



Use and Maintenance Manual Marine Generating

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- II. On board connections
- III. Installation drawings
- IV. Technical specification
- V. Wiring diagrams

I. Introduction

I.2 Indications for the manual use

Dear Customer,

COELMO MARINE generating sets are designed to be used on leisure boats.

The manual contains information and essential instructions necessary to correctly and safely carry out the activities related to the generating sets life cycle operational aspect.

Please consult the specific documents of the relevant manufacturers for information about the engines characteristics.

This manual and the other reference documents which accompany the generating set, are addressed to those who will install, maintain and use the equipment during its operational life cycle, and are to be within the reach of all those who manage the generating set.

I.3 Importance of the manual

The manual and the other documents you are supplied with, are an integral part of the equipment, and are to be carefully stored, away from humidity and all other agents that can damage them, all along the equipment life cycle. The documents are to accompany the Generating Set whenever it goes to another user or a new owner. You are strongly advised to carefully read and strictly adhere to the instructions and suggestions mentioned in the manual and reference documents. This is the only way to ensure the regular functioning of the equipment, its reliability and the prevention of damages from occurring to persons and things.

COELMO declines all responsibility for damages resulting from installation, use and maintenance operations not in conformity with the indications of this manual.

Do not hesitate to contact COELMO Technical Assistance department, in case of doubts, inconvenience and difficulties.

Remark: the information given in this manual is valid when this document has been printed. Yet, when necessary, the information herein can be modified without notice or obligation to notify, according to COELMO's policy in improving its products.

This information is valid for the Generating Set which comes with this manual, except if otherwise stated and/or integrated in specific supply documents.

2. General Safety Precautions

Thoroughly read the OPERATOR'S MANUAL before operating the generator. Safe operation and top performance can only be obtained when equipment is operated and maintained properly.



This symbol is found next to all safety indications, which are to be carefully adhered to. Follow it carefully.

Particularly you will find it to alert you an immediate hazard that will result in severe personal injury or death.

Safety indications are to be reported to all persons in charge of using, installing and maintaining the generating set.

All safety and accident-prevention laws and standards are to be adhered to.

Electricity, fuel, exhaust, moving parts and batteries present hazards which can result in severe personal injury or death.

I. Engine exhaust is deadly

- Never sleep in the boat while the generator is running unless the boat is equipped with properly working carbon monoxide detectors.
- The exhaust system must be installed in accordance with the generator Installation Manual and be free of leaks.
- Make sure the bilge is adequately ventilated with a power exhauster.
- Inspect for exhaust leaks every startup and after every 10 hours of operation.

II. Generator voltage is dangerous

- Generator electrical output connections must be made by a trained and experienced electrician in accordance with applicable codes.
- The generator must not be connected to shore power or to any other source of electrical power. Back-feed to shore power can cause electric shock resulting in severe personal injury or death and damage to equipment. An approved switching device must be used to prevent inter-connections.
- Use caution when working on live electrical equipment. Remove jewelry, make sure clothing and shoes are dry, stand on a dry wooden platform or rubber insulating mat and use tools with insulated handles.

III. Moving parts can cause severe personal injury or death

- Do not wear loose clothing or jewelry near moving parts such as PTO shafts, fans, belts and pulleys.
- Keep hands away from moving parts.
- Do not remove the canopy panels when the generator is running.

IV. Battery gas is explosive

- Wear safety glasses.
- Do not smoke.
- To reduce arcing when disconnecting or reconnecting battery cables, always disconnect the negative - battery cable first and reconnect it last.

V. Flammable vapor can cause a diesel engine to over speed

Do not use cold start aids. Do not start the generator in presence of flammable vapors.

VI. Filling liquids

- Do not ingest, inhale, or contact used oil or its vapors.
- Ethylene glycol, used as engine coolant, is toxic to humans and animals. Clean up spills and dispose of used engine coolant in accordance with local environmental regulations.
- Diesel fuel is combustible.
- Do not smoke or turn electrical switches ON or OFF where fuel fumes are present or in areas sharing ventilation with fuel tanks or equipment. Keep flames, sparks, pilot lights, arc-producing equipment and all other sources of ignition well away.
- Fuel lines must be secured, free of leaks and separated or shielded from electrical wiring.

VII. General precautions

- Keep children away from the generator.

- Do not step on the generator: parts can bend or break leading to electrical shorts or to fuel, coolant or exhaust leaks.
- To prevent accidental or remote starting while working on the generator, disconnect the negative (-) battery cable at the battery.
- Let the engine cool down before removing the coolant pressure cap or opening the coolant drain. Hot coolant under pressure can spray and cause severe burns.
- The structure is not self supporting. Do not lift the Generator by using the canopy.
- Keep the generator clean and stowed in dry and ventilated compartment.
- Make sure all fasteners are secure and properly torque.
- Do not work on the generator when mentally or physically fatigued or after having consumed alcohol or drugs.
- Only specialised personnel can access the Generating Set compartment. The technician must be trained and experienced to make adjustments on the generator.
- Keep multi-class ABC fire extinguishers handy. Class A fires involve ordinary combustible materials such as wood and cloth; Class B fires, combustible and flammable liquid fuels and gaseous fuels; Class C fires, live electrical equipment.
- Generator installation and operation must comply with all applicable local, state and federal code and regulations.
- Install the generator to allow the routinely maintenance operation and inspection of the terminal box.

- The soundproofing booth has to be opened only after having switched the generating off.
- Never touch the parts in motion when the Generating Set is functioning.
- Never touch the hot parts of the Generating Set, and never put any inflammable materials near the engine and/or the Generator.
- The Generator is to be switched off before checking regulating its parts.
- The oil or cooling liquid level can be checked only after having switched off the equipment, and never when the engine is hot.
- Never open the expansion vessel lid, if present, when the engine has reached the operating temperature.

The maintenance operations are to be carefully carried out and only adequate tools are to be used.

2.1 Identification plate

The plate of the generating sets contains all the identification data, in conformity with ISO 8528 Standard, and the EC Marking requirements Hereunder is a facsimile of the identification plate used for our generating sets.

| | | | |
|----------------------------------|------------------|------------|---|
| MARINE GENERATING SET SN: | | |  |
| Version: | | | |
| Model: | Year | RPM | |
| KVA: | cos ϕ | Coll. | |
| V | In A | Hz | |
| Engine | | SN:..... | |
| Alternator | | SN:..... | |
| Protection device | | | |
| Neutral state | | | |
| Rating according to ISO 8528 LTP | | | |

2.2 Setting at work

For the correct installation of the generating set and the guarantee entering into force, the equipment setting at work is to be carried out by an authorized technician, who is to fill-in and sign the Setting at Work document, attached in appendix A I, in duplicate.

2.3 Guarantee

Any non-observance of the installation instructions, or of the use and maintenance standards of the Generating Set and its parts make this guarantee invalid. The guarantee period of the generating sets is indicated in the contractual documents. Moreover, the general guarantee conditions for industrial products are also valid. All required operations under guarantee are to be immediately reported to the Coelmo Service Point. Any not authorized operation could not be carried out under guarantee.

2.4 Spare parts

Spare parts are to be obtained exclusively from authorized distributors or from COELMO assistance centers. In order to get the correct spare parts, the data mentioned in the equipment identification plate on the alternator, are to be specified. For a correct identification of the parts, it is important to adhere exclusively to the official spare parts document (Catalogues, Spare Parts, Service Information, etc), supplied by COELMO. All other information sources, not approved by COELMO, could be misleading or wrong.

 **ATTENTION** not using original parts will automatically make this guarantee invalid.

3. Description of the generating set

Always consult the drawings in the *Appendix I-II*, in order to identify the overall dimension and the generator wiring connection.

Consult the engine manual for the identification of the engine specific parts.

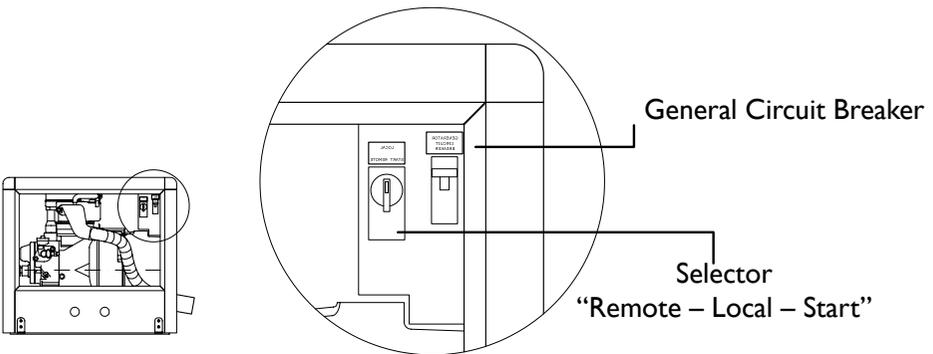
The type of the engine for each generating set model is mentioned in the *Appendix IV*.

The relevant manual is to be taken into consideration for specific use and maintenance operations.

3.1 Digital control board EOS



3.2 On board panel (DM SERIES)



4. General terms of use

Adherence to the following conditions shall lengthen the life of the generator, and improve its performance and make its use more economical.

- Indicated maintenance operations, including those mentioned in the “daily procedures before switching-on”, are to be regularly carried out.
- Use an antifreeze product or a cooling liquid in the engine cooling system, in order to protect it from corrosion and damages caused by freezing up (excluded DM350);
- Use a good-quality lubricant (*);
- Use a good-quality gas-oil free from water or other impurities (*);
- In order to correctly use the generator, it is advisable to avoid using it at maximum power for prolonged periods of time.

(*) The user and maintenance manual of the engine is to be consulted when choosing the specifications of gas- oil, oil and cooling liquid. The engine manual is to be consulted for the filling up quantities, indications and modality.

4.1 Running-in

In order to lengthen the engine’s duration, it is necessary to adhere to the following points during the first 50 hours:

- The engine is to be warmed before connecting a load to the generator;
- Avoid using the generator at full load for prolonged periods of time.

4.2 Before switching-on

The following points are to be checked before switching-on:

- Oil level (using the relevant stick);
- Cooling liquid level (except for DM350);
- Main switch between the battery and generator being connected

- (remove battery);
- All facilities are disconnected or disabled;
 - The sea water cock opening.

4.3 After reparation

Ensure that all safety devices are installed and that all used tools and materials are removed from the engine and/or generator. Clean the generator chamber from any traces of leaked cooling liquid, oil, and/or gas-oil, which might have resulted from the maintenance works.

Make also sure that the cooling circuit sea cock valve is open.

Do not use other aids (such as rapid injection switching on) when switching-on with “pre-ignition”. This can cause accidents.

5. Start and stop

In ordinary conditions, the generator can be started either from the dashboard control panel (remote) or from the outfitted panel aboard the machine.

5.1 Start / Stop DML - DTL SERIES

The panel that is switched on first, becomes MASTER, and becomes also the panel used to start the controls. The other panels connected to the Can Bus become MONITOR, then they will only be used to view the parameters. The MASTER card is enabled to perform the commands and is marked by the ON led light.

5.1.1 Switching on (from MASTER panel)

Press *ON/OFF* button marked by the symbol  .

The circuit switches on and the panel test starts.

The display shows the measurements with the relevant values (if values are taken, otherwise “zero” will be viewed).

When the led light is *ON*, it indicates that the panel controls are enabled. Press *START* briefly.

The circuit shall start the preheating phase - except for DM350 - during which the "Engine heating" reading shall be displayed. Start the generator immediately afterwards.

During the start phase, "Engine starting" shall be viewed on the display. "Generator ready", shall be viewed when the generator has been started.

The Generator is automatically put on the load closing the contactor "load insertion" installed on board.

The *START* key is "assisted", and one push on it for at least 1 second is enough to begin the aforementioned start operation. If the *START* button is continuously pressed, the starter shall remain connected until the button is released. In all cases, if the engine starts or if it reaches the maximum pre-set start time, the starter shall be automatically disconnected, even if the *START* button being pressed.

5.1.2 Stopping (from MASTER panel)

Briefly press *STOP*; the circuit (after having opened the "load insertion" contactor) shall start the ventilation phase (for the pre-set duration of time), and "Engine cooling" shall be viewed. After this operation, the stopping phase starts during which "Generator stopping" shall be viewed.



LAY OUT OF DASHBOARD PANEL

If during the maintenance or other operations, is needed to enable the Generator by the on board panel, it is needed to switch off before the dashboard panel if enabled, and only after is possible to switch on the on board panel. This operation avoid that the Generator could be switched on inexpertly by remote panel.

5.2 Start / Stop DM series

Differently from the DML-DTL SERIES, on the DM SERIES, the on board panel is different from the dashboard one. For the switching on and switching off of the EOS panel on the dashboard, follow the same indications of the cap. 5.1.1 and 5.1.2.

In the case of maintenance or other operation, is needed to enable the Generator by using the on board panel, and is necessary, keeping the EOS panel enabled, to turn the selector “**Remote-Local-Start**” on the “**Local**” position. On the display EOS will be displayed “Automatic Mode.

Remark: if the Generator is in motion for being previously started by the dashboard control, it can be stopped by rotating the selector to “local” position.

5.2.1 Switching the equipment ON from the local panel

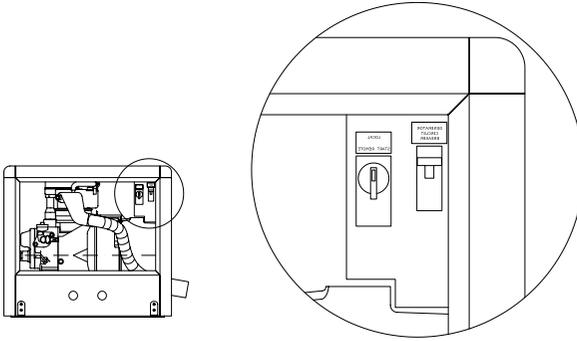
Rotate the selector further towards the “Start” position to begin the starting cycle. The starting cycle is identical to that controlled by the remote panel.

5.2.2 Stopping the equipment from the local panel (DM SERIE)

Before stopping the equipment, disconnect all the applications, switching on the circuit breaker, and leave it to function without any load for about 1 minute. Bring the selector back to the “**Local**” position; the circuit will switch off.

Remark: Rotate the selector to the “**Remote**” position to bring back the

dashboard controls.



5.3 Automatic start / stop

The signal card, installed aboard the equipment, has two inlets. The first inlet enables the Generator automatically, and the second starts and/or stops the machine through a remote signal. Consult COELMO Service for its functioning and correct use.

⚠ ATTENTION: Never disconnect the battery from the generator when the latter is running.

⚠ ATTENTION: It is recommended to close the valve on the sea cock during sailing, if the equipment is not to be used.

5.4 Graphic display of the dashboard panel

5.4.1 The generator condition

- “Starting” start the equipment, (1)
- “Stopping” machine stopping underway, (1)
- “Stop” engine shut-down, (2)
- “Run” engine running, (3)
- “Preheating” preheating underway, (1)

“Cooling” cooling underway, (1)

Led “ON” = if turned-on, it indicates that the panel is in “Master” mode, therefore, the controls are enabled.

Led “ON” = if turned-off, it indicates that the panel is in “Monitor” mode, therefore, the controls are disabled.

(1) The “RUN” led blinks (2) “RUN” led is switched-off (3) “RUN” led is switched-on.

5.4.2 Measurements of electrical and mechanical quantities

Use the “triangular” keys to view the various screens (pages) which show the following:

1st page (“home”)

Alternator voltage (Vac)

Frequency (Hz)

Ampere (A) (DM-DML SERIES) (I_r, I_s and I_t if it on DTL SERIES)

2nd page

Phase voltage

Power (kVA)

3rd page

Battery voltage (Vcc)

Oil pressure (bar) (outfitted on DML-DTL)

Fuel level (optional)(*)

Engine temperature (°C) (outfitted on DML-DTL)

(*) 0% will be viewed if no probe is connected (VDO or equivalent). Contact COELMO service for the calibration of the fuel level probe, if connected.

5.4.3 Alarm and/or block message

Alarms and/or blocks are indicated by an acoustic signal, in addition to the following blinking readings shown on the display (together with the blinking “FAULT” Led)

- low oil pressure (block)
- engine overheating (block)
- exhaust high temperature (block)

- belt broken (alarm)
- running failure (only in “automatic” mode) (block)
- mechanical failure (block)
- battery failure (alarm)
- dynamo - battery charge reg. failure
- wrong voltage (alarm with ventilation)
- wrong frequency (alarm with ventilation)
- over-speed (block)
- maintenance due (only viewing)
- generator overload (alarm)
- Generator over-temperature (only DM600) (alarm with ventilation)

Remarks: The alarms are resettable with the RESET key. A slight press on the key will silence the siren. The failure can also be reset by pressing this key for a “long” time (1).

Block = immediate stop of the generator

Alarm with ventilation = delayed stop of the generator

6. Maintenance

The following indications regard periodic and daily maintenance.

Each maintenance operation is to be carried out at the indicated time.

Indicated time intervals refer to normal conditions of use.

Neglecting maintenance operations can provoke breakdown of the generator and its permanent damage.

The guarantee cannot be honoured if maintenance has not been accomplished correctly.

6.1 Cleaning the generator

The generator is to be kept clean as much as possible. Many electric failures happen due to the accumulation of dirt. Remove the accumulated dirt and dust from the generator, using a jet of oil-free compressed air, making sure that

dust does not enter into the winding. The generator is to be kept clean both internally and externally, and stains of oil, water and dirt are to be removed. Ensure that all electric connections are correctly performed. The rotor rear pad is hermetically closed, and is sufficiently lubricated all through the duration and does not need further maintenance.

⚠ ATTENTION Before starting any maintenance operations on the Generator, ensure, for the DM series, that the local card is enabled as MASTER (led ON switched on), and that the emergency block is pressed. Never work on the generator when it is functioning. Should it be necessary to keep the generator moving, in order to check its electric and mechanical parameters, the operation is to be carried out exclusively by specialised staff skilled, qualified to work on live equipment.

6.2 Maintenance chart

Consult the below maintenance chart for a correct using of the generating set.

| |
|---|
| Every 10 hours, or before each switch on |
| • Check the oil level |
| • Check the cooling liquid level |
| • Check the cooling water filter |
| After the first 20 hours, or within 45 days from setting at work |
| • Check the head screws |
| • Remove the water from the fuel filter |
| • Change the oil and filter |
| • Check the trapezoidal belt |
| • Check the number of revolutions |
| • Check the valve clearance |
| Every 100 hours, or at least once a year |
| • Replace the fuel filter |
| • Change the oil and filter |
| • Check the trapezoidal belt |
| • Replace the sea water pump impeller |
| Every 200 hours, or at least once a year |
| • Check the number of revolutions |
| • Check the valve clearance |
| • Clean the water cooler and replace the relevant gaskets |

(*) Consult the engine manual when these maintenance works are to be carried out. Not all the above mentioned maintenance operations are to be necessarily carried out on your generating set. This depends on the type of engine.

6.2.1 Getting ready for the winter

Consult the engine manual for its storage during winter.

It is not necessary to carry out specific operations on the equipment at the beginning of the winter storage. The only operation to do is to make the engine run without load, and make fresh water circulate in the sea water circuit.

6.2.2 Getting ready for the summer

Consult the engine manual for its functioning at the beginning of the navigation season.

It is not necessary to carry out specific operations on the generating set at the beginning of the navigation season, apart from the indications mentioned in the “Generating Set Functioning and initial start up” paragraph.

7. Failure investigation

 **ATTENTION** the failure investigation are to be carried out exclusively by specialized costumer. Any uncorrected operation makes the guarantee invalid and could provoke damages to the Generating Set.

Do not hesitate to contact COELMO Technical Assistance Department, in case of doubts, inconvenience and difficulties.

General information

In case a failure occurs, and before carrying out the checks mentioned in the table, make sure that:

- There are no mechanical damages in the equipment.

- The Generating Set is not polluted with oil, fuel, dirt or other chemical agents. If this happens, the relevant part is to be cleaned again and repaired before starting the check.

| | |
|---|--|
| 1) No load, no voltage | |
| Possible cause | Solution |
| Loss of residual magnetism | Briefly connect a 12Vdc battery to the condenser poles, in order to recover the field |
| | Check the windings resistance, according to the values indicated in Appendix IV |
| Faulty condenser | Replace the condenser |
| Rotor winding in short circuit, or wrongly connected | Check the windings resistance, according to the values indicated in Appendix IV |
| Diode interrupted or in short circuit | Replace the diode |
| Breaking down load insertion | On the DM series replace the power relay on On the DML-DTL series replace the contactor |
| 2) No load, voltage too high or too low | |
| Possible cause | Solution |
| Incorrect number of engine revolutions | Check the revolution number and adjust it, if necessary, as indicated in the engine manual |
| 3) No load, oscillating voltage | |
| Possible cause | Solution |
| The engine is functioning irregularly due to insufficient fuel, or a failure of the fuel injection pump | Encourage the inflow of water-free fuel, or have the injection pump checked by a specialised person, and adjust or repair it, if necessary |
| 4) With load, no voltage | |
| Possible cause | Solution |
| Short circuit of the applications | Find and eliminate the short circuit |

| | |
|---|---|
| 5) With load, voltage too high or too low | |
| Possible cause | Solution |
| Wrong number of revolutions | Check the number of the engine revolutions and adjust it, if necessary |
| 6) With load, oscillating voltage | |
| Possible cause | Solution |
| The engine is functioning irregularly due to insufficient fuel, or a failure of the fuel injection pump | Encourage the inflow of water-free fuel, or have the fuel injection pump checked by a specialised person, and adjust or repair it, if necessary |
| Electrical connections wrongly done | Repair the connections |
| 7) With load, the generating set is too overheated | |
| Possible cause | Solution |
| Overloaded | Reduce the load by closing some applications |
| Air inlet and outlet blocked | Free the air inlet and outlet |

Remarks:

With load = machine switch closed

No load = machine switch open

Annexes:

A1: Commissioning and setting at work coupon

A2: Use and maintenance manual

GENERATING SET SETTING AT WORK AND START UP COUPON

Generating Set model..... Serial N°.....
 Engine type..... Serial number N°.....
 Brand and model of the boat..... Length..... Width.....
 Name of the boat..... Registration number.....
 Customer's full name..... Telephone number.....
 Customer full address.....
 Postal code..... Country.....

Checks of the engine setting at work

Inspection operations:

- Cooling liquid level Checking
- Fuel level checking
- Fuel circuit drain (vent) checking
- Battery voltage checking> 13V
- Engine oil level checking
- Signals cables wiring checking
- Checking of the fuel inlet piping
- Checking of the fuel return piping
- Checking of the discharge piping
- Checking of the positioning respect to the sea water level
- 1) up 2) down
- Checking of the corrects siphon breaker installation
- Checking of the gas exhaust piping
- Checking of the accessibility for the routinely maintenance

*Note: Mark the corresponding box after each operation. Refer to use and maintenance manual for general information.
 ** Note: start the Generating Set and leave to run unloaded for 10 minutes. Check that the voltage supplied by the Generating Set falls within the plate data.

| | |
|--|-------------------|
| Official dealer stamp or Coelmo center | Date..... |
| Signature: | Buyer's signature |

8. Installation

8.1 General remarks about the installation

The right running and the end life of the generator is strictly connected to the installation of the same.

This manual addresses the following aspects of the installation:

- Location and mounting
- Engine exhaust discharge and silencing
- Engine cooling
- Generator room ventilation
- Fuel connections
- Electrical connections
- Batteries
- Bonding for grounding
- Accessibility for operation and maintenance
- Noise and vibration

Note: Manuals are constantly updated to be adequate to the modification carried on the Generators.

8.1.2 Standards for safety

 **WARNING** This generator is not a life support system. It can stop without warning. Application of redundant power or an alarm system, must be used if generator operation is critical.

Refer to safety rules mentioned in the cap.2 of this manual, and applicable standards for safety, according to the regulations of the country where the installation is carried out.

8.1.3 Outline drawings

See the applicable drawing in *Appendix I-II-IV* for installation details: mounting bolt hole locations, connection points, battery, sea water, exhaust, remote control and power output.

 **WARNING** Improper installation can result in severe personal injury, death and equipment damage. The installer must be qualified to perform installation of electrical and mechanical equipment.

8.2 Location and mounting

8.2.1 Lifting

Use the dedicated lifting eyes, accessible through the superior panel. Refer to the applicable data sheets for the weight of the generator and make provisions accordingly for the safe handling.

 **WARNING** Do not lift by using the canopy. Refer to the Generator technical data to know the weight and then, handle the Generator properly.

8.2.3 Location

See the other sections titled Ventilation, Fuel Supply, Engine Cooling and Engine Exhaust for additional considerations that bear on location.

The generator is not “ignition protected” and therefore not permitted to be located in presence of flammable vapors or ignition liquids. If the boat has Petrol-fueled propulsion engines, the generator will have to be located where it can be isolated from the gasoline fuel system by approved methods.

 **WARNING** The generator can ignite explosion or fire in presence of fumes causing severe personal injury or death. Approved methods must be used to isolate the generator from a gasoline fuel environment.

Because of noise, vibration and fumes, the generator compartment should be located as far from living quarters as practical. Locate the generator where there will be enough room to perform periodic maintenance and service. Non service sides should have at least 50 mm of clearance. The rear side should have at least 100 mm of clearance for air flow in and at least 50 mm on the lateral sides for the air flow out (DML-DTL SERIES).

Make sure there is access for:

- Starting and stopping the generator
- Enabling the commands using the local panel
- Enabling the automatic 4poles circuit breaker on board
- Checking, filling and draining engine oil
- Changing the engine oil filter
- Changing the fuel filter
- Checking, filling and draining engine coolant
- Making fuel connections
- Making battery and ground connections
- Replacing exhaust hoses
- Replacing the sea water pump impeller
- Replacing the V-belt (when provided)
- Accessing to the control board on board for the ordinary maintenance operations

8.2.4 Mounting

The generator has integral vibration isolators. The supporting structure underneath should be level and able to support the weight of the generator. The floor must extend under the whole base pan for support. Floor or frame stiffness should be greatest under the vibration isolators. Secure the generator with four bolts. When provided use the dedicated fasteners.

8.3 Ventilation

 **WARNING** exhaust gas is deadly! Fuel vapors are explosive! Failure to provide proper ventilation can result in asphyxiation, fire and explosion.

Ventilation is required to prevent dangerous concentrations of fuel vapors, exhaust fumes and high compartment temperatures and provide combustion air. The highest compartment temperatures can occur just after the boat has been docked and the engines have been shut down.

The Generator is projected to run at the ambient temperature of 45°C maximum. Highest temperature cause the Generator derating and reduce the life of electrical components, generator windings, rubber and other construction materials. When calculating air flow required for combustion and ventilation, refer to Specifications for data regarding air flow and heat radiated to the room, in the *Appendix IV*.

8.3.1 Carbon monoxide

All openings and feed-through holes for wiring, conduit, pipe and hose must be sealed to prevent exhaust gases from entering the rest of the boat. Wiring conduit must be sealed inside as well as outside. Cabin plumbing drains must have approved traps to prevent the entrance of exhaust gases from outside.

 **WARNING** in case of CO detection, stop immediately the generator and provide an adequate ventilation to the generator compartment before the further starting.

8.4. Fuel connection

8.4.1 Fuel tanks and piping

See the *Appendix IV* and the Engine use manual for recommended fuel.

 **WARNING** improper storage and handling of Fuel can lead to fire. Fuel tank construction, location, installation, bonding for grounding, ventilation,

pipng, inspection and leak testing must be in accordance with applicable standards and regulations.

 **CAUTION** Do not use galvanized fuel tanks or piping. The trace of sulfur in diesel fuel attacks galvanized zinc coatings causing debris that can clog fuel filters, pumps and injectors.

8.4.2 Fuel filters

The generator is equipped with a fuel filter. It is recommended that a 10 to 30 micron water-separator fuel filter be installed. Such filter have to be installed upper to the fuel piping system.

8.4.3 Fuel fittings

Use the same diameter of the connection fitted on the canopy / base frame. Refer to the *Appendix II-IV*.

8.4.4 Fuel hoses

Use USCG TYPE AI or ISO 7840-AI fuel hoses. See Fuel Line Sizing in this section for recommended sizing. Refer to the *Appendix IV* to get information about the fuel hoses recommended sizes.

Because the fuel tanks are required to be bonded to the common negative [-] grounding system of the boat, conductive fuel lines connected directly to the generator will carry cranking currents which could ignite fire or explosions. The fuel hoses connected at the generator must be non-conductive so that the fuel lines do not become paths for cranking current.

 **WARNING** Use non-conductive fuel hoses for connections at the generator to prevent the fuel lines from becoming paths for cranking current.

8.4.5 Fuel line sizing

An inside diameter of at least 8 mm is recommended for inlet fuel lines and hoses, and of at least 6mm for outlet fuel lines and hoses.

Larger diameter fuel lines are harder to prime and keep primed and are thus more likely to cause disruption of generator service.

Run fuel lines as directly as possible avoiding hard priming, and the priming height must not overcome the values reported in the Specification chart in *Appendix IV*.

8.4.6 Fuel pickup tube

A separated fuel pickup tube and supply line, inlet and outlet, is recommended for each generator and engine. Outlet tubes and distribution manifolds can lead to fuel starvation and difficult priming. In a common fuel supply tank the generator suction point tubes should be higher than the propulsion engine suction point to prevent the generators from being able to empty the fuel tanks.

Make sure the fuel tanks are large enough to cool the returning fuel. Make sure the fuel return pipeline is fitted on the top of the fuel tank.

8.4.7 Fuel shutoff valves

A fuel shutoff valve is required at the fuel tank if the end of the fuel line is located below the highest level of fuel in the tank.

8.4.8 Fuel lift

The fuel lift pump on the generator has a maximum fuel lift suction of 80 cm.

Note: that resistance to fuel flow in hoses, tubing, fittings, valves and filters as well as actual lift in elevation, reduces the above level. The Lift is a combination of the actual vertical lift and the resistance to fuel flow.

If needed, an electrical fuel lift pump must be installed by using the connection

available on the generator wirings.

Refer to the electrical drawings in *Appendix V*.

Refer to COELMO Service for the kit needed.

8.5 Engine cooling

8.5.1 Cooling system

Except for DM350, The engine is cooled by a pressurized, closed-loop liquid cooling system in which coolant is pumped through passages in the engine block, head and exhaust manifold. Heat is carried away from the coolant by sea water sea water heat exchanger. A gear-driven sea water pump is allows the sea water circulation. Refer to the *Appendix II-IV* for connection points and fitting sizes.

8.5.2 System components

- *sea water pump*

The sea water pump can deliver the required flow of cooling water against a maximum lift suction of 1.20 meters. Lift is a combination of the actual vertical lift and the resistance to flow caused by the hoses, filter, sea cock and through-hull fitting.

- *sea water hose*

Use SAE 20R4 or equivalent sea water hose that is able to resist a slight vacuum without collapsing. All of the hoses, pipes and fittings in the sea water pickup line should have the same internal diameter as the hose connected to the sea water pump inlet.

- *sea water filter*

The sea water filter should be located below and as close to the sea water pump as practical. The basket must be removable for cleaning. The filter should

not allow debris larger than 4.5 mm to enter the cooling system. If the filter is above the water line, fill the sea water filter for faster priming at startup.

- *sea cock*

Install a bronze, full-flow sea cock on the through- hull fitting.

- *through-hull fitting and filter*

The through-hull fitting should be as close to the generator as possible. If the filter has slotted openings, the slots must be parallel to the keel and opposite to the running way. It is suggested to install the sea cock as far as from the impeller and as close as possible to the keel bow. Through-hull fittings should be staggered along the keel so that downstream fittings are not starved.

- *initial coolant fill*



CAUTION Running the engine without coolant can cause damage not covered by Warranty.

The generator is normally shipped from the factory with coolant, unless prohibited by shipping regulations.

Fill the system, if necessary, in accordance with the Operator's Manual.

- *siphon break*



CAUTION Engine damage due to flooding as a result of failing to install a required siphon break is not covered by Warranty.

Conduct the SEA WATER PICKUP TEST to determine whether a siphon break is required to prevent the muffler and engine from being flooded with floatation water. The top panel of an enclosed generator has knockouts for the hoses to pass through. A siphon break kit is available from Coelmo.



WARNING To keep leaks from spilling on the generator, do not

mount the siphon break directly above the generator.

8.5.3 Raw water pickup test

Objective: The objective is to determine the elevation of the water line relative to the generator under all anticipated uses and speeds of the boat, in order to verify the necessity to install a siphon breaker.

Method: When the boat is ready for its sea trials and loaded to its maximum rated capacity:

1. Close the sea cock and disconnect the raw water pickup hose from the generator. Alternatively, connect a clear plastic hose to the strainer or sea cock.
2. Raise the end of the hose above expected water level and open the sea cock. The water line is at the level visible in a clear plastic hose or where water just begins to spill as the end of the hose is lowered. While the boat is still docked, mark the level on the generator enclosure.
3. Operate the boat through its range, forward and reverse. While the boat is operating, have someone monitor the water level in the hose and mark the highest level obtained. In this way it has been obtained the “Dynamic sea water line”.

Requirement: A siphon break must be installed if the engine exhaust-water mixer riser is not at least 200 mm, above sea water line, both the static and dynamic.

Remark: If the water line when the boat is moving is much higher than when the boat is docked, the difference could be due to the through-hull fitting or its location. If the through-hull fitting is of the forward facing scoop-type designed to create ram pressure, replace it with a flush-type fitting. Another possibility might be to move the fitting to a location where the dynamic hull pressure is less.

8.5.4 Sea water intake and out board exhaust system

The generator installation requires a sea cock for the cooling sea water intake, and an overboard discharge outlet.

During the designing and creation of the generator position, it is necessary to pay attention to the sea cock and discharge systems.

There are two types of sea cocks:

1. direct sea cock, also called static;
2. baffle valve, also called dynamic or scoop.

 **ATTENTION:** if it is indeed to use the Generator during the navigation, it is indispensable to use static sea cocks. The use of dynamic or scoop type ones will lead to the immediate annulment of the guarantee, and COELMO shall be relieved from any responsibility for direct or indirect damages.

The generator cooling system intakes from the sea cock, and circulates it into the cooling circuits, then pumps it into the discharge circuit through the exhaust mixing opening.

During the generator normal functioning, the exhaust gas pressure ejects the water from the discharge ducts to avoid accumulation.

When the boat is moving, the sea cock can create pressure or de-pressure, which facilitates or hinders the circulation of the cooling water, and also circulates the sea water when the generator is turned off.

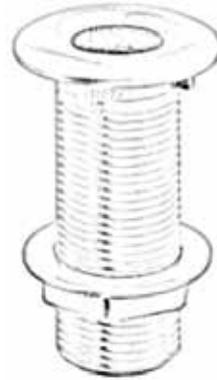
This dynamic method represents the inconvenience that the water can go over the pump until it reaches the muffler, even when the generator has stopped, and this hinders the emptying effect due to the pressure of exhaust gases.

 **ATTENTION:** should the water in the exhaust duct go over the generator exhaust mixer, the sea water shall enter into the engine exhaust ducts first and then goes into its cylinders, causing thus serious damages to the engine.

An incorrect installation, can generate in the sea cock, dependant on the boat speed, de-pressure and thus hinders the functioning of the sea water suction pump in the generator, causing its overheating.



Baffle valve, also called dynamic or scoop.



Direct sea cock, also called static.

8.6 Engine exhaust

8.6.1 Generality

 **WARNING** Exhaust gas is deadly! The exhaust system must be leak-free and convey all exhaust outside, away from windows, doors and vents.

Figure III-2 Appendix III illustrates a typical exhaust system installation.

A separate engine exhaust system must be installed for each generator. It must be isolated from all other engine exhaust systems.

Mufflers, water separators and siphon breaks are available as kits from

COELMO.

8.6.2 Hose and hose fitting diameters

No hose or hose fitting in the exhaust system may have a smaller inside diameter than the engine outlet. If the total run of exhaust hose is more than 6 meters, measure exhaust back pressure and use larger diameter. See Specifications chart in *Appendix IV*.

8.6.3 Exhaust hose

Use hose that has been approved for wet exhaust systems. Approved hose and stainless steel elbows are available from Coelmo. Horizontal runs of hose must slope down at least 40 mm/meter and be supported such that there are no sags. The entire run of hose must be accessible for regular, visual inspections and replacement.

8.6.4 Hose clamps

Use two stainless steel hose clamps at least 12.7 mm wide to clamp each end of each hose.

8.6.5 Muffler

Install an approved muffler as close a practical to the engine. For optimum silencing, the length of hose between the engine and muffler should not exceed 2 meter. The muffler inlet should be a minimum of 300 mm below the exhaust-water mixer and the outlet should be vertical. The muffler capacity should be 15 / 20% higher than the exhaust pipe. Install a water separator or fabricate a knee. The base of the muffler should not be more than 1.4 meter below the water separator or 1.2 meter below the knee in the piping.

Mount the muffler such that air can circulate underneath to prevent condensation and mold.

8.6.6 Exhaust water separator

When an exhaust water separator is used (Figure III-2 Appendix III), the muffler outlet and water separator inlet diameters must be the same size. The water separator should be installed directly above the muffler to maintain a vertical lift. The through-hull fitting for the drain hose should be below the load water line and must have a sea cock. An exhaust water separator backflow test must be conducted during the sea trials to determine that there is no backflow that could flood the engine.

8.6.7 Exhaust through-hull fitting

The exhaust through-hull fitting must be above the highest sea water line between the docked and the moving sea water line.

To reduce wave wash-in when a water separator is used (Figure III-2 Appendix III) the top of the water separator must be at least 450 mm above the load water line. When an elbow is used at the top of the muffler outlet hose, the elbow must be at least 300 mm above the through-hull fitting Figure III-2 Appendix III.

 **CAUTION** Backflow can cause major engine damage if the cylinders become flooded. The sea trials must verify that there is no backflow through either the exhaust hull fitting or the water separator drain hose fitting.

 **CAUTION** In the case of Generator under the sea water line, a siphon breaker valve must be installed. See the Figure III-1 Appendix III

8.6.8 Exhaust water separator backflow test

1) Objective

To determine that there is no backflow through the exhaust water separator under any operating condition.

2) Method

Conduct this operation during the sailing tests together with the “Raw water pickup test”.

3) Requirement

There must not be any back flow while operating the boat throughout its speed range. To carry out the test, it is needed to close the exhaust pipe of the sea cock, and disconnect the water separator pipe. Open the sea cock and carry out the test keeping the pipe towards the connecting point with the water separator. It is needed to verify that, while operating the boat throughout its speed range, it should be not there any water leak.

8.7 Electrical connections

8.7.1 Power connections

 **WARNING** Hazardous voltage! Touching un-insulated live parts inside the generator and connected equipment can result in severe personal injury or death. For your protection, stand on a dry wooden platform or rubber insulating mat, make sure your clothing and shoes are dry, remove jewelry from your hands and use tools with insulated handles. Secure protective covers when completing installation.

 **WARNING** Improper wiring can cause fire or electric shock resulting in severe personal injury or death.

 **WARNING** Accidental / remote starting of the generator can cause severe personal injury or death. To prevent unintended starting, do not connect the starting battery until it is time to start up the generator.

i. Power terminals

On the DM Series, the terminal powers are placed on insulated connector

fixed on the upper side of the on board control panel.

On the DML-DTL Series, the power terminals are accessible opening the terminal box placed on the rear central side, as indicated in the *Appendix II*.

ii. Wiring Methods

All wiring methods, connections, wire capacities, equipment grounding and materials must be inspected and comply with applicable regulations. Use flexible conduit and stranded conductors for load wiring to take up movement and vibration.

Note: All feed-through holes in decks and bulkheads for wiring must be sealed to prevent exhaust gases and flammable vapors from entering the rest of the boat. Wiring conduit must be sealed inside as well as outside.

iii. Generator (Alternator) Connections

 **WARNING** do not change the alternator cable configuration, without the authorization of Coelmo Service.

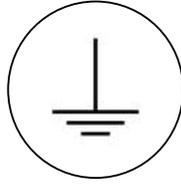
8.7.2 Grounding

The generator, power supply wiring and all connected electrical equipment must be bonded to the common grounding system of the boat in accordance with applicable regulations.

As standard on DML SERIES the neutral is not grounded, while the differential protection is not needed. To ensure the safety use insulation control devices. On DTL SERIES the neutral is grounded (in this case Coelmo recommends using of differential protection).

 **WARNING** Faulty grounding of electrical equipment can lead to fire or electric shock resulting in severe personal injury or death. Let carry out the wirings by a specialized technician, respecting the country installation current laws.

Remark: the grounding point is indicated by the symbol below.



i. Transfer switch Mains / Generator sectioner

Use an approved transfer switch if provision is made for connecting the boat to shore power.

⚠ WARNING Back feed to shore power can cause electric shock resulting in severe personal injury or death and damage to equipment. Use an approved device to prevent the generator from being interconnected with shore power.

ii. Load Balancing

On the DTL models, to avoid damages on the Generator and allow the maximum power supply, the electrical loads should be balanced as closely as possible.

8.8 Battery connections

As standard, the generator requires negative (-) ground, 12 VDC for its control and starting system. Some models, could be equipped for customized applications requiring an isolated ground.

8.8.1 Batteries

See Specifications in *Appendix IV* for recommended battery capacity.

8.8.2 Battery Recharging

The generator s equipped with a charging battery dynamo able to recharge the starting batteries during its functioning. In the case of long docking, use a static automatic charging battery with charging currents not up than 1/10 of the nominal batteries capacity.

8.8.3 Battery Location and Mounting

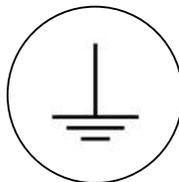
 **WARNING** Locate the battery where spills and leaks will not drip acid on fuel lines, wiring or other equipment and where ventilation is adequate to prevent the accumulation of explosive gases. Secure the battery so that it cannot shift and provide a boot over the battery positive (+) terminal to protect against accidental contact.

 **WARNING** Arcing can ignite the explosive hydrogen gas given off by the battery, causing severe personal injury. The battery compartment must be ventilated and isolated from spark-producing equipment.

8.8.4 Battery wiring

Size battery cables according to Table 8-1. Total cable length is the sum of the lengths of the positive (+) and negative (-) cables. In other words, total cable length will be approximately twice the distance between the battery and the generator.

Connect the positive (+) directly on the positive (+) of the starting engine, and the negative (-) on the grounding point indicated by the symbol below, paying attention to protect the (+) with insulating cover terminals.



| | | | | |
|--|---|-----|-----|----|
| Battery cable section (mm ²) | 35 | 50 | 70 | 95 |
| | Max cable length (mt) (total of cable length + e -) | | | |
| DM350 DM600 | 5 | 7 | 10 | 14 |
| DML740 DML970 | 3,5 | 5,5 | 7,5 | 10 |
| DML1330 DTL2590 DTL3200 DTL3950 | 3 | 4 | 6 | 8 |

 **WARNING** Sparks can ignite fuel leading to severe personal injury or death.
Use an insulating protection element on the positive terminal (+) to protect from the accidental contacts.



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