LIGHTING TOWER
SIMAQ NIGHTMASTER 350 LED

OPERATION AND MAINTENANCE MANUAL

ConstruMarket

CONTENTS

FOREWOR

Nothing contained in this document is intended to extend any promise, warranty or representation, expressed or implied, regarding lighting tower described herein.

The use of the machine in any of the situation types listed in table 1
a)Is not approved by manufacturer
b)May impair the safety of users and other persons
c)May prejudice any claims made against manufacturer.

TABLE 1
Use of the machine exceeding the ambient temperature range specified in the *GENERAL INFORMATION SECTION* of this manual.
This machine is not intended and must not be used in potentially explosive atmosphere, including situations where flammable gases or vapors may be present.
Use of the machine with safety or control components missing or disabled.
Lighting tower
Use of the machine to supply load(s) greater than those specified.
Use of unsafe or unserviceable electrical equipment connected to the machine.
Use of electrical equipment: (a) Having incorrect voltage and/or frequency ratings. (b)Containing computer equipment and/or similar electronics.

WARRANTY

The warranty Period is based on the purchasing date and operation time. The one which is due first is used as the criterion, unless different specific regulations are made in this manual or in relevant commercial contracts.

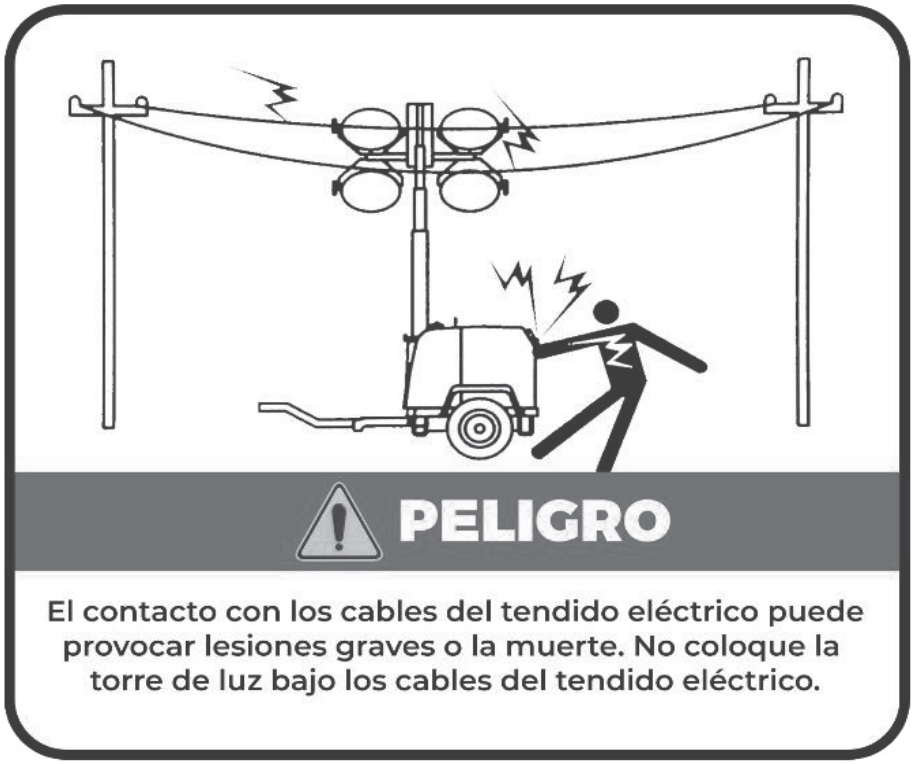
- ·1000 working hours, or
  ·Twelve months

The time which occurs first is used as the criterion.

The above warranties do not apply to failures occurring as a result of abuse; misuse, negligent repairs, corrosion, erosion and normal wear and tear, alterations or modifications made to the product without express written consent of manufacturer; or failure to follow the recommended operating practices and maintenance procedures as provided in the product's operating and maintenance publications.

DECALS

GRAPHIC FORM AND MEANING OF ISO SYMBOLS



ADVERTENCIA

- Opere este equipo en superficies niveladas.
- Siempre use gafas, guantes, casco y botas de protección.
- Lea y entienda el manual de instrucciones antes de usarlo.
- Este equipo no debe de ser remolcado en carretera, su traslado debe de ser sobre la plataforma de un camión o pick up debidamente asegurado.

GENERAL INFORMATION

WARNINGS
Warnings call attention to instructions which must be followed precisely to avoid injury or death.

CAUTIONS
Cautions call attention to instructions which must be followed precisely to avoid damaging the product, process or its surroundings.

NOTES
Notes are used for supplementary information.

General Information

Never operate the unit without first observing all safety warnings and carefully reading the operation and maintenance manual shipped from the factory with this machine.

Ensure that the Operation and Maintenance manual, and the manual holder, are not removed from the machine.

Ensure that maintenance personnel are adequately trained, competent and have read the Maintenance Manuals.

This machine is not designed for operating life sustaining equipment. It is equipped with a safety shutdown system that will cause the machine to stop operating whenever a shutdown condition is present.

Hazards may exist on the jobsite should this unit shutdown automatically and all lamps be extinguished. Personnel should be advised of this and have additional lighting.

Hot pressurized fluid – remove cap slowly to relieve PRESSURE from hot radiator. Protect skin and eyes. HOT water or steam and chemical additives can cause serious personal injury.

Electrical shock hazard will cause severe injury or death. Do NOT operate the place light tower under electric power lines.

Improper operation of this machine can result in severe injury or death.

Hazardous Voltage can cause serious injury or death.

Never inspect or service the unit without first disconnecting battery cable(s) to prevent accidental starting.

Wear eye protection while cleaning unit with compressed air, to prevent debris from injuring eyes.

Do not enter ballast box while engine is running. Do not steam clean ballast box. Capacitor/Ballast can cause severe injury.

Do not operate lights with broken or missing lens or broken glass bulb. Ultra violet radiation can cause serious skin burn and eye inflammation.

Do not place hand in tower recess while tower is being lowered or raised. Pinch points can cause severe injury.

Ground equipment in accordance with applicable codes. (Consult local electrician).

Do not operate electrical equipment while standing in water, on wet ground, with wet hands or shoes.

Use extreme caution when working on electrical components. Battery voltage (12V) is present unless the battery cables have been disconnected. Higher voltage (potentially 500 volts) is present at all times when the engine is running.

Always treat electrical circuits as if they were energized.

Before attempting any repair service, disconnect all leads to electrical power loads.

Do NOT connect or disconnect lamps while the engine is running. Make sure that all protective covers are in place and that the canopy/doors are closed during operation.

The specification of this machine is such that the machine is not suitable for use in flammable gas risk areas. If such an application is required then all local regulations, codes of practice and site rules must be observed. To ensure that the machine can operate in a safe and reliable manner, additional equipment such as gas detection, exhaust spark

arrestors, and intake (shut-off) valves may be required, dependent on local regulations or the degree of risk involved.

A weekly visual check must be made on all fasteners/fixing screws securing mechanical parts. In particular, safety-related parts such as coupling hitch, drawbar components, road-wheels, and lifting bail should be checked for total security.

All components which are loose, damaged or unserviceable, must be rectified without delay.

This machine produces loud noise with the doors open or service valve vented. Extended exposure to loud noise can cause hearing loss. Always wear hearing protection when doors are open or service valve is vented.

Do not use petroleum products (solvents or fuels) under high pressure as this can penetrate the skin and result in serious illness. Wear eye protection while cleaning unit with compressed air to prevent debris from injuring eye(s).

Rotating fan blade can cause serious injury. Do not operate without guard in place.

Use care to avoid contacting hot surfaces (engine exhaust manifold and piping, air receiver and air discharge piping, etc.).

WARNING: Under no circumstances should volatile liquids such as Ether be used for starting this machine.

Never operate unit with guards, covers or screens removed. Keep hands, hair, clothing, tools blow gun tips, etc. well away from moving parts.

Do not alter or modify this machine.

Materials

The following substances may be produced during the operation of this machine:

. Brake lining dust
. Engine exhaust fumes

AVOID INHALATION

Ensure that adequate ventilation of the cooling system and exhaust gases is maintained at all times.

The following substances are used in the manufacture of this machine and may be hazardous to health if used incorrectly:

- engine lubricant
- rust preventative
- diesel fuel
- battery electrolyte

AVOID INGESTION, SKIN CONTACT AND INHALATION OF FUMES

Safety data sheets for engine lubricants should be obtained from the lubricant supplier.

Never operate the engine of this machine inside a building without adequate ventilation. Avoid breathing exhaust fumes when working on or near the machine.

This machine may include such materials as oil, diesel fuel, antifreeze, brake fluid, oil/air filters and batteries which may require proper disposal when performing maintenance and service tasks. Contact local authorities for proper disposal of these materials.

When recycling or disposing of any electrical components, light bulbs etc., do not mix with general waste.

There is a separate collection system for used electronic products in accordance with legislation that requires proper treatment, recovery and recycling.

Please contact your local authorities for the correct method of disposal or recycling

Battery

A battery contains lead-acid and can give off gases which are corrosive and potentially explosive. Avoid contact with skin, eyes and clothing. In case of contact, flush area immediately with water.

DO NOT ATTEMPT TO SLAVE START A FROZEN BATTERY SINCE THIS MAY CAUSE IT TO EXPLODE.

Radiator

Hot engine coolant and steam can cause injury. Ensure that the radiator filler cap is removed with due care and attention.

Do not remove the pressure cap from a HOT radiator. Allow radiator to cool down before removing pressure cap.

Generator sets

The generator set is designed for safety in use. However, the responsibility for safe operation rests with those who install, use and maintain it. The following safety precautions are offered as a guide, which, if conscientiously followed, will minimize the possibility of accidents throughout the useful life of this equipment.

.Operation of the generator must be in accordance with recognized electrical codes and local health and safety codes.

The generator set should be operated by those who have been trained in its use and delegated to do so, and who have read and understood the operation manual. Failure to follow the instructions, procedures and safety precautions in the manual may increase the possibility of accidents and injuries.

Do not start the generator set unless it is safe to do so. Do not attempt to operate the generator set with a known unsafe condition.

Fit a danger notice to the generator set and render it inoperative by disconnecting the battery and disconnecting all ungrounded conductors so others who may not know of the unsafe condition will not attempt to operate it until the condition is corrected.

The generator set should only be used with the earth point connected directly to the general earth/ground mass.

WARNING: DO NOT OPERATE THE MACHINE UNLESS IT HAS BEEN SUITABLY EARTHED.

Do not make contact with electrically energized parts of the generator set and/or interconnecting cables or conductors with any part of the body or with any non-insulated conductive object.

Make sure the generator set is effectively grounded in accordance with all applicable Regulations prior to attempting to make or break load connections and prior to attempting operation.

Keep all parts of the body and any hand-held tools or other conductive objects, away from exposed live parts of the generator set engine electrical system. Maintain dry footing, stand on insulating surfaces and do not contact any other portion of the generator set when making adjustments or repairs to exposed live parts of the generator set engine electrical system.

Close and lock all access doors when the generator set is left unattended.

Do not use extinguishers intended for Class A or Class B fires on electrical fires. Use only extinguishers suitable for class BC or class ABC fires.

Keep the towing vehicle or equipment carrier, the light tower, tools and all personnel at least 3 meters from all power lines and buried power cables.

Attempt repairs only in clean, dry, well lighted and ventilated areas. Connect the generator set only to loads and/or electrical systems that are compatible with its electrical characteristics and that are within it's rated capacity.

Transport

When loading or transporting machines, ensure that the specified lifting and tie down points are used.

When loading or transporting machines ensure that the towing vehicle, its size, weight, towing hitch and electrical supply are all suitable to provide safe and stable towing at speeds either, up to the legal maximum for the country in which it is being towed or, as specified for the machine model if lower than the legal maximum.

Ensure that the maximum trailer weight does not exceed the maximum gross weight of the machine (by limiting the equipment load), limited by the capacity of the running gear.

Note:

Gross mass (on data plate) is for the basic machine and fuel only, excluding any fitted options, tools, equipment and foreign materials.

Before towing the machine, ensure that:-

- The tyres and towing hitch are in a serviceable condition.
- The canopy is secure.
- All ancillary equipment is stored in a safe and secure manner.
- The brakes and lights are functioning correctly and meet necessary road traffic requirements.
- Break-away cables/safety chains are connected to the towing vehicle.

The machine must be towed in a level attitude in order to maintain correct handling, braking and lighting functions. This can be achieved by correct selection and adjustment of the vehicle towing hitch and, on variable height running gear, adjustment of the drawbar.

To ensure full braking efficiency, the front (towing eye) section must always be set level.

When adjusting variable height running gear:-

Ensure front (towing eye) section is set level

When raising towing eye, set rear joint first, then front joint.

When lowering towing eye, set front joint first, then rear joint.

After setting, fully tighten each joint by hand and then tighten further to the next pin. Refit the pin.

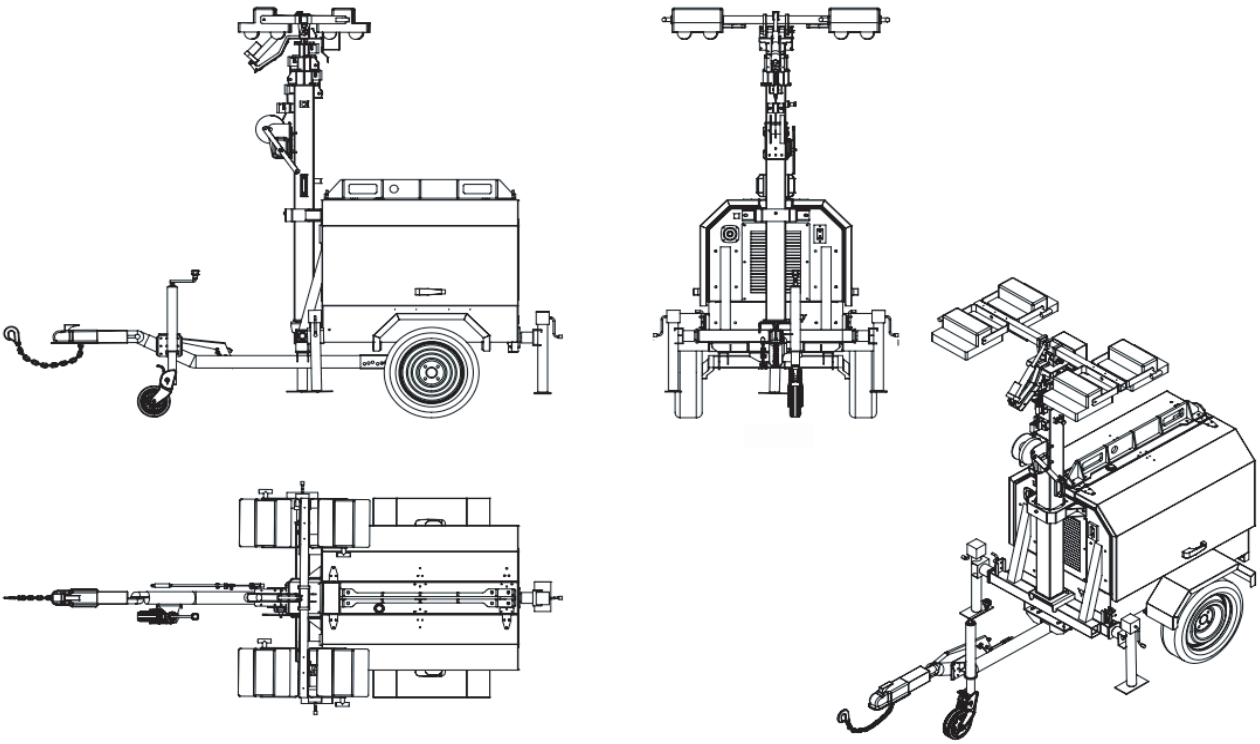
When parking always use the handbrake and, if necessary, suitable wheel chocks.

Make sure wheels, tyres and tow bar connectors are in safe operating condition and tow bar is properly connected before towing.

Do not store or transport hazardous or combustible materials in or on this unit.

Do not suspend this machine with other equipment hanging from the running gear.

Three view of the lighting tower



14 OPERATING INSTRUCTION

COMMISSIONING

Ensure that all transport and packing materials are all complete.

Ensure that the correct fork lift truck slots or marked lifting / tie down points are used whenever the machine is lifted or transported.

When selecting the working position of the machine ensure that there is sufficient clearance for ventilation and exhaust requirements, observing any specified minimum dimensions (to walls, floors etc.).

Adequate clearance needs to be allowed around and above the machine to permit safe access for specified maintenance tasks.

Ensure that the machine is positioned securely and on a stable foundation. Any risk of movement should be removed by suitable means, especially to avoid strain on any rigid discharge piping.

Lighting tower has a negative pole switch, customers cannot connect the battery cable, and customers can directly switch the negative pole switch.

SET–UP (PRIOR TO RAISING MAST)

1. Make sure the lighting tower is in a horizontal position.
2. Inspect cables. Cables should not be frayed, cut, abraded, or otherwise damaged. Replace damaged cables.
3. Check hydraulic oil level. Fill if necessary / as required.
4. Ensure no obstruction is overhead within 15 meters.
5. Be sure lamps are secure on cross bar and position as desired.
6. Level unit using jacks and bubble level indicator.

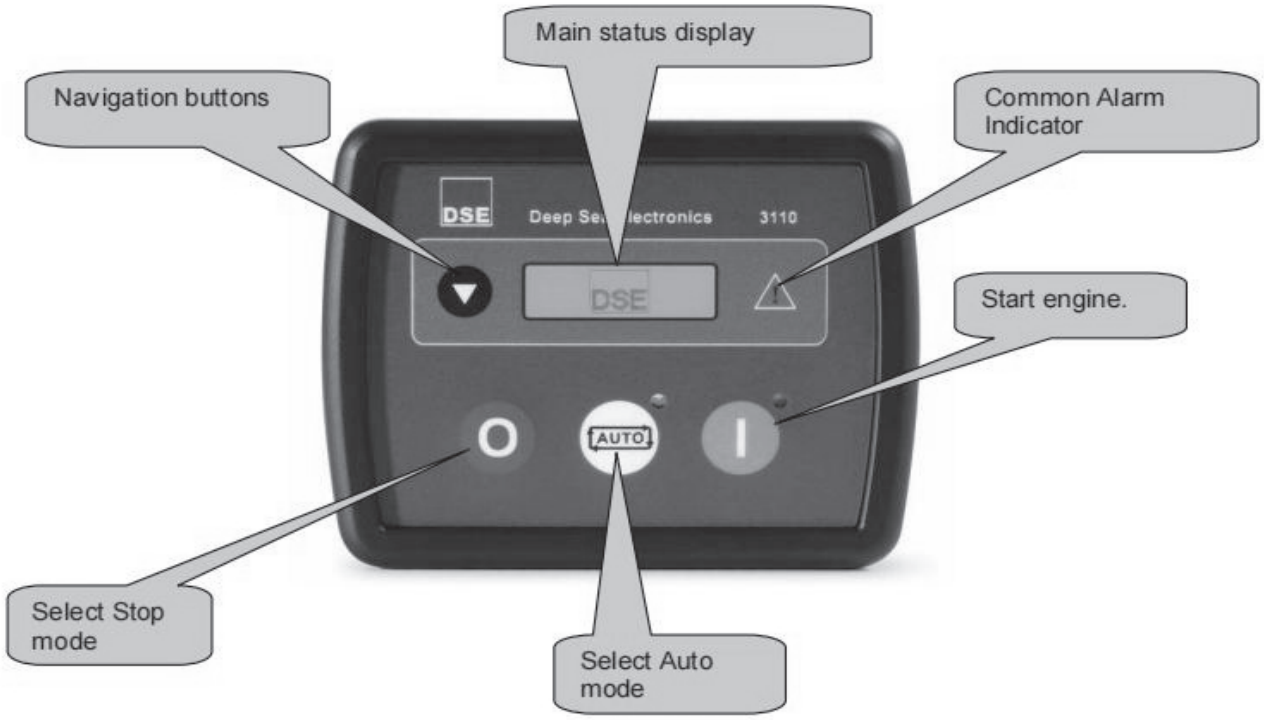
BEFORE STARTING THE ENGINE

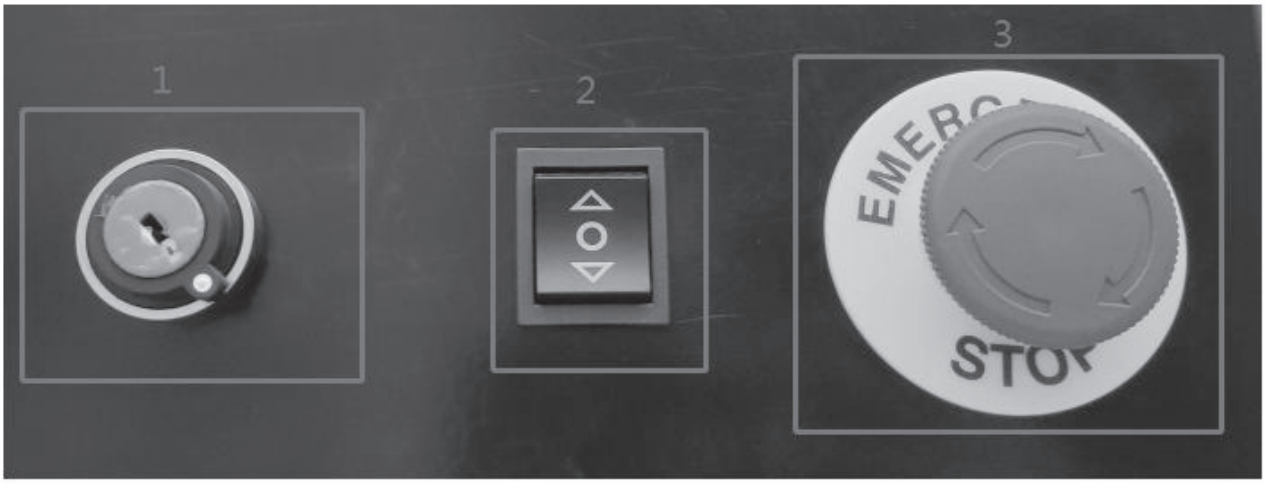
Before starting the engine, carry out the following checks:

1. Engine oil level: Add as specified.
2. Engine coolant level: Add as specified.
3. Fuel/water filter: Drain any accumulation of water. Clean or replace element as required.
4. Fuel level in tank: Fill, using CLEAN DIESEL fuel, at the end of the day to minimize condensation.
5. Battery: Keep terminals clean and lightly greased.
6. Engine belts and hoses: Check for proper fit and/or damage. Service as required.
7. Air Vents/Grilles: Both engine radiator and generator cooling air Check for obstructions (leaves, paper, etc.).
8. Visual inspection: Check for excessive fluid leaks, evidence of arcing around control panel, loose wire-routing clamps, etc.

CAUTION: *Call a qualified person to make electrical repairs.*

OPERATING INSTRUCTION





Reference	Description	Function
1	Power switch	Supply Power
2	Light switch	Control the angle of light
3	Emergency	Stop lighting tower in case of emergency

OPERATING INSTRUCTION

STARTING THE ENGINE

1. Turn the control system power button green.
2. Press the engine start button to start the engine.
3. Allow the engine to warm up for 3 to 5 minutes.

WARNING: Keep side doors closed for optimum cooling and safety of unit while running.

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NOTE: The engine in this unit is protected with sensors for high coolant temperature and low oil pressure. Should either of these conditions occur, the engine will automatically stop causing a loss of power to all lamps. Before restarting the unit, check the fuel level and engine/radiator thoroughly and correct the problem. The lamps should not be restarted in 15 minutes.

LIGHTING THE LAMPS

When the engine speed is stable, close the main switch, and then close the lamps switch one by one, with special attention, each lamp switch close again after the before lamp light up completely.

NOTE: If the lights are turned off, they should not be restarted for 15 minutes.

OPERATING INSTRUCTION

MAST OPERATION

WARNING: Check that no person is behind the machine (within 10m) while the tower is raised or lowered.

Check that no obstruction is overhead.

Before operating the mast, inspect the cable for damage. Replace damaged cables if necessary.

Before and during all mast operation, ensure the area is clear of persons and obstructions within a 2m radius.

When the mast has reached its maximum travel height, immediately release the control switch, to avoid cable over tension.

Raising the tower

1. Remove the transport straps and mast locks
2. Start the engine.
3. Use the mast control switch to raise the tower.
4. Rotate the tower to the desired position.

Adjust the Angle of lamps and lanterns

1. If need lighting larger area press the lamp tilt

2. After the lighting work is finish, adjust the lamps and lanterns to the horizontal position

Lowering the tower

1. Switch the lamps off.
2. Continues press the mast down button, until the mast can not be lower

3 Use the mast control switch to lower the mast to transport position

OPERATING INSTRUCTION

TOWING

WARNING: Beware of lamps lowering when operating under mast area.

WARNING: Make sure the hitch is completely engaged to the tow vehicle and is secure. Failure to do so could result in serious personal injury.

Do not use the eye or coupler with any bent or otherwise damaged parts.

1. Connect the machine to the vehicle.
2. Rotate the lamps to transport position and secure by fitting straps [1] around the lamp bodies.

WARNING: The lamp bodies may be HOT.

3. Make sure that the tow vehicles hitch [5] is the proper size to securely connect to the eye or coupler on the unit.
4. Check eye or coupler bolts for any looseness or wear. Tighten or replace as required.
5. Check the wheels.
6. Position the tow vehicle to align the hitch with the eye or coupler [5].
7. Stand aside while operating the jockey wheel [6] to seat the eye or coupler onto the hitch.
8. Secure the hitch.
9. Make sure outriggers and jacks are stored in transport position and the handles are secured by the chains.
10. Attach the brake actuator breakaway chain/cable [8].
11. Make sure the units towing lights are working properly, in accordance to the towing vehicle's lighting as well as local regulations.
12. Connect the towing lighting plug.
13. Remove wheel chocks.
14. Release hand brake [4].
15. Check that the units brakes are operating correctly.
16. Unit is ready to be towed.

LIFTING THE MACHINE

Before lifting the machine, carry out the following checks:

1. No loose objects are stored inside or on top of the machine.
2. No additional equipment is hung onto or under the machine.
3. Any device used for lifting is rated at a minimum of 2000kg.
4. No personnel should be on or under the machine at any time during lifting.

Lifting can be done by either:

1. Using the forklift holes at the rear of the unit

RE-STARTING AFTER AN EMERGENCY STOP

If the machine has been switched off because of a machine malfunction, then identify and correct the fault before attempting to re-start. Check the controller for error messages.

If the machine has been switched off for reasons of safety, then ensure that the machine can be operated safely before re-starting.

MONITORING DURING OPERATION

Should any of the safety shut-down conditions occur, the unit will stop. These are:

- Low engine oil pressure
- High engine water temperature

OPERATING INSTRUCTION

DECOMMISSIONING

When the machine is to be permanently decommissioned or dismantled, it is important to ensure that all hazard risks are either eliminated or notified to the recipient of the machine. In particular:-

- Do not destroy batteries or components containing asbestos without disposing the materials safely.
- Do not dispose of any pressure vessel that is not clearly marked with its relevant data plate information or rendered unusable by drilling, cutting etc.
- Do not allow lubricants or coolants to be released into land surface or drains.
- Do not dispose of a complete machine without documentation relating to instructions for its use.

MAINTENANCE SCHEDULE

	Initial		Daily	Weekly	Hours	Monthly / Hours			
	km (miles)	Hours			200/400	1/–	3/250	6/500	12/1000
	850(500)	50							
Engine Oil Level			C						
*Radiator Coolant Level			C						
Gauges/Lamps			C						
*Air Cleaner Service Indicators			C						
Fuel Tank (Fill at end of day)			C						
*Fuel/Water Separator Drain			C						
Oil Leaks			C						
Fuel Leaks			C						
Drain Water From Fuel Filters			C						
Coolant Leaks			C						
Header Tank Cap.			C						
Fan/Alternator Belts				C					
Battery Connections				C					
Tire Pressure and Surface				C					
*Wheel Lug Nuts						C			
Hoses (Oil, Air, Intake, etc.)						C			
Automatic Shutdown System						C			
Air Cleaner System						C			
*Engine Rad/Oil Cooler Exterior						C			
Fasteners, Guards							C		
Air Cleaner Elements								R/WI	
*Fuel/Water Separator Element								R	
Engine Oil Change		R			R/–				
Engine Oil Filter		R			R/–				
*Water Pump Grease.									R
*Engine Coolant								C	

*Disregard if not appropriate for this particular machine. (1) or 3000 miles/5000km whichever is the sooner (2) or as defined by local or national legislation

C = Check (adjust, clean or replace as necessary)

CBT =check before towing.

CR = Check and report

D = Drain

G = Grease

R=Replace

T = Test

W I =or when indicated if earlier.

Refer to specific sections of the operation manual for more information.

MAINTENANCE

	Initial.		Daily	Weekly	Hours	Monthly / Hours			
	km (miles)	Hours			200/400	1/–	3/250	6/500	12/1,000
	850(500)	50							
Fuel Filter Element					–/R				
*Injection Nozzle Check								C	
Shutdown Switch Settings									T
*Feed Pump Strainer Cleaning.									C
Coolant Replacement									R
*Valve Clearance Check									C
Lights (running, brake, & turn)			CBT						
Pintle Eye Bolts			CBT						
*Brakes	C					C			
*Brake linkage	C								
Emergency stop		T							
Fasteners		C							
Running gear linkage						G			
Running gear bolts(1)							C		
Evidence of Arcing Around Elect. Terminals			C						
Tower Cables			C						
Nylon Guides / Slide check			C						
Hydraulic Oil Level									
Loose Wire Routing Clamps			C						
Proper Grounding Circuit			C						
Wiring Insulation			C						
Obstructions in Air Vents			C						
Control Compartment (Interior)								C	
Engine Shutdown System Switches (setting)									C
Exterior Finish	As needed								
Engine	Refer to Engine Operation Manual								
Decals	Replace decals if removed, damaged or missing								

*Disregard if not appropriate for this particular machine.
(1) or 3000 miles/5000km whichever is the sooner
(2) or as defined by local or national legislation
C = Check (adjust, clean or replace as necessary)
CBT =check before towing.
CR = Check and report
D = Drain
G = Grease
R=Replace
T = Test
W I =or when indicated if earlier.
Refer to specific sections of the operation manual for more information.

Do not tow this unit with a vehicle that has a towing capacity that is less than the unit gross weight shown in General Data.

MAINTENANCE

ROUTINE MAINTENANCE

This section refers to the various components which require periodic maintenance and replacement.

The *SERVICE/MAINTENANCE CHART* indicates the various components' descriptions and the intervals when maintenance has to take place. Oil capacities, etc., can be found in the *GENERAL INFORMATION* section of this manual.

For any specification or specific requirement on service or preventative maintenance for the engine, refer to the *Engine Manufacturer's Manual*.

Ensure that maintenance personnel are adequately trained, competent and have read the Maintenance Manuals.

Prior to attempting any maintenance work, ensure that:-

- The machine cannot be started accidentally or otherwise, by posting warning signs and/or fitting appropriate anti-start devices.
- All residual electrical power sources (mains and battery) are isolated.

Prior to opening or removing panels or covers to work *inside* a machine, ensure that:-

- Anyone entering the machine is aware of the reduced level of protection and the additional hazards, including hot surfaces and intermittently moving parts.
- The machine cannot be started accidentally or otherwise, by posting warning signs and/or fitting appropriate anti-start devices.

Prior to attempting any maintenance work on a *running* machine, ensure that:-

- The work carried out is limited to only those tasks which require the machine to run.
- The work carried out with safety protection devices disabled or removed is limited to only those tasks which require the machine to be running with safety protection devices disabled or removed.
- All hazards present are known (e.g. pressurized components, electrically live components, removed panels, covers and guards, extreme temperatures, inflow and outflow of air, intermittently moving parts, safety valve discharge etc.).
- Appropriate personal protective equipment is worn.
- Loose clothing, jewelry, long hair etc. is made safe.
- Warning signs indicating that *Maintenance Work is in Progress* are posted in a position that can be clearly seen.

Upon completion of maintenance tasks and prior to returning the machine into service, ensure that:-

- The machine is suitably tested.
- All guards and safety protection devices are refitted.
- All panels are replaced, canopy and doors closed.
- Hazardous materials are effectively contained and disposed of.

ELECTRICAL SYSTEM

WARNING: Always disconnect the battery cables before performing any maintenance or service.

Inspect the safety shutdown system switches and the instrument panel relay contacts for evidence of arcing and pitting. Clean where necessary.

Check the mechanical action of the components.

Check the security of electrical terminals on the switches and relays i.e. nuts or screws loose, which may cause local hot spot oxidation.

Inspect the components and wiring for signs of overheating i.e. discoloration, charring of cables, deformation of parts, acrid smells and blistered paint.

ELECTRICAL TERMINALS

Check daily for evidence of arcing around the electrical terminals

GROUNDING CIRCUIT

Daily check that the grounding circuit is in accordance with local code requirements. Check to ensure continuity between the grounding terminal, frame, generator and engine block.

WIRING INSULATION

Daily check for loose, or frayed wiring insulation or sleeving.

MAINTENANCE

BATTERY

Keep the battery terminals and cable clamps clean and lightly coated with petroleum jelly to prevent corrosion.

The retaining clamp should be kept tight enough to prevent the battery from moving.

INSTRUMENTS

Inspect the instrument lamps, gauges and switches prior to start-up and during operation to ensure proper functioning.

CONTROL COMPARTMENT

Every six months or 500 hours with the unit "OFF", perform visual inspection for loose connections, dirt, arcing, damage to electrical components.

TOWER CABLES

Each day the tower lifting cables should be inspected to ensure the ends are attached securely. The cables should be checked for fraying or other damage and replaced if damaged. Also the pulleys should be checked for unusual wear or damage and replaced if worn excessively or damaged.

WIRE ROUTING CLAMPS

Daily check for loose wire routing clamps. Clamps must be secure and properly mounted. Also check wiring for wear, deterioration and vibration abrasion.

TOWER GUIDES

Every month inspect all of the tower guides for proper operation. Clean sliding surfaces. Replace any missing or damaged parts before raising the tower.

ENGINE RADIATOR

Check the coolant level in the radiator. The coolant must cover the tubes in the top tank (approximately 1 inch high on a clean measuring rod, inserted down filler neck).

WARNING: Remove cap slowly to relieve Pressure from HOT radiator. Protect skin and eyes. Hot water or steam and chemical additives can cause serious personal injury.

The engine coolant system is normally filled with a 50/50 mixture of water and ethylene glycol. This permanent type anti-freeze contains rust inhibitors and provides protection to−35℉ (−37℃). The use of such a mixture is recommended for both summer and winter operation.

It is recommended to test the freezing protection of the coolant every six months or prior to freezing temperatures. Replenish with a fresh mixture every twelve months.

Each month, inspect the radiator exterior for obstructions, dirt and debris. If present, blow water or compressed air containing a non-flammable solvent between the fins in a direction opposite the normal air flow. Should the radiator be clogged internally, reverse flushing, using a commercial product and the supplier's recommended procedure, may correct the problem.

ENGINE PROTECTION SHUTDOWN SYSTEM

The operation of the engine protection shutdown system should be checked every month, or whenever it appears to be not operating properly. The three switches involved in this protective shutdown system are the engine coolant high temperature switch, the engine oil pressure switch and the low fuel level switch (optional).

The engine oil pressure switch prevents the engine from operating with low oil pressure. Once a month, remove a wire from the engine oil pressure switch to check the shutdown system for proper operation.

Test the engine oil pressure switch by removing it and connecting it to a source of controlled pressure while monitoring an ohmmeter connected to the switch terminals.

As pressure is applied slowly from the controlled source, the switch should close at 12 psi (84 kPa) and show continuity through the contacts. As the pressure is slowly decreased to 10 psi (70 kPa) the contacts should open and the ohmmeter should show a lack of continuity through the contacts. Replace a defective switch before continuing to operate the unit.

Once a year, the temperature actuated switch should be tested by removing it from the unit and placing it in a bath of heated oil. The engine coolant high temperature switch will require a temperature of approximately 220℉ (104℃) to actuate.

CAUTION: *Never operate the unit with a defective safety shutdown switch or by by−passing a switch.*

AIR FILTER ELEMENTS

The air filter should be inspected regularly and every 6 Months (500 hours), whichever comes first. The dust collector box(es) should be cleaned daily (more frequently in dusty operating conditions) and not allowed to become more than half full.

Removal

> ***CAUTION:*** *Never remove and replace element(s) when the machine is running.*

Clean the exterior of the filter housing and remove the filter element by releasing the nut.

Inspection

Check for cracks, holes or any other damage to the element by holding it up to a light source, or by passing a lamp inside.

Check the seal at the end of the element and replace if any sign of damage is evident.

Reassembly

Assemble the new element into the filter housing ensuring that the seal seats properly.

Reset the restriction indicator by depressing the rubber diaphragm. Assemble the dust collector box parts, ensuring that they are correctly positioned.

Before restarting the machine, check that all clamps are tight.

VENTILATION

Always check that the air inlets and outlets are clear of debris etc.

> ***CAUTION:*** *NEVER clean by blowing air inwards.*

COOLING FAN DRIVE

Periodically check that the fan mounting bolts in the fan hub have not loosened. If, for any reason, it becomes necessary to remove the fan or re-tighten the fan mounting bolts, apply a good grade of commercially available thread locking compound to the bolt threads and tighten to the torque value shown in the TORQUE SETTING TABLE later in this section.

The fan belt(s) should be checked regularly for wear and correct tensioning.

FUEL SYSTEM

The fuel tank should be filled daily or every eight hours. To minimize condensation in the fuel tank(s), it is advisable to top up after the machine is shut down or at the end of each working day. At six month intervals drain any sediment or condensate that may have accumulated in the tank(s).

FUEL FILTER WATER SEPARATOR

The fuel filter water separator contains a filter element which should be replaced at regular intervals (see the SERVICE/MAINTENANCE CHART).

LUBRICATION

The engine is initially supplied with engine oil sufficient for a nominal period of operation (for more information, consult the Engine section of this manual).

> ***CAUTION:*** *Always check the oil levels before a new machine is put into service.*

If, for any reason, the unit has been drained, it must be re-filled with new oil before it is put into operation.

ENGINE LUBRICATING OIL

The engine oil should be changed at the engine manufacturer's recommended intervals.

ENGINE LUBRICATING OIL SPECIFICATION

ENGINE OIL FILTER ELEMENT

The engine oil filter element should be changed at the engine manufacturer's recommended intervals.

TYRES/TYRE PRESSURE

See the GENERAL INFORMATION section of this manual.

GENERAL CLEANING INSTRUCTIONS

Keeping the machine clean of any oil and dirt is recommended for both appearance and maximum service life of the equipment. The frequency of cleaning will be dependent on local conditions and the severity and frequency of operation.