exhaust manifold, exhaust pipe, muffler and radiator may become very high temperature during operation. Be sure not to touch those parts to avoid injury by burning.
- Do not refill or inspect coolant and/or lube. oil during operation, because cooling water and lube. oil may become high temperature as well.

⚠ CAUTION ***PAY ATTENTION TO THE FIRE***

- Do not smoke and/or strike match near oils & fats, like fuel oil or lube. oil.
- Refuel under open-air with good ventilation.
- Be sure to stop the engine when refueling. Do not put storage tank near the machine. Do not spill fuel and spilt oil must be wiped off at once. Locate fire extinguisher near the machine, in case of an emergency.

⚠ CAUTION ***PROHIBITION OF OPENING DRAIN COOK***

- Do not open drain cock of coolant and lube. oil during operation.

⚠ CAUTION ***OVERLOAD AND UNEVEN LOAD***

- If breaker shutdown many times, it may be over loaded, in such case, reduce load and start again.
- In case of using 3-phase load, check current of each phase and be sure that each phase is sharing equalized load.
- Operate generator with rated frequency, regardless of the capacity of load. Operating

with lower frequency than rated value, generator may be broken.

※Neglecting above cautions may cause burning of generator or cause fire.

1.3CAUTIONS DURING INSPECTION

⚠ CAUTION ***HANG THE CARD INDICATING DUNDER INSPECTION***

- Before inspection, be sure to set all breakers off, pull starting key off and hang a card indicating [under inspection] on the attractive place of the machine. Inspector should keep starting key by himself during inspection.
- Detach (-) terminal connector of battery cable.
- Neglecting above cautions and any third person starts the machine during inspection, serious accident may occur, which may injure not only people but damage the machine as well.

⚠ WARNING ***CAUTION WHILE ADJUSTING THE TENTION OF V-BELT***

- Before adjusting tension of v-belt, stop the engine without fail, pull starting key off, which should be kept by operator (and/or inspector).
- If the engine is not stopped, you may be caught in the belt and be injured seriously.

⚠ WARNING ***CAUTION AROUND COOLING FAN***

- When inspecting near cooling fan, be sure to stop the engine and pull key off. Otherwise, you may be in danger to be caught by cooling fan and seriously injured.

⚠ WARNING ***CAUTION WHEN CLEANING WITH COMPRESSED AIR***

- Wear protective goggle when cleaning dust or stain caught by the air filter with compressed

⚠ WARNING USE OF LIGHTING UTENSILS

Use light with safety-guard when inspecting in a dark and oorly visible place. Handling machine by groping or with the sixth sense may cause unexpected acident. If using regular, not guarded light, breaking the bulb may ignite fuel etc, and cause fire.

⚠ CAUTION ***OPENING & DETACHING RADIATOR CAP***

- When opening and detaching radiator cap, stop the engine and confirm the machine is cooled enough. Open cap slowly decreasing pressure inside, otherwise cap may blow off and hot steam may spout out, which may cause burnt or other serious accident.

⚠ CAUTION ***OPENING DRAIN COOK OF COOLANT***

- When opening coolant drain cock, stop the engine and confirm coolant is cooled down completely. If coolant has not cooled down enough, boiled water may spout resulting with scald.

⚠ CAUTION ***FILLING AND/OR DRAINING OF LUBE.OIL***

- Inspection of amount of lube.oil should be done 10 to 20 minutes after stopping the engine

and the engine and the engine is cooled down enough.

- Lube has become at very high temperature during operation and just after stopping the engine. Moreover,pressed high temperature lube.oil and may cause scald.

⚠ CAUTION ***CAUTION DURING CLEANING THE MACHINE***

- When cleaning the whole machine, be sure to cover electrical and electronical parts such as control panel and generator so as not to be splashed with water. Unless otherwise, insulation will be deteriorated, which may cause many cause many serious troubles.

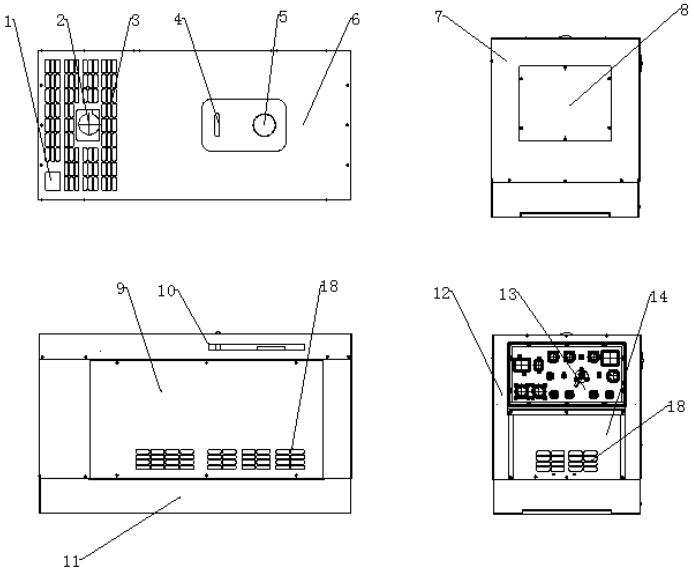
⚠ CAUTION ***DISPOSING WASTED FLUID***

- Wasted fluid contains poisonous elements. Do not dump on the ground, in the river, pond and sea-shore. Such is prohibitted and will cause environmental pollution as well.
- Be sure to pour wasted fluid into proper container, when draining from the machine.

Observe required lows and regulations in case of disposing poisonous substances such as lubricant oil, fuel, coolant, filters, batteries nd so on.

2. NAME OF COMPONENT

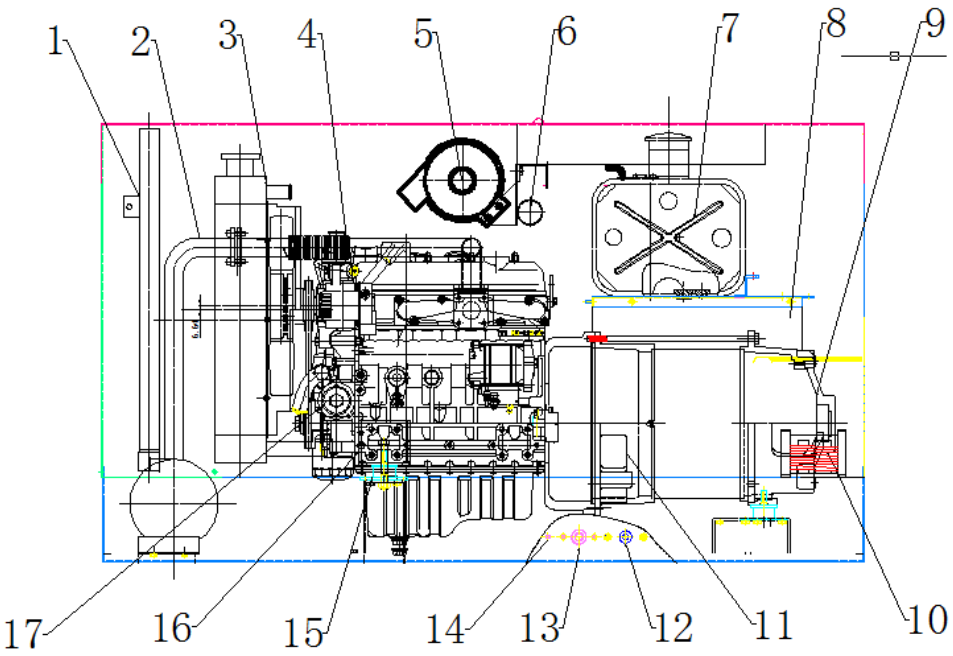
2.1 EXTERIOR AND EACH NAME



NO.	NAME	NO.	NAME	NO.	NAME
1	EXHAUST OUTLET	7	MUFFLER	13	CONTROL PANEL
2	COOLANT INLET	8	INSPECTION COVER, MUFFLER	14	INSPECTION COVER, GENERATOR
3	AIR OUTLET	9	INSPECTION COVER, LEFT	15	HINGE
4	LIFTING HOOK ARCH	10	WATER DRAIN, TOP	16	LOCK
5	FUEL INLET	11	BOTTOM	17	DOOR, RIGHT
6	TOP COVER	12	CONTROL BOX	18	AIR OUTLET

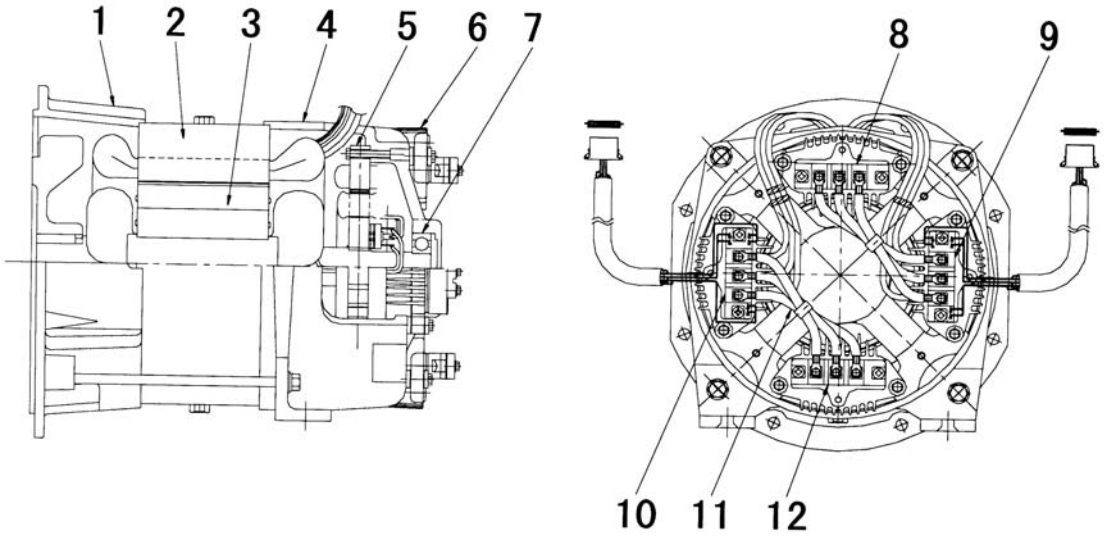
2.2 COMPORNENTS AND EACH NAME

（1）STRUCTURE FIGURE



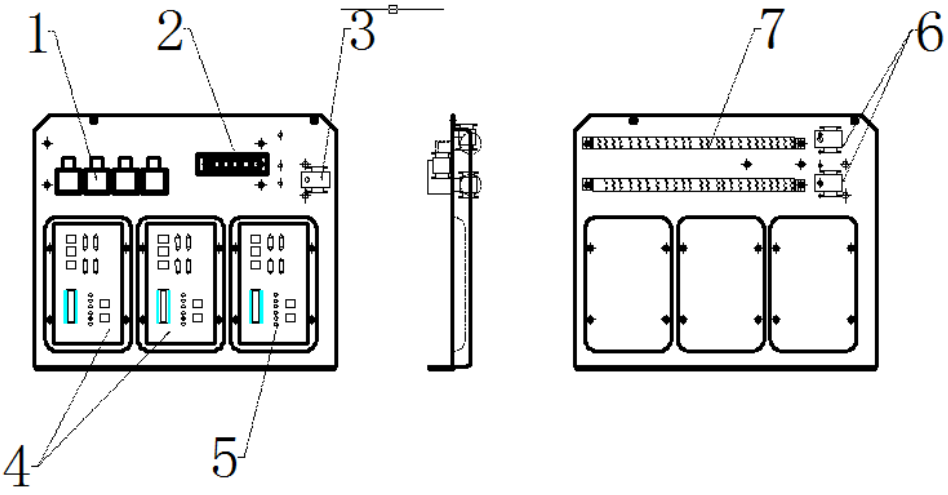
NO.	NAME	NO.	NAME
1	EXHAUST OUTLET	10	REACTOR
2	MUFFLER	11	COUPLING, MIDDLE
3	RADIATOR	12	WATER DRAIN
4	AIR INLET	13	OIL DRAIN
5	AIR FILTER	14	FUEL DRAIN
6	SUPPORT, AIR FILTER	15	ABSORBER
7	FUEL TANK	16	SUPPORT, ENGINE
8	SUPPORT, FUEL TANK	17	ENGINE
9	BRACKET, GENERATOR	18	

（2）GENERATOR



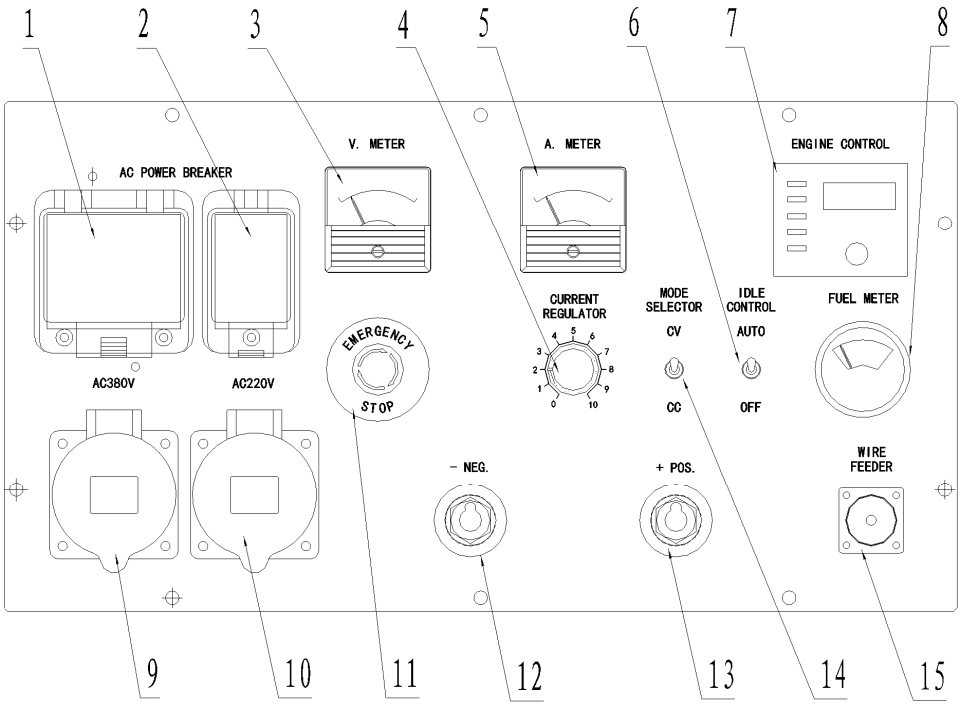
NO.	NAME	NO.	NAME
1	BRACKET·FRONT	7	BEARING
2	STATOR	8	RECTIFIRE A
3	ROTOR	9	THYRISTOR A
4	BRACKET·REAR	10	THYRISTOR B
5	STATOR·EXCITER	11	WIRING HARNESS
6	HEAT RADIATOR FIN	12	RECTIFIRE B

（3）SUPPORT PARTS



NO.	NAME	NO.	NAME
1	RELAY	5	AVR
2	TERMINAL CONNECT	6	CT, WELD
3	CT, AC	7	RESISTOR
4	WCR	8	

2.3 CONTROL PANEL



NO.	NAME	NO.	NAME
1	ELCB (3- PHASE)	9	RECEPTACALS (3-PHASE)
2	ELCB (1- PHASE)	10	RECEPTACALS (1-PHASE)
3	VOLTAGE METER (AC)	11	EMERGENCY STOP
4	CURRENT REGULATOR	12	WELDING TERMINAL, NEG.
5	AMP. METER	13	WELDING TERMINAL, POS.
6	IDLE CONTROL	14	MODE SELECTOR (EW320DS-CC/CV)
7	ENGINE CONTROL UNIT	15	WIRE FEEDER (EW320DS-CC/CV)
8	FUEL METER	16	

2.4 ALARM AND ITS INDICATING LAMP

For safety operation, the following safety devices (alarm lamps and emergency-stop) are standard.

Should any one of the followings occur, automatic operation-stop mechanism will operate to stop the machine, which will be indicated by alarm lamp(s) located on the control panel.

※Engine will stop automatically, at the same time when lamp lights.

Items	Conditions	Treatment
Lube. oil press	Lamp will light when oil press lowers less than normal. <preset operating pressure> lower than 98±19.6kPa	Please refer to Chapter "trouble-shooting".
Cooling water	Lamp will light in case coolant temp rises higher than regulated value <preset operating temperatures> higher than 115℃±1:3℃	
Charging lamp charge.	This lamp will light when it does not	

- In case engine stops by automatic operation-stop mechanism, set starter switch to 'stop' position and check the cause of trouble and repair immediately. If the machine is left under stopped condition by auto-stop mechanism, battery may be discharged and cannot start next time. To avoid serious trouble, be sure to perform everyday routine maintenance not depending on safety device.

3.TRANSPORTATION

⚠ CAUTION

- Use lifting hook fitted at the center of bonnet ceiling for lifting up and down the machine.
- When transporting the machine, be sure to put it on the truck bed and use the rope hooks to secure it with rope at the center of bonnet. Apply suitable stoppers to fix the machine on the truck bed.
- If the machine is equipped with casters, fix caster with stoppers so as the machine not to move during transportation.
- Never transport the machine while it is running. Otherwise fatal trouble or serious accident may occur.

3.1 LIFITING

- Use the lifting hook at the center of bonnet ceiling for hoisting up and down the machine.
- Select suitable truck and crane referring to the weight and dimensions described in chapter 9. "Specification" of this Manual.
- Only the licensed driver of crane can operate the crane.

4.INSTALLATION

4.1 PLACE AND CONDITION OF INSTALLATION

⚠ WARNING

- Exhaust gas from engine is poisonous, so do not face exhaust outlet to people and housed as well to avoid serious accident caused by inhaling exhaust gas
- Do not use the machine in ill-ventilated places such as tunnel or small workroom.

⚠ CAUTION

- The machine should be installed on a dry and level ground.
- In case the machine be inevitable to be installed on a slope, keep its slant less than 5 degrees.
- Avoid installing it in a damp place and/or apt to pool water after rain. Installing on such places may cause electric shock.
- Do not face the exhaust gas outlet to people nearby and/or houses as well.
- When installing the machine neat the seashore or on a ship, make sure the machine should not be exposed directly by sea water.
- If the machine is used in sandy place, be sure that exhaust from generator or radiator does not blow the sand up in the air ,or suck into the machine.
- The machine is regulated to deliver its full performances under the following ambient conditions.

Ambient temperature	-15℃ to± 40℃
Relative humidity	less than 85%
Altitude	lower than 300m above sea level

- When more than 2 machines are operated at same site, keep enough distance and space so that exhaust gas and/or air of each machine does not affect each other.
- Keep enough space around the machine for inspection and maintenance access.

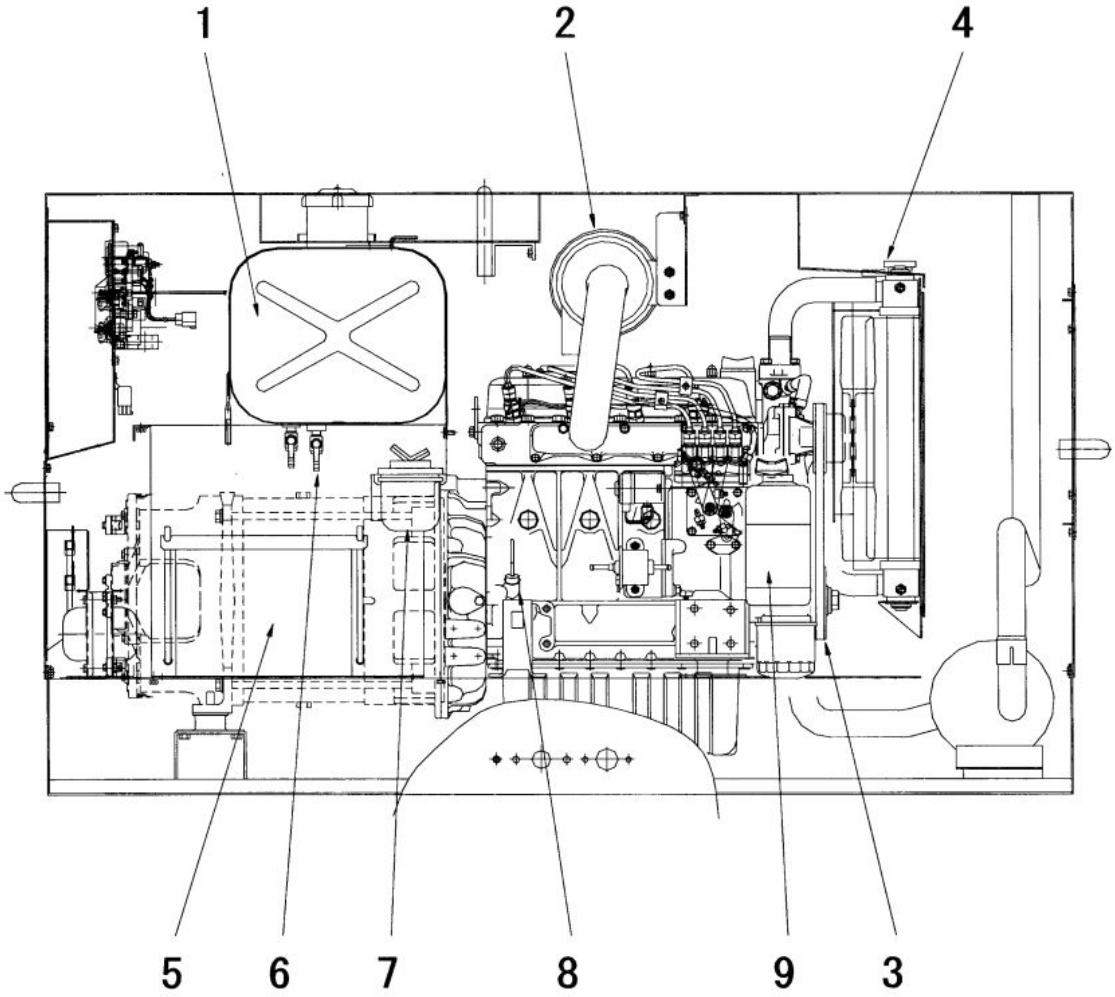
5.OPERATION

5.1 INSPECTION AND CONFIRMATION BEFORE OPERATION

⚠ CAUTION

- Before starting operation, be sure to inspect the condition of the machine. Should any abnormal be found, repair at once and operate it always in good condition.
- Neglecting such inspection and operating the machine without noticing any abnormality, unexpected accident may occur, even cause fire.

5.1 1 Check items and places



NO.	ITEMS	NO.	ITEMS
1	Check amount of fuel.	7	Water draining of fuel filter.
2	Check clogging of air filter element.	8	Check lube. oil level.
3	Check tension of V-belt.	9	Check amount of coolant.
4	Check radiator cap fitting condition.		※Check grounding of machine package
5	Check battery.		※Check connection of each part.
6	Drain condensate from fuel tank		

5.1.2 Check engine oil level

- Keep the machine horizontal and check the amount by level-gauge.
- When checking oil level you have once started, wait for 10~20 minutes to cool clown the engine enough.

<Procedure>

① Pull level gauge(dip-stick) out and wipe off oil with a clean cloth.

② Then re-insert level gauge and pull it out again. If the gauge stain shows the level between upper and lower limit, it is normal.

③ If the stain is below its lower limit, replenish lube. oil. (refer to 6.4.1)

④ At the same time, check and confirm the contamination, and if it is found dirty, contaminated or should be changed according to the periodic inspection, change the oil. (see 6.4.1)

5.1.3 Check coolant amount

⚠ CAUTION

- At first, be sure to stop the engine and confirm the engine is cooled enough. Loosen cap slowly decreasing pressure inside. Neglecting above procedure, its inner pressure may blow off cap and steam jetting out of the radiator could cause scalding, etc.
- Check the amount in the reserve tank. If' it is lower than the limit, open the cap and replenish the coolant to keep over LOW mark.
- In case little coolant is left in the reserve tank fill the tank and radiator as well.
- Do not open radiator cap under routine maintenance.
- TIGHTEN RADIATOR CAP

After checking amount of coolant, be sure to tighten radiator cap completely, otherwise inner pressure may blow cap off and resulting grave accident.

5.1.4 Inspection of battery

- Keep inflammables away from battery.
- Battery may generate hydrogen gas，and may explode. Therefore recharging should be done in a well—ventilated Place. Do not smoke and spark.
- Never check battery by short—circuiting both terminals by Metal fragment.
- Check battery liquid periodically. Do not use and charge battery with little liquid lower than limit level，which may not only deteriorate its quality and shorten its life but may Cause explosion. Replenish distilled water and keep liquid level always between UPPER and LOWER level.
- Do not charge frozen battery to avoid explosion. In case of Charging frozen battery，warm battery up to about 16~30℃,then charge battery.

- Battery liquid is dilute sulphuric acid. Handle with care, otherwise you may by burnt.
- Wear protective glove and goggle. Should battery liquid be Splashed on cloth and/or skin，wash off immediately with large amount of water.
- If liquid is splashed into eye，wash off at once and have Examined by a doctor. Delay of proper treatment may lose your eyesight.
- In case of disposing batteries，follow the relative regulations of the area.

⚠ CAUTION

- Be sure to connect battery cable correctly in case of exchanging and charging with booster. Cable. Incorrect connecting with(+)and(-)may cause spark and break each part of battery.

（1）Check connecting part of battery cable

- Check terminals of battery cable whether there is any loosening or rusting. Loosening of connection may cause starting failure and/or insufficient charging. Tighten terminal

（1）completely.

（2）Check amount of battery liquid

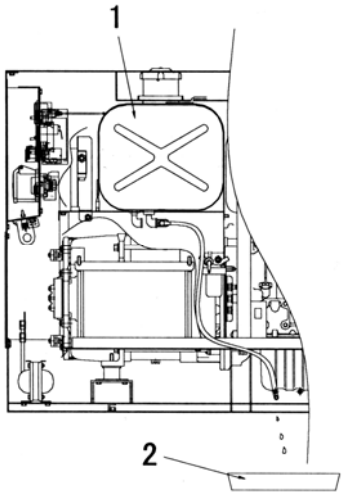
Battery liquid decreases by repeating charge and discharge. Check liquid level constantly and if shortened, supply appointed liquid for battery or distilled water to the regulated level.

Do not supply dilute sulphuric acid for routine replenishment. For the replenishment of battery liquid, be sure to follow the instruction, as treatment may differ from each battery.

5.1.5 Check fuel

- Do not smoke and spark matches near the fuel.
- Keep any explosives away from fuel oil to avoid fire.
- Be sure to stop the engine when refueling. Do not put fuel near the machine nor spill while refueling. Spilt fuel must be wiped off and keep machine always clean otherwise may cause fire.
- Refuel under open-air and/or well-ventilated
- Recommended fuel oil is light oil of ASTM no,2 or equivalent.
  Using fuel poor quality, engine cannot deliver its power nor causes trouble.
- Be sure to check amount of fuel and replenish if shorted, to avoid interrupting operation by refueling during operation due to shortage of fuel.
  After refueling, fasten fuel cap perfectly and wipe off spilt oil completely to avoid catching fire

5.1.6 Discharging water pooled in fuel tank



- Open drain cock(l) placed at the bottom of tank and discharge water pooled in the tank；
- After confirming pooled water is drained completely, close drain valve tightly.
- Drained water is containing fuel, it should be disposed in certain container(2), and should be disposed following to the related regulation of the area, accordingly.

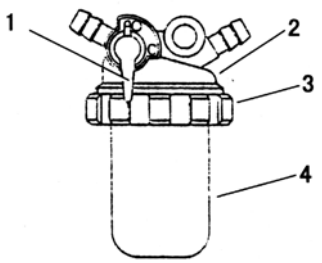
5.1.7 Water draining inside the fuel filter

Remove fuel filter element and dispose water gather inside the element.

<Procedure>

①Close lever(1) of fuel filter.

②Loosen ring-nut(3) and remove cup(4) with element inside and dispose water gathered inside. Fuel oil is contained in cup(4), be careful not to stain nearby with fuel.



③ Clean cup(4) and insert element into filter body(2) and tighten with ring-nut(3).

④ Open fuel filter lever(1).

(1) Air bleeding of fuel

After draining water inside the fuel filter, be sure to bleed air contained in fuel system. (see 5.2.5)

5.1.8 Check clogging of air filter element

- If element is choked up and/or having a hole or a crack, dust and/or rubbish may sucked inside the engine, which may fasten defacement of moving parts and shorten the life of the engine. To keep engine life, routine inspection and cleaning is essential.
- details of inspection and cleaning of air element,6.5.3.

5.1.9 Check tension of fan belt

Check tension and condition of fan belt regularly.

- Too tight tension of fan belt results breaking of shaft and shorten the life of bearing. And if tension of fan belt is looser than normal, slipping of belt may shorten its life.

(1) Proper tension of fan belt

Push center part of fan pulley(I) and generator pulley(2) with fingers (about 49N (5kgf)) as shown in illustration at the right. It is normal when slacking is about within 10mm.

(2) Condition of fan belt

Check breaking and/or wear of belt, and if any, exchange it with genuine new one.

(3) Adjusting method

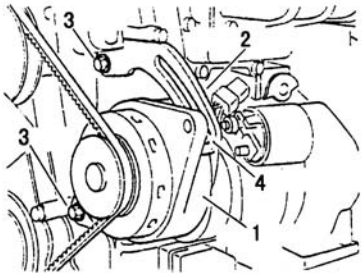
Tension of fan belt can be adjustable by sliding mounting position of generator(I).

① Loosen nut(4) of adjustable plate(2) and fixing bolt(3) which are fixing generator(I).

② Recline generator(I) and adjust tension of belt within proper position. After adjusting, fix generator(I) firmly.

③ Tighten fixing bolt(3) and nut(4) completely.

After fixing generator(I), tension of belt may change a little, so recheck tension again to the proper position. Unless fixing bolt(3) and nut(4) are not tightened firmly, abnormal vibration may break parts and generator as well, resulting serious accident and/or trouble



④ After adjusting, do idling for about 5 minutes and stop engine once. Then check and confirm tension of belt again.

⑤ Check surface of belt, and wipe off any adhered oil/fat and/or LLC completely.

(4) Exchange belt

Be sure to use genuine one for exchange. If belt of poor quality is used for exchange, the life of belt will be shorten and/or break may occur, resulting abnormal noise and overheating of the engine as well.

5.1.10Confirm perfect grounding of machine package.

Referring to 4.2, confirm that all the machine package and load package are grounded properly.

5.1.11Check each part of wiring and connection

Check and confirm that all the wiring and connecting part, and if any loosening, breaking detaching or short-circuiting be found, fix again and/or repair.

5.2 OPERATION

- Be sure to close all doors during operation.
- If there is no option but to operate with doors open, take care not to touch moving part and/or area where reaching high temperature.

  Touching such places may cause serious injury.
- After starting the engine, do idling for about 5mimutes to worm up the engine. Neglecting idling and operating the machine with full load just after starting may shorten the life of its

life.

- While idling, check and confirm there is no loosening of fixture, no leakage of coolant, fuel and lube. oil.
- Check and confirm that all the alarm lamps are off.
- Be sure to operate the machine with its rated frequency, regardless of the capacity of loads. If the machine is operated lower frequency than it's rating, the machine is in danger to be burnt.

5.2 1 Starting procedure

①Set all the breakers to [OFF].

②Set auto-idling switch to [ON].

③Turn starter switch to [OPERATION] position.

④Press Preheat button, preheating lamp will light, which shows preheating. And release the Preheat button according to local temperature. Start the engine, do idling for about 5 minutes.

5.2.2 Indication of each monitor lamp during operation

- Normal indication of each lamp when the starter switch is at [OPERATION] position.

Monitor lamp	***Oil press***	***Water temp***	***Charge***	***Pre-heat***
Before starting Key is at [on]	● Gone out	● Gone out	● Gone out	● Gone out
Preheat completion	● Gone out	● Gone out	● Gone out	○ Lighten up
Operating	● Gone out			

<NOTE> While operation, check occasionally each meters, lamps and instruments are working normally and there is no leakage of water, lube. and fuel oil.

5.2.3 Stopping the machine

<Procedure>

①The engine will stop by turning starter switch to the [STOP] position.

②After stopping the engine, pull starting-key out and keep it certainly, no to be lost.

5.2.4 How to restart when the engine does not start by one attempt

- If the engine does not start with the procedure described in 5.2.1, set key-switch once to [STOP] position and restart after about 30 seconds, following the procedure.

  Never keep starter motor on running in vain.
- In case the engine would not start by some trial, following causes may be suggested. Confirm and removing the cause(s) of trouble and start again.

  Fuel shortage

  Fuel cock is closed and/or fuel filter is clogged.

  Battery is discharged, resulting low cranking speed.

5.2.5 Auto-system

Air entered into fuel system may cause difficulty of starting and other engine troubles. Vent air completely when fuel tank has become empty, after draining water inside fuel filter and/or exchanging filter element.

These machines adopt automatic air-vent system, air vent can be done by setting starter switch to [OPERATION] position to operate electro-magnetic pump.

Air-vent method

- Refuel
- Operating electro-magnetic pump by starting-key at [OPERATION] position, fuel oil is delivered by pressure through injection pump, fuel pipe and leak-off pipe of each nozzle and contained air is automatically vent out of the fuel tank.

5.3 WELDER

IMPORTANT!

- Before start welding, touch the base metal once with a welding rod, and so the engine will increase its speed to the rated value.

  If start welding suddenly when the engine is at idling condition, which may cause engine revolution speed lowres than rated speed, and may result poor welding.
- Put on slow-down switch everytime you start and stop the engine.

5.3.1 Choice of welding cable

The size of welding cable is proportionate to the length and capacity of welding current.

The following table shows the relation between the length and welding current, and will be

help of you for the suitable choice of the cable to keep voltage drop within 5V.

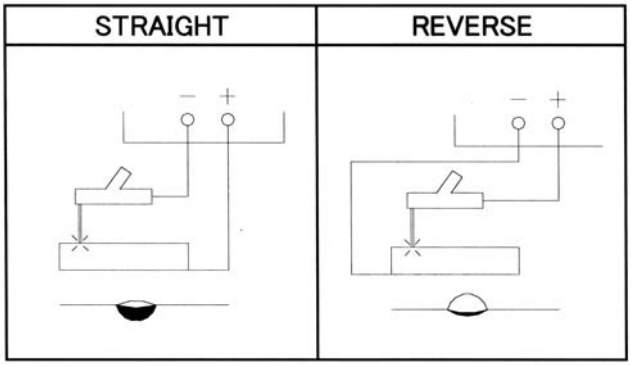
（mmφ）

current / length	20m	30m	40m	50m	60m	80m	100m
100A	22	22	22	22	38	38	38
150A	22	22	38	38	38	60	60
200A	22	38	38	38	60	60	100
250A	22	38	38	60	60	100	100
300A	38	38	60	60	100	100	150

*The figure shows the return length including ground cable.

5.3.2 Polarity

There are two methods of polarity, “STRAIGHT” and “REVERSE”. Select proper method regarding to the welding rod used and/or required conditions of work.



5.3.3Welding

CC MODE

<Procedure>

① Stop the engine and connect welding cable firmly to [welding terminal (+), (-)], and lock terminal cover.

② Set MODE SELECTOR at [CC] position (EW320DS-CC/CV)

③ Start the engine. (See 5.2.1)

④ Be sure to set voltage at ‘MAX’ position in order to be able to deliver maximum power from the machine (FOR STANDARD MODEL).

⑤ Select Auto-idling switch [ON] or [OFF] as occasion demands.

⑥ Adjust Current Regulator to the same point of dial, to get suitable current for welding work.

CURRENT

Adjustable current range

Current Selector	Single-operator mode
Current adjustable range(A)	30-300
Available welding rod(Φmm)	2.0-6.0

CV MODE (EW320DS-CC/CV)

<Procedure>

①Stop the engine and connect welding cables to [welding terminal (+), (-)], and lock terminal cover.

Select suitable cables according to the required conditions of work (refer to5.3.1)

Select proper polarity suitable for the work, and connect wire-feeder

②Set [MODE SELECTOR] at [CV] position

④Select Auto-idling switch [OFF] position.

⑤Connect the remote controller to REMOTE SOCKET

⑥Start the engine (refer to 5.2.1)

⑦Adjust remote controller to suitable voltage.

IMPORTANT!

- Before start welding, touch the base metal once with a welding rod, and so the engine will increase its speed to the rated value.

  If start welding suddenly when the engine is at idling condition, which may cause engine revolution speed lowres than rated speed, and may result poor welding.

- Put on slow-down switch everytime you start and stop the engine.

5.3.4 Duty cycle

The figure of Duty-Cycle means the available actual welding time during 10 minutes operation. The Duty-cycle of this machine is 50%, which means available to work continuously for 5 minutes during 10 minutes, and you should stop working for the rest 5 minutes

5.4 HOW TO USE AC. AUX. POWER

- Be sure to set BREAKER to [OFF], before connecting load cables.
- Ground the machine body-earth without fail.
- Be sure to use the load within the rated current limitation.
- Should BREAKER be tripped, stop the engine at once, check and confirm condition of the load and eliminate trouble, if any the start the engine again.

5.4.1 Selection of cables

- Be sure to use the cable of suitable size considering the applicable current of the cable and the distance from generator to the load.
- If improper cable were used, flowing current to the load may exceed its limitation and cause overheat and/or cannot deliver sufficient voltage to operate load resulting poor performance of load and/or even cannot operate load.

5.4.2 Connecting method of load

- Never connect receptacle of this machine to commercial power source. It is prohibited by the law and may cause electric shock, trouble of machine and even fire.
- Be sure to ground machine package and load as well. Installing on damp ground, iron-frame and iron-plate may cause electric shock.
- Never touch receptacle during operation.
- Be sure to set BREAKER to [OFF], stop the engine and pull starter key off when connecting and disconnecting the cab-tire cables. Starting key should be kept at hand of the operator.
- Be sure to use new, covered cable of properly insulated one against required voltage. Connect cable firmly to the proper terminals; otherwise loosening of cable may cause electric shock and/or even fire.
- Use suitable, cables Considering the capacity of load and distance from. generator to load.
- Confirm the phase and voltage of the load.
  Be sure to use and connect cable accordingly.
- Install [ON]/[OFF] switch panel between output terminals of the unit and load, as shown in the right, which enables ON' & 'OFF' of load not directly switching Breaker provided on the generator control panel.
- Be sure to take enough space between each cable in order not to touch each other.

5.4.3Actual use of AC. power

<Procedure>

①At first, stop the engine and set Breaker to [OFF]
②Connect load cable to the terminals firmly.
③Start the engine. (seeS.2.t)

④Select "Idle control switch" [ON] or [OFF] as occasion demands.
⑤Set Breaker to [ON], then power will be supplied to the load.

5.5 MAINTENANCE EVERY 100 HOURS

- If element is choked up and/or having a hole or a crack, dust and/or rubbish may sucked inside the engine, which may fasten defacement of moving parts and shorten the life of the engine. To keep engine life, routine inspection and cleaning is essential.

  AC. Load such as lighting equipments and electro-motive tools can be operated at the same time while welding. For the simultaneous use, pay attention to the following points.
- For the simultaneous use of AC. Power while welding, be sure to keep the limitation of the available range. The following table shows the relation between the available size of welding rod and the range of AC. Power.

Available range of Welder and AC. Power

Welding rod (mm)	2.0	2.6	3.2	4.0	5.0	6.0
Single-phase load only (KW)	5.0	5.0	5.6	4.0	1.6	0
Three-phase load only (KW)	9.0	8.5	7.0	5.0	2.0	0

NOTE: if one single-phase receptacle work: maximum power is less than 3KVA
If two single-phase receptacles used simultaneously: total power is less than 5KVA
If single-phase and three-phase receptacles used simultaneously, current of each phase must be less than 22.7A.

5.6 AUTO-IDLING DEVICE

- In case the AC. loads are small capacity like electro-motive tolls and/or motors with speed controller, set“Idle control Switch”to [OFF].

The Idle control device is provided to reduce the engine revolution speed automatically when the machine is not welding and/or supplying AC. Power, to save fuel consumption and reduce noise from the machine.

The Auto-idling device is available while welding, supplying AC. Power.

For the use of this device, set the switch to [ON] provide on the control panel.

Function of decontrol Switch when the switch is [ON]

*While welding:

The engine revolution speed will increase immediately up to its rated speed when the electrode touches the base metal. Just about 7 seconds after the operation is over, the engine will automatically

decrease its revolution to idling speed.

*While using AC. Power

About 1 A. of current flow, the engine will increase its revolution upto its rated speed, and the engine will decrease its speed to its idling speed about 7 seconds after cutting the load off.

6. PERIODIC INSPECTION AND MAINTANANCE

6.1IMPORTANT ITEMS AT PERIODIC INSPECTION, MAINTENANCE AND AFTER MAINTENANCE

The manual shows proper interval for periodic inspection and maintenance under normal operating condition. Inspection and maintenance should be performed more often under extremely harsh conditions.

- Before inspection, be sure to remove the starter key from the starter switch and hang up a "UNDER INSPECTION" tag where it can be easily seen. The checker must keep the key during working and maintenance and inspection work.
- Remove the negative (-) side cable from the battery. If the above procedure is neglected and should another person start operating the machine during inspection and/or maintenance, it could cause serious injury.
- Be sure to use appropriate tools for inspection and maintenance work. Inappropriate tools could cause unexpected injury.
- Place a container or a pan underneath the oil port to receive waste liquid so that such liquid cannot be split out on the floor or inside the unit.
- Be sure that no waste liquid is disposed of onto the ground. Such waste on the ground, river. or lake will cause serious, environmental contamination Be sure to follow the local code. If harmful materials such as oil, antifreeze solution or. filters are disposed of incorrectly, the responsible person should be punished by the authority.
- Be sure to use recommended fuel, oil, grease, and antifreeze.
- Do not disassemble or adjust engine, generator main body, or part(s) for which inspection or maintenance is not referred to in this manual.
- Use genuine parts for replacement.
- Any breakdown, caused by using non-designated parts or by wrong handling, will be out of the scope of "WARRANTY".
- Do not pour water and/or steam on electrical components.

6.2 DAILY INSPECTION AND KEEPING OPERATION LOG

- Be sure to carry out daily inspection every morning before operation. See Chapter 5 “OPERATION” of the manual for the details of inspection.
- Pay attention to and carefully observe the following points during daily operation or inspection and maintenance work. If any trouble or abnormality is found, immediately investigate its cause and make repairs. If the cause is unknown or not traceable, or if the trouble involves a part of component not described in the manual, ask your nearest dealer for information.

(a)Controls ad instruments function properly.

(b)Quantity and any leak of water, fuel, and oil or any contamination should be checked.

(c)Appearance, abnormal noise or excessive heat should be checked.

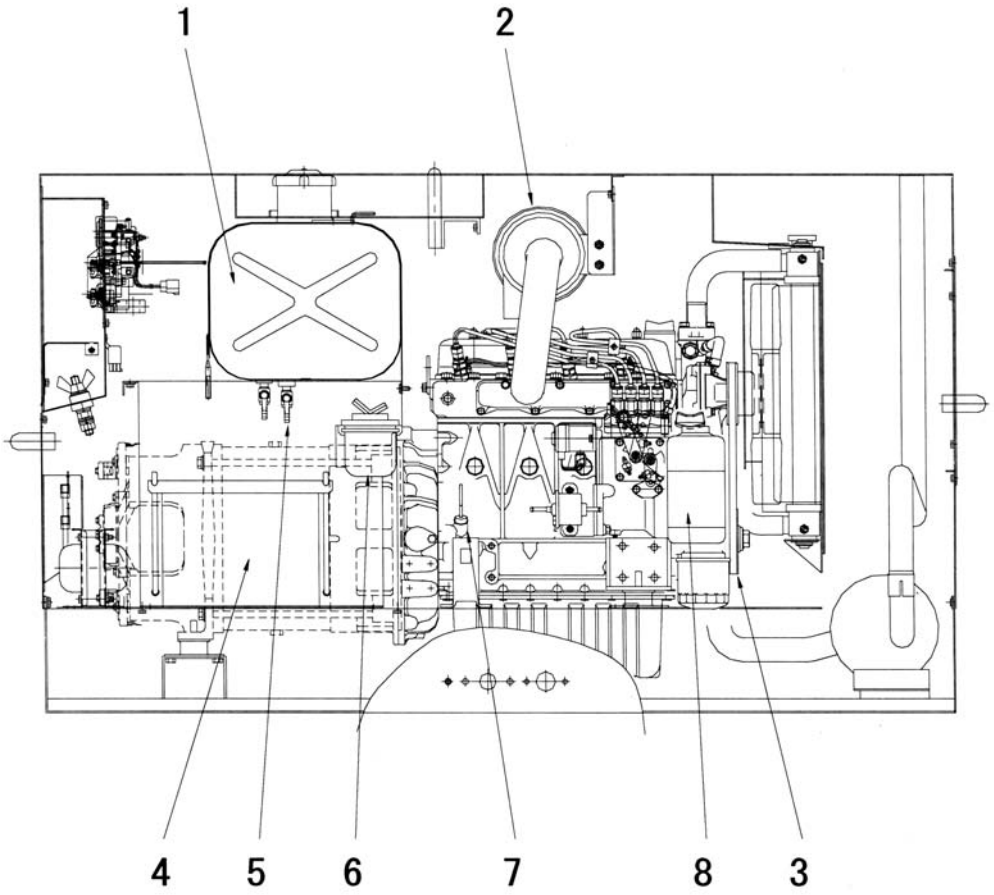
(d)Loose bolt or nut should be checked.

(e)Any damage, wear or shortage of machine components and parts should be checked.

(f)Performance of each part or component should be proper

- Keep the operation log to record constant inspection of each component, so that trouble of the unit can be easily discovered and preventive measures can be taken. It is very useful to record information such as frequency, temperature, current, maintenance items and replenishment of lubricant on a daily maintenance log.

6.3 ITEMS AND PLACE OF INSPECTION



NO.	*ITEMS*
1	AMOUNT OF FUEL
2	INSPECT THE CLOGGING OF AIR FILTER ELEMENT
3	TENTION OF FAN- BELT
4	LEVEL OF BATTERY-LIQUID
5	DRAINING OF WATER POOLED IN FUEL TANK
6	CONDITION OF FUEL FILTER
7	CHECK AMOUNT OF LUBE..OIL AND REPLENISHING
8	AMOUNT OF COOLNG WATERS

6.4 FIRST MAINTENANCE AT INITIAL 50 HOURS

6.4.1 Change Engine Oil

<At 50 hours of the first change and every 200 hours.>

- When checking, replenishing, and draining the engine oil, be sure to wait 10 to 20minutes after engine stops until it cools down.
- Engine oil becomes very hot and highly pressure during and/or just after the operation. Careless handling may cause serious injury.
- Be sure to use the engine oil of the class CD or superior one. (Using engine oil of poor quality may shorten the life of the engine).
- When two or more different brands of oil are mixed, its performance can be deteriorated. Do not mix oils.

(Procedure)

① Loosen the drain plug located outside of the frame to drain the oil.

② When oil is completely drained, close the drain plug firmly and refill new engine oil through the filler port.

③ When the oil is refilled, fasten the filler port cap tightly.

6.4.2 Change Oil Filter Element

<At 50 hours of the first change and every 200 hours thereafter>

(Procedure)

①Detach oil filter (2) using filter wrench (1). Be careful oil remained inside the filter may flow out when detaching.

②Spread oil over the gasket of element before inserting new cartridge in the filter-cup.

③Screw in the new element and when the gasket touches the surface of seal, further tighten the filter by approximately two-thirds turn with a filter wrench.

④After the oil filter is assembled, check and confirm that no oil is leaking during operation.

6.5 MAINTENANCE EVERY 100 HOURS

6.5.1 Check tightness of wiring connection of output Receptacle.

Loose terminal connection may cause fire due to overheat. Check wiring connection of output terminals periodically.

6.5.2 Inspection of tightness of fuel pipe/fuel-returning pipe and bands

If fuel pipe, fuel returning pipe and/or bands are loosen, fuel may and cause serious troubles, Periodically check tightness of pipes and bands and when loosening is found, tighten them firmly.

6.5.3 Clean and Change Air Filter Element

IMPORTANT!

- Air filter is a critical component for the performance and the life of a unit. Use our genuine parts for replacement. And fix firmly, otherwise dust and/or rubbish may be sucked in, which may haste the wareing of cylinder liners and/or piston rings.

pressing the test button (1).

① Detach air filter element and blow air from inside of the element.

② After cleaning, light up inner surface of the filter.

If pinhole and/or thin region are found, replace with new one.

6.6 MAINTENANCE EVERY 200 HOURS

6.6.1 Change Engine Oil

Follow the same procedure for changing engine oil as mentioned in 6.4.1.

6.6.2 Replacement of Engine Oil Filter

Refer to the Section 6.4.2, and follow the procedure stated in.

6.6.3 Check Insulation Resistance

Make it a rule to measure Insulation resistance of the generator before operation to avoid troubles and/or accident caused by electrical leakage and electric shock.

Stop the unit without fail when measuring insulation resistance.

- When the generator has not been operated for a long time or rainwater has got inside the machine, be sure to measure' the insulation resistance before operation. If it is reduced below 1MΩ, it could cause an electrical leakage or fire. Dry up the generator until the resistance exceeds 1M Ω, prior to operation.
- Since the generator insulation may drop when moisture, oil vapor, and dust are stuck, always keep the machine clean.
- All the ball bearings used are sealed type, there is no need to supply grease.

(Procedure)

①Remove the load side cable from the output terminals.

②Open inspection cover of the unit and remove AVR and WCR connector inside the control panel.

③ Check and confirm insulation resistance of single-phase AC wiring. Measure resistance between output terminal and bonnet fixing bolt with 500V. Mega-tester. If its insulation resistance is over 1MΩ, it is good.

④Confirm insulation resistance of welding wiring. Remove generator inspection cover beneath the control panel, detach welding wiring(2)from welding thyristor(1) and measure resistance between that detached welding wiring and bonnet fixing bolt with 500 V. Mega-tester.

If its insulation resistance is over 1MΩ, it is good.

6.7 MAINTENANCE EVERY 300 HOURS

6.7.1 Measure Specific Gravity of Battery Fluid

- NO FIRE
- Battery may generate hydrogen gas and may explode.
- Therefore, recharging should be done in a well-ventilated place.
- Never spark nor light a match nor smoke near the battery.
- Check battery using Voltmeter or Gravity meter. Do check battery by short-circuiting the positive(+) and negative(-) terminals with metallic materials.
- Do not charge the frozen battery to avoid explosion. If the battery is frozen, warm it until the temperature of battery rises up to 16 to 30℃
- Battery electrolyte is dilute sulfuric acid. Careless handling may cause skin burning.
- Wear protective gloves and safety glasses when handling a battery.
- When electrolyte solution contacts your clothes or skin wash it away with fresh water at once.
- If the battery electrolyte gets into your eyes, wash it away immediately with plenty of water, then see a doctor at once, otherwise it is feared your eyesight might be lost. Dispose of battery, observing local regulations. Never reverse the cable connections.
- When there is no choice but to use booster cables or when a set of cables are connected after changing, be sure to connect the electric terminals (+) and (-) correctly. Reverse-connected cables will cause components sparks or damage components.

If there seems to be a problem in starting the engine due to discharging of battery, carry out the checks by following the procedures bellow:

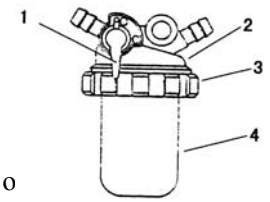
(1) Enclosed type battery:

Check the indicator on top surface of the battery. If the indicator shows that charge is needed, recharge the battery at once.

(2) Ordinary type battery:

Measure specific gravity of battery electrolyte, and if it shows below 1.24, recharge the battery immediately Refer to 7.2. for method of specific gravity measurement and recharging the battery.

6.8 MAINTENANCE EVERY 450 HOURS



6.8.1 Replacement of Fuel Filter Element

(1) Replacing procedure:

①Turn fuel filter lever(l) to "CLOSE".

② Loosen ring nut(3) and remove cup(4), then detach element o

③ Clean cup(4), set new element into cup and attach new packing onto ring-nut.

④ Attach cup(4) with new element inside and fasten firmly onto body(2) with rims-nut(3).

⑤ Turn fuel filter lever(l) to "OPEN".

(2) Air-bleeding of fuel system:

Be sure to eliminate air in the fuel system completely when replacing fuel filter. (Refer to 5.2.5)

6.8.2 Olean Interior of the Radiator

- When inside of radiator or water piping of the engine is dirty with scale and rust, its cooling efficiency will drop. Olean the inside of the radiator periodically.
- Contact your nearest dealer for cleaning the interior of radiator.

6.9 MAINTENANCE EVERY 1YEAR

6.9.1 Replace Air Filter Element (1year or every cleaning 6times)

Remove air filter element and replace with new one. (See 6.5.3)

6.10 MAINTENANCE EVERY 2YEARS

6.10.1 Change Coolant

- Be sure to stop the machine and confirm that coolant is cooled enough and inner pressure is released, then loosen the radiator cap and take it off.

  Neglecting this procedure, inner pressure may blow cap off and steam jetting out of the radiator could cause scald.

  ★LLC<Long Life Coolant) is POISONOUS>

  - Should any person be drunk LLC by accident, make him vomit and see a doctor at once.
  - When LLC is splashed into one's eyes, wash eyes with clean running water and make him see a doctor immediately.
  - For Storage, be sure to keep it in a container with visible clear indication [LLC bottled], seal it up and keep it away from children.
  - Beware of flames.

- Follow the designated regulations to dispose of LLC.
- Use soft water of good quality for coolant such as tap water. When water with dirt, sand and/or dust contained, or hard water such as well water (ground water) is used, which may cause deposits inside radiator or on cylinder head, and will cause engine overheat due to poor flow of coolant.
- We recommend to use LLC where the unit is used in a cold region and possible freezing is expected.
- Adjust mixing ratio of LLC with water according to the ambient temperature.
- Use LLC Within. the range of mixing ratio between 35 and 60%.
- More than 60 %. of mixing ratio may decrease its antifreeze effect.

(Procedure)

①To drain coolant, remove the radiator cap, and loosen drain plug 1.

②After draining coolant completely, close drain plug again and fill new coolant mixing LLC from the filter port up to the "FULL" level of reservoir tank. Pour coolant slowly in order to avoid air contamination.

③After changing the coolant, run the engine without load for about 5 minutes, then stop it. Check the coolant level again after the engine cools down and replenish coolant if necessary checking its level in the radiator and reservoir tank.

6.11 PERIODIC INSPECTION LIST

○: Replacement. △: Inspection/Cleaning /Replenishment.
〈※: Initial replacement timing〉

Follow Engine Instruction Manual for tetail, concerning maintenance of Engine.

	Maintenance	Daily	First 50hrs	Every 100 hrs	Every 200 hrs	Every 300 hrs	Every 450 hrs	Every 1year	Every 2year
GENERATOR	Check grounding of body earth	△							
	Check measuring instruments and warning lamp	△							
	Check wiring connection of output receptacle			△					
	Check insulation resistance				△				
ENGINE	Check engine oil level and cleanliness	△							
	Check amount of coolant	△							
	Check radiator cap status	△							
	Check level of battery liquid and status of terminals	△							
	Check fuel level	△							
	Drain condensate from fuel tank	△							
	Remove water from fuel filter	△							
	Check tention of fan belt	△							○ or 500hrs
	Check looseness in wiring connection and tear	△							
	Check leakage of oil, coolant and fuel	△							
	Change engine lube. oil		※○		○				
	Replace oil filter element		※○		○				
	Check looseness of fuel pipe, fuel return pipe and band			△					
	Clean and change air filter element		△	△				○ or cleaning 6time	
	Check & confirm gravity of battry liquid	△				△			○
	Change fuel filter element						○		
	Clean interior of radiator						△		
	Change coolant								○
	Clean interior of radiator						△		

7. MAINTENANCE ADJUSTMENT

7.1 MANTENANCE OF BATTERY

7.1.1Measure Specific Gravity（Applicable only for standard type batteries）

- When the electrolyte level is found below the lower limit without a trace of electrolyte leakage, refill the distilled water so that the electrolyte level can be between upper and lower levels.
- To compensate for the shortage of electrolyte due to spilling, or to measure or change the specific gravity, remove the cap and measure the specific gravity of electrolyte by using a hydrometer.
- Only responsible person for handling is allowed to measure the specific gravity and to mix electrolyte.

7.1.2 Charge Battery

- Disconnect cable between battery and unit, charge battery with 12V battery charger. Do not charge two or more batteries at the same time.
- Be sure not to connect (+) and (-) terminals backwards.
- Be sure to read operation manual of battery charger to understand whether it is applicable for the battery you charge before usage.

[reference] Condition of battery concerning gravity

Gravity	condition	countermeasure
over 1.28	too high gravity	Check amount of liquid and pour electrolyte
1.28 ～ 1.25	in good condition	
1.25 ～ 1.24	fair condition	Recharge battery in case gravity is inequal
less 1.24	poor condition	Recharge battery immediately

7.1.3 How to Use Booster Cable

<Do not connect the cable reverse>

⚠ CAUTION

● When booster cable has to be used or when battery is replaced and cables are connected again, be careful not to connect (+) and (−) terminals backwards. Such incorrect cable connection will cause spark and damage to each component.

(Procedure to use booster cable7

①Stop the engine.

②Connect one end of the (+) cable to the (+) terminal of the machine battery.

③Connect the other end of the (+) cable to the (+) terminal of the external battery.
④Connect one end of the (-) cable to the (-) terminal of the external battery.
⑤Connect the other end of the (-) cable to the engine block of the machine.
⑥Start up the engine.
⑦Disconnect the booster cable by following the procedure back in the reverse order.

7.2 TROUBLE-SHOOTING

- Should any breakdown occur during operation, do not leave it. Investigate the cause and take appropriate measures.
- Read the manual carefully and fully understand what to do in case of trouble.
- The better you understand the construction and function of the unit, the faster you can find a problem and solution.
- This chapter describes the state, cause and countermeasures of important breakdowns in detail:

Symptom	Cause	Countermeasure
Monitor lamps (pre-heat, oil press. charge) do not glow when starter switch is ON.	·Battery is discharged ·Fuse(EF1,EF2) are broken ·Loose wiring, connectors or disconnection	Check/charge or change Check/Replace Check and correct
Low starter rotation and Engine does not start up.	·Battery is discharged ·Fuel cock is closed ·fuel shortage ·Inadequate fuel ·Fuel filter element is clogging ·Faulty of electromagnetic pump ·Faulty of stop-solenoid	Check/charge or change Open cock (O=open, C=close) Replenish fuel Switch to adequate fuel Change element Check/Replace Check/Replace
Engine oil pressure warning lamp glows	·Engine oil shortage ·Faulty of oil pressure switch ·Loosening and/or disconnection of wiring and/or connectors	Replenish lube. Oil Check/Replace Check and correct
Water temperature warning lamp glows	·Radiator clogging ·Shortage of cooling air ·Coolant shortage ·Faulty of water temp. switch	Clean radiator Correct tension of fan belt Replenish coolant Check/Replace
Charge warning lamp glows	·Alternator faulty ·Regulator faulty ·Loosening and/or disconnection of wiring and/or connectors	Check/Replace Check/Replace Check and correct
Low engine rotation ·Accelerator actuator operates ·Accelerator actuator does not operate	 ·Fuel filter element is clogging ·Air filter is clogging ·Idle control switch stays ON ·Loosening, disconnection and poor contact of wiring and/or connectors of Auto-idling switch controller	 Change fuel element Change air element OFF the switch and check Check and correct or change controller

Symptom	Cause	Countermeasure
No generation	·Trouble with Voltmeter ·Disconnection or damage of AVR fuse	Check/Replace Check/Replace
No welding	·Trouble with WCR or thyristor ·Reactor faulty	Check/Replace Check/Replace
Poor welding performance	·Engine speed is lowered ·Inadequate polarity selection ·Reactor faulty	Adjust engine speed Change polarity Check/Replace
Insufficient welding current	·Improper current control ·Improper size & length of cable	Adjust properly Select suitable cable
Current controller ineffective	·Current controller faulty or disconnected ·WCR or thyristor faulty	Check/Replace Check/Replace
Insufficient AC. Power	·Beaker is at OFF position ·Beaker is operating	Turn Beaker ON and check Check load-side
Cannot operate voltage controller	·AVR faulty ·Voltage controller faulty or disconnected	Check/Replace Check/Replace
Auto-idling does not work	·Idle control switch is OFF ·Idle control switch faulty ·Loaded ·Improper adjustment of accelerator actuator ·Auto-idling timer faulty, loosening and/or disconnection of wiring ·Auto-idling controller faulty	Turn switch ON and check Check/Correct/Replace Disconnect load and check Check/Replace Check/Correct/Replace Check/Replace
Battery discharges abnormally fast	·Starter switch is remaining ON. ·Deterioration of battery	Check key position Replace battery
Engine shows loaded condition	·Short-circuit of Alternator lead-wire	Repair
Abnormal vibration	·Improper installation	Install securely
Irregular noise	·Loosening or lost of bolt	Check and tighten bolts

★ Contact your nearest dealer if you find it difficult to repair by yourselves.

★ Refer to the engine operation manual for troubles concerning the engine.

8. PREPARATION FOR LONG TERM STORAGE

8.1 DAIRY STORAGE

Be sure to store the unit in dry and clean place, without dust, salty atmosphere, and keep the unit on a flat level place.

8.2 LONG TERM STORAGE

When the unit is to be kept unused and stored for a long time, be sure to follow the preparations below and put the unit in a dry and clean place without dust.

(1)Put the unit in a temporary cabin in case it will be stored outside. Never leave the unit outside with only a sheet cover directly on the unit for a long time, to avoid the unit from rusting.

(2)Run the unit at lease 5 minutes once every week to circulate oil to each rotating part of the unit.

(3)When the unit is stored where above mentioned routine running is difficult, be sure to follow the procedure stated below.

<Procedure>

①Discharge existing lubricant from the engine oil pan.

Pour new lubricant into the oil pan to clean its inside and run the engine for a while, then drain it again.

②Spread lubricant on every moving parts.

③Charge battery to the full and disconnect grounding wires. Remove the battery from the unit, as far as possible, and store it in a dry place.

<Charge the battery once a month, to keep normal cell-voltage>

④Discharge coolant and fuel oil completely from the unit.

⑤Seal every opening part of the engine such as air intake, muffler and etc., with vinyl sheet or packing tape, etc., to avoid any moisture and dust getting into the unit.

⑥Be sure to repair any broken and/or faulty part and maintain the unit so that it can be ready for the next operation.

(4)Run the unit at least once every 3 months, and check and keep the unit always in good conditions.

9. SPECIFICATIONS

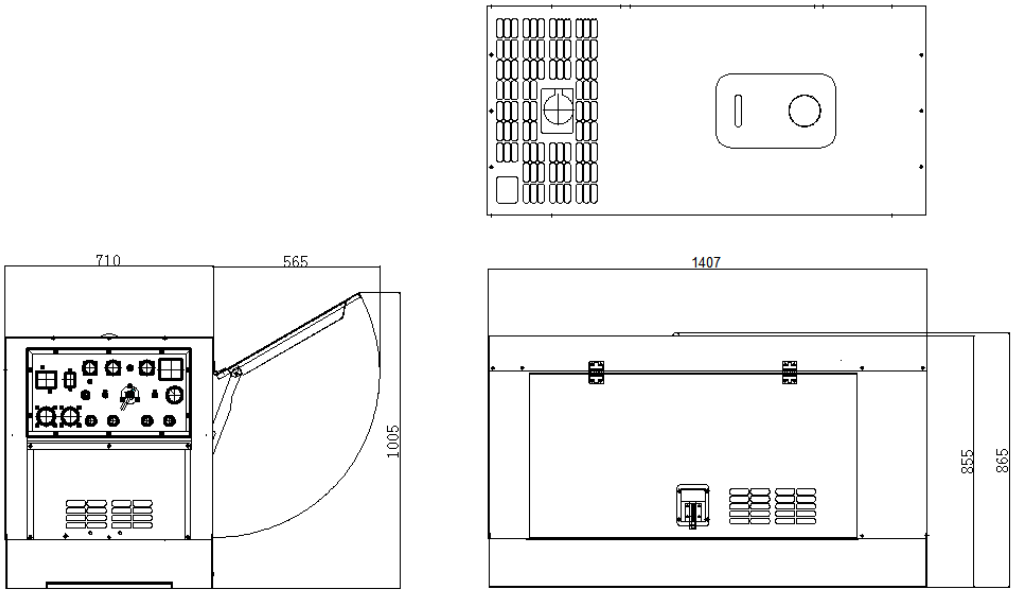
9.1 SPECIFICATIONS

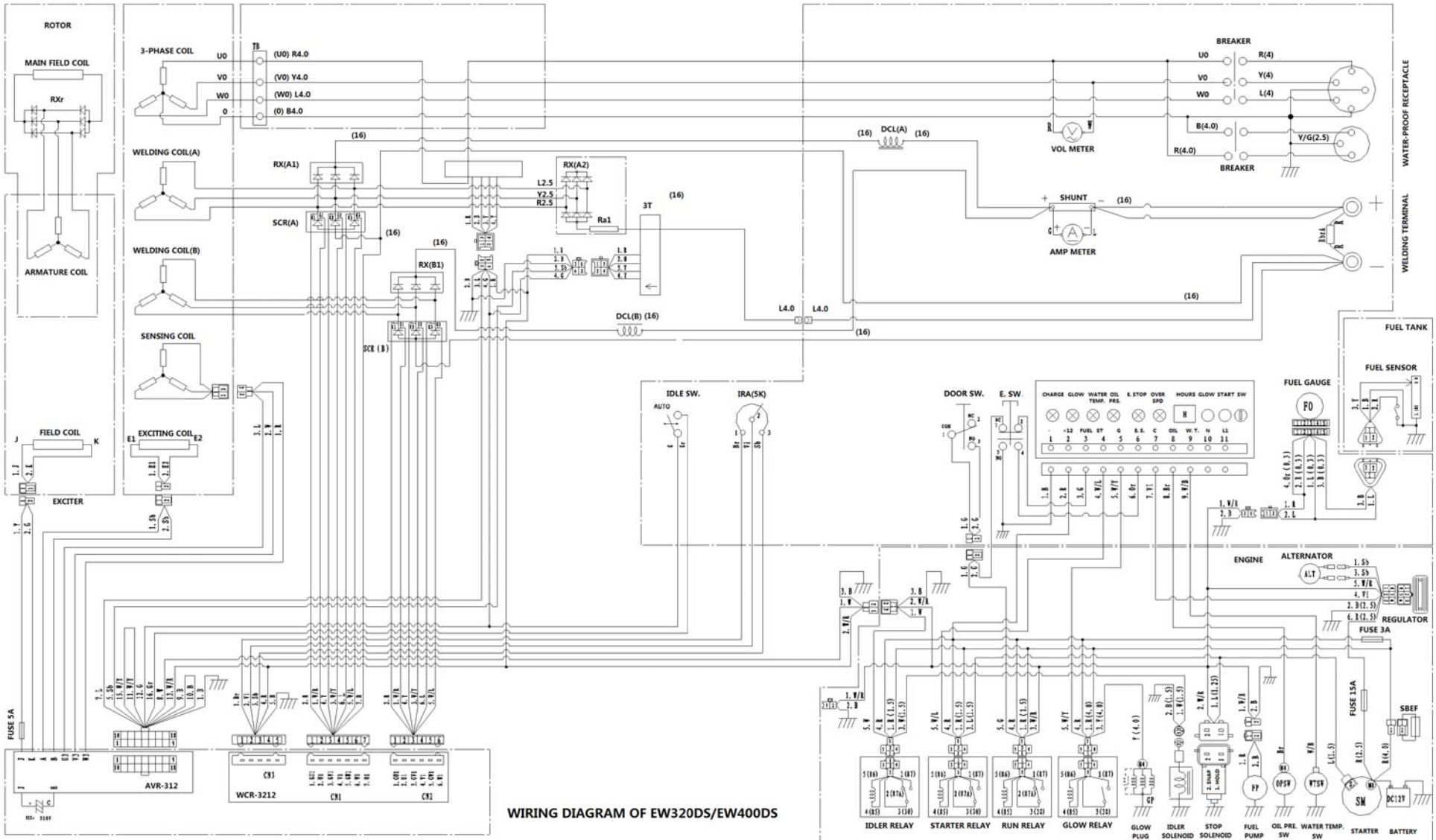
SET MODEL: EW320DS (EW320DS-CC/CV)

Generator		
DC Welder (CC MODE)		
Rated Output	KW	9.6
Rated Current	A	300
Rated Voltage	V	32
Current Range	A	30-300
Open-circuit Voltage	V	70
Duty Cycle	%	60
Rated speed	rpm	3,600
Type	-	Rectified DC output type
Applicable Electrode	mm	2.0-6.0
DC Welder (CV MODE)		
Voltage Range	V	20-40
Rated Current	A	60-300
Aux. power		
Rated Output	KVA	15
Rated Voltage	V	440
Phase	-	3-phase/4 wires
Power Factor	%	80
Frequency	Hz	60
Rated Speed	rpm/min	3,600
Excitation	-	Brushless
Driven	-	Direct Coupling
Engine		
Model	-	Kubota D1005
Type	-	4-cycle, water-cooled diesel engine
Cylinder arrangement	-	3-L
Total displacement	cc	1001
Rated Output	KW	17.5
Speed	rpm	3,600
Cooling System	-	Water-cooled by radiator type

Driven	-	Direct Coupling
Fuel		Light diesel oil
Start System	-	Electric motor（12V）
Fuel Tank Capacity	L	37
Oil Capacity	L	5.7
Battery Capacity	-	12V-45AH/HR
Dimension （L×W×H）	mm	1407×710×865
Net Dry Mass	Kg	410
Operating Mass	Kg	450

9.2 OUTLINE DIMENSION





WIRING DIAGRAM OF EW320DS/EW400DS