

KIPOR

KIPOR POWER

OPERATION MANUAL

PLEASE READ THIS MANUAL CAREFULLY.
IT CONTAINS IMPORTANT SAFETY INFORMATION.

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KIPOR

WUXI KIPOR POWER CO., LTD.

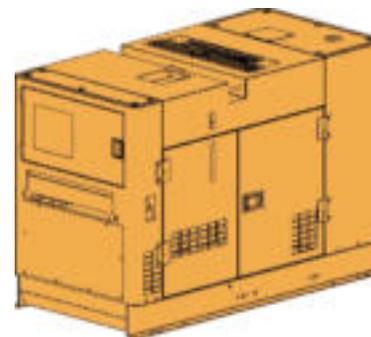
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DIESEL GENERATING SET



Single-phase:

KDE9000SS	KDE11SS
KDE13SS	KDE16SS
KDA9000SS	KDA9000SS0
KDA11SS	KDA11SS0
KDA13SS	KDA13SS0
KDA16SS	KDA16SS0

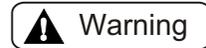
Three-phase:

KDE9000SS3	KDE13SS3
KDE15SS3	KDE20SS3
KDA9000SS3	KDA9000SS03
KDA11SS3	KDA11SS03
KDA13SS3	KDA13SS03
KDA16SS3	KDA16SS03

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Preface

Please read this instruction and ensure understand all regulations concerning handling, check and maintenance thoroughly prior to application.
Failure to follow this instruction may cause serious accidents.



Incorrect operation is likely to lead accidents.

Operate and maintain the machine on the basis of thorough understanding of this instruction.

- Place this instruction in the fitting box or near machine after reading because it is regularly needed.
- If this introduction is lost or damaged, please order one from local KIPOR dealer.
- Please provide this introduction to another user whom machine will be transferred to.
- Machine may be improved or modified. Therefore actual conditions may be different from this introduction.
- If you have any doubt, please consult local KIPOR dealer.
- Machine is the special diesel generator for ground application.
- Safety information contained in this introduction are extremely important.

Information about labeling, purchase of parts and contact for occurrence of errors

Labeling of machine

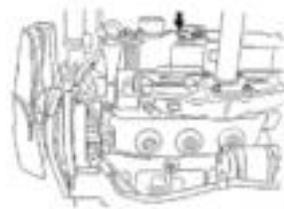
At panel

Forbid removing labels without proper reasons.

Labeling of engine

On the top of engine cylinder hood

Forbid removing labels without proper reasons.



Mark the engine No. at one side of engine.

Purchase of parts and contact for occurrence of errors

If user intends to purchase certain parts or finds any errors, please provide type of machine and actual running period to local KIPOR after-sales department.
For example:

Type: KDE15SS3
Actual running period: 1000hours
Error description:

The choice of the electric cable

The choice of the electric cable depends on the allowable current of the cable and the distance between the load and the generator. And the cable section should be big enough.

If the current in the cable is bigger than the allowable current, it will become over hot and the cable will be burnt. If the cable is long and thin, the input voltage of the electric appliance will be not enough, causing that the generator doesn't start. In the following formula, you can calculate the value of the potential "e".

$$\text{Potential (v)} = \frac{1}{58} \times \frac{\text{Length}}{\text{Section area}} \times \text{Current (A)} \times \sqrt{3}$$

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

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

The application of the single-core insulating cable section mm²

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

The application of the multi-core insulating cable section mm²

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

11. APPENDIX

Modified coefficient table of ambient condition power

The conditions of generator rated output:

Altitude: 0 m Ambient temperature: 25°C Relative humidity: 30%

Ambient modified coefficient: C (Relative humidity 30%)

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

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

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

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

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

Counting example:

When the rated power of generator is $P_N = 5\text{KW}$, altitude is 1000m, ambient temperature is 35°C, relative humidity is 80%, the rated power of generator is:

$$P = P_N \times (C - 0.02) = 5 \times (0.82 - 0.02) = 4\text{KW}$$

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10. Warranty statement

Thank you for buying KIPOR products, if disqualification happens to your generator sets, our company will ensure below followings according to this warranty statement.

Guarantee content

Our company will provide free repair if material or product disqualification happen to the genuine part of your generator. (Free repair is called guarantee repair in below passage, which means change and repair the parts). In addition, the disqualification parts will belong to KIPOR.

Guarantee term

The term of guarantee repair starts from the day you bought the machine and lasts one year. But if machine is long-term or frequently used, the guarantee term will be six months.

Other guarantee things

Battery will be guaranteed according to standards made by the accessory producers. Please consult with the store you bought the machine or KIPOR generator service store. (Only for generators with battery).

Things which can't be guaranteed

Errors caused by below reasons can't be guarantee repaired.

- Fail to check and maintain machine timely according to the instruction.
- Fail to operate according to the instruction.
- Badly or wrongly maintain.
- Over-time work.
- Change without promise of KIPOR.
- Error caused by inattention
- Use anti-purity accessory or discommend grease.

Below things can't be guarantee repaired.

- Aging after a period of time, such as nature fading on cover of decorated dope and plated metal.
- General feeling phenomenons which don't affect quality and performance, such as sound, shock, etc.
- Problems brought by typhoon or flood.
- Problems brought by medicine or salt damage.

Cost of below things is not paid.

- Expendable, such as spark plug, air cleaner, fuel filter, lamp, tie plate, seal washer, fuse, and brush and grease and so on.
- Repair machine not in KIPOR generator service store or store where you bought the machine.
- Check, clean, adjust and maintain timely.
- Inconvenient and loss brought by can't work, such as shutout or business loss.
- Compensate cost beyond instruction in this warranty statement.

Guarantee range

This guarantee is just for generator bought inland, and will be end if bring abroad.

Ways to receive guarantee repair.

Please bring generator, warranty statement and invoice to the store you bought the machine or KIPOR generator service store to get guarantee repair. We will not provide guarantee repair if you don't bring with warranty statement.

Guarantee repair go into effect.

The guarantee repair goes into effect as soon as you and the supplier write down some important terms on the warranty statement and sign or seal.

WUXI KIPOR POWER CO.LTD

Beside jingyi Rd, Third-stage Development section of Wangzhuang Industry Area.

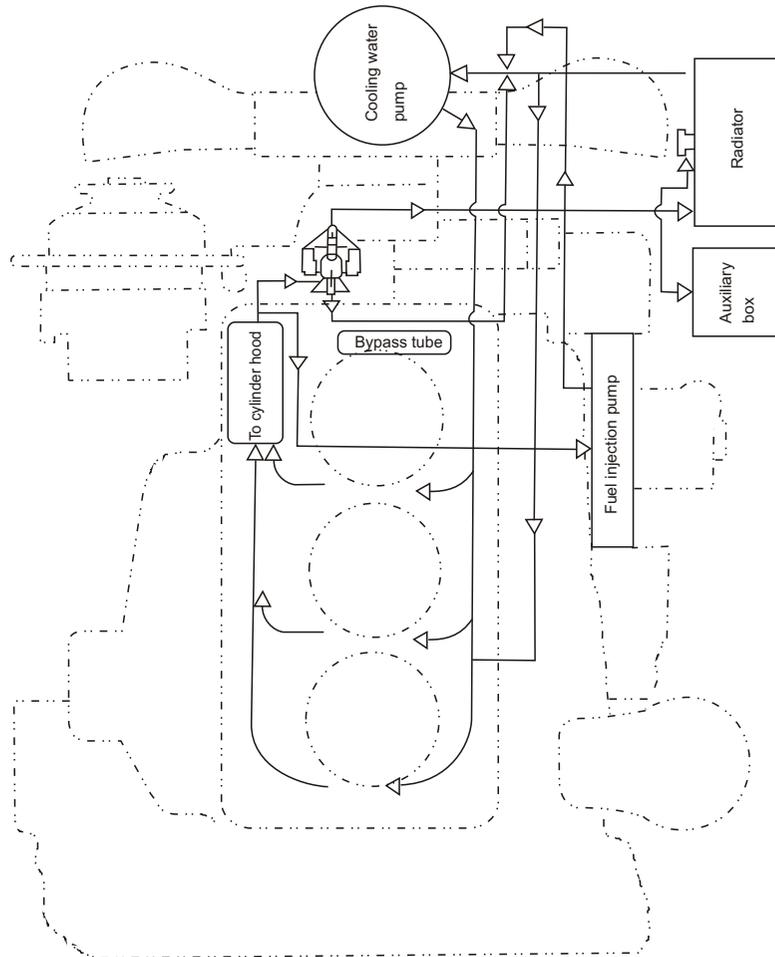
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9.4 Lubricant system drawing



1. Safety



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

1.1 Safety marks

Please carefully read and thoroughly understand this introduction and precautions and attentions marked on the machine prior to operation, check and maintenance. Then official operation is allowed.

Identify conditions of risks and damages if operation is incorrect with following



Danger

Indicates the extreme risk. Incorrect operation can lead to serious injury even death.



Warning

Indicates the potential risk. If no measures are taken to avoid risk, serious injury even death is very likely to occur.



Attended

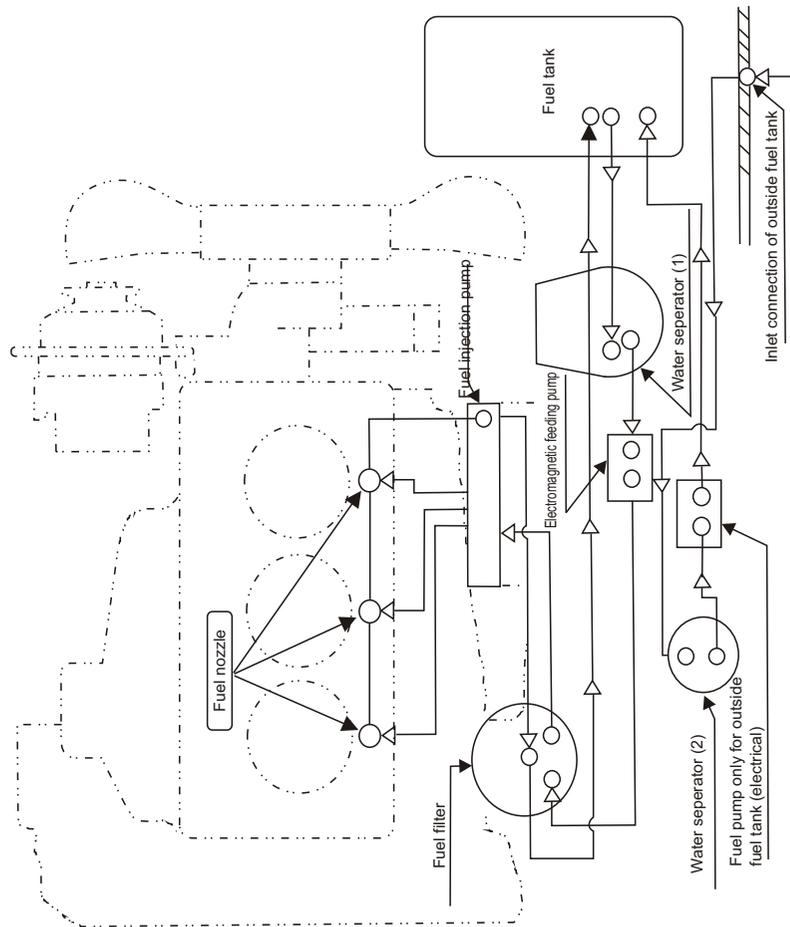
Attention reminds operator not to ignore potential risks. If no measures are taken to avoid risk, mild or moderate injury or mechanical damage is very likely to occur.

[Attended operation]

Indicate that mechanical damage or shorter duration and etc. is likely to occur in case of neglect.

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

9.2 Wiring drawing of engine



- Do not run the machine in the place with bad ventilation such as room, stockroom, cabin, tunnel and enclosed box.
- If it is necessary to run the machine on mentioned conditions, necessarily extend exhaust pipe outside of room and provide proper ventilation device to ensure sufficient ventilation.
- Mount the plug screw to water outlet of exhaust muffler and ensure no leakage of waste gas. Otherwise there is risk of leakage of waste gas.



Electric shock

- Touching output terminals of running machine leads to electric shock even death, particularly when hands are wet.
 - Cut off the breaker and stop running machine before wiring. (If machine is run with shunt feeding, please cut off power feeder outside of machine.)
 - Close the cover of output terminal and screw down holding screws when machine is running.
 - Touching the circuit in the control panel of running machine leads to electric shock even death. Please screw down holding screws.
 - Close the breaker (OFF) and stop the machine before opening the control panel in consideration of changeover of running machine and other reasons.
- Stop engine and take out ignition key before checking the control panel.



Keep far away from rotating part of running machine.

- If operator touches part of running machine rotating at high speed, he/ she will be injured.
 - Close side door of running machine carefully.
 - If it is necessary to open side door of running machine, keep hand and face away from rotating part of running machine.
 - Stop running machine prior to check and maintenance.



Precaution of fire risk

Fuel, lubricant and anti-freezing liquid are easily inflammable materials. If they are exposed to flame or ignition source, there is fire risk.

- Please stop running engine upon fuel fill-in. Additionally, prevent cigarette or match or other ignition source close to the machine during fuel fill-in.
- Do not place inflammable materials (paper scrap or sawdust) or hazardous materials (grease, thin liquid, powder and etc.) near the machine.
- Wipe off overflowed fuel and lubricant immediately.
- Keep inflammable materials away from vent because hot waste gas can ignite inflammable materials.



Pay attention to parts under high-temperature

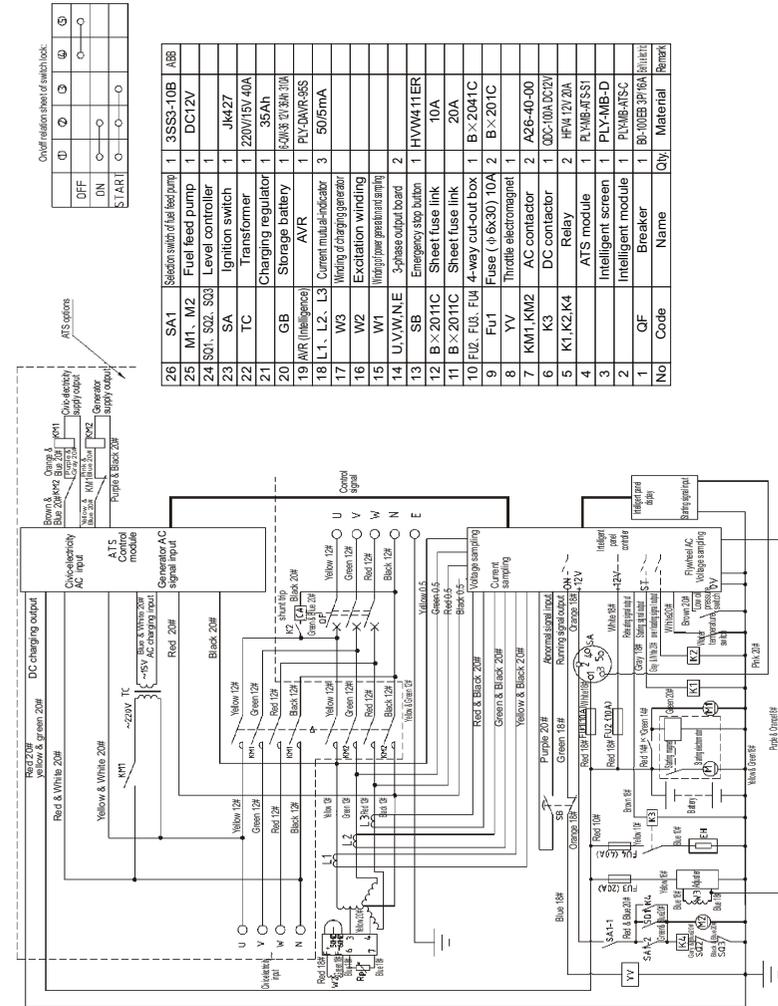
- Heated parts of running machine are exposed to high temperature even when machine stops working. There is scalding risk.

- Close side door of running machine carefully.
- If it is necessary to open side door of running machine, do not touch exhaust muffler, exhaust pipe, cylinder hood, machine body, generator casing and similar parts.
- Check and maintain the machine after engine is cold completely.
- Even if machine stops working, some inside parts are still hot.



Pay special attention to operation of storage battery

- Storage battery can produce inflammable gas. So incorrect operations can lead to explosion or serious injury.
 - Do charging in the well-ventilated place. Otherwise it is exposed to ignition and explosion risks due to inflammable gas.
 - Do not connect (+) and (-) poles of storage battery upon lead connection. Additionally do not connect wrong leads. Splashed spark may ignite inflammable gases from storage battery thus to cause explosion.
- Electrolyte of storage battery contains thin sulfuric acid. Incorrect operation can lead to serious injury.
 - If clothes or skin touches electrolyte of storage battery, immediately wash with plenty of water. If eyes touch electrolyte of storage battery, immediately wash with plenty of water and consult physician.
- If electrolyte of storage battery is below LOWER LEVEL, do not use storage battery. Inside aging of storage battery leads to shorter life even explosion.



Pay attention to electric shock

- Some parts of running machine are under high voltage. It is dangerous.
 - Start check and maintenance after engine stops.



Pay attention to parts at high-temperature

- As certain parts in the machine are hot
 - It is necessary to start check and maintenance after engine stops.
 - Please pay particular attentions. Even if machine stops working, some inside parts are still hot. Therefore check and maintain the machine after engine is cold completely.



Attentions for handling storage battery

- Incorrect operation may lead to explosion even serious injury.
 - Take out the earth line of storage battery (-) pole then cut off power supply upon mechanical check and maintenance.
 - Connect (+) pole prior to (-) pole upon connection of storage battery.

Lighting apparatus must have explosion-proof.

- Please use lighting apparatus with explosion-proof upon check of fuel, lubricant, cooling water and electrolyte of storage battery. Otherwise, explosion may occur.

Periodical change of important parts

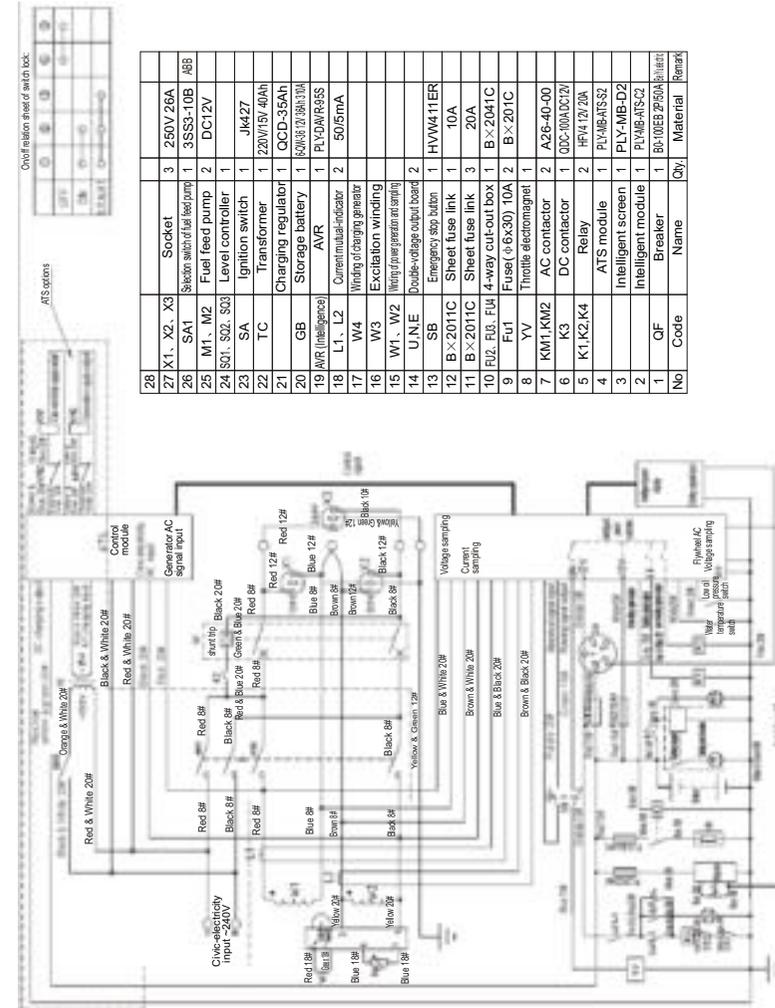
- Periodically change following parts because aging or damage may cause fire accident.
 - Fuel system: Periodically change fuel hose, fuel pipe, cover of fuel tank and others even if no abnormalities.

Disposal of waste oil and water

- Do not dispose waste oil into sewage or river, which pollutes environment.
 - Collect the lubricant drained out from the machine in the special container. Do not dispose it on the ground.
 - Disposal of fuel, lubricant, cooling water, solvent, filters, storage battery and other hazardous matters shall observe state and local regulations.

9. Electrical wiring drawing

9.1 Wiring drawing of generator

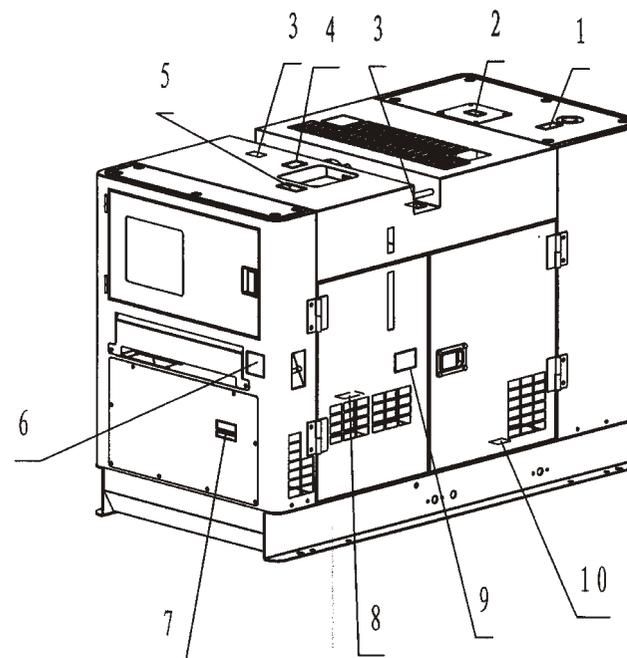


Error	Analysis	Solutions
No start display	1.Broken panel fuses	Replace fuses
	2.Bad contact or damage of switch lock	Check or replace switch lock it according to on-off relation of switch lock
	3.Bad contact of inserts	Check module nine PIN inserts and data line
P-01	1.Insufficient lubricant	Fill lubricant to rated value
	2.Error of lubrication system	Check lubrication system
	3. Damage of low-oil-pressure switch (normal open)	Replace with same type
	4. Earth short-circuit of low-oil-pressure switch	Check circuit
P-02	1.Broken sampling harness	Check voltage sampling harness if not indicate voltage or frequency after machine starts
	2.Abnormal frequency (excessive or below)	Check output frequency with AVO meter; calibrate actual value as per displayed value; adjust rotation speed of engine; keep output frequency compliant with ex-works setting
	3. Abnormal fuel system; instable rotation speed of engine	Check fuel system
P-03	1.Broken sampling harness	Check voltage sampling harness if not indicate voltage or frequency after machine starts
	2.Abnormal voltage (excessive or below)	Check output frequency with AVO meter; calibrate actual value as per displayed value; adjust AVR to ensure output voltage compliant with rated value
	3.Open-circuit of excitation circuit	Check excitation line and carbon brush
	4.Burnt AVR or motor	Replace AVR or motor in same type
P-04	1. Overload/Reduce load till load is below rated value.	Reduce load till load is below rated value. Then close breaker.
P-05	1.Broken fuse of start circuit	Replace fuse in same type
	2. Broken wire of start circuit or bad contact of inserts	Check circuit and inserts
	3.Damage of start motor	Replace start motor
	4.Damage of charging motor	No signal input of successful start
	5.Error of fuel system	Check fuel supply system and fuel pump
P-06	1. Damage of emergency stop button or short-circuit of normal open point.	Replace emergency stop button
P-07	1.Open-circuit of charging circuit	Check signal of AC charging generator and inserts
	2.Error of charging motor	Replace charging motor in the same type
P-08	1.High-temperature of cooling water.	Cut off breaker; idle machine for certain time; stop machine and re-start it after water temperature falls down.
	2.Insufficient cooling water	Add cooling water to rated level
	3.Earth short-circuit of water temperature switch	Check circuit
	4.Damage of water temperature switch (normal open)	Replace water temperature switch in the same type

1.3 Warning labels

Several warning identifications are marked on the machine for safety concern. Keep identifications clean regularly. Prevent them from contamination or damage. In case of contamination or damage, replace it with new one.

1) Labeling

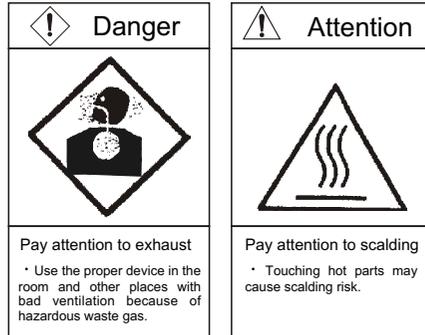


NO.	Meaning
1	Pay attention to exhaust and scalding
2	Pay attention to high temperature
3	Forbid lifting the machine
4	Lifting position
5	Prevent flame and fire

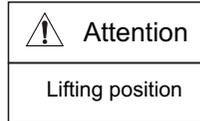
NO.	Meaning
6	Attended operations
7	Pay attention to electric shock and connect earth line
8	Pay attention to handling of storage battery
9	Avoid being involved in the running machine
10	Attentions for inside check of engine

(2) Warning label (identification)

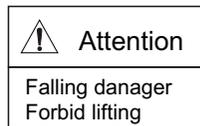
a. Pay attention to exhaust and scalding.



b. Lifting positions



c. Forbid lifting the machine.



d. Attended operations.



- Carefully read and thoroughly understand this introduction prior to use. If this introduction or safety identification is damaged, please order one from KIPOR sales department.
- Forbid connecting the machine with distribution line of power company and distribution line in the building willfully.
- Stop the engine before fuel fill-in.
- Check if breaker is cut off before machine starts.
- Forbid moving running machine.
- Use the machine after its wheels are fixed.
- Only professional technicians with required skills are allowed to operate this machine for safety concern.
- There is risk of electric shock and injury. Some parts in the machine are under high voltage, rotation and high temperature. Close side door before machine starts. Parts in the cover of output terminal and control panel are under high voltage. Close side door before machine starts.
- Stop running machine prior to check and maintenance.

Abnormality	Possible reasons	Solution	—
● Excessive voltage	Error of AVR	Check and replace	○
	Bad adjustment of speed-regulating knob	Check, adjust and repair	—
● Voltage falls down considerably with increase of load	Error of AVR	Check and replace	○
	Imbalance load	Adjust load to balance load at 3 phases	—
● Cannot adjust voltage	Bad function of voltage regulator	Check and replace	○
	Bad function of field circuit	Check and replace	
	High-temperature of generator due to overload	Reduce load	
● Pointer of current meter does not work with load.	Error of current meter or CT; use terminals not at U phase	Replace; connect with U-phase terminal	○
● Pointer of frequency meter does not work.	Error of frequency meter	Replace	
● Cannot turn 3-phase breaker to ON	Bad breaker	Replace	○
	Short-circuit of load circuit	Check and repair	
	Improperly release of cutoff and electricity leakage alarm	Re-operate	
● Cannot turn single-phase breaker to ON	Bad breaker	Replace	○
	Short-circuit of load circuit	Check and replace	

Abnormality	Possible reasons	Solution	—	
Central indication lamps are on.	● Jammed air filter	Jammed filter core aperture	Clean and replace the filter core	—
	● Bad charging of storage battery	Loose or damaged V belt	Check, adjust and replace	—
		Loose terminals, corrosion or broken wire of terminals	Check, repair and replace	—
		Insufficient electrolyte	Check and fill	—
		Bad function of storage battery	Replace	—
		Error of AC generator	Repair and replace	○
● Pointer of rotation-speed meter does not work. (Time recorder does not work.)	Damage of rotation speed meter	Replace	○	
● No voltage from generator	Damage of volometer	Check and replace	○	
	Error of AVR	Check and replace		
	Broken wire	Repair		
	Bad function of breaker	Replace		
	Error of guide-blade rotator	Repair and replace	○	
● Below rated voltage	Bad volometer	Replace	○	
	Error of AVR	Check and replace		
	Bad operation and adjustment of speed-regulating knob	Check and adjust	—	
	Broken wire or bad contact of voltage regulator	Repair and replace	○	

e. Prevent flame and fire.



Prevent flame and fire

- Fire is possible if flame is close to fuel inlet.
- Stop the engine upon fuel fill-in.

f. Avoid being involved in the running machine.



Danger

Avoid being involved in the running machine

- Prohibit put hands or fingers into running machine.
- There is injury risk.

g. Pay attention to high temperature.

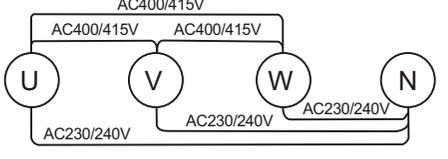


Attention

Pay attention to high temperature

- Do not open water fill-in cover at high temperature.
- Splash of hot water may cause scalding.

h. Pay attention to electric shock and connect earth line



AC400/415V

AC400/415V AC400/415V

U V W N

AC230/240V AC230/240V AC230/240V

Earth joint of engine hood (earth line for machine body)

Risk of electric shock Please connect earth line

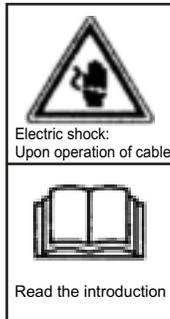
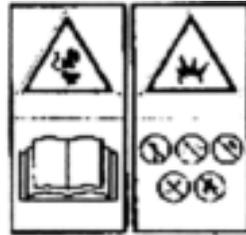
Danger

Pay attention to electric shock

- Do not terminals of running machine.
- Touching may cause risk of electric shock.

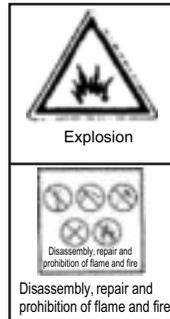
Risk of electric shock Please connect earth line

i. Pay attention to handling of storage battery



Operation of cable is exposed to risk of electric shock.

Read the introduction and operate correctly.



Explosion causes injury.

Do not drill, blow out, impact or disassemble the machine or be close to flame and fire.

j. Attentions for inside check of engine



- Check the machine after the engine is cold.
- If machine check requires running engine, particularly do not touch exhaust muffle, exhaust pipe, and similar parts in order to avoid scalding risk.

Abnormality	Possible reasons	Solution	—
<ul style="list-style-type: none"> ● Engine stops ● Rotation speed below rated value 	Air into fuel pipe	Eliminate air	—
	Dirty filter core or jammed filter core apertures	Clean or replace filter core	—
	Dirty air filter core	Clean and replace filter core	—
	Incorrect wiring of speed-regulating knob	Repair	○
<ul style="list-style-type: none"> ● Instable rotation speed, abnormal, fluctuation, rise or reduction 	Bad function of fuel-injection valve, speed regulator and fuel-injection pump	Adjust and repair	○
	<p style="writing-mode: vertical-rl; transform: rotate(180deg);">Central indication lamps are on.</p>		
<ul style="list-style-type: none"> ● Lubricant pressure falls down (engine stops) 	Insufficient lubricant level	Fill lubricant	—
	Spill of lubricant	Check and repair	—
	Jammed core apertures of lubricant filter	Replace filter core	—
	Bad function of oil pressure switch	Replace	—
<ul style="list-style-type: none"> ● Temperature rise of cooling water (engine stops) 	Insufficient cooling water	Check and fill	—
	Loose or damaged V belt	Check, adjust and replace	—
	Seriously jammed radiator by oil dirt	Clean	—
	Damage of temperature controller	Check and replace	○
	Contamination of cooling water pipe	Clean cylinder, cylinder hood, radiator and cooling water pipe	○
Improper operating environment	Check exhaust position of radiator and ensure good ventilation around generator	—	—

8. Error-shooting

[Attended operations]

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

Continue running abnormal generator may cause unexpected serious accidents.

Abnormality	Possible reasons	Solution	—	
Not work engine	<ul style="list-style-type: none"> ● Cannot rotate motor ● Rotation speed below rated value 	Shelf depreciation of storage battery	Check electrolyte level and specific gravity	—
		Release, loose or corrosion of storage battery terminals	Clean and screw down	—
		Bad earth, loose joint, broken line	Repair	—
		Bad function of start switch	Replace	○
		Bad function of starter	Replace	○
		Excessive viscosity of lubricant	Check and replace	—
		Insufficient fuel	Fill fuel	—
		Air into fuel pipe of fuel system	Eliminate air	—
		Jammed core of fuel filter	Replace	—
		Bad function of fuel-off solenoid valve	<ul style="list-style-type: none"> ● Check and replace fuse for off-circuit.(If it is abnormal, find out reasons then replace it) ● Check and replace fuel-off solenoid valve 	○
		Incorrect wiring position of speed-regulating knob	Repair	○
		Frozen fuel	Use improper fuel in the cold areas. Recommended 3# light oil.Forbid using heavy fuel.	—
		Frozen water in the fuel system	Eliminate the water in fuel tank, fuel filter and fuel supply pipe at hot status.	—

2. Machine introduction

2.1 Use and laws

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

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

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

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

2.2 Main technical parameters (single-phase diesel generator sets)

Item		Model	KDE9000SS/KDA9000SS/KDA9000SSO		
			50Hz	60Hz	
Generator	Rated output (capacity)	KVA	6.0	7.2	
		kW	6.0	7.2	
	Rated voltage	V	115/230	120/240	
	Rated current	A	26×2/26	30×2/30	
	Rated rotation speed	rpm	1500	1800	
	Circuit mode	--	Single and three circuits		
	Factor power	cos φ	1.0		
	Insulation grade	--	H		
	Pole number	--	4		
	Excitation number	--	Brushless self-excitation and constant voltage (with AVR)		
	Output	Voltage	V	115/230	120/240
		Receptacle	kVA	Two single phase receptacles	
		Joint	kVA	Output terminal post	
Engine	Model	--	KD373		
	Type	--	Vertical, water cooled, four stroke, diesel engine		
	Cylinder No.-Bore x Stroke	mm	3-73×78		
	Total displacement	L	0.979		
	Rated power	kW	7.4	9.0	
	Compression ratio		21.5	21.5	
	Rated rotation speed	R/min	1500	1800	
	Burning type	--	Steaming		
	Cooling type	--	Forced, water cooled, closed type cycle		
	Lubricate type	--	Mixing type(pressure lubricating + splash lubricating)		
	Starting type	--	12V Electric starter		
	Fuel	--	Diesel: 0#(summer),-10#(winter),-35#(cold)		
	Lubricating oil	--	L-ECD grade 15W30 or 15W40		
	Cooling water amount	Engine	L		
		Water tank	L	4.6	
	Lubricating oil amount	Total capacity	L	(To the calibration tail of oil ruler)4.8	
		Available capacity	L	6.9	
	Battery motor capacity	V-kW	12V 1.5KW		
	Charge DC generator capacity	V-A	12V 35A		
	Battery mode	--	12V 65Ah		
	Fuel consumption/ rated time	g/KW.h	≤340		
	Set	Overall length	mm		
		Width	mm		
Height		mm			
Net weight		kg			
Weight at running		kg			
Structure type			Ultra silent		

5) Check damping material

Please consult sales department and sale agency if damping materials appear aging obviously or contaminated by oil dirt.

6)Check all rubber hoses

Please check damage or aging of rubber hose concerning cooling water, fuel and lubricant system.

7.3.5 Per 2000hours

1) Check and repair parts in cooling system

Cooling performance falls down if cooling system is rusty or contaminated by water scale after long-term use.

Please clean and repair following parts upon replacement of cooling water in order to eliminate water scale.

Cylinder, cylinder hood, radiator

Cooling water pump, lubricant cooler, temperature controller and etc.

Please consult sales department and sale agency for professional acknowledge.

2) Repair seal of inlet valve and exhaust valve

Carry on repair for seal performance of cylinder hood.

Please consult sales department and sale agency for professional acknowledge.

3) Check and adjust fuel injection time (Check and repair advance angle of fuel supply)

Adjust timing of fuel injection for better performance of engine.

Please consult sales department and sale agency for professional acknowledge.

4) Repair fuel injector and fuel pump

Repair fuel injector and fuel pump for better performance of engine.

Please consult sales department and sale agency for professional acknowledge.

5)Check and replace all rubber hoses

It is easy for aging or damage of rubber hoses in cooling water system, fuel system and lubricant system. Please replace rubber hoses after they are used for certain time, even if no abnormality, for safety concern. Please consult sales department and sale agency for professional acknowledge concerning replacement.

● Periodic replacement It is recommended to make once replacement every two years or every 4000hours.

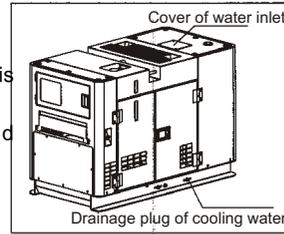
7.3.4 Per 1000hours

1) Replace cooling water

Performance of cooling water may fall down if it is contaminated by rust or dirt.

Replace the additive of anti-freezing liquid periodically as it turns aging.

Replace cooling water once per year.



Do not drain off water immediately after machine stops because ejection of hot water may cause scalding.

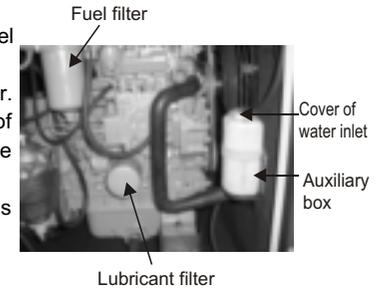


- a. Take off the upper casing and disassemble the cover of radiator water inlet.
 - b. Open the plug screw for cooling water drainage in the generator frame. Collect inside water with special disposal container.
 - c. Please open side access door.
 - d. Open the drainage plug screw at the side of cylinder. Collect inside water with special disposal container.
 - e. Mount cover of water inlet, casing and plug screw of radiator after drainage finishes.
 - f. Fill new cooling water into radiator and auxiliary box.
(Refer to 6.4.4 for keynotes.)
 - g. Please close the side access door.
- 2) Check and adjust gap between suction and exhaust valves
Adjust valve gap properly to enable most performance of engine.
Please consult sales department and sale agency of KIPOR for professional acknowledge and skills for check.
- 3) Check and adjust oil-injection pressure
Optimum adjustment of oil-injection pressure and spray can ensure most performance of engine.
Please consult sales department and sale agency of KIPOR for professional acknowledge and skills for check.
- 4) Check anti-vibration rubber
Please consult sales department and sale agency if engine support and anti-vibration rubber is damaged or is deformed due to oil dirt.

Item		Model KDE11SS/KDA11SS/KDA11SSO		Model KDE13SS/KDA13SS/KDA13SSO			
		50Hz	60Hz	50Hz	60Hz		
Generator	Rated output (capacity)	KVA	8.5	10.5	10	12	
		kW	8.5	10.5	10	12	
	Rated voltage	V	115/230	120/240	115/230	115/230	
	Rated current	A	37×2/37	43.8×2/43.8	43.5×2/43.5	50×2/50	
	Rated rotation speed	rpm	1500	1800	1500	1800	
	Circuit mode	--	Single and three circuits		Single and three circuits		
	Factor power	cos φ	1.0		1.0		
	Insulation grade	--	H				
	Pole number	--	4				
	Excitation number	--	Brushless self-excitation and constant voltage(with AVR)				
	Output	Voltage	V	115/230	120/240	115/230	120/240
		Receptacle	kVA	Two single phase receptacles		Two single phase receptacles	
		Joint	kVA	Output terminal post		Output terminal post	
Engine	Model	--	KD388G		KD388G		
	Type	--	Vertical, water cooled, four stroke, diesel engine				
		mm	3-88×90		3-88×90		
	Total displacement	L	1.642		1.642		
	Rated power	kW	12.3	14.8	12.3	14.8	
	Compression ratio		18.2	18.2	18.2	18.2	
	Rated rotation speed	R/min	1500	1800	1500	1800	
	Burning type	--	Direct injection				
	Cooling type	--	Forced, water cooled, closed type cycle				
	Lubricate type	--	Mixing type(pressure lubricating + splash lubricating)				
	Starting type	--	12V Electric starter				
	Fuel	--	Diesel: 0#(summer),-10#(winter),-35#(cold)				
	Fuel tank capacity	L	65				
	Lubricating oil	--	L-ECD grade 15W30 or 15W40				
	Cooling water amount	Engine	L	2			
		Water tank	L	2.6			
	Lubricating oil amount	Total capacity	L	6.9			
		Available capacity	L	3.3			
	Battery motor capacity	V-K W	12V 1.4KW				
	Charge DC generator capacity	V-A	12V 15A				
Battery mode	--	12V 80Ah					
Fuel consumption/ rated time	g/KW.h	≤340					
Set	Overall length	mm	1570				
	Width	mm	780				
	Height	mm	1050				
	Net weight	kg	675		685		
	Weight at running	kg	750		760		
Structure type		Ultra silent					

Item		Model	KDE16SS/KDA16SS/KDA16SSO		
			50Hz	60Hz	
Generator	Rated output (capacity)	KVA	13	15.5	
		kW	13	15.5	
	Rated voltage	V	115/230	120/240	
	Rated current	A	56.5×2/56	64.6×2/64.6	
	Rated rotation speed	rpm	1500	1800	
	Circuit mode	--	Single and three circuits		
	Factor power	cos φ	1.0		
	Insulation grade	--	H		
	Pole number	--	4		
	Excitation number	--	Brushless self-excitation and constant voltage(with AVR)		
	Output	Voltage	V	115/230	120/240
		Receptacle	kVA	Two single phase receptacles	
Joint		kVA	Output terminal post		
Engine	Model	--	KD488G		
	Type	--	Vertical, water cooled, four stroke, diesel engine		
	Cylinder No.-Bore x Stroke	mm	4-88×90		
	Total displacement	L	2.190		
	Rated power	kW	16.4	19.7	
	Compression ratio		18.2	18.2	
	Rated rotation speed	R/min	1500	1800	
	Burning type	--	Direct injection		
	Cooling type	--	Forced, water cooled, closed type cycle		
	Lubricate type	--	Mixing type(pressure lubricating + splash lubricating)		
	Starting type	--	12V Electric starter		
	Fuel	--	Diesel: 0#(summer),-10#(winter),-35#(cold)		
	Fuel tank capacity	L	65		
	Lubricating oil	--	L-ECD grade 15W30 or 15W40		
	Cooling water amount	Engine	L		
		Water tank	L	2.6	
	Lubricating oil amount	Total capacity	L		
		Available capacity	L	6.9	
	Battery motor capacity	V-K W	12V 1.4KW		
	Charge DC generator capacity	V-A	12V 15A		
	Battery mode	--	12V 80Ah		
Fuel consumption/ rated time	g/KW.h	≤320			
Set	Overall length	mm	1570		
	Width	mm	780		
	Height	mm	1050		
	Net weight	kg	720		
	Weight at running	kg	790		
Structure type		Ultra silent			

- a. Please open side access door.
- b. Please place special fuel container under fuel filter.
- c. Use special wrench of filter. Turn the fuel filter towards left side for disassembly.
- d. Clean the position for mounting the filter. Apply proper engine lubricant to washer of new filter prior to mounting. Fill fuel into the filter fully. Close side access door after filter is fastened tightly.



[Attended operations]

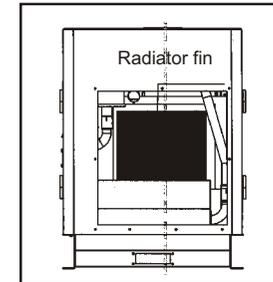
In order to prevent fastening fuel filter excessively, first fix fuel filter on the filter seat by hand. Then use special wrench for filter and turn filter 2/3 cycle.

- 2) Clean radiator and fan
Clean radiator and jammed fins with steam or high-pressure water.

[Attended operations]

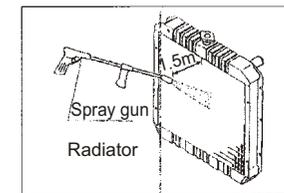
Please spray water towards radiator and fan and hose of radiator 1.5m away to avoid any damage, if high-pressure cleaner is used.

- a. Take off the side casing of engine.
- b. Blow off oil or dirty matters or leaves blocking holes of radiator, fan and fins with compressed air. Or eliminate any foreign matters with steam.
- c. Please check if oil or other contaminants remained on the radiator or fan is cleaned completely.
- d. Please mount the casing.



- 3) Replace the air filter core
(Refer to 7.3.2-4 for keynotes.)

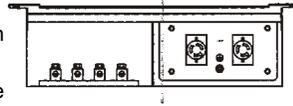
- 4) Check circuit terminals and connections
Check if any joints of main circuit and auxiliary circuit are loose, corroded or burnt.



- d. Please replace contaminated or damaged filter core.
- e. Clean foreign matters and dust in the casing.
Assemble casing of filter core and air filter as per specifications.
- f. Please close side access door.

5) Measure the insulation resistance

Measure the insulation resistance with 500V megohmmeter once per month. Confirm that reading is over 1MΩ.



- a. Disconnect all lines to AVR in the operation panel. Otherwise AVR will be broken through.
- b. Disconnect 3-phase cable with 3-phase terminal of output terminal block as shown on the right drawing.
- c. Turn 3-phase breaker to ON. Measure the insulation resistance between terminals and generator.
- d. Electricity leakage and fire may occur if insulation resistance is below 1 MΩ. Clean contaminated 3-phase joints, 3-phase breaker and generator leads by oil or salt. Bake them after cleaning. If they are not recovered after treatment, please consult the dealers of KIRPOR.
- e. Connect AVR inserts as per specifications after measurement.

7.3.3 Per 500hours

- 1) Replace the fuel filter core



- Forbid any flame or fire.
- Parts are still hot even if engine stops. Therefore disconnect the earth line of storage battery and replace the filter core after engine is cold completely. Overflowed fuel may cause fire if it touches the high-temperature surface or electrical elements.

Item		Model		KDE9000SS3/KDA9000SS3/KDA9000SSO3		KDE13SS3/KDA13SS3/KDA13SSO3		
		50Hz	60Hz	50Hz	60Hz			
Generator	Rated output (capacity)	KVA	7.5	9	10.6	13.1		
		kW	6.0	7.2	8.5	10.5		
	Rated voltage	V	230/400	240/416	230/400	240/416		
	Rated current	A	10.8	12.5	15.3	18.2		
	Rated rotation speed	rpm	1500	1800	1500	1800		
	Circuit mode	--	Three phases, four lines, Y connection		Three phases, four lines, Y connection			
	Factor power	cos φ	0.8 (lag)		0.8 (lag)			
	Insulation grade	--	H					
	Pole number	--	4					
	Excitation number	--	Brushless self-excitation and constant voltage(with AVR)					
	Output	Voltage	V	230/400	240/415	115/230	120/240	
		Receptacle	kVA	One single phase receptacles and one three phases receptacles				
		Joint	kVA	Output terminal post				
Engine	Model	--	KD373		KD388			
	Type	--	Vertical, water cooled, four stroke, diesel engine					
	Cylinder No.-Bore x Stroke	mm	3-73×78		3-88×90			
	Total displacement	L	0.979		2.19			
	Rated power	kW	7.4	9.0	12.3	14.8		
	Compression ratio		21.5	21.5	18.2	18.2		
	Rated rotation speed	R/min	1500	1800	1500	1800		
	Burning type	--	Direct injection					
	Cooling type	--	Forced, water cooled, closed type cycle					
	Lubricate type	--	Mixing type(pressure lubricating + splash lubricating)					
	Starting type	--	12V Electric starter					
	Fuel	--	Diesel: 0#(summer),-10#(winter),-35#(cold)					
	Fuel tank capacity	L	65		65			
	Lubricating oil	--	L-ECD grade 15W30 or 15W40					
	Cooling water amount	Engine	L					
		Water tank	L	4.6				
	Lubricating oil amount	Total capacity	L	4.8				
		Available capacity	L	6.9				
	Battery motor capacity	V-K W	12V		1.4KW			
	Charge DC generator capacity	V-A	12V		15A			
Battery mode	--	12V 80Ah						
Fuel consumption/ rated time	g/KW.h	≤340						
Set	Overall length	mm			1570			
	Width	mm			780			
	Height	mm			1050			
	Net weight	kg	675		675			
	Weight at running	kg	750		750			
Structure type		Ultra silent						

Item		Model	KDE15SS3/KDA15SS3/KDA15SSO3		KDE20SS3/KDA20SS3/KDA20SSO3	
			50Hz	60Hz	50Hz	60Hz
Rated output (capacity)	KVA	12.5	15	17	20	
	kW	10	12	13.6	16	
Rated voltage	V	230/400	240/416	230/400	240/416	
Rated current	A	18	20.8	24.5	27.8	
Rated rotation speed	rpm	1500	1800	1500	1800	
Circuit mode	--	Three phases, four lines, Y connection		Three phases, four lines, Y connection		
Factor power	cos φ	0.8 (lag)		0.8 (lag)		
Insulation grade	--	H				
Pole number	--	4				
Excitation number	--	Brushless self-excitation and constant voltage(with AVR)				
Output	Voltage	V	230/400	240/415	230/400	240/415
	Receptacle	KVA	One single phase receptacles and one three phases receptacles			
	Joint	KVA	Output terminal post			
Model	--	KD388		KD488		
Type	--	Vertical, water cooled, four stroke, diesel engine				
Cylinder No.-Bore x Stroke	mm	3-88×90		4-88×90		
Total displacement	L	2.48		2.190		
Rated power	kW	12.3	14.5	16.4	19.7	
Compression ratio		18.2	18.2	18.2	18.2	
Rated rotation speed	R/min	1500	1800	1500	1800	
Burning type	--	Direct injection				
Cooling type	--	Forced, water cooled, closed type cycle				
Lubricate type	--	Mixing type(pressure lubricating + splash lubricating)				
Starting type	--	12V Electric starter				
Fuel	--	Diesel: 0#(summer),-10#(winter),-35#(cold)				
Fuel tank capacity	L	75		65		
Lubricating oil	--	L-ECD grade 15W30 or 15W40				
Cooling water amount	Engine	L				
	Water tank	L	4.6		4.6	
Lubricating oil amount	Total capacity	L				
	Available capacity	L	6.9		6.9	
Battery motor capacity	V-K W	12V 1.4KW				
Charge DC generator capacity	V-A	12V 15A				
Battery mode	--	12V 80Ah				
Fuel consumption/ rated time	g/KW.h	≤320				
Set	Overall length	mm	1570		1570	
	Width	mm	780		780	
	Height	mm	1050		1050	
	Net weight	kg	685		720	
	Weight at running	kg	760		790	
Structure type		Ultra silent				

7.3.2 Per 250 hours

1) Water drainage of fuel tank

Open the plug screw for fuel drainage in the generator frame to eliminate foreign matters in the fuel tank (e.g. water and foreign matters)

a. Collect drained fuel with special disposal container.

b. Screw down the plug screw after fuel is drained off completely.

Fastening torque: 53.9~63.7N.m (5.5~6.5kgf)

2) Replace lubricant and lubricant filter (after second replacement). Replace the lubricant once per 250hours after the second time.

Please reduce replacement time reasonably and as much as possible if machine is working in the dusty place.

Replace the lubricant filter with lubricant.

3) Check tension of fan belt

(Refer to 7.3.1-3 for keynotes.)

4) Clean or replace air filter core

**Attention**

Please wear protective apparatus like goggles during cleaning.

Distribution or splash of foreign matters may hurt eyes.

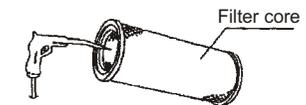
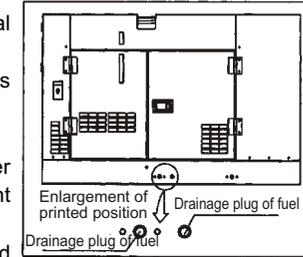
Output power of engine reduces if dust into air filter remains at the filter core considerably. Therefore please check it periodically and clean air filter core.

If indication lamp for blockage of air filter suction is on when machine is working, clean the filter immediately even if check interval does not arrive.

a. Open side access door.

b. Take off the hood of air filter and remove filter core assembly.

c. Blow off compressed air below 0.69Mpa (7kgf/cm³) from core inside. Eliminate dust outside of filter core.



f. Apply one thin layer of lubricant to the seal of new lubricant filter.

Please screw down the filter by hand at first. Then use special wrench for filter and turn about 3/4 cycle. Confirm if filter is fastened or not.

Fastening torque: 19.6~23.5N.m (2.0~2.4kgf.m)

g. Fill new lubricant into lubricant inlet till required level is met. (Refer to 6.4.3 for keynotes.)

h. Start trial running for 5min to check if any lubricant leakage.

i. Stop the engine and re-measure the lubricant level with oil gauge in 10min. Fill the lubricant to make up any insufficiency

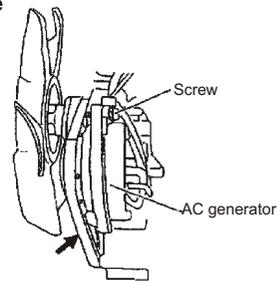
3) Check tension of fan belt (for first time)

Bad operation of fan, cooling water pump and AC generator due to insufficient fan tension may cause overheat of engine or bad charging. On the other hand, large tension of belt will damage bearings of water pump or AC generator. Please adjust the belt tension as per following requirements.

a. Open the side door.

b. Check belt tension. Press the middle of belt with thumb for flexibility.

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

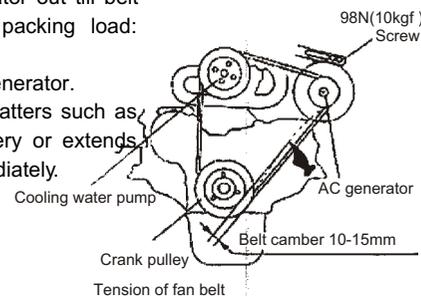


c. Loosen anchor bolts of AC generator for tension adjustment. Then move AC generator out till belt flexibility is within 10-15mm [i.e. packing load: 98.1N (10kgf)].

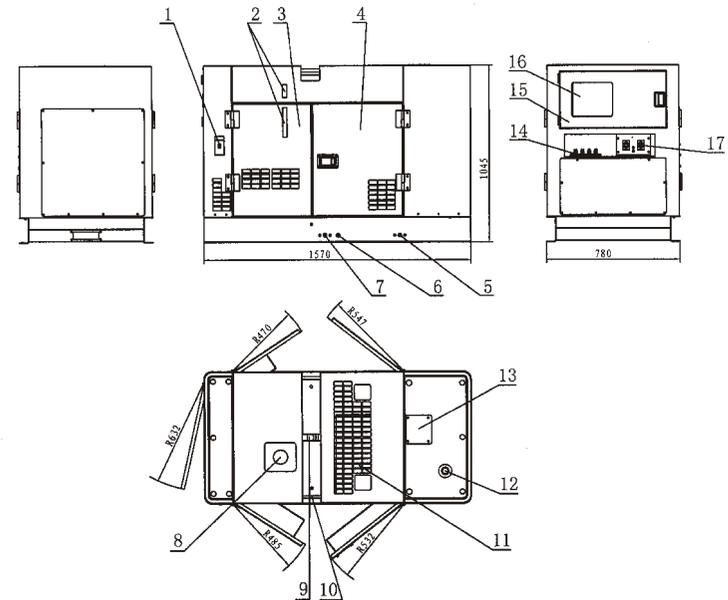
d. Screw down anchor bolts of AC generator.

e. Prevent belts from any foreign matters such as oil. Otherwise belt becomes slippery or extends easily. Replace damaged belt immediately.

f. Close the side door.

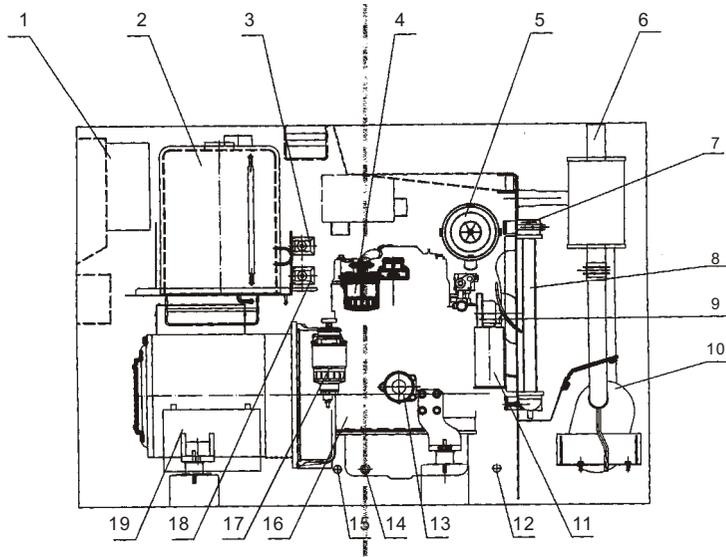


2.3 Outlook and parts' names



- | | |
|---|-----------------------------|
| 1. Fuel inlet (connection with outside fuel tank) | 10. Transportation hook |
| 2. Fuel meter | 11. Air vent |
| 3. Check side door (one side of generator) | 12. Exhaust vent |
| 4. Check side door (one side of machine) | 13. Cover of water tank |
| 5. Outlet of cooling water | 14. Output panel |
| 6. Outlet of lubricant | 15. Door of operation panel |
| 7. Outlet of fuel | 16. Operation panel |
| 8. Cover of fuel tank | 17. Single-phase socket |
| 9. Lifting hook | |

2.4 Structure



- | | |
|---|---|
| 1. Control panel | 13. Lubricant filter |
| 2. Fuel tank | 14. Outlet of lubricant |
| 3. Fuel feed pump (only for fuel tank with machine) | 15. Outlet of fuel |
| 4. Fuel filter | 16. Engine |
| 5. Air filter | 17. Fuel/ water separator |
| 6. Exhaust vent | 18. Fuel feed pump (only for outside fuel tank) |
| 7. Cover of water tank | 19. Storage battery |
| 8. Water tank | 20. Operation panel (Instrument panel) |
| 9. Fan belt | 21. Single-phase socket |
| 10. Exhaust muffler | 22. Earth terminal |
| 11. Auxiliary tank | 23. Generator |
| 12. Outlet of cooling water | |

7.3 Periodical check

7.3.1 Per 50hours

Check following parts after new machine is used for first 50hours:

1) Water drainage of filter and cleaning (per 50h)
Please drain off water or eliminate foreign matters remained in the filter.

If machine is equipped with fuel tank

- Open access side door and place the fuel collector under water- outlet of filter.
- Open water drainage plug to eliminate water and foreign matters remained.
- If it is impossible to drain off water successfully, please open air-exhaust plug.
- Start exhausting after water drainage.

(Refer to information from p.3- p.7 for exhaust keynotes.)

e. Please close the access valve.

2) Replace lubricant and lubricant filter (first time)



Attention

Please do not replace lubricant or lubricant filter immediately after machine stops.
Hot lubricant may cause scalding.



Please replace lubricant earlier because preliminary run-in wearing of internal parts leads to advance aging.

Replace new lubricant filter with lubricant.

It is able to drain off lubricant completely after machine stops and when lubricant is still hot.

a. Please prepare special container for waste lubricant.

b. Open the plug screw for lubricant drainage in the generator frame to drain off lubricant.

c. Please screw down the plug screw after lubricant drainage tightly.

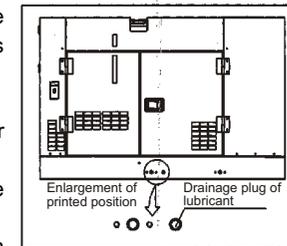
Fastening torque: 53.9~63.7N.m (5.5~6.5kgf.m)

d. Use the special wrench for filter and disassemble the lubricant filter.

e. Please clean the mounting interface of filter.



Water separator

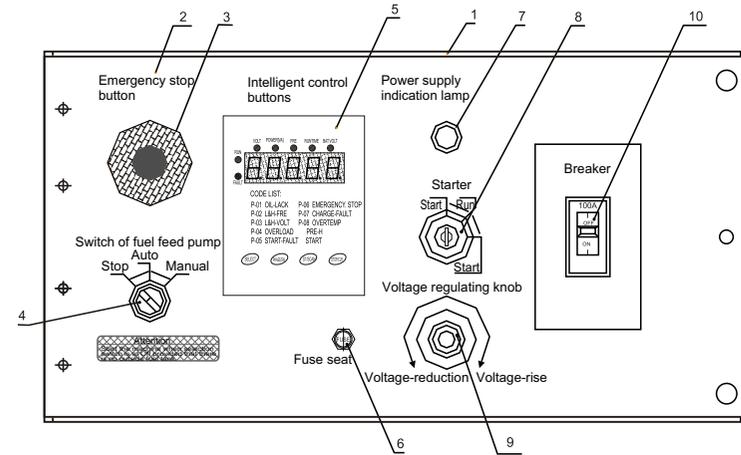


○: Check ◉: Part replacement ●Consult sales department or sale agency of KIPOR for check

Part	Check	Start check	Check intervals				
			First 50h	250h	500h	1000h	2000h
	Clean and repair cooling-water pipe						●
	Tension check for special fan belt for cooling water pump	First time	◉				
Exhaust suction system	Exhaust leakage check	○					
	Color check of engine exhaust	○					
	Clean and replace air filter		○	◉			
Electrical parts	Check working conditions of all instruments and alarm lamps	○					
	Check electrolyte level	○					
	Measure specific gravity of electrolyte		○				
Cylinder hood	Adjust faucet gap between suction and exhaust valves				●		
	Valve seat wearing of suction and exhaust valves					●	
Injection valve of fuel injection pump	Check and adjust pressure for opening injection valve				●		
	Check and adjustment during injection					●	
	Repair of injection pump					●	
Generator	Check protective earth	○					
	Check if terminals are loose	○					
	Measure insulation resistance		○				
	Check circuit connections			○			
	Check if any screw or nut is loose	○					
	Check all rubber hoses				○	● (2 years or every 400h)	
	Check anti-vibration and sound-proof material				○		

2.5 Operation panel

2.5.1 Configuration and name



NO.	Name	NO.	
1	Instrument panel	7	Working indication lamp
2	PVC film	8	Starter
3	Emergency stop button	9	Voltage regulator
4	Switch of fuel pump	10	Main breaker
5	Intelligent display		
6	Fuse seat		

2.5.2 Functions and operation introduction

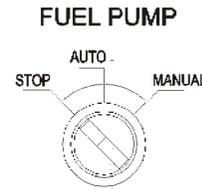
1) Setting of instruments, indication lamps and machine refers to User Manual of Intelligent Panel for details.

Outside fuel tank

Use fuel pump to fill fuel into fuel tank with machine from outside fuel tank. Turn power supply switch of fuel pump to AUTO position.

(Switches are mounted on the panel.)

● If turn the switch in right drawing to AUTO, fuel pump starts filling fuel when fuel in the fuel tank with machine is below lower level. Fuel pump stops filling fuel when fuel in the fuel tank with machine is up to upper level. Please note that fuel pump does not work if fuel in the fuel tank with machine is not below lower level, even though turn the switch in right drawing to AUTO. In such case, turn the switch to MANUAL and release it if fuel fill-in is required. Machine stops filling fuel automatically and return to the AUTO status as fuel tank is full.



[Attended operations]

Do not forget STOP operation of power supply switch of outside fuel tank

● If there is no outside fuel tank,

Turn the switch to STOP. If power supply switch of feed pump is at AUTO, feed pump starts working when fuel in the fuel tank with machine is below lower level, leading to idle running and damage of feed pump.

● If there is outside fuel tank,

Regularly check fuel level in the outside fuel tank.

If there is no fuel in the outside fuel tank and pump power-supply switch is at AUTO, fuel level in the fuel tank with machine cannot be up to upper limit, which causes long-term idle running and damage of feed pump.

2) Operation of switch and regulator

1. Starter

Work start, running and stop.



Take out the start key and keep in the proper place if generator is not used.

7.2 Periodical checks and intervals

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

Periodic check and interval are different in respect of application, load, quality of fuel and lubricant and operation. Following information is just common.

[Attended operations]

In order to not miss any required check and to enforce periodic check as per specifications, plan for periodic check is established in consideration of use. If user forgets or ignores periodic check, errors or short duration may occur. And it may cause electric shock. Consult sales department or sale agency of KIPOR for check and repair at intervals over 1000hours because such services require professional technology and skills.

○ : Check ◉ : Part replacement ● Consult sales department or sale agency of KIPOR for check

Part	Check	Start check	Check intervals				
			First 50h	250h	500h	1000h	2000h
Fuel system	Check and fill fuel level in the fuel tank	○					
	Fuel leakage check	○					
	Drain off water from fuel tank			○			
	Replace core of fuel filter				◉		
	Water treatment and washing of filter		○				
Lubricant system	Check and fill lubricant level	○					
	Lubricant leakage check	○					
	Replace lubricant		First time ◉	After first time ◉			
	Replace lubricant filter		First time ◉	After first time ◉			
Cooling water system	Check and fill the level of cooling water	○					
	Water leakage check	○					
	Replace cooling water					◉	
	Clean radiator fan				○		

Consult sales department or sale agency of KIPOR for necessary repair such as disassembly of parts.

7.1.1 Torque list

Fasten bolts and nuts in metric unit, if no other specification, in accordance with torque listed in the below table.

Item	Diameter of bolt x pitch	Fastening torque [N. m (kgf.m)]	Remark
Hex bolt (7T) and nut	Common thread	M6×1	9.8~11.8 (1.0~1.2)
		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)
	Fine thread	M14×1.5	127.5~147.1 (13~15)
M16×1.5		210.8~240.3 (21.5~24.5)	
Pipe connection 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)	

OFF

Indicate that start key is taken out and engine stops.

● Intelligent indication lamps are all off.

ON

Keep the position when machine works.

START

Indicate start position of engine. In the case that starter is turned to this position, machine is preheated and starts. If operator releases the start key, starter returns to ON automatically.

Pre-heating (HEAT)

Automatically start pre-heating upon start of intelligent panel controller. Operator can define preheating time.

When intelligent display shows PRE-H, machine is preheated. After preheating, machine automatically enters into start procedure. When intelligent display shows START, machine is running.

2. Main breaker

Functions are:

To supply power produced by generator to main switch of 3-phase joint of output terminal block

Automatically cut off the switch when loading equipment is at short-circuit or over-load. Protect the generator.

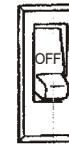
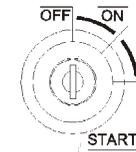
● It is at OFF when engine starts. It is at ON when power is used.

[Attended operations]

Do not operate loading equipment ON/OFF with the breaker. If user requires ON/OFF function, add Load ON/ OFF switch between 3-phase joint and loading equipment. Otherwise there are some errors of breaker.

● If there is over current, regulating handle of breaker maintains between ON and OFF when breaker is cutoff. This condition is named tripping. By then turn regulating handle downward to OFF. If regulating handle does not return to original position, it is not allowed to turn regulating handle to ON.

STARTER SW



Breaker
Do not operate loading equipment ON/OFF with the breaker.

3. Voltage regulator

It is used to regulate output voltage. If turn it right, voltage rises. If turn it left, voltage falls down.

● Voltage regulation range

	50Hz(V)	60Hz(V)
MAX	250 ± 2	260 ± 2
MIN	200以下	210以下

4. Fuse

- (1) Preheating circuit: fuse (capacity: 50A)
- (2) Charging circuit: fuse (capacity: 20A)
- (3) Circuit of control power-supply: fuse (capacity: 10A)

2.5.3 Functions and identification of protectors

This generator is equipped with error protectors. Machine automatically stops engine or disconnects with load as below description in case of serious errors. Meanwhile intelligent panel shows abnormal parts with relative codes. For small errors, alarm lamps and sound are available.

NO.	Error	Description		Auto stop	Auto cutoff	Indicate alarm
		Normal	Abnormal			
1	Reduction of lubricant pressure	—	P-01	●	—	Intelligent panel display —
2	Temperature-rise of cooling water	—	P-08	●	—	
3	Over-voltage	—	P-03	●	—	
4	Bad charging of storage battery	—	P-07	—	—	
5	Over-current	—	P-04	—	●	
6	Over-frequency	—	P-02	●	—	
7	Start error	—	P-05	●	—	
8	Emergency stop	—	P-06	●	●	

[Attended operations]

Immediately stop the machine and start check and repair if there is any error. Accident is possible if abnormal machine is still running.

7. Maintenance and check

7.1 Check

● Please carry out periodic check.

Aging and performance fall appear if engine runs for long term.

Accident and error may occur if no check, maintenance and care. Cause great consumption of fuel and lubricant, bad exhaust and large noise. In addition duration of engine becomes shorter. Therefore routine and periodic check and maintenance can effectively avoid error occurrence. In addition, periodic check on electricity system can avoid electric shock.

● Please observe pre-start checks

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

(Refer to 6.4.1 for keynotes about check before work.)

● Periodic check as per running record

Establish the running record for daily operation, maintenance and check.

Periodic check is divided into several intervals like 50hours, 250hours, 500hours, 1000hours and 2000hours. If running time of machine approaches defined check interval, please do periodic check as per requirements.

● Please use our original parts.

Replace damaged parts with our original parts.

Otherwise, its mechanical performance falls or duration of engine turns shorter.

● Prepare special tools for check and maintenance

For regular check on generator, prepare maintenance tools and maintenance in the place neighboring to generator

● Provide user periodic check and repair

Professional maintenance technicians provide user maintenance, check and repair.

Consult sales department or sale agency of KIPOR.

● Torque for fastening bolts and nuts

If bolts and nuts are fastened too tightly, it is possible to break bolts or damage thread. On the other hand, oil leakage at mounting surface is possible, or loose bolts may damage parts if fastening torque is too small. Therefore please fasten bolts and nuts with specified torque tightly.

Fasten important parts with torque wrench in accordance with specified torque and correct fastening method and order. Gradually fasten parts till required torque is met.

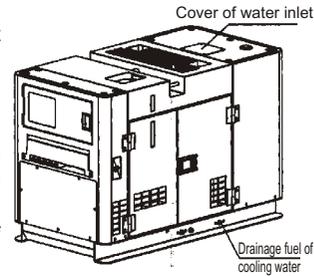
6.5 Long-term storage

Please implement following maintenance for the generator idle for long-term.

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

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

- a. Take off upper hood and open radiator cover.
- b. Take off drainage plug of cooling water in the frame of generator to drain inside water.
- c. Loosen the drainage plug at the side of cylinder and drain out the water.



[Attended operations]

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

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

2) Please clean mud, dust and oil remained on the machine surface.

3) Must finish periodic check prior to maintenance.

4) In order to prevent dew concentration in the fuel tank. Drain off fuel or fill fuel completely.

5) Disconnect cable of storage battery with (-) pole.

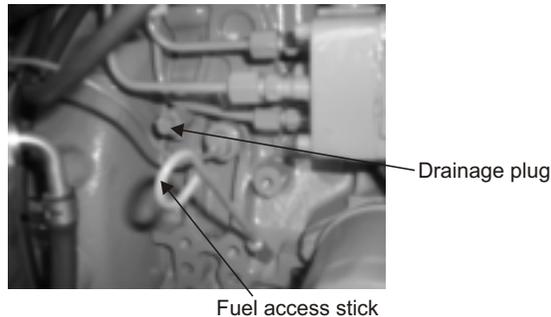
6) Apply lubricant to operating devices and relevant connections.

7) Please cover the plastic hood and similar parts in order to prevent water or dust into control box, radiator and muffle of exhaust pipe.

8) Store the machine in the place without moisture or dust and with good ventilation.

9) Please charge the storage battery once per month to resolve intrinsic shelf depreciation during machine storage.

10) Please do no-load running for short time and at low speed if machine is idle for



3. Connection of load

3.1 Capacity of motor

[Attended operations]

If select the motor with improper capacity, it is impossible to start the motor.

Decide the capacity of motor as per followings:

● According to type, application, start method, quantity and operating power of motor, features of generator, type of auto voltage regulator, starting capacity of generator is different.

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

It is recommended to discuss with manufacturer of motor upon decision of capacity. User can calculate the capacity simply with below formulas.

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

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

Power factor of motor: 0.8 Motor efficiency: 0.8

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

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

Generator capacity = 2x input power of motor

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

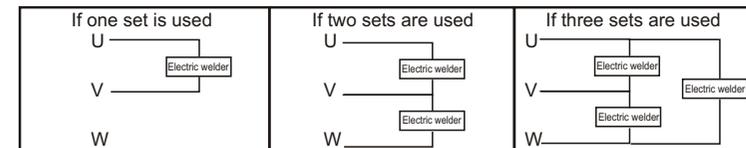
Generator capacity = 3x input power of motor

○ Star/ triangular-starting squirrel-cage motor

Generator capacity = 1.2~1.5x input power of motor

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

Therefore user shall distribute phases equally as per following:



[Attended operations]

Input power of one electric welder shall be below 1/3 of output power of generator.

Over-load may cause motor damage.

3.2 Selection of 3-phase cable

[Attended operations]

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

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

3.3 Connection of loading equipment



- Touching output terminal of running machine may cause electric shock even death risk, particularly when hands are wet.

- Start connection work after cut off breaker and stop running machine.

(If machine is run with shunt feeding, please cut off power feeder outside of machine.)

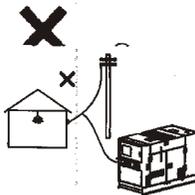
- Application of damaged cable may cause electric shock. Forbid using such cable.



- Laws forbid connecting power supply of generator with inside distributing line (common distributing line accepting power from the power company).

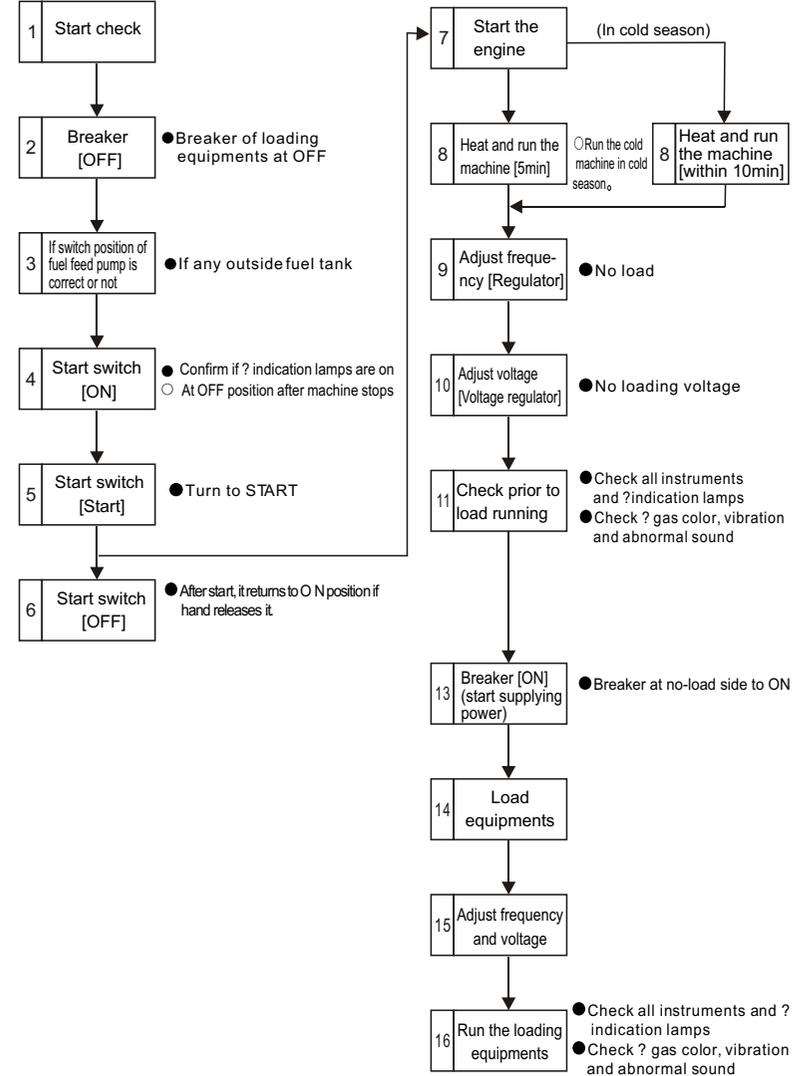
- If connection with inside distributing line, there is over-current of inside distributing line and generator thus to cause fire or electric shock accident.

- Please do not connect the machine with inside distributing line.



6.4.6 Start procedure

Show main operations with below No.-marked process drawing. Stop operations in the reverse order of No. 9, 8, 4 and 2 after loading equipments stop.



- c. If there is any abnormal sound and vibration
 - d. If there is any leakage of fuel, lubricant or cooling water
 - e. If rest fuel is sufficient
- If fuel supply is interrupted during machine runs, please eliminate air remained in the fuel pipe after fuel fill-in.

6.4.4 Stop the machine

Stop the machine in the following order.

- a. Turn the breaker at the side of loading equipments to OFF.
- b. Turn the breaker (single-phase/ 3-phase) of generator to OFF
- e. Please run the machine at cold status for about 5minutes (no-load)

[Attended operations]

Do not stop the machine suddenly if load running starts. Otherwise temperature of engine parts rises rapidly, leading to blow engine or cylinder scoring.

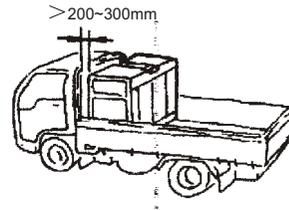
- f. Turn the start key to OFF to stop running machine.
- g. Take off the key and keep it properly

6.4.5 Running on the automobile

If run the machine temporarily on the automobile, please do not block or cover the air inlet or exhaust vent of generator.

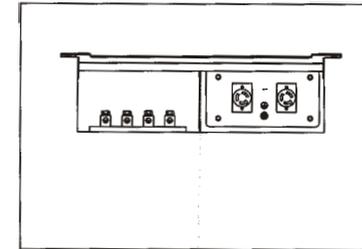
[Attended operations]

If place materials around the breather hole of machine and run the machine,

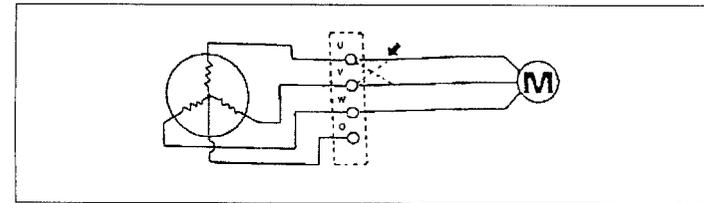


3.3.1 3-phase power supply (400V/415V)

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



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



3.3.2 Single-phase power supply (120V/240V)

There are two connection methods for single-phase power supply, i.e. single-phase universal socket and 3-phase joint as indicated in the below drawing.

Please select proper connection method.

Universal socket and breaker are two 15A circuits (W-phase use). 3-phase joint combines O-phase with U, V and W-phase.

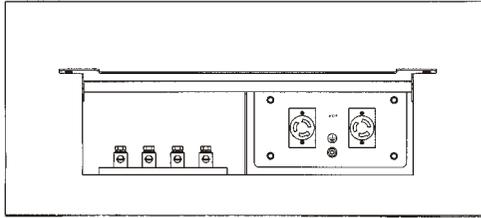
Regulate the voltage with voltage regulator.

[Attended operations]

Tolerable current of generator takes single-phase and 3-phase into account.

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

- Check AC current instrument on the operation panel is up to or over rated current.



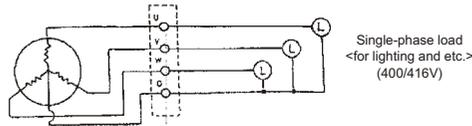
- As use O terminal with U, V and W terminals

[Attended operations]

- In order to keep phase balance, please equally use output of generator, i.e. 1/3 rated power. If unbalance load is necessary, difference between 3-phase shall be within 20%.

- For single-phase socket or VO, WO

Prevent overload of generator.



Adjust voltage to 230V with voltage regulator (240V at 60Hz).

- For single-phase socket

Turn the single-phase breaker to ON to energize universal socket.

[Attended operations]

- There are two single-phase sockets (below 15A) on the panel.
- Prevent overload of generator if single-phase power is used via single-phase socket or VO, WO.



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

- Check if fuel switch of outside fuel tank is at the correct position.

- Check the environment of engine.

- If color of exhaust is normal or not

Colorless or light gray: Normal

Black: Abnormal (insufficient combustion)

Blue: Abnormal (Combustion of lubricant)

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

- If any sound is abnormal, or running is stable, or there is any abnormal vibration or not

- If there is any leakage of fuel, lubricant and cooling water

- Check if breaker at the side of loading equipments is at OFF.

- Turn the 3-phase breaker of generator to ON.

2) Load conditions

[Attended operations]

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

- Turn the breaker (single-phase/ 3-phase) of generator to ON

- Turn the breaker at the side of loading equipments to ON

3) Adjustment during running

- Adjust the rotation, frequency and voltage according to load.

4) Checks during running

[Attended operations]

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

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

- Check all instruments and central indication lamps

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

- If color of exhaust is normal or not

Colorless or light gray: Normal

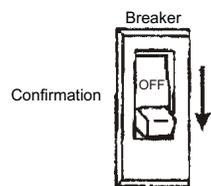
Black: Abnormal (insufficient combustion)

Blue: Abnormal (Combustion of lubricant)

6.4.2 Adjustment upon start and no-load



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



1) Start the machine at normal temperature

Start the machine in the following order.

- a. Confirm breaker at side of generator and loading equipments at OFF
- b. Insert the start key and turn it to ON. Indication lamp of intelligent display is on. Please confirm it.
- c. Turn the key to START then release it. Key returns to ON automatically. Engine is pre-heated and starts.

Check that intelligent display shows no error code when engine starts.
Repeat start operations. Carry on start operations after engine stops running completely. Operation on the running machine causes errors of starter and damages start motor.

[Attended operations]

Try the best to limit once operation time of starter within 15seconds.
Longer start time burns start motor.
Please remember the 15sec interval when start operations repeat.

2) Adjustment of frequency and voltage

Make adjustment after machine is heated and runs.
Heat the machine for about 5 minutes (no-load).

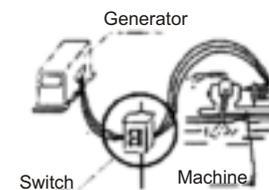
- a. Adjust the regulating screw rod of oil-pump rotation speed till frequency is up to rated value.
- b. Adjust the voltage with volometer as per specifications.

6.4.3 Keynote for load running

1)Pre-running check

3.3.3 Connect loading equipment

- Add Load ON/ OFF switch between wiring terminal of generator and loading equipments. If breaker of generator is also used as load switch of loading equipments, error is possible for breaker due to frequent start and stop.
- Turn the breaker at side of generator to OFF upon connecting cable. And connect the cable when engine stops for safety concern.
- Do not connect cable with joints at other phases.
- Close cover of output terminal block and screw down holding screws upon finish of cable connection.



[Attended operations]

- Special load is used for this generator.
- Using load with other generators may cause error of generators.

3.3.4 Low-load operation

Prevent low-load operation for long term.

- Long-term operation is allowed when load exceeds 1/4.
 - Operation period shall be no longer than 5hours if load is within the scope of 1/8-1/4.
- If run the machine at low-load, carbon collects on the engine and exhaust pipe. Engine works badly.

3.4 Earth

1) Earth of loading equipment



Do not neglect the earth at side of loading equipments even if generator is equipped with electrical-leakage protector.
If no reliable earth, electrical leakage may flow through human body and cause serious injury.
Provide reliable earth to generator and loading equipments.



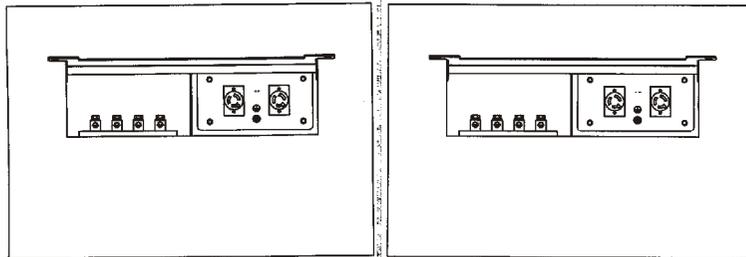
Decide diameter of earth line as per technical specifications of electrical facilities. Select the size with proper load capacity. Please use earth pole in compliance with following earth resistance.

- Earth resistance of loading equipment shall be below 500 Ω.

2) Information of common earth

Implement earth of outside box and loading equipments independently. However common earth is acceptable if independent earth is difficult on site.

- ① Select the maximum value for diameter of common earth cable in accordance with respective requirements.
- ② Select the minimum value for earth resistance of common earth cable in accordance with respective requirements.
- ③ Reliably screw down terminals.
- ④ If implement common earth in the way not described in the below drawings, please make consultation.



3) Handling attentions for earth project

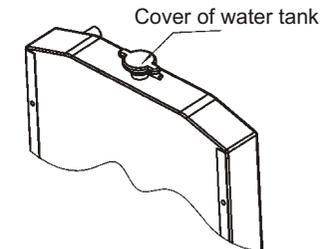
- Earth pole shall be placed in the shady and wet place. Upper part shall be in the soil.
- If earth pole is placed in the place where there is a lot of passerby, please carefully fix it to avoid blocking passerby.
- Connect lead extension as following
Weld lead extension or use proper sleeve. Meanwhile cover connection part with insulation tape. In addition, connection part shall on the ground.
- Do not place the earth pole of the machine within 2m away from earth for lightning rod.
- Not allow using the same earth line with telephone.
- Not allow using the same earth line with others.

5) Check and fill cooling water



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

Check and add cooling water before machine is running and when engine is cold.



[Attended operations]

Check quantity of cooling water

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

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

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

- Normal change on water level

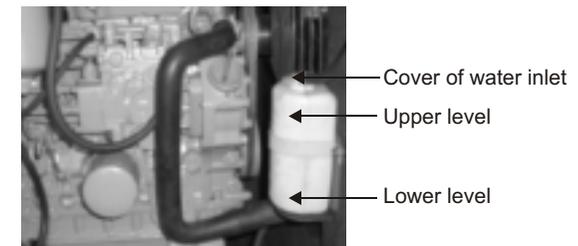
Prior to running (cold status): low level

After stop (high-temperature status): upper level

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

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

Please do not connect O-phase special to 3-phase joint directly to earth line.



6.4 Operation



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

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

Run the machine with all instruments on the operation panel.

6.4.1 Pre-start checks

Carry on following checks prior to each start.

1) Remove foreign matters in the generator

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

2) Check in the generator

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

Do not run the machine before eliminating any founded abnormality.

3) Check and fill fuel

Regularly check rest fuel level in the fuel tank and add recommended fuel on time (refer to 6.3.1).

4) Check and fill lubricant

- Check lubricant level with oil gauge.
- Add recommended diesel lubricant from oil-inlet of gear chamber when oil level is insufficient.

Check the lubricant with oil gauge. Add lubricant up to upper scale mark with check (refer to 6.3.3).

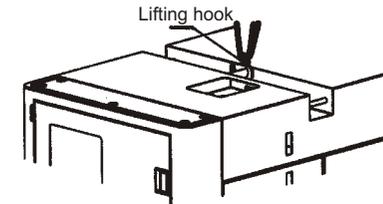
4. Transportation and overlapping-storage

4.1 Lifting attentions

- Lift generator with the lifting hook on the top of cover. If lifting the generator with transportation hook or other parts, there is the risk of mechanical damage or falling-down.

- Do not stand under the lifted generator.

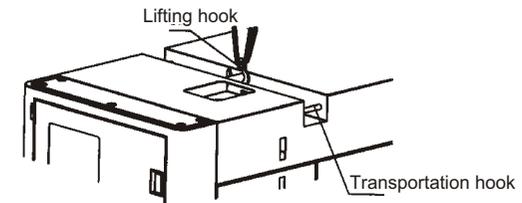
- Do not lift or move the running generator. Some irrevocable errors like fan damage may occur.



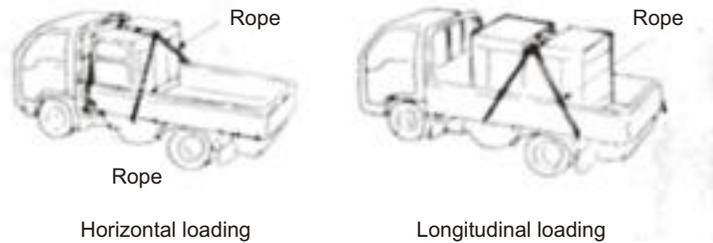
4.2 Transportation attentions

[Attended operations]

If shipping with the truck, please fix the generator on the loading table in the truck for safety concern.



Bind the generator with ropes at left and right hands indicated on below drawings after loading.

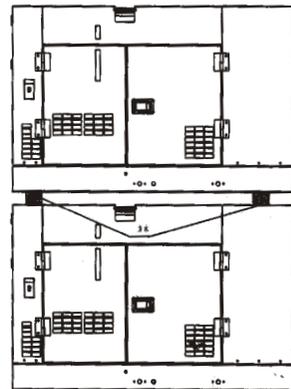


4.3 Overlapping-storage attentions

[Attended operations]

Please store generators as following if two-layers storage is required.

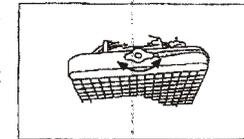
- Check if generator hood is damaged or screw is loose or released.
- Check if the ground is flat and solid and can bear static weight of overlapped generators.
- 1● Place the wooden lumps between generators.
- 1● Prevent generators in the upper layer from inclination.
- 1● Prevent generators in the upper layer heavier than those in the lower layer.
- Do not run the generator at the status of storage.



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

Fill water into radiator

- a. Turn the cover of radiator towards left side and take it off.
 - b. Add the cooling water till it overflows from water inlet of radiator. Slowly fill cooling water to avoid any foam.
 - c. Close the cover of radiator tightly to prevent any water leakage. Direct the inside clip towards notch of water inlet. Then press down the cover and turn the cover towards right side for 1/3 cycle to close the cover.
- Fill water into overflow bucket of auxiliary tank
- d. Please take off the cover of water inlet of auxiliary tank. Add cooling water up to the upper scale mark. Then re-mount the cover.
 - e. Check if joints of rubber hoses connecting auxiliary tank and radiator are loose, released or damaged. If any, auxiliary tank cannot work.



6.3.5 Trial running

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

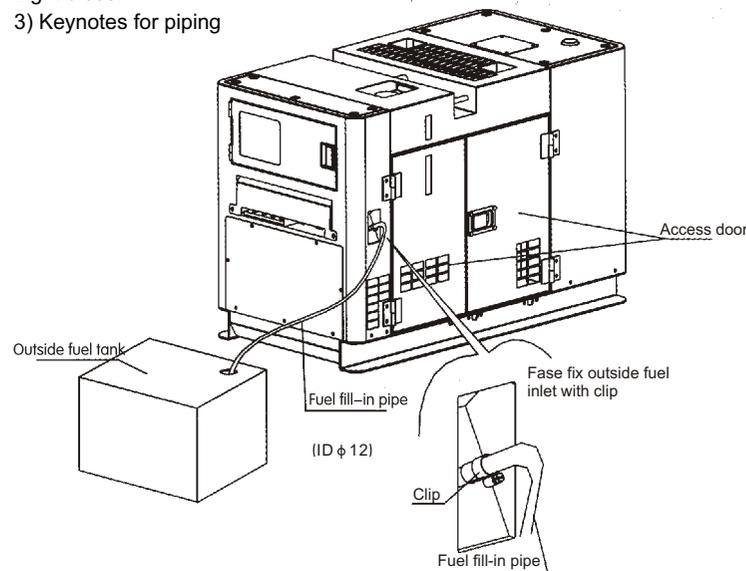
- a. Turn the breaker of generator to OFF.
- b. Insert the start key and turn it to START. Then engine starts. Run the engine for about 5min to check if any abnormal sound and leakage of water, oil and gas.
- c. Turn the key to OFF and stop engine.

6.3.6 Quantity re-confirmation of lubricant and cooling water

Please re-confirm the quantity of lubricant and cooling water after 5-minute trial running, if lubricant or cooling water is filled into for the first time or is replaced. Trial running distributes lubricant and cooling water around the machine. During re-check level of lubricant and cooling water shall be lower. By then, please make up insufficiency.

- Add lubricant (refer to 6.3.3)
- Add cooling water (refer to 6.3.4)

- 2) Recommended fuel
Light diesel
- 3) Keynotes for piping



6.3.3 Fill lubricant



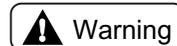
Keep lubricant level between upper and lower scale marks. Lubricant level shall not exceed the upper mark. Ejection of lubricant from the breather hole may cause engine errors.

- a. Keep engine level upon lubricant fill-in.
- b. Take off the yellow cover of lubricant inlet on the top of gear chamber. Add recommended diesel up to the upper mark of oil gauge.
- c. Measure the lubricant with oil gauge. In order to get correct level, please clean the oil gauge before inserting it into lubricant. Lubricant trace remained on the oil gauge indicates measurement.

Re-confirm it after 3-5min running.

Volume of lubricant: 6.9L

6.3.4 Fill cooling water



Close the cover of radiator water inlet tightly. Otherwise, ejected steam or hot water may cause scalding.

5. Installation



Please work the machine in the well-ventilated place. Bad ventilation causes breath of waste gas thus to death.

- Do not work the generator in the building or place with cover, bad ventilation or static exhaust.
- Do not work the generator in the place with bad ventilation such as inside stockroom, tunnel, cabin or enclosure channel.
- If it is necessary to run the machine on mentioned conditions, necessarily extend exhaust pipe outside of room and provide proper ventilation device to ensure sufficient ventilation.
- Mount the plug to water outlet of exhaust muffle and ensure no leakage of waste gas. Otherwise there is risk of leakage of waste gas.
- Prevent exhaust vent direct to passerby or other's family.

Pay attention to vibration

Running machine produces vibration as inside engine is working.

Please observe the following requirements upon installation.

① Place the machine on the solid ground and keep it level.

Abnormal vibration may occur if machine runs on the uneven ground.

Therefore please install the machine after solid foundation is completely finished.

Consult local KIPOR sales department for detailed information concerning vibration specification and foundation project.

Pay attention to noise.

There is great noise if operator opens the side door as inside engine is working.

In addition, there is still certain noise even if side door is close.

① Close the side door after machine is installed.

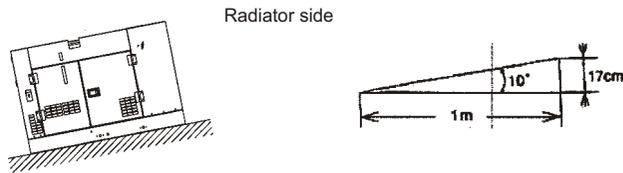
② If there is uptown around, residents may complain about noise. Therefore please take additional measures against noise. Consult local KIPOR sales department for detailed information concerning noise specification.

● This generator is portable and used as main or auxiliary power supply for outside work. Installation shall consider below requirements.

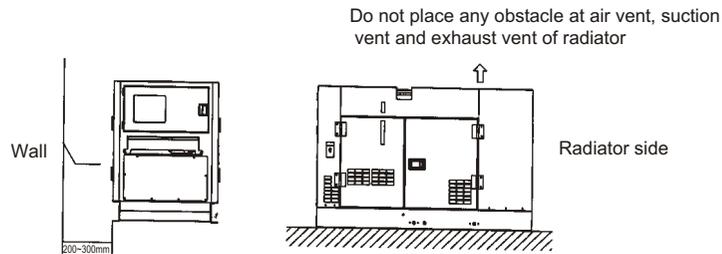
[Attended operations]

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

● If it is necessary to run the machine on the inclined ground, make sure the side with radiator upward and inclination angle within 10° . Engine may face over-heat due to bad working of water temperature switch, air into cooling water pipe and etc.



● Keep machine at least 200-300mm away from walls upon installation. Keep air vent of radiator and suction inlet and exhaust vent of engine upward. Prevent them from any jam. Otherwise temperature rise or reduction of cooling airflow may cause over-heat of engine or reduction of rotation. In addition, temperature of exhaust or increase of load also may lead to shorter duration.



● Run the machine in the place free of moisture, dust and rubbish and with fresh air.

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

● Place the generator near to working equipments like motor, lamps and etc. Long line reduces efficiency because of large resistance and electricity loss. And electricity fee turns more.

● Prevent releasing all loads of generator instantly. Please release loads gradually and evenly.

6.3 Pre-start preparations

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

6.3.1 Fill fuel

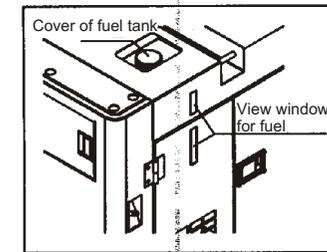


- Fill the proper fuel. Improper fuel may lead to risk of fire. Please confirm the type of fuel in advance.
- Clean any overflowed fuel.



Fuel tank is provided with lock. Open the lock and take off the cover of fuel tank. Fill clean and clear fuel without water and foreign matters into fuel tank.

● In order to prevent any overflow when machine is running, fill-in amount shall be approximately 90% of tank volume.



Volume of fuel tank: 65L

6.3.2 Keynotes for filling fuel with outside fuel tank

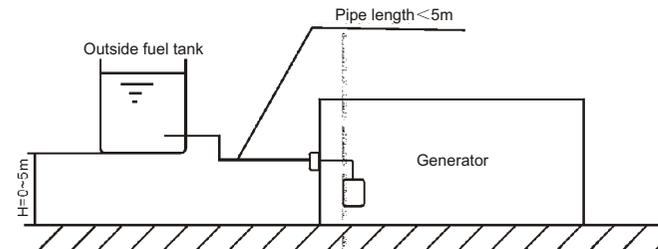
● Ensure tight connection of fuel pipe with fuel inlet of outside fuel tank. Any loose connection leads to fuel spill.

● Idle running of fuel feed pump causes damage. Please pay more attention to fuel level in the outside fuel tank. Try best to avoid idle running.

Location of outside fuel tank

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

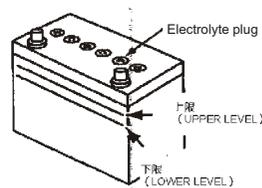
In addition, foundation height for outside fuel tank must be within 0-5m.



6.2.1 Check of storage battery

1) Check electrolyte level

Open the access cover. Electrolyte level between upper level and lower level is normal. If electrolyte level is below the middle line, please add more.



2) Check specific gravity of electrolyte level

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

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

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

Temperature(%) \ Lowest°C	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

6.2.2 Charging attentions

When charge the equipped storage battery,

● Disconnect the distribution line with terminal of storage battery before charging.

● Remove all electrolyte plugs to exhaust gases during charging.

● Disconnect the earth line first when disconnecting the distribution line with terminal of storage battery.

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

When connecting the distribution line with terminal of storage battery, connect the earth line finally.

● Ensure sufficient ventilation during charging.

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

● Re-charge the storage battery after intervals if storage battery is extremely hot, i.e. electrolyte temperature is above 45°C.

Stop charging immediately as storage battery is full.

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

1) Over-heat of storage battery

2) Reduction of electrolyte

3) Abnormality of storage battery

● Connect the (+) leads prior to earth line at (-) pole when operator makes wiring of storage battery.

Incorrect wiring may damage the engine.

6. Operation

6.1 Fuel, lubricant and cooling water

6.1.1 Fuel

[Attended operations]

Only designated fuel is allowed. Otherwise it is impossible to take full use of engine performance even leads to errors.

1) Fuel type and air temperature

Select the fuel type on the basis of following conditions and with reference to outside temperature.

Reference standard	Selection method
● GB 252-1994	● 0# light diesel for the summer, -10# or 20# diesel for the winter
● JISK2204	● 2# (>-5°C), 3# (>-25°C)

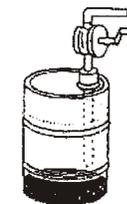
2) Use of fuel

a. Fuel with water or foreign matters may cause bad working. Store the fuel in the clean container.

Container shall be protected against rainwater or other foreign matters.

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

Only use clear and clean fuel upper with pump.



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

6.1.2 Lubricant

[Attended operations]

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

1) Selection of lubricant

It is recommended to use original lubricant.

Use No. 10W-30 and 15W-40 high-grade diesel lubricant (CD grade). It is required to select the CD grade (API classification) of marketable lubricant.

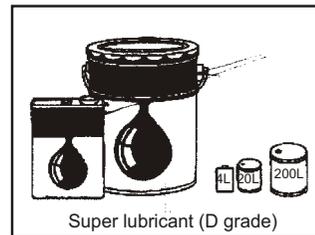
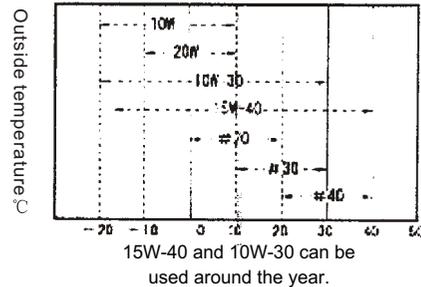
2) Use of lubricant

Avoid foreign matters and dust into lubricant upon storage and handling.

Please pay particular attentions to minor foreign matters around lubricant inlet upon lubricant fill-in.

Do not combine different lubricant in order to prevent bad performance of lubrication.

Refer to the blow table for viscosity No.
Select the lubricant proper to outside temperature.



6.1.3 Cooling water

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

Must use clean soft water (fresh water).

[Attended operations]

● Add anti-rustiness & anti-freezing liquid upon handling cooling water. In the cold winter, frozen cooling water expands and damages parts in the cooling water pipe. Exclusive use of fresh water and rustiness of water pipe lead to bad cooling effect. If the generator is used in the hot area without freezing risk, it is also recommended to add specified anti-freezing liquid to avoid rustiness.

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

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

1) Anti-freezing liquid

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

Lowest temperature °C	<-15	-25	-20
Combination ratio %	30	40	35

2) If use the marketable anti-freezing liquid,

Select the anti-rustiness & anti-freezing liquid. Observe the combination ratio specified by the manufacturer.

Replace the anti-freezing liquid once per year.

6.2 Operation of storage battery



Observe followings upon handling storage battery

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

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

· Prevent (+) pole from contacting (-) pole upon connecting cable of storage battery.

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

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

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

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

