UNIV Generator Set
Operator & Maintenance
Instruction Manual

CONTENES

1. INTRODUCTION

Thank you for choosing our company to supply your electrical power needs. In line with our policy of continuous product improvement, we reserve the right to change the information contained within this manual without notice.

This Operator Instruction Manual has been designed to help you operate and maintain your electrical generator set correctly. We recommend that the operator should take the time to read this manual. Certain tasks may require work to be completed by specifically trained technicians, an operator should only attempt a task detailed for an operator to complete.

This generator set is one of a family of heavy duty industrial generator sets designed to be ready to run when it arrives. Years of diesel generator set experience has gone into the set to produce a quality source of electrical power that is efficient and reliable.

Always ensure that maintenance, adjustments and repairs are done by personnel who are authorised to do the work and have been properly trained. Maintenance and repairs should also be carried out at regular intervals using genuine parts, this will prolong the life of the generator set. The manufacturer is not liable for any defects or claims due to the user's improper

installation, maintenance or use, or for any products which have been modified in any way from the state in which they were sold. All generator sets should only be operated by those required to do so and therefore be safely kept away from non authorised use.

Some photographs or illustrations in this manual show details or attachments that may be different from your generator set. These images are for illustrative purposes only. If you have any questions regarding your generator set, please contact your local Dealer for the latest available information.

Every generator set is uniquely defined by a model number and serial number indicated on a rating plate generally affixed to the alternator housing (See Section 3.1). This information is required when ordering spare parts or when service or warranty work is required.

2. SAFETY

2.1 GENEERAL

The generator set is designed to be safe when used in the correct manner. Responsibility for safety, however, rests with the personnel who use the set. Before performing any procedure or operating technique, it is the user’ s responsibility to ensure that it is safe to do so.

Warning：

⚠ **Read and understand all safety precautions and warnings before operating the generator set.**

⚠ **Failure to follow the instructions, procedures and safety precautions in this manual may increase the possibility of accidents and injuries.**

⚠ **Never start the generator set unless it is safe to do so.**

⚠ **Do not attempt to operate the generator set with a known unsafe condition.**

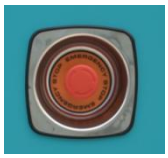
⚠ **If the generator set is unsafe, fit danger notices and disconnect the battery negative (–) lead so that it cannot be started until the condition is corrected.**

⚠ **Ensure the generator set is protected from any unauthorised use, use signs were appropriate.**

⚠ **Disconnect the battery negative (–) lead prior to attempting installation, repairs or cleaning on the generator set.**

⚠ **Install and operate this generator set only in full compliance with relevant National, Local, or Federal Codes, Standards or other requirements.**

2.1.1 Emergency Stop Button



The emergency stop button is in the OUT position for normal engine operation. Push the emergency stop button. The engine will not start when the button is locked. Turn the button clockwise in order to reset.

Warning:

⚠ **Familiarise yourself with the location of the Emergency Stop Button. Emergency shutoff controls are for EMERGENCY use ONLY.**

⚠ **DO NOT use emergency shutoff devices or controls for normal stopping procedure.**

⚠ **Do not start the engine until the problem necessitating the emergency stop has been located and corrected.**

2.2 Personal Protective Equipment

Figure 2.1 – Typical PPE to be worn by an Operator

- Appropriate PPE should always be worn whilst working in and around the generator set. Wear a hard hat, protective glasses, gloves and other protective equipment, as required by generator set location.
- When work is performed around an engine that is operating, wear protective devices for ears in order to help prevent damage to hearing.
- Do not wear loose clothing or jewellery that can snag on controls or on other parts of the engine.
- Ensure that all protective guards and all covers are secured in place on the engine.
- Never put maintenance fluids into glass containers. Glass containers can break.
- Use all cleaning solutions with care.
- Report all necessary repairs.
- Unless other instructions are provided, perform the maintenance under the following conditions:
- The engine is stopped. Ensure that the engine cannot be started.
- Disconnect the batteries when maintenance is performed or when the electrical system is serviced. Disconnect the battery ground leads. Tape the leads in order to help prevent sparks.

- Do not attempt any repairs that are not understood. Use the proper tools. Replace any equipment that is damaged or repair the equipment.

2.3 General Hazard Information

2.3.1 Pressurized Air and Water

Do not use pressurized water near electrical components or near component’ s bearings

Pressurized air and/or water (not recommended) can cause debris and/or hot water to be blown out which could result in personal injury.

When pressurized air is used, wear protective clothing, protective shoes and eye protection. Eye protection includes goggles or a protective face shield.

The maximum air pressure for cleaning purposes must be reduced to 205 kPa (30 psi) when the air nozzle is deadheaded and used with effective chip guarding (if applicable) and personal protective equipment. The maximum water pressure for cleaning purposes must be below 275 kPa (40 psi). Always wear eye protection for cleaning the cooling system.

Do not touch any part of an operating engine. Allow the engine to cool before any maintenance is performed on the engine. Relieve all pressure in the air system, in the hydraulic system, in the lubrication system, in the fuel system, or in the cooling system before any lines, fittings or related items are disconnected.

2.3.2 Containing Fluid Spillage

Care must be taken to ensure that fluids are contained during inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

NOTE：

- If fluid containment is incorporated into the baseframe it must be inspected at regular intervals. Any liquids present (fuel, oil, coolant, rainwater or condensation) should be drained out and disposed of in accordance with local regulations and mandates.

2.3.3 Lines, Tubes and Hoses

Do not bend or strike lines. Do not install lines, tubes, or hoses that are damaged.

Inspect all lines, tubes, and hoses carefully. Do not use bare hands to check for leaks. Organise with your local Dealer repair of any fuel lines, oil lines, tubes, or hoses that are loose or damaged.

Check for the following conditions:

- End fittings that are damaged or leaking
- Outer covering that is chafed or cut
- Wire that is exposed in reinforced hose
- Outer covering that is ballooning
- Flexible part of the hose that is kinked or crushed
- Armoring that is embedded in the outer covering

Ensure that all of the clamps, the guards and the heat shields are installed correctly. Correct installation of these components will help to prevent these effects: vibration, rubbing against other parts and excessive heat during operation.

2.3.4 Disposal of Waste

Improper disposal of waste can threaten the environment. Potentially harmful fluids should be disposed of according to local regulations. Always use leakproof containers when you drain fluids.

Do not pour waste onto the ground, down a drain, or into any source of water.

2.4 Fire and Explosion

All fuels, most lubricants, and some coolant mixtures are flammable. Flammable fluids that are leaking or spilled onto hot surfaces or onto electrical components can cause a fire. Fire may cause personal injury and property damage.

Determine whether the engine will be operated in an environment that allows combustible gases to be drawn into the air inlet system. These gases could cause the engine to overspeed. Personal injury, property damage, or engine damage could result. If the application involves the presence of combustible gases, consult your local Dealer for additional information about suitable protection devices.

Do not allow any flammable materials to accumulate on the engine. Store fuels and lubricants in properly marked containers away from unauthorized persons. Store oily rags and any flammable materials in protective containers. Do not smoke in areas that are used for storing flammable materials.

Wiring must be kept in good condition, all electrical wires must be properly routed and securely attached. Check all electrical wires daily, seek appropraite maintenance from your local Dealer for any wires that are loose or frayed, before you operate the engine.

Arcing or sparking could cause a fire. Secure connections, recommended wiring and properly maintained battery cables will help to prevent arcing or sparking.

Never check the battery charge by placing a metal object across the terminal posts. Use a voltmeter or a hydrometer.

The batteries must be kept clean, the covers (if equipped) must be kept on the cells. Use the recommended cables, connections, and battery box covers (where fitted) when the generator set is operated.

Warning:

- ⚠ **Do not charge a frozen battery, this may cause an explosion.**
- ⚠ **Ensure the generator set room is properly ventilated.**
- ⚠ **Keep the room, the floor and the generator set clean. When spills of fuel, oil, battery electrolyte or coolant occur, they should be cleaned up immediately.**
- ⚠ **Never store flammable liquids near the engine.**
- ⚠ **Store oily rags in covered metal containers.**
- ⚠ **Do not smoke or allow sparks, flames or other sources of ignition around fuel or batteries. Fuel vapours are explosive. Hydrogen gas generated by charging batteries is also explosive.**
- ⚠ **Avoid refilling the fuel tank while the engine is running.**
- ⚠ **Do not attempt to operate the generator set with any known leaks in the fuel system.**
- ⚠ **Do not use aerosol types of starting aids such as ether. Using these types of items could result in an explosion and personal injury.**

2.4.1 Fire Extinguisher

Fuels and fumes associated with generator sets can be flammable and potentially explosive. Proper care in handling these materials can dramatically limit the risk of fire or explosion. However, safety dictates that fully charged BC and ABC fire extinguishers are kept on hand. Personnel must be familiar with the operation of the fire extinguisher. Inspect the fire extinguisher and service the fire extinguisher regularly. Obey the recommendations on the instruction plate.

2.5 Exhaust Gases

Always start and operate the engine in a well-ventilated area. If the engine is in an enclosed area, vent the engine exhaust to the outside.

Warning:

- ⚠ **Engine exhaust contains products of combustion which may be harmful to your health.**

2.6 Mechanical

The generator set is designed with guards for protection from moving parts. Care must still be taken to protect personnel and equipment from other mechanical hazards when working around the generator set.

Warning:

⚠ **Do not attempt to operate the generator set with safety guards removed. While the generator set is running do not attempt to reach under or around the guards for any reason.**

⚠ **Keep hands, arms, long hair, loose clothing and jewellery away from pulleys, belts and other moving parts. Some moving parts can not be seen clearly when the set is running.**

⚠ **Keep access doors on enclosures, if equipped, closed and locked when not required to be open.**

⚠ **Avoid contact with hot oil, hot coolant, hot exhaust gases, hot surfaces, sharp edges and corners.**

⚠ **Wear protective clothing including gloves and hat when working around the generator set.**

2.7 Chemical

Fuels, oils, coolants, lubricants and battery electrolyte used in this generator set are typical of the industry. However, they can be hazardous to personnel if not treated properly. The disposal of fuels, oils, coolants, lubricants, battery electrolyte and batteries should be carried out in accordance with local government laws and regulations.

2.7.1 Coolant

When the engine is at operating temperature, the engine coolant is hot. The coolant is also under pressure. The radiator and all hoses to the heaters or to the engine contain hot coolant. Any contact with hot coolant or with steam can cause severe burns. Allow cooling system components to cool before the cooling system is drained. Cooling system conditioner contains alkali. Alkali can cause personal injury. Do not allow alkali to contact the skin, the eyes, or the mouth.

2.7.2 Oils

Hot oil and hot lubricating components can cause personal injury. Do not allow hot oil to contact the skin. Also, do not allow hot components to contact the skin.

2.7.3 Batteries

Electrolyte is an acid. Electrolyte can cause personal injury. Do not allow electrolyte to contact the skin or the eyes. Always wear protective glasses for servicing batteries. Wash hands after touching the batteries and connectors. Use of gloves is recommended.

Warning:

⚠ **Do not swallow or have skin contact with fuel, oil, coolant, lubricants or battery electrolyte. If swallowed, seek medical treatment immediately. Do not induce vomiting if fuel is swallowed. For skin contact, wash with soap and water.**

⚠ **Do not wear clothing that has been contaminated by fuel or lube oil.**

⚠ **It is recomended to check the electrolyte level in accessible batteries every 500 hours.**

2.8 Noise

Sound levels will vary depending on the configuration of the generator set and the final installation of the generator set. Refer to the following for factors that influence the level of exposure:

- The characteristics of the area around the generator set.
- Gaps below generator set base and installation surface or plinth.
- Other sources of noise.
- The number of machines and other adjacent processes.
- The length of time of exposure to the noise.

This information will enable the user of the machine to evaluate the hazard and the risk.

Warning:

⚠ **Prolonged exposure to noise levels above 80 dBA is hazardous to hearing.**

⚠ **Ear protection must be worn when operating or working around an operating generator set.**

2.9 Electrical

Warning:

⚠ **Before the generator set is operated please consult your local dealer to establish whether an NEL has been fitted.As more than one NEL per site may be unsafe, it is important to establish whether one has already been installed on site.**

2.9.1 Neutral-Earth Link (NEL)

Depending on the specific product installation, a Neutral-Earth Link may be required on your generator set. Your local dealer or qualified electrical personnel should be consulted to confirm specific earthing requirements for the generator set installation, and to ensure that local wiring regulations are met.

Safe and efficient operation of electrical equipment can be achieved only if the equipment is correctly operated and maintained.

Warning:

⚠ **Ensure the generator set, including a mobile set, is effectively grounded/earthed prior to operation.**

⚠ **Do not touch electrically energised parts of the generator set and/or interconnecting cables or conductors with any part of the body or with any non insulated conductive object.**

⚠ **Use only Class BC or Class ABC extinguishers on electrical fires.**

⚠ **For generator sets with external socket outlets only – Residual Current Device (RCD) protection on socket outlets, where fitted, is designed to operate within a TN earthing system. Ensure local wiring regulations are met prior to generator set operation and that all equipment connected via the generator set sockets, including plugs and electrical cables, are of the correct specification and are known to be in a safe and undamaged condition.**

2.9.2 Generator Isolating

When you service or repair an electric power generation set, follow the procedure below:

1. Stop the engine.
2. Isolate the battery with the battery isolator provided. Attach a "DO NOT OPERATE" or similar warning tag to the enprime mover starting circuit. Disconnect the engine starting circuit.
3. Disconnect the generator from the distribution system.
4. Lock out the circuit breaker. Attach a "DO NOT OPERATE" or similar warning tag to the circuit breaker. Refer electricaldiagram. Verify that all points of possible reverse power flow have been locked out.
5. For the following circuitry, open miniature circuit breakers: power / sensing / control
6. Attach a "DO NOT OPERATE" or similar warning tag to the generator excitation controls.
7. Remove the cover of the generator's terminal box.
8. Use an audio/visual proximity tester to verify that the generator is de-energized. This tester must be insulated for the proper voltage rating. Follow all guidelines to verify that the tester is operational.
9. Determine that the generator is in a de-energized condition. Add ground straps to the conductors or terminals. During the entire work period, these ground straps must remain connected to the conductors and to the terminals.

2.10 First Aid For Electric Shock

Warning:

⚠ **Do not touch the victim's skin with bare hands until the source of electricity has been turned off.**

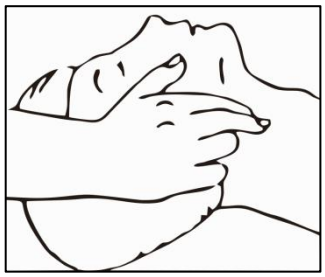
⚠ **Switch off the power, if possible.**

⚠ **Otherwise pull the plug or pull the cable away from the victim.**

⚠ **If this is not possible, stand on dry insulating material and pull the victim clear of the conductor, preferably using insulated material such as dry wood.**

⚠ **If victim is breathing, turn the victim into the recovery position.**

⚠ **If victim is unconscious, perform resuscitation as required:**



OPEN THE AIRWAY:

1. Tilt the victim's head back and lift the chin upwards.
2. Remove objects from the mouth or throat (including false teeth, tobacco or chewing gum).

BREATHING:

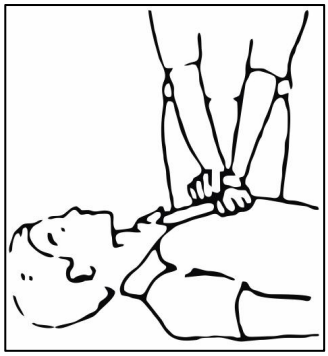
1. Check that the victim is breathing by looking, listening and feeling for the breath.

CIRCULATION:

1. Check for pulse in the victim's neck or wrist.

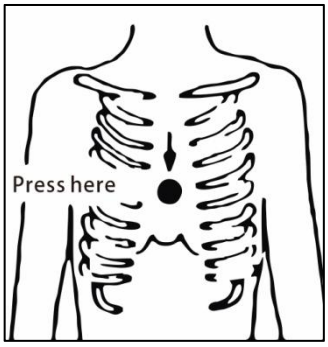
IF NO BREATHING BUT PULSE IS PRESENT:

1. Pinch the victim's nose firmly.
2. Take a deep breath and seal your lips around the victim's lips.
3. Blow slowly into the mouth watching for the chest to rise. Let the chest fall completely.
Give breaths at a rate of 10 per minute.
4. If the victim must be left to get help, give 10 breaths first and then return quickly and continue.
5. Check for pulse after every 10 breaths.
6. When breathing restarts, place the victim into the recovery position described later in this section.



IF NO BREATHING AND NO PULSE:

1. Call or telephone for medical help.
2. Give two breaths and start chest compression as follows:
3. Place heel of hand 2 fingers breadth above ribcage/breastbone junction.
4. Place other hand on top and interlock fingers.
5. Keeping arms straight, press down 4–5 cm (1.5–2 inch) 30 times at a rate of 100 per minute.
There should be equal timing between chest compression and release.
6. Repeat cycle (2 breaths, 30 compressions) until medical help takes over.
7. If condition improves, confirm pulse and continue with breaths. Check for pulse after every 10 breaths.
8. When breathing restarts, place the victim into the recovery position.



Warning:

⚠ **Do not apply pressure over the ribs, lower tip of the victim's breastbone or the abdomen.**

RECOVERY POSITION:

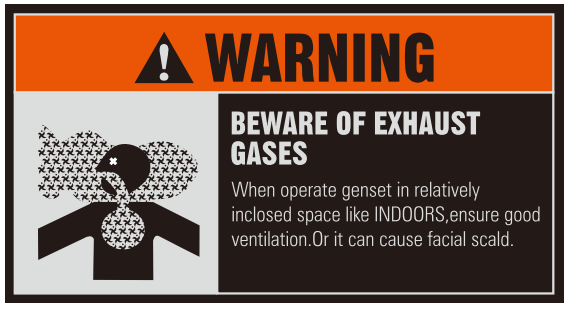
1. Turn the victim onto the side.
2. Keep the head tilted with the jaw forward to maintain the open airway.
3. Make sure the victim cannot roll forwards or backwards.
4. Check for breathing and pulse regularly. If either stops, proceed as above.

Warning:

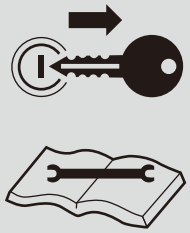
⚠ **Do not give liquids until victim is conscious.**

2.11 Hazard Label Legend

Ensure that all of the safety messages are legible. Clean the safety messages or replace them if the words cannot be read or if the illustrations are not visible. Use a cloth, water and soap to clean the safety messages. Do not use solvents, gasoline, or other harsh chemicals as these could loosen the adhesive that secures the safety messages. Safety messages that are loosened could drop off the engine. Replace any safety message that is damaged or missing. If a safety message is attached to a part of the engine that is replaced, install a new safety message on the replacement part. Your local Dealer can provide new safety messages.



WARNING Safety instructions



IMPROPER OPERATION CAN CAUSE SEVERE IN JURY OR DEATH

- Read the instruction manual carefully before operating or servicing.
- This machine should only be operated by a person with sufficient knowledge and skills.
- High voltage circuits are located inside the output terminal cover and control panel.Close the cover and control panel before operating.
- Moving parts and hot surfaces are contained within the enclosure.Close all doors and lock them before operating.
- Before inspection,the start key and cathode of battery have to be removed. Without this step ,it may cause serious injury

WARNING Safety instructions

LOCK DOORS

Access can cause electric shock, arc flash, or injury.

L017

WARNING

FIRE

- Make sure to stop engine and keep fires away from fuel when refueling.
- Never place flammable material near the machine

DIESEL FUEL (ASTM No.2-D)

DANGER DO NOT PANEL WHILE UNIT IS RUNNING **HIGH VOLTAGE**

WARNING ELECTRIC SHOCK AND ARC FLASH CAN CAUSE SERIOUS INJURY OR DEATH

SAFETY INSTRUCTIONS

- Read and understand the supplied Operator's Manual before operating the machine. Failure to do so increases the risk of injury to yourself or others.
- Always complete the grounding path from the ground terminal on this genset to an extenal grounding source
- An solation(transfer)switch must be installed before connecting this generator to any buildings
- Dot not touch running electrical pats. Wearing dry insulating gloves when operating. Don't operate the unit under wet surrounding.Maintain electrical parts in proper condtiton.

3. GENERAL DESCRIPTION

This generator set has been designed as a complete package to provide superior performance and reliability.

Each generator set is provided with a Rating Plate generally affixed to the alternator housing / panel enclosure. This label contains the information needed to identify the generator set and its operating characteristics. This information includes, but is not limited to, the model and serial numbers, output characteristics such as voltage, phase and frequency, output rating in kVA and kW and rating type (basis of the rating). The model and serial numbers uniquely identify the generator set.

The diesel engine powering the generator set has been chosen for its reliability and the fact that it has been specifically designed for powering generator sets. The engine is of the heavy duty industrial type with 4 stroke compression ignition and is fitted with all accessories to provide a reliable power supply.

The engine electrical system is either 12 or 24 volts DC depending on the size of the set.

The engine cooling system comprises of a radiator, a high capacity pusher fan and a thermostat. The main AC alternator has its own internal fan to cool the alternator components.

The output electrical power is produced by an alternator fine tuned to the output of this generator set.

The engine and alternator are coupled together and mounted on a heavy duty steel base frame. The base frame standard incorporates an integrated fuel tank, big capacity units approximately 1600kva can customize external fuel tank

The generator set is fitted with vibration isolators which are designed to reduce engine vibration being transmitted to the foundation on which the generator set is mounted. These isolators are fitted between the engine/alternator feet and the base frame.

An exhaust silencer is provided loose for installation with the generator sets. The silencer and exhaust system reduce the noise emission from the engine and can direct exhaust gases to safe outlets.

One of several types of control systems and panels is fitted to control the operation and output of the generator set and to protect the set from possible malfunctions. Section 5 of this manual provides detailed information on these systems and will aid in identification of the control system fitted on the generator set.

To protect the alternator, a suitably rated circuit breaker selected for the generator set model and output rating is supplied mounted in a steel enclosure.

3.1 Typical Rating Plate

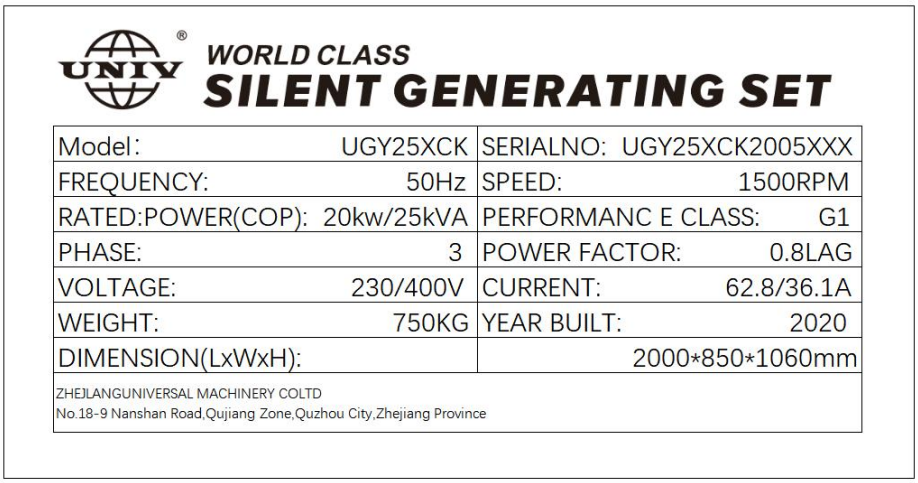


Figure 3.1 Rating Plate

3.2 Generator set Description

1.Radiator
2.Exhaust
3.Alternator
4.Control Panel
5.Output Board
6.Base frame
7.Battery switch
8.Battery
9.Engine

3.3 Power Factor

Power factor (PF) is the ratio of real power to apparent power. The real power is also known as the active power, or kW. The apparent power is also called kVA. Real power (kW) is the mechanical power output of the engine converted to electrical energy, consumed by the load. The apparent power (kVA) is the total power that is produced by the generator. Power factor can be calculated by using the following formula:

- PF = kW / kVA,
- kW – kilowatts (real power)
- kVA – Kilo-Volt-Ampere (apparent power)
- kVAR – kilo-Volt-Ampere (reactive power)

Note:

The generator does NOT control power factor. Power factor is determined by the load.

In most applications, loads such as electric motors, solid-state controls, and transformers determine the power factor of the system. Induction motors usually have a power factor that is no larger than 0.8. Incandescent lighting is a resistive load of about 1.0 power factor, or unity. Solid-state controls, variable frequency drives (VFD), variable speed drives (VSD), and control systems Uninterruptible Power Supplies (UPS) can operate at any power factor, leading, or lagging. In this case, the power factor can be between 0.4 and 1.0.

The power factor of a system may be determined by a measurement or by calculation and is displayed on the control panel.

4. INSTALLATION, HANDLING AND STORAGE

4.1 General

This section discusses factors important in the effective and safe installation of the generator set.

Selecting a location for the generator set can be the most important part of any installation procedure. The following factors are important in determining the location:

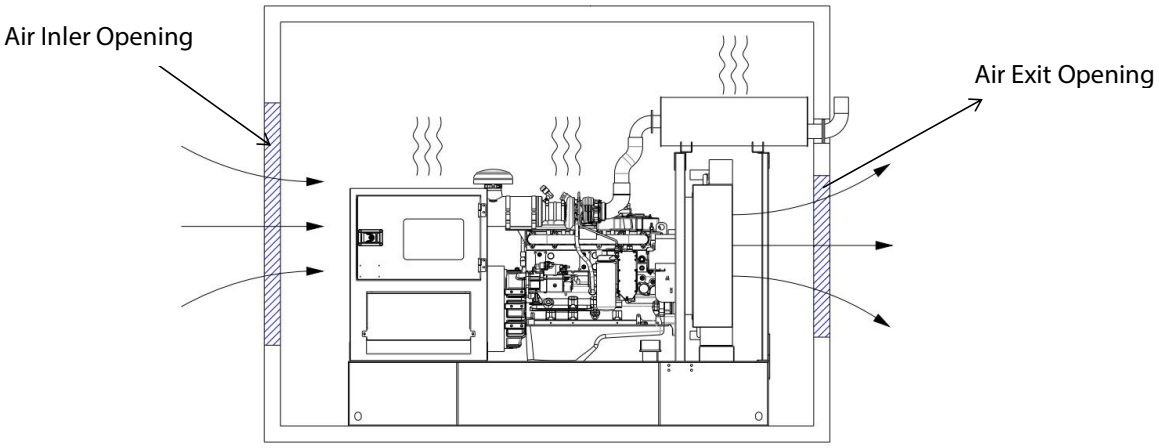


Figure 4.1 Typical installation showing generator set ventilation

- Protection from the elements such as rain, snow, sleet, wind driven precipitation, flood water, direct sunlight, freezing temperatures or excessive heat.
- Protection from exposure to airborne contaminants such as abrasive or conductive dust, lint, smoke, oil mist, vapours, engine exhaust fumes or other contaminants.
- Protection from impact from falling objects such as trees or poles, or from motor vehicles or lift trucks.
- Clearance around the generator set for cooling and access for service: at least 1 metre (3ft 3in) around the set and at least 2 metres (6ft 6in) headroom above the set.
- Access to move the entire generator set into the room. Air inlet and outlet vents can often be made removable to provide an access point.
- Limited access to unauthorised personnel.

If it is necessary to locate the generator set outside of the building, the generator set should be enclosed in a weatherproof canopy or container-type housing which is available for all sets.

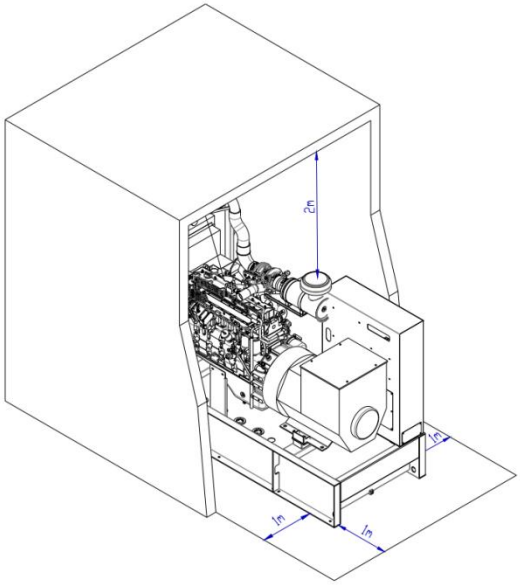


Figure 4.2 Typical installation showing generator set access

4.2 Outdoor Installation

Installation and handling is greatly simplified when the generator set has been equipped with an enclosure. Two basic types may be fitted. The first type is a close fitting canopy enclosure. This will be both weatherproof and sound attenuated. The other enclosure type is a walk-in type container, similar to a shipping container. It may be weatherproof or sound attenuated.

These enclosures provide a self contained generator set system that is easily transportable and requires minimal installation. They also automatically give protection from the elements and protection from unauthorised access.

Warning:

⚠ **Make sure all personnel are out of the canopy or container, if equipped, before closing and latching enclosure doors.**

⚠ **Enclosures fitted with doors stays or lift off doors (when Applicable) should not be used when wind exceeds 15 mph.**

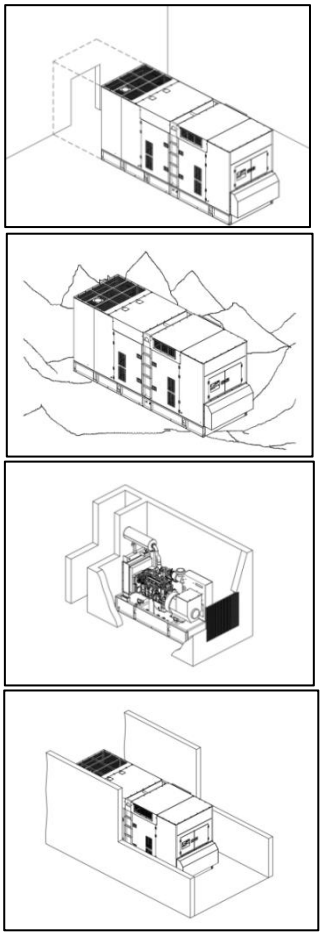
⚠ **Before closing canopy or enclosure doors, ensure all obstructions (especially hands and fingers) are clear to prevent damage or injury.**

⚠ **For transport purposes, some silencer outlets on generator sets housed in walk-in type enclosures will be fitted with cover plates. These are to be replaced with the supplied stub pipes complete with fitted rain hood.**

⚠ **Ensure there is no debris on the base frame prior to starting, as loose items will cause radiator damage.**

Because enclosed generator sets are easily transportable and may be installed and operated in a temporary location, many of the fixed installation details given in this chapter may not apply. The following considerations must be taken into account when temporarily installing the generator set:

- Locating the generator set where it will be protected from damage and away from the exhaust fumes of other engines or other airborne contaminants such as dust, lint, smoke, oil mist or vapours. Sound levels will vary depending on the configuration of the generator set and the final bolted down installation of the generator set on a flat surface.
- Ensure the generator set is not positioned in such a way that it will obstruct the entrance or exit to the area where the it is situated.
- Locating the generator set on firm, level ground which will not subside or be otherwise affected by the vibration caused by the operation of the generator set.
- Ensuring that fumes from the exhaust outlet will not be a hazard especially when wind is taken into account.
- Ensure there is enough area around the generator set for access and serviceability.
- Electrical grounding of the generator set at all times, in accordance with local regulations.
- Providing access to refill the fuel tank when required.
- Protecting electrical cables installed between the generator set and the load. If these are laid on the ground ensure they are boxed in or covered to prevent damage or injury to personnel.



WARNING:

⚠ **Enclosed generator sets should be installed outside. In the event that the enclosed generator set is installed inside, adequate fresh cooling air must be provided and that both engine and hot coolant air exhausts must be ducted outside the building. The ducting and exhaust pipework must be designed to minimise back pressure which would have a detrimental effect on generator set performance.**

4.2.1 Positioning of Walk-in Containers

Proper installation of the container is required if successful generation of power is to be achieved. The following information must be considered in the selection of the operating site for the container. The containerised generator set must be placed on a flat surface in order to maintain proper alignment. Containers can be successfully installed on a concrete plinth or level, natural surface. The foundation must bear the static weight of the module plus any dynamic forces from engine operation.

Warning:

⚠ **For generator sets housed in walk-in type containers, crankcase breather outlets terminated at the external face of the enclosure will be plugged. These must be removed prior to operation.**

4.2.2 Concrete Plinth

Setting the container on a concrete plinth is the preferred method for permanent installation for both ISO and Design to Order (DTO) containers. The concrete plinth should have been designed to withstand the weight of the container. Please consult the installer for further details.

4.2.3 Installation Location

The generator set must be parked on a flat surface such as a concrete pad or a level natural surface. Prepare the foundation for the operation of the generator set. The foundation must be able to bear the weight of the generator set and any forces from engine operation.

Railroad ties or wood beams beneath the base frame of the generator set, the landing gear, and the jack stands should be considered for the following conditions: loose soil, loose gravel, loose sand, and wet conditions. This procedure will prevent the generator set from settling into the soft surface due to the weight of the generator set. A concrete pad should be considered if the generator set will be operated at a site for a long time.

4.2.4 Exhaust Discharge

Heat from the engine will be expelled via the engine exhaust, other heat is removed from the cooling system as a cooling fan forces air through a radiator core. Both of these exhaust streams will leave the generator set and enter the surrounding atmosphere. When you choose a site, consider the hot exhaust that exits the generator set.

Position the generator set so there is no trees and plants in the path of the hot exhaust as any excessive heat may destroy them. The generator set should not be parked close to a building. The excessive heat may make building interiors uncomfortable. Do not place the air intake of a generator set in the location of the exhaust of another generator set.

Be aware of overhead power lines ensure that any power lines are not exposed to hot exhaust. Overhead power lines may also become coated with soot. An electric arc may develop between the exhaust soot and the ground if exhaust soot is allowed to build up on power lines.

4.3 Moving the Generator set

Prior to any movement or installation of the generator set please review the following steps

⚠ **Keep all non-essential personnel clear of the area.**

⚠ **Load the package and unload the package on a level surface.**

⚠ **Block the transport vehicle so the vehicle cannot move.**

⚠ **Keep both the trailer bed and the ramps for the trailer clean. Remove any clay, oil, or other slippery materials.**

⚠ **If ramps are used, ensure that the ramps are of adequate size and strength. The ramps should be installed at the**
⚠ **proper height and the angle of the ramps should be low.**

⚠ **Use the lifting eye of the enclosure. Ensure that all the lifting devices have adequate capacity.**

⚠ **Chain the package or block the package securely before you transport the package.**

⚠ **Check the height and width of the package for clearance for traveling. Check the weight of the package for load limitations.**

The generator set base frame is specifically designed for ease of moving the set. Improper handling can seriously damage components.

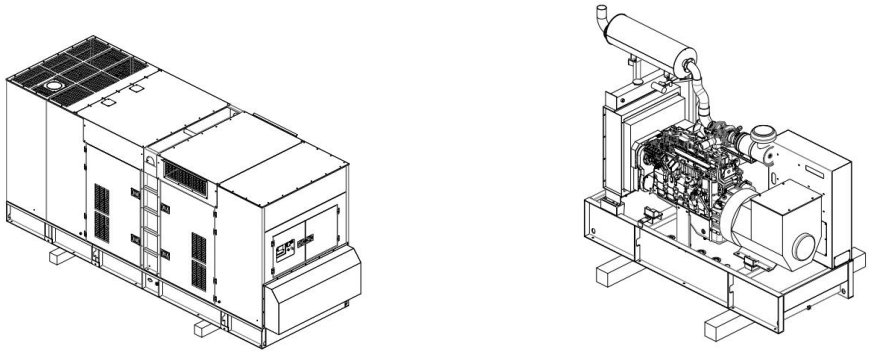


Figure 4.3 - Open and Closed generator sets on wooden skids

Using a forklift, the generator set can be lifted or carefully pushed/pulled by the base frame. If pushing, do not push the base frame directly with fork.

Warning:

⚠ **Always use wood between forks and the base frame to spread the load and also between the forklift carriage and the side of the canopy to prevent damage.**

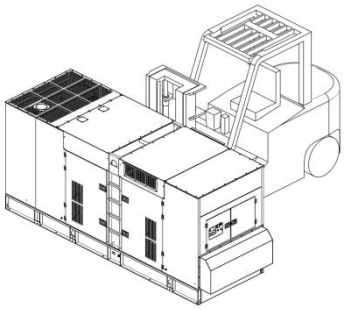


Figure 4.4 Transporting a generator set using a forklift

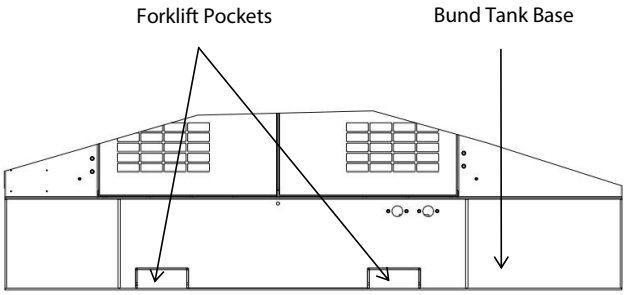


Figure 4.5 Typical generator set with Bund Tank Base option

If the generator set will be regularly moved, it should be fitted with the optional Bund Tank Base which provides forklift pockets in the base frame along with eyes for pulling. The smaller sets have forklift pockets in the base frame as standard.

Warning:

⚠ **Please ensure the fuel tank is empty when lifting the generator set to ensure safe and stable lifting.**

⚠ **Never lift the generator set by attaching to the engine or alternator lifting lugs.**

⚠ **Ensure the lifting rigging and supporting structure is in good condition and is suitably rated.**

⚠ **Keep all personnel away from the generator set when it is suspended.**

To lift and install the generator set you can use the single point lifting points or the lifting points provided on the base frame. Points of attachment should be checked for cracked welds or loose nuts and bolts before lifting. A spreader bar is required to prevent damage to the generator set whilst lifting from the base frame. It should be positioned over the centre of gravity, to allow a vertical lift. Generator sets fitted with QUAD point `lift frame`, the lifting eyes are positioned either side of the base to allow easy access. The lifting points are positioned as close to the center of gravity of the generator set as is possible. Guide ropes should be used to prevent twisting or swinging of the generator set once it has been lifted clear of the ground. Place the generator set down on a level surface capable of supporting its weight.

⚠ **Lifting eyes not intended for use shall be shielded with the appropriate lifting eye shield. Each shield shall display a "NO LIFTING" label. Refer to section 2.11**

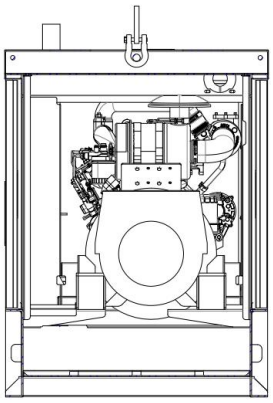


Figure 4.6 Single Point lift

Warning:

⚠ **Please ensure the fuel tank is empty when lifting the generator set to ensure safe and stable lifting.**

⚠ **Centre of gravity decal is located on the base / canopy of the generator set.**

⚠ **The centre of gravity may not always be located at the centre of the generator set. The center of gravity will change depending on package options and also volume of liquid on board . The center of gravity shifting may cause lift angle to vary between +5° and – 5 ° from horizontal. Ensure that generator set is not lifted if the angle of lift is outside these values.**

⚠ **Do not attempt to lift in high winds.**

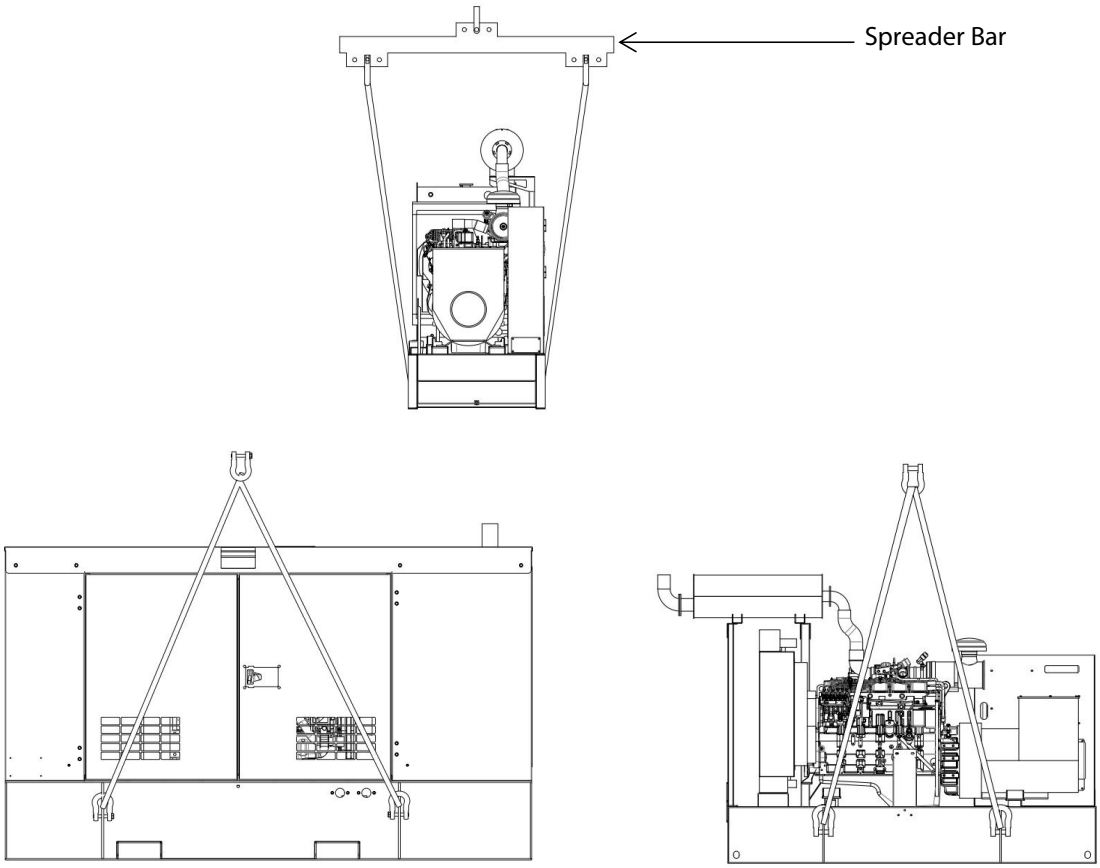


Figure 4.7 Proper lifting arrangement for installing the generator set (open & enclosed)

4.4 Foundations and Vibration Isolation

The generator set is supplied on a rigid base frame that precisely aligns the alternator and engine and needs only be bolted down to a suitably prepared surface.

Typical installation highlighting vibration reduction techniques

4.4.1 Foundation

A reinforced concrete pad makes the best foundation for the generator set. It provides a rigid support to prevent deflection and vibration. Typically the foundation should be from 150 mm to 200 mm (6 to 8 inches) deep and at least 150 mm (6 inches) wider and longer than the generator set. The ground or floor below the foundation should be properly prepared and should be structurally suited to carry the combined weight of the foundation pad and the generator set. (If the generator set is to be

installed above the ground floor the building structure must be able to support the weight of the generator set, fuel storage and accessories.) Relevant building codes should be consulted and complied with. If the floor is wet from time to time, such as in

a boiler room, the pad should be raised above the floor. This will provide a dry footing for the generator set and for those who connect, service or operate it. It will also minimise corrosive action on the base frame.

4.4.2 Vibration Isolation

To minimise engine vibrations being transmitted to the building, the generator set is fitted with vibration isolators. On small and medium sized generator sets these isolators are fitted between the engine/alternator feet and the base frame. This allows the frame to be rigidly bolted to the foundation. On larger generator sets the coupled engine/alternator is rigidly attached to the base frame and the vibration isolators are supplied loose for fitting between the base frame and the foundation. In all cases the sets should be securely bolted to the ground (either through the base frame or through the vibration isolators) to prevent movement.

Vibration isolation is also required between the generator set and its external connections. This is achieved by the use of flexible connections in the fuel lines, exhaust system, radiator air discharge duct, electrical conduit for control and power cables and other externally connected support systems.

4.5 Storage

Long term storage can have detrimental effects on both the engine and alternator. These effects can be minimised by properly preparing and storing the generator set.

4.5.1 Engine Storage

The engine should be put through an engine “preservation” procedure that includes cleaning the engine and replacing all the fluids with new or preserving fluids. Please consult your local Dealer for more information on engine storage.

4.5.2 Alternator Storage

When an alternator is in storage, moisture tends to condense in the windings. To minimise condensation, store the generator set in a dry storage area. If possible use space heaters to keep the windings dry.

Please consult your local Dealer for more information on alternator storage.

4.5.3 Battery Storage

While the battery is stored, it should receive a refreshing charge every 12 weeks (8 weeks in a tropical climate) up to a fully charged condition.

5.CONTROL SYSTEM DESCRIPTION AND TROUBLE SHOOTING

5.1 Control System Description

An electronic control system has been designed and installed to control and monitor the generator set. Depending on the requirements of the generator set, one of several different standard control systems may be fitted. Other more specialised systems may be fitted for specific installations in which case separate documentation is provided.

These control systems consist of three major components working together:

Control Panel – provides a means of starting and stopping the generator set, monitoring its operation and output and automatically shutting down the generator set in the event of a critical condition arising such as low oil pressure or high engine coolant temperature to prevent major damage to the engine / alternator.

Engine Interface Module (where fitted) - provides switching relays for the Starter Motor Solenoid, Glow Plug and Fuel Solenoid. Each of these circuits is protected with individual fuses mounted in the module. Individual LED's illuminate when each circuit is energised.

Power Output Circuit Breaker - serves to protect the alternator by automatically disconnecting the load in the event of overload or short circuit. It also provides a means of switching the generator set output.

5.1.1 Pre-Start Checks (applicable to all control systems)

Warning:

⚠ **The following checks detailed below are the only tasks that an operator should undertake.**

The following checks should be performed prior to starting the generator set:

1. A visual inspection should take only a few minutes and can prevent costly repairs and accidents – For maximum generator set life, visually inspect the generator set before starting. Look for items such as:
   - Loose fastenings / fixings, worn belts or loose connections. Repair as necessary.
   - The fan and exhaust guards must be at the correct positions and securely fixed. Repair damaged / loose guards or renew missing guards.
   - Wipe clean all filler caps before the engine is serviced or fluids are topped up to reduce the chance of any system contamination.
   - For any type of leak (coolant, lubricating oil or fuel), clean away the fluid. If a leak is observed, find the source and correct the leak. If a leak is suspected, check the fluid levels frequently until the leak is found and repaired.
   - Accumulated grease and / or oil on an engine is a fire hazard. Remove it by steam cleaning or by the use of a high pressure water jet. Avoid high-pressure water on the electronic/electrical components provide suitable protection were possible.
   - Ensure that the coolant pipes are fitted correctly and that they are secure. Check for leaks. Check the condition of all pipes for splits or signs of rubbing.

Fluid levels

2. Check the engine oil and coolant levels – replenish as necessary (see engine handbook for locations). Ensure fluids used are as recommended within the engine handbook.

Warning:

⚠ **Do not remove the radiator cap or any component of the cooling system while the engine is running and while the coolant is under pressure, because dangerous hot coolant can be discharged, posing a risk of personal injury. Do not add large amounts of cold coolant to a hot system as serious engine damage could result.**

Note:

⚠ **Diesel engines normally consume lube oil at a rate of 0.25% to 1% of the fuel consumption.**

⚠ **When adding coolant to the radiator system, always pour slowly to help prevent air from becoming trapped in the engine. Always top up when engine is cold.**

Warning:

⚠ **When filling the fuel tank, do not smoke or use an open flame in the vicinity.**

3. Check the fuel level – fill as necessary. Drain water from the water separator (if equipped)

Warning:

⚠ **Before tightening the fan belts, disconnect the battery negative (–) lead to ensure the engine cannot be accidentally started.**

4. Check the condition and tension of the fan and engine alternator belts – tighten as necessary.
5. Check all hoses for loose connections or deterioration – tighten or replace as necessary.
6. Check the battery terminals for corrosion – clean as necessary.

Warning:

⚠ **When working with the batteries, do not smoke or use an open flame in the vicinity. Hydrogen gas from batteries is explosive.**

⚠ **Do not short the positive and negative terminals together.**

7. Check the battery electrolyte level – fill with distilled water as necessary.
8. Check the control panel and the generator set for heavy accumulation of dust and dirt – clean as necessary. These can pose an electrical hazard or give rise to cooling problems.
9. Check the air filter restriction indicator, if fitted – replace the filter as necessary.
10. Clear the area around the generator set of any insecure items that could inhibit operation or cause injury. Ensure cooling air ventilation screens are clear.
11. Visually check the entire generator set for signs of leaks from the fuel system, cooling system or lubrication seals.
12. Periodically drain exhaust system condensate traps, if equipped.
13. If fluid containment is incorporated into the baseframe it must be inspected. Any liquids present (fuel, oil, coolant,rainwater or condensation) should be drained out and disposed of in accordance with local regulations and mandates.
14. Ensure the Alternator Output Circuit Breaker is in the “OFF” (handle down) position.

5.2 SmartGen

5.2.1 keys dscription

Figure5.1 - Operator interface of HGM6110-4G

Picture	Function	Description
	Stop/Reset	Can stop genset under Manual/Auto mode; Can reset shutdown alarm; Press this key at least 3 seconds to test panel indicators are OK or not (lamp test); During shutdown process, press this key again and can stop genset immediately.
	Start	Start genset under Manual mode, during starting process, press this key can transfer to next status.
	Manual	Pressing this key will set the module as Manual mode.
	Auto	Pressing this key will set the module as Auto mode.
	Gens Close/Open	Can control gens to switch on or off in Manual mode. Note: the key is fit for HGM6120N-4G series controllers.
	Close	Can control gens to switch on in Manual mode. Note: the key is fit for HGM6110N-4G series controllers.
	Open	Can control gens to switch off in Manual mode. Note: the key is fit for HGM6110N-4G series controllers.
	Set/Confirm	Press this key to enter menu interface; Shift cursor to confirm in parameters setting menu.
	Up/Increase	Screen scroll; Up cursor and increase value in setting menu.
	Down/Decrease	Scroll screen; Down cursor and decrease value in setting menu.
	Home/Return	Return to homepage when in main interface; Exit when in parameters setting interface.

5.2.2 Fault Finding

Symptoms	Possible Solutions
Controller Inoperative	Check starting battery; Check connections of controller; Check the DC fuse.
Genset Stops	Check if water/cylinder temperature too high; Check alternator voltage; Check the DC fuse.
Emergency Stop	Check if an emergency stop key function is correct; Ensure battery positive is connected to the emergency stop input; Check if connection is open circuit.
Low Oil Pressure Alarm (After Crank Disconnect)	Check oil pressure sensor and connections.
High Water Temp. Alarm (After Crank Disconnect)	Check water temperature sensor and connections.
Shutdown Alarm During Running	Check switch and connections according to information on LCD; Check configurable inputs.
Crank Disconnect Failed	Check connections of fuel solenoid; Check starting battery; Check speed sensor and its connections. Refer to engine manual.
Starter Inoperative	Check connections of starter; Check starting battery.
Genset Running While ATS Not Transfer	Check ATS; Check connections between ATS and controller.
RS485 Failure	Check connections; Check if COM port is correct; Check if A and B of RS485 is connected reversely;

5.3 DSECONTROL

5.3.1 keys dscription

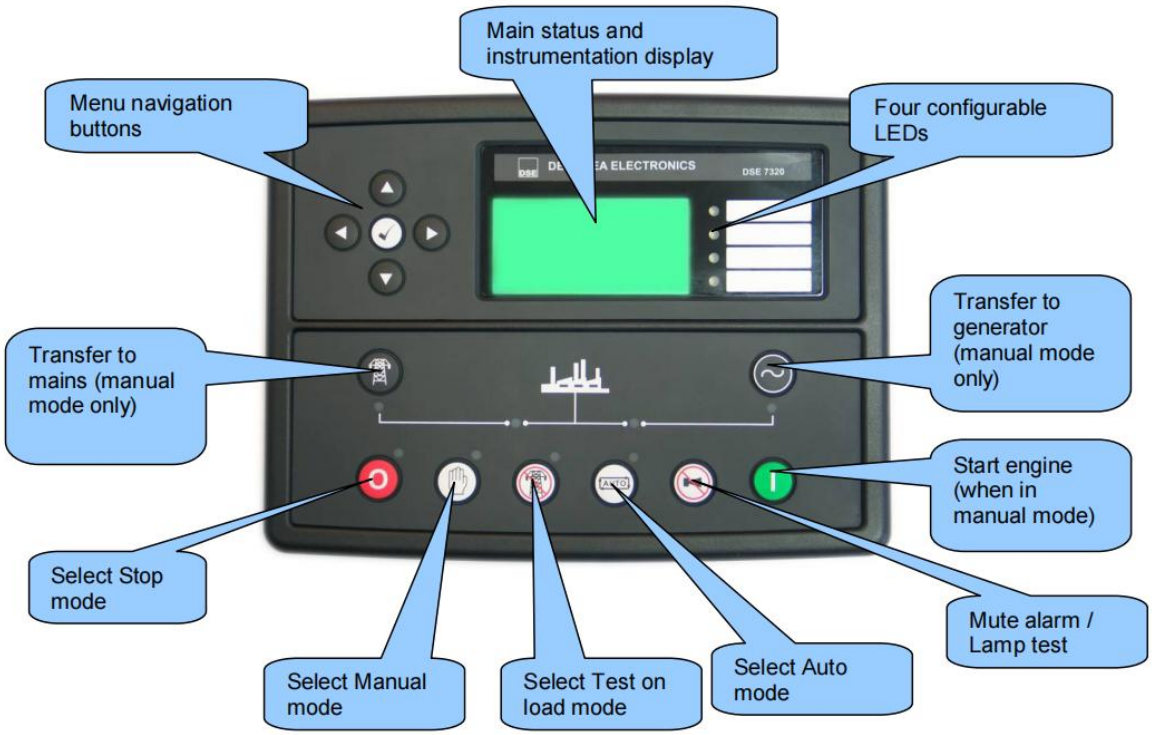


Figure 5.2 Operator interface of DSE 7210/7310

Description	Picture
Stop / Reset This button places the module into its **Stop/Reset** mode. This will clear any alarm conditions for which the triggering criteria have been removed. If the engine is running and the module is in Sto mode, the module will automatically instruct the changeover device to unload the generator ('**Close Generator**' becomes inactive (if used)). The fuel supply de-energises and the engine comes to a standstill. Should a **remote start** signal be present while operating in this mode, a remote start will not occur.	
Manual This mode allows manual control of the generator functions. Once in **Manual mode** the module will respond to the start button, start the engine, and run off load. If the engine is running off-load inthe **Manual mode** and a **remote start signal** becomes present, the module will automatically instruct the changeover device to place the generator on load ('Close Generator' becomes active (if used)). Upon removal of the **remote start signal**, the generator remains on load until either selection of the 'STOP/RESET' or 'AUTO' modes. For further details, please see the more detailed description of 'Manual operation' elsewhere in this manual.	
Auto This button places the module into its **'Automatic'** mode. This mode allows the module to control the function of the generator automatically. The module will monitor the remote start input and mains supply status and once a start request is made, the set will be automatically started and placed on load. Upon removal of the starting signal, the module will automatically transfer the load from the generator and shut the set down observing the stop delay timer and cooling timer as necessary. The module will then await the next start event. For further details, please see the more detailed description of 'Auto operation' elsewhere in this manual.	
TEST (DSE7220/DSE7320 ONLY) This button places the module into its **'Test'** mode. This allows an on load test of the generator. Once in Test mode the module will respond to the start button, start the engine, and run on load. For further details, please see the more detailed description of 'Test operation' elsewhere in this manual.	

START This button is only active in STOP/RESET MANUAL mode. Pressing this button in manual or test mode will start the engine and run off load (manual) or on load (test). Pressing this button in STOP/RESET mode will turn on the CAN engine ECU (when correctly configured and fitted to a compatible engine ECU)	
Mute / Lamp Test This button silences the audible alarm if it is sounding and illuminates all of the LEDs as a lamp test feature/ When correctly configured and fitted to a compatible engine ECU, pressing this button in STOP/RESET mode after pressing the START button (to power the ECU) will cancel any "passive" alarms on the engine ECU.	
Transfer to generator Allows the operator to transfer the load to the generator (when in Manual mode only)	
Open generator (DSE7210/DSE7310 only) Allows the operator to open the generator (when in Manual mode only)	
Transfer to mains (DSE7220/DSE7320 only) Allows the operator to transfer the load to the mains (when in Manual mode only)	
Menu navigation Used for navigating the instrumentation, event log and configuration screens. For further details, please see the more detailed description of these items elsewhere in this manual.	

5.3.2 Fault Finding

SYMPTOM	POSSIBLE REMEDY
Unit is inoperative Read/Write configuration does not operate	Check the battery and wiring to the unit. Check the DC supply. Check the DC fuse.
Unit shuts down	Check DC supply voltage is not above 35 Volts or below 9 Volts Check the operating temperature is not above 70°C. Check the DC fuse.
Unit locks out on Emergency Stop	If no Emergency Stop Switch is fitted, ensure that a DC positive signal is connected to the Emergency Stop input. Check emergency stop switch is functioning correctly. Check Wiring is not open circuit.
Intermittent Magnetic Pick-up sensor fault	Ensure that Magnetic pick-up screen only connects to earth at one end, if connected at both ends, this enables the screen to act as an aerial and will pick up random voltages. Check pickup is correct distance from the flywheel teeth.
Low oil Pressure fault operates after engine has fired	Check engine oil pressure. Check oil pressure switch/sensor and wiring. Check configured polarity (if applicable) is correct (i.e. Normally Open or Normally Closed) or that sensor is compatible with the 73x0 Module and is correctly configured.
High engine temperature fault operates after engine has fired.	Check engine temperature. Check switch/sensor and wiring. Check configured polarity (if applicable) is correct (i.e. Normally Open or Normally Closed) or that sensor is compatible with the 7000 series module.
Shutdown fault operates	Check relevant switch and wiring of fault indicated on LCD display. Check configuration of input.
Warning fault operates	Check relevant switch and wiring of fault indicated on LCD display. Check configuration of input.
Fail to Start is activated after pre- set number of attempts to start	Check wiring of fuel solenoid. Check fuel. Check battery supply. Check battery supply is present on the Fuel output of the module. Check the speed-sensing signal is present on the 7000 series module's inputs. Refer to engine manual.
Continuous starting of generator when in AUTO	Check that there is no signal present on the "Remote Start" input. Check configured polarity is correct. Check the mains supply is available and within configured limits (DSE7220/DSE7320 only)
Generator fails to start on receipt of Remote Start signal.	Check Start Delay timer has timed out. Check signal is on "Remote Start" input. Confirm correct configuration of input is configured to be used as "Remote Start" . Check that the oil pressure switch or sensor is indicating low oil pressure to the controller. Depending upon configuration, then set will not start if oil pressure is not low.
Pre-heat inoperative	Check wiring to engine heater plugs. Check battery supply. Check battery supply is present on the Pre-heat output of module. Check pre-heat configuration is correct.
Starter motor inoperative	Check wiring to starter solenoid. Check battery supply. Check battery supply is present on the Starter output of module. Ensure that the Emergency Stop input is at Positive. Ensure oil pressure switch or sensor is indicating the "low oil pressure" state to the 7300 series controller.
Engine runs but generator will not take load	Check Warm up timer has timed out. Ensure generator load inhibit signal is not present on the module inputs. Check connections to the switching device. Note that the set will not take load in manual mode unless there is an active remote start on load signal.
Incorrect reading on Engine gauges Fail to stop alarm when engine is at rest	Check engine is operating correctly. Check sensor and wiring paying particular attention to the wiring to terminal 47 (refer to appendix). Check that sensor is compatible with the 7000 series module and that the module configuration is suited to the sensor.

Module appears to 'revert' to an earlier configuration	When editing a configuration using the PC software it is vital that the configuration is first 'read' from the controller before editing it. This edited configuration must then be "written" back to the controller for the changes to take effect. When editing a configuration using the fascia editor, be sure to press the Accept button to save the change before moving to another item or exitingthe fascia editor
Set will not take load	Ensure generator LED is lit Check that the output configuration is correct to drive the load switch device and that all connections are correct. Remember that the set will not take load in manual mode unless a remote start on load input is present or the close generator button is pressed.
Inaccurate generator measurements on controller display	Check that the CT primary, CT secondary and VT ratio settings are correct for the application. Check that the CTs are wired correctly with regards to the direction of current flow (p1,p2 and s1,s2) and additionally ensure that CTs are connected to the correct phase (errors will occur if CT1 is connected to phase 2). Remember to consider the power factor. Ie (kW = kVA x powerfactor) The 7000 series controller is true RMS measuring so gives more accurate display when compared with an 'averaging' meter such as an analogue panel meter or some lower specified digital multimeters. Accuracy of the controller is better than 1% of full scale. Ie Gen volts full scale is 333V ph-n so accuracy is ±3.33V (1% of 333V).

5.4 ComAp

5.4.1 keys dscription

Figure5.3 Operator interface of InteliLite 4 AMF8/AMF9

Position	Picture	Description
1		**LEFT** button. Use this button to move left or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed. ***Note:*** *This button will not change the mode if the controller mode is forced by one of binary inputs listed in the Reference Guide – "Operating modes" chapter.*
2		**RIGHT** button. Use this button to move right or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed. ***Note:*** *This button will not change the mode if the controller mode is forced by one of binary inputs listed in the Reference Guide – "Operating modes" chapter.*
3		**HORN RESET** button. Use this button to deactivate the horn output without acknowledging the alarms .

4		**FAULT RESET** button. Use this button to acknowledge alarms and deactivate the horn output . Inactive alarms will disappear immediately and status of active alarms will be changed to "confirmed" so they will disappear as soon as their reasons dismiss .
5		**UP** button. Use this button to move up or increase value.
6		**PAGE** button. Use this button to switch over display pages .
7		**DOWN** button. Use this button to move down or decrease value.
8		**ENTER** button. Use this button to finish editing a setpoint or moving right in the history page.
9		**START** button. Works in MAN mode only . Press this button to initiate the start sequence of the engine.
10		**STOP** button. Works in MAN mode only . Press this button to initiate the stop sequence of the Gen-set . Repeated pressing of button will cancel current phase of stop sequence (like cooling) and next phase will continue.
11		**GCB** button. Works in MAN mode only . Press this button to open or close the GCB.
12		**MCB** button. Works in MAN mode only . Press this button to open or close the MCB.
13		**GENERATOR** status indicator. There are two states – Gen-set OK (indicator is green) and Gen-set failure (indicator is red). Green LED is on if the generator voltage and frequency is present and within limits . Red LED starts flashing when Gen-set failure occurs . After FAULT RESET button is pressed, Red LED goes to steady light (if an alarm is still active) or is off (if no alarm is active).
14		**MAINS** status indicator. There are two states – Mains OK (indicator is green) and Mains failure (indicator is red). Green LED is on, if mains is present and within limits . Red LED starts blinking when the mains failure is detected and after the Gen-set has started and connected to the load it lights permanently until the mains failure disappears .
15		Graphic B/W display, 132 × 64 px .
16		**GCB Status**. Green LED is on if GCB is closed. It is driven by GCB CLOSE/OPEN output or by GCB feedback signal.
17		**MCB Status**. Green LED is on if MCB is closed. It is driven by MCB CLOSE/OPEN output or by MCB feedback signal.

5.4.2 Symbols in this manual

3 x Phases

Active current sensor

AirGate


Alternating current


Analog modem


Battery


Binary output


Breaker contact

Breaker contact


Breaker


Breaker


Breaker


Capacitor

Coil


Connector - female


Connector - male


Contact


Contactor

Controller simplified

Module simplified


Current measuring

Current measuring


Diode


Ethernet male


Ethernet female


Fuel solenoid


Fuse


Fuse switch

Generator


Generator schematic


Grounding


GSM


GSM modem


Jumper


Load


Mains


Mains


Mobile provider

Passive current sensor


Pick - up


Relay coil


Relay coil of slow-operating


Resistor


Resistor adjustable


Resistive sensor RPTC


RS 232 male


RS 232 female


Starter


Switch - manually operated


Transformer


USB type B male


USB type B female

Voltage measuring


Wi-fi / WAN / LAN

back to Document information

6. OPERATION

6.1 Products fitted with the Pre-Filter / Water Separator

1.T·Handle
2.Lid
3.Filte

Figure 6.1 Example of a Pre-filter

With Fuel Supply from the Base Tank

Following Pre-filter element change or if the Pre-filter unit is drained for any reason, then repriming of the unit, as specified by Pre-filter, will be required:

- Remove T-handle (1) and lid from the top of the unit.
- Screw T-handle into centre tube finger tight.
- Fill the assembly with clean fuel to just above the top of the element. This ensures the “dirty” side of the unit is completely filled with fuel.
- Lubricate the lid gasket (2) and T-handle (1) o-ring with clean fuel.
- Replace the lid (2) taking care to seat the gasket correctly and tighten the T-handle (1) – do not use tools.
- Operate the priming switch (if fitted) to give the system a 2 minute prime.
- Start engine.
- In the event of a failure to start the engine within 3 crank cycles, see the “troubleshooting” section of this procedure for the repeat prime procedure.

With Fuel Supply from a Remote Tank

If the fuel lines from the remote tank are empty:

- Carry out the manual filling procedure of the Pre-filter unit as detailed above.
- Operate the priming switch for 2 minutes.
- Re-fill the Pre-filter unit as detailed above.
- Re-prime for a further 2 minutes.
- Start engine.
- In the event of a failure to start the engine after 3 crank cycles, see the ‘troubleshooting ‘ section of this procedure for the repeat prime procedure.
- If the fuel lines from the remote tank are full:
- Carry out the priming procedure as detailed in fuel supply from base tank.

6.2 Troubleshooting

Having completed the designated priming procedure, or after certain period still standby, if the engine does not start, there may be air in the fuel line.

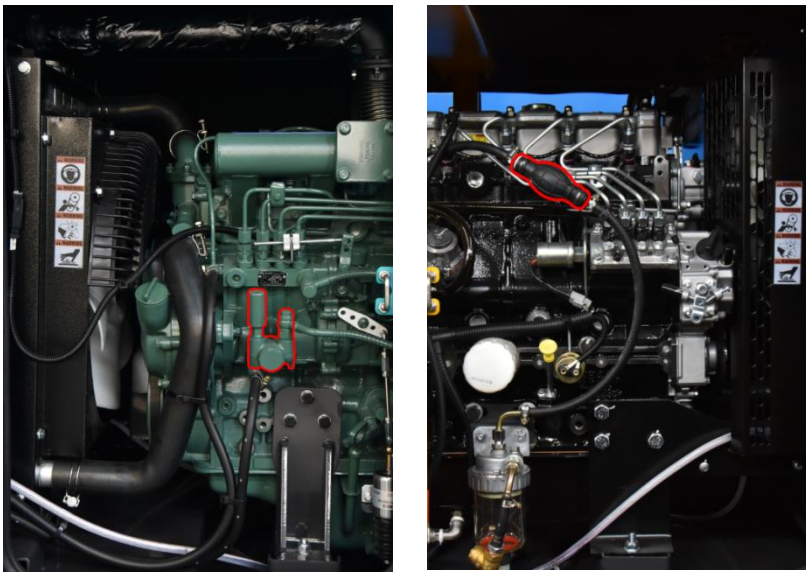


Figure 6.2 – hand pump

1.Check the whole line of the fuel line from tank to the pump, ensure all connectors are tightened.

2.Drain air by the hand pump on engine.(different brands of engine configured different kind of hand pump), consult your local UNIV generator dealer the usage if necessary.

3.Push hand pump till it getting hard to be pressed, means the pump is free from air.

4.Try to start again.

6.3 Fuel Conservation

The efficiency of the engine can affect the fuel economy. The design and technology in manufacturing provides maximum fuel efficiency in all applications. Always ensure that genuine filters are used. Follow the recommended procedures to attain optimum performance for the life of the engine.

- Avoid spilling fuel.
- Fuel expands when the fuel is warmed up. The fuel may overflow from the fuel tank. Inspect fuel lines for leaks. Repair the fuel lines, as needed.
- Be aware of the properties of the different fuels. Use only the recommended fuels.
- Observe the service indicator frequently. Keep the air cleaner elements clean.
- Ensure that the turbocharger is operating correctly so that the proper air/fuel ratio is maintained. Clean exhaust indicates proper functioning.
- Maintain a good electrical system.
- One faulty battery cell will overwork the alternator and can consume excess power and excess fuel.
- Ensure that the belts are properly adjusted. The belts should be in good condition.
- Ensure that all the connections of the hoses are tight. The connections should not leak.
- Ensure that the driven equipment is in good working order.
- Cold engines consume excess fuel. Utilise heat from the jacket water system and the exhaust system, when possible. Keep cooling system components clean and keep cooling system components in good repair. Never operate the engine without water temperature regulators. All these items will help maintain operating temperatures.
- Ensure that all the connections of the hoses are tight. The connections should not leak.
- Ensure that the driven equipment is in good working order.
- Cold engines consume excess fuel. Utilise heat from the jacket water system and the exhaust system, when possible. Keep cooling system components clean and keep cooling system components in good repair. Never operate the engine without water temperature regulators. All these items will help maintain operating temperatures.

Consult your local Dealer for more information.

6.4 Cold Weather Operation

UNIV Diesel generator sets can operate effectively in cold weather, however the starting and the operation of the diesel engine can be impacted by the following factors:

- The type of fuel that is used

- The viscosity of the engine oil
- The operation of the glow plugs
- Optional Cold starting aid
- Battery condition

The operation and maintenance of an engine in freezing temperatures is complex because of the following conditions:

- Weather conditions
- Engine applications

Recommendations from your UNIV dealer are based on past proven practices. The information that is contained in this section provides guidelines for cold-weather operation.

6.4.1 Hints for Cold Weather Operation

- Generator set operating temperatures -30℃ to 50℃ (-22°F to 122°F). For operating conditions lower than-30℃(-22°F), Lower than -10℃ condition need extra heating components, please informing supplier before placing order, and consult your local UNIV generator dealer.
- If the engine will start, operate the engine until a minimum operating temperature of 80° C (176° F) is achieved. Achieving operating temperature will help prevent the intake valves and exhaust valves from sticking.
- The cooling system and the lubrication system for the engine do not lose heat immediately upon shutdown. Retention of heat means that an engine can be shut down for a time and the engine can remain able to start readily.
- Install the correct specification of engine lubricant before the beginning of cold weather.
- Check all rubber parts (hoses, fan drive belts, and so on) weekly.
- Check all electrical wiring and connections for any fraying or damaged insulation.
- Keep all batteries fully charged and warm.
- Fill the fuel tank at the end of each shift.
- Drain the water from the fuel system. Refer to this Operation and Maintenance Manual, “Fuel System Primary Filter/Water Separator - Drain”.
- Check the air cleaners and the air intake daily. Check the air intake more often when you operate in snow.

⚠ **Personal injury or property damage can result from alcohol or starting fluids. Alcohol or starting fluids are highly flammable and toxic and if improperly stored could result in injury or property damage.**

⚠ **Do not use aerosol types of starting aids such as ether. Such use could result in an explosion and personal injury.**

6.4.2 Viscosity of the Engine Lubrication Oil

Correct engine oil viscosity is essential. Oil viscosity affects the amount of torque that is needed to crank the engine. Consult your local Dealership for further information for the recommended viscosity of oil.

6.4.3 Recommendations for the Coolant

Provide cooling system protection for the lowest expected outside temperature. In cold weather, check the coolant often for the correct glycol concentration to ensure adequate freeze protection. Consult your local Dealership for further information.

7 Control System

7.1 Standard Panel

Figure7.1 Standard Control Panel

7.1.1 Operating Procedure(according to Deepsea module)

1.Check prior to Operating

a)Check all fluids including oil, coolant, add fuel daily

b)Check belt tension from cooling fan shaft to water pump and charging alternator

c)Verify all circuit breaker are in the OFF(open) position

2.Starting procedure(MANUAL)

a)Rotate battery connect switch within canopy enclosure to ON position

b)Rotate power switch on control panel to ON position

c)Verify all personnel are aware the generator is about to start

d)Push the hand button for manual operation

e)Push the green button to start the engine for manual operation

f)Warn up the generator for at least 1minute, then put load slowly. Do not put full load once.

g)Verify voltage is within parameters expected.

h)Switch the breaker to the ON(close) position, get ready for putting load

3.Starting procedure(AUTO)

Activate AUTO mode by pressing the AUTO button, Indicator light beside the button confirms the action, press

once more, back to manual mode.

Under AUTO mode, generator will run fully aytomatically, no operator needed.

Connecting ATS need this mode. If no ATS, just use Manual mode.

4.Stopping procedure

a)Switch all breakers to OFF(Open) position

b)Cool down the engine with 1minute running without load

c)Push stop button on the control panel

d)Rotate power switch to OFF position

5.Checking list of start failure

a)Battery power and connection

b)Fuel supply, first time start or start after long time stock fuel supply can not reach to pump at first or 2nd rotate, please do it several times, if still no start. Need check fuel line from tank through water separator till the engine pump, if any air leakage or damage.

c)Refer to engine and generator manual

6.Fault finding

More control methods or faults finding refer to the manual of specific controller model on generator, or consult your local UNIV generator dealer.

7.2 Syncronization system

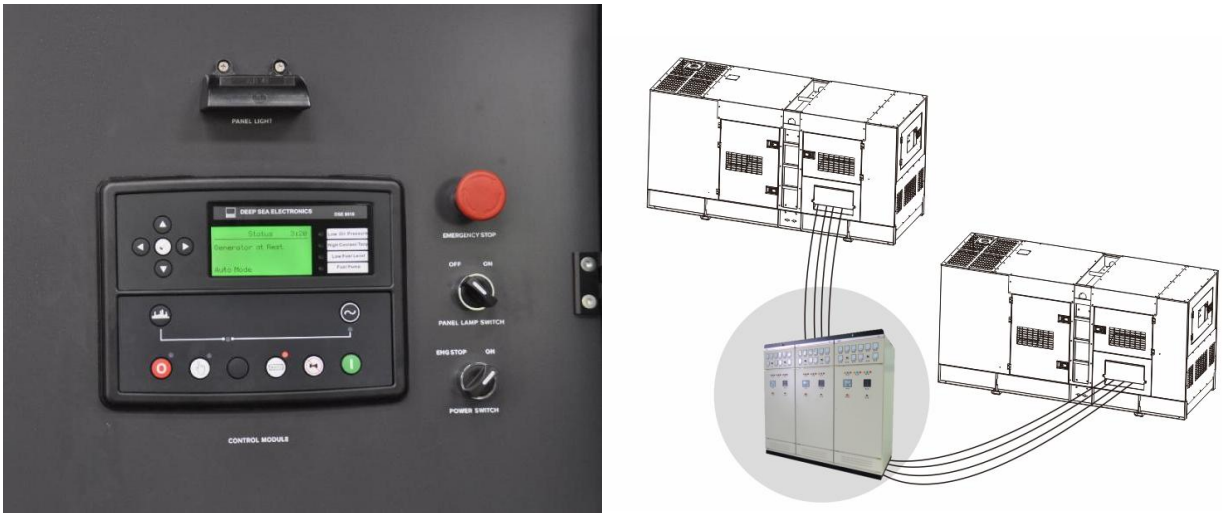


Figure 7.2 Available for the paralleled controlmodules(Deepsea DSE8610 ComAp IC-NToptional)

UNIV STANDARD generator controllers integrating digital,intelligent and network techniques are used as the automatic control systems for dieselGenerators,it can carry out functions including pre-alarm,warning &electrical trip,fail monitoringand controls etc

- parameter configuration via RS-232 Serial Communication;
- Log last 50 events& alarm information with Measured values
- statistics records
- Remote start/stop;
- Speed sensing from alternator voltage ormagnetic pickup;
- Configurable 3inputs and 6 outputs;
- ECU powers,ECU stop,STOP or fuel solenoid selection;
- Automatic transfer switching control and engine control;
- Adjustable start,load and stop timers

7.3 AUTOMATIC TRANSFER SWITCH（short for ATS）

When the generator set is required to automatically provide switching to standby power in the event of mains failure, an optional ATS is required. These ATS are designed to sense when the mains have failed, signal the generator set to start, switch the load from the failed mains to the generator set and then switch it back after the mains supply is re-established.

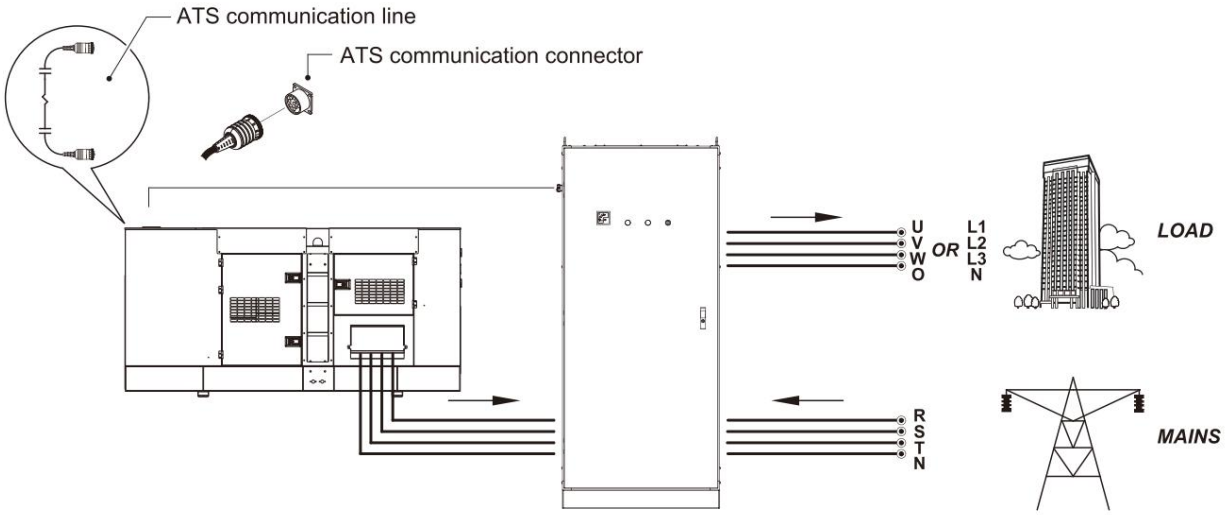


Figure 7.3 – Function of a ATS

Figure 7.4 ATS

Figure 7.5 Generator Standard Output Panel

7.3.1 Output Circuit Breaker Description

The alternator output circuit breaker is of sufficient rating for the generator set output. Electrical output is switchable through this device, with “ON” being indicated by the handle being up. The breaker will carry its rated current continuously but will trip to off position if the rating on any one phase is exceeded for a period depending on the percentage overload and the circuit breaker characteristics.

Warning:

⚠ **Maintenance and/or replacement of circuit breakers should only be completed by a fully trained technican.**

Figure 7.5 Manual Main Breaker

Figure 7.6 Electrical Main Breaker

8. MAINTENANCE

Warning:

⚠ The following procedures should only be carried out by a qualified technician.

A good maintenance programme is the key to long generator set life. Maintenance and service should only be carried out by qualified technicians. Records of this work should be kept to aid in developing an efficient maintenance programme.

In general, the generator set should be kept clean. Do not permit liquids such as fuel or oil film to accumulate on any internal or external surfaces or on, under or around any acoustic material, if fitted. Wipe down surfaces using an aqueous industrial cleaner. Do not use flammable solvents for cleaning purposes.

Any acoustic material with a protective covering that has been torn or punctured should be replaced immediately to prevent accumulation of liquids or oil film within the material.

Refer to a qualified generator set technician for details of required preventative maintenance.

8.1 Battery Maintenance

Warning:

⚠ **Ensure personnel have been trained in the handling and proper use of batteries. Always wear the correct personal protection equipment (PPE) when handling batteries.**

⚠ **Battery maintenance checks should also be completed as part of your routine maintenance inspections.**

⚠ **Always wear the appropriate PPE when handling electrolyte. If splashed with electrolyte, immediately flush the affected area with clean water and seek medical advice.**

⚠ **Never add undiluted sulphuric acid to a battery.**

⚠ **Keep batteries upright to prevent electrolyte spillage. Electrolyte is a dilute sulphuric acid and is harmful to the skin.**

⚠ **Use tools with insulated handles when removing or fitting the abttery. Never place tools or metal objects across the battery terminals.**

⚠ **During charging, the battery gives off explosive gases. Keep the battery in a well ventilated area and away from naked flames and sparks. Smoking is also prohibited.**

Generator set batteries, by law, must not be disposed of with household waste.

Batteries contain hazardous materials and in the charged state, each cell contains electrodes of lead metal (Pb) and lead (IV) dioxide (PbO_2) in an electrolyte of about 33.5% w/w (6 Molar) sulphuric acid (H_2SO_4). In the discharged state both electrodes turn into lead (II) sulphate ($PbSO_4$) and the electrolyte loses its dissolved sulphuric acid and becomes primarily water.

It can be damaging to the environment to send these to landfill, burning batteries can also cause atmospheric pollution. Dealing with lead acid batteries can be hazardous so it is important to follow all safety guidelines.

Batteries are an essential part of the generator set and should be maintained appropriately. Keep the battery area clean and dry and ensure any vent caps are tight (if fitted).

Clean the battery case with one of the following cleaning solutions:

- A mixture of 0.1 kg (0.2 lb) of baking soda and 1 L (1 qt) of clean water
- A mixture of 0.1 L (0.11 qt) of ammonia and 1 L (1 qt) of clean water

Thoroughly rinse the battery case with clean water.

All battery connections must be kept clean and tight. Use a fine grade of sandpaper to clean the terminals and the cable clamps. Clean the items until the surfaces are bright or shiny. Do not remove material excessively. Excessive removal of material can cause a poor connection between the clamps and the battery terminals. Coat the clamps and terminals with grease or other terminal protector to prevent corrosion.

The electrolyte level should be covering the plates/grids (1/2 inch / 13 mm) within the battery to maximize full charge transfer. If the liquid level is below the plates/grids, only add distilled water; never add battery acid to top up the volume, as the addition of extra acid will destroy the grids.

It is recommended to check the electrolyte and condition of the batteries every 500 running hours. In high ambient conditions, it is recommended to use thermal compensation and check electrolyte levels more frequently, for example every 200 running hours. These checks should also be completed as part of your routine maintenance inspections.

8.1.1 Battery Removal and Fitting

- Battery acid can burn clothing and skin or cause blindness if it leaks. Please wear protective clothing when inspecting a battery prior to its disconnection / transportation.
- Ensure the battery to be fitted is filled with the correct levels and mixture of electrolyte and is fully charged.
- If vents are fitted, ensure they are firmly in place.
- Before removing a battery, carry out a thorough inspection of its condition. Use a torch if visibility is poor to check all sides of the battery for any marks, dents or leaks.
- If the battery has any severe dents or leaks please contact your local Dealer for assistance. DO NOT attempt to remove the battery.
- Disconnect the battery safely before inspecting it (see below).
- Disconnect any battery charging circuitry before fitting the battery.
- When removing a battery for whatever reason always ensure all load is removed before disconnecting the battery so that no sparks are created. Disconnect the negative cable first followed by the positive cable to avoid short circuit against any metal framework, then remove the hold down clamp or strap securing the battery base. The battery can be heavy so please be careful when lifting and carrying the battery. Seek assistance if required.
- When refitting the battery, ensure the terminal posts are correctly aligned with the cables to avoid wrong connection and place the new battery into the hold-down tray and reattach the hold-down clamp or strap. Attach and tighten the positive battery cable to the positive terminal first. Then attach and tighten the negative battery cable to the negative terminal.
- Keep the battery terminals clean and free from corrosion and lightly smear the connections with petroleum jelly.
- Ensure battery terminals are tight as loose battery terminals can reduce battery life and are a fire hazard.
- Ensure the positive terminal on each battery is covered correctly.
- When fitting a battery and / or battery charger please ensure they are appropriately matched. Please consult a qualified technician if unsure.
- During transport, please ensure that battery terminals are covered to remove the possibility of a short circuit.
- Keep the battery upright at all times.

8.1.2 Battery Fluid Levels

To ensure the battery operates at its optimal level it is advised that you check the fluid levels as outlined in section 9.1 above.

Low Fluid Levels

The electrolyte fluid level is too low if any part of the plates are exposed to air. If the plates are not fully covered with electrolyte, then the battery cannot operate at full capacity. Exposing the plates to air can destroy the area exposed within a few days reducing the performance of your battery. If the electrolyte is only about 1/2 inch (13 mm) below the top of the plates adding distilled water to the battery may return it to serviceable condition at a slightly reduced capacity. Please consult your local Dealer about the performance and replacement of your battery.

Recommended Fluid Levels

The recommended fluid level is approximately 1/2 inch (13 mm) above the top of the plates or about 1/8 inch (3 mm) below the bottom of the filler tubes that extend down from the port openings. If the fluid level is within these recommended guidelines, replace the port covers and inspect again in three months.

Maximum Fluid Levels

The maximum safe fluid level is when the fluid is just touching the bottom of the filler tubes that extend down from the port openings. When the fluid level reaches the bottom of a filler tube, a distinctive eye shape meniscus should appear indicating that the battery has reached its maximum level and you should stop filling the battery.

8.2 Preventative Maintenance Interval Schedule

Depending on the application of the generator set, requirement for preventative maintenance will vary.

Warning:

⚠ **Enclosures fitted with doors stays or lift off doors (when Applicable) should not be used when wind exceeds 15 mph**

⚠ **Maintenance intervals for the engine may be more frequent than those shown in this section. Please consult your local dealer for maintenance guidelines specific to your engine**

⚠ **Operators should only perform the Pre-Start Check tasks detailed in the Control System Description – Section 5.**

⚠ **The following procedures should only be carried out by a qualified technician.**

Daily or at Each Startup:

(For standby generator sets these procedures may be performed weekly.) A walk around inspection should be performed on a daily basis and prior to starting the engine. The Pre-Start checks contained in Section 5 should be performed during this walk around.

Every Two Weeks:

(For standby generator sets that have not been run.) Perform an operational check on the generator set by starting and running it for only 5 minutes.

Every Month:

(For standby generator sets that have not been run on load.) Perform an operational and load check on the generator set by starting and running the generator set on at least 50% load for 1 to 2 hours.

Drain the Water and the Sediment from Fuel tank – Fuel tanks can be drained from the bottom of the fuel tank by the drain plug or drain valve (if applicable) or by using a hand pump accessible through the fuel fill pipe or tank access socket. Dispose of the water properly.

Drain dual wall tank bund area – Dual wall tanks (if applicable), outer bund area should be drained by a hand pump accessible through the rear access socket located behind the generator, dispose of any removed fluid properly.

Warning:

⚠ **Do not run diesel engines at low loads for long periods.**

Every Twelve Months or 500 Hours:

Repeat the daily procedures plus the following:

1. Check all control system safety devices by electrically simulating faults.
2. Clean all battery cap vents.
3. Tighten all exhaust connections.
4. Tighten all electrical connections.
5. Start the engine and observe the instrument panel to ensure that all gauges and meters are operating properly.

8.3 Alternator Preventative Maintenance

There is no routine maintenance required on the alternator, however observe the following recommendations:

- Periodically inspect the alternator winding condition and carry out general cleaning.
- Periodically inspect the cable connections between the alternator and the circuit breaker.
- See your local Dealer.

8.4 Engine Preventative Maintenance

Please consult your local dealer for guidance on specific maintenance requirements for the following:

- Daily start up checks
- Weekly
- Service schedules – should only be completed by a qualified technicians

8.5 Welding on or near Generator Sets

When welding is being performed near or on Generator Sets, without precautions and correct procedures, the electrical/ electronic and other components could be severely damaged by the current flow from the welder.

If the engine is electronic, due to the complexity and type of components within the engine ECM, this could be severely damaged.

Proper welding procedures are necessary in order to avoid damage to the engine ECM, sensors, and associated components. When possible, remove the component that requires welding from the unit and then weld the component. If removal of the component is not possible, the correct procedure must be followed.

When welding on a unit that is equipped with an Electronic Engine, the following is considered to be the safest procedure.

Warning:

⚠ **Do not ground the welder to electrical components such as the ECM or sensors. Improper grounding can cause damage to the drive train, the bearings, hydraulic components, electrical components, and other components.**

⚠ **Do not ground the welder across the centerline of the package. Improper grounding could cause damage to the bearings, the crankshaft, the rotor shaft, and other components.**

⚠ **Clamp the ground cable from the welder to the component that will be welded. Place the clamp as close as possible to the weld. This will help reduce the possibility of damage.**

⚠ **Perform the welding in areas that are free from explosive hazards.**

1. Stop the engine. Turn the switched power to the OFF position.
2. Disconnect the battery cables from the battery. If a battery disconnect switch is provided, open the switch. If possible, remove the battery completely.
3. Disconnect the connectors from the ECM. Move the harness to a position that will not allow the harness to move back accidentally and contact any of the ECM pins.

8.6 Decommissioning, Dismantling and Disposal

Please consult your local Dealer and local regulations regarding the disposal of materials on your generator set

Most of the Iron, steel and copper from the generator set can be taken by companies specialising in recycling scrap metal

Some components such as electrical cable, electronic accesories and plastics require specialist treatment. Please consult a specialist company regarding the removal of such items.