

KIPOR[®]

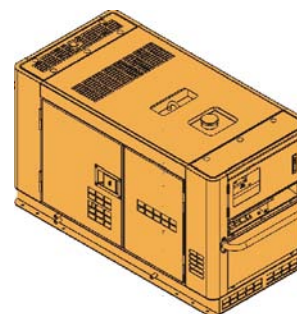
KIPOR POWER OPERATION MANUAL

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

KIPOR[®]

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DIESEL GENERATING SET

Single-phase:

**KDE16EA KDE16STA
KDE19EA KDE19STA**

Three-phase:

**KDE16EA3 KDE16STA3
KDE19EA3 KDE19STA3**

PREFACE

Thank you for purchasing a our generating set.

This manual covers the operation and maintenance of our generating sets KDE16EA/KDE16STA/KED19EA/KED19STA/KDE16EA3/KDE16STA3/KED19EA3/KED19STA3 generating set. All information in this manual is based on the latest product information available at the time of printing.

We reserves the right to make changes at any time without notice and without incurring any obligation.

No part of this publication may be reproduced without written permission.

This manual should be considered an important part of the generating set, and it must stay with the generating set if resold.

Check local laws and regulations before operating the generating set. If you have any questions about compliance with local requirements governing generating set use, consult a qualified electrician, electrical inspector, or licensed contractor.

Read this manual careful. Pay special attention to these symbols and any instruction that follow:



Failure to properly follow these precautions can result in property damage, serious injury or DEATH!

Read all labels and the owner's manual before operating this generator.

Operate only in well ventilated areas. Exhaust gas contains poisonous carbon monoxide, and can be deadly. Always stop engine before refueling. Wait 5 minutes before restarting.

Check for spilled fuel or leaks. Clean and/or repair before use.

Keep any sources of ignition away from engine.



WARNING

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



[IMPORTANT INFORMATION]

Indicates that the equipment damage will result if the instructions are not followed.



[OPERATION NOTICE]

Indicates that helpful information is provided.

To ensure the safety and durability, be sure to obey to this manual. To ensure the safety of the operator and others, be sure to correctly operate and carefully manage your generating set.

Indicates that there is potential danger of severe personal injury or death if carelessly operate or misuse the generating set. Be sure to read this manual before operation.



WARNING

If a problem should arise, or if you have any questions about your generating set, consult our company or an authorized our agent.

If a problem should arise, or if you have any questions about your generating set, consult our company or an authorized our agent.

EC Declaration of Conformity **According to EU Machinery-Directive 98/37/EC**

We, Wuxi Kipor Power Co., Ltd. (Add: Beside Jingyi Rd, Third-stage Development Section of Wangzhuang Industry Area, Wuxi High & New Technology Industry Development Zone.)

declare under our sole responsibility that the product diesel generator set: KDE16EA, KDE16EA3, KDE16STA, KDE16STA3, KDE19EA, KDE19EA3, KDE19STA, KDE19STA3, to which this declaration relates correspond to the relevant basic safety and health requirements of Directive:

- 98/37/EC (*Machinery-Directive*),

- 2006/95/EC (*LVD-Directive*),

- 89/336/EC (*EMC-Directive*), and

- 2000/14/EC (*noise directive*) incl. modifications.

For the relevant implementation of the safety and health requirements mentioned in the Directives, the following standards and/or technical specification(s) have been respected:

EN 55012:2002/+A1:2005,

EN 12601: 2001,

EN ISO 3744, ISO 11094.

<div>Mode Item</div>	KDE16STA	KDE16STA3	KDE19STA	KDE19STA3	KDE16EA/EA3 KDE19EA/EA3
<i>Measured sound power level</i>	95.43dB(A)	93.82dB(A)	94.58dB(A)	94.38dB(A)	94.0dB(A)
<i>Guaranteed sound power level</i>	96.0dB(A)	96.0dB(A)	96.0dB(A)	96.0dB(A)	95.0dB(A)

Conformity assessment method to annex VII Directive 2000/14/EC

Maintenance of technical documentation:

Wuxi Kipor Power Co., Ltd.

Signature: Shuoming Huang

Name: Shuoming Huang

Quality Guarantee Manager

2. 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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11. APPENDIX

1. 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 mm ²
Length beneath Current	50m	75m	100m	125m	150m	200m	
50A	8	14	22	22	30	38	
100A	22	30	38	50	50	60	
200A	60	60	60	80	100	125	
300A	100	100	100	125	150	200	

The application of the multi-core insulating cable							section mm ²
Length beneath Current	50m	75m	100m	125m	150m	200m	
50A	14	14	22	22	30	38	
100A	38	38	38	50	50	60	
200A	38×2	38×2	38×2	50×2	50×2	50×2	
300A	60×2	60×2	60×2	60×2	80×2	100×2	

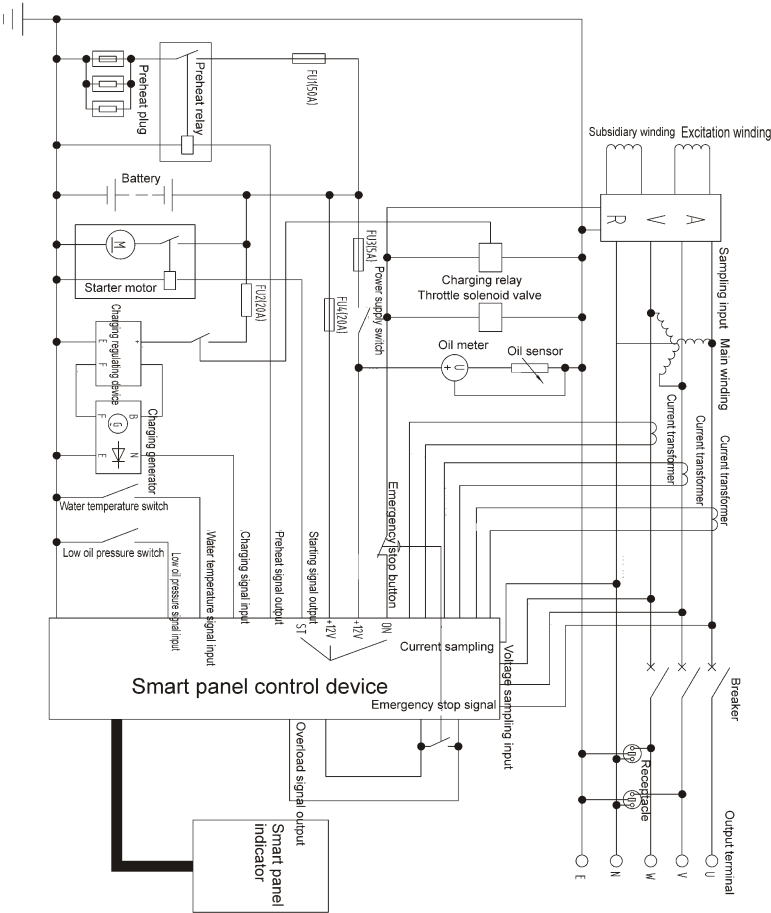


Caution:

Electrical equipment (including electrical lines and plugs connection) could not be defective. By the effect of mechanical stress, make sure to use the rubber sheathed flexible cable or analog.

Limit length of electric line when using the extension line or distributed network is: less than 60m for cables of 1.5mm², and less than 100m for cables of 2.5mm²

4. Electrical wiring diagram of KDE16EA3, KDE19EA3



1. SAFETY INFORMATION

WARNING For the safety of the operator and others, be sure to operate the generating set carefully.

Operator Responsibility: Know how to stop the generating set quickly in case of emergency. Master the usage and connection procedures of all generating set controllers, output receptacles. Be sure that the operator must receive proper instruction. The children or the pets are forbidden to close to the generator. The operation including installation, running and maintenance should be done by professional people who know well about the feature of generator.

WARNING

Carbon monoxide hazards
Exhaust contains poisonous carbon monoxide, a colorless and odorless gas. Inhaling exhaust can cause loss of consciousness and lead to death. If you run the generating set in unventilated or confined place, the air you breathe could contain a dangerous amount of exhaust gas. So, be sure to keep the good ventilation to prevent the exhaust gas from building up.

WARNING

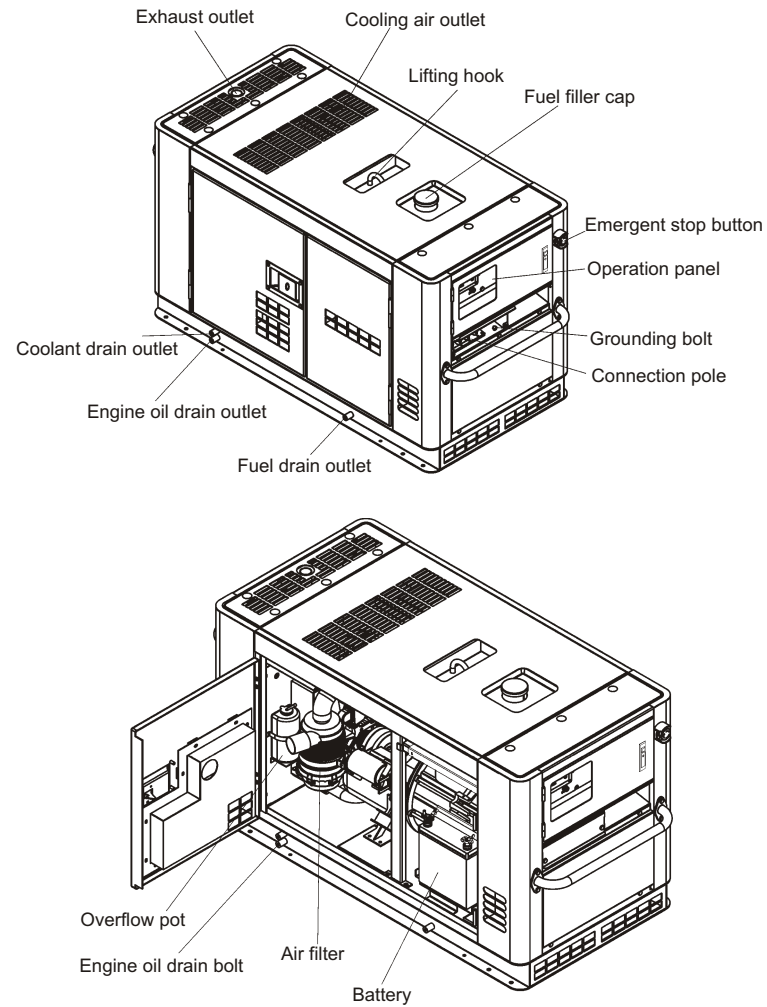
Electric shock hazards
The generating set will produce enough electric current to cause a serious shock or electrocution if misused. Running the generating set in the wet places such as rain, snow, swimming pool or sprinkler system, or when your hands are wet, could result in electrocution. Do not connect to the building's power system without installation of the isolation switch performed by a qualified electrician.

WARNING

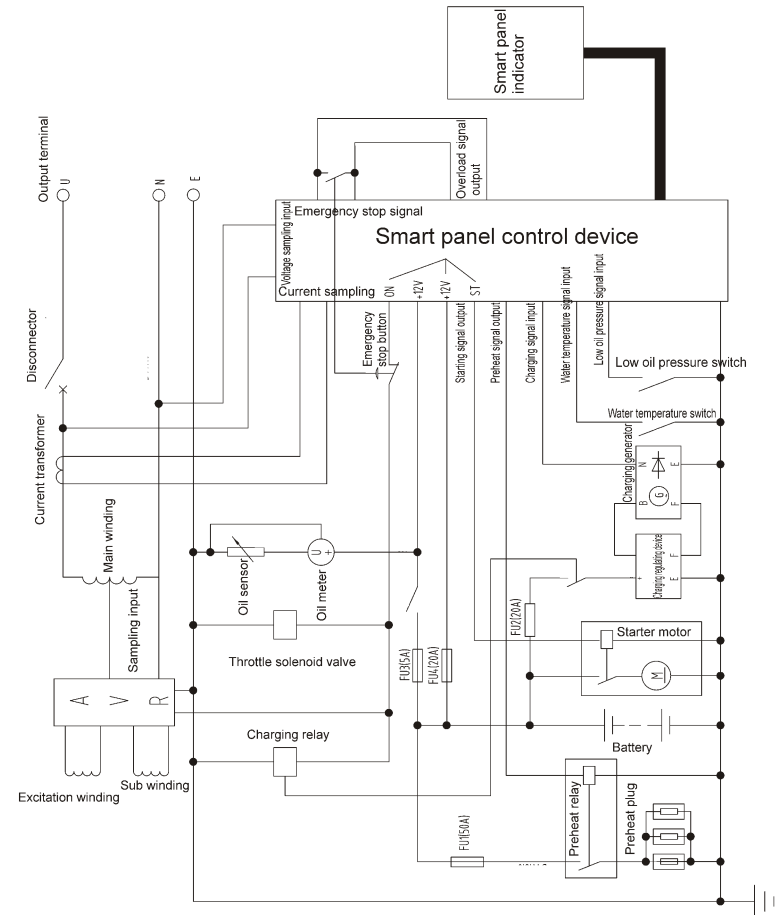
Fire and burn hazards
The exhaust gets hot enough to ignite some materials. The generating set must be kept at least 1 meter away from buildings and other equipments. Keep flammable materials away from the generating set. Be sure to service or store the generating set in doors after the engine cooled. The fuel is flammable and fuel vapor can explode. Refuel in a well-ventilated place with the engine stopped. Keep the flames and sparks away, and do not smoke in the area. Fuel may spill and ignite if the generating set is tilted or overturned. Place the generating set on a firm, level surface. Avoid loose sand or snow. It is limited to use the generator in the high-hazard risk area. Some parts of the explosive motor are very hot. Failure to operate could lead to burn. Please note the warning stickers on the generator. Operators should have self-protection awareness when operating generator, please wear sound-proof ear shield, insulating boot and insulating gloves. The key of door lock and electric door accessories for meter door and maintenance door should be well kept by operators. Please lock the doors of generator tightly to prevent somebody to operate (the children can not realize the danger).

2. PATS NAME AND CONTROL UNIT

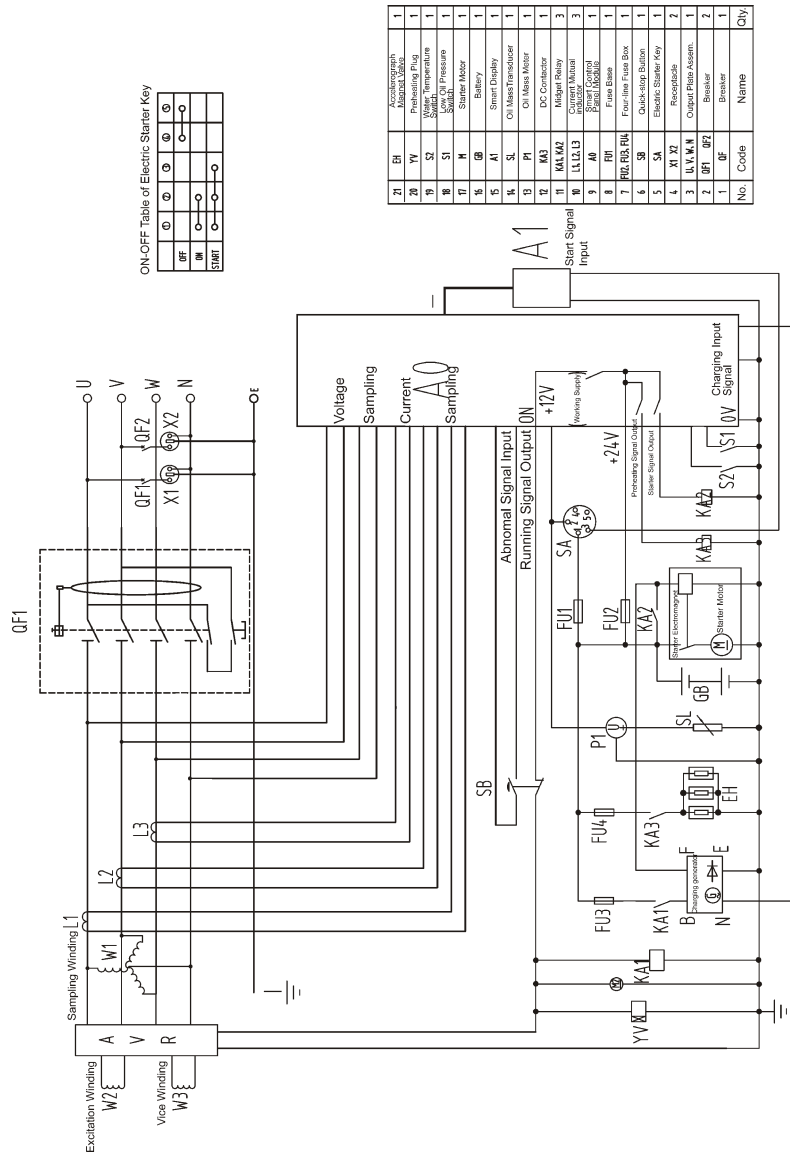
2.1 Generator fig.



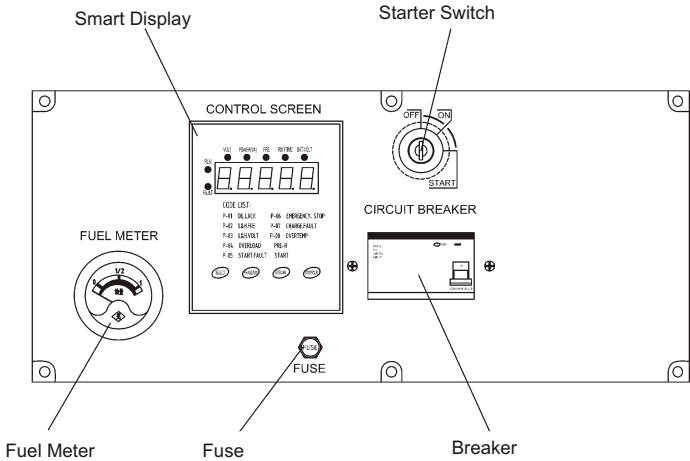
3. Electrical wiring diagram of KDE16EA, KDE19EA



2. Electrical wiring diagram of KDE16STA3, KDE19STA3



2.2 Control panel



Starter switch


To start and stop the engine.

Key position:

OFF: To stop the engine, the key can be inserted.

ON: To run the engine after started.

START: To start the engine. The starter motor rotates. Release your hand from the key after the engine started, the starter switch will return to "ON" position automatically.

 [OPERATION NOTICE]

Be sure to set the starter switch to "OFF" position when the engine stopped. The load warning lamp will come on if the engine switch left in "ON" position.

2.3 Circuit Breaker

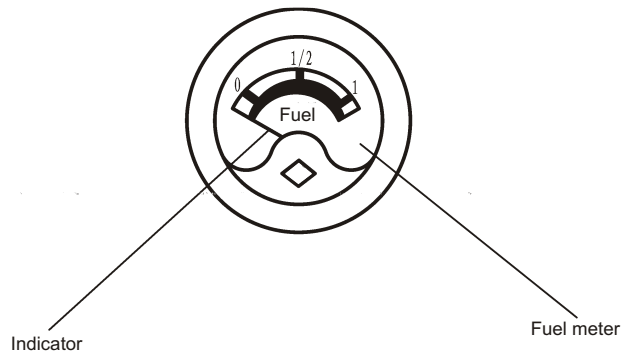
The circuit breaker will automatically switch off if abnormality or overload detected in the circuit during operation.

Be sure to check for abnormality or overload in the equipment before turning the circuit breaker on again.

Breaker can prevent the electric shock. If need to replace , please replace one that has equal degree and performance.

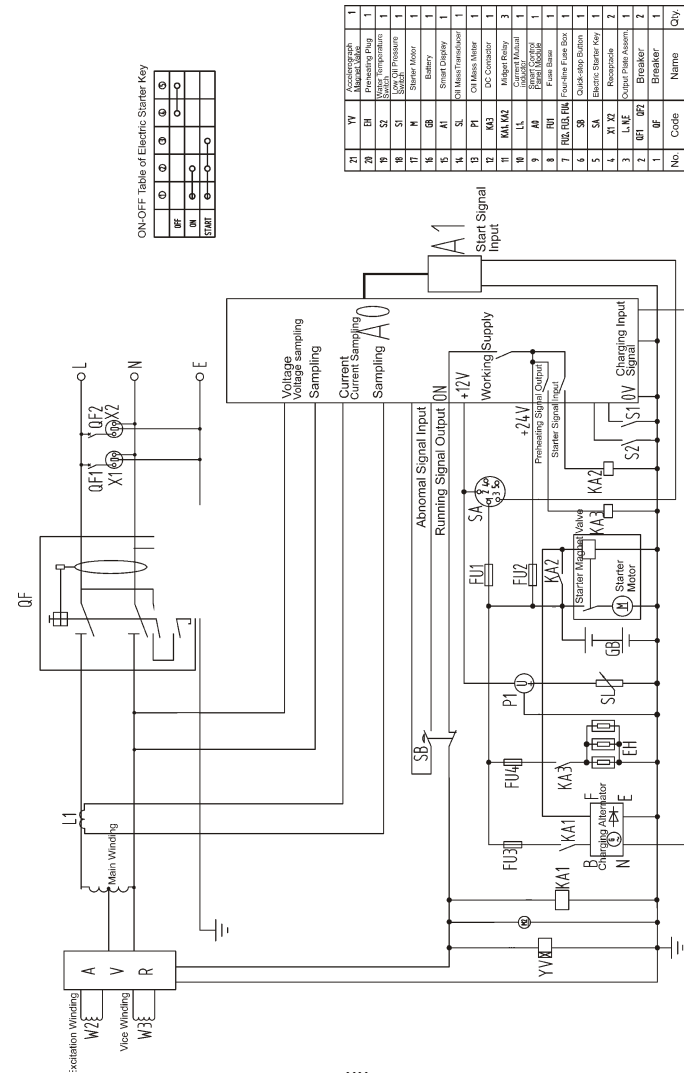
2.4 Fuel Meter

Indicates the amount of the fuel in the fuel tank when electric door lock is in "ON" position. Refill the fuel tank if the finger point to the "O" mark.



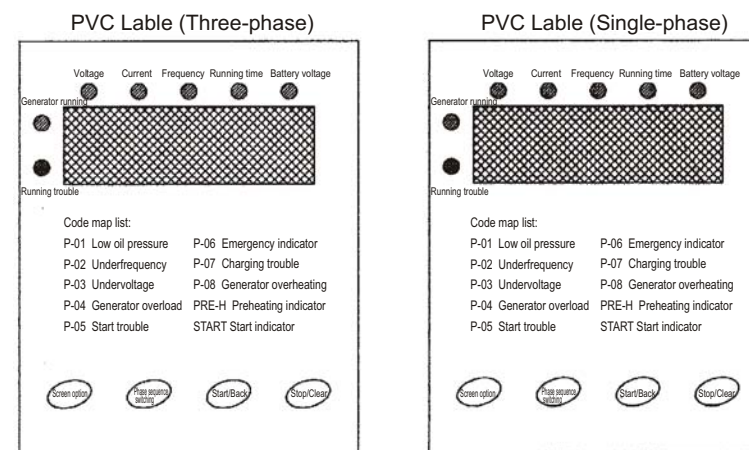
10. ELECTRICAL WIRING DIAGRAM

1. Electrical wiring diagram of KDE16STA, KDE19STA



Generating Set Model		KDE16EA		KDE16EA3		KDE19EA		KDE19EA3	
Engine	Model	KM376AG		KM376AG		KM376AG		KM376AG	
	Type	4–stroke, OHV, 3–cylinder, water–cooled							
	Displacement(L)	1.048		1.048		1.048		1.048	
	BoreXStroke(mm)	76X73		76X77		76X77		76X77	
	Calibration power kw/r(r/min)	13.5/3000	15.5/3600	15.3/3000	17.5/3600	15.3/3000	17.5/3600	15.3/3000	17.5/3600
	Fuel	Light diesel oil							
	Fuel consumption (g/kWh)	≤295		≤295		≤295		≤295	
	startomg system	12V DC electric starter							
	lubricating system	Pressure and splashing							
	Engine oil capacity(L)	4.8							
Generator unit	Rated output (kW)	12	14	13.5KVA	15.5KVA	14.4	17	16.25KVA	19.0KVA
	Rated frequency (Hz)	50	60	50	60	50	60	50	60
	Rated voltage(V)	230/115	240/120	400/230	416/240	230/115	240/120	400/230	416/240
	Rated current(A)	52.2/104.4	58.3/116.6	19.5	21.5	62.6/125	70.8/142	23.5	26.4
	Max. output (kVA)	13	15	15kVA	17kVA	16.7	18.7	18.75kVA	21kVA
	Phase	Single phase		Three phase		Single phase		Three phase	
	Power factor	1.0		0.9(Lag)		1.0		0.9(Lag)	
	Excitation method	Self-excited stabilivolt (AVR)							
	Fuel tank capacity(L)	38							
Unit	Structure	Ultra silent generator							
	LxWxH(mm)	1210 × 800 × 855							
	Net weight (kg)	300		300		320		320	

2.5 The functions of the digital panel



Knob function:

Screen Option: Switch the content of display, the content including: battery voltage, running time, output frequency, output current, generator voltage.

Phase Sequence Switch: Switch the three-phase voltage and current.

Start/Back: Start the generator, press the knob for two minutes after the generator started, the generator current specification will display automatically.

Stop/Clear: Stop the generator, it can stop the annunciator, trouble indicator light.

Indicator function:

Battery Voltage: Indicating battery voltage.

Running Time: Indicating generator total running time.

Frequency: Indicating generator frequency.

Three-phase current: Indicating generator current.

Single phase power: Indicating generator power.

Generator voltage: Indicating generator voltage.

Generator running: Indicating the existence of electrical power.

Running trouble: Indicating running trouble, check it according to the code map list.

The indication lamp function of Code map list :

P-01 Low oil pressure: Indicating low oil pressure, the generator will self-braking.

P-02 Underfrequency: Indicating frequency higher (lower), the generator will self-braking.

P-03 Undervoltage: Indicating voltage higher (lower), the generator will self-braking.

P-04 Generator overload: indicate overload, the generator will self-braking.

P-05 Start trouble: Indicating failure start

P-06 Emergency indicator: Indicating stop generator according to emergency measure.

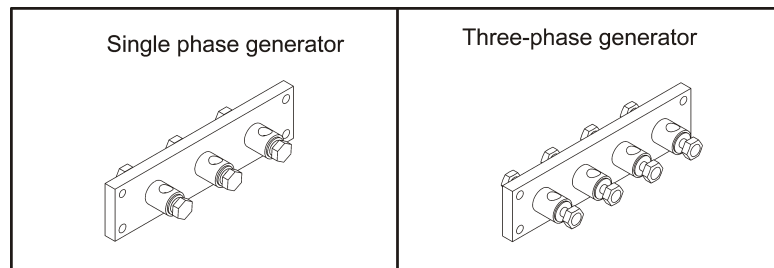
P-07 Charging trouble: Charging system trouble.

P-08 Generator overheating: Water temperature of generator is overheated, the engine will self-braking.

2.6 AC Three-phase and Single-phase Output Terminals

■ The AC output terminals are used while the AC power is available.

■ Loose terminals could cause a fire during operation. Be sure to tighten the terminal bolts securely after connecting wires.



9. TECHNICAL SPECIFICATIONS AND DATA

Specifications and technical of Ultra-silent generating set

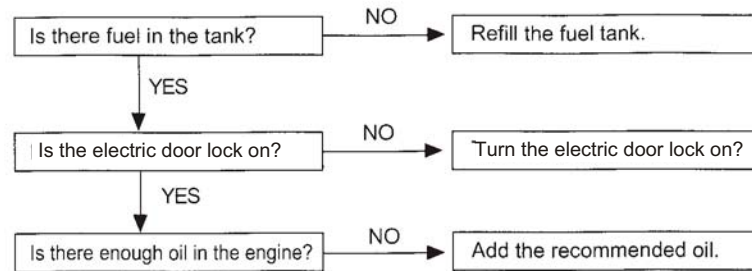
Generating Set Model		KDE16STA		KDE16STA3		KDE19STA		KDE19STA3	
Engine	Model	KM376AG		KM376AG		KM376AG		KM376AG	
	Type	4–stroke, OHV, 3–cylinder, water–cooled							
	Displacement(L)	1.047		1.047		1.047		1.047	
	BoreXStroke(mm)	76X77		76X77		76X77		76X77	
	Calibration power kw/(r/r/min)	15.3/3000	17.2/3600	15.3/3000	17.2/3600	15.3/3000	17.5/3600	15.3/3000	17.5/3900
	Fuel	Light diesel oil							
	Fuel consumption (g/kWh)	≤320		≤320		≤320		≤320	
	startomg system	12V DC electric starter							
	lubricating system	Pressure and splashing							
	Engine oil capacity(L)	5.2							
Generator unit	Rated output (kW)	12	14	13.5KVA	15.5KVA	14.4	17	16.25KVA	19.0KVA
	Rated frequency (Hz)	50	60	50	60	50	60	50	60
	Rated voltage(V)	230/115	240/120	400/230	416/240	230/115	240/120	400/230	416/240
	Rated current(A)	52.2/104.4	58.3/116.6	19.5	21.5	62.6/125	70.8/142	23.5	26.4
	Max. output (kVA)	13	15	15	17	16.7	18.7	18.7	21
	Phase	Single phase		Three phase		Single phase		Three phase	
	Power factor	1.0		0.9(Lag)		1.0		0.9(Lag)	
	Excitation method	Self-excited stabilivolt (AVR)							
	Fuel tank capacity(L)	38							
Unit	Structure	Ultra silent generator							
	LxWxH(mm)	1540X845X925							
	Net weight (kg)	420		420		442		442	

⚠ INSTRUCTION

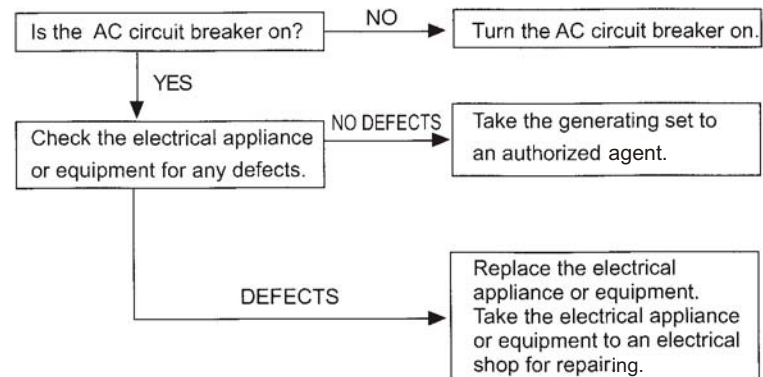
the noise list indicates the noise emission level while not the safe working noise level. Although the noise emission level is related to the sound exposure level, it is not the judging standard for whether applying noise protection. Factors affect the practical noise level include: the ambient condition and other noise source, such as the quantity of working machine or the working hours in noisy condition. Furthermore, the sound exposure level varies among different countries.

8. TROUBLESHOOTING

When the engine will not start:

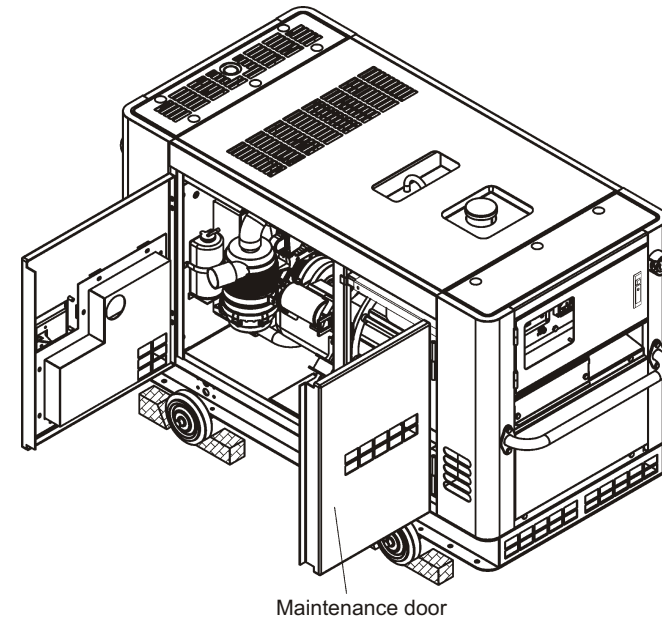


No electricity at the AC receptacles:



3. PRE-RUNNING CHECK

Check these items before starting the generator. Be sure the generator is on a level surface with the wheels blocked.



3.1 Engine Oil



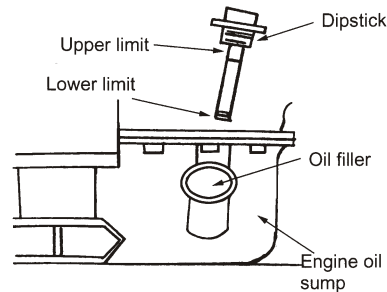
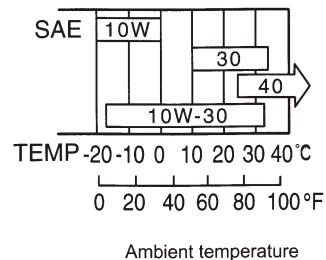
[IMPORTANT INFORMATION]

Engine oil is a major factor affecting engine performance and service life. Be sure to check the engine on a level surface with engine stopped.

- CC or CD grade SAE 10W-30 engine oil or the equivalent product is recommended. (There must be CC or CD remarks on the engine oil container.)
- SAE10W-30 is recommended for general, all temperature use. Select the appropriate viscosity for the average temperature in your area.

1. Open the maintenance door.
2. Remove and wipe the dipstick clean.
3. Screw in the dipstick as per the figure.
4. Check the oil level. If the level falls to the lower limit, refill the recommended oil to the upper limit.

Engine oil: API CC, CD



7.2 Storage

1. Clean each generating set component.
2. Check each part according to the maintenance schedule and repair/service the faulty parts.
3. Replace the engine oil with fresh oil before operating the generating set after storage.
4. Fill the fuel tank with fresh diesel fuel.
5. Disconnect the battery ground cable from the terminal and tape it. While storing the battery, fully charge the battery once a month.
6. Cover the generating set and place it in a well ventilated and dry area. If the generating set is still hot, wait until it cools down cover.



[OPERATION NOTICE]

Remove the radiator cap and check the coolant level before operating the generating set after storage. If the coolant level is low consult our authorized agent.

7. TRANSPORTING AND STORAGE

The engine becomes very hot during operation and remains hot for a while after stopping. Allow the engine to cool before transporting or storing indoors.

7.1 Transporting



WARNING

- When transporting the generating set, turn the engine switch OFF and keep the generating set level to prevent fuel spillage. Fuel vapor or spilled fuel may ignite.
- Contact with a hot engine or exhaust system can cause serious burns or fires. Let the engine cool before transporting or storing indoors.

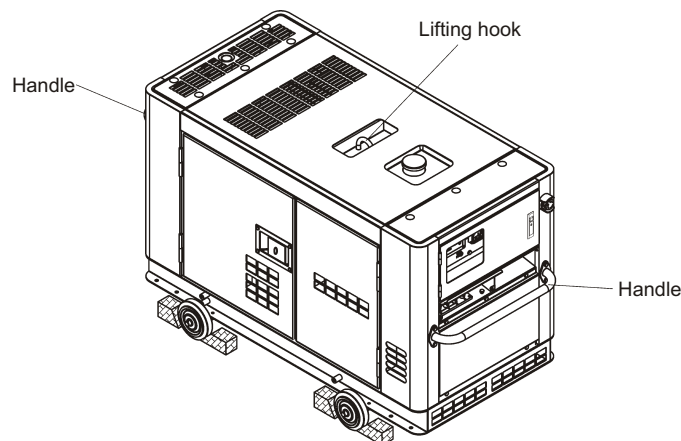
■ Take care not to drop or strike the generating set when transporting. Do not place heavy object on the generating set.

■ Load/unload the generating set in a level place to avoid that the generating set slides/roll down and in a place free from large stones which could damage the generating set.

■ Use lifting hook when lifting the generating for transportation. Do not lift the generating set by the carrying handle and frame pipe.

■ When transporting the generating set on a track, tie a rope around the carrying handle and frame pipe to secure the generating set.

■ On the wheel(optional parts) equipped model, block the wheels securely.



3.2 Fuel

Fuel tank capacity: 38L.

- Turn the electric door lock to ON position and check the fuel indicator.
- If necessary, refill the tank to the upper limit. Do not fill the fuel tank above the upper limit mark.



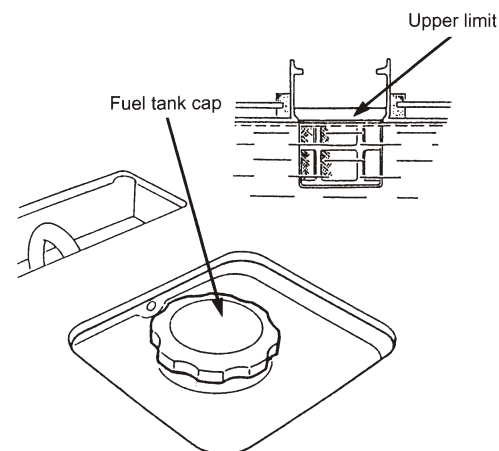
[OPERATION NOTICE]

Use diesel fuel.
Do not use the fouled or mixed diesel fuel.
Avoid getting the dirt or water in the fuel tank.
Be sure to screw on the fuel tank cap firmly after refueling.



WARNING

Diesel fuel is flammable and explosive under certain conditions. Refuel in a well ventilated area with the engine stopped.
Do not smoke or allow flames or sparks in the area where the engine is refueled or where diesel fuel is stored.
Do not overfill the tank, and make sure the filler cap is securely closed after refueling.
Be careful not to spill fuel when refueling or spilled fuel vapor may ignite. If any fuel is spilled, make sure the area is dry before starting the engine.
Use diesel fuel only. Do not use gasoline, kerosene etc, fuel oils.





[OPERATION INFORMATION]

Use different grade of diesel fuel according to season and ambient temperature. The fuel might freeze and prevent the engine from starting if summer fuel is used in winter. If winter fuel is used in summer, it could result in a lack of power. Be sure to use the proper grade of diesel fuel that complies with the ambient temperature.

Refill the fuel frequently, especially in winter. Water could accumulate if there is much air in the fuel tank. We recommend that you refill after each use of the generator.



[IMPORTANT INFORMATION]

Drain out the air.

It's difficult to restart the engine after the fuel was up, for the air are mixed in the fuel pipes. Be sure to drain out all the air according to the instructions including in the engine operation manual, meanwhile be sure that the fuel has delivered to the fuel-water separator, then restart the engine at zero load.



[IMPORTANT INFORMATION]

The fuel and lube oil have been drained out from the generating set before leave the factory. Be sure to fill the recommend fuel and lube oil before initial operation.



[IMPORTANT INFORMATION]

Check whether the fuel and lube oil and coolant are in the recommended level.

The waste oil and water processing:

Don't pour waste oil into the sewer or the river to prevent environment pollution. The exhaust oil from generator must be stored in container. To deal with bad matter, such as fuel, oil cooling water, solvent, filter and battery, according to the law.

6.5 Replace the Fuse

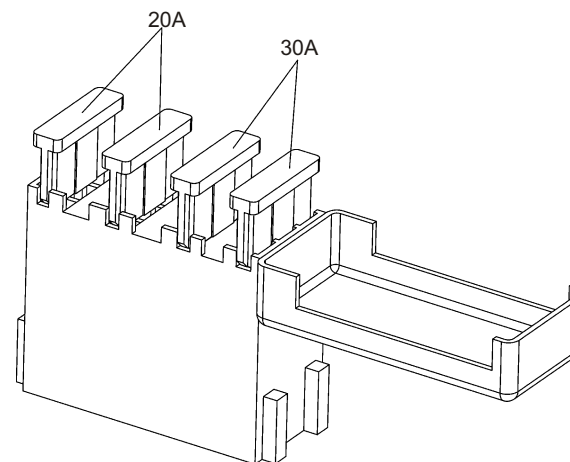
Turn the key of electric door lock to OFF position and remove the key before checking and replacing the fuses to prevent accidental short circuit.

To replace the sub fuse, pull out the old fuse out of the clips with your finger. Push a new fuse into the clips.



[Operation Notice]

If the main fuse is blown out, see your authorized agent.



[IMPORTANT INFORMATION]

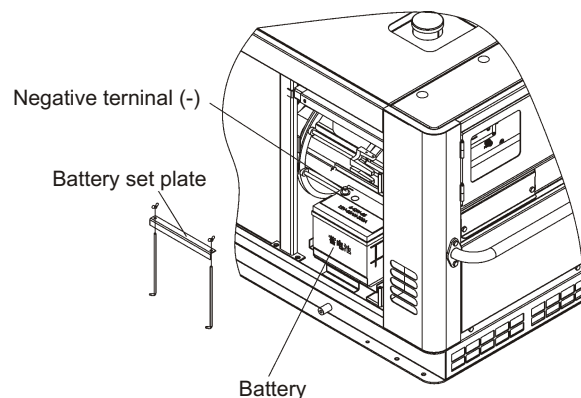
If frequent fuse failure occurs, determine the cause and correct the problem before attempting to operate the generating set further.

Never use a fuse with a different rating from that specified. Serious damage to the electrical system or fire may result.

6.4 Clean the Battery

If the battery terminals are dirty or corroded, remove the battery and clean the terminals.

1. Remove the battery set plate.
2. Disconnect the battery cable at the battery negative(-) terminal, then at the battery positive(+) terminal.



3. Remove the battery and clean the battery terminals and battery cable terminals with a wire brush or sand paper. Clean the battery with a solution of baking soda and warm water, taking care not to get the solution or water in the battery cells. Dry the battery thoroughly.
4. Connect the battery positive(+) cable to the battery positive(+) terminal, then the battery negative(-) cable to the battery negative(-) terminal. Tighten the bolts and nuts securely.
5. Coat the battery terminals with grease.
6. Reinstall the battery set plate.

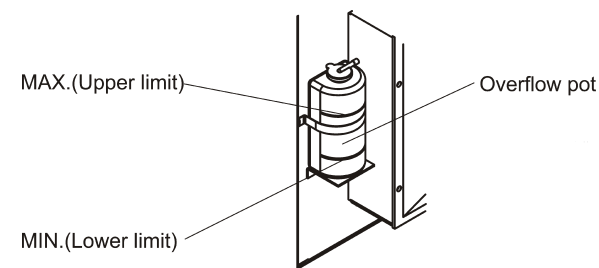


[IMPORTANT INFORMATION]

When disconnecting the battery cable, be sure to disconnect at the battery negative(-) terminal first. To connect, connect at the positive (+) terminal first, then at the negative(-) terminal. Never disconnect/connect the battery cable in the reverse order, or it causes a short circuit when a tool contacts the terminals.

3.3 Coolant

1. Open the maintenance door.
2. Check the water level while the engine has the normal working temperature. If the level is approaching the "MIN" mark, refill coolant to "MAX" mark.



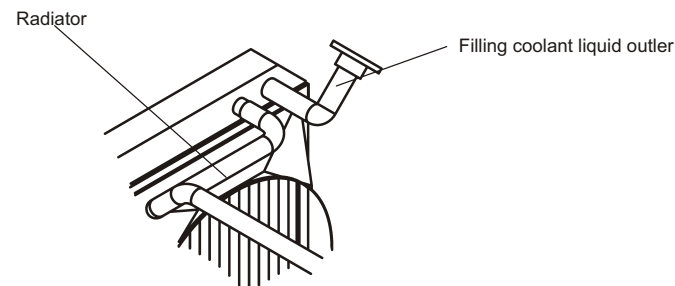
3. If there is no coolant in the overflow pot, check whether the cooling system has leakage and service it if necessary. Be sure that there is coolant in the radiator and the overflow pot.



WARNING

Do not open the radiator cap while the engine is still hot otherwise the coolant will spill out, result in the severe burning.

- Wait until the engine is cold, turn the radiator cap counterclockwise until stops. Do not press down while turning the cap. After any remaining pressure has been relieved, remove the cap by pressing down and again turning it counterclockwise.
- Add enough coolant to fill the radiator, and reinstall the cap. Be sure to tighten it securely. Fill the overflow pot up to the MAX mark with the engine cold.



Coolant Recommendation

Use the specified high quality ethylene glycol antifreeze. Mix the antifreeze with low-mineral drinking water or distilled water. A 50/50 mixture of ethylene glycol antifreeze and water is recommended to provide the best performance of temperature-descent and anticorrosion. A higher concentration of antifreeze decreases cooling efficiency and is recommended only if additional protection against freezing is needed. A concentration of less than 40% antifreeze will not provide proper corrosion protection.

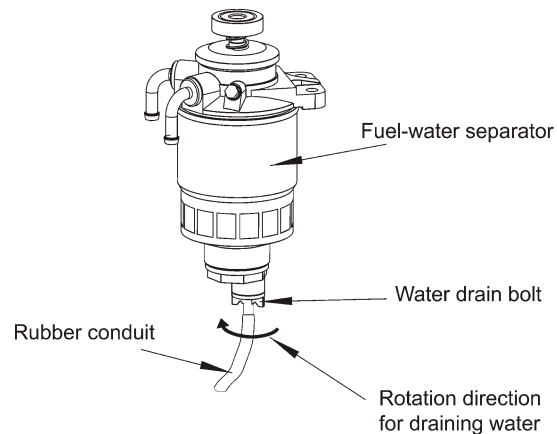


[IMPORTANT INFORMATION]

The use of unsuitable antifreeze, hard water, or salt water may cause corrosion damage that will shorten the life of the engine.

3.4 Fuel-water Separator

- Open the maintenance door.
- Check the fuel-water separator for dirt, water or deposit, clean it if necessary.



- Drain water: there is water mixed in oil usually, the fuel-water separator can separate the water, and settled the cup base. So need to change regularly. Loose the drain water bolt, the water will drain from the rubber conduit and drain it up, then tighten the bolt.

6.3 Service the Air Cleaner

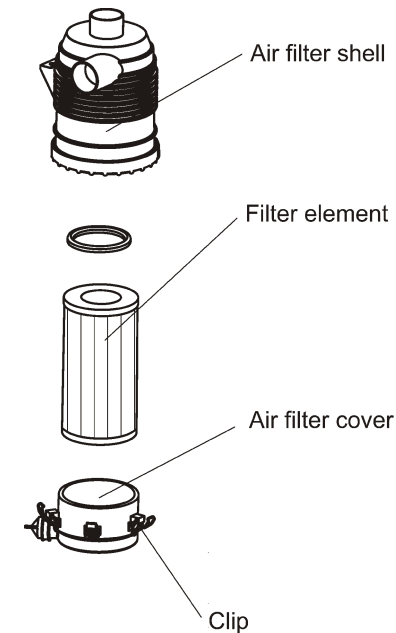
If you operate the generating set at very dirty areas, check and replace the air cleaner more often than specified in the maintenance schedule.



[IMPORTANT INFORMATION]

Run the engine without air cleaner will cause rapid engine wear.

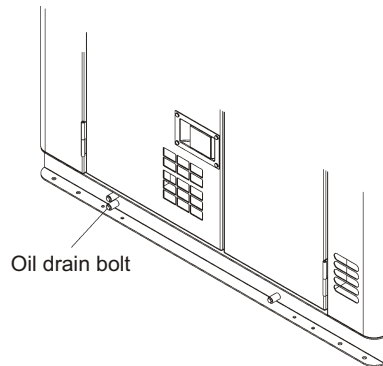
1. Open the maintenance door.
2. Unhook the clips and remove the air cleaner cover and element.
3. Install the element and air cleaner cover in the order of the disassembling.
4. Fasten the clip securely.



6.2 Replace Engine Oil

To drain the engine oil quickly and completely before the engine cooled.

1. Open the maintenance door.
2. Remove the oil dipstick and screw off the drain plug to drain out the engine oil.
3. Screw on the drain plug.
4. Add the engine oil and check the oil level.
5. Screw on the dipstick cap.



Engine oil capacity: 5.2L.



[OPERATION NOTICE]

- Used engine oil may cause skin cancer if repeatedly left in contact with the skin for prolonged periods. Although this is unlikely, unless you handle used oil on a daily basis, it is still advisable to thoroughly wash your hands with soap and water as soon as possible after handling used oil.
- Please dispose of used engine oil in a manner that doesn't harm our environment. Our suggest you take it in a sealed container to your local service station for reclamation. Do not throw it in the trash or pour it on the ground or down a drain.

3.5 Battery

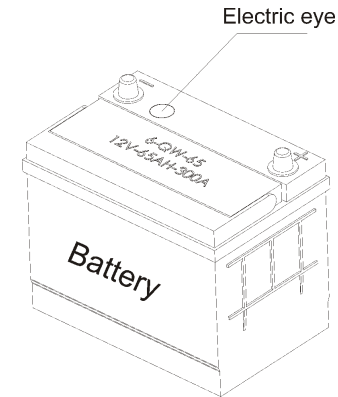
The generator uses battery which dose not need maintenance and filling liquid.

Observe the status displays of battery:

Blue: the battery is in good condition

White: the electricity is not enough, need to charge.

Red: the electrolyte is not enough, need to change.



WARNING



BATTERY exhausts the explosive gases. Flames and sparks and cigarettes must be kept away from the BATTERY. Keep the BATTERY at well-ventilated place when charging.



WARNING



Chemical Hazard: BATTERY electrolyte contains sulfuric acid. Contact with eyes or skin, may cause severe burn. Wear a face shield and protective clothing.
Antidote: If the electrolyte gets into your eyes, flush thoroughly with warm water for at least 15 minutes and call a physician immediately.
Poison: Electrolyte is poisonous.
Antidote:
External: Flush thoroughly with water.
Internal: Drink large quantities of water or milk. Follow with milk of magnesia or vegetable oil, and call a physician immediately.
KEEP OUT OF REACH OF CHILDREN.

4. START AND SHUTOFF THE ENGINE

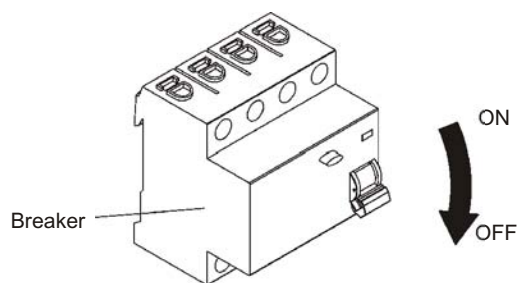
4.1 Break-in Period (initial 50 hours)

An initial break-in period is very important for extending the engine service life. Do not run the engine with full load during break-in period. Be sure to run the engine with 50%~60% load during break-in period.

4.2 Start the Engine

Disconnect any load from the AC receptacle before starting.

1. Shutoff the AC circuit breaker.



2. Insert the key to electric door lock and turn to START position, the unit is preheating and starting, then hands off , the key will back to ON position automatically

3. Smart panel control can preheat automatically when start, the time can be set.

6. MAINTENANCE

■ Periodical maintenance and adjustment are helpful for keeping the generating set at good working condition. Please follow the maintenance schedule to perform the maintenance and inspections.

■ To prevent from carbon monoxide poisoning, be sure to shutoff the engine before perform any maintenance. If the engine is operated at the unventilated or confined place, the exhaust concentration will reach a dangerous level. If the engine must be run for any reason, be sure the area is well ventilated.

■ To avoid burns, let the engine cool before perform maintenance.

■ Use only genuine KAMA parts or their equivalent for maintenance and repair. Parts of lower quality may damage the engine.

6.1 Maintenance schedule


Item	Periodical	Every time	Initial 50hrs(3)	Every 200hrs(3)	Every 400hrs(3)	Every 600hrs(3)	Every 1000hrs(3)	Every 4000hrs(3)
Engine Oil	Check	○						
	Replace		○	○				
The electric eye color of battery electric								
Coolant Check	Check	○						
	Replace							
Every two years(2)								
Fuel-water separator(4)	Check	○						
Fuel	Check	○						
Warning lamps	Check	○						
Fan belt	Check		○ (2)	○ (2)				
Air cleaner element(1)	Check			○				
Engine oil filter	Replace				○ (2)			
	Replace				○			
Fuel/water separator element	Replace							
Carbon brush	Check						○ (2)	
Nozzle	Check						○ (2)	
Valve clearance	Check-adjust						○ (2)	
Timing gear	Replace							○ (2)
Fuel pipeline	Check							
	Replace							
Every two years(2)								
Every four years(2)								

[OPERATION NOTICE]


- (1) Shorten maintenance intervals when the set is run at dirty area.
- (2) These items should be performed by our authorized agent unless the owner has proper tools and is mechanically proficient. See the Operation Manual.
- (3) Record the running hours for professional commercial use to determine proper maintenance intervals.
- (4) To determine the water draining intervals of the fuel-water separator according to local diesel oil quality, usually drain water from the separator per 50~100 hrs.

5.3 Usages of Receptacles and Terminals

■ Refer to the following specifications while using the receptacles and terminals.
Apply load to each receptacles and terminals equally to prevent overloading.


 [OPERATION NOTICE]

Apply load to single-phase receptacles equally to prevent voltage fluctuation.
The receptacle should not have default

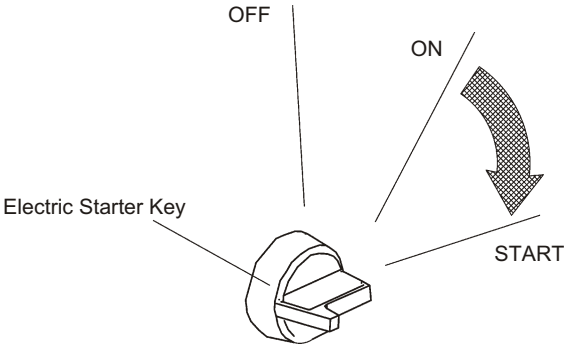
 [OPERATION NOTICE]


When you use 400V (three phase terminal) and 230V(single phase terminal),
be sure that the current applied in each receptacle and terminal is lower than
the rated capacity, meanwhile the total current lower than rated output.

Model	KDE16STA3				KDE19STA3			
Fre-quency (Hz)	50		60		50		60	
The maximum lad of each recep-tacle or terminal (kVA)	Three phase Terminal	Recep-tacle	Three phase Terminal	Recep-tacle	Three phase Terminal	Recep-tacle	Three phase Terminal	Recep-tacle
	13.5	0	15.5	0	16.25	0	19	0
	10	1.1	12	1.2	15	0.4	15	1.3
	8	1.8	10	1.8	12	1.4	12	2.3
	6	2.5	8	2.5	10	2.0	10	3
	4	3.1	6	3.2	8	2.7	8	3.7
			4	3.8	6	3.4	6	4.3
					4	4.0	4	5

 [IMPORTANT INFORMATION]

When displays PRE-H, the unit is preheating. After preheat, the unit will back to START automatically. When displays START, the unit is starting.

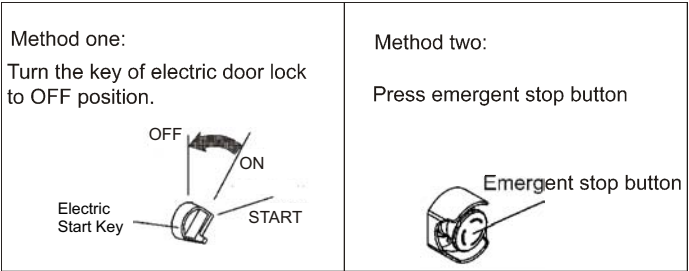


 [OPERATION NOTICE]

Warm-up the engine to stabilize the engine speed, eliminates voltage fluctuation as well as to reduce the wearing and prevent seizure by warm-up the engine oil and lube oil.
It's normal that blue smoke might be exhausted during warm-up.

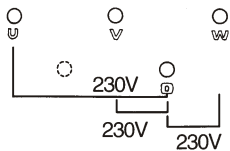
4.3 Shutoff the Engine

- In an emergency:
Turn the engine switch to OFF position.



- To restore the emergency button, screw it by clockwise.
1. Turn off the electrical appliance switch.
 2. Close the breaker(Turn the breaker to "OFF")
 3. Close the electric door lock(Turn the key of electric door lock to "OFF")

- To use 230V terminals (single-phase)

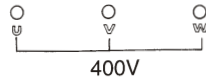


- [1] When only one circuit is used:
Connection: U-O terminals or V-O terminals or W-O terminals.
- [2] When two circuits are used simultaneously, apply load to each pair of terminals equally to prevent overloading:
Connection: U-O, V-O terminals or V-O, W-O terminals or U-O, W-O terminals.
- [3] When three circuits are used simultaneously, apply load to each pair of terminals equally to prevent overloading:
Connection: U-O, V-O and W-O terminals.
The load must not exceed the following specifications:

Model	KDE16STA3		KDE19STA3	
Frequency (Hz)	50	60	50	60
One circuit (kVA)	4.5	5.2	5.4	6.3
Two circuit used (kVA)	9.0	10.3	10.8	12.6
Three circuit used (kVA)	10.8	12.4	13	15.2

AC Output Terminals

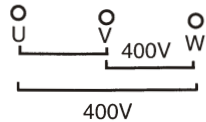
- To use 400V terminals (three-phase)



Note: Do not exceed rated output when only one circuit is used.

Connection: U, V and W terminals

- To use 400V terminals (single-phase)



[1] When only one circuit is used:

Connection: U-V terminals or U-W terminals or V-W terminals.

[2] When two circuits are used simultaneously, apply load to each pair of terminals equally to prevent overloading:

Connection: U-V, U-W terminals or U-W, V-W terminals or U-V, V-W terminals.

[3] When three circuits are used simultaneously, apply load to each pair of terminals equally to prevent overloading:

Connection: U-V, U-W and V-W terminals.

The load must not exceed the following specifications:

Model	KDE16STA3		KDE19STA3	
Frequency (Hz)	50	60	50	60
One circuit (kVA)	7.2	8.3	8.7	10.1
Two circuit used (kVA)	10.8	12.4	13	15.2
Three circuit used (kVA)	10.8	12.4	13	15.2

5. HANDLING THE GENERATING SET

5.1 Connecting to a Building's Power Supply System

If the generating set will be used as alternative to utility company power, an isolation switch must be installed to disconnect the utility lines from the building when the generating set is connected. Installation must be performed by a qualified electrician and must comply with all applicable laws and electrical codes.

⚠ WARNING

Improper connections to a building's electrical system can allow electricity from the generating set to backfeed into utility lines and may cause serious injury or death to utility company workers or others who contact the lines. Consult the utility company or a qualified electrician.

👉 [IMPORTANT INFORMATION]

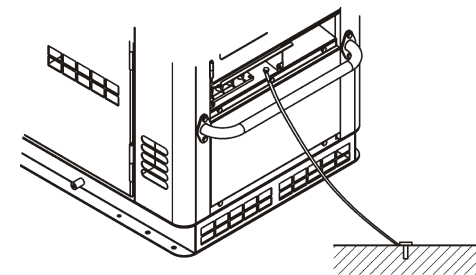
Improper connections to a building's electrical system can allow electricity from the utility company to backfeed into the generating set, which will severely damage the generating set and may cause fires.

👉 [OPERATION INFORMATION]

In some areas, generating sets are required by law to be registered with local utility companies. Check local regulations for proper registration and use procedures.

⚠ WARNING

To prevent electrical shock from faulty appliances, the generating set must be grounded. Connect the ground terminal of the generating set with an external ground source.



5.2 AC Application

[OPERATION INFORMATION]

Be sure that all appliances are in good working condition before connecting them to the generating set. If an appliance begins to operate abnormally, becomes sluggish, or stop suddenly, shutoff the engine immediately. Disconnect the appliance and determine whether the problem is due to an appliance problem, or overloading.

[IMPORTANT INFORMATION]

Be sure that appliances do not exceed the generating set's rated load capacity for more than 30 minutes and that they never exceed the maximum load capacity. Substantial overloading will switch off the circuit breaker. Marginal overloading may not switch off the circuit breaker, but it will shorten the service life of the generating set.

- Be sure to shutoff the engine and remove the key from the engine switch before connecting the appliances to the AC terminals.

- Use cables of sufficient sizes or current ratings to connect appliances to the AC terminals.

- When connect the cable to the output terminal(three-phase or single-phase), attach the cable end to the terminal and screw on the screw.

Do not touch the receptacles or terminals while the generating set is running.

- Do not connect or disconnect the appliance when the AC circuit breaker is at ON position, otherwise the electrical shock or appliance damage will result.

- Do not connect appliance of frequency and voltage ratings other than the specified, otherwise the generating set or appliance damage will result.

[OPERATION NOTICE]

- Most appliance and electric motors require more than the rated operating current for start-up. The starting current of the electric motor is 5-7 times higher than the rated operating current, so the generating set at best can start those electric motors with 40%~50% of the load capacity of the set.

- An overload will trip the circuit breaker. If this happens, reduce the electrical load on the circuit. Wait a few minutes before resetting the circuit breaker

- If there are some electric motors loading in appliance, please start the high-power motor first, then start the low-power.

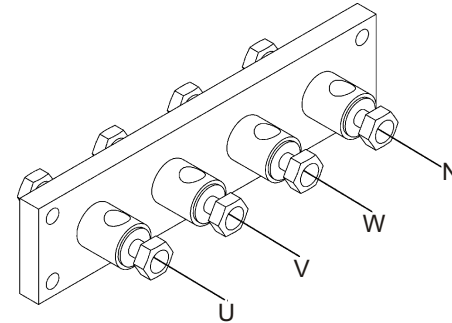
- Be sure to start the electrical motor at zero load, after that connect the load.

AC Application (three-phase 400V)

1. Open the connection wiring box cover and connet the cable to terminal U,V and W.(Using terminals)

[IMPORTANT INFORMATION]

Be sure to connect the cables to the correct terminals, otherwise the electrical motor will run in reverse direction. Do not connect an appliance to two generating sets simultaneously.

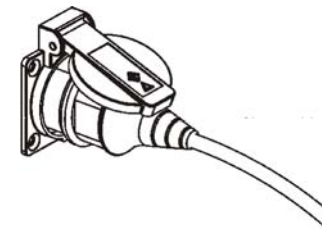


2. Close the connecting box cover and tighten the bolts.

3. Start engine

Examine the generator three-phase voltage and frequency by smart display.

4. Connect the appliance. (single-phase 220V)



[IMPORTANT INFORMATION]

To prevent overload, each receptacle load and terminal load is equal, especially when the generator been used in communicator and sensor to voltage.

Turn the AC breaker to ON position.