



## Operation & Maintenance Manual

9.0kVA 1500rpm



**LC9** (Internal)

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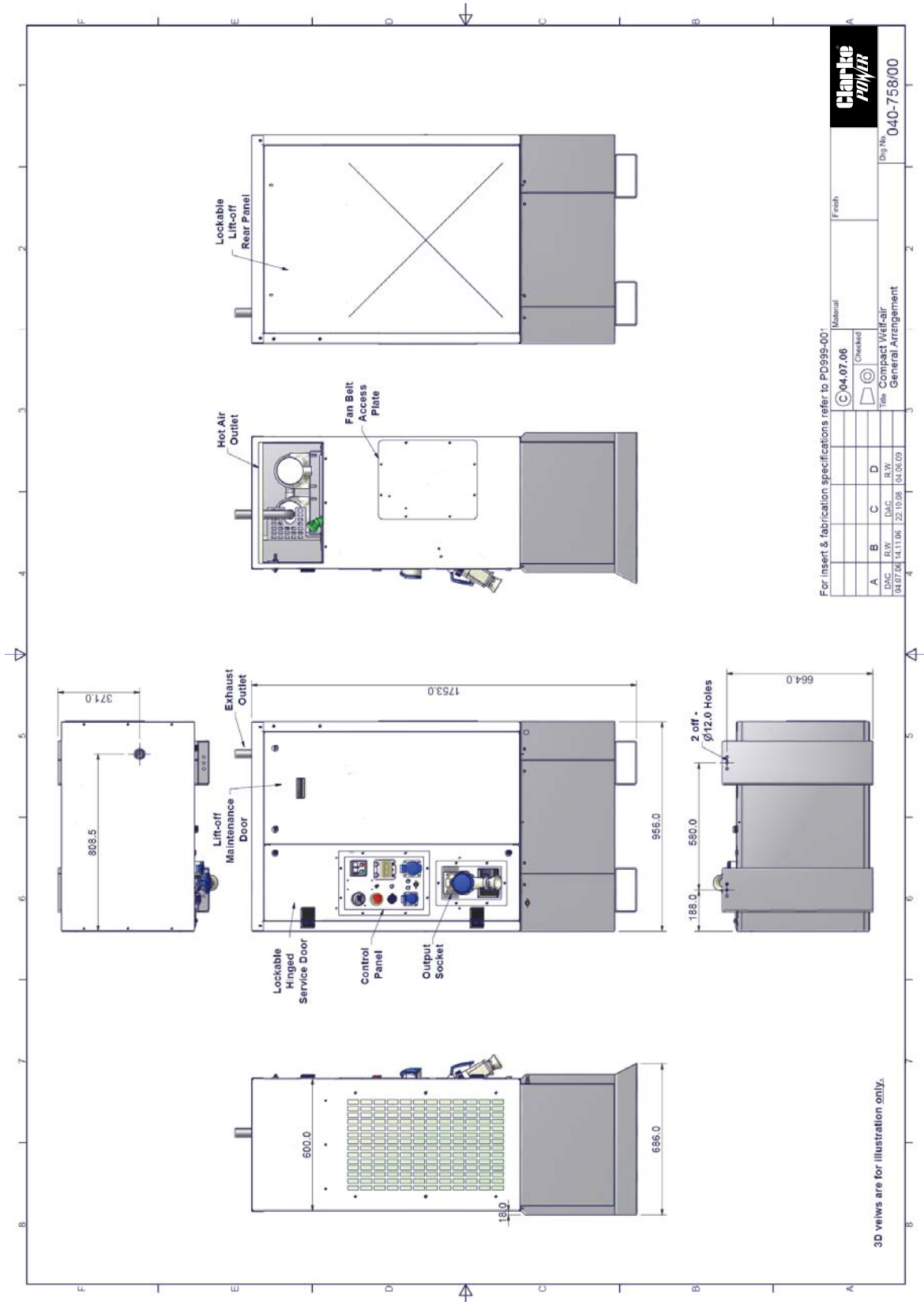
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2.1 Figure 1 General Dimensions




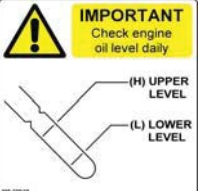




**2.2 Table 1 General Specification**

<b>Model Name</b>	<b>Compact Welf-Air</b>
<b>Basic configuration</b>	<p>Standard Sincro version with 230V output.</p> <p>Powered by either Kubota or Lombardini Diesel engine</p> <p>For fixed / long term installation use, either in cabins or as a standby set.</p>
<b>Engine</b> Oil capacity Oil specification	Lombardini LDW1003 3.7 litres 10W40 Fully Synthetic API grade CF or better
<b>Fuel</b>	Diesel
<b>Coolant</b>	Ethylene glycol, (50%) and water mixture (50%) with inhibitive coolant additives
<b>Alternator</b>	Sincro SK160CA1
<b>Generator 230V</b> <b>Power Output:</b> AC Power  Power factor pf	7.2kW 9.0kVA 0.8
<b>Dimensions (approx):</b> Height Length Width Weight dry for shipping Weight with engine oil and 10 litres of fuel	1755mm 686mm 956mm 460 kg 470 kg
<b>Output Voltages</b>	230V (110V Optional).
<b>Sockets</b>	1 x 16A, 1x 32A & 1x 63A
<b>Sound Level</b>	2006 EC Stage 2 Regulations LWA 89 dB 64db (A) @7 metres.

Model Name	Compact Welf-Air	Compact Welf-Air
Protection	MCB's on all sockets. Earth leakage RCD fitted to 230V output	MCB's on all sockets. Earth leakage RCD fitted to 230V output
IP Rating	IP23	IP23
Fork Lift Truck lifting by forks underneath	Yes	Yes
Fuel Tank Capacity	195 litre	195 litre
Fuel run time at 75% power	115 hours approx.	115 hours approx.
Low fuel shut down	Yes	Yes
Low oil pressure shut down	Yes	Yes
Over cranking protection	Yes	Yes
Hours run counter	Yes	Yes
Electric battery start	Yes	Yes
Battery	44 Ah maintenance-free unit	44 Ah maintenance-free unit
Fine fuel filter and water trap	Yes	Yes
Easy access to oil dip stick	Yes	Yes
Standard Colour	White	White
Maximum ambient operating temperature	40°C	40°C
Minimum ambient operating temperature (using standard diesel fuel)	-5° C	-5° C
Maximum altitude above sea level (without affecting performance significantly)	1000 m	1000 m





**3.1 General Precautions**






The generator is fitted with a number of labels that alert the User to the safe operation and safety requirements. A full explanation of these is contained here. If any of the labels are missing or unreadable a duplicate should be obtained and fitted. All labels are quantity 1 unless otherwise indicated.





Label	Location and Part No.	Description
	Adjacent to control module.  Label Part No: 499-376/31	<p><b>NO OIL IN ENGINE</b></p> <p>This generator is shipped without oil. Suitable oil must be added before attempting to start the generator.</p> <p>This label should be removed when oil is added.</p>
	On the control-side access door.  Label Part No: 499-376/10	<p><b>CHECK ENGINE OIL LEVEL DAILY</b></p> <p>The oil level should be seen on the oil dip stick as per the diagram on the label.</p>
	On the fuel tank.  Label Part No: 499-376/03	<p><b>DIESEL FUEL ONLY</b></p> <p>This generator must only be filled with commercial diesel fuel.</p>
	Next to air vents. Qty 2 off.  Label No: 499-376/04	<p><b>INLET AND OUTLET VENTS TO BE KEPT CLEAR</b></p> <p>These must be kept free from obstructions to allow a free flow of cooling air or the engine and alternator could over heat.</p>
	Next to exhaust outlet.  Label part No: 499-376/02	<p><b>CAUTION HOT EXHAUST</b></p> <p>The exhaust pipe is shielded as much as is practical but the final outlet is hot.</p>
	On side panel  Part of label No: 499-376/11	<p><b>ELECTRICITY IS DANGEROUS</b></p> <p>If in doubt about the correct use consult a qualified electrician or contact our Technical Help Line.</p>






	<p>On side panel Part of label No: 499-376/11</p>	<p><b>CHECK ENGINE OIL LEVEL DAILY</b></p> <p>Check the oil level each day and top up if necessary to the top mark given in the oil level diagram above. If oil consumption is excessive investigate further.</p>
	<p>On side panel Part of label No: 499-376/11</p>	<p><b>OPERATING THE GENERATOR AT LOW LOADS LEVELS FOR LONG PERIODS OF TIME MAY CAUSE EXCESSIVE SMOKE AND REDUCE EFFICIENCY DUE TO CARBON BUILD UP.</b></p> <p>If the generator is not required switch it off and avoid running with light or no load wherever possible.</p>
	<p>On side panel Part of label No: 499-376/11</p>	<p><b>ENSURE GENERATOR IS AT LEAST 1 METRE AWAY FROM BUILDINGS, VEHICLES etc. WHEN IN USE.</b></p> <p>Ensure exhaust and air exit vents are not restricted or obstructed.</p>
	<p>On side panel Part of label No: 499-376/11</p>	<p><b>OPERATE ONLY IN WELL VENTILATED AREAS. EXHAUST FUMES CAN KILL.</b></p> <p>Generally the generator will be operated out of doors or in large well ventilated industrial buildings. If the generator is to be operated in a small room or compartment an optional exhaust extension should be used to duct the exhaust gas straight outside and sufficient air grilles for ventilation should be provided. For such applications consult the Technical Help Line if in doubt.</p>
	<p>On silencer guard, inside main door. Label No: 499-376/34</p>	<p><b>HOT WATER UNDER PRESSURE</b></p> <p><b>CHECK WATER LEVEL DAILY</b></p> <p>Coolant level must be sufficient to appear in the filler neck.</p> <p><b>DO NOT OPEN A HOT RADIATOR</b></p>

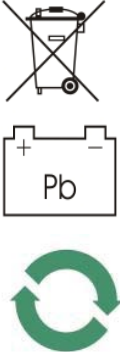







	<p>On side panel Part of label No: 499-376/11</p>	<p><b>CHECK THE RADIATOR COOLANT LEVEL AND EXPANSION BOTTLE LEVEL DAILY WHEN THE ENGINE IS COLD. DO NOT REMOVE PRESSURE CAPS FROM A HOT ENGINE</b></p> <p>Coolant level should reach the bottom of the radiator filler neck and should be between the level marks on the expansion bottle.</p> <p>Filling the expansion bottle does NOT refill the cooling system</p>
	<p>On side panel Part of label No: 499-376/11</p>	<p><b>STOP ENGINE AND ALLOW TO COOL DOWN FOR A FEW MINUTES BEFORE REFUELLING.</b></p> <p>In addition <b>DO NOT SMOKE</b> while refuelling, use a funnel or similar to prevent fuel spillage, avoid over filling the fuel tank and wipe up any spilt fuel. Avoid contact of fuel with skin.</p>
	<p>On side panel Part of label No: 499-376/11</p>	<p><b>DO NOT SPILL FUEL ONTO HOT SURFACES</b></p> <p>The exhaust outlet and the box around it in particular are hot.</p>
	<p>On side panel Part of label No: 499-376/11</p>	<p><b>DO NOT ADJUST THE SPEED OF THE ENGINE UNLESS YOU HAVE BEEN TRAINED TO DO SO</b></p> <p>If the generator is not producing enough power for the application or you suspect a problem do not adjust the engine speed. This may damage the engine, alternator and any power equipment plugged into the generator.</p>

	<p>On side panel Part of label No: 499-376/11</p>	<p><b>KEEP CHILDREN AT A SAFE DISTANCE FROM THE EQUIPMENT AND DO NOT ALLOW THEM TO OPERATE IT</b></p> <p>This is a mandatory Health and Safety Requirement for this equipment. A version with a key switch is available if required.</p>
	<p>On side panel Part of label No: 499-376/11</p>	<p><b>DO NOT OPERATE WITH ANY COVERS OPEN</b></p> <p>If covers are open (or missing) the generator will exceed the European Noise Regulations and the cooling of the engine and alternator will be affected which could cause damage to them.</p>
	<p>On side panel Part of label No: 499-376/11</p>	<p><b>ONLY OPERATE ON A LEVEL SURFACE</b></p> <p>Generally the generator will only be used on a level surface. It can be used on small inclines but additional precautions may be needed to stop it moving due to vibration and this may also affect fuel autonomy.</p>
	<p>On control panel and the front of the base. Qty 2 off. Label No: 499-376/08</p>	<p><b>EARTH POINT</b></p> <p>If an earth leakage trip (RCD) or centre tapped to earth alternator is fitted an M8 brass earth stud is supplied next to the output sockets for the external earth connection.</p>
	<p>On the expansion bottle, inside the main door. Label No: 499-367/35</p>	<p><b>EXPANSION BOTTLE</b></p> <p>Coolant level should reach the bottom of the radiator filler neck and should be between the level marks on the expansion bottle.</p> <p>Filling the expansion bottle does NOT refill the cooling system</p>

	<p>On side panel</p> <p>Part of label No: 499-376/11</p>	<p><b>THIS GENERATOR SHOULD ONLY BE USED TO POWER DOUBLE INSULATED CLASS II ELECTRICAL EQUIPMENT UNLESS THE OPTIONAL EARTH LEAKAGE TRIP (RCD) IS FITTED.</b></p> <p>In the UK it is currently permissible to use small mobile generators for short periods without an external earth connection being made. But <b>ONLY</b> double insulated electrical equipment can be powered by the generator. All modern electrical equipment intended for out doors use should be double insulated and marked with the logo. </p>
	<p>On side panel</p> <p>Part of label No: 499-376/11</p>	<p><b>IF AN EARTH LEAKAGE TRIP (RCD) IS FITTED THE GENERATOR'S BRASS EARTH STUD SHOULD BE CONNECTED TO AN EXTERNAL EARTH FOR THE RCD TO WORK CORRECTLY. THIS EXTERNAL EARTH CAN BE AN EARTH SPIKE OR ANY SUITABLE EARTH POINT. THE RCD SHOULD BE TESTED DAILY BY PRESSING THE TEST BUTTON AND CHECKING IT DOES TRIP.</b></p> <p>If the generator is to be used for a fixed installation or installed on the same site for a long period it should be installed by a competent person. The User should be shown where the <b>TEST</b> button is located and shown how to use it. An earth spike kit is available as an optional extra</p>
	<p>On lower RHS of the front access panel/door</p> <p>Label part No: 499-325/89</p>	<p><b>LWA 89 dB</b></p> <p>This is the sound level. At this level the generator should not be operated in a small space occupied by people.</p>

<b>BATTERY COMPARTMENT</b>		
	<p>On the front of the base.</p> <p>Part of label No: 499-376/06</p>	<p><b>DANGER ELECTRICITY</b></p> <p>The battery is 12 V DC and care should be taken not to come into contact with the terminals.</p>
	<p>On the front of the base.</p> <p>Part of label No: 499-376/06</p>	<p><b>DANGER ACID</b></p> <p>The battery contains acid and if any liquid is seen check the source, but assume first that it is acid. Care should be taken in cleaning up acid. See Section 3 Safety.</p>
	<p>On the front of the base.</p> <p>Part of label No: 499-376/06</p>	<p><b>WARNING EXPLOSIVE MATERIAL</b></p> <p>The battery can under certain conditions give off small quantities of hydrogen gas. Do not smoke or use naked flames while working on a battery. NEVER attempt to burn a battery as a method of disposal.</p>
	<p>On the front of the base.</p> <p>Part of label No: 499-376/06</p>	<p><b>DISCONNECT NEGATIVE LEAD FIRST AND RECONNECT LAST</b></p> <p>This is to ensure that if a spanner slips you cannot create a circuit from the live battery post to the generator chassis.</p>
	<p>On the front of the base.</p> <p>Part of label No: 499-376/06</p>	<p><b>NO SMOKING OR NAKED LIGHTS</b></p> <p>The battery can under certain conditions give off small quantities of hydrogen gas. Do not smoke or use naked flames while working on a battery.</p>

	<p>On the front of the base.</p> <p>Part of label No: 499-376/06</p>	<p><b>RECYCLE</b></p> <p>The battery contains lead and sulphuric acid and should be recycled at an approved facility only and not put into a dust bin.</p>
	<p>On control side access panel</p> <p>Label part No: 499-376/32</p>	<p><b>AUTOMATIC MACHINERY – MAY START WITHOUT WARNING</b></p> <p>This is only fitted if the generator is an AMF (automatic mains failure) version intended to start the set automatically if the mains electricity fails <b>OR</b> a Remote Start Version.</p> <p>While checking the oil level or doing any type of maintenance on this generator it should be made safe so it cannot start automatically by removing the control fuse.</p>
	<p>On control side access panel</p> <p>Label part No: 499-376/20</p>	<p><b>DANGER – MOVING MACHINERY INSIDE DOOR</b></p> <p>Moving parts will be present whilst the machine is in operation. Stop the machine and isolate before removing the door/access panel.</p>
	<p>On base – front RHS</p> <p>Label No: 499-376/26</p>	<p><b>ENGINE OIL DRAIN</b></p> <p>Engine oil is drained by removing the cap on the front RHS of the base. The oil will drain easier from a warm engine. Observe correct disposal practices.</p>

	<p>On the front panel</p> <p>Label No 499-376/33</p>	<p><b>LOW FUEL SHUTDOWN</b></p> <p>The fuel gauge also incorporates a low fuel shutdown facility. The set will shut down when the level falls to approximately 10-12% of its capacity, thus eliminating the need to bleed the system at restart.</p>
	<p>On base near the fork pods. Qty 4 off.</p> <p>Label No: 499-376/01</p>	<p><b>FORK LIFT POINT</b></p> <p>The generator can be lifted from the sides or from the front or rear using a fork lift truck with correctly spaced forks.</p>

### 3.2 Electrical Safety

In addition to the information given previously the generator should be installed, earthed and used with reference to the following available from HMSO:-

- I.E.E Regulations 17<sup>th</sup> Edition (BS 7671:2004)
- Health and Safety Executive Publications GS27 Protection Against Electric Shock
- Health and Safety Executive Publications GS24 Electricity On Construction Sites
- Health and Safety Executive Publications PM53 Emergency Private Generation

Alternatively the HGI Technical Help Line would be pleased to advise on the best measures for your particular application.



This generator is NOT fully waterproof and neither the generator, nor any electrical equipment should be left outside indefinitely and operated in prolonged and heavy rain or snow. The generator is suitable to be left outside in light rain. We would NOT recommend operating hand held electrical equipment in light rain or snow.

DO NOT use a pressure washer to clean the generator as high pressure water may enter the electrical system.

**3.3 Lifting and Moving**

In addition to the information given previously the following apply:-

**3.3.1 Mechanically Assisted Lifting**

The weight has been given previously in this manual but could be 580 kg with a full fuel tank. In Great Britain all assisted lifting is governed by:-

- Lifting Operations & Lifting Equipment Regulations 1998 (LOLER) SI 1998 No: 2307

and the following publication should be observed:-

- HSE ACoP publication L113 Safe Use of Lifting Equipment, Lifting Operations and Lifting Equipment Regulations.

As a guide line only you should ensure that all lifting equipment is:-

- Sufficiently strong, stable and suitable for the proposed use.
- The load and anything attached must be suitable to be lifted.
- Positioned or installed to prevent the risk of injury, e.g. from the equipment or the load falling or striking people.
- Visibly marked with any appropriate information to be taken into account for its safe use, e.g. safe working loads.
- Accessories, e.g. slings, clamps etc. should be similarly marked.

You must ensure that a lifting operation must be planned, supervised and carried out in a safe manner by people who are competent.

No personnel should be present in an area where a mechanical lifting operation is taking place.

**3.3.2 Lifting by Fork Lift Truck**

The generator can be lifted from the sides using a fork lift truck with correctly spaced forks.

It is intended that the when lifting from the sides that the forks pass through the base assembly.

### 3.4 Hazards to Health

A list of the hazards that may affect health are included with safety precautions and first aid instructions.

Material / Location	Hazard	First Aid Measures
<p><b>Engine Oil</b></p>	<p>When hot may burn the skin but not expected to give rise to an acute hazard under normal conditions of use. May cause an allergic skin reaction in sensitive individuals. Continuous skin exposure may give rise to dermatitis.</p> <p>Gloves, overalls and eye protection should be worn when handling this product.</p> <p>Do not burn old oil as a method of disposal as combustion is likely to give rise to a complex mixture of airborne solids, liquid particulates and gases including carbon monoxide and unidentified organic and inorganic compounds.</p> <p>Old engine oil has potential health implications and should not come into contact with the skin.</p> <p>A funnel is supplied with each generator to make topping up with oil easy and clean.</p>	<p><b>Burns:</b> Rinse with clean water, cover with a sterile pad and obtain medical assistance.</p> <p><b>Skin Contact:</b> Remove contaminated clothing and wash thoroughly with soap and water. If persistent irritation occurs obtain medical attention. If the material is injected under high pressure into the body obtain medical assistance immediately.</p> <p><b>Inhalation:</b> In the unlikely event of inhalation of fumes if dizziness or nausea occurs move the individual to fresh air. If symptoms persist, obtain medical attention. If difficulties are experienced with breathing a qualified person should administer oxygen. If breathing stops give artificial respiration.</p> <p><b>Eyes:</b> In the unlikely event that the material enters the eye flush with copious quantities of clean water. If persistent irritation occurs obtain medical attention.</p> <p><b>Ingestion:</b> In the unlikely event that ingestion occurs, wash out the mouth with water and seek medical attention. Do not induce vomiting.</p>
<p><b>Diesel Fuel</b></p>	<p>May cause skin irritation. Gloves, overalls and eye protection should be worn when handling this product.</p>	<p>As for engine oil above.</p>
<p><b>Fibre Glass Insulation</b>  (over exhaust pipe duct and lining exhaust pipe box).</p>	<p>The User will not normally come into contact with this material but Service Technicians may.</p> <p>May cause skin and respiratory tract irritation.</p> <p>Gloves, overalls, dust mask and eye protection should be worn when handling this product.</p>	<p><b>Skin Contact:</b> Remove contaminated clothing and wash thoroughly with soap and water. If persistent irritation occurs obtain medical attention.</p> <p><b>Inhalation:</b> In the unlikely event of inhalation of dust or fibres if irritation of the mouth and throat occurs rinse with water. If persistent irritation occurs obtain medical attention.</p> <p><b>Eyes:</b> In the unlikely event that the material enters the eye flush with copious quantities of clean water. If persistent irritation occurs obtain medical attention.</p>



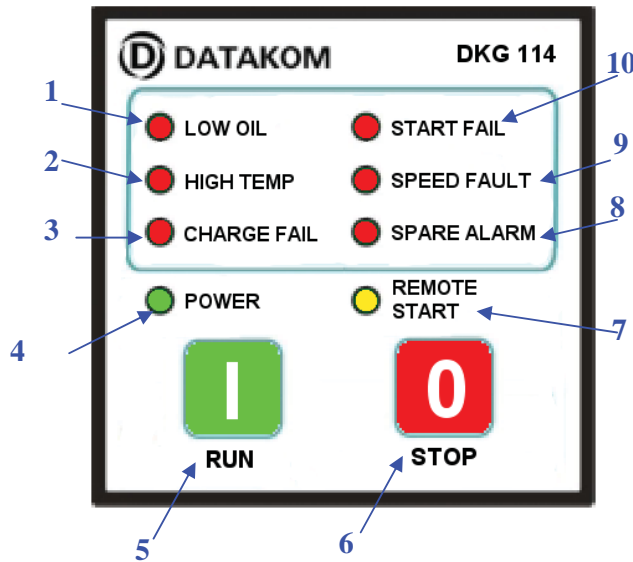
<p><b>Other insulation, gaskets and seals.</b></p>	<p>No specific hazards under normal use conditions.</p> <p>DO NOT burn as a method of disposal as combustion is likely to give rise to a complex mixture of airborne solids, liquid particulates and gases including carbon monoxide and unidentified organic and inorganic compounds which may be hazardous to health.</p>	<p>n/a</p>
<p><b>Asbestos</b></p>	<p>This generator is asbestos free.</p>	<p>n/a</p>
<p><b>Battery Acid</b></p> <p>Battery is located in the battery compartment at the front of the generator.</p>	<p>The User and Service Technicians will not normally come into contact with acid unless a battery has leaked for any reason.</p> <p>This is a concentrated sulphuric acid solution and may cause skin burns.</p> <p>Protective overalls, rubber gloves and eye protection should be worn when handling this product.</p> <p>If spilt dilute and wash away with copious quantities of water.</p>	<p><b>Skin Contact:</b> Rinse skin and contaminated clothing with copious quantities of water. If persistent irritation or blistering occurs obtain medical attention. If the material is injected under high pressure into the body obtain medical assistance immediately.</p> <p><b>Inhalation:</b> In the unlikely event of inhalation of fumes move the individual to fresh air. Obtain medical attention immediately. If difficulties are experienced with breathing a qualified person should administer oxygen. If breathing stops give artificial respiration.</p> <p><b>Eyes:</b> In the unlikely event that the material enters the eye flush with copious quantities of clean water for at least 15 minutes. Place a sterile pad over the eye and seek medical attention immediately in all cases.</p> <p><b>Ingestion:</b> In the unlikely event that ingestion occurs, wash out the mouth with water. Do not induce vomiting. If the patient is conscious give them water or milk to drink. Obtain medical attention immediately.</p>
<p><b>Exhaust Fumes</b></p>	<p>Exhaust fumes are very hot and contain carbon monoxide which can cause unconsciousness and death in humans and animals. It is odourless and tasteless but diesel exhaust fumes contain other chemicals and soot which will irritate the eyes and breathing and will usually alert the user to the presence of fumes.</p> <p>Symptoms of carbon monoxide poisoning are dizziness, nausea, fatigue and vertigo.</p>	<p><b>Skin Contact:</b> Rinse skin with water. If persistent irritation or blistering occurs obtain medical attention</p> <p><b>Inhalation:</b> In the event of inhalation of fumes move the individual to fresh air. If difficulties are experienced with breathing a qualified person should administer oxygen. If breathing stops give artificial respiration. Obtain medical attention in all cases.</p> <p><b>Eyes:</b> In the unlikely event that the fumes enter the eye flush with copious quantities of clean water for at least 15 minutes. Place a sterile pad over the eye and seek medical attention immediately in all cases.</p>

**Electric Shock**

- Assess the situation first.
- DO NOT touch the person until it is safe for you to do so.
- Identify where the electricity is coming from. DO NOT assume it is the generator
- Turn off the electricity at the source.
- To stop generators in an emergency press the RED stop button on the generator control panel or remove the plug from the socket. On Automatic Mains Failure Units (AMF) press the emergency stop button on the main control panel.
- If necessary check patients airways, administer artificial resuscitation, move the person to the recovery position.
- Even if the person remains conscious anticipate that they will pass into shock.
- Local burns where contact was made should be covered by a sterile dressing.
- Obtain medical attention immediately.

### 4.1 Engine Control Module

Figure 2 Datakom DKG114 Control Module



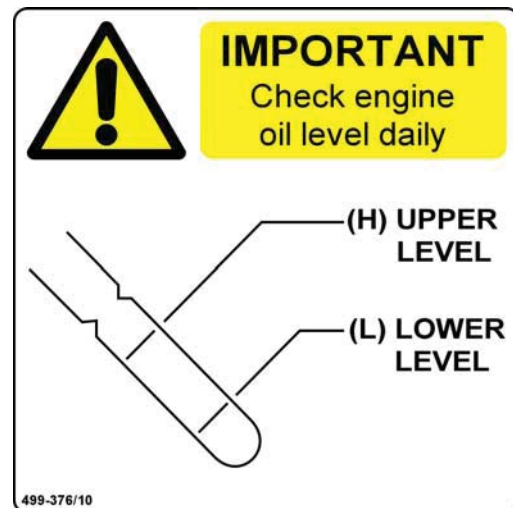
1	<b>Low Oil Pressure</b> Stops the engine if the oil pressure or fuel level is too low. It does not operate during first starting.
2	<b>High Engine Temperature</b> - Stops the engine if the temperature is too high.
3	<b>Charge Fail (battery)</b> - Stops the engine if the machine has a charging fault
4	<b>Power</b> – flashes green when unit active.
5 and 6	<b>Run and Stop buttons.</b> Press once ONLY to start or stop the engine. The unit will automatically attempt up to 3 starts. Press STOP to clear the alarms.
7	<b>Remote Start</b> – LED lights yellow when a remote start is in operation. <b>Note:</b> The engine runs-on for 2 minutes after a remote start to cool down.
8	<b>Spare alarm</b> - Not used
9	<b>Speed Fault</b> - If engine does not run at the correct speed it will close down.
10	<b>Start Fail</b> – if the engine does not start after 3 attempts it will go to an alarm.

### 4.2 Engine Oil

Check the oil level daily and top up when necessary. Check the oil level when the engine is stationary. If the generator is an AMF or Remote Start version it may automatically start without warning if the mains electricity supply fails. Make the generator safe first by removing the control fuse or remote start connection.

Do not overfill. The oil level should be as marked on the dipstick when it is screwed into the engine.

Figure 3 Engine Oil Level



Replace the engine oil after the first 50 hours, then every 200 or 300 hours of running (dependent on engine make). When changing the oil or topping-up, use oil of a grade suitable for the prevailing ambient temperatures (see table).

Drain the oil into a suitable waste oil container, and follow HSE recommendations regarding the handling and disposal of contaminated oil products. Information on the Health and Safety aspects of working with oil are contained in this manual.

#### 4.3 Starting Manually and Remotely

Check the lubricating oil level and fuel level, and top up as necessary. Do not overfill. The Oil level should be as marked on the dipstick when it is screwed into the engine.

Press the Green Run/Start pushbutton once only and after 2 seconds the starter motor will turn and the engine will crank.

If the engine fails to start within 5 seconds the Control Module will automatically attempt up to 3 starts before going to a *Start Fail* alarm. Press the Red Stop push button to clear the alarm.

If the engine does not start after three attempts investigate the cause.

For Manual Starts allow the engine to warm up for 1 minute before connecting any load to the generator output.

If the unit is fitted with the CN222 Remote Start/Stop control (Fig 4b), use the corresponding buttons on the remote unit.

For a *Remote Start* the yellow neon will light and the Control Module will attempt to start 3 times as above.

#### 4.4 Stopping Manually and Remotely

For a Manual STOP, switch off the electrical output and disconnect the load. Allow the generator to run off-load for 2 minutes to cool down. Press the red Stop/Reset push button to stop the generator.

For a Remote STOP the engine note will change as the load is transferred back to the mains or removed. The Datakom control module will keep the generator running for 2 minutes to allow it to cool down.

In an **emergency** the yellow/red Emergency Stop button should be used. Twist and pull the button to reset it.

#### 4.5 Power Output Connections

These generators will be supplied with output sockets, terminal box or other features to suit the customer's requirements. Figure 5 shows sockets.

On models with an RCD (earth leakage device), the M8 brass stud next to the output sockets should be connected to an external earth point or to an earth spike. An earth spike can be supplied as an optional extra and should be driven at least 600 mm into soil.

The RCD should be tested by pressing the TEST button and checking that the RCD trips and has to be reset while the generator is running. This should be done every day.

Connect the equipment to be powered (load) into the socket outlets on the generator control panel.

Operating the generator at low load levels for long periods of time may cause excessive smoking, reduce efficiency due to carbon build-up and cause other engine problems

Do not overload the generator as this will cause overheating, and shorten the life of the generator. Check that the total load from all equipment connected does not exceed the generator rating.

Each output socket is individually protected by an MCB (miniature circuit breaker), 15 Amps on small output sockets and 30 and 63 Amps on the larger sockets. If the current being drawn through the socket exceeds this for a short time the MCB will trip. To reset the MCB when it has tripped remove the load from that socket, wait a few minutes and then reset.

Operating the generator at low load levels for long periods of time may cause excessive smoking, reduce efficiency due to carbon build-up and cause other engine problems.

#### 4.6 Shutdown Protection Devices

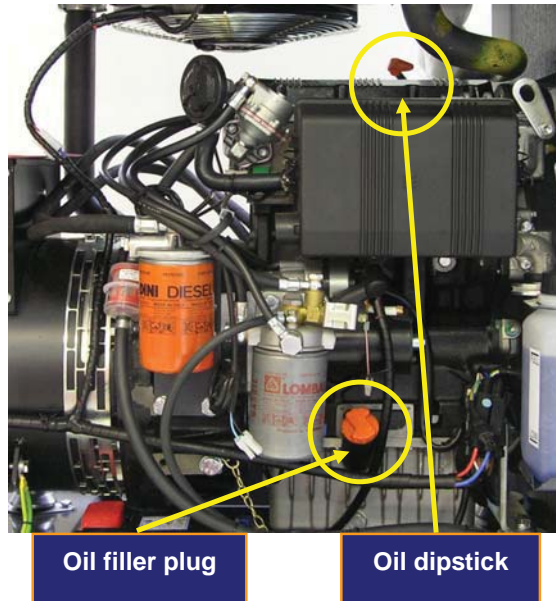
The generator is fitted with the following protection devices that will shut down the generator in the event of a fault. They are indicated by LED's on the engine control module (Fig 2).

**Start Fail.** Operates if the engine fails to start after 3 attempts. This is to help prevent damage to the starter motor. If the engine fails to start then the cause should be investigated before further attempts are made.

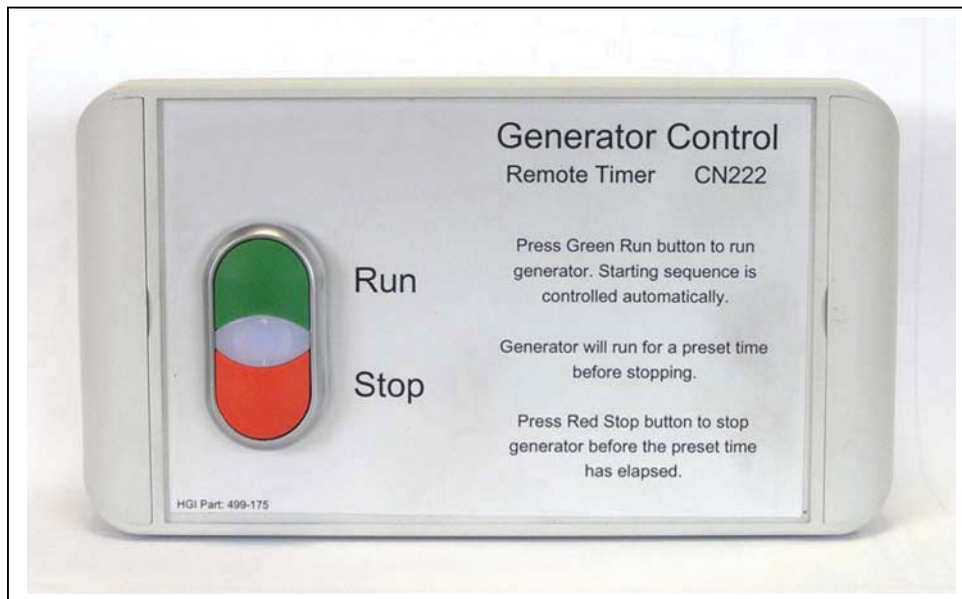
**Low Oil Pressure.** This operates if the oil pressure falls below a safe level. This can be caused by a lack of oil, wrong type of oil or high temperature. Check and top up the oil level as necessary. During starting, the alarm is held off for 10 seconds to allow the oil pressure to build up to normal running level. The engine will not crank if there is no low oil pressure signal prior to starting.

**Low Fuel Level.** The fuel gauge also incorporates a low fuel shutdown facility. Te set will shut down when the level falls to approximately 10-12% of its capacity, thus eliminating the need to bleed the system at restart.

**Figure 4a Lombardini Engine Compartment  
(Looking via access panel)**



**Figure 4b  
CN222 Remote Start/Stop Unit**



**NOTE:** For safety reasons, the battery negative lead will be disconnected prior to delivery. It is recommended that this action is repeated when moving the generator or for long term storage.

4.7 Control Panel

Fig. 5 – Control Panel



1	Hours run meter/fuel gauge	7	16A 230V AC Output Socket
2	Hours run meter AC fuse	8	Earth Connection Stud
3	Emergency Stop Switch	9	Start/Stop/Control & Indication Module
4	DC Miniature Circuit Breaker	10	Main Output MCB & RCD
5	Remote Control Socket	11	32A 230V AC Output Socket
6	Output Socket Circuit Breakers		



**5.1 Engine Fails to Start**

**IMPORTANT:** If the following checks and investigations can be completed without the use of tools then the User can safely undertake them. If tools are needed then **ONLY** trained technicians can undertake the work safely. Wiring diagrams are contained in this manual to help with electrical fault finding.

Symptom	Cause and Remedy
<p>Starter motor did not attempt to turn the engine over. No L.E.D's on the Control Module Fig 2 are lit.</p>	<p>Check the control fuse and MCB has not failed. Flat battery or wrong polarity from battery. Check that the battery is producing over 12V DC from the positive terminal relative to the chassis of the generator. Check the connections to the control module.</p>
<p>Starter motor did not attempt to turn the engine over. The Start Fail L.E.D lights.</p>	<p>Check the Emergency Stop button has not been used. The control module pulls in a slave relay to put 12V DC onto the starter motor solenoid. Check the control module is not faulty by swapping it. Check it is attempting to pull in the slave relay. Check the operation of the slave relay. Check the connections to the starter motor. Check the operation of the starter motor by making a temporary connection to its solenoid.</p>
<p>Starter motor did not attempt to turn the engine over. Oil pressure fault L.E.D is lit.</p> <p>The <b>Low Fuel</b> sensor is also connected to the Low Oil alarm but should not interfere with its normal operation.</p>	<p>The control module believes that oil pressure is present when the engine is off. Check the oil pressure switch has not gone faulty. Check the control module has not gone faulty by swapping it. Check the fuel level in the tank.</p>
<p>Engine turns over but will not start. (the Start Fail L.E.D should light after 3 attempts to start) No smoke seen from exhaust pipe.</p>	<p>Check that the fuel filter is not blocked or full of water. Check there is a 12V DC supply to the fuel solenoid valve. *Check fuel is getting past the fuel solenoid valve. *Check fuel is flowing at high pressure out of the fuel pump located next to the fuel solenoid. Suspect the fuel system is air locked or there is contamination blocking the fuel system or injector.</p>
<p>Engine turns over but will not start. (The Start Fail L.E.D should light after 3 attempts to start). Smoke seen from exhaust pipe.</p>	<p>Suspect faulty fuel supply as above. Suspect faulty fuel injector nozzle. Suspect contaminated / unsuitable fuel. Suspect starter motor is not turning engine over quickly enough particularly if the temperature is too low. Suspect serious fault with the engine.</p>

\* Care should be taken while working on the fuel system particularly when fuel is under high pressure.

### 5.2 Engine Starts but then Stops

<p>Engine starts but then closes down. No L.E.D's are lit on the Control Module.</p>	<p>Check control circuit fuse and MCB. Check battery charger circuit fuse. Check the 12V DC supplies from the battery and battery charger have not been lost. Suspect faulty control module. Swap it to check it.</p>
<p>Engine starts but then closes down. L.E.D's are lit on the Control Module.</p>	<p>Low Oil L.E.D lights. The Low Fuel sensor is also connected to this alarm. Check the fuel level and that the fuel system is not blocked or air locked. Then check for faulty fuel level switch. Check oil level then check for faulty oil pressure switch. Check the fuel solenoid valve has not closed prematurely. Check the fuel system has not become contaminated or defective as given previously.</p>
<p>Engine starts but then closes down on Speed Fault on the Control Module.</p>	<p>Speed Fault - If the engine does not run at 1800 to 3420rpm it will shut down. The most common cause of incorrect speed is air or contamination in the fuel system. Bleed the system and try starting again.</p>

### 5.3 Other Engine Faults

<p>Engine runs but makes excessive smoke and/or runs erratically.</p>	<p>Check for contaminated fuel. Check for contamination in the fuel system particularly the fuel injector nozzle. Check for blocked fuel filter or water in the filter. Check for faulty or worn fuel injector nozzle. Check for blocked air filter. Suspect serious engine fault with governor, timing or compression.</p>
<p>Battery goes flat or will not turn over the starter motor fast enough.</p>	<p>Check the fuse in the battery charging circuit has not failed. Check battery charger is delivering above 13V DC to the battery. The battery must be fitted to see this. If the unit is fitted with a refillable battery, check electrolyte level in the battery. This can be topped up with distilled water. If an external mains powered battery charger is fitted inside an AMF Panel check its operation.</p>



**5.4 No Electrical Output**

<p>Has the electrical output selector switch (if fitted) been set to the correct position.</p>	<p>For dual voltage generators there is a choice of 115V / OFF / 230V. Choose the correct setting.</p>
<p>If fitted has the earth leakage (RCD) unit tripped.</p>	<p>Before resetting disconnect all equipment plugged into the sockets. Look for any obvious reasons or faults as to why the equipment has caused the earth leakage unit to trip. Use the 115V/OFF/230V selector switch and turn to OFF. Reset the trip and reconnect and switch on equipment one piece at a time. Do not hold the suspect equipment and use the selector switch on the generator to turn the supply ON to the suspect equipment. If a piece of equipment trips the earth leakage unit repeatedly make sure it cannot be used again by removing the plug and labelling <i>Faulty / Unsafe</i>.</p>
<p>Has the miniature circuit breaker (MCB) tripped or 2-pole circuit breaker tripped or been set to OFF.</p>	<p>Each output socket has its own MCB to prevent excessive electrical load being taken through that socket. These are rated at 15 Amp for the small sockets and 30 Amps for the large sockets and they will trip in a short time if larger currents are taken through them.</p>
<p>The earth leakage unit has not tripped, the miniature circuit breakers have not tripped, the voltage selector switch is in the correct position.</p>	<p>Connect another piece of electrical equipment that is not faulty to confirm that the generator is faulty. Suspect a major fault with the alternator or its voltage regulation unit.</p>

### 6.1 Service Schedule

Service intervals will have to be reduced if the generator is operated in dusty or severe conditions. The first service is required after 50 hours from new then as given below.

Servicing must be carried out by a competent engineer. A written record of the service work should be made using the form contained in this manual or a similar form. The generator must be serviced in accordance with our recommendations for the warranty to remain valid.

DO NOT use a pressure washer to clean the generator as high pressure water may enter the electrical system. Use a damp cloth or similar

Maintenance Schedule <b>Lombardini</b>	Daily Checks	After the first 50 hours	Every 3 months or 300 hours	Every 6 months or 600 hours	Every 12 months or 1200 hours
Check & replenish fuel	✓				
Check & replenish engine oil	✓				
Check fuel filter for dirt and water	✓				
Check coolant level	✓				
Check battery fluid level (if refillable)	✓				
Check for oil and fuel leaks	✓				
Check operation of earth leakage unit (RCD) trip (if fitted).	✓				
Check the hours run meter works	✓				
Change engine oil		✓	✓		
Replace oil filter		✓	✓		
Replace fuel filter			✓		
Check air filter & clean	✓				
Replace air filter			✓		
Adjust valve clearances				✓	
Replace coolant					✓
Check radiator hoses & clamps			✓		
Check intake air hoses & clamps			✓		
Replace fan belt				✓	
Check fan belt tension		✓	✓		
Check operation of MCBs				✓	
Control Module Safety Shut Down				✓	
Battery Charger (where fitted)				✓	
Canopy				✓	
General Inspections				✓	

**6.2 Engine Oil & Coolant**

- Check the oil level daily and top up if necessary.
- Check the oil level when the engine is stationary and on a level surface.
- Do not overfill. The oil level should be as marked on the dipstick when it is pushed into the engine.
- Replace the oil as recommended. When changing the oil or topping-up, use oil of grade suitable for the prevailing ambient temperatures (Check engine manuals).
- Check the coolant level daily and top up if necessary.
- Check the radiator and hoses for signs of damage or leaks.
- Check the cap and seal for signs of damage.
- Check the coolant level when the engine is stationary and on a level surface.
- Do not overfill. The coolant level should be as marked on the expansion bottle.
- Replace coolant every 12 months or as specified.
- Drain the waste fluids into suitable waste containers, and follow HSE recommendations regarding the handling and disposal of contaminated oil products.

**6.3 Fuel System**

- Check the semi-transparent pre-filter for signs of water contamination and replace is necessary.
- Change the main filter in accordance with the engine manufacturer's schedule and instructions.

**6.4 Valve Clearances**

- Valve Clearances should be checked as specified by the engine manufacturer. Refit the rocker cover with a new gasket.

**6.5 Battery**

- Check the level of the battery electrolyte every day (where possible). This should cover the plates. The battery is a maintenance free unit and should not require the electrolyte being topped up.
- Check that the positive and negative terminals are tight and secure, and free from corrosion. Lightly coat them with petroleum jelly or similar to protect from corrosion.

- Check that the battery securing strap/clamp is tight and the battery is held firmly.

**6.6 Alternator**

- Ensure that the cooling air vents do not become blocked by dirt, debris etc.

**6.7 Earth Leakage Unit/RCD**

- The earth leakage unit has a self test button which can be used to apply a fault and to check that the unit trips out when the generator is running.

**6.8 Control Module Safety Shut Down**

- This module will prevent the generator from starting or shut it down if faults occur. Check the following:-
- Hours Run Counter: Confirm counter is working with the engine running.
- Over cranking: Remove the 12V DC supply to the starter motor solenoid and attempt to start. After 3 attempts the Control Module should stop and show an alarm.
- Low Oil Pressure: With the engine off, remove the connection to the normally closed oil pressure switch and attempt to start the engine. The Control Module should see an open circuit representing oil pressure when there should be none and prevent starting.
- With the engine running short the oil pressure switch to the generator chassis to simulate loss of oil pressure and the module should shut down the engine and show an alarm.
- Low Fuel Level: The sensor is connected to the low oil alarm circuit. With the engine running allow the fuel tank to run out of fuel and the engine should stop and the Low Oil alarm should be seen. Refill with fuel and the engine should start and run normally.

**6.9 Battery Charger**

- If an external mains powered battery charger is installed in an AMF panel isolate it.
- Stop and start the engine a few times if needed to draw off the battery.
- Start the engine and allow it to run for 5 minutes and check that the engine's battery charger is delivering at least 13V DC into the battery.
- If an external mains powered battery charger is installed in an AMF panel check its operation.

**6.10 Canopy**

- Check security of fixings and fasteners on the machine.
- Lubricate hinges and latches with light machine oil.
- Ensure that the inlet and outlet louvers are kept clean and unimpeded at all times.
- Check that no sound insulation has become loose and obstructed them.
- The engine should be sucking in air from outside the canopy. With the front panel removed, check the foam seal is complete all around this compartment and air can only be drawn from outside the set.

**6.11 General Inspections**

- Air Filters are subject to the operating environment and as such should be inspected daily, cleaned as required and replaced when cleaning becomes ineffective regardless of operating hours.
- Refer to the engine manufacturer's manual for more details.

**6.12 Canopy**

- Inspect generally for :-
- Fuel, Coolant, and Oil Leaks: Look for excessive oil in the base tray. Look for weeps from hoses and connections.
- Worn or Failed Anti Vibration Mounts: When the side panels are removed rock the engine and check all four anti vibration mounts are flexing slightly and have not failed or broken up.
- Damaged or missing insulation and seals: Generally look at the sound insulation and seals and check it is still securely fitted and has not deteriorated.
- Missing Safety Labels: These labels are a mandatory safety requirement and if any are missing or not easy to read they should be replaced. Full details of all labels are contained in this manual. A replacement label kit is available.
- Chaffing or Stretching of Cables: Inspect all cables and connections and look for obvious signs of wear or damage.
- Lifting Points: Inspect the lifting points for obvious signs of wear, damage or distortion.
- Signs of Over Heating: Look for obvious deterioration due to heat and investigate the cause and rectify as necessary.

**6.12 Maintenance Record Sheet**

Photocopy this page and use it as a service record.

<b>COMPACT WELF-AIR GENERATOR MAINTENANCE RECORD SHEET</b> (for use by owner / service agent)	
<b>Name of owner:</b> <b>Address:</b>	<b>Name of service organisation:</b> <b>Address:</b>
<b>Order No:</b>	<b>Job No:</b>
<b>GENERATOR DETAILS ( From Data Plate )</b>	<b>Date of service:</b>
<b>Model:</b> <b>Serial No:</b> <b>Code:</b> <b>Year of Manufacture:</b> <b>Rated Power:</b> <b>Power Factor PF:</b> <b>Voltage (Current):</b> <b>Fuel type:</b>	<b>Hours run meter reading:</b> _____ hrs <b>Service Daily / 50hrs /</b> 3 months 200 (300)hrs / 6 months 400 (600)hrs <b>General Condition:</b>
<b>Daily Checks:</b> 1 Fuel level checked Yes/No 2 Oil level and coolant checked Yes/No 3 Battery liquid level correct? Yes/No 4 Check for oil / fuel leaks Yes/No 5 Check RCD works (if fitted) Yes/No 6 Check fuel filter not contaminated Yes/No	<b>6 months cont ...</b> 10 Check operation of Control Module Yes/No a) Hours run meter is running Yes/No b) Over cranking cut out works Yes/No c) Low oil pressure shut down works Yes/No d) Low fuel shut down works Yes/No 11 Check Canopy Yes/No a) All fixings secure Yes/No b) Inlet/outlet air louvres clear Yes/No c) Confirm all seals in the engine compartment sound and serviceable Yes/No d) No signs of over heating Yes/No 12 General checks Yes/No a) Anti vibration mounts are serviceable Yes/No b) All insulation/seals fitted & serviceable Yes/No c) All safety labels are fitted Yes/No d) All cables and connections sound Yes/No e) Exhaust system sound and serviceable Yes/No
<b>After first 50 hours from new.</b> <b>Every 3 Months or 200 (300) hrs Service</b> 1 Complete Daily Checks Yes/No 2 Change the engine oil Yes/No 3 Clean the oil filter Yes/No 4 Check the air filter clean Yes/No	
<b>Every 6 Months 400 (600) hrs Service</b> 1 Complete Daily Checks Yes/No 2 Complete 400 (600) hrs service Yes/No 3 Check battery terminals and fixing Yes/No 4 Replace fuel filter Yes/No 5 Replace air filter Yes/No 6 Set engine valve clearances Yes/No 7 Check alternator brushes & slip rings Yes/No 8 Check alternator vents are clear Yes/No 9 Check operation of all MCB's Yes/No	
<b>Spare parts used:</b>	
<b>Notes:</b>	
<b>Signed:</b>	<b>Representing:</b>
<b>Date:</b>	

**7.1 Contact Details**

<b>General Enquiries and Sales Department</b> Clarke International Hemnall Street, Epping, Essex, CM16 4LFG Tel: 01992 565333 Fax: 01992 561562 www.clarkeinternational.com Email: sales@clarkeinternational.com	<b>Parts Department</b> Tel: 020 8988 7400
<b>Service Department</b> (Staffed by Service Engineers who will also help with technical questions relating to the operation, servicing and fault finding of the generator). Tel: 020 8988 7400	<b>Export Department</b> Tel: 00 44 (0)1992 565335

**7.2 Spare Parts List (main items only)**

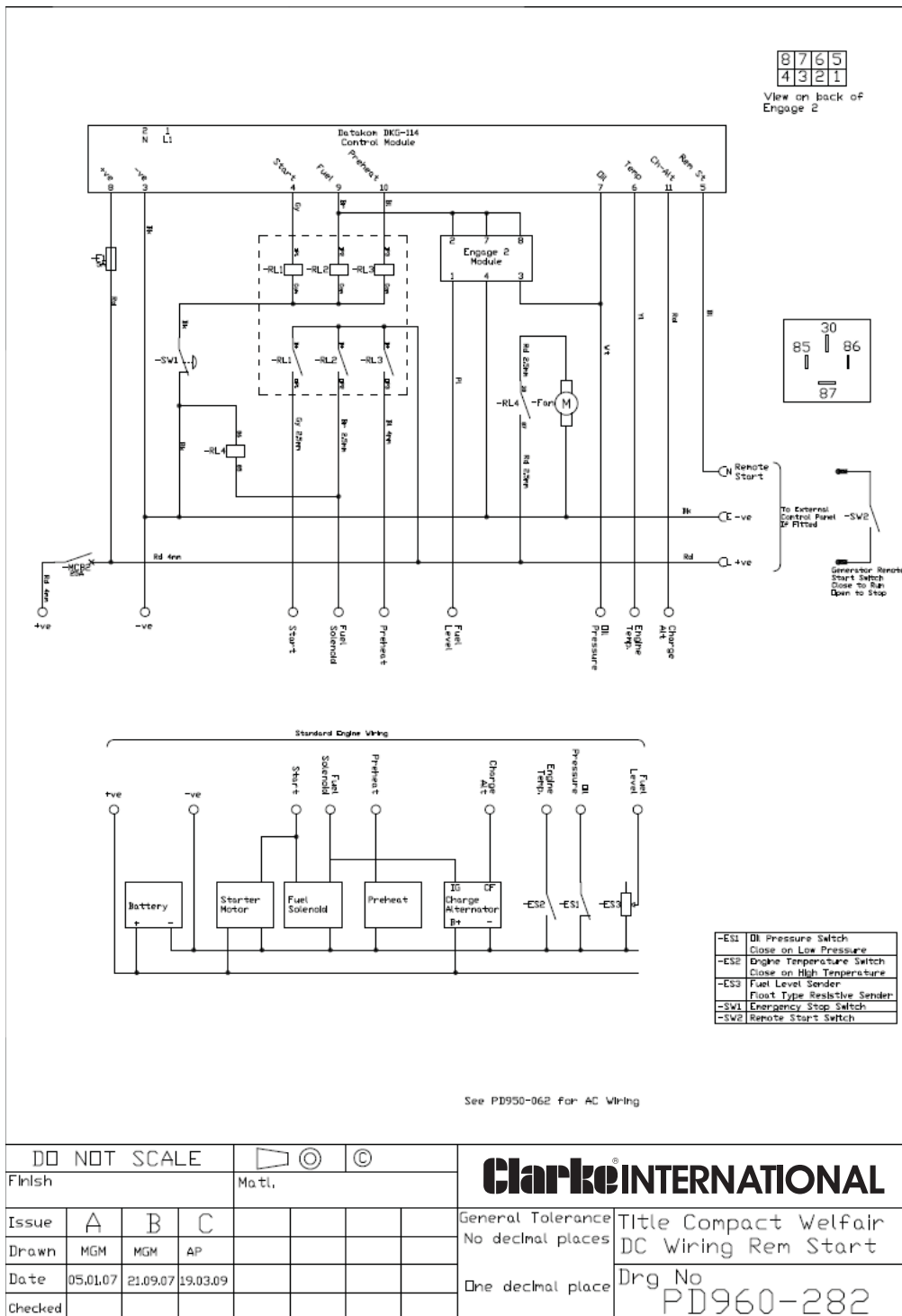
Part Description	Part Number
<b>Engine</b>	<b>Lombardini</b>
Air filter element	LM2175164
Oil filter element	LM2175104
Fan belt	LM2400305
<b>Other Fuel System</b>	
Fuel filter element	LM2175046
<b>Electrical</b>	
Earth leakage (RCD) unit	110-532
Miniature circuit breaker (MCB) 15 Amp (same part used on 115V and 230V outputs)	110-015
Miniature circuit breaker (MCB) 30 Amp (same part used on 115V and 230V outputs)	110-030
Control Module Type Datakom DKG114	125-150
Fuse for control circuit 5 Amp	100-005
2 pole MCB 25A	110-225
<b>General</b>	
Battery 12V 44Ah	120-015
Anti vibration mounting (4 no.)	070-504

**8.1 Long Term Storage**

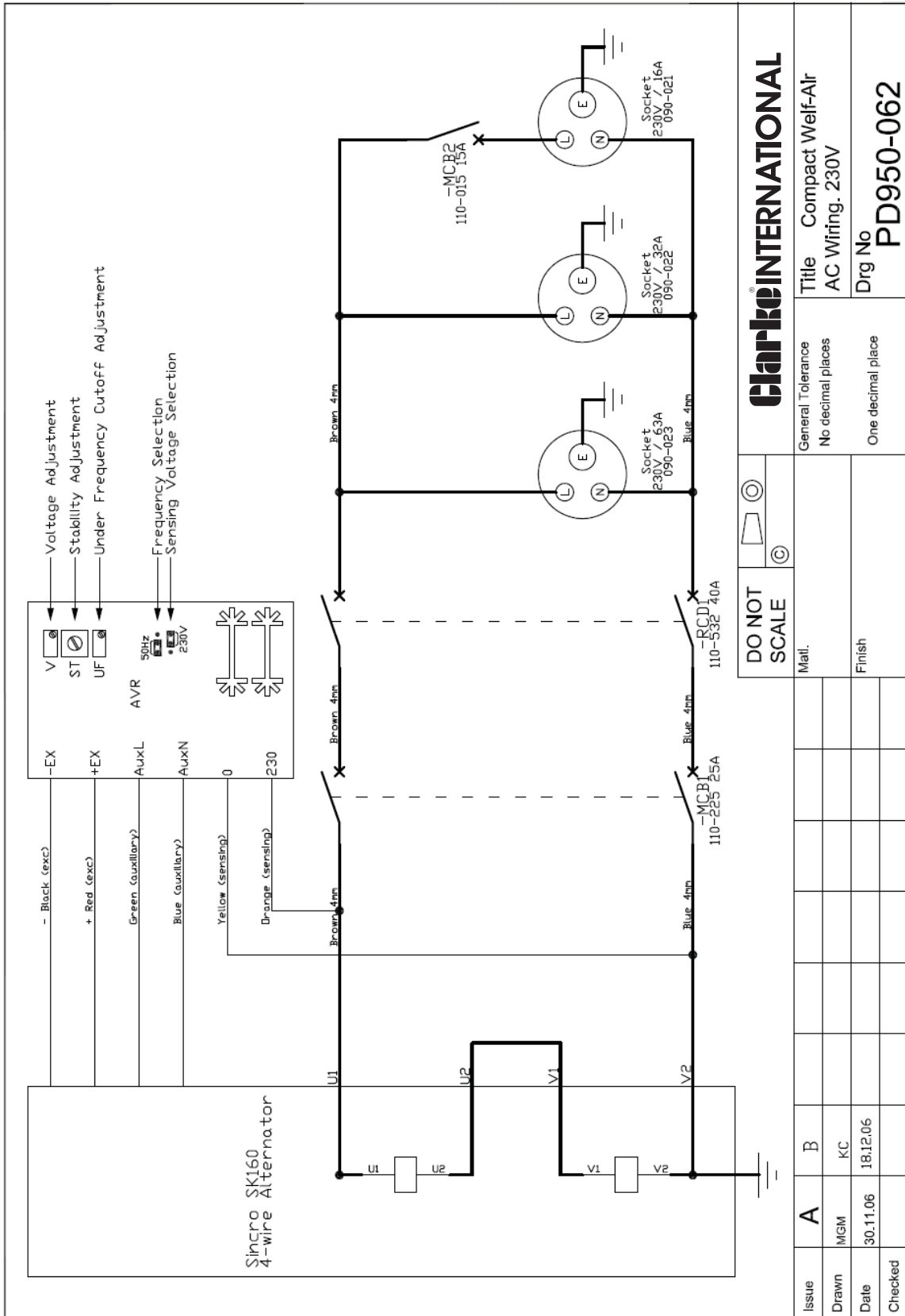
<p><b>Engine</b></p>	<p>Do not run the generator out of fuel. If the engine runs out of fuel the fuel system will become air locked and will have to be bled before the engine will restart. Leave a small quantity of fuel in the fuel tank. Drain any water from the water separator / filter. Run the engine for a few minutes and drain the warm oil and fill with new oil as for a normal service.</p>
<p><b>Alternator</b></p>	<p>No special requirements other than store in a dry well ventilated place. If the generator has been stored for a considerable period of time e.g. several years the alternator insulation winding resistance should be checked as they can absorb moisture. The insulation resistance must be at least 2 MΩ (two mega ohms). If it is less than this then the alternator windings can be dried out by placing the alternator in an oven at 60-70°C for a few hours with plenty of air movement. Generally if this procedure is required consider replacing the alternator.</p>
<p><b>Electrical</b></p>	<p>No special requirements other than store in a dry well ventilated place.</p>
<p><b>Battery</b></p>	<p>The battery should be fully charged before storage. Make sure the fluid level in the battery is at the normal level before storing. Disconnect the negative then the positive connections. It would be beneficial to trickle charge the battery periodically to maintain its condition.</p>
<p><b>General</b></p>	<p>Store in dry well ventilated place. If the generator is to be stored long term it would be beneficial to start and run the generator under electrical load for half an hour every three months and then store as above ( but no need to change the oil each time or disconnect the battery ).</p>

9.0 Electrical Wiring Diagrams

The most common wiring diagrams will be sent out with the machine. Check for the appropriate diagram by looking at the wiring diagram numbers on the Data Plate. If the generator was built to the special electrical requirements of the customer the correct wiring diagram will have been sent out with the generator when new. Duplicates are available from our Technical Help Line.







**Clarke<sup>®</sup>INTERNATIONAL**

DO NOT SCALE

Issue	A	B							
Drawn	MGM	KC							
Date	30.11.06	18.12.06							
Checked									
Matl.									
Finish									
General Tolerance		No decimal places							
Title		Compact Well-Air AC Wiring. 230V							
Drg No		PD950-062							





# WARRANTY STATEMENT

Clarke Generators are covered by a 12 month or 1,000 hours warranty, whichever occurs the soonest for sets operating at 3000rpm. At 1500rpm generators are covered for 2000 hours or one year, whichever is the sooner. Where a product is to be used in adverse conditions or for prolonged duration, a shorter period may apply. This does not affect your statutory rights (Consumer Protection Act 1987).

The manufacturer's warranty will not apply in the following circumstances:

1. If the product has suffered customer or user abuse.
2. Damage by accident or deliberate misuse.
3. Lack of maintenance.
4. Failure to ensure the machine has received reasonable care and attention.
5. Fitment of unauthorized parts or accessories.

Contact Clarke International for instruction on an appropriate course of action for equipment failures during the warranty period. This may be one of the following;

i) Goods to be returned to the local dealer/ supplier (or alternatively a site visit by dealer/ supplier at his option). All warrantable parts etc. and full technical support supplied FOC from the factory.

or:

ii) Goods can be returned direct to our factory by the customer. Full parts and labour repairs carried out in our workshops. Goods returned to customer at our expense. An order number will be required to cover non-warrantable work. A 'Returns Number' should be obtained prior to returning product.

## Notes

All parts supplied FOC are on condition that faulty parts are returned to the factory within 14 days of replacement and subject to factory examination for valid claims.  
Failures due to wear and tear and accidental damage are not covered.

Equipment supplied for operation outside the UK mainland will normally be dealt as described in (i) or (iii) above.

Limited warranty applies in special circumstances where equipment operates in extreme environmental conditions and/or for extended periods. Consult the factory.

On-site and extended warranty terms are available. Please contact the factory for details.

The Company will not be held responsible for consequential losses, or costs incurred by the customer during a warranty repair. The Company will not accept claims of compensation.

### Issue A