PREFACE

● Thank you for purchasing our ultra silent diesel genset.

This manual will tell you how to install, operate and maintain diesel the gensets correctly.

Please read this manual carefully before using this genset and ensure you understand all procedures regarding handling, operation, servicing and maintenance prior to use.

Failure to follow these instructions may cause serious personal injury and equipment damage and shorten its working life.

If you have any comments or problems, please contact us or your local distributor.

Please pay more attention to the warnings and cautions throughout the manual.

⚠ WARNING

Failure to observe the warning notices throughout this manual to prevent severe personal injury or death due to incorrect operation.

Safety information contained in this introduction is extremely important. Read this manual carefully before using it.

● Only qualified technicians are allowed to operate this genset.

● Please read this manual carefully and keep it available at all times.

● Please contact the factory or your distributor if this manual is lost or damaged.

● Please transfer this manual if you lend or sell this genset to others.

● Our continually seeks advancements in product design and quality. Therefore, while this manual contains the most current product information available at the time of printing, there may be minor discrepancies between your genset and this manual. If there is any question concerning this manual, Please consult a Our dealer.

● Pay close attention to particularly important safety information distinguished in this manual.

Contact information for parts purchase and damage

For part purchase and repair, please give the following information to our company and after-sale service of the company.

Genset model： RDE20SS3

Actual working hours: 200Hours

CONTENT

1. SAFTY INSTRUCTIONS

⚠ WARNING

Please read all safety instructions carefully. It may cause severe personal injury if you fail to comply with these instructions.

1.1 Safety symbols

Please pay special attention to the material in this manual when preceded with the following symbols:

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

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

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

【Note】

Indicates a possibility of equipment damage if instructions are not followed or provides helpful information.

⚠ CAUTION

- Please transfer this manual if you lend or sell this genset to others.
- Any modification without authorization from the factory is strictly prohibited. The generator may be damaged or the service life shortened. Also, the possibility of severe personal injury exists. The warranty may also be invalidated.
- Always use genuine Our service and replacement parts to insure proper operation of the genset.

⚠ CAUTION

The company cannot predict all the dangers during the operating, checking and maintenance process. Customers should take into full account of some safety issues that are not covered in this manual.

1.2. Safety Information and Specific Hazards

⚠ CAUTION **Operator**

- Don't use this genset when you are tired, ill or physically impaired
- Please wear protective clothing and personal protective equipment
- The genset should be operated by experienced technicians otherwise it may cause injuries or electric shock accidents.
- Never operate the genset before receiving relevant training programs or correct guidance.
- Keep children and pets away from the genset.

⚠ CAUTION **Abnormality**

- Only qualified technicians are allowed to operate this genset
- If the genset seems abnormal during operation such as strange sounds, vibrations, exhaust leaks, fluid leaks or system alarms, stop the genset immediately and determine the cause of the malfunction. Don't use the genset until is it back in a normal state of operation.

⚠ DANGER **Exhaust gas is toxic**

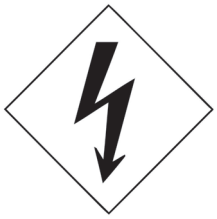
- Exhaust gas contains poisonous carbon monoxide that will kill you
- Always run the genset in a will ventilated area.
- Any operation indoors must be done in a specially designed room with provisions for proper ventilation and exhaust.
- The exhaust may not be directed toward any residential areas or offices
- Install the drain plug tightly to prevent waste gas leakage.

⚠ DANGER **Rotating parts**

Don't touch any moving parts to avoid severe personal injury

- Close and lock all cabinet doors while the genset is in operation If you have to open a door, keep your hands head and clothing away from moving parts
- Please stop the genset before any checks or service.
- Some electric cooling fans will continue to run after the generator is stopped. Ensure it has stopped rotating before working in the area of the radiator and fan.

⚠ DANGER **Electric shock**



- Touching the output terminal during operation can cause a severe electric shock injury or death. Never touch the genset with wet hands.
- Turn off the circuit breaker and stop the genset before connecting terminals(When gensets are running in parallel, other power should also be shut down)
- Close the output terminal cover and tighten all screws before running this genset.
- Output voltage will hurt you even at idle speed. Stop the genset before checks or service
- Never touch electrical circuits in the control panel when the genset is running. Close the control box, tighten the screw before running the genset.
- Turn off the main circuit breaker, stop the genset and pull out the start key before working in the control box
- If the circuit breaker is defective replace it with a Our supplied part of the exact same rating
- Ground the genset correctly.

⚠ DANGER **Grounding protection**

- If the genset is improperly grounded, the genset or operator is not fully protected from electric shock leading to injury or death. Refer to section 4.2 for proper grounding instructions.
- The terminals, generator frame, enclosures and loads must be properly grounded.

⚠ CAUTION **Fire hazard**

Fuel, oil, antifreeze and battery gasses are extremely flammable and can lead to fire or explosion.

- Stop the genset and allow it to cool before refueling in a well-ventilated area. Keep cigarettes, sparks and any other source of combustion away from genset.
- Don't place any flammable (paper scrap or its of wood)and explosive materials (oils and fats, thinner and gunpowder) in the vicinity of the generator

- Wipe up spilled fuel, oil, or coolant immediately.
- Special precautions shall be taken while using the genset in an area with potentia fire risks.

- Do not place any inflammable material close to the muffler.

⚠ CAUTION **Hot parts**

Hot parts inside the generator are very dangerous

- Lock the cabinet doors and keep your hands away from the muffler, exhaust elbow and pipes, cylinder heads, engine block, radiator and hoses, generator frame and any other hot parts.

- Stop the engine and wait until it's cool before checks or service
- Some parts remains hot for a long time even after the genset has stopped.
- When the engine is shut down, cooling water and oil remain hot. Do not drain oil and water or replace filter to prevent scald.

⚠ CAUTION

Don't remove the radiator cap while the engine is hot. Hot water or steam may burn you seriously.

- Engine coolant is very hot and under high pressure. Don't open the radiator cap until the engine completely cooled or steam and hot water will be released and cause burn injuries.
- Inspecting the coolant level and servicing the cooling system must be done before operating the generator or when the engine stopped and the coolant temperature falls to 50℃.

⚠ CAUTION **Battery**

The battery may produce flammable gas. Be careful to avoid any injuries from an explosion.

- Charge the battery in a well-ventilated area to prevent a fire or explosion. Charging produces gaseous vapors.
- Never connect the positive terminal with negative terminal at the same time. Don't apply reverse polarity or short circuit will produce spark which will cause inflammable gas explosion.
- Please disconnect grounds before service.
- The electrolyte of battery is dilute sulphuric acid, careless operation may cause to burn. If your skin or clothing comes into contact with electrolyte, flush with lots of water. If it enters your eyes, flush your eyes with large amounts of water and seek immediate medical attention.
- Always stop the genset before checking the battery.
- Do not use the battery if the battery indicator shows the white color which means the aging of the battery. The aging inside the battery will shorten the battery service life and may cause explosion.

⚠ CAUTION **Noise**

- Close the doors while running to prevent abnormal generator noise.
- When working in close proximity to the generator with the doors open, wear ear plugs or other protective hearing protection.

Noise instructions:

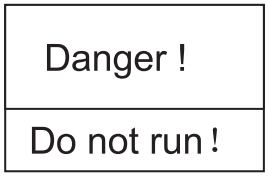
The noise level listed in this manual is not safety working level but emission level. There is a linkage between emission level and noise level. The emission level cannot be regarded as the standard to decide whether the noise protection measures need to be taken.

Factors affecting the actual noise level include the environment of the operating room and other noise sources (The quantity of the generators, working hours in the noisy environment, etc.) Noise level varies with different countries.

⚠ CAUTION **Cable connections**

- Use an isolating switch or a double-throw switch and cut off utility power before connecting cables to a factory or other buildings.
- Only qualified electricians are allowed to make cable connections.
- Comply with all local rules and regulations before using the genset.

⚠ WARNING **Maintenance practices**



- Severe personal injury can result if someone else starts the genset during a check or service.
- Place an appropriate warning label such as “DANGER! DO NOT RUN” in a clearly visible position near the starting switch in order to prevent others from starting the genset unexpectedly.
- Never check or service the genset when it is still running unless stated in the engine or generator service manuals.
- If you have to run the genset for troubleshooting, two people should be involved- one for performing the maintenance and the other ready to stop the genset in an emergency.
- Keep your body or clothing away from moving parts.

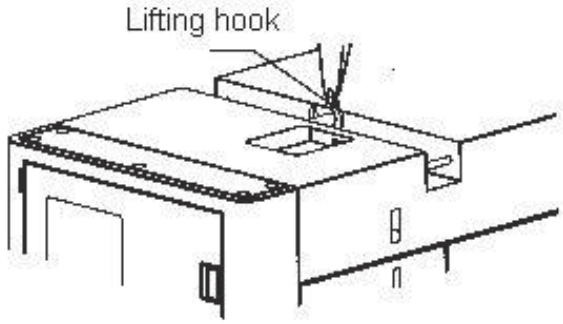
⚠ CAUTION **Dispose of used liquids properly**

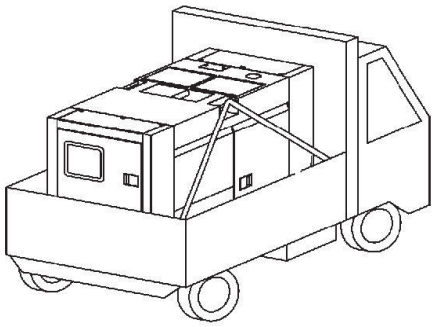
- Waste fuel, oil, coolant and dead batteries will pollute the environment seriously.
- Use a proper container while draining fuel, oil or coolant. Never pour liquids directly into any body of water or on the ground.
- Dispose of fuel, oil, cooling water ,solvent, filter and battery properly in accordance with local regulations.

⚠ CAUTION **Transportation**

Don't use ladders and ropes to lift the genset to prevent the generator from falling.

- Lift the genset at the lifting rod at the center of the canopy or use the forklift slots. The outer lifting rods can be used to stabilize the genset while lifting. Use steel cables or adequate straps that can bear the weight of the genset safely.
- Don’t stand under the genset while lifting.
- Don't lift the genset while the engine is still running to prevent a serious accident.
- Bind the genset securely when transporting in a truck or trailer.



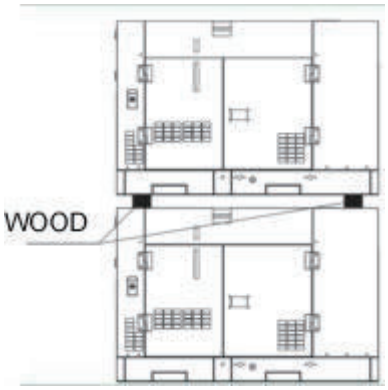


⚠ CAUTION **Storage**

• Use extreme caution when stacking generators to prevent falling.

•Make sure that the genset enclosure is not broken and all fasteners are intact.

• The genset should be put on level ground which is hard enough to support its weight.



•Do not stack more than two high. Put the heavier of two generators on the bottom. Protection measures should be taken between generators.

•Never run the generators when they are stacked together. The vibration may cause one generator to shift and fall.

⚠ CAUTION **Explosion-proof of Illuminating equipment**

• Use explosion-proof illuminating equipment to check fuel, oil, cooling water and battery electrolyte to avoid explosion.

CAUTION **Fire fighting equipments and first-aid kit**

- Fire fighting apparatus should be equipped to avoid fire hazard.
- First-aid kit is required.
- Place a poster on site to indicate how to fight against fire risk and accidents.
- Display the contact information of emergency center on the working site.

CAUTION **Periodical replacement of important parts.**

- To prevent fire risk due to aging and damage of the parts, following items should be replaced periodically.

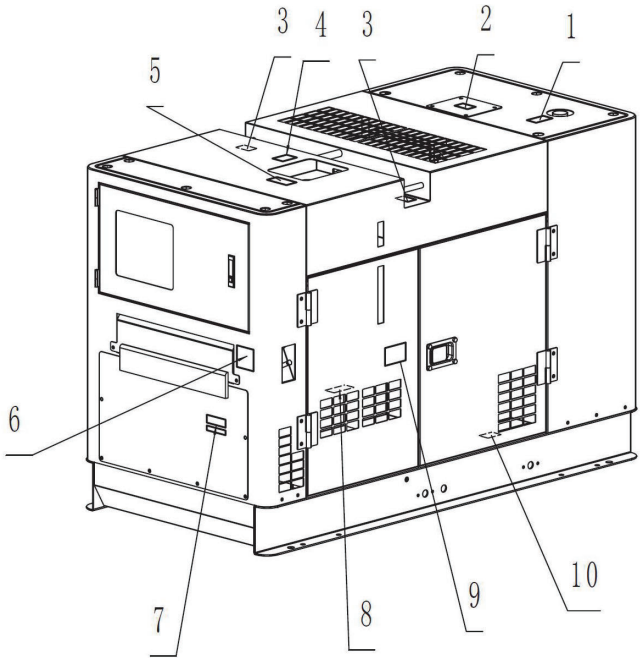
Fuel system: Some parts should be replaced periodically even if there is no abnormality, such as fuel flexible hose, fuel hose and fuel tank cap.

1.3 Warning labels

Warning labels are put on the products for safety concerning.

Labels should be clean regularly to prevent pollution and damage. New labels should be posted if any labels are damaged or lost.

(1) Post position for warning stickers.



Ref	Warning description	Ref	Warning description
1	(Air exhaust, scald) Labels	6	(Operation notice) Labels
2	(High temperature) Labels	7	(Electric shock notice, grounding connection) Labels
3	(Lifting forbidden) Labels	8	(Battery notice operation） Labels
4	（Lifting position） Labels	9	（Prevent being involved in） Labels
5	（No smoking） Labels	10	（Check the inside of the engine） Labels

(2) Warning labels

a. Air exhaust notice

b. Prevent scald notice

c. Lifting position

d. Lifting position

e. No smoking

f. Do not get involved in the machine

g. Check the inside of the engine:

2. PRODUCT DESCRIPTION

2.1 Applications and laws

● This genset is to be used as prime or standby power for outdoor work. In some countries it is illegal to connect to indoor distribution terminals. Comply fully with local regulations and laws.

● This genset is categorized as a mobile power set. Please make relevant declarations as local laws require.

● Only qualified technicians are allowed to operate this genset.

⚠ DANGER

Connecting the genset to other power supplies such as utility power is strictly forbidden. Only a qualified technician is allowed to connect this genset to loads.

⚠ CAUTION

Lock the control panel door and maintenance door securely when it is not in use. Keep the door keys by the operator for safekeeping. Keep children and any other personnel who are unaware of the dangers away from the genset.

2.1.1 General instructions:

Ref	Item	Description
1	Application	Outdoor standby power
2	Output rated power Environmental conditions	Ambient temperature：5℃～25℃ Relative humidity：30％ Elevation: 0～1000m
3	Installation condition	On hard level ground

⚠ CAUTION

Refer to controller operation manual for the detailed instruction of genset control system. Carefully refer to the controller operation manual will ensure the safe operation of the genset and bring you best benefits.

⚠ CAUTION

Please pay attention that all the pictures in the operation manual are taking RDE20SS3 as example. Other genset models are somewhat different from this model.

2.2 Genset main technical parameters

2.2.1 Power Derating

Test conditions:

Altitude: ≤1000 m Ambient temperature: 5℃～25℃ Relative humidity: 30％

Power derating factor：C (@ 30% relative humidity)

Altitude	Ambient temperature （℃）				
（m）	25	30	35	40	45
1000	1	0.97	0.94	0.91	0.87
2000	0.87	0.84	0.81	0.78	0.74
3000	0.73	0.7	0.67	0.64	0.60
4000	0.60	0.57	0.54	0.51	0.47

Note: (1) The power derating factor is C-0.01 @ 60% relative humidity

The power derating factor is C-0.02 @ 80% relative humidity

The power derating factor is C-0.03 @ 90% relative humidity

The power derating factor is C-0.04 @ 100% relative humidity

(2) When the altitude is below 4000 meters, the power derates 4% for every 300 meters

(3) When the ambient temperature is above 25°C, the power derates 3% for every 5° increase in temperature. When the ambient temperature is above 40°C, the power derates 4% for every 5° increase in temperature

(4) When the ambient temperature is lower than 5°C, the power derates 3% for every 5° drop in temperature. Use heating equipment such as space heaters, water jacket heaters, fuel heaters, block heaters, etc. to raise the temperature.

For example：

The rated power of the genset is 20KW (PN) in test conditions. To determine the power if the altitude is 2000 meters, the ambient temperature 40°C and the relative humidity is 80%:

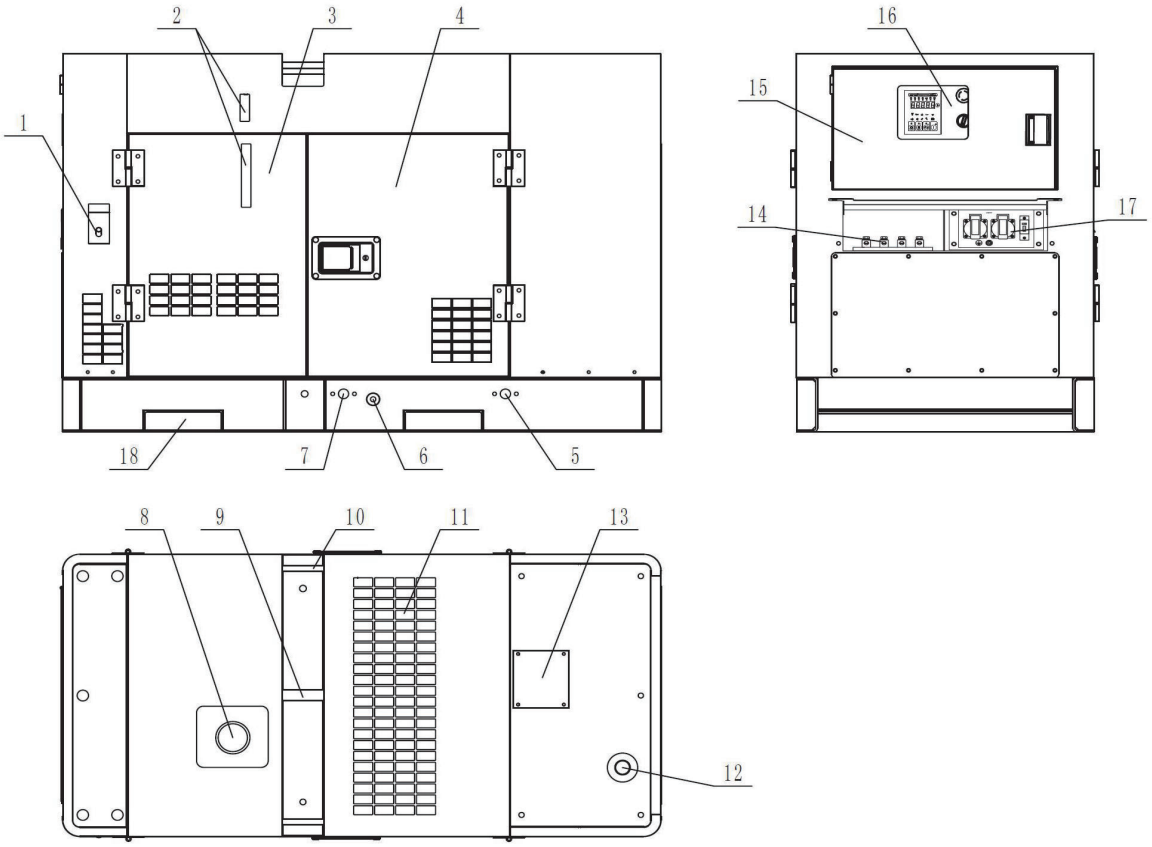
P＝ PN×(C－0.02)＝20×(0.78－0.02) ＝15.2 KW

2.2.2 Main technical parameters

Model			RDE11SS		RDE16SS		RDE19STA	
Genset	Rated frequency	HZ	50	60	50	60	50	60
	Prime power	KVA	8.5	10.5	13	15.5	13	15.5
		KW	8.5	10.5	13	15.5	13	15.5
	Standby power	KVA	9.5	11.5	14	17	14	17
		KW	9.5	11.5	14	17	14	17
	Rated voltage	V	115/230	120/240	115/230	120/240	115/230	120/240
	Rated current	A	74/37	87.5/43.8	113/56.5	129.2/64.6	113/56.5	129.2/64.6
	Rated Speed	r/min	1500	1800	1500	1800	1500	1800
	Model		FD1C1-4		FD1ES1-4		FD1ES1-4	
	Poles		4		4		4	
	Loop mode		Single-phase					
	Excitation type		Brushless self-excitation permanent pressure (With AVR)					
	Power factor	COSΦ	1.0		1.0		1.0	
	Insulation class		H		H		H	
	Model		RD385D		RD485D		RD485D	
	Cylinder arrangement		3-cylinder In-line, water-cooled, 4-stroke, direct injection		4-cylinder In-line, water-cooled, 4-stroke, direct injection		4-cylinder In-line, water-cooled, 4-stroke, direct injection	
	Bore × stroke	mm	85×90		85×90		85×90	
	Displacement	L	1.532		2.156		2.156	
	Compression ratio		18：1		18：1		18：1	
	Rated power	KW	11	13	17	20	17	20
	Lubrication type		Pressure splashed					
	Oil type		Above CD grade, SAE 10W-30, 15W-40					
	Starting system		12V electric start		12V electric start		12V electric start	
	Starting motor capacity	V-KW	12V 3KW		12V 3KW		12V 3KW	
	Battery capacity	V-Ah	12V 65Ah		12V 65Ah		12V 65Ah	
	Engine fuel consumption	g/KW.h	≤255		248		248	
	Fuel type		Diesel: 0＃（summer）-10＃（winter）-35＃（chilly）					
Genset	Controller type		Smartgen digital panel					
	Output Socket		2 single-phase		2 single-phase		2 single-phase	
	Output Terminal pole		with		with		with	
	Noise at 7 meters	dB(A)	51	53	53	54	70	
	Fuel tank capacity	L	68		68		68	
	Overall dimensions	mm	1600×780×1050		1600×780×1050		1500×790×1050	
	Net weight	kg	685		720		630	

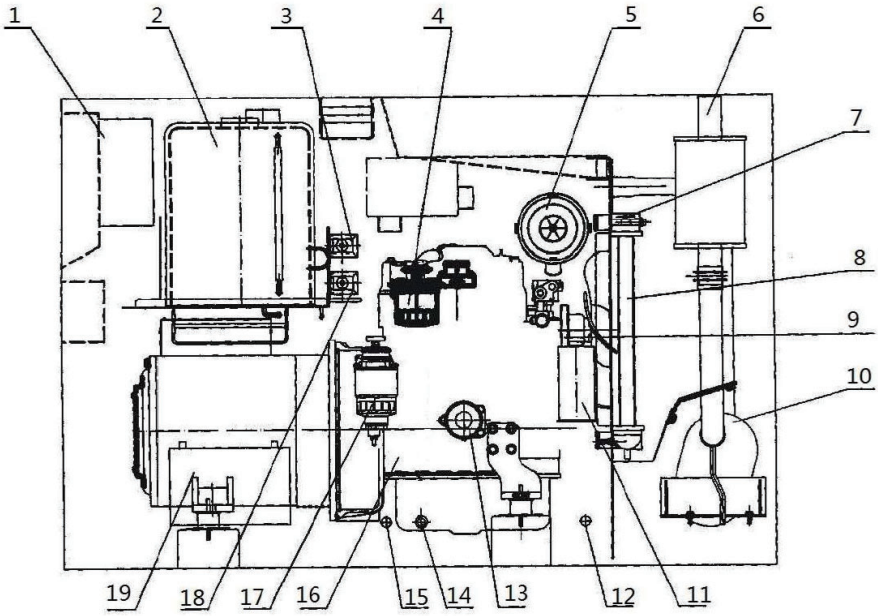
Model			RDE13SS3		RDE20SS3		HDE19STA3	
Genset	Rated frequency	HZ	50	60	50	60	50	60
	Prime power	KVA	10.6	13.1	16.2	19.3	16.2	19.3
		KW	8.5	10.5	13	15.5	13	15.5
	Standby power	KVA	11.6	14.5	17.5	21.2	17.5	21.2
		KW	9.3	11.6	14	17	14	17
	Rated voltage	V	400/230	416/240	400/230	416/240	400/230	416/240
	Rated current	A	15.3	18.2	23.4	26.8	23.4	26.8
	Rated Speed	r/min	1500	1800	1500	1800	1500	1800
	Model		FD1C1-4		FD1ES1-4		FD1ES1-4	
	Poles		4		4		4	
	Loop mode		Three- phase					
	Excitation type		Brushless self-excitation permanent pressure (With AVR)					
	Power factor	COSΦ	0.8(Lag)		0.8(Lag)		0.8(Lag)	
	Insulation class		H		H		H	
	Model		RD385D		RD485D		RD485D	
	Cylinder arrangement		3-cylinder, In-line, 4-stroke, direct injection, water-cooled		4-cylinder, In-line, 4-stroke, direct injection, water-cooled		4-cylinder, In-line, 4-stroke, direct injection, water-cooled	
	Bore × stroke	mm	85×90		85×90		85×90	
	Displacement	L	1.532		2.156		2.156	
	Compression ratio		18:1		18:1		18:1	
	Rated power	KW	11	13	17	20	17	20
	Coolant capacity Engine only	L	1.87		2.29		2.29	
	Coolant capacity With radiator	L	3.25		3.7		3.7	
	Lubrication type		Pressure splashed					
	Oil type		Above CD grade, SAE 10W-30、15W-40					
	Oil capacity	L	6.9		8.5		8.5	
	Starting system		12V electric start		12V electric start		12V electric start	
	Starting motor capacity	V-KW	12V 3KW		12V 3KW		12V 3KW	
	Battery capacity	V-Ah	12V 65Ah		12V 65Ah		12V 65Ah	
	Engine fuel consumption	g/KW.h	≤255		248		248	
	Fuel type		Diesel： 0＃（summer）-10＃（winter）-35＃（chilly）					
Genset	Controller type		Smartgen digital panel					
	Output Socket		2 single-phase		2 single-phase		2 single-phase	
	Output Terminal pole		with		with		with	
	Noise at 7 meters	dB(A)	51	53	51	53	70	
	Fuel tank capacity	L	68		68		68	
	Overall dimensions	mm	1600×780×1050		1600×780×1050		1500×790×1050	
	Net weight	kg	685		720		630	

2.3 Outline and description of each part



Ref	Description	Ref	Description	Ref	Description
1	Fuel filling port of external fuel tank	2	Fuel level observation window	3	Check the side door(at the side of the generator)
4	Check the side door(at the side of the engine)	5	Cooling water drainage port	6	Lube oil drainage port
7	Fuel drainage port	8	Internal fuel tank cap	9	Lifting pull rod of genset
10	Pull rod for transportation	11	Air exhaust port of genset	12	Air exhaust port of muffler
13	Water filling port of cooling water	14	Output terminal	15	Control cabinet door
16	Control panel	17	Single-phase receptacle	18	Forklift slot

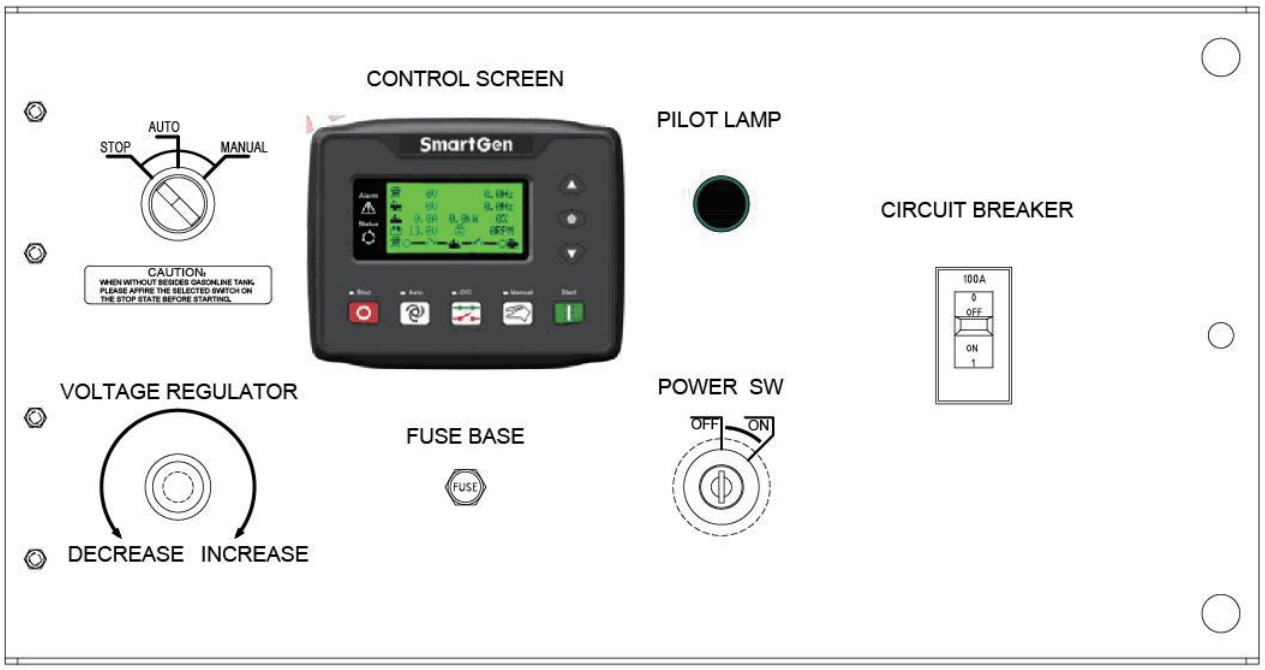
2.4 Internal structure of the product



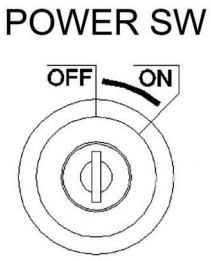
Ref	Description	Ref	Description
1	Control panel	2	Fuel tank
3	Fuel pump of internal fuel tank	4	Fuel filter
5	Air filter	6	Air exhaust port of muffler
7	Water filling port of radiator water tank	8	Radiator water tank
9	Fan belt	10	Muffler
11	Auxiliary water tank	12	Cooling water drainage port
13	Lube oil filter	14	Lube oil drainage port
15	Fuel drainage port	16	Engine
17	Fuel & water separator	18	Fuel pump(Designed for external fuel tank)
19	Battery		

2.5 Control panel and operation instructions:

2.5.1 control panel:



2.5.2 Control panel components and description.



(1) Power switch:

It's used to run or stop engine. Insert the key and turn to "ON".

It will close the control circuit and the digital control panel will operate.

Engine is ready to start.

- START

Insert the key and turn to "ON"; After starting, release the key. It will return to "ON" automatically

- ON

This position is to start the engine.

Insert the key and turn to "ON", press the "manual" key on the controller, and then press the "ON" key, the engine will preheat and then start.

- OFF

Turn the key to "OFF" and the engine will stop immediately.

Remove the key and secure it when the generator is not in use to prevent unauthorized operation.

⚠ CAUTION

Pull out the key and secure it when the generator is not in use to prevent an unauthorized operation

(2) Breakers:

Supply the genset power to the main breaker of the output terminal pole.

Breakers are switched off automatically in case of short-circuit, overload and genset fault alarming to

protect the genset.

- Push breaker lever from "OFF" to "ON" position to start the engine.
- Main breaker should be in "OFF" position when abnormality occurs and the engine is shut down by pushing the emergency stop button.

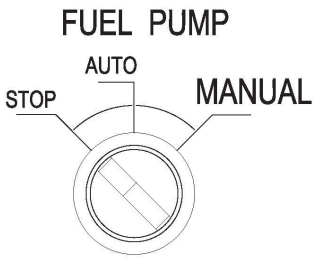
⚠ CAUTION

- Do not use this breaker to start or stop the load equipment. Set the "ON" and "OFF" switch between terminal and load equipment to start and stop load equipment to prevent breaker damage.
- Breaker lever should stay in the middle of "ON" and "OFF" position when the breaker is switched off automatically due to excess current, which means the breaker is tripped out. Correct the faults and set the beaker lever down to "OFF" position and then back to "ON" position which means the breaker is switched on.
- When the genset sends fault alarming signal, the main breaker will tripped out automatically. The genset will be shut down after running for a certain time. Switch on the main breaker after the genset fault is eliminated.
- Main breaker is set in "OFF" position when the genset is shut down with emergency stop button. After the fault is eliminated, breakers cannot be set to "ON" position if emergency stop button is not reset.

(3) Auto fuel filling switch:

Filling fuel from external fuel tank to genset fuel tank with fuel pump. Set the fuel pump switch to "AUTO" position and the fuel level is low, start the fuel pump to fill the fuel to the fuel tank.

●See the picture on the right. When the switch is set to "AUTO" position and the fuel level is decreased below lower limit, fuel pump starts fuel filling. If the fuel level reaches upper limit, fuel pump will stop working automatically. Fuel pump will not work if the fuel level does reach lower limit even the switch is on "AUTO" position. Put the switch in "MANUAL" position then release it to start the pump. The genset will stop fuel filling when the fuel level is reached.



【**Note**】Set the Auto fuel filling switch to "STOP" position if the externa fuel tank is not used.

● When the external fuel tank is not used:

Set the switch to "STOP" position.

When power switch of fuel pump is set to "AUTO" position, and the fuel level is in lower limit, the fuel pump will be started. The pump will be burnt out due to running at idle speed.

● When using external fuel tank

Check the fuel level in the external fuel tank regularly.

If there is no fuel in the external fuel tank, and the pump switch is in "AUTO" position, fuel level in the

fuel tank cannot reach upper limit and the fuel pump will be burnt out due to continuous running at idle speed.

(4) Voltage regulator:

The voltage regulator is to adjust the genset output voltage. Rotate the knob in the right direction to increase the output voltage. Rotate the knob in the left direction to decrease the output voltage.

Adjust range: ± 10％。

(5) Emergency stop button:

Press the “EMERGENCY STOP” button in an emergency to stop the engine immediately.

Reset the button by pressing and rotating it clockwise after the fault is corrected.

(6) Fuse

① Preheat circuit：Fuse (Capacity：50A)

② Charging circuit：Fuse (Capacity：20A)

③ Control power circuit：Fuse (Capacity：10A)

(7) Fuel meter:

Fuel level indicator is to remind users to add fuel in time.

(8) Intelligent controller

There are three parts on the control panel: Measured parameter display on LCD, control buttons and running status indicator.

Refer to detailed controller operation manual .

(9) Protective device

The genset is equipped with fault protection device. When serious fault occurs, genset will stop engine and disconnect the load automatically, the intelligent control panel will show abnormal situation with code on the display. In addition, for minor abnormality, the genset will remind the user by indicator lamp and alarming device.

【Note】

Stop the genset immediately and perform the service if any abnormal occurs.

Continuous running of the genset will lead to serious accidents.

3. INSTALLATION AND TRANSPORTATION

3.1 Placement notices

DANGER **Toxic exhaust**

Poor ventilation may cause severe injury or death due to carbon monoxide poisoning

- Do not operate the genset in the room or poorly ventilated area
- Do not operate the genset indoors unless it is installed in a specially designed room with ventilated devices.
- Extend the exhaust pipe into outdoors if the genset must be operated inside the rooms. Besides, the ventilation device is required.
- The exhaust vent must not open out to offices or residences

CAUTION **Vibration**

Pay attention to vibrations during the installation:

- The genset should be put on a hard ground level; uneven ground may cause abnormal vibrations.
- Vibrations should not disturb others working or living around the genset

Noise

- Close and lock the doors when running the genset.
- If the noise is excessive, use additional sound attenuating methods such as adding insulation to the genset room. Contact the factory for assistance with special mufflers or resonators.

CAUTION **Placement**

- The genset should be put on a hard ground level.
- Install the generator at least 1M from the wall at the side of the refueling inlet.
- Keep fuel lines and connection cables at least 1.2 meters from the control panel.
- Air exhaust vent should be saved on top of the cabinet. Allow adequate space for the water filling of the radiator.
- Pay special attention to the condition of the generator when operating in dusty conditions or salty air. These cause the genset to deteriorate quickly.

CAUTION **Indoor Installation**

- Air inlet port should be large enough to avoid overheat.
- Poor ventilation inside the rooms will increase the temperature and affect the running of the genset.

3.2 Installation

Pay attention to the following installation notes:

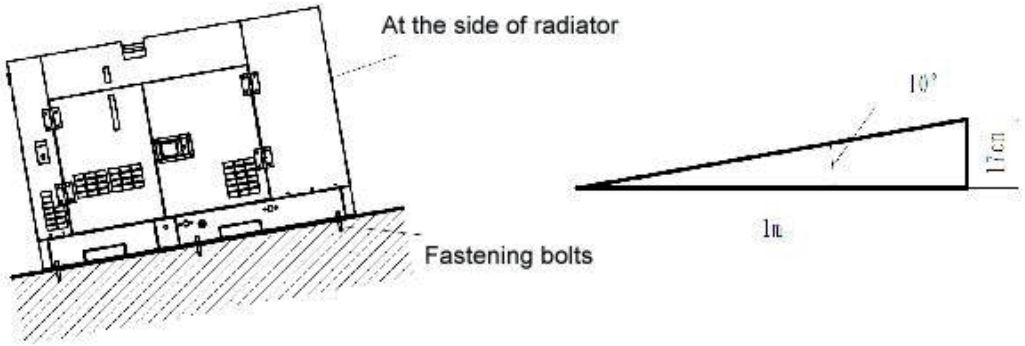
(1) Operate the genset in an area with fresh air and enough cooling air. Meanwhile, make sure that the exhausted air will not be sucked by the genset.

(2) Place the genset in an area that is protected from rain, snow, ice, water and excessive heat.

(3) Operate the genset in an area with fresh air. Air with humidity, dust and trash will lead to short-circuit, electricity leakage of the genset or even cause engine overheat.

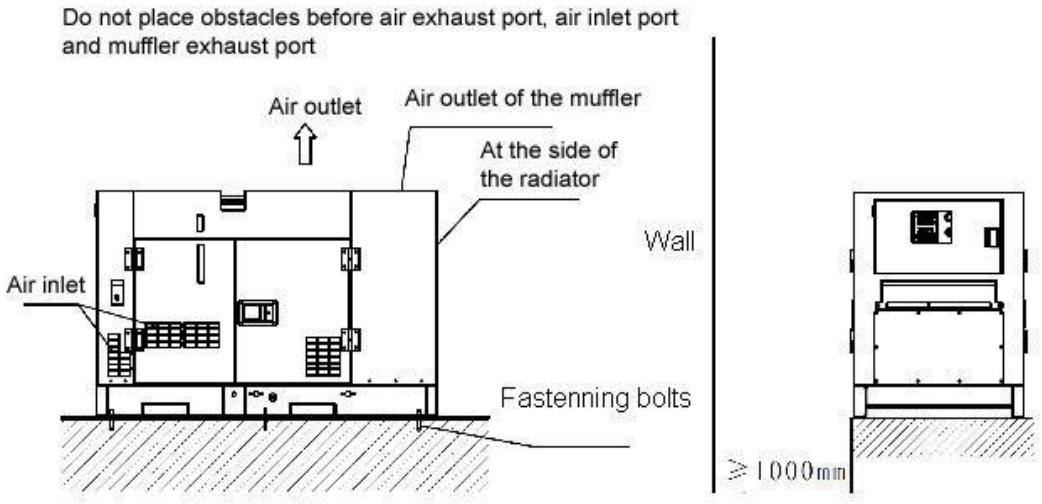
(4) If you want to install the genset outdoors, it should be equipped with a canopy or enclosure designed for an outdoor application. Observe the surroundings and try to keep the generator away from trees or power lines that could fall and cause damage.

(5) Install the genset on a solid and level ground. Make sure the bottom of the genset contacts the ground evenly to prevent excessive vibration.



(6) If you have to install the genset on a slope, make sure the side with the radiator faces upwards and the inclination angle is less than 10°. The genset installed obliquely will cause overheat of the engine due to air mixed in the cooling water pipelines.The engine may overheat if the coolant level sensor is not close to level.

(7) There must be enough room around the genset for cooling and maintenance. Keep the genset at least 1M away from walls and 2M away from the ceiling. Keep the air outlet of radiator, engine air inlet and exhaust vented upwards and prevent any blockage. This will help prevent overheating and poor engine performance due to excessive back pressure



(8) Place the genset as close to the loads if possible. If the power cable is too long there will be a voltage drop due to increased resistance.

(9) If the genset is placed in a room, make sure the room is accessible for installation, maintenance ,movement and ventilation.

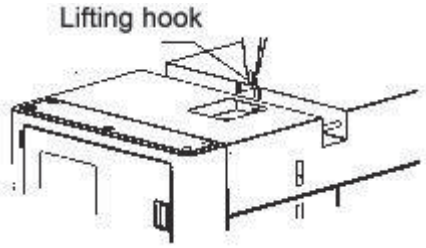
(10) Non-authorized personnel cannot be allowed to enter the genset room or get close to the machine to avoid any injuries

3.3 Genset transportation

3.3.1 Genset lifting

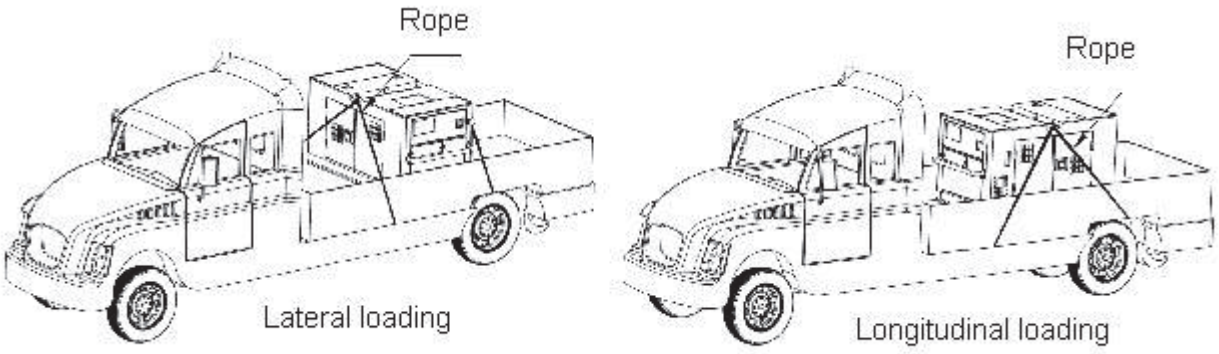
⚠ WARNING

- Lift the genset at the lifting rod at the center of the canopy to prevent the generator from falling.
- Don’t stand under the genset while lifting.
- Don't lift the genset while the engine is still running to prevent a serious accident.



3.3.2 Genset transportation

If the genset is transported by truck, fix the genset on the loading platform with ropes and hooks for the safety.



4. LOAD CONNECTION

4.1 Input power of the load

【Note】

Electrical equipment, especially motor driven devices, can draw large current at startup. If the power of the selected load does not match the genset power, the load will not start.

Consider the following when connecting loads to the generator:

● According to the load type, application, starting methods, load quantities, load rate, generator performance and the AVR, the starting power of the generator varies considerably.

The starting current of an electric motor is typically 5-8 times rated current. The abrupt increase in current may cause an overload and output voltage will drop suddenly. The motor may fail to start properly.

Consult the manufacturer of the tool or appliance to determine the power required for start.

● You can calculate the genset size with the following formulas

○ The genset size of a squirrel cage asynchronous motor (kVA)

$$\text{The genset size (kVA)} = \frac{\text{Rated power of motor (kW)}}{\text{Motor efficiency} \times \text{Power factor}}$$

Motor efficiency ： 0.8 Power factor:0.8

The genset size (kVA) =1.56×Rated power of motor (kW)

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

The genset size =2× Input power of motor

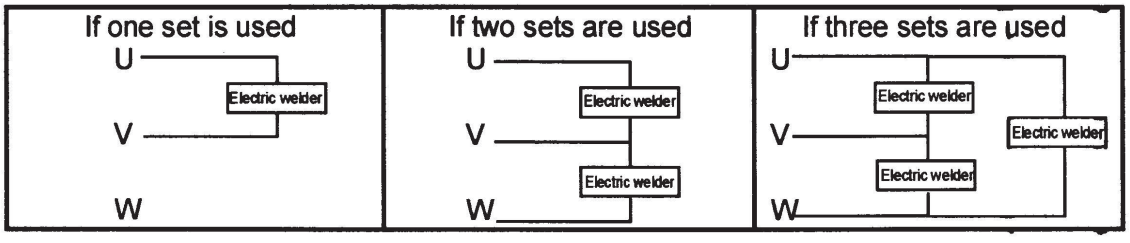
○ Direct starting the squirrel cage asynchronous motor with contactor.

The genset size =3× Input power of motor

○ Apply a star-triangle mode to start the squirrel cage asynchronous motor

The genset size =1.2~1.5× Input power of motor

● It is better to balance the load if more than one AC electric welder is used. Balance each phase as follows:



【Note】

The input power for each electric welder should be adjusted to less than 1/3 genset output power. Overload will burn the genset.

● When starting the appliance, it should be started without load. Load can be applied after the motor is started. If there are several motor loads in the circuit, the motor with the high power consumption should be started first then the others in turn.

4.2 Selection of the three-phase cables

【Note】

Select the cable size based on the permissible current and distance between genset and load.

If the power cable diameter is too small, it may be overheat under high current and burn the cables.

If the power cable is too long, the resistance will be large and cause a voltage drop which may stop the load from working.

- Choose the cable length and section area within 5% rated voltage.
- The following formula can be used to calculate the voltage drop value "e" from cable length,sectional area and current in 3-phase 3-line situation.

$$\text{Voltage drop (V)} = \frac{1}{58} \times \frac{\text{Length}}{\text{Section area}} \times \text{Current (A)} \times \sqrt{3}$$

The selection chart for single core and multi-core cables is as follows: (It's applicable for 220V voltage with a voltage drop of less than 10V).

Ambient temperature：25℃

No	Copper wire type	Single core current capacity (25 ℃)(A)		Voltage drop mv/M	3-core current capacity (25 ℃)(A)		Voltage drop mv/M	4-core current capacity (25 ℃(A)		Voltage drop mv/M
		VV22	YJV22		VV22	YJV22		VV22	YJV22	
1	1.5mm²	20	25	30.86	13	18	30.86	13	13	30.86
2	2.5mm²	28	35	18.9	18	22	18.9	18	30	18.9
3	4mm²	38	50	11.76	24	32	11.76	25	32	11.76
4	6mm²	48	60	7.86	32	41	7.86	33	42	7.86
5	10mm²	65	85	4.67	45	55	4.67	47	56	4.67
6	16mm²	88	110	2.95	61	75	2.6	65	80	2.6
7	25mm²	113	157	1.87	85	105	1.6	86	108	1.6
8	35mm²	142	192	1.35	105	130	1.2	108	130	1.2
9	50mm²	171	232	1.01	124	155	0.87	137	165	0.87
10	70mm²	218	294	0.71	160	205	0.61	176	220	0.61
11	95mm²	265	355	0.52	201	248	0.45	217	265	0.45
12	120mm²	305	410	0.43	235	292	0.36	253	310	0.36
13	150mm²	355	478	0.36	275	343	0.3	290	360	0.3
14	185mm²	410	550	0.3	323	400	0.25	333	415	0.25
15	240mm²	490	660	0.25	381	480	0.21	400	495	0.21

Note: Both ambient temperature and the method of laying cable will affect the current capacity of the copper wire. The table is provided for your base reference.

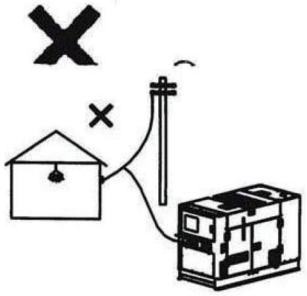
4.3 Connected with load

DANGER

- Touch the output terminals with your hands may cause electric shock leading to death.
- Turn the main circuit breaker to “OFF” and stop the genset before service.
  （If machine runs in parallel, other power supply should also be cut off.）
- Don't use damaged cables to prevent an electric shock accident.

CAUTION

- It is not allowed to connect genset power with indoor distribution lines which supplied by the power company.
- Genset power connected with indoor distribution lines will cause over current and may lead to serious fire risk or electric shock.
- Do not connect the genset with indoor distribution lines.

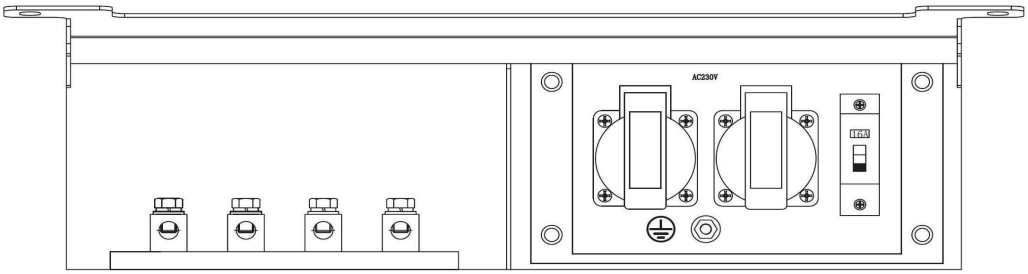


(1) 3-phase, 4-line wirings

Connect the load cable with the three phase terminals of the genset.

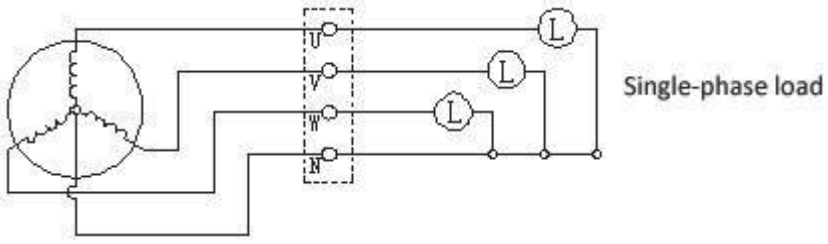
CAUTION

Check the phase and voltage of the loads before connection. Ensure three-phase four-line terminals inside the junction box.



CAUTION

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



(2) Single-phase output power（230/240V）

Single-phase power has two connection methods: single-phase receptacle and three-phase connector. Select proper connections.

Receptacle and breaker are two circuits which are set as 15A (For W-phase). Besides, three-phase connector is a combination of N-phase and U,V,W-phase. Voltage adjustment can be realized by voltage regulator.

(3) Combination of three-phase connector：

【Note】Ensure the value on the AC current meter is above the rated current.

① The maximum current of the genset is the total current of single-phase and three-phase loads.

When the AC voltage meter is 400/416 V (50/60Hz), the single-phase output voltage is 230/240V.

② If it is a single-phase output, output power of each single phase is only 1/3 of the rated power of the genset (KW). If you use single-phase and three-phase loads at the same time, note that the load's power of each phase cannot exceed 1/3 of rated power (KW).

Maximum load power of a single phase is PN/3×0.8

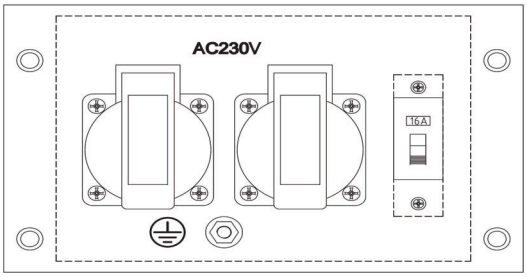
PN: indicates the rated power of the genset

③ Prevent overloading. If an unbalanced load is necessary, the difference between three phases shall be within 20%

(4) Receptacles

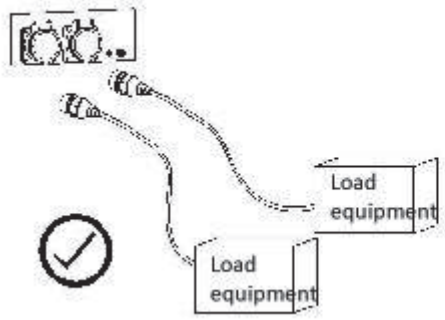
● Single-phase receptacle:

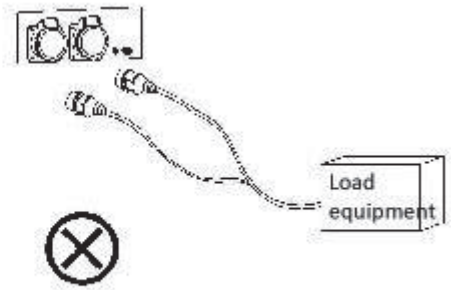
If the single-phase breaker is set to "ON", receptacles are electrified.



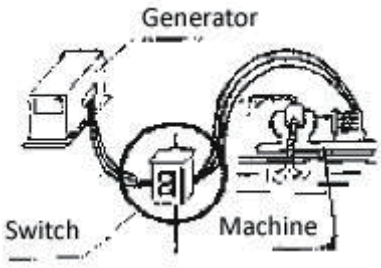
● There are 2 single-phase receptacles on the panel of output junction box and they are separate circuits.

● Avoid overload when using single-phase receptacle and single-phase power.





(5) Load connections:



① Add Load ON/ OFF switch between wiring terminal of generator and load equipments. If the genset breaker is also used as load switch, breaker may be damaged due to frequent starting and shut down.

② Turn the breaker at side of generator to OFF for cable connections. Meanwhile, connect the cables when engine is shut down.

③ Do not connect cable with output wires for other phases.

④ Close output terminal cover and fix the screw tightly after cable connections.

4.4 Grounding of protective device

DANGER **Electric shock**

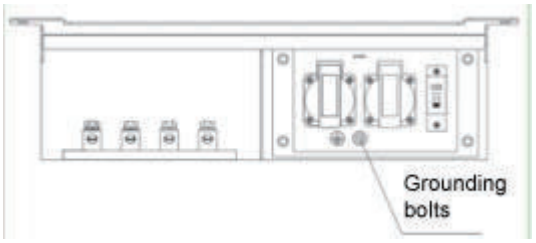
(1) Touching the output terminals with your hands may cause electric shock leading to death

(2) Don't use damaged cables to prevent an electric shock accident. If the cables are not securely tightened, the connection may overheat and cause a fire or accident.

● Switch off the breaker and stop the genset before connections.

● Close the output terminal board and fix the screw tightly before running the genset.

(1) Genset grounding



Refer to the Pic for the grounding of outer box grounding terminal.

Grounding of outer box grounding terminal

The section of the grounding cable should be in accordance with the generator capacity specified in the technical standard for the electric appliance. Please use grounding rod with resistance meets the following resistance.

If it is D grounding (No.3 grounding), the resistance is below 100Ω.

(When the voltage is over 300V, please use C class grounding, and the grounding resistance is below 10Ω).

(2) Grounding of loads

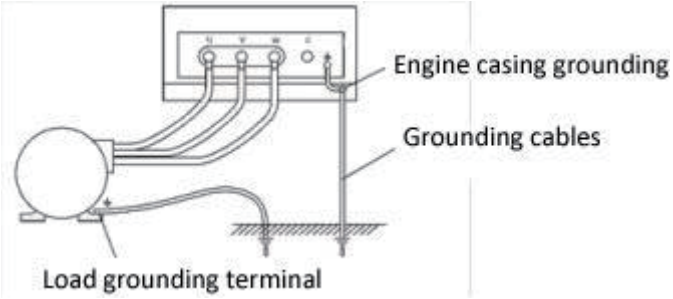
CAUTION

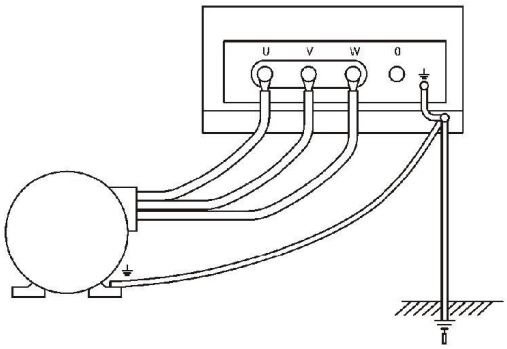
Loads must be grounded even if the genset is equipped with an electrical leakage protector.

The housing of the loads must be grounded.

The section of grounding cable depends on the load capacity and relevant electrical standards. If it is

D class (No.3 grounding) the grounding resistance should be lower than 500Ω.





(3) Common grounding

It is preferable to ground the genset canopy and loads separately. However common grounding is allowed in some situations.

① Calculate grounding cable sections separately then selects the larger one.

② Calculate the grounding cable resistance separately then select the smaller one.

③ Tighten all grounding cables securely.

(4) Grounding precautions

● The grounding rod should be placed in a shady area. If the soil has high moisture content, bury the upper part completely in the soil.

● Clamp the cable securely to avoid tripping people who walk around it.

● Connect the extended cable as following:

Weld the extended cable or use a sleeve to tighten. Cover the connection part with insulation tape. The connection should be above ground for periodic checks.

● Keep the grounding rod at least two meters away from any lighting rod.

● Don't use the same grounding cable with the telephone ground or any other grounds

⚠ CAUTION

Screw on the bolts securely with a wrench when connecting the loads. Otherwise it may cause overheating and a fire.

5. FUEL,LUBRICANT,COOLANT,BATTERY

5.1 Fuel

【Note】

Use specified fuel. Apply corresponding levels of diesel engine fuel according to different temperatures. Low grade or improper fuels may damage the engine and shorten its service life.

［Applied to international diesel standard］

GB/T252-1994 light diesel, 0# in summer ， －10# ， －20# ， －35# in winter.

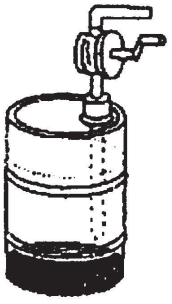
(1) Fuel type and temperature

Fuel type is classified by the condensation point. Select the proper fuel based on the ambient temperature:

Ambient temperature ℃	Light diesel fuel（GB252）
＞4	0 #
＞－5	－10 #
＞－5～－14	－20 #
－14～－29	－35 #
－29～－44	－50 #

(2) How to use fuel

a. Fuel with water or foreign matter may damage the engine.
b. Store the fuel in a clean container
c. The container shall be protected against rainwater or other foreign matter.。
d. Do not move the fuel container and keep it static for several hours. This lets water and foreign matter in the fuel deposit at the bottom. Only pump fuel from the clean section of the tank.



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

⚠ CAUTION

(1) Fuel used --- light diesel fuel

Some areas have very strict regulations on the proper use of fuel. Do not mix types or blends of fuel. This machine is designed to run on light diesel fuel as part of its emissions control system. The use of fuels other than light diesel fuel will cause excessive emissions.

(2) Fuel used in winter

Choose the proper fuel in winter or summer. Using the wrong fuel in the winter may make the engine hard to start. Additionally, the fuel may freeze.

5.2 Lubricant

【**Note**】The lubricant has a vital impact on the startup and lifetime of the engine. Use the specified lube oil. The use of lubricants with the wrong specification may cause early wear of the internal parts of the engine greatly reducing its service life.

(1) Oil selection

● Use genuine lubricant

● Use high-grade diesel engine lubricant: SAE10W-30、15W-40

● When purchase lubricant from the market, select API classified CD grade or CF grade lubricant.

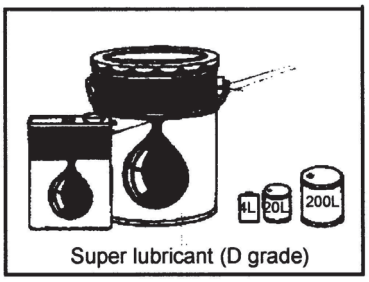
(2) Oil viscosity

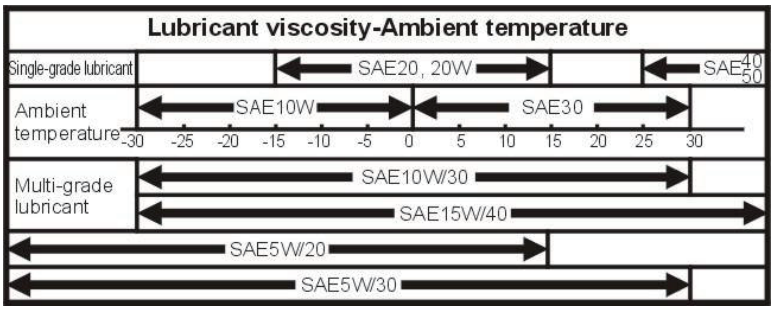
● Choose the correct viscosity for the prevailing ambient temperature

● Use SAE15W-40 diesel lube oil for most environments.

● Generators running in the lower temperature conditions should use lower viscosity multi-grade oil. Take engines used in plateau area for example, this kind of engine should use SAE10W-30 oil because the highest ambient temperature in that area is 25℃ and the average temperature is 2～6℃. When the temperature increased, it is recommended to use 15W-40 oil.

● Replace the lube oil after the initial 50 hours and every 250 hours thereafter.





(3) How to use lube oil

● Avoid foreign matter or dust falling into the oil during storage and filling

● Check for foreign material around the oil inlet when refilling

● Do not combine different brands or grades of oil.

5.3 Coolant

Daily management of the engine coolant is very important. Clean soft water (tap water or distilled) must be used.

(1) Use of coolant

Proper coolant is a mixture of either ethylene glycol or propylene glycol with clean water. For cooling,

freeze and boil protection, the ratio of ethylene-glycol or propylene-glycol to water is 30% to 50%. If the ratio is lower than 30%, the coolant will provide lower rust resistance.

The relationship between the mixture ratio and ambient temperature is as follows:

30% ： －10℃

40% ： －20℃

50% ： －30℃

Use the same mixture when adding coolant.

【Note】

●Coolant is made by mixing water with antifreeze which contains a rust inhibitor. At low temperature in winter, frozen coolant will damage the spare parts of cooling system due to expand effect. If coolant is made only by fresh water, the optimal cooling effect cannot be reached due to rust and dirty in the cooling pipe.

● In climates where the ambient temperature remains above freezing, antifreeze or water with a rust inhibitor must be added to prevent the formation of rust and scale deposits in the radiator and engine block.

● Anti-rust effect will decrease with lower antifreeze concentration. With lower temperature, spare parts of cooling system will be damaged. Higher concentration of antifreeze will affect engine cooling performance. Proper mixing ratio must be followed.

(2) Antifreeze

Antifreeze can prevent rust of the parts so that no extra rust inhibitor is needed. Antifreeze can be used for a whole year. The mixing ratio should be between 30%~ 55%.

Lowest temperature℃	Below －15	－20	－25
Mix ratio ％	30	40	50

(3) Antifreeze sold in the market

Use a coolant with an anti-rust agent. Follow the mix ratio specified by manufacturer.

Replace the coolant at least once a year regardless of how many hours the genset has run.

5.4 Battery

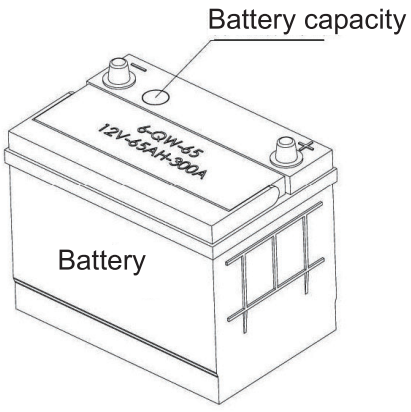
▲DANGER

The battery produces highly flammable gas during charging. Improper operation may cause explosion and serious injuries.

5.4.1 Pay close attention to the below points:

- Charge the battery in a well-ventilated area to prevent fire or explosion from the highly flammable gas.
- Never connect the positive terminal with the negative terminal directly. Sparks can be generated that will ignite the battery gases.
- Disconnect the negative terminal first while servicing the battery.
- Most electrolytes are diluted sulfuric acid. Improper operation will cause serious injuries.
- If the electrolyte contacts your clothing or skin, flush with large amounts of water.If electrolyte gets into your eyes, flush them with large amounts of water and seek immediate medical attention.
- Do not use the battery when the battery electricity is not sufficient. Otherwise it will shorten the service life of the battery and increase the aging of the battery. Do not run the starting motor frequently or the battery will discharge.
- Check the battery after the engine is stopped.
- Do not disconnect the battery while the genset is still running to prevent damage to the starting motor.

5.4.2 Checking the battery



(1) Check the electrolyte level

Check the battery indicator lamp on a maintenance free battery. A green lamp indicates sufficient power while a red lamp indicates insufficient power.

(2) Check the electrolyte specific gravity.

If the starter rotation speed is slower than the rated value, it wil lead to start failure so keep the battery charged. If the genset cannot start after charging, replace the battery.

Measure the specific gravity of the electrolyte level with a hydrometer if the battery lacks an adequate charge. If the residual voltage is below 75%, charge the battery.

Check the battery voltage first before starting the genset if it hasn't been used for more than 3 months. Charge the battery if the voltage is lower than 12V. Starting a genset with low voltage may damage the starting motor.

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

Temperature (ºC) / 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

Note: A tolerance of ± 0.01 is permissible.

Charge the battery immediately when the charging ratio is lower than 75%.

(3) Charging information

When charging with battery is connected:

- Remove the battery wires before charging.
- Charge the battery in a well-ventilated area.
- Disconnect the negative cable first when disconnecting cables. (If you disconnect the positive cable first, it may cause an electrical spark the cable is touches the genset housing). When reconnecting the cables, connect the positive cable first and then connect negative wire.
- Keep fire, sparks or any other source of combustion away from the highly inflammable gas.

Never produce spark or get close to the fire to avoid explosion by the inflammable gas produced during the charging.

- If the battery is extremely hot, i.e. electrolyte temperature is above 45°C, stop charging until it cools down.
- Stop charging when the battery is completely charged. Continued charging will lead to:

1) Battery overheating
2) Loss of electrolyte
3) Battery failure

- When reconnecting the battery, connect the positive (+) lead of the battery first and then negative (-) lead.
- Do not reversely connect the battery terminal or the AC alternator will be burnt.

6. OPERATION

6.1 Preparation before start-up

Perform the following procedures when operate the genset for the first time:

6.1.1 Adding fuel

DANGER

Recommended fuel: GB/T252-1994 light diesel :0# in summer , －10# ，－20# ，－35# in winter

● Use the proper fuel. Improper fuel may be a fire risk and damage the engine. Please confirm the fuel type before filling

● Clean up any fuel that spills. Don't start the engine before cleanup.

●In order to prevent any overflow when the genset is running, the volume of fuel should be approximately 90% of total tank volume.

6.1.2 Adding fuel to the external tank

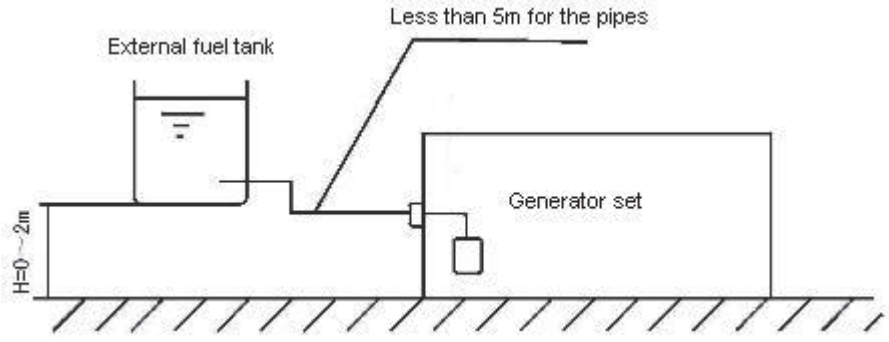
● Check all fuel lines for wear and the tightness of all connections and joints.

● The fuel pump may be easily damaged when the fuel pump is running at idle speed. Pay special attention to the fuel level of the external fuel tank and avoid the idle speed of the fuel pump.

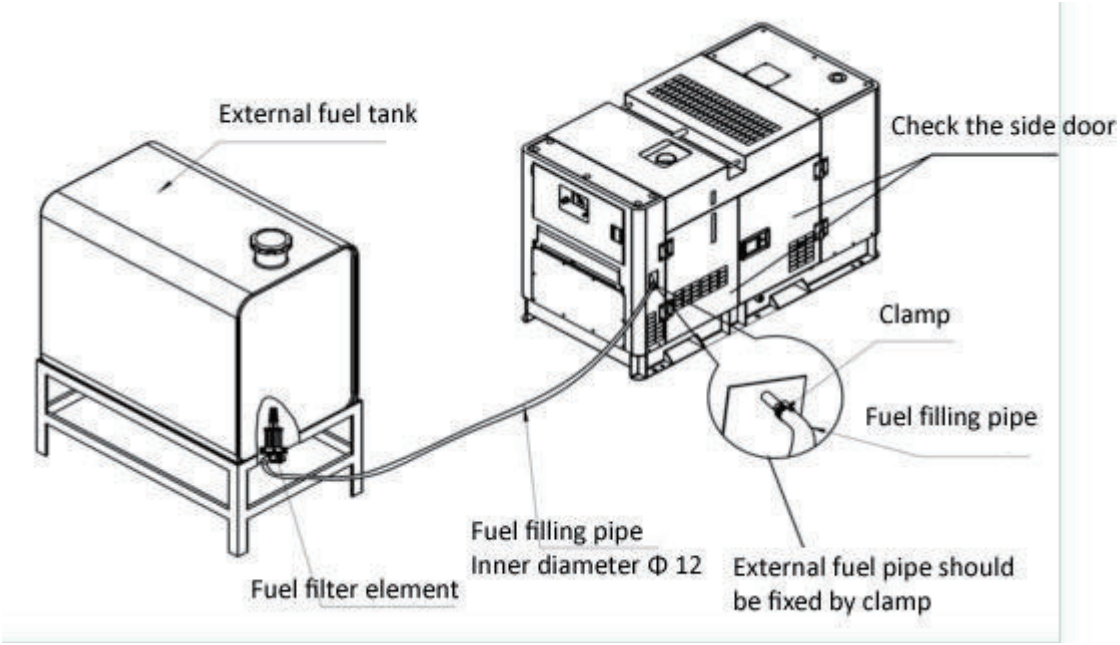
(1) The position of the external fuel tank.

Do not place the external tank more than 5 meters away from the generator

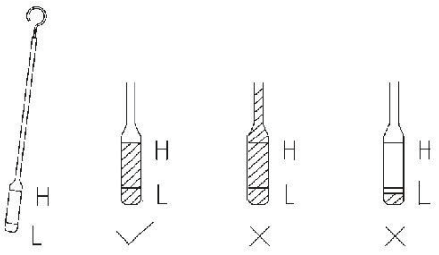
The base of the tank should be no more than 2 meters above the generator.



2) Distribution pipelines:



6.1.2 Adding oil



a. Keep the engine on ground level when checking and adding oil.

b. Take off the cover off the lube oil inlet. Add recommended oil up to the upper mark (H) on the dipstick.

c. Measure the oil level with the dipstick. In order to get correct level, please clean the dipstick completely before reinserting it into the dipstick tube. Meantime, check if the lubricant is polluted.

⚠ CAUTION

Keep the oil level between the upper and lower scale marks. The oil level shall not exceed the upper mark. Too much oil puts a strain on the engine and can accumulate in the breather tube causing performance problems.

6.1.3 Adding coolant

Add the coolant following the below procedures. Add antifreeze solution in the coolant.

● **Filling the radiator**

Turn the radiator cover anticlockwise and remove it.

b. Add coolant until it overflows from the radiator water inlet. Slowly fill coolant to avoid any bubbles or foam.

c. Close the radiator cover tightly to prevent any water leakage or pressure loss. Insert the cover's inside clip in the notch of the water inlet. Then press down the cover and turn the cover clockwise for a

1/3 revolution to close the cover.

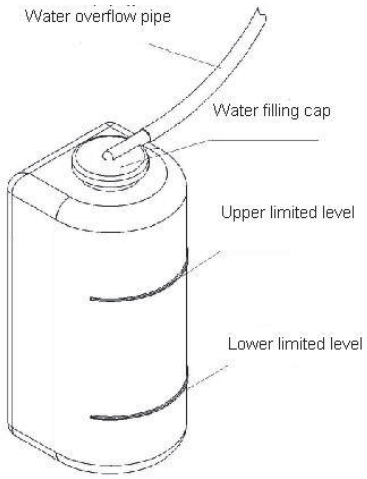
● **Filling water to overflow bottle of auxiliary tank**

a. Remove the water filling cap and add cooling water to the upper mark and reinstall the cap.

b. Check for the loose and damage of the connectors of rubber overflow pipe which connects auxiliary tank and radiator. Repair or replace the connectors if necessary to avoid cooling water leakage.

⚠ WARNING

Screw the water filling cap tightly after adding the cooling water. Otherwise the cooling water is easy to be evaporated and cause engine damage. In addition, steam, hot water injected during the genset running may cause serious injuries.



6.2 Check before Running

Please check the following items before running:

(1) Remove any foreign matter in or around the genset

● Check for tools or rags inside the cabinet

● Check for trash or inflammable matter around the muffler or engine.

● Ensure the air inlet and exhaust outlet is not blocked.

(2) Check the general condition of the genset

● Check for oil leakage

● Check for fuel leakage and fuel hoses aging

● Check the coolant leakage

● Broken distribution lines, short circuits or loose connections

● Check all fasteners for tightness

● Check fan belt tension

● Check battery capacity

● Check grounding protection

⚠ CAUTION

Do not run the genset before all discrepancies have been fixed.

6.3 Starting the Genset

Check that the surrounding area is safe before starting the genset.

Close all doors before starting.

1. Start-up method 1

1) Turn the genset main breaker to “OFF”.

2) Rotate the start key to “START” and the genset will start to run. Release the key immediately, it will return to “ON” and the genset will keep on running.

2. Start-up method 2

1) Please insert the start key and rotate it to “ON” and the digital controller indicator will be illuminated.

2）Set the controller on “MANUAL  ” mode

3）Press  to start the genset.

⚠ CAUTION

If the engine fails to start, turn the start key to “OFF” and wait for at least 15 seconds before restarting. Don’t try to start the engine more than twice for every minute. If you attempt to start the engine frequently or the starting time is too long, it will cause the loss of battery power and lower its voltage. Additionally the starting motor may be damaged.

⚠ WARNING

Starting the generator with loads applied is forbidden.

6.4 Initial running

⚠ CAUTION

Run the genset initially without loads. It will deliver lube oil to all moving parts. Applying loads immediately can cause abnormal abrasion or damage to the pistons, cylinder sleeves, crankshaft, camshaft, bearings and other parts.

a. Check for alarms such as low oil pressure, high coolant temperature, charging failure or other faults.

b. Please warm up the engine for at least 5 minutes after starting.

c. Check for abnormal noise or fluid leaks.

d. Check the oil and coolant levels after stopping the engine.

After initial running, some oil and coolant will remain in parts of the engine. Refill these fluids to the proper levels.

6.5 Running

⚠ DANGER

While the genset is running, avoid contact with the following parts: Rotating parts such as the radiator fan and belts; High temperature parts such as the engine block, cylinder heads, exhaust pipe and muffler; High voltage parts. Stop the genset before check or service.

● Close and lock the door when the genset is running.

● Stop the engine and wait until it cools before adding fuel, oil or coolant.

● Operate the genset with the buttons on the controller.

6.5.1 Inspection during the running

(1) Check and fill fuel

Regularly check the residual fuel level in the tank and add more fuel as necessary

(2) Lube oil check and filling

● Check the oil level on the dipstick

● Refill the specified oil through the oil filling port on top of the gear box if necessary.

Check the oil level on the dipstick. Add the oil to the upper scale mark. Make sure the oil is clean.

(3) Cooling water check and filling

Fill cooling water before the operation of the generator. Make sure the engine has been completely cooled down.

⚠ WARNING

When the generator is running or after the engine immediately shut down, the cooling water is at high temperature and pressure. Don't open the radiator cap in such situation to avoid being burnt by sprayed hot water and steam. When the temperature of cooling water drops, wrap the cap with cloth and unscrew the cap slowly. When the internal pressure is released, remove the cap completely.

【Note】

Daily inspection of cooling water can be performed by the water level of auxiliary tank. Cooling water level should be between the upper and lower scale mark. Make sure the cooling water level is in normal situation before starting the generator.

Check the cooling water level changes before running the genset every day.

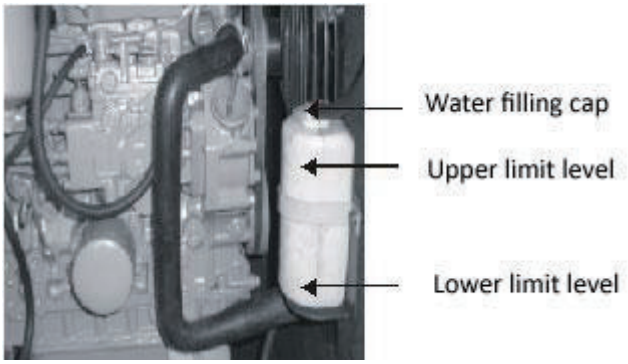
● Cooling water level fluctuation in normal situation

Before starting（in cooling status）； Low level

After shut-down(in high temperature）： High level

● If the cooling water is below lower limited level, refill the cooling water

● Open radiator pressure cap every week to check if cooling water is full or not.



⚠ CAUTION

Check and fill the cooling water before and after the generator is running. Make sure there is no loose, drop and damage for the rubber hose connecting the radiator cap and auxiliary tank.

(4) Inspection of generator special grounding

Check if the grounding of the generator and load equipment are in good condition or not.

Don't connect the N-phase for the three-phase connector directly with earth wire.

(5) Check for the water and fuel leakage

Inspect the surrounding of the generator and open the service door to check if there is any water and fuel leakage. Repair if necessary. Contact the authorized distributor or our service department if necessary.

(6) Check for the loose of bolts and nuts.

Check for the loose of bolts and nuts. Tighten them if necessary. Pay special attention to air filter, muffler and charging generator.

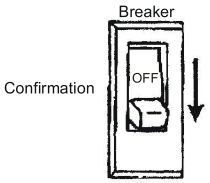
Check for the disconnection and shortening of electrical wires. Inspect if the connection terminal is loose or not.

(7) Inspection of fan belt

Check for the tension and flexibility of the belt. Check for the slipping and deformation of the belts due to fuel polluted. Replace it if necessary.

6.5.2 Starting without loads

⚠ DANGER



- Turn the main circuit breaker to “OFF” before starting.It may damage the genset or loads if you start the genset with the main circuit breaker “ON”

Warm up the genset without load for 5 minutes

- After 5-minute of operation without loads , then perform the adjustments.
- Adjust voltage and frequency

a. Adjust the regulating screw rod of the fuel pump until the frequency is at rated value.

b. Adjust the voltage with the AVR to specification.

6.5.3 Run at low load

⚠ WARNING

Running at low loads for extended periods is harmful to the genset.

● Running the genset above 1/4 of rated load for long periods is permissible.

● Don't run the genset at 1/8 to 1/4 of rated load for more than 5 hours.

Long-term operation at low loads will damage the engine due to the carbon deposit on the engine and it exhaust pipe.

6.5.4 How to apply loads

1) Check before start

a. Check that the voltage, current and frequency shown on the controller panel are in the normal range.

b. Check the surroundings of the genset and loads.

c. Turn the main circuit breaker to "OFF" and turn the loads circuit breakers to "OFF"

● Check the color of exhaust

Colorless or light gray: Normal

Black : Abnormal (insufficient combustion)

Blue: Abnormal (Combustion of lube oil)

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

● Check the sound, running state and vibration

● Check for fluid leaks

2) Applying the load

a. Turn the main circuit breaker to "ON" position.

b. Turn the loads circuit breakers to "ON" position then the load machine will be put into operation.

【Note】

Don't increase or decrease loads rapidly for the first 50 running hours of a new genset.

3) Adjust during running

Please adjust voltage ,frequency and speed to the normal range.

4) Check during running

Please check the following items during running:

a. Check parameters

Check that the voltage, current and frequency is in the normal range. Check for any alarms.

b. Check the color of exhaust

Colorless or light gray: Normal

Black : Abnormal (insufficient combustion)

Blue: Abnormal (Combustion of lube oil)

c. Check the sound, running state and vibration

d. Check for fluid leaks

e. Check if the fuel is sufficient or not.

If the genset runs out of fuel while running, bleed air from the fuel system before restarting.

【Note】

If there are alarms or other problems with the genset, stop it immediately to prevent a severe accident or damage.

6.5.5 Genset running in vehicle-mounted status

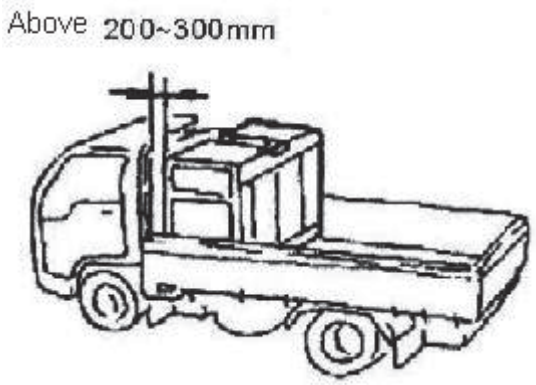
Do not block and cover air inlet and exhaust port of genset in vehicle-mounted status.

【Note】

Operate the genset with anything around the air port will cause the overheat of the genset.

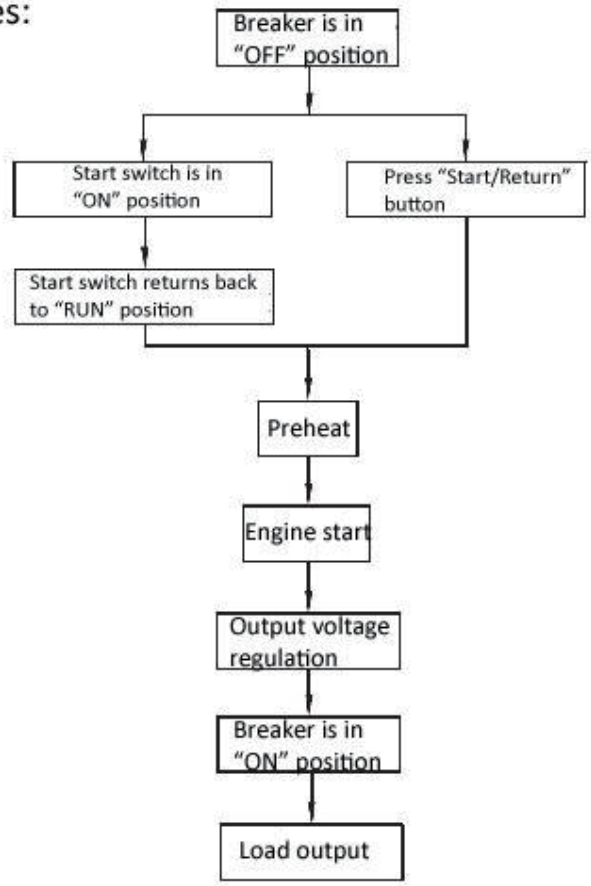
Ensure 200～300mm distance between operator's seat and genset. Make sure that there is no obstacles around the air vent before start the generator.

Do not run the genset in vehicle-mounted status for a long time and make sure the vehicle is stopped.

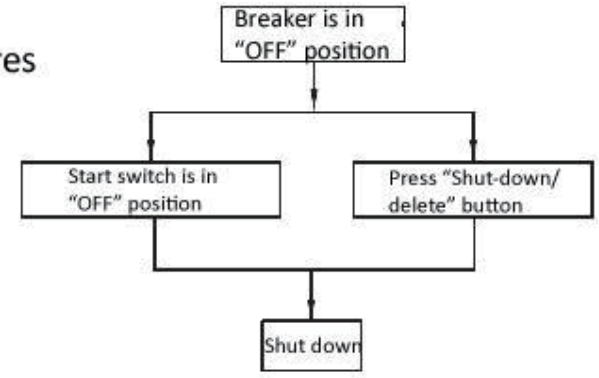


6.5.6 Start and shut-down procedures :

Starting procedures:



Shut-down procedures



6.6 Stopping the Genset

1. Normal shutdown

a. Turn off all loads

b. Turn loads circuit breakers to “OFF”;

c. Turn the main circuit breaker of genset to “OFF”

d. Run the genset without load for 5 minutes

e. Turn the start key to “OFF” or press the “STOP” button on the controller panel to stop the genset.

f. Take out the start key and keep it in a secure location.Make sure that all the indicator lamp of the control panel are off.

⚠ WARNING

It is forbidden to stop the genset with a load applied .

2. Emergency stop

a. Operator should pay attention to the running status of the genset and shut down the machine in a normal way if any abnormality occurs.

b. In an emergency such as a short circuit, electric shock, overspeed, excessive vibration or unusual noise, press the “EMERGENCY STOP” button to stop the genset.

c. After stopping the genset, please reset the “EMERGENCY STOP” button before a restart. Press the button and rotate it clockwise to restore it to the normal position.

⚠ CAUTION

When pressing the “EMERGENCY STOP” button, the main circuit breaker will turn to the “OFF” position immediately and cut power to the loads. At the same time, the genset will stop and the digital control panel will show an alarm.

To resume operation, reset the “EMERGENCY STOP” button first and then press the “RECOVER” button on the control panel. After eliminate troubles and there are no alarms, then you can start the genset again.

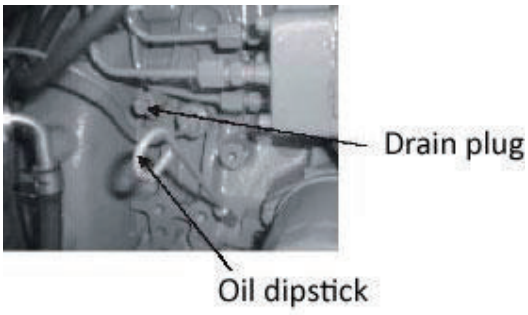
Switch on the main breaker after the normal operation of genset to supply power to loads.

⚠ WARNING

Please don't press " EMERGENCY STOP" button if it's not a true emergency because it can be harmful to the genset. The engine temperature will rise rapidly and could lead to cylinder damage.

6.7 Long-term storage

Store the genset in a dry and well-ventilated area for long time storage.Pay careful attention to the following instructions:



1) Drain all coolant completely.

(Water drainage is not necessary if antifreeze solution is used.)

a. Open the door and remove the radiator cap.

b. Remove the radiator drain plug and drain the coolant from the radiator into a suitable container

c. Remove the engine block drain plugs and drain coolant from the engine

【Note】

Water drainage must be performed. Otherwise, the freezing and expansion of the remaining cooling water inside the genset will damage the genset.

d. Drain the expansion tank

e. Reinstall the radiator cap and drain plugs.

2) Run the genset for 3 minutes and then stop the engine. Drain the oil while the engine is still warm and then refill with fresh oil. Change the oil filter at this time. Dispose of used oil properly.

3) Drain any remaining fuel in the fuel tank and clean out any sediment in the tank.

4) Lubricate the speed regulation system

5) Wipe off dirt and grease from the genset.

6) Remove the battery terminal wires, negative (-) first and then positive (+). Charge the battery with an external charger at least once a month.

7) Check and service the genset according to the maintenance schedule prior to storage. Correct any discrepancies before storage.

8) Cover the genset with a plastic cover or tarp to keep water and dust away from the genset. Use additional protective equipment for outdoor storage.

9) Store the genset in a well-ventilated area free from moist and dust.

10) Please carry out the "Section 6.1 starting procedures" when start the genset after long-term storage.

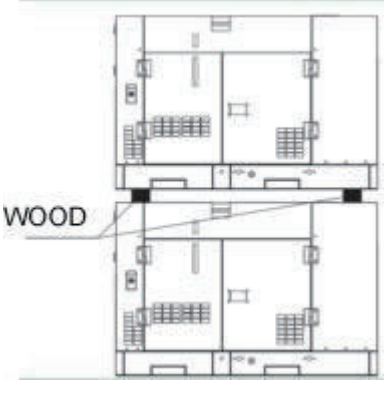
Refer to engine operation manual about engine operation issues.

(2) Genset stack

⚠ CAUTION

Use extreme caution when stacking generators to prevent falling.

- Make sure that the genset enclosure is not broken and all fasteners are intact.
- The genset should be put on level ground which is hard enough to support its weight.
- Do not stack more than two high. Put the heavier of two generators on the bottom. Protection measures should be taken between generators.
- Never run the generators when they are stacked together. The vibration may cause one generator to shift and fall.
- Put woods between two layers of gensets then place genset evenly. Do not place woods beyond the place which is showed in the below picture.



7. PERIODIC MAINTENANCE AND SERVICE

7.1 Maintenance Attentions

Regular and systematic preventive and periodic maintenance is the key to a long service life of the generator. Repair and maintenance should be carried out by qualified technical personnel. In addition, periodical maintenance of electrical system can prevent electrical shock.

⚠ CAUTION **Perform periodical inspection**

● Keep detailed records of all maintenance activities

● Periodical inspection interval should be set as every 50 hours, every 250 hours, every 500 hours , every 100 hours and every 2000 hours. Maintenance should be performed if the service time is close to the setting value.

● Maintenance tools should be prepared in the vicinity of the genset.

⚠ DANGER **Warning labels during maintenance**

● Do not carry out any maintenance unless the generator has completely stopped, the circuit breakers placed in the off position and the battery cables disconnected.

● During checks or maintenance, place the warning label “DANGER NOT RUN” at obvious positions around the genset such as starting switch to keep you safe and protected from an inadvertent startup.

⚠ CAUTION **Checks before starting**

Always perform the daily checks before starting. Refer to section 6.1 -6.2 for detailed instructions.

⚠ CAUTION **Use genuine Our parts**

Please replace spare parts with OUR genuine spare parts. Our parts have been engineered to fit your generator. The use of unauthorized parts may have an adverse effect on the performance of the generator and possibly void your warranty.

⚠ CAUTION **Safety instructions**

● Service and maintenance can only be carried out by qualified technicians.

● Wear suitable clothing when working on the generator. Loose clothing can get caught in rotating parts and cause a serious injury.

⚠ CAUTION **Dispose waste liquids**

● Dispose waste liquids in the container.

● Don't pour waste liquids into streams, lakes, rivers or on the ground to prevent polluting the environment.

● Dispose of all wastes such as used oil, coolant, and diesel fuel properly in accordance with local regulations.

⚠ CAUTION **Tightening torque for bolts and nuts**

During maintenance, over tightening of bolts and nuts will broke the bolts or damage the thread. In addition, small tightening torque will cause fuel leakage or damage the parts due to the loose of the bolts. As a result, bolts and nuts should be tightened according to the specified torque.

● Important parts are tightened by torque wrench according to correct torque value, tightening method and procedures.

● Contact with sales department or distributors for parts disassembly and maintenance.

● Bolts and nuts of metric thread without special signs should be tightened according to the torque in the following table.

Item		Bolt diameter * Screw pitch	Tightening torque N.m (kgf.m)	Remark
Hexagon bolts (7T) and nuts	Normal thread	M6×1	9.8~11.8 (1.0~1.2)	(1) One side of the tightening is aluminum, the torque value is 80% of the left side (2) Torque of 4T bolts and tightening nuts is 80% of the left side. (3)Fine thread is used on the engine
		M8×1.25	22.6~28.4 (2.3~2.9)	
		M10×1.5	44.1~58.8 (4.5~6.0)	
		M12×1.75	78.5~98.1 (8.0~10)	
		M14×2	117.7~147.1 (12~15)	
		M16×2	166.7~206.0 (17~21)	
		M18×2.5	235.4~284.4 (24~29)	
		M20×2.5	323.6~402.1 (33~41)	
	Fine thread	M14×1.5	127.5~147.1 (13~15)	
		M16×1.5	210.8~240.3 (21.5~24.5)	
Pipe connector joint thread		M8	12.7~16.7 (1.3~1.7)	
		M12	24.5~34.3 (2.5~3.5)	
		M14	39.2~49.0 (4.0~5.0)	
		M16	49.0~58.8 (5.0~6.0)	

7.2 Routine and Periodic Service Chart

【Note 】

● Regular and systematic preventive and periodic maintenance is the key to a long service life of the generator.

● Periodical check items and interval varies due to difference of application, load status, fuel & oil quality and operation. This chapter lists the general situations.

Routine service: check before every start.

Periodic service: It is recommended that you keep records of running diary which lists the daily running and check results, accumulated genset working hours. Refer to the following table for detailed instructions.

Periodic service: certain items must be checked or parts replaced at regular intervals of 50, 250, 500, or 1000 hours.Contact the factory or your local distributor for technical assistance concerning the checks above 1000 hours.

Periodical maintenance intervals can be ahead of schedule and delayed according to actual situations, such as genset application, load status, fuel and lube oil quality and other conditions. Refer to the following table for details.

○：Check ◎：Replacement ●Check qualified by professional person and contact with distributors

	Items	Daily check	Periodical maintenance interval				
			Every 50h	Every 250h	Every 500h	Every 1000h	Every 2000h
Fuel system	Fuel level check and filling	○					
	Fuel leakage check	○					
	Water drainage of fuel tank			○			
	Fuel filter element replacement				◎		
	Fuel-water separator check		○				
Lube oil	Lube oil level check and filling	○					
	Oil leakage check	○					
	Replacement of lube oil		◎ Primary	◎ Future			
	Replacement of oil filter		◎ Primary	◎ Future			
Cooling system	Cooling water check and filling	○					
	Water leakage	○					
	Replacement of cooling water					◎	
	Clean of radiator fan				○		
	Clean and maintenance of cooling pipelines						●
	Tension inspection of cooling pump belts		○ Primary	○			
Air inlet and exhaust system	Air leakage check	○					
	Check for the color of air exhaust	○					
	Clean and replacement of air			○	◎		

	filter element						
Electrical system	Inspection of working status and alarming indicator lamp for equipments.	○					
	Check battery	○					
	Inspection of battery electrolyte specific gravity			○			
	Check for protective grounding	○					
	Check for the loose of connection terminal	○					
	Measurement of Insulation resistance			○			
	Check for the electrical wirings				○		
Cylinder	Adjust switch clearance of the air inlet and exhaust valve					●	
	Valve seat wearing of air inlet and exhaust valve						●
Fuel injection	Injection valve pressure check and adjustment					●	
	Check and adjust of injection time						●
	Service of fuel injection pump						●
Check for the loose of bolts and nuts		○					
Check rubber hoses						○	● 2 year or 4000 hours
Check the shock absorption rubber and sound insulation material						○	

7.3 Service Intervals

7.3.1 Initial 50-hour service

(1) Replace lube oil

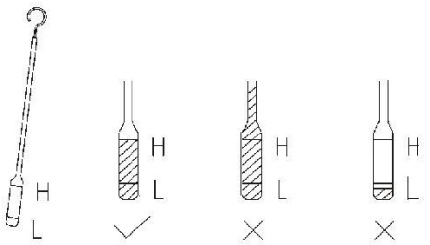
⚠ CAUTION

Do not replace the lube oil immediately after the engine is shut down.

High temperature of the lube oil may cause burnt.

For initial use, lube oil should be replaced ahead of schedule due to wearing of the internal parts and aging of the oil.

Replace lube oil after the initial 50 hours and every 250 hours



thereafter.

① Remove the oil drain plug and drain the oil completely. It's easier to drain the oil if you run the genset for 3-5 minutes.

② Tighten the plug tightly after the drainage.

③ If new oil is applied, add the oil with oil can. Remove the oil filler cap and add the recommended oil to the upper mark (H) of dipstick.

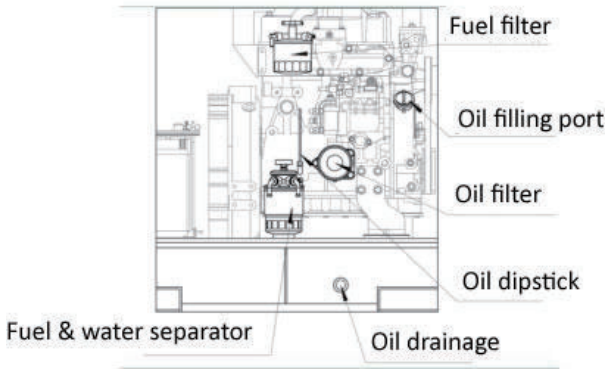
④ After adding oil, start the genset and run for a few minutes. Stop the genset to and recheck the oil level to be sure it is between the upper mark (H) and lower mark (L).

(2) Replace oil filter element

Replace the oil filter element after the initial 50 hours and every 250 hours thereafter.

Please replace more frequently when operating in dirty or dusty conditions.

Spring seal ring is facing upward and drain the oil completely before replacement.



a． Remove the oil filter element with an oil filter wrench.

b. Spread a thin film of oil on the new oil filter sealing surface. Install the filter by hand until it contacts the sealing surface and then tighten it with a filter wrench ¾ to 1 revolution.

c. Start the engine and recheck the oil level as above. Normal oil level shall be between H and L.

d. Refer to engine owner's manual for the manufacturer and type of oil filter spring seal ring.

(3) Check fan belt tension

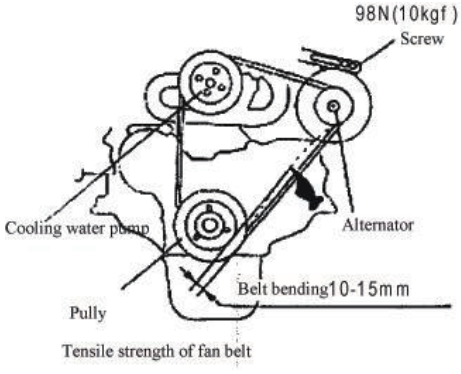
Poor belt tension may cause improper fan operation, the coolant pump and the charging generator, resulting in overheating or charging failure. Excessive belt tension will cause damage to the bearings of the water pump and charging generator. Adjust the belt tension as follows:

a. Open the side door. press the middle part of the belt with your finger to test its tension.

b. To adjust the belt tension, unscrew the adjusting bolt of the charging generator. Move the charging generator until the belt curvature is 10-15 mm or the tension is 98.1N (10 kgf).

c. Tighten the bolts fixing the AC alternator

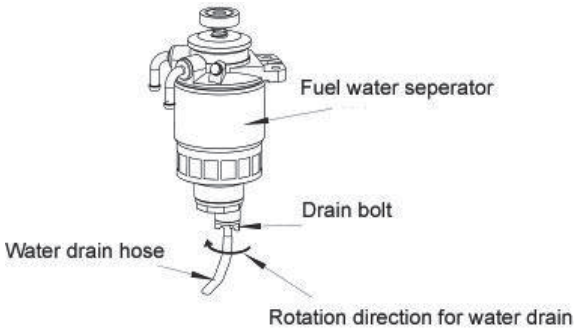
d. Keep oil and dirt away from the belt or it may slip or elongate. Replace a damaged belt immediately.



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

(4) Water drainage of fuel-water separator

The water mixed in the diesel fuel will affect the performance of the genset. The fuel-water separator can separate the water from the fuel and these separated water will stayed at the bottom of the separator. It is necessary to drain off the water from the separator.



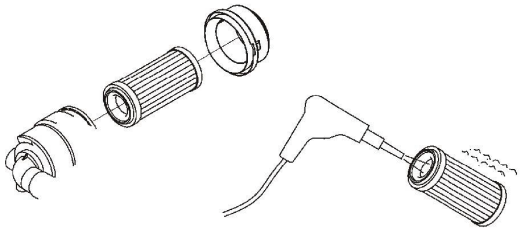
a. Open the service door and check for the dust, greasy dirt and blockage of the fuel-water separator. Clean and replace if necessary.

b. Place a container close to the outlet of the fuel-water separator to contain the fuel and water.

c. Remove the drain plug, unscrew the drain bolts of the separator until the water come from the hose.

d. Drain off the water completely until the fuel is coming out , then screw the drain bolt tightenly.

7.3.2 250 hour service



(1) Perform all 50 hour service items

(2) Clean the air filter element

Remove the air filter element and blow it out with clean compressed air.

- Check the air filter element. If it is crushed or the filter media is torn, replace it.
- Clean the air filter housing at the same time.
- Install the air filter element so it is sealed in the housing to prevent dirt intrusion.

(3) Insulation resistance measurement

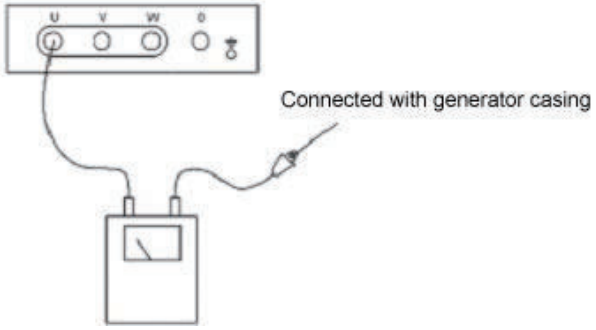
⚠ DANGER **Electric shock**

- Check the insulation resistance after stopping the engine.
- Before measuring the insulation resistance, first disconnect the connection wire of the AVR and GU320 a controller or they will be damaged.

Measure the insulation resistance once a month by using a 500V insulating resistance meter. The insulation resistance should be above 1 MΩ.

Measurement:

Dismantle the three phase power cables and turn the main circuit breaker to ON. Measure the insulation resistance between the output terminal and the generator frame.



Insulation resistance lower than 1 MΩ can be a

shock or fire hazard. Clean and dry the output terminals, breakers and cables. Consult the factory or your local distributor if you have any questions.

(4) Check the electrolyte specific gravity

Poor battery power or electricity leakage will lead to bad engine start. Measure the battery electrolyte gravity to check.

(Refer to 5.4.2 section for the relationship of battery charging status (charging ratio) and gravity.)

(5) Clean internal part of fuel tank

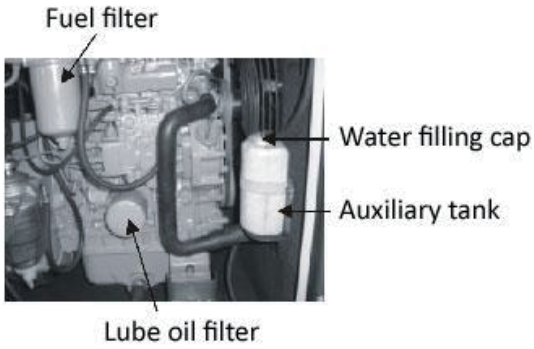
Open the cover of fuel filling port, remove the fuel tank cap ,drain off the fuel completely , and clean dirt inside the fuel tank(water and foreign matter, etc.)

a. Drain off the fuel to the container.

b. Make sure the fuel tank is completely cleaned and add new fuel, then screw the fuel tank cap tightly.

7.3.3 500 hour service

Perform the 250 hour service items at the same time



(1) Replace the fuel filter spring seal gasket

① Remove the fuel filter with a filter wrench and remove the spring seal gasket.

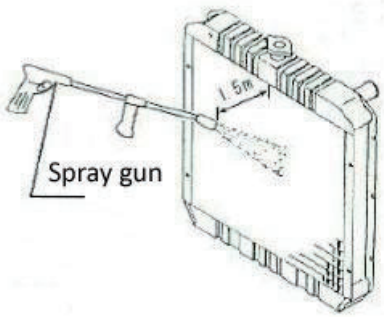
② Clean the filter mounting area and spread a thin film of oil on a new spring seal gasket surface. Tighten the new filter by hand until it contacts the seating area. Then tighten an additional 2/3 rotation with a filter wrench.

③Bleed the air from the fuel lines after filter replacement. See the engine operation manual.

(2) Clean the radiator

When cleaning the radiator, use steam or high pressure compressed air to clean the radiator cooling fins.

⚠ CAUTION



If you clean radiator with high-pressure air, please keep it at least 1.5 meters away from the radiator to prevent damage to the radiator Remove the electric fan prior to cleaning.

a. Remove the genset radiator cover.

b. Blow the oil dirt or fouling block the radiator eyelet with compressed air or clean with steam.

c. Check if the oil dirt and foreign matter on the radiator and fan is clean or not. Check for the leakage of the radiator.

d. Reinstall the cover after clean.

In addition, to prevent the damage of electrical circuit inside the genset, drain off the radiator cooling water, then remove the radiator and clean it with high pressure wter or steam.

(3) Check electrical wiring and terminals

Check all terminals and wires for signs of burning, chafing, cracking or other damage. Replace all damaged wires and terminals

7.3.4 1000 hour service

Perform the 250 & 500 hours service items at this time

(1) Replace the coolant

The cooling performance will be decreased if the coolant is polluted by rust or dirt.

The coolant should be replaced at least once a year.

Please don’t open the radiator cover while it's still hot. Hot water or steam may burn you severely.

a. Open the door and remove the radiator cover.

b. Remove the drain plug at the bottom of the radiator and drain the coolant into a suitable container. Dispose of the old coolant properly

c. Unscrew the drain plug at the side of the engine block and drain the water to the container.

d. Reinstall the radiator cover, casing and plug screw.

e. Add new coolant to the radiator and expansion tank.

(2) Check the vibration dampers

If the vibration dampers are damaged or distorted contact the factory or local distributors for replacements.

(3) Check all hoses

If the hoses are cracked, brittle, distorted or have soft spots, replace them.

(4) Check sound absorbing material.

If the material glued to the inside of the cabinet and doors has been wet, peeled off or torn, the sound deadening effectiveness is diminished. Contact the factory or local distributor for replacement pieces.

7.3.5 2000 hour service

1) Check and service for cooling system parts

Parts of cooling system are easy to be rust or polluted by incrustation scale, which will decrease the cooling performance of the engine.

To remove incrustation scale , the following parts need to be clean and repaired together with the replacement of cooling water

Cylinder block·cylinder head·radiator

Cooling water pump·oil cooler·thermostat,etc.

Maintenance requires professional knowledge and contact with sales department or authorized

distributions.

2) Leakage of Air inlet valve & air exhaust valve

Service should be performed to avoid cylinder head leakage.

Maintenance requires professional knowledge and contact with sales department or authorized distributions.

3) Fuel injection time check & adjustment (Fuel supply advanced angle check and adjustment)

Fuel injection timing should be adjusted to maintain excellent engine performance.

Maintenance requires professional knowledge and contact with sales department or authorized distributions.

4) Service of fuel injector and fuel injection pump

Fuel injector or fuel injection pump should be serviced to increase the engine performance.

Maintenance requires professional knowledge and contact with sales department or authorized distributions.

5) Check and replace rubber hoses

Rubber hoses for cooling water, fuel and lube oil system are easy to be damaged and aging. For safety concerning, these rubber hoses should be replaced periodically even if there is no abnormality.

Replacement requires professional knowledge and contact with sales department or authorized distributions.

● Replace periodically… It is recommended to replace hoses every 2 years or every 4000 hours.

8. TROUBLESHOOTING

【Note】

Stop the genset immediately if there are any abnormal noises, vibrations, smoke, etc.

Determine the cause of the fault and repair before restarting the genset.

Moving parts

Never touch rotating parts to prevent accidents

● Stop the engine before performing service and maintenance unless prescribed by the service manual

● The cooling fan may keep moving after the engine has stopped. Make sure it has stopped completely before performing service around the fan and radiator.

Electric Shock

High voltage parts insides the operating machine is very dangerous.

● Turn the main circuit breaker to “OFF” and stop the genset before service.

Hot Parts

It's very dangerous to touch hot parts.

● Stop genet before check and service.

● The genset remains hot after you stop the genset. Check that the unit is cool before service.

The battery may produce flammable gas. Be careful to avoid any accident due to an explosion.

● Remove the negative cable when perform the maintenance for the genset to avoid the plus earth.

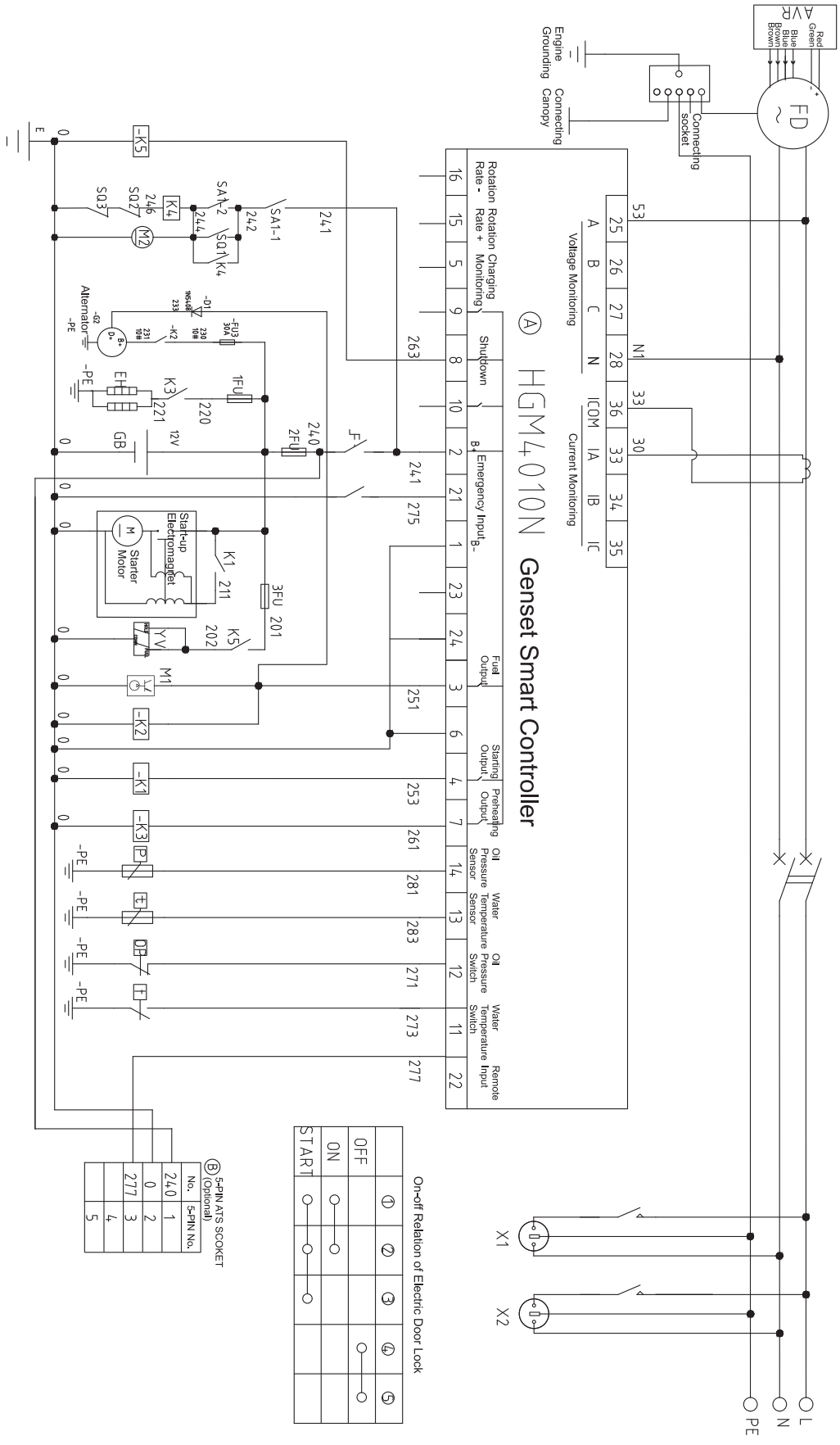
Troubleshooting

Trouble		Possible reason	Corrective Action
Engine doesn't start	Starting motor is not running or run slowly	Battery leakage	Check for battery electrolyte
		Battery terminal loose, disconnect and corrosion.	Clean terminal and reinstall
		Bad grounding	Repair
		Bad starting switch	Replace
		Bad starting motor	Repair and replacement
		Wire disconnection	Repair
	Starting motor is rotating but do not start	No fuel	Refill fuel
		Blockage of fuel filter hole	Clean or replace fuel filter
		Air mixed in fuel hose	Discharge air
	In cold area	Fuel freezing	Use fuel that can be applied in cold area
		Frozen of accumulated water in fuel system	After warm-up, drain off water in fuel tank, fuel filter and fuel hoses.
Automatical engine shut-down or engine speed cannot be increased		Bad discharge of fuel hose	Discharge air
		Blockage of fuel filter	Clean or replace fuel filter
		Engine compression leakage	Repair engine
		Blockage of air filter	Clean or replace air filter element
Engine shut-down due to oil pressure decrease		Lack of engine oil	Fill oil
		Oil pressure switch is bad	Replace switches
		Blockage of engine oil filter hole	Replace filter
Abnormal vibration and sound		Untightened	Fix tightly
		Internal of engine	Abnormal sound
		AC alternator	Bearing is faulty
			Tightening bolt is loose
		Abnormal sound of engine casing	Check and repair
Genset overheat		Reconfirmation of surrounding conditions	Remove items around air exhaust port
		Lack of cooling water	Check and refilling of cooling water
		Loose of fan belt	Adjustment and service of fan belt
		Blockage of radiator cooling hole	Clean of radiator cooling parts
		Thermostat abnormality	Service of engine thermostat
		Overload	Decrease load

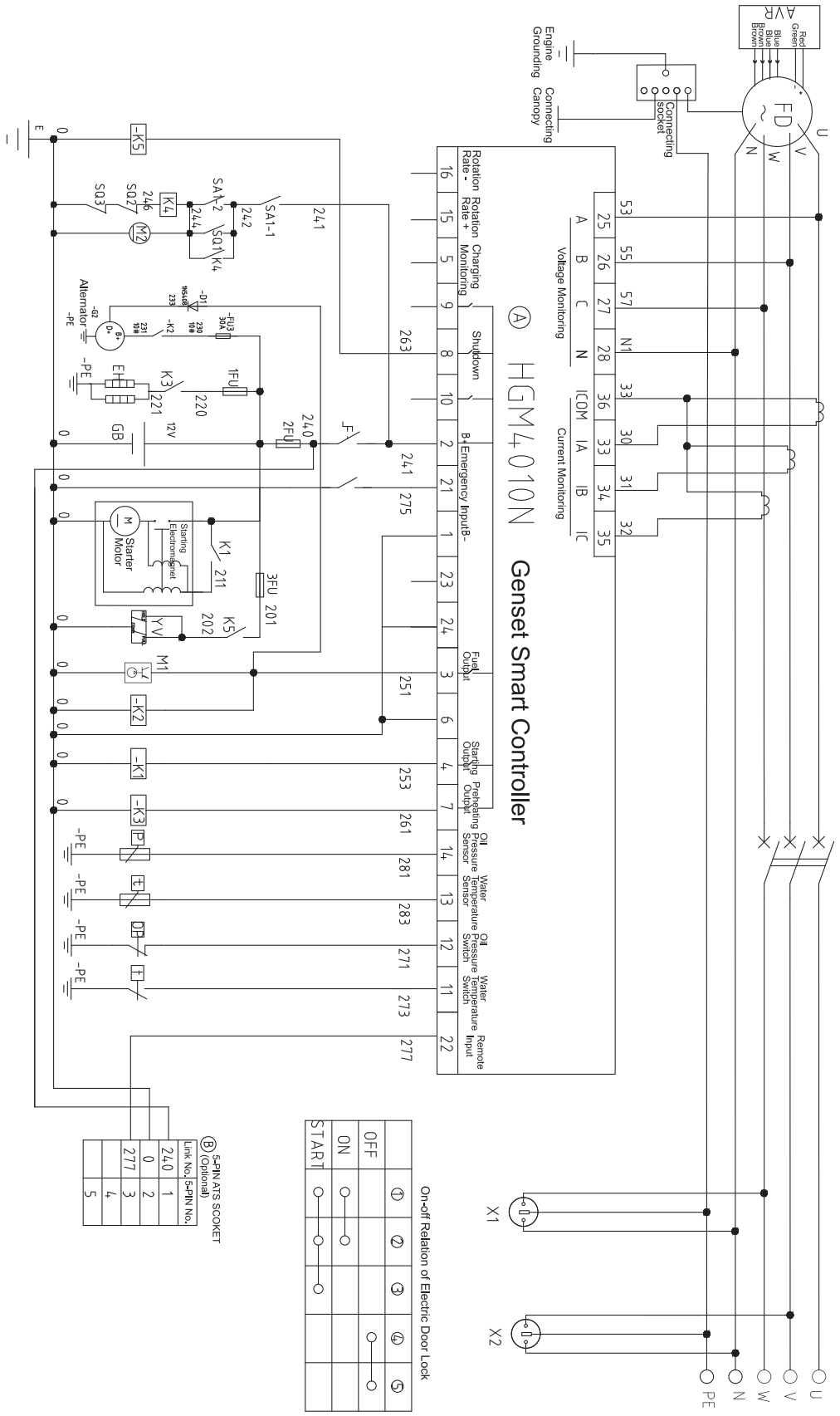
Trouble	Possible reason	Corrective Action
Voltage abnormal or no voltage	Bad AVR	Contact with service department
	Rotating rectifier is burnt out	Replacement or contact with service department
	Rotor circuit is disconnected	Repair, replacement or contact with service department
	Engine circuit is burnt out	Repair, replacement or contact with service department
Rated voltage cannot be reached	Bad AVR	Contact with service department
	Rotating rectifier is burnt out	Replacement or contact with service department
	Generator distribution lines are burnt out	Repair
	Low engine speed	Increase engine speed
Voltage is too high	Bad AVR	Contact with service department
Voltage decreased sharply when load is connected	Rotating rectifier is burnt out	Contact with service department
	Bad AVR	Contact with service department
	Main winding and exciter winding are burnt out	Contact with service department
	Unbalance of load	Balance
Breakers cannot work	Bad breakers	Contact with service department
	Bad over-current breakers	Contact with service department
	Short circuit of load circuit	Check

9. ELECTRICAL DIAGRAM

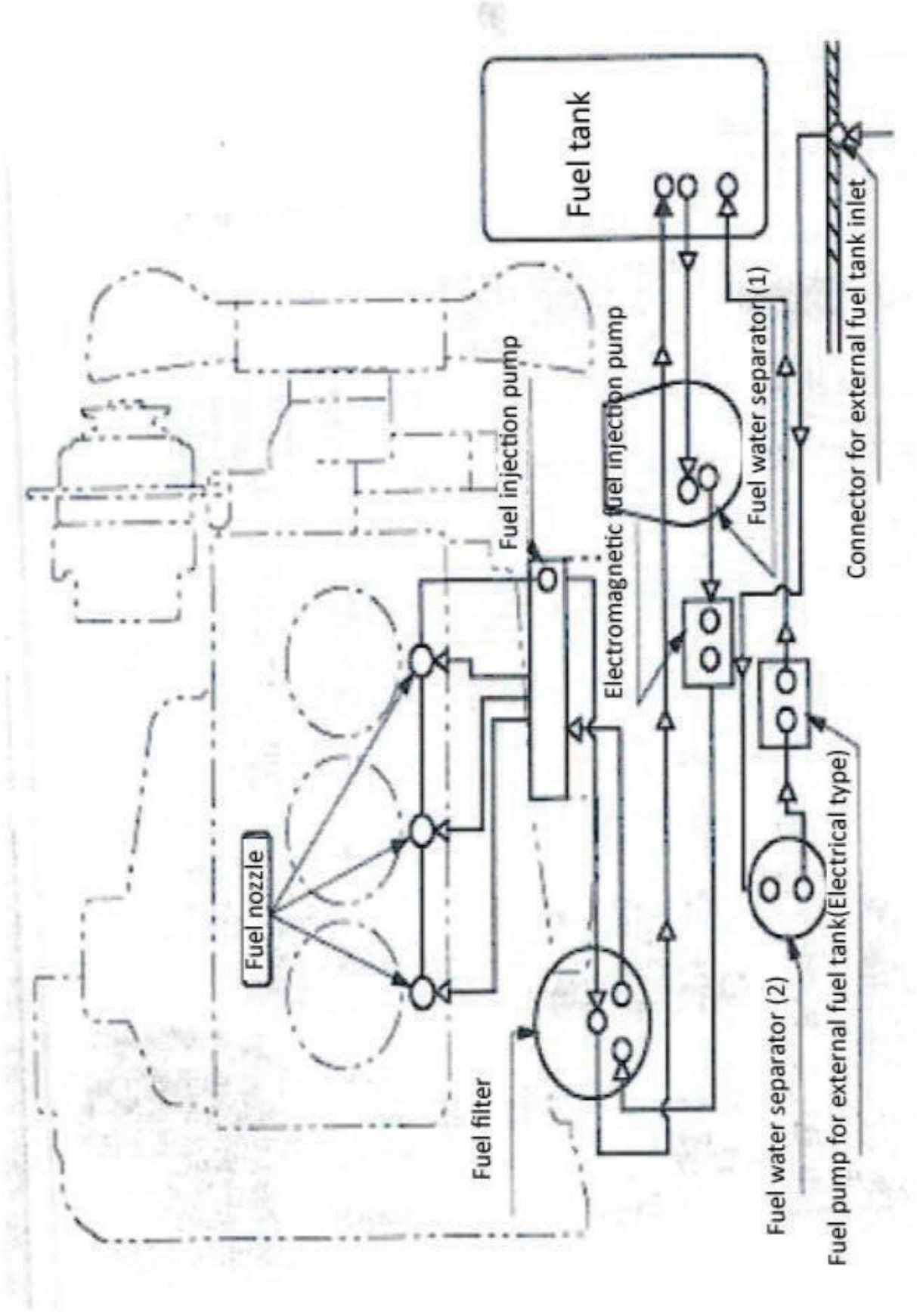
9.1 RDE11SS, RDE16SS,RDE19STA single-phase genset electrical diagram



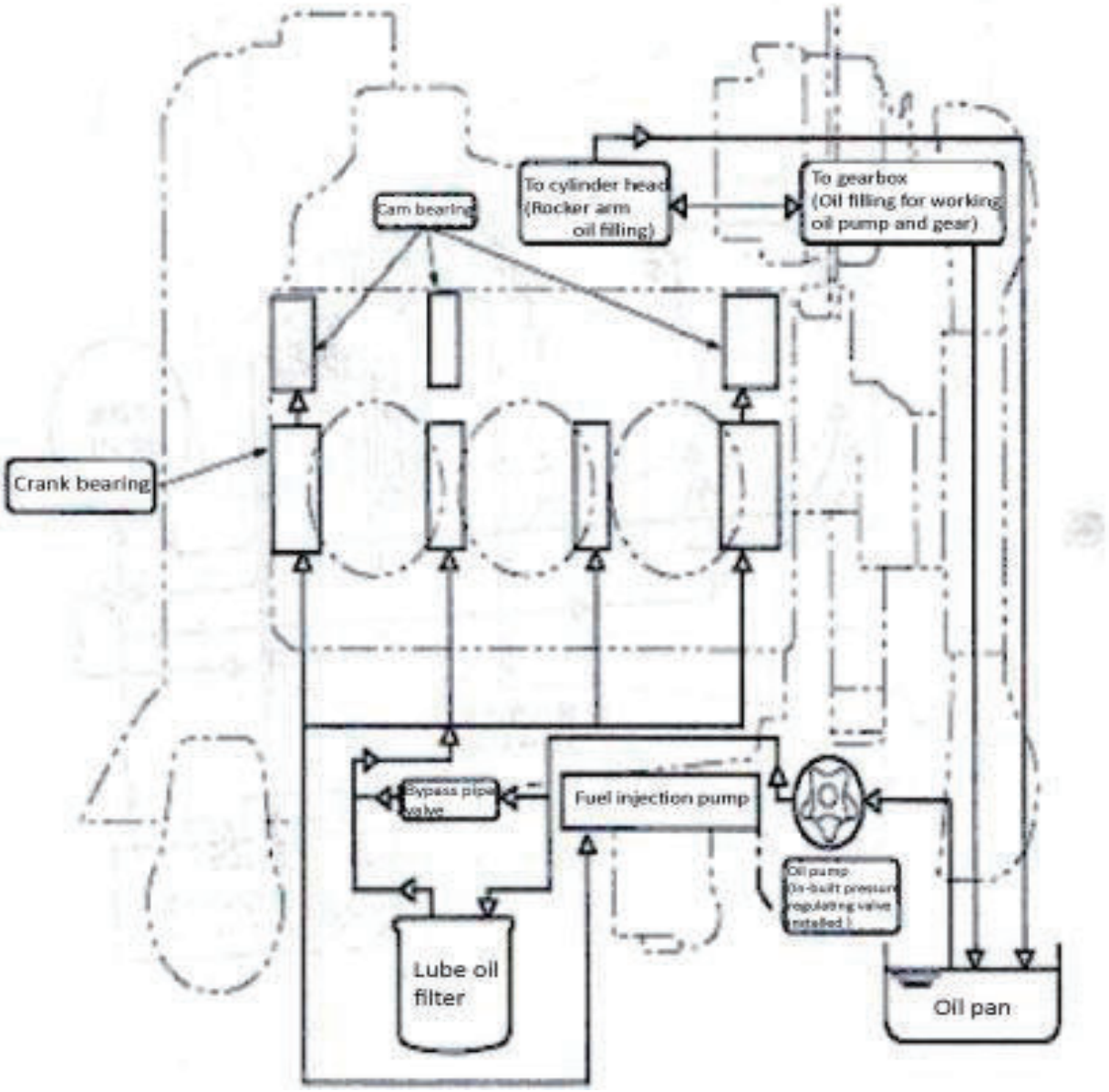
9.2 RDE13SS3, RDE20SS3,RDE19STA3 three-phase genset electrical diagram



9.3 Fuel system diagram



9.4 Lube oil system diagram



9.5 Cooling water system diagram