USER´S MANUAL

GENERATOR SETS

SERIE RENTAL

GESAN

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1

WELCOME

Thank you for acquiring a GESAN generator set.

The purpose of this manual is to describe the use and operation of the generator set, its components and maintenance.

It is recommended that this manual be read carefully prior to working with the equipment for a proper use.

Keep the document in case you need to refer to it and if the unit is resold, ensure this information accompanies the generator set.

A general description of the unit and the necessary information for its installation, operation and preventive maintenance can be found below.

In addition, you should have received a specific user manual for the engine and alternator, circuit diagrams and set of keys.

If any problem is encountered with the supplied equipment please contact the distributor directly.

GRUPOS ELECTRÓGENOS EUROPA S.A, with the on-going aim of improving the product, will revise its manuals to incorporate improvements made to the units supplied. For this reason the information contained in this document may change without prior warning or obligation to update it.

2 BASIC SAFETY RULES

Prior warnings and safety advice for handling the generator set supplied by GRUPOS ELECTRÓGENOS EUROPA S.A

1) Do not allow unauthorised staff or minors without adult supervision to use the unit.
2) Use the necessary personal protective equipment.
3) Connect the machine to earth.
4) Ensure there is sufficient lighting on the control panel.
5) Do not install the generator set outdoors without its casing; there is a danger of electrocution and breakdown.
6) It must be connected by a qualified electrician in accordance with the current standards and regulations. A bad connection can cause the electric current to return leading to a risk of electrocution for any person working with the grid.
7) The supply line from the generator set to the consumers must be protected by a switch with differential protection against earth leakage.
8) Do not operate the unit with the doors open: risk of electrocution, burns or entrapment. Be sure the doors are closed with keys before the start-up.
9) The exhaust system generates enough heat to ignite some materials. Therefore, never install the generator set near flammable materials or near materials that may ignite easily or in locations where the risk of a fire occurring is high.
10) Do not touch the engine or the exhaust while the generator set is running as it can cause severe burns.
11) Do not breathe the exhaust gases generated by the equipment.
12) Now how to stop the unit in case of emergency. Be special careful with his handling and storage.
13) For refuelling the engine, the generator set incorporates an exterior fuel filler neck and cap for filling the tank with diesel. Never refuel with the engine running or in poorly ventilated areas; remember that fuel vapours are toxic and flammable. Take the necessary safety precautions when handling fuel; the use of gloves and safety goggles is recommended.
14) The fuel used is inflammable and volatile.
15) If you notice the generator set behaving abnormally, stop it immediately, locate, examine and resolve the possible fault in the unit before starting it up again. Contact the technical services if required.
16) Keep the equipment separated at least one metre from buildings and other equipment.

17) Be careful when replacing or installing a battery since it contains extremely hazardous acids. Avoid spills and use protective equipment to avoid contact with the skin and eyes. In case of contact wash with plenty of water and consult a doctor immediately.

18) In case of ingestion of battery acid, drink large quantities of water or milk and consult a doctor immediately.

19) Use only distilled water in the battery as tap water shortens its service life.

20) If you exceed the maximum level when filling the battery the electrolyte will overflow. Clean it up quickly to avoid the parts in contact with it corroding.

21) Frequently clean the equipment to prevent obstructions or the adherence of foreign objects (dust, humidity, etc.).

22) Regularly inspect the unit's electrical cables.

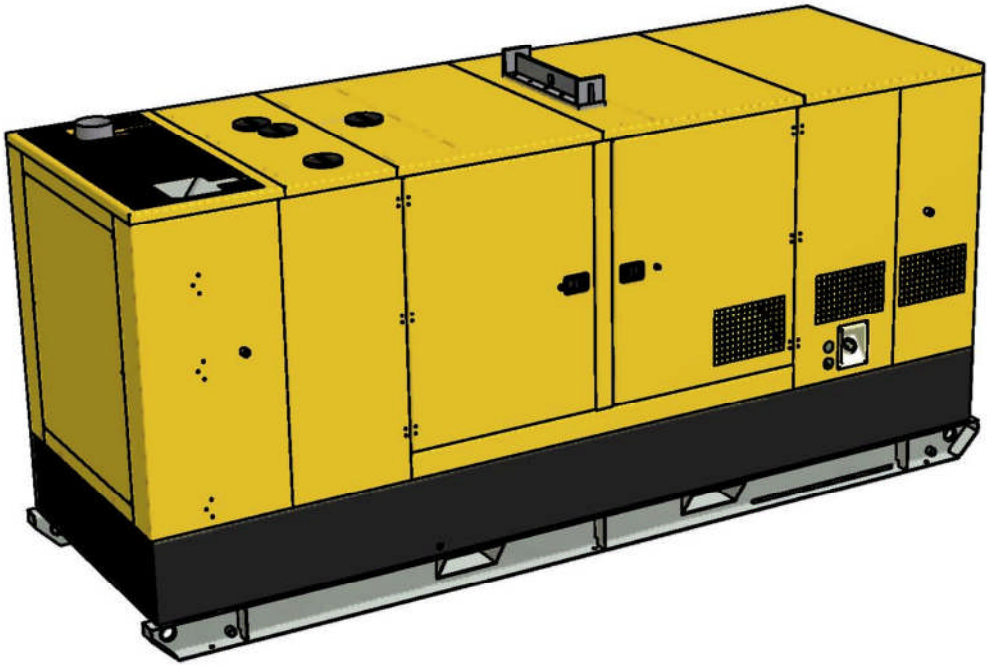
23) Engine oil is toxic and hazardous to the environment. Adopt the necessary safety measures when handling engine oil. Prolonged exposure to used engine oil may cause skin cancer. Carefully wash your hands after handling.

24) Prevent oil spills from occurring inside as well as outside the generator set. In the event of an oil spillage inside the unit, clean it properly as it can be an inflammable material.

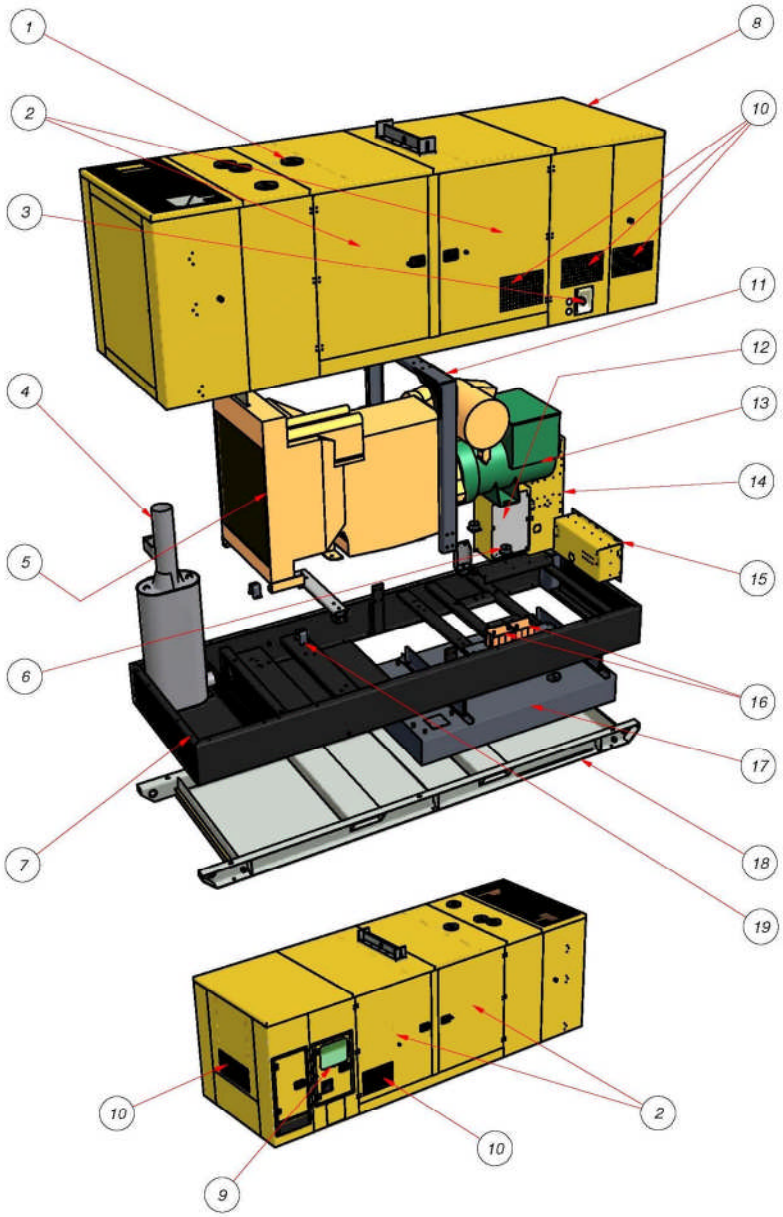
25) Do not fill the tank excessively. Ensure it is correctly closed. If there is a fuel spillage, take precautions as the vapours and the fuel itself are inflammable. Properly clean the surroundings prior to re-starting the equipment.

3 DESCRIPTION OF THE GENERATOR SET

A general description of the generator set manufactured by GRUPOS ELECTRÓGENOS EUROPA S.A (not identical to the genset supplied) and its different configurations can be found below.



Picture 1- Generator set with casing



Picture 2- Exploded view of RENTAL soundproofed generator set

1) Coolant filler trap
2) Side access door
3) Fuel tank filler cap
4) Exhaust silencer
5) Engine
6) Antivibration mounts
7) Bedplate
8) Casing
9) Switch board door
10) Air inlet grilles
11) Elevationgantry and eyebolt
12) Power panel
13) Alternator
14) Power panel
15) RENTAL socket panel
16) Batteries
17) Fuel tank
18) Liquid collection tray
19) Sections supporting generator set on bedplate
20) Base support

3.1. SOUND INSULATION

The unit supplied is **soundproofed** and its bodywork incorporates sound insulation. See point 11, Noise level, for further information.

Picture 3-Inside a soundproofed generator set

Each generator set is supplied with a sticker indicating the level of acoustic power generated and the need to use hearing protection.

Acoustic power 90 dBA	*Acoustic power 114 dBA*	*Hearing protection must be worn.*

Picture 4-Pictograms for acoustic power and compulsory hearing protection

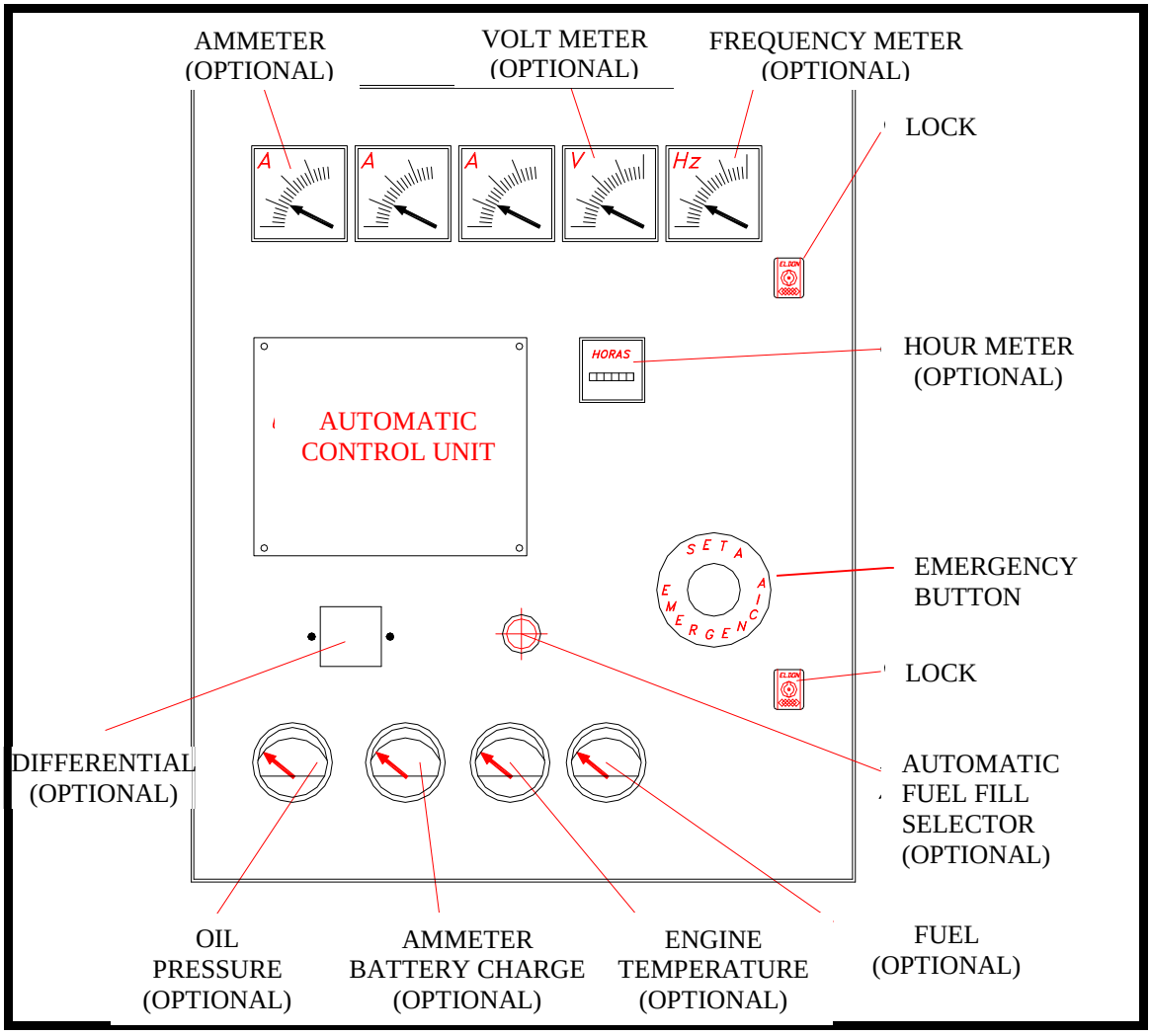
The noise was measured according to European Directive 2000/14/CE and in compliance with the maximum values determined by Directive 2005/88/CE.

Local standards that may be more restrictive must be taken into consideration. In all cases it is the responsibility of the installer to comply with the current regulations.

3.2. CONTROL UNITS

The unit supplied can be controlled from the different boards depending on the operation mode for which it has been designed.

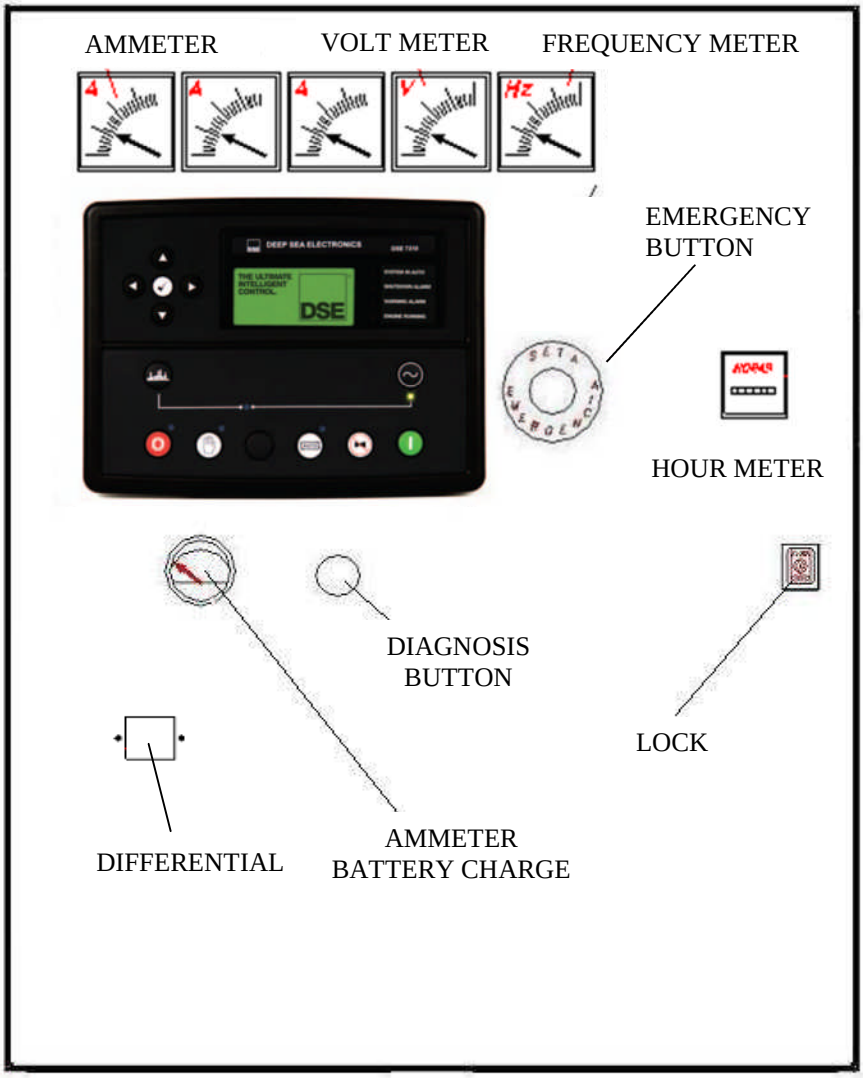
Below you can see a generic control panel, which contains all its electric and mechanical possibilities.



Picture 5- Generic control panel

3.1.1. DEEP SEA digital control plate

If you have acquired a generator unit with a DEEP SEA 7310 control board, the switchboard will look like the following diagram:

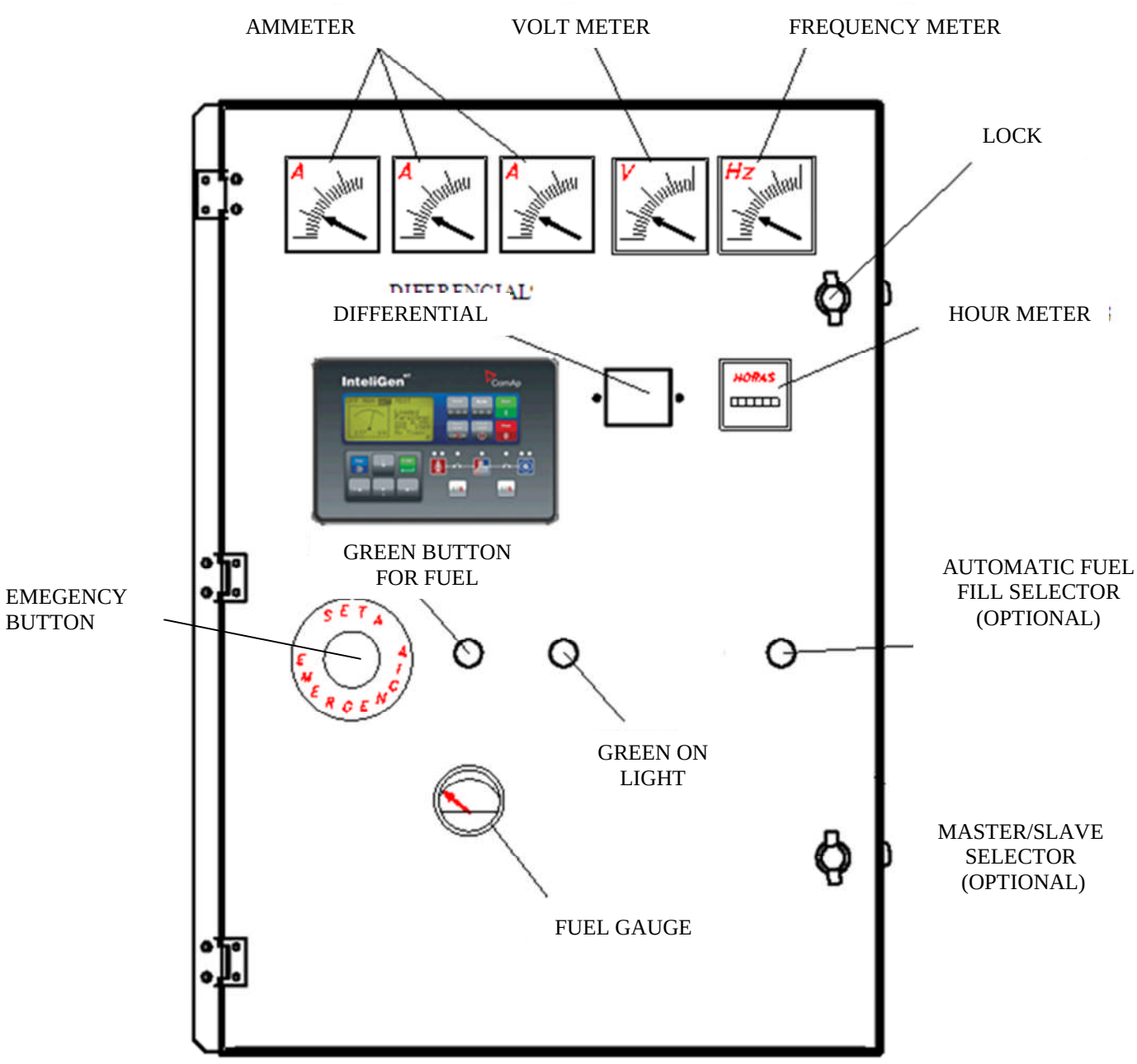


Picture 6 - Control panel on Deep Sea control board All the instruments are optional.

Note: The button *on the control board fulfils the same function as the diagnosis button (in OFF/AUTO mode).*

3.1.2. INTELIGEN digital control plate

If you have acquired a generator unit with an INTELIGEN control board, the electric panel will look like the following diagram:

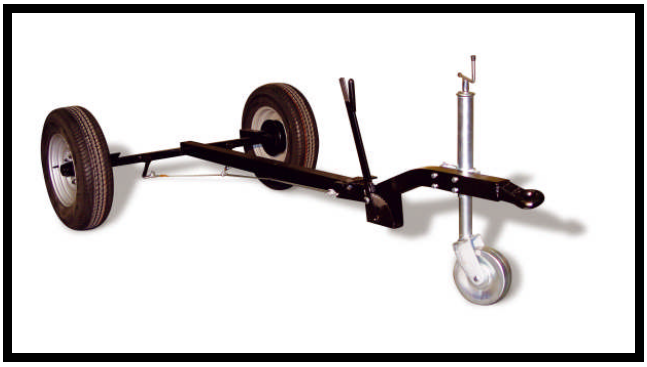


Picture 7 - Control panel on InteliGen

3.2. TRAILER

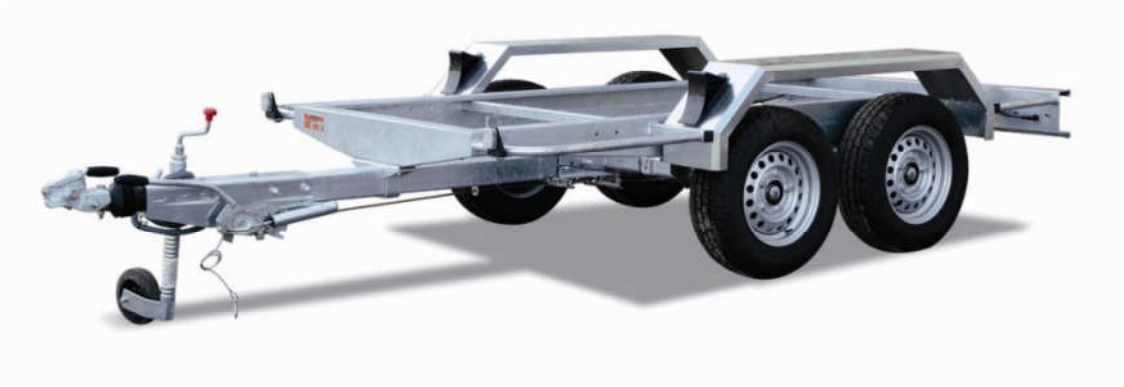
The generator unit may have a transport trailer.

- **On-site trailer:** its use is limited to areas of private use. It has a DIN type tow hitch, parking brake and jockey wheel.



Picture 8- On-site trailer

- Approved speed trailer: suitable for use on public roads. It incorporates inertia and parking brakes (only in models heavier than 750 kg), a DIN or ball type tow hitch, identification plate with the chassis number, jockey wheel, lights kit and mudguards (supplied separately).



Picture 9 Approved speed trailer

Note: The European Community authorises people with driving licences for vehicles type B, C and D to drive vehicles with a trailer with a maximum authorised weight of 750 kg, or greater in the case of class B licences when the maximum authorised weight of the trailer does not exceed the tare of the car towing it and the sum of the authorised maximum weights of both vehicles does not exceed 3500 kg. Check the Maximum Authorised Weight (MAW) of the generator set supplied by GRUPOS ELECTRÓGENOS EUROPA S.A. is lower than the Maximum Towable Weight (MTW) with or without brake depending on the trailer supplied. It is not necessary to contract a special insurance policy for towed loads weighing less than 750kg, simply notify the company with which you are insured as towed items are included in the policy. If it exceeds 750 kg an independent insurance policy must be taken out. Once you have acquired

the trailer, GRUPOS ELECTRÓGENOS EUROPA S.A will provide the relevant documentation. If it exceeds 750 kg, the approved trailer must be taken to the Traffic Office to obtain a trailer licence board (red in Spain).

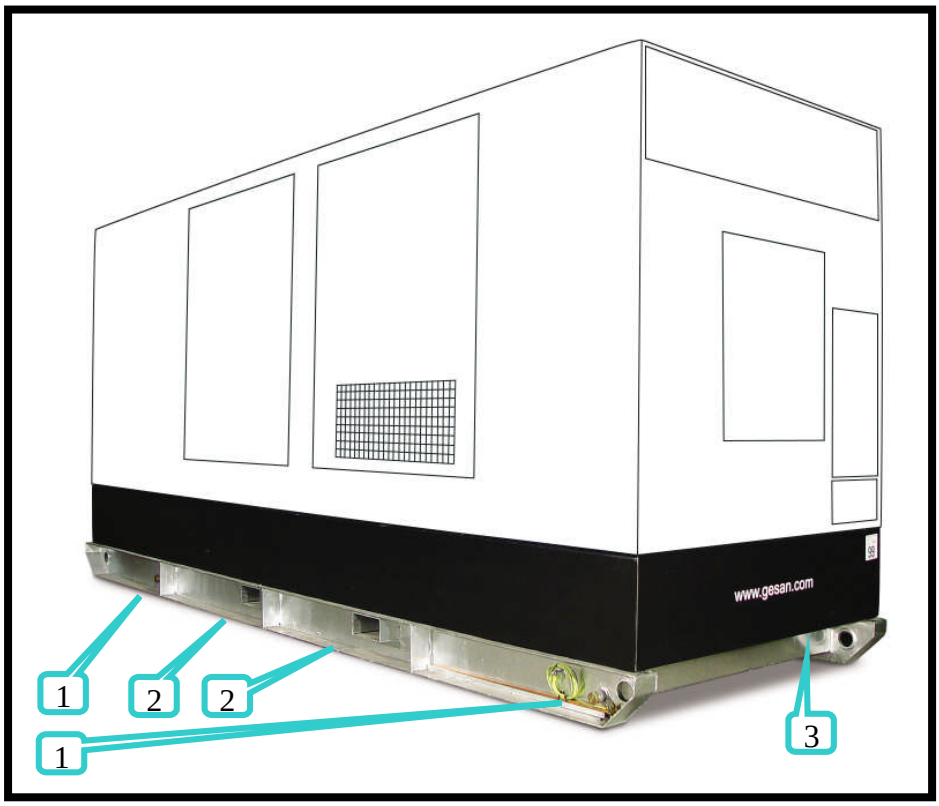
When selecting the ***tow hitch*** take into account the maximum weight the vehicle can tow.

The formalities for driving legally must be carried out by the owner. Once the generator set has been received, contact GRUPOS ELECTRÓGENOS EUROPA S.A and they will send you the vehicle roadworthiness inspection card. Then the formalities must be completed to obtain the vehicle registration and permission to drive on public roads (ITV in Spain, MOT in the UK).

3.3. LIQUID COLLECTION TRAY

The generator set may include a liquid collection tray, to avoid spills coming from the unit (fuel, oil or coolant), with a capacity of 110% of the total volume of the liquids in the generator set.

It is the installer's responsibility to take the appropriate measures to avoid possible spills of pollutants. If your generator set does not include the collection tray and you feel it should, please contact our technical department.



Picture 10- Liquid collection tray

1) 4 drainage plugs (2 on each side of the tray)

2) Through holes for the fork lift arms

3) Level sensor (optional)

4. INSTALLATION OF THE GENERATOR SET

This manual describes the installation of a generator set from the RENTAL range composed of a diesel engine, an alternator and a switchboard. For all particular applications, our technical services will advise you.

4.1. UNLOADING AND TRANSPORT

The unit must be unloaded and transported by qualified staff taking into account at least the minimum safety conditions.

The ground must be perfectly able to bear the weight of the unit and the hoist.

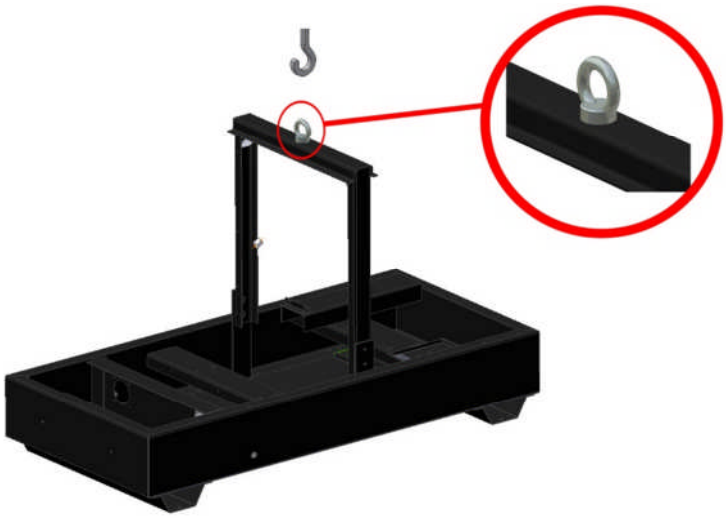
Ensure that the battery is disconnected.

Ensure the fuel tank is empty.

With the fork lift, position the open arms under the chassis so they are equidistant with respect to the elevation gantry.

With the crane, hoist using the elevation gantry eyebolt.

The picture below shows a diagram of a generator set equipped with a gantry with one single point of elevation.



Picture 11- Elevation gantry

If your unit has a trailer there are two possibilities:

- **Trailer 1 - On-site trailer**: It is secured with a DIN type tow hitch and safety chains to the back of the towing vehicle. This trailer is not authorised for use on public roads. Use the parking brake when necessary.
- **Trailer 2 - Trailer with approved speed:** Take into account the legal considerations detailed in point 3.3.

Always exercise the following precautions:

- Verify that the tow hitch and the coupling of the towing vehicle to the trailer are of a suitable size for a load greater than or equal to the gross load of the vehicle to tow.
- Verify there is no wear or damage to the tow hitch or coupling, and never tow the unit if there is any excessive wear or any part is damaged.
- Verify that the coupling is correctly secured to the towing vehicle.
- Monitor the condition of the trailer's tyres.
- Connect the safety hook to the bumper or the back of the towing vehicle, never to the generator set or the tow hitch itself.
- Check that the brakes of both the trailer and the towing vehicle are in perfect condition.
- Verify that the indicator and brake lights of the trailer are correctly installed and function correctly.
- At the end of each trip, apply a film of grease to the coupling of the towing vehicle and the ring of the trailer. Before towing again, clean it and grease it again.
- Install the safety chains in the units that include the on-site trailer.

4.2. INSTALLATION OF MOBILE UNITS

Mobile units are those that change workplace at least twice a year. This manual describes the installation of a “generic” generator set composed of a diesel engine, an alternator and a switchboard. For all particular applications, our technical services will advise you.

4.2.1. Location

This type of unit must be installed in well-ventilated places, thus ensuring sufficient flow of coolant air and that the fumes from the combustion do not recirculate towards the engine's air intake.

The unit shall be located in a place fully able to bear the weight of the generator set, guaranteeing both **horizontal and vertical stability.**

There must be sufficient distance to allow access to the inside of the generator set (minimum 1 metro distance to any building or wall, with the doors of the generator set fully open).

Avoid installation in damp places or in areas where water may get into unit.

* Note: The exhaust has the option of a spark arrester at the exhaust output.

4.2.2. Fuel

In light of the current laws, you must take special care when storing fuel classified as a hazardous product. The generator set shall be installed with a tank for daily consumption.

Before starting work, check the amount of fuel in the tank and ensure there is enough.

There is the optional of quick fuel connectors, which are connected using ducts through the machining of the casing.

You must take into account a number of points:

a. For coupling and decoupling, move the bushing of the female connector back.
b. Make sure the intake circuit from the external tank does not contain air.
c. In the external tank, the intake end must be the male and the return the female of the 3/8 BSP connectors.
d. The return must be correctly connected.
e. Both connectors must be sealed; they close when disconnected.
f. It is important that the distance between the supply tank and the generator set is as short as possible. In the event of abnormal behaviour (insufficient power if there are intake problems) reduce the distance or increase the diameter of the hoses. The following table shows the maximum distances

PERKINS					
Group	Engine	Max distance/Tube diameter	Maximum suction height (m)	Flow (l/h)	Maximum pressure (kPa)
DPR 100	1104C-44TAG2	10m / 8-12,7mm	1	150	26
DPR 20	404D-22G	3m / 8mm	0.8	63	30
DPR 250 NC	1306C E87TAG6	3m / 8mm	1	180	30
DPR 30	1103D-33G3	10m / 8-12,7mm	1	150	26
DPR 30 NC	1103A-33G	10m / 8-12,7mm	1	150	26
DPR 45	1103C-33TG3	10m / 8-12,7mm	1	150	26
DPR 45 NC	1103A-33TG1	10m / 8-12,7mm	1	150	26
DPR 500 NC	2506A-E15TAG2	3m / 15mm	3	413	30
DPR 60	1104C-44TG3	10m / 8-12,7mm	1	150	26
DPR 60 NC	1103A-33TG2	10m / 8-12,7mm	1	150	26
DPR 80	1104D-E44TAG2	3m / 8mm	1.5	130	10
DPR 80 NC	1104A-44TG2	10m / 8-12,7mm	1	150	26

VOLVO					
Group	Engine	Max distance/Tube diameter	Maximum suction height (m)	Flow (l/h)	Maximum pressure (kPa)
DVR 140 NC	TAD 532 GE	6m /12 mm	1.5	360	35
DVR 150	TAD 751 GE	6m /12 mm	1.5	240	35
DVR 200	TAD 753 GE	6m /12 mm	1.5	240	35
DVR 200 NC	TAD 733 GE	6m /12 mm	1.5	360	35
DVR 250 NC	TAD 734 GE	6m /12 mm	1.5	164	35
DVR 315 NC	TAD 941 GE	6m /12 mm	1.5	108	20
DVR 400 NC	TAD 1344 GE	6m /12 mm	1.5	120	30
DVR 460 NC	TAD 1345 GE	6m /12 mm	1.5	125	30
DVR 500 NC	TAD 1641 GE	6m /12 mm	1.5	170	20

The unit may have an automatic suction transfer pump (SAB-BE), with eccentric self-adjusting blades. Inside there is a 352-micron removable filter that must be used.

Picture 12- Pump SAB-BE

Note: If the distance from the unit is going to be greater than that recommended, the pump must be removed and located near the external tank. The pump will work if the unit is running and has an OFF/AUTO switch on the door of the switchboard integrated in the unit.

4.2.3. **Exhaust**

When installing the exhaust you must take into account the load losses caused and its insulation.

The suspension of the elements that comprise it, the level of noise produced and the polluting emissions produced.

The compensators and flexible tubes of the installation absorb the movements (due to the dilatation and vibrations).

4.2.4. Starting the generator set

The starting system for the generator set is electric. It consists of a 12 or 24 V electric engine powered by one or several lead-acid batteries.

Low temperatures make it more difficult to start the engine. A start failure (three tries without success) shall lead to the order to stop the whole generator set. For these temperature conditions, and to avoid this and ensure the generator set starts correctly at any external temperature, you have the option of installing a boiler (heating of the cooling water) by means of a preheating system connected to the grid. This system functions automatically, governed by a thermostat (factory-regulated to between 40 and 60ºC), and indicated in the panel with a reading on the DEEP SEA 4420 module.

If the unit has been sent outside of Spain the dry charged batteries shall be commissioned by removing the plugs and filling each element of the battery with sulphuric acid with a density of 1.28 (or 1.23 in tropical countries). Leave it to settle for at least 20 minutes and check the level of electrolyte (25 mm above the plates). Never fill it up to the top. Replace the plugs.

⚠ *It is recommended to wear protective goggles and gloves when filling up the battery acid. Ensure you have access to running water in the area to clean any affected areas.*

⚠ *You must take safety measures and precautions when performing the tasks indicated in this manual. Special attention must be paid to short-circuit hazards that may occur when metal objects come in contact with the equipment power terminals.*

If you have acquired an MTU engine, on occasions, with the generator set on and the engine stopped, the engine's central unit will consume a large quantity of the battery's energy, so it is possible that it runs flat and it is impossible to start it up again. For this reason, there is a selector on the switchboard that disconnects the battery in the event of an extended stop. For this purpose, we advise you to carry out the following start-up process:

1) Switch the selector to position 1.
2) Start up the generator set.
3) Switch the selector to position 0.

Note: Step 1 is strongly recommended, as if the selector is in position 0 once the generator set is running, the board will remain without a power supply.
IT is recommended to avoid keeping the central unit in position 1 for more than 2 days, as the batteries will discharge completely, which would impede the generator set starting up again later. If the selector is moved to 0 while the generator set is running, the generator set will not stop. The battery can only be disconnected with the engine stopped.

If your generator set does not have an MTU engine installed, you will find an informative sticker warning you to disconnect the battery to avoid it discharging during extended stops.

4.2.5. Electrical connection

The cables that supply the consumers must be connected by qualified staff, to the outputs U, V, W and N or L1, L2, L3 and N or in the electrical outlets. The aforementioned qualified staff must follow these safety instructions:

1) Use the relevant personal protection equipment to carry out the electrical installation safely.

2) Place the control module selector in the STOP position.

3) Ensure the emergency stop button has been pressed.

4) Verify that the battery is disconnected.

5) Disconnect the supply from the electrical grid.

6) Before starting to install the equipment that has been supplied, ensure it can provide the voltage and frequency you need.

7) Handle the cables with maximum care as they may be live.

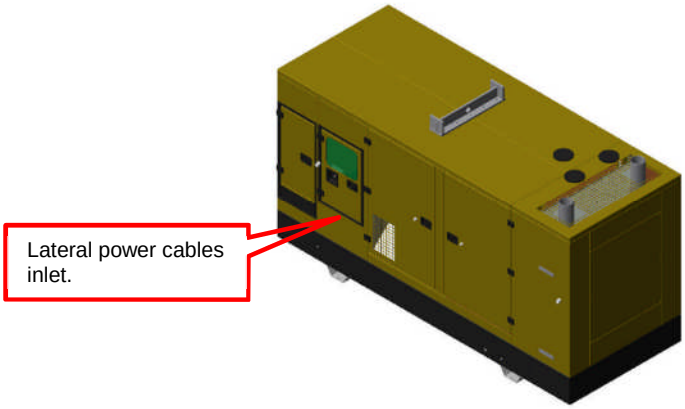
8) You must connect the generator set to earth correctly (labelled on the unit with the following icon).

The four-polar switches have strips at the output to facilitate connection of the conductors and avoid their deterioration caused by the repetition of the connection.

The outlets may or may not, depending on the option selected, have individual protection per outlet, thus differentiating the protection per outlet from the general unit using an individual switch.

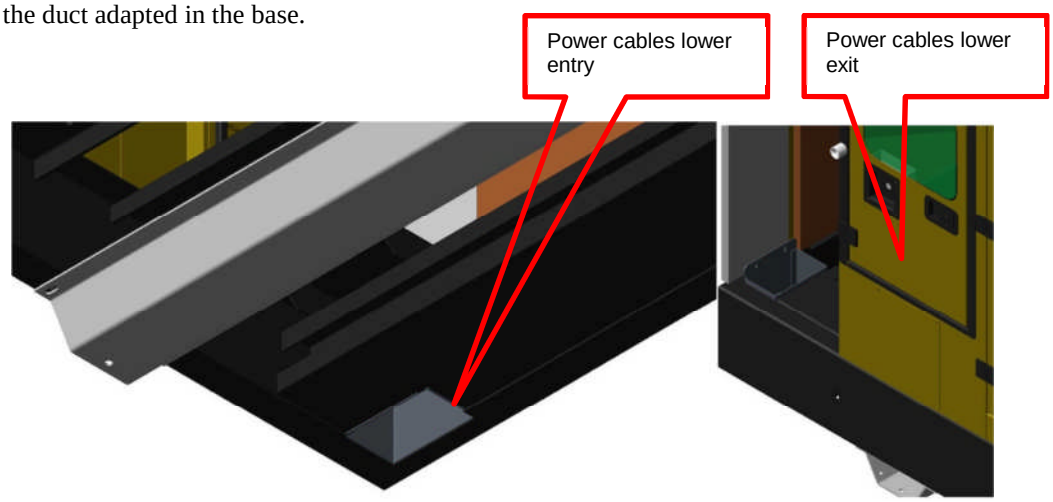
In isolated power box gensets, mains cable instalation could be realized by two ways:

-Lateral power cables outlet: This way, power cables come out by the trapdoor with protective rubber placed in the control box door, as shown in the Picture:



Picture 13- Lateral power cables trapdoor entry

-Power cables lower exit: This way, the power cables enter directly from the bedplate lower part throught the duct adapted in the base.



Picture 14- Power cables entry by bedplate

In the installation drawing you could find the exact measures, and also relative positions.

If the unit has been sent outside of Spain the dry charged batteries shall be commissioned by removing the plugs and filling each element of the battery with sulphuric acid with a density of 1.28 (or 1.23 in tropical countries). Leave it to settle for at least 20 minutes and check the level of the electrolyte (25 mm over the plates); never fill it up to the top. Replace the plugs.

4.3. STORAGE

If you believe your generator set will be inactive for some time, you must follow the instructions below:

1) Position the control board in STOP.
2) Press the emergency button to avoid unwanted start-ups when it is connected in future.
3) Empty the fuel tank. Ensure the interior protection valve is in the correct position.
4) Leave the battery disconnected, using the battery disconnector.
5) Do not leave the unit in a place where dust accumulates or in excessively damp places.
6) Do not use pressurised water when cleaning the unit.
7) In order to better preserve the engine, refer to its manual; this manual has been supplied along with this document.
8) In order to better preserve the alternator, refer to its manual; this manual has been supplied along with this document.

5. COMMISSIONING AND STOPPING

Once the installation of the generator set has been completed, or its location has been changed, follow these steps:

1) Check the unit is correctly balanced and supported on the ground.
2) Check and, if necessary, retighten the screws that secure the engine-alternator assembly to the bedplate.
3) Check and, if necessary, retighten the screws securing the radiator to the bedplate and engine.
4) Check and, if necessary, adjust the fan and battery charge alternator belts, and their alignment. If the power of the generator set exceeds 750 kVA, this recommendation is compulsory. Contact your distributor to request specific information to carry out this task.
5) Check the bodywork is sealed, especially the upper casing. Clean and reseal if necessary.
6) Check the connections of the battery terminals, and retighten, clean and grease when necessary.

Before commissioning the generator set, follow these steps:

1) Check the levels: verify the levels of the oil, coolant and fuel in the control module. Close the battery disconnector.
2) Release the emergency button, if it has been pressed.
3) Supply the mains circuit and verify that the voltage indicator gives a suitable reading.
4) Verify the circuit breaker (the lever must be up).
5) Once the tasks prior to commissioning are finished, ensure the control module selector of the generator set is in the desired position. For this, duly read how your control module works in point 6 (OPERATION MANUAL).

To stop the unit:

1) Disconnect the loads.
2) Disconnect the circuit breaker.
3) Leave the engine running at no load for 2 minutes to cool the generator set.

Stop the engine by moving the selector on the control board to the OFF position.

5.1. GENERATOR SETS AND POWER FACTOR CORRECTORS

The power factor (cos φ) of the loads the generator set supplies must be determined. Inductive power factors below 0.8 can overload the unit. The power factor values for which the generator set has been designed are between 0.8 and 1 (inductive).

Special attention must be paid to installations that have power factor correction units (capacitor banks) to avoid capacitive power factors. These can lead to instability in the voltage and dangerous overvoltages.

5.2. OPERATION AT LOW LOAD IN DIESEL ENGINES

If a diesel engine works at a load system below 25-30% of its nominal power, certain symptoms will be observed that must be taken into account. The engine is designed to work at maximum power and, consequently, its components (pistons, cylinders and valves) are also designed for this.

When engines work at low load, the energy supplied by the cylinders is lower, and consequently the pressure and temperature within the cylinders are also lower. Therefore, the dilatation of the material and the seal of the valves are not suitable, and oil will leak into the cylinders, burning along with the fuel, which increases the engine's oil consumption.

Oil also appears in the intake commutator.

Turbocharging systems are used to increase the power of an engine by increasing the amount of air that enters the cylinders. When the system operates the air is sucked in, causing vacuums of up to500 mm H2O, with pressure ratios of 3:1. The gaskets of the system are designed to work at the point of maximum efficiency. If the engine works at low load, the system works more slowly (less energy in the exhaust gas, as less fuel is burned) and the air is less compressed allowing oil to appear, which reaches the conmutator impregnating its walls and, oil leaks occasionally form.

Due to this running at low load, the combustion worsens (there is an excess of fuel in the cylinders) causing a characteristic blackening of the exhaust gas.

In addition, more cinder is formed in the valves, in the piston crown and exhaust system. Therefore, the time intervals of 2500 hours between exhaustive maintenance sessions must be reduced. There will also be a dilution of the fuel in the lubricant oil.

The following precautions are recommended:

- Running at low load must be avoided or limited. If you start the generator up weekly at no load, this should be for 15 minutes or less if the batteries are already recharged.
- Every year the generator must be subject to full load to eliminate accumulations of cinders in the engine and exhaust. It may need additional external loads. The load should be increased gradually over the four hours of operation.
- If you anticipate long periods of operation at low load, an additional load using resistor banks will be necessary.

6. OPERATION MANUAL

The generator set you have acquired was designed for manual service; it is started up and stopped manually.

Different elements are described below, depending on the choice of generator set.

6.1. SWITCHBOARD COMPONENTS

Ammeter:

Ammeter (A), by means of a selector of the different lines of the Generator set.

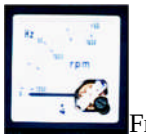
Indicator dials for parameters of the engine: (Optional)

Oil pressure

Battery charge current

Engine temperature

Fuel level


Frequency meter:

Indicator of generator set frequency (Hz)

Voltmeter with switch.

Voltage meter (V), by means of a selector of the different lines of the generator set.

Hour meter:

Indicator of the hours that the generator set has been operating.

The two digits on the right in red indicate hundredths of an hour. The hours will be indicated from

the third digit on and they will be displayed in white.

Emergency button:

Pressing it causes the generator set to stop immediately. To cancel it, turn it anticlockwise, but be sure the emergency is over.

For soundproofed units the emergency button is installed outside of the switchboard (integrated in the bodywork).

Diagnosis button:

Enables consultation of the engine's parameters when the generator set is stopped (electronically managed engines). The different generator alarms can also be read here.

Differential:

This is a protection against earth faults of one of the lines, tripping the main protection switch of the electrical generator.

It is configured to trip when it exceeds 30 mA for residential use or 300 mA for industrial use, with a delay of 0 s. It is the responsibility of the installer to adjust and seal the differential according to the current regulations.

DEEP SEA 7310 module;

Automatic module that monitors the mains supply.

ComAp INTELIGEN module (optional)

Module for manual or signaled start-up.

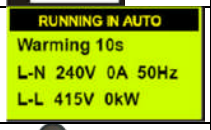
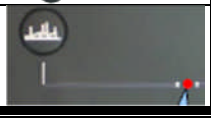
Auxiliary socket panel (standard).

The following table shows the types of sockets included in the power panel for the RENTAL Series, depending on the power of the generator set supplied by GRUPOS ELECTRÓGENOS EUROPA S.A

Sockets	Type	9-10 kVA	13-25 kVA	30 kVA	40-160 kVA	180-500 kVA
Single phase	1X 16 A. SCHUKO 2F+T *	1	1	1	1	1
	1X 16 A. CEE 2F+T	1	1	1	1	1
	1X 32 A CEE 2F+T	-	-	1	1	1
Three phase	1X 16 A CEE 3F+T	1	-	-	-	-
	1X 16 A CEE 3F+N+T	1	1	1	-	-
	1X 32 A CEE 3F+T	-	-	1	1	1
	1X 32 A CEE 3P+N+T	-	1	1	1	1
	1X 63 A CEE 3P+N+T	-	-	-	1	1

6.2. DEEP SEA 7310 CONTROL MODULE

Picture 15- Deep Sea 7310 control module

NUMBER	SYMBOL	DESCRIPTION	IDENTIFICATION
(1)		Stop button.	Red LED
(2)		MANUAL mode button	Red LED
(3)		TEST mode button	Green LED (available on model 7320 only)
(4)		AUTOMATIC mode button	Red LED
(5)		Mute alarm / Lamp test button	
(6)		Generator set start up button	
(7)		“Transfer to generator” button	Green LED on when generator set is available
(8)		Configurable LED indicators.	Red LED
(9)		Status generator set display.	
(10)		Menu navigator	
(11)		“Open generator” button	LED on: generator set is supplying loads.

Deep Sea **7320** is an automatic control module that monitors the main power supply; if a mains failure occurs, generator set will start up and loads are transferred. This control module also allows the option of manual startup. The user can also control all of the generator unit’s parameters as well as the status of mains power supply. This model is supplied with standby generator sets with or without ATS.

Deep Sea **7310** control module is supplied with “standby by signal” type units.

- ***AUTOMATIC mode (AUTO):***

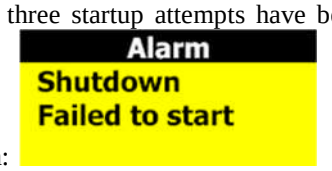
This is the normal operating mode.

The automatic mode is activated by pressing the button

(4), at which point the LED at the top of the button will turn on, indicating that it is operational.

(**7320)** If the mains power supply fails for longer than the unit's programmed period, the LED

(**7310**) If a mains failure occurs, the external management system should send a startup signal to the generator set, at which point the LED indicating remote startup active (8) turns on and the startup process of the generator set begins.

The engine will start; if it should fail, there will be a maximum number of startup attempts (3). If all three startup attempts have been unsuccessful, the information screen will display a startup alarm: 

When mains power is restored (or when the remote startup signal disappears) there will be a period of time in which the engine will continue operating at no load to cool down before stopping completely.

If a mains failure occurs or remote startup signal appears again during the no-load operating period (cool-down period), the generator set would begin the startup process again.

Press (1) or the emergency stop button to intentionally stop the unit.

- ***MANUAL mode:*** The manual mode is activated by pressing the button (2), at which point the LED at the top of the button will turn on, indicating that it is operational.

Press (6) to start up the unit.

To terminate this mode, press the button

(4).

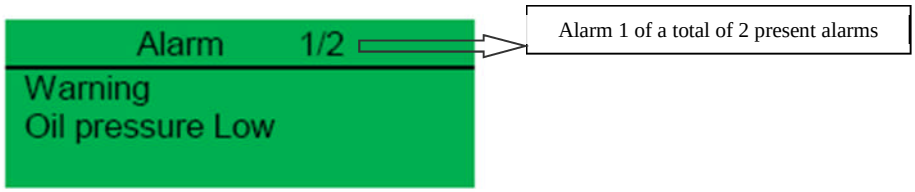
Once button (4) is pressed and there is adequate mains power supply (without the remote startup signal activated), the shutdown sequence will begin as described in the automatic mode.

Press (1) or the emergency stop button to intentionally stop the unit.

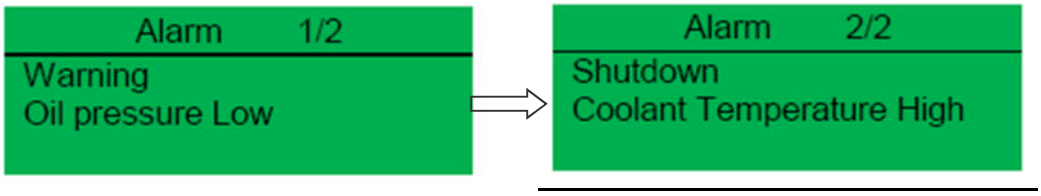
ALARMS:

Press (5) to silence the audible alarm and acknowledge the common alarm LED.

By default, the information screen will show the status screen and if an alarm occurs, the screen will display the following:



If shutdown occurs while a warning is active, the screen will cycle through the active alarms:



The warnings do not entail generator unit shutdown.

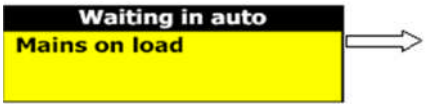
Press (1) to reset all the alarms which causes the stops. If the cause which caused the alarm has not gone we cannot reset the board

INCIDENT	ALARM DESCRIPTIONS
ALARM Warning Charge failure	Charge alternator voltage not detected
ALARM Warning Battery under voltage	Battery voltage beyond established limits
ALARM Warning Battery over voltage	
ALARM Warning Fail to Stop	After shutdown command, engine continues running. Could also indicate faulty oil pressure sender
ALARM Warning Auxiliary inputs	Auxiliary inputs can be configured and will display the message as written by the user
ALARM Warning Low fuel level	Fuel level below established limits
ALARM Warning CAN ECU error	Engine ECU has detected a warning alarm. The exact error is also indicated on module display (only for electronic engines).
ALARM Warning kW overload	The total kW are above the warning setting.
ALARM Warning Earth fault	The earth fault current is above alarm settings (only under customer request)
ALARM Warning Negative phase sequence	Indicates “out of balance” current loading of the generator set.
ALARM Warning Low oil Pressure	Low oil pressure, below established limit
ALARM Warning Engine high temperature	Engine temperature beyond established limits
ALARM Warning Engine low temperature	
ALARM Warning Underspeed	Engine speed beyond established limits
ALARM Warning Overspeed	
ALARM Warning Generator over frequency	Generator set frequency beyond established limits
ALARM Warning Generator under frequency	
ALARM Warning Generator over voltage	Generator set voltage beyond established limit
ALARM Warning Generator under voltage	
ALARM Warning High Current	Current of the generator set output beyond established limits

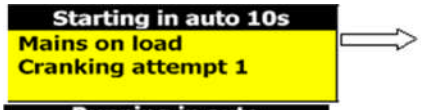
INCIDENT	DESCRIPTION OF SHUTDOWNS
ALARM Shutdown Earth fault	The earth fault current is above shutdown settings (only under customer request)
ALARM Shutdown Failed to Start	Engine does not start, three attempts made.
ALARM Shutdown Emergency stop	Controlled shutdown of the unit. It will not be functional until the emergency stop button has been reset.
ALARM Shutdown Low oil pressure	Oil pressure below established limit
ALARM Shutdown High temperature	Engine temperature above established limit
ALARM Shutdown Phase rotation	The phase rotation is different to the configured direction
ALARM Shutdown Overspeed	Engine speed beyond established limits
ALARM Shutdown Underspeed	
ALARM Shutdown Generator over frequency	Generator set frequency beyond established limits
ALARM Shutdown Generatp or under frequency	
ALARM Shutdown Generator over voltage	Generator set voltage beyond established limit
ALARM Shutdown Generator under voltage	
ALARM Shutdown Oil pressure sender open circuit	Faulty oil pressure sender
ALARM Shutdown Auxiliary input	An active auxiliary input configured as a shutdown will cause the engine to shutdown. The display shows the text as configured by the user.
ALARM Shutdown Loss o speed signal	The speed signal from magnetic pick up as not received by the module.
ALARM Shutdown ECU data fail	The module configured for CAN operation and doesn´t detect data on data link.
ALARM Shutdown ECU shutdown	Engine ECU has detected a shutdown alarm. The exact error is also indicated on module display (only for electronic engines).
ALARM Shutdown kW overload	The total kW is above the shutdown setting.
ALARM Shutdown Negative phase sequence	Indicates “out of balance” current loading of the generator set.
ALARM Shutdown High Current trip	Current of the generator set output beyond established limits
Note: If the established limit for shutdown is exceeded, a corresponding alarm screen will be displayed and on the configurable LED indicator (8) the Common Shutdown alarm will appear.	

INCIDENT	DESCRIPTION OF ELECTRICAL TRIPS
ALARM Electrical trip Generator over current	Generator set current above electrical trip setting.
ALARM Electrical trip Auxiliary inputs	Auxiliary inputs can be configured and will display the message as written by the user
ALARM Electrical trip kW overload	The total kW is above electrical trip setting.
ALARM Electrical trip Earth fault	The earth fault current is above electrical trip settings (only under customer request)
ALARM Electrical trip Negative phase sequence	Indicates “out of balance” current loading of the generator set.
Note: Electrical trips are latching and stop the generator set but in a controlled manner. Firstly de-energize the “close generator” output to remove the load from the generator set, and later, cool down and shutdown the unit.	

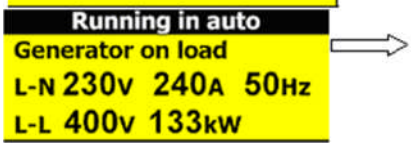
Typical LCD Display Screens



Indicates that the generator set will respond to either a mains failure or an active remote start.

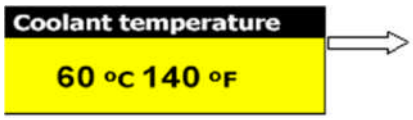


Indicates that generator set is in automatic mode and has been initiated after a mains failure has been detected.

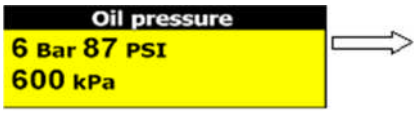


Indicates generator set running normally in automatic mode. Also indicates the average line to neutral voltage (L-N), the highest of the three phase currents, the rated frequency, average line-to-line voltage (L-L) and total kilowatts.

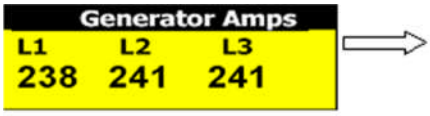
– **Measurement Parameter Display Screens:**



Coolant temperature in degrees (ºC) Celsius and degrees Fahrenheit (ºF)



Displays engine oil pressure in Bar, PSI and kPa.

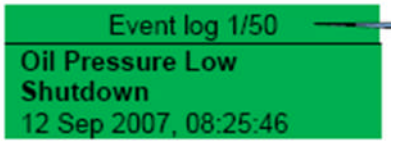


All three generator line currents.

- **Event Log:**

To view the event log, press the following button repeatedly until the LCD display the event log.

It registers the shutdown alarms occurring in the generator unit. A screen similar to this is shown:



"On September 12, 2007, at 08:25:46, the unit detected that the oil pressure was below the minimum level and has shut down the generator. It´s the event 1 of a total of 50 logged events"

To move from one event to the next, press .

To exit the main screen, press .

Note: Warning alarms are not logged.

- **Displaying information:**

Pressing this button: .

Page order:

- Status display
- Instrument display (engine, generator and mains)
- Alarms display
- ECU DTCs (electronic engines only)
- Event Log
- Scheduler (if enabled)
- About

It is possible to scroll through the different display screens by pressing the next page button: . Once selected, the page will remain on the screen until the user selects a different page or after a period of inactivity for the control module, at which point the status display appears.

If no buttons are pressed upon entering an instrumentation page, the instruments will be displayed automatically.

Alternatively, by pressing on or buttons, the user can scroll through all the instruments on a particular screen. This disables autoscroll. When autoscroll is disabled, if no buttons are pressed the display will return to the status page. To re-enable autoscroll, press on or buttons to scroll to the title of the instrument page.

If an alarm becomes activated while viewing instruments, the Alarms page will be automatically displayed.

Instrument page content:

Engine

- Engine speed
- Oil pressure
- Coolant temperature
- Engine battery volts
- Run time
- Oil temperature*
- Coolant temperature*
- Inlet temperature*
- Exhaust temperature*
- Fuel temperature*
- Turbo pressure*
- Fuel pressure*
- Fuel consumption*
- Fuel used*
- Fuel level*
- Auxiliary sensors (if fitted and configured)
- Engine maintenance due (if configured)
- Engine ECU link*

** When connected to suitably configured and compatible engine ECU.*

Generator

- Generator AC voltage L-N
- Generator AC voltage L-L
- Generator frequency
- Generator current
- Generator earth current (under customer request)
- Generator load (kW)
- Generator load (kVA)
- Generator power factor
- Generator load (kVAr)
- Generator load (kWh, kWAh, kVArh)
- Generator phase sequence

Mains (DSE 7320 only)

- Mains voltage L-N
- Mains voltage L-L
- Mains frequency

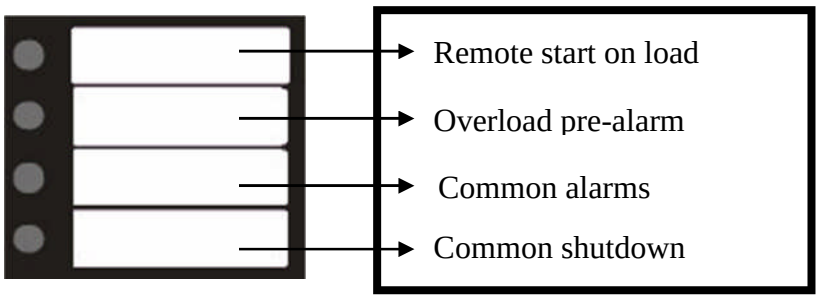
About

- Module type
- Application version
- USB ID – unique identifier for PC USB connection
- Analogue measurements version
- Firmware update boot loader version

If the following appears in an instrument display: *****, this means that the engine can't provide this parameter; the control module, however, does provide this option.

If the following appears in an instrument display: ####### with the generator set in OFF/AUTOMATIC mode (with the engine stopped), this means that the control module is not connected to the engine. Press this button (6) to display the given value.

– **Alarm LED:**



Editing the current Date and Time:

The date and time are adjustable. When the battery is disconnected, the date and time are frozen; when the battery is reconnected, the date and time shown will be from the last time the battery was disconnected.

The date and time reflected in the Event Log will be taken from the configuration according to the following steps:

Press and simultaneously, then enter the correct PIN number using or buttons to select the right figure, and using and to move from one figure to another. Finally press button

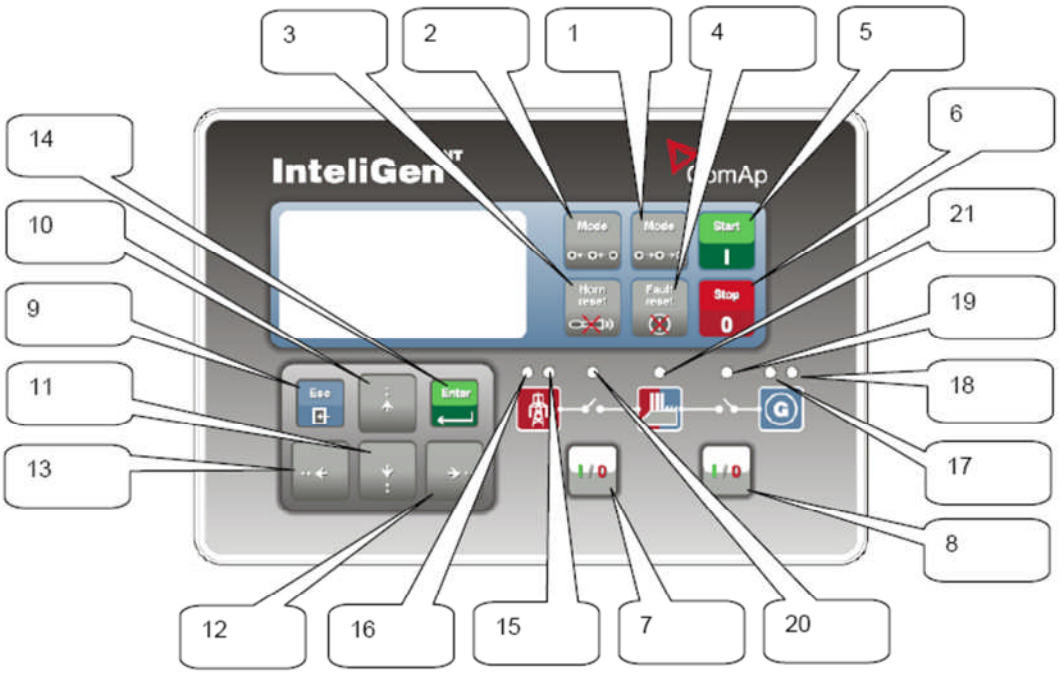
Press until the Display section. Press until “Current date and time”.

When “Current Date and Time” appears, press the button. The figures will start to flash. Press or to adjust to the desired values.

Press the button to confirm the value entered.

Press and hold to exit the editor at any time.

6.3. INTELIGEN^{NT} DIGITAL CONTROL MODULE (OPTIONAL)



Picture 16- INTELIGEN^{NT} Digital Control Module

#	SYMBOL	DESCRIPTION	IDENTIFICATION
(1)		Scrolls through different operating modes	OFF←MAN←AUT←TEST
(2)			OFF→MAN→AUT→TEST
(3)		Deactivates audible alarm	
(4)		Fault reset	Acknowledges faults and alarms
(5)		Start button	In manual mode
(6)		Stop button	In manual mode
(7)		MCB ON/OFF	Opens and closes MCB in manual mode
(8)		GCB ON/OFF	Opens and closes GCB in manual mode
(9)		Exit from actual screen (without save changes if editing)	
(10)		Selects on-screen value, set point, history record or increase/decrease set point value	Increases value
(11)			Decreases value

(12)		Moves history record displayed columns to the right/left, 5% increase/decrease of edited set point, a value or go out/into alarm list.	Increases value
(13)			Decreases value
(14)		Enter button	Confirms on-screen value
(15)		Mains power status	Green if mains power correct
(16)		Mains failure	Red light flashes if mains failure occurs and generator set doesn´t run; continuous if generator is operating, turns off when Mains power restored.
(17)		Generator voltage present	Green led is on if unit voltage is present and within limits.
(18)		Generator set failure	Flashing Red LED indicates alarm
(19)		State of GCB	Green led is on if GCB is closed. Flashes during synchronization with mains.
(20)		State of MCB	Green led is on if MCB is closed Flashes during reverse synchronization with mains.
(21)		State of bus	Green led is on if bus voltage is correct

NOTE: GCB = Generator Circuit Breaker; MCB = Mains Circuit Breaker.

The InteliGen^{NT} module contains a main menu screen and the following seven submenu screens:

- Alarmlist
- Measurement
- Measurement I/O
- History
- Setpoints
- User/Password
- Languages

Pressing several times the main menu is displayed. To enter in a submenu, scroll up and down using (10) or (11) buttons and press (14) button. To display the different

instruments or parameters on each screen menu, press (10) or (11) buttons. To come back to a previous menu screen, press

(9) button.

The alarmlist screen display the alarms detected by the module. Pressing

button (4) faults and alarms are acknowledged.

The measurement screen displays the parameters measured on the engine; if the engine uses an electronic management system, many additional parameters can be displayed. In addition to these parameters, measurements can be displayed for fuel level, oil pressure, current, voltage, frequency, run hours and battery charge level.

The measurement I/O screen display the status of digital inputs and outputs and the measured parameter of analogue inputs (senders).

The history screen menu displays the log of alarms that have occurred in the generator unit. It also logs the opening and closing of the mains circuit breaker as well as the starting and shutting down of the generator unit.

The set points menu screen displays the adjustment parameters already configured; it is not necessary to edit any of these.

The users/password screen allows to define users and passwords. The languages screen allows to change the display language

- ***AUTOMATIC mode (AUTO):***

If a mains failure is detected, the InteliGen^{NT} module will open the MCB (main circuit breaker). Startup command is issued to generator set. If generator voltage is within the established limits, the LED indicator (17) will be on and the control module closes the GCB (generator circuit breaker). Once mains power has been restored, synchronization between mains and generator occurs; then the MCB is closed, causing the generator to discharge, followed by the opening of the GCB. When mains power is restored, there will be a period of time during which the engine continues operating at no load to cool down before stopping completely.

Note: If

(4) is pressed following a disconnection alarm, the engine could automatically start without any warning.

- ***NO-LOAD TEST mode (MANUAL):***

Press the START button

(5) to start up the generator set. When the generator voltage is within the established limits, the LED indicator (17) will be on. To stop the unit, press STOP

(6).

- ***LOAD TEST mode (TEST):***

This operating mode is used for generator set start test is the mains is OK or to transfer the load to the generator set when a mains failure is announced in advance. To stop this mode, change to another mode by means of the buttons

(1) or (2).

- ***OFF mode:***

The generator set will not start. Even if we press the buttons START

(5), STOP (6)

, GCB ON/OFF

(8), the generator will not respond.

ALARMS:

The InteliGen^{NT} control module includes the following warnings:

INCIDENT	STORED IN HISTORY RECORD
Startup sequence initiated	Startup of Gen-Set
Shutdown of the Gen-Set	Gen-Set stops
Electrical Generator circuit breaker closed	GCB connected
Electrical Generator circuit breaker opened	GCB disconnected
Some GCB in group was opened (in MINT)	Other GCB trip
Mains circuit breaker closed	MCB connected
Mains circuit breaker opened	MCB disconnected
Time mode has been changed	TimeModeChngd
STARTUP INFO	
AMF Startup	GenSetMF start
AMF Stop	GenSetMF stop
Remote startup by binary input (SPM, SPtM)	GenSetRemStart
Remote stop by binary input (SPM, SPtM)	GenSetRemStop
System startup by binary input (MINT, MEXT)	GenSetSysStart
System stop by binary input (MINT, MEXT)	GenSetSysStop
Peak start (SPtM)	GenSet PKstart
Peak stop (SPtM)	GenSet PKstop

ENGINE		
EVENT SPECIFICATION	**ALARM**	**HISTORY**
Electrical Generator Startup failure	Sd Start Fail	Sd Start Fail
Electrical Generator Overspeed	Sd Overspeed	Sd Overspeed
Electrical Generator Underspeed	Sd Underspeed	Sd Underspeed
SD Stop fail	Sd Stop Fail	Sd Stop Fail
Emergency Stop	Emergency Stop	Emergency Stop
RPM Pickup fail	SdPickupFail	SdPickupFail
Battery voltage warning	Wrn Batt volt	Wrn Batt volt
Battery is discharged	Sd Batt flat	0

GENERATOR	
EVENT SPECIFICATION	**HISTORY**
Generator phase 1 overvoltage	Unl Vg1 Over
Generator phase 1 undervoltage	Unl Vg1 Under
Generator phase 2 overvoltage	Unl Vg2 Over
Generator phase 2 undervoltage	Unl Vg2 Under
Generator phase 3 overvoltage	Unl Vg3 Over
Generator phase 3 undervoltage	Unl Vg3 Under
Generator Overfrequency	Unl Fgen Over
Generator Underfrequency	Unl Fgen Under
Generator voltage unbalance	Unl Vgen Unbal
Generator overload	UnlGen Overload
Load surge protection	LoadSurge
Reverse power	Unl Rev Pwr
Synchronization timeout	Stp SyncTO
Ground fault protection	Unl EarthFltC
Failure of generator circuit breaker	GCB fail
Generator short circuit protection	Unl Short Igen
Generator IDMT protection	Unl IDMT
Generator current unbalance	Unl Igen Unbal
Voltage on mains terminals (SPM)	UnlCounterVolt
Bus voltage error (MINT)	Unl BusMeasErr

PHASE SEQUENCE		
EVENT SPECIFICATION	**ALARM**	**HISTORY**
Generator phase L1 is inverted	GEN L1 neg	0
Generator phase L2 is inverted	GEN L2 neg	0
Generator phase L3 is inverted	GEN L3 neg	0
Wrong generator phase sequence	G ph opposed	0
Wrong generator phase sequence and phase L1 is inverted	G ph + L1 neg	0
Wrong generator phase sequence and phase L2 is inverted	G ph + L2 neg	0
Wrong generator phase sequence and phase L3 is inverted	G ph + L3 neg	0
Mains phase L1 is inverted	B L1 neg	0
Mains phase L2 is inverted	B L2 neg	0
Mains phase L3 is inverted	B L3 neg	0
Wrong mains phase sequence	B ph opposed	0
Wrong mains phase sequence and phase L1 is inverted	B ph + L1 neg	0
Wrong mains phase sequence and phase L2 is inverted	B ph + L2 neg	0
Wrong mains phase sequence and phase L3 is inverted	B ph + L3 neg	0

7. MAINTENANCE OF THE GENERATOR SET

Ensure that the person doing this is trained to do so and uses suitable personal protection equipment.

7.1. BEFORE MAINTENANCE

You must:

- Position the control board at STOP
- Press the emergency button
- Open the battery disconnector

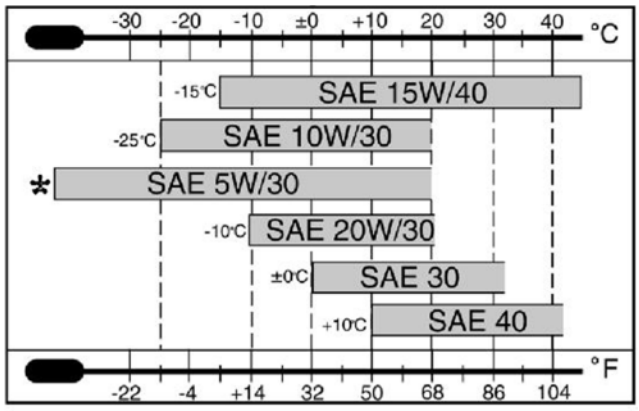
To eliminate the grid voltage the control module receives to carry out its monitoring work, you must disconnect the magnetothermic switch of 10 A located on the switchboard supplied by GRUPOS ELECTRÓGENOS EUROPA S.A If you are using a switchboard from another manufacturer, ensure this cut-out is made before handling the generator set.

7.2. DURING MAINTENANCE

The preventive maintenance tasks are required for properly maintaining the material condition of the equipment; this will result in an optimum operation. You must verify the following points:

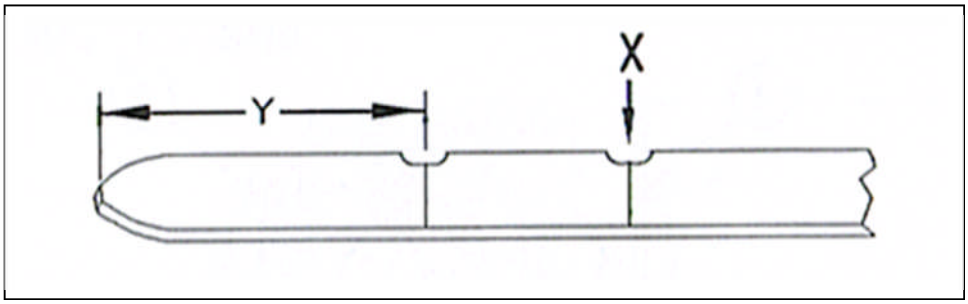
1) With the engine cold, the oil level must be between the minimum and maximum value. If it is lower, then the engine oil must be filled.

Note: The DEEP SEA 7310 and INTELIGEN boards will issue a warning to change the oil after 50 hours of service. The recommended oil is 15W40.For temperature conditions other than those indicated, choose the type of fuel according to the following table



Picture 17-Types of oil recommended according to temperature

2) The Engine oil level shall also be checked periodically. This will be accomplished by pulling out the dipstick. It shall be carried out with the engine cold and in a horizontal position. If you wish to check the oil level upon shutting down the Engine, wait for the housing to drain prior to checking the oil level.



Picture 18 -Oil level dipstick.

The dipstick has two markings; a minimum oil level marking (Y) and a maximum oil level marking (X). The recommended service level is between both markings.

If the oil level is below the minimum, the engine oil must be serviced. However, the oil level shall never exceed the maximum level.

Unscrew the Engine's oil filler plug; completely remove the plug in order to have free access to the oil tank. Once serviced with oil, clean the oil tank cover and reinstall the oil filler plug. If the engine oil must be replaced, first the engine oil must be drained. To accomplish this, the generator set may include an external connection with a plug, from which the engine oil can be drained; otherwise, the generator set must be opened and the engine oil shall be drained through the lower plug located under the engine housing (refer to the engine manual delivered separately). Once the engine oil is drained, re-install the plug that was removed and service the engine oil as indicated for checking the oil level (refer to the engine manual, which is delivered separately for this task).

Take into account the capacity of the tank where the used fluid is going to be poured and be careful not to spill any fluid. Remember that the fluid is hazardous to the environment. Adopt the necessary protective measures for handling the fluid; especially the use of protective goggles. If fluid comes in contact with the skin, immediately wash the affected area.

3) The level of water in the radiator is correct.
4) The amount of fuel in the tank must be sufficient for the service that is to be provided by the set. The DEEP SEA 7310 control module, housed in the control panel, has a fuel level indicator.
5) Always refuel in a well-ventilated area with the engine turned off.
6) Visually inspect the connections and the electrical circuits of both switching and power.
7) Visually inspect for possible liquid leaks. If you detect any, locate their origin and resolve the problem that has caused them.
8) The air outlets and inlets must be completely free so that the cooling air can circulate freely.

9) Check the state of the unit's radiator and clean if necessary. The Engine cooling fluid levels shall be checked periodically, and shall be serviced if found below the minimum. The cooling fluid used will be 50% ethylene glycol with a corrosion inhibitor (BS 658: 1992 or MOD AL39) and 50% distilled water. To drain the engine cooling circuit, depending on the model, the generator set may incorporate an external connection with a drain plug for that circuit; otherwise, the draining must be carried out through the bottom part of the radiator. Servicing with coolant once the circuit has been drained will be accomplished through the top part of the radiator, through the radiator's top plug, which is accessible through the covered openings arranged on the generator set's fairing. Take into account the capacity of the tank where the used fluid is going to be poured and be careful not to spill any fluid. Remember that the fluid is hazardous to the environment. Adopt the necessary protective measures for handling the fluid; especially the use of protective goggles. If fluid comes in contact with the skin, immediately wash the affected area.

   For further information, refer to the engine manual, which is delivered separately.

10) Make sure the exhaust tube is not obstructed.

11) Check in the battery connection terminals and the level of electrolyte (if necessary add demineralised or distilled water). Never add acid. The battery must be charged if the voltage in the terminals is below 12.3 V.

12) If you wish to recharge the battery after having removed it from the unit, remove the plugs and recharge with direct current only. The charger's positive (+) cable is connected to the battery's positive (+) cable and the charger's negative (-) cable is connected to the battery's negative (-) terminal. Recharge with a current equal to 1/10 of the nominal capacity (Ah). The battery is completely charged when the density of the acid is 1.28. Before finishing charging turn off the charger before disconnecting the battery and check the level of electrolyte.

13) If the battery is discharged and you wish to carry out an emergency start with another battery from another generator set, first check the tightness of the discharged battery's terminals. Stop the engines of the two units and first connect the two positive terminals of the batteries and then the negative terminal of the charged battery with a metal area of the faulty unit (earth). Start up the auxiliary unit and then the unit to repair. Disconnect the cables in reverse order to avoid short circuits. Finally recharge the battery completely.

14) Do not operate under any circumstances the genset with open doors. Risk of electrical shock, burns or entrapment. Make sure doors are locked group prior to implementation.

15) The incorporation of the water separator in all the units means you must monitor the water in it and bleed it depending on how full it is. This is not particularly inconvenient as all you have to do is monitor the transparent tank to decide when to bleed it. If the filter has reached the end of its service life, replace it completely.

16) The oil vacuum pump is an improvement when draining the tank, thus saving time and facilitating maintenance.

17) The fuel tank includes a cleaning record for quick access and a safety key to avoid fuel theft through the output connector on the bedplate.

18) The radiator is drained through the bedplate connector.

19) For maintenance of the casing, it is recommended to wash it occasionally in order to avoid the accumulation of dirt. Its galvanised bodywork prevents corrosion and rusting.

Note: Preventive maintenance tasks are recommended, using goggles and gloves for all operations in which battery acid is handled.

Note: Remember that all the operations shall be carried out as carefully and safely as possible, as indicated in this manual. (Take special care with the risks of short circuits that can be caused by contact with metal objects in the unit).

7.3. MAINTENANCE TABLE

PERIODICITY	MAINTENANCE TASK
MONTHLY	Perform a simulation of an electrical grid failure: the unit should supply the consumers for 1 hour.
	For systems with multiple generator sets in parallel, check the coupling and the distribution of the loads.
	Check the connections of the starter battery; clean and coat with Vaseline.
	Ensure the battery charger is working correctly.
	Verify the fuel level in the main tank.
	Verify the levels of coolant and oil.
	Verify that all the lights on the switchboard function correctly.
	Check that the switching works correctly in the transfer.
	Check and verify all the dials and indicators on the switchboard.
	Consult the manufacturer's manual for the engine and alternator for specific tasks.
EVERY SIX MONTHS	Start up the engine manually 3 times; each time note the readings of voltage and density of each element of the battery. If any of the voltage readings differs significantly from those of the other elements of the battery, do not carry out the remaining manual start-ups.
	Fully charge the battery and verify the level of electrolyte.
	Verify that the cooling pipes are not leaking.
	Check that all the alarms of the unit are displayed correctly.
	Consult the engine manufacturer's manual for specific tasks.
EVERY YEAR	Clean the exterior of the fuel tank, verify the fuel and coolant transport pipes and replace if necessary.
	Clean the radiator and top up with antifreeze.
	Verify that the measuring instruments show correct measurements.
	Clean the control panel and re-tighten the connections.
	Verify the antivibration elements, connectors and belts are in good condition.
	Check that the vibrations and noise are within the standard values.
	Consult the manufacturer's manual for the engine and alternator for specific tasks.
EVERY 3 YEARS	Replace the starter batteries

Notes:

Consult the manuals for the engine and alternator for specific maintenance tasks.

Ensure the maintenance is performed by qualified staff.

Ensure you comply with the local legislation on environmental protection. Any batteries, filters, liquids and electrical equipment that have been replaced and any packaging must be sent to an authorised recycling centre.

** When cleaning the generator set, do not use pressurised water as it could damage components.*

8. SOLUTION OF BREAKDOWNS

INCIDENT			PROBABLE CAUSE	SOLUTION
In the switchboard	The engine does not start	The starter motor does not turn	1.-Battery defective	1.-Change the battery
			2.-Starter system defective	2.-Replace the starter system
				3.-Contact the technical service
		The starter motor works correctly	1.-Voltage detector of the control module damaged	1.-Contact the technical service
			2.-Lack of fuel	2.-Fill the fuel tank
	The engine starts	It stops with reason	1.-There has been an emergency	1.-Take the appropriate measures
		It stops without apparent reason	1.-Emergency not indicated due to a fault with the LED indicator	1.-Contact the technical service
		It does not stop when there is an emergency	1.-Shut-down system defective	1.-Press the emergency button
				2.-Contact the technical service
		The generator set does not stop when in the stop position	1.-Control module damaged	1.- Press the emergency button
			2.-Shut-down system defective	2.-Contact the technical service
From inside the unit	Unit running	High voltage at no load	1.-Excessive speed	1.- Contact the technical service
			2.-Fault in the alternator	
		Low voltage at no load	1.-Insufficient speed	1.- Contact the technical service
			2.-Fault in the alternator	
		Voltage correct but low with load	1.-Excessive loads	1.-Reduce the loads of the unit
			2.-Insufficient speed with load	2.- Contact the technical service
			3.-Fault in the alternator	
		Voltage unstable	1.-Voltage meter damaged	1.- Contact the technical service
			2.-Engine speed unstable	
			3.- AVR damaged	
		Strange noise inside the unit	1.-Various causes	1.-Verify that there is nothing stopping the unit from functioning correctly.
				2.- Contact the technical service

9. PROTECTION OF THE ENVIRONMENT

Once the generator set has been installed, clean up the packaging, accessories, electric tools, etc. that were necessary for its full installation.

When you wish to dispose of the batteries according to the environmental regulations, it is recommended that the batteries be turned into an authorized recycling centre.

For an improved environment, recycle as much as possible and do not throw electrical components out with the rubbish, according to European Directive 2002/96/CE. These must be set aside so they can be subjected to an environmental safe recycling.

10. WARRANTY

- The warranty of the generator set is extended for a calendar year from the date it is commissioned. This must be reported to GRUPOS ELECTRÓGENOS EUROPA S.A, (hereafter the manufacturer) in writing, whether by fax, or e-mail. The data that must be communicated is the MODEL NUMBER, SERIAL NUMBER AND COMMISSIONING DATE.

  If the manufacturer is not notified of the commissioning within a maximum period of sixty days from the invoice date, then the invoice date itself will be used as the effective start date of the warranty period. If for any reason the commissioning cannot be performed in the sixty days following the invoice date, the manufacturer must be informed of this in writing. This extension of the warranty is subject to the acceptance of the end supplier of the engine and alternator. This shall never exceed 120 days from the invoice date. This acceptance shall be sent by staff of GRUPOS ELECTRÓGENOS EUROPA S.A The warranty covers defects in components and assembly, not due to improper use, manipulation, modification or insufficient maintenance. The warranty does not cover failures caused by use of the generator set with other devices that have not been installed or supplied by the manufacturer. Also excluded are any failures and damages caused by prolonged or improper storage. In this last case, refer to the manufacturer's user manuals. The warranty for the generator set ONLY covers spare parts and labour required for operating the set by personnel authorized by the manufacturer. Travel, and other expenditures derived from the repairing of a set under warranty are excluded from the warranty coverage therefore, under no circumstance shall the manufacturer cover these expenses, which must be paid for in full.
- The decision to accept or deny a warranty claim will be made by the manufacturer. Regarding engine and alternator failures, the warranty will be granted by the supplier of these components in accordance with their warranty conditions. The manufacturer reserves the right to require that the faulty component be returned to them. In this case, all expenses arising from this recovery shall be covered by the customer until the resolution of the warranty. If the warranty is accepted, the transport costs of this return shall be paid provided the cost is not greater than that caused by shipping the material in advance. Any repair made within the warranty period shall not lead to the modification of expiry date for the generator set warranty.
- The warranty does not cover damages caused by terrorist acts, natural disasters, sabotages or similar occurrences. If any of the stated provisions does not comply with the legislation of a specific country, the importer is required to notify the manufacturer prior to executing the purchasing-sale operation.
- This warranty expressly replaces all other warranties, explicit or implicit, including any warranty that is commercial or suitable for personal use. The warranty presented here is for exclusive use in resolving claims based on defects and non-conformities in generator sets, regardless of whether the claim is based on a contract or grievance, and replaces other resolutions, responsibilities or rights, whether or not they arise by law.

11. NOISE LEVEL

GRUPOS ELECTRÓGENOS EUROPA S.A. generator sets have different acoustic levels depending on the power and the sound proofing of the generator set. The acoustic power is indicated on a sticker on the generator set bedplate.

Each generator set is supplied with a sticker indicating the level of acoustic power generated (see ANNEX 1 PICTOGRAMS). The noise was measured according to European Directive 2000/14/CE and in compliance with the maximum values determined by Directive 2005/88/CE.

Commercial reference	Sound levels	
	LWA	dBA@7m
DPR 20	90	60
DPR 30 / DPR 30 NC	90	60
DPR 45 / DPR 45 NC	94	64
DPR 60 / DPR 60 NC	94	64
DPR 80 / DPR 80 NC	94	64
DPR 100	97	67
DPR 250 NC	97	67
DPR 500 NC	98	68
DVR 140 NC	97	67
DVR 150	97	67
DVR 200 NC	97	67
DVR 250 NC	97	67
DVR 315 NC	97	67
DVR 400 NC	97	67
DVR 460 NC	98	68
DVR 500 NC	98	68
DTR 250	97	67
DTR 275	97	67
DTR 300	97	67
DTR 400	98	68
DTR 450	98	68
DTR 500	98	68

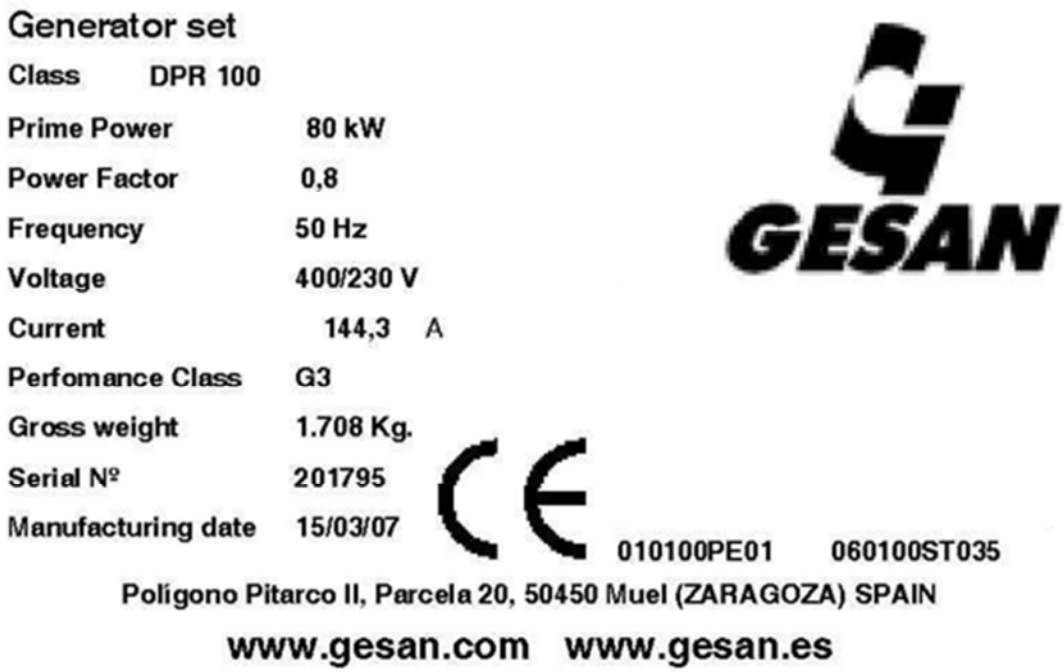
Note: If you are continuously carrying out your work near the equipment, it is recommended that you use hearing protection.

12. DECLARATION OF CONFORMITY CE

In conjunction with the unit, GRUPOS ELECTRÓGENOS EUROPA S.A shall deliver “Declaration of CE conformity” sheet, complying with the regulations or standardised documents to which it refers.

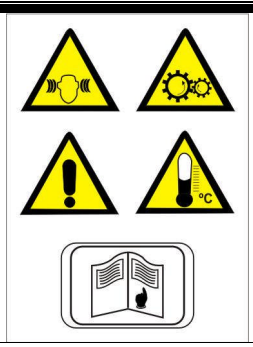
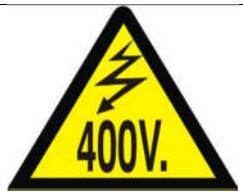
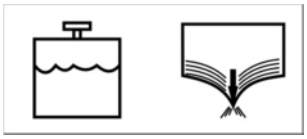
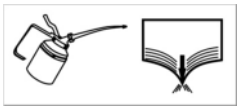
13. ANNEX 1: PICTOGRAMS

Details of the unit's identification plate:



Picture 19- Identification plate

NO.	NAME	DESCRIPTION
(1)	DPR 100	D => The engine fuel is diesel 1,500 rpm.
		P => The engine manufacturer is (**P**)erkins, (**V**)olvo, (**C**)ummins or Deut(**Z**)
		R => The generator set is Rental
		100 => Commercial name.
(2)	Nominal power	Nominal power of the engine expressed in kW.
(3)	Power factor	Indicates the power factor of the alternator.
(4)	Nominal frequency	Nominal frequency of the generator set (Herz).
(5)	Nominal voltage	Nominal voltage of the generator set (Volts).
(6)	Execution class	When the engine bears an overload it reacts with catalogued times, according to ISO 8528.
(7)	Weight	Total weight of the generator set.
(8)	Serial No.	Serial number for the manufacture of the set.
(9)	Date of manufacture	Date of manufacture of the generator set.
(10)		The CE marking indicates that the generator set complies with all the relevant directives.

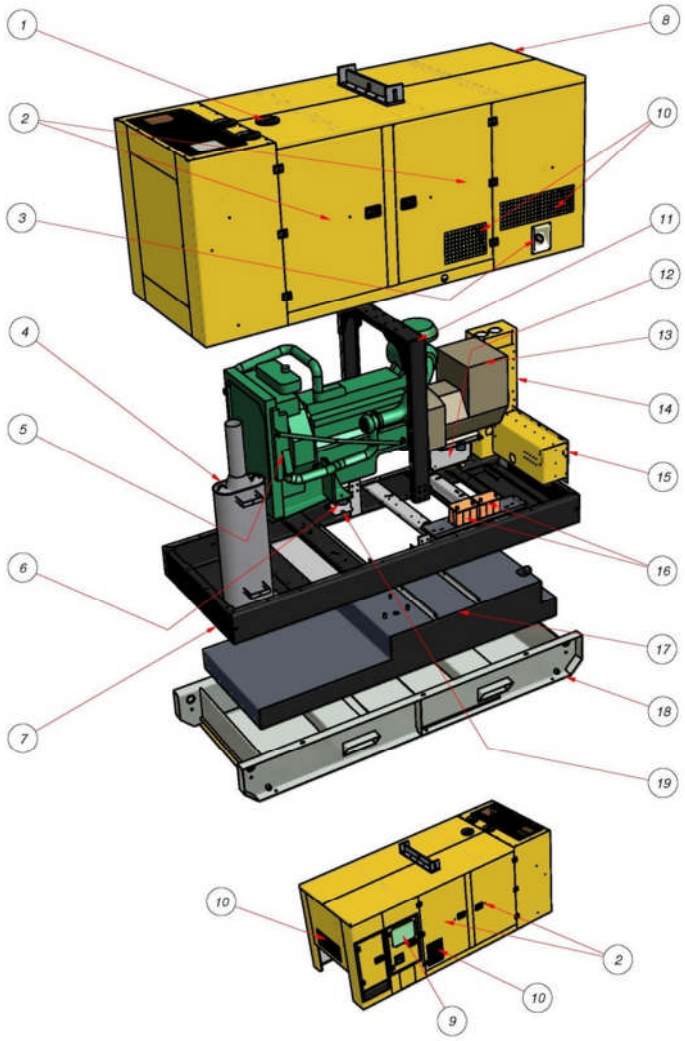
		
Picture 20 This genset may start without prior warning	*Picture 21 General warning*	*Picture 22 Unknown hazard warning*
		
Picture 23 230 volt electrical hazard	*Picture 24 400 volt electrical hazard*	*Picture25 Lifting point*
Picture26 Possible battery spill	*Picture27Earthing connection*	*Picture28 Noise level 90 dB*
		
Picture29 Noise level 114 dB	*Picture30 Mandatory use of hearing protection*	*Picture31 Coolant drainage*
		
Picture32 Oil drainage	*Picture33 Fuel drainage*	*Picture 34 Battery isolator*
	On hot surfaces where it has not been possible to minimize the risk of burns, the following warning pictogram will be installed.	
Picture 35:High temperature		

14. ANNEX 2: SILENT-ENERGY RENTAL:

If you have been supplied with a SILENT ENERGY RENTAL generator set, all the information in this manual applies to this model except in the following sections:

14.1. DESCRIPTION OF THE GENERATOR SET

A general description of the SILENT ENERGY RENTAL generator set manufactured by GRUPOS ELECTRÓGENOS EUROPA S.A and its different configurations can be found below.



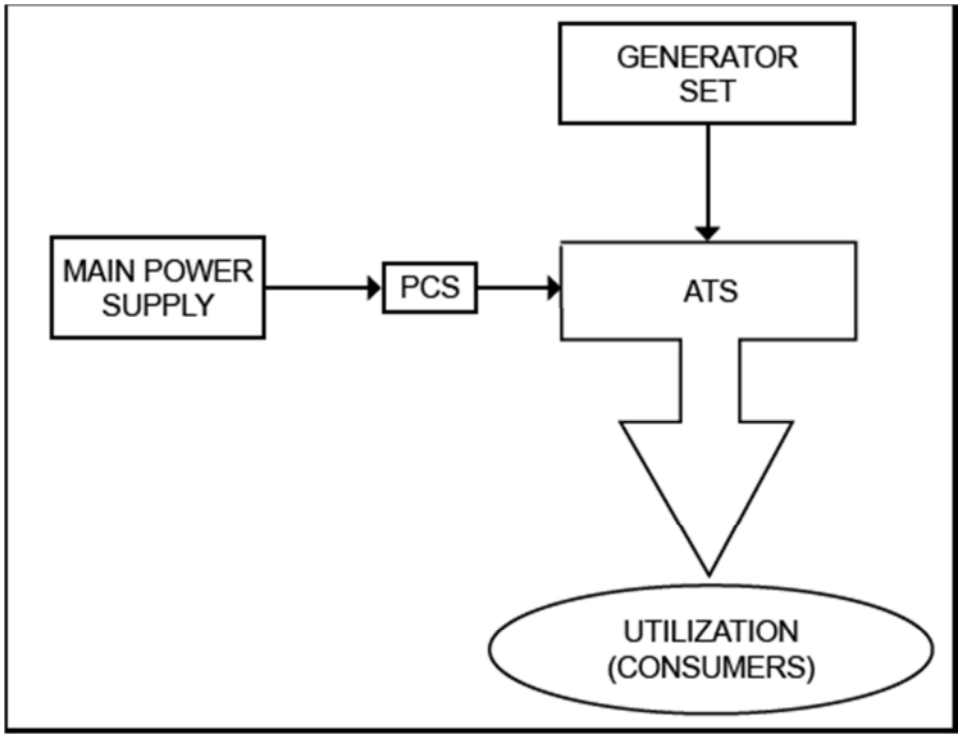
Picture 36-Inside a soundproofed generator set

1) Coolant filler trap
2) Side access doors
3) Fuel tank filler cap
4) Exhaust silencer
5) Engine
6) Antivibration mounts
7) Bedplate
8) Casing
9) Switch board door
10) Air inlet
11) Elevation gantry
12) Switchboard
13) Alternator
14) Power panel
15) Socket panel Silent Energy Rental
16) Batteries
17) Bedplate with fuel tank
18) Liquid collection tray
19) Sections supporting generator set on bedplate

14.2. VARIATIONS IN THE ELECTRICAL CONFIGURATION:

The generator unit can be supplied:

- With automatic switchboard
- Without automatic switchboard



Picture 37-Switchboard diagram

Note: I.C.P.: Power regulator switch

14.3. VARIATIONS IN THE CONTROL INSTALLATION:

The control installation can be carried out in three different ways:

1) The switchboard has been supplied by GRUPOS ELECTRÓGENOS EUROPA S.A

2) The switchboard has not been supplied by GRUPOS ELECTRÓGENOS EUROPA S.A

3) The unit is of the "Emergency by signal" type

14.3.1. Switchboard supplied by GRUPOS ELECTRÓGENOS EUROPA S.A

Connect the R S T N terminals and the terminals numbered 37, 40, 41, 44 (with GECO control module also connect 45, 46 and 47) of the control panel installed in the set to the terminals of the switchboard numbered in the same way.

ATTENTION: Do not confuse the control terminals R S T N with the power terminals R S T N (see the connections diagram preceding the control and power installation explanations).

To carry out these connections you must use a conductor with eight 1.5 mm² wires (11 wires with the GECO module). This cable is not supplied with the generator set. The maximum distance between the control panel and the switchboard shall be 25 m for a section of 1.5 mm² and a power of 650 kVA. For greater powers and distances you must calculate the section of the cable to avoid an excessive voltage drop.

The switchboard can be supplied as an option with units manufactured by GRUPOS ELECTRÓGENOS EUROPA S.A (see point 3.3); if it is not supplied this switchboard must be supplied by the customer.

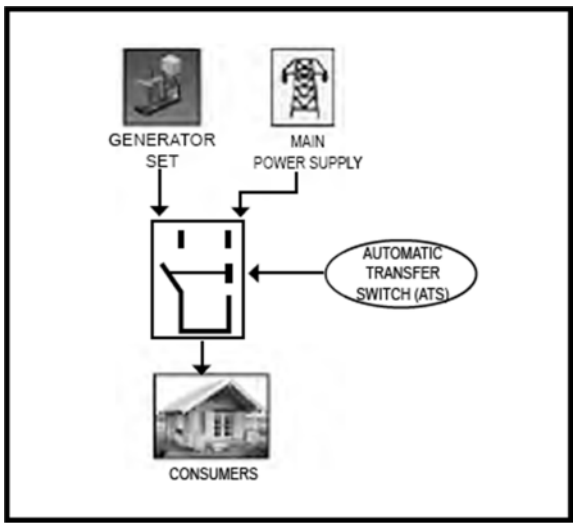
The switchboard consists of electrical switchgear. This switchboard shall avoid simultaneous supply by the electrical grid and generator set.

There are three types of electrical switchgear used in the automatic switchboard supplied by GRUPOS ELECTRÓGENOS EUROPA S.A:

- Contacts: mechanically and electrically interlocking. They are used when the nominal current is between 40 and 125 A.
- Motorised switches: used from 160 A to 3200 A.

Motorised circuit breakers: mechanically and electrically interlocking. Supplied when requested by the customer.

The following diagram shows the functioning of a switchboard:



Picture 38- Switchboard diagram

The electrical installation of the switchboard is divided in two parts: firstly the control part must be installed (electrical grid monitoring and management and switching) and secondly the power part (transmission of electrical energy).

14.3.2. Switchboard not supplied by GRUPOS ELECTRÓGENOS EUROPA S.A

Consult the user manual of the corresponding switchboard and follow these steps.

– Connect the terminals R S T N of the control panel (reference voltage of the electrical grid) to the supply input of the electric company.

– Connected the terminals numbered from 37 to 47 (both inclusive) to the control wiring of the switchboard (consult the electrical diagram of the generator set panel).

– Ensure that the electrical and mechanical interlocking has been correctly executed. Ensure that the switchboard you wish to install is compatible with the generator set supplied. Typical assembly is with contacts. For motorised switches consult GRUPOS ELECTRÓGENOS EUROPA S.A

– The section of the conductor must be suitable for your installation.

14.3.3. "Emergency by signal" generator set:

The generator set will not monitor the electrical grid nor control the switching, as this must be controlled by the user's management system.

The terminals through which the generator set receives the start-up signal are 184 and 185, and must be activated by a potential-free contact.

For terminals 120 and 121 the generator set returns a potential-free signal when its voltage and frequency are correct.

The terminals R S T N must be connected to the electrical grid at a point prior to the switchboard: the power for the engine block heater and battery charger is received through them. The section of the conductor must be suitable for your installation.

14.3.4. POWER installation:

The connection diagram is shown in the picture.

The power installation can be carried out in two ways:

1) The switchboard has been supplied by GRUPOS ELECTRÓGENOS EUROPA S.A

- Connect the U V W N outputs of the generator with the U V W N terminals of the switchboard.
- Connect the ICP of the electric company to the R S T N terminals.
- Connect the X Y Z N terminals of the switchboard to your installation.

2) The switchboard has not been supplied by GRUPOS ELECTRÓGENOS EUROPA S.A or the generator set is of the "emergency by signal" type.

- Connect the U V W N output of the generator to the input of the switchboard. Consult the manual of your switchboard.

This installation must be executed by qualified staff, adapting the section of the conductor to the distance and the power transported.

Remember that the earthing connections must be made according to the current regulations.

14.4. ATYS SWITCHES:

The switches are a type of electrical switchgear especially designed for grid transfer systems that simplify the equipment and the necessary control wiring.

The connection terminals of the switches are organised as follows:

- Upper terminals: for connecting the consumers.
- Lower left terminals: for connecting the electrical grid.
- Lower right terminals: for connecting the generator set.

You can find a connections diagram on the switch casing.

The switches can also be operated manually. They include a lever for grid transfer in the event of emergency when there is no source available.

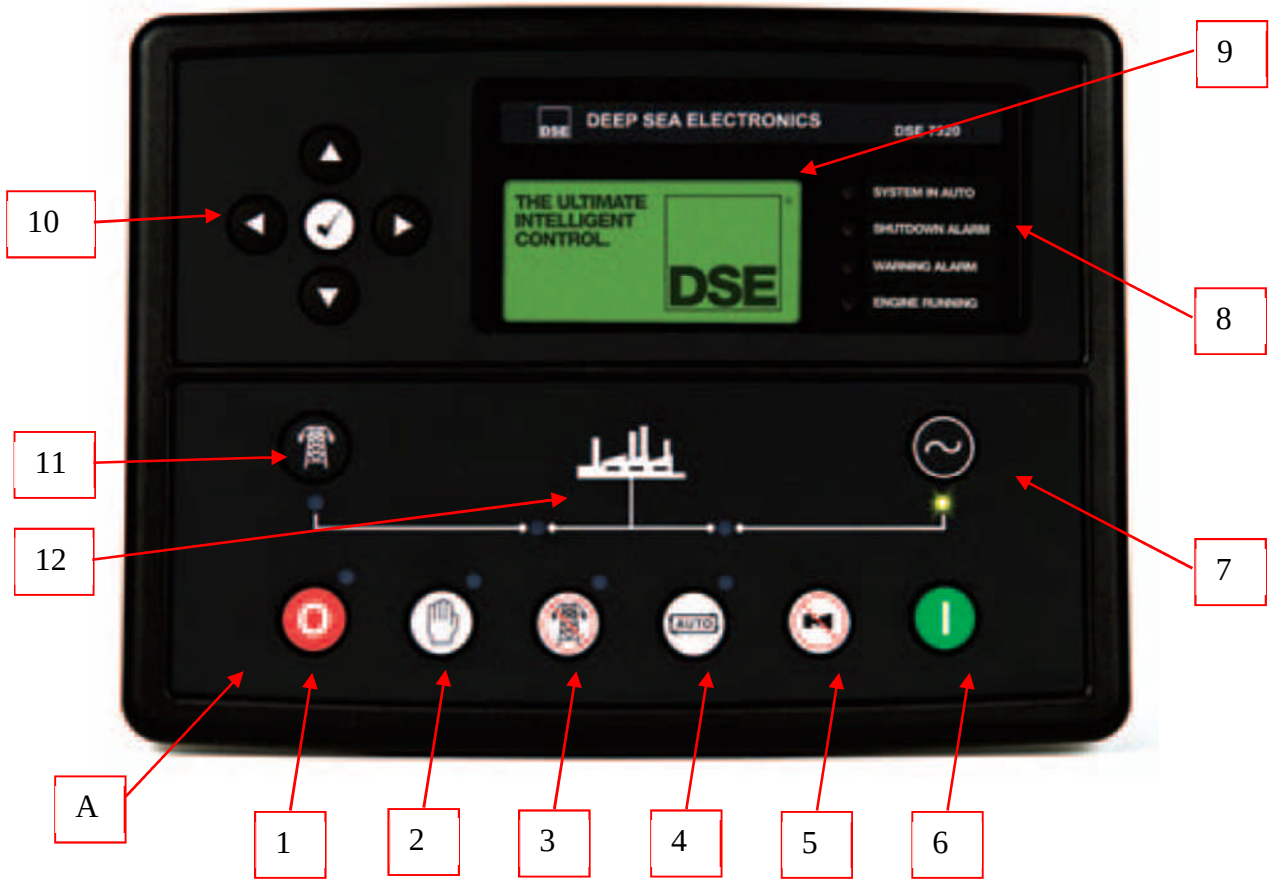
As a safety guarantee, the switches may be locked in position 0 with a padlock (thus manual operation is impossible and the electrical controls are disabled.

If you need additional information, consult the manual of the switch manufacturer.

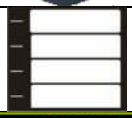
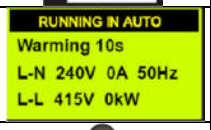
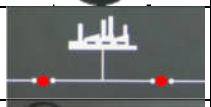
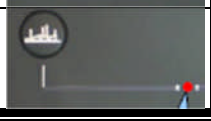
14.5. ADDITIONAL COMPONENTS SUPPLIED WITH THE SILENT ENERGY RENTAL UNITS:

14.5.1. DEEP SEA 7320 Digital Control MODULE

In the SILENT ENERGY RENTAL sets, DEEP SEA 7320 scheduled board programmed for DC operation is replaced with the DEEP SEA 7320 board that allows running in an emergency if there is a grid failure.



Picture 39- Deep Sea 7320 control module

NUMBER	SYMBOL	DESCRIPTION	IDENTIFICATION
(1)		Stop button	Red LED
(2)		Manual mode button	Red LED
(3)		Test mode button	Green LED (available only in model 7320)
(4)		Automatic mode pushbutton	Red LED
(5)		Alarm silencer/test button for lights	
(6)		Start pushbutton	
(7)		Button to “force the generator set”	Green LED when the generator set is available
(8)		Definable LED indicators	Red LED
(9)		Display of parameters	
(10)		Menu navigator	
(11)		Button to “force the grid”	Green LED (available only in model 7320)
(12)		Switchboard status	Left red LED: grid supplying the loads / right red LED: Generator set supplying the loads
(A)		Button to “open the generator set”	Red LED: generator set supplying the loads

The Deep Sea **7320** control module is an automatic module that monitors the supply of the electrical grid and, if this fails, will start up the generator set. This control module also has the option of starting up manually.

Case 1: Manual operation:

Step 1: Make sure the switch is in the OFF position
Step 2: Close the battery disconnector.
Step 3: Start up the generator set, pressing button 1.
Step 4: Once the generator set is ready to load, close the switch.
Step 5: To be able to stop the generator set again press button 0.
Step 6: Disconnect the battery.

Case 2: Automatic operation:

Step 1: Make sure the switch is in the OFF position
Step 2: Close the battery disconnector.
Step 3: If there is an alarm, reset it with button 0 (once resolved).
Step 4: Toggle the switch to the ON position.
Step 5: Press the automatic mode button.

Case 3: Manual to automatic mode without stopping.

The user has the possibility of controlling all the generator equipment parameters as well as the status of the electrical grid power supply. This module is supplied with automatic type generator sets with or without switchboards.

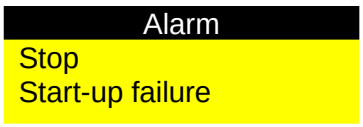
- ***AUTOMATIC (Auto) mode:***

This is the usual operation mode.

Manual mode is activated when you press button

(4). The LED of the upper part of the button will light up indicating that it is operational.

(**7320**) If the electric grid supply fails for longer than the configured time, the LED (11), that indicates the electrical grid is available, goes off.



When the mains electricity returns, the engine will continue working at no load for a period of time to cool before stopping completely.

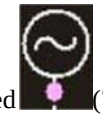
If during the period of work at no load (cooling period) a new mains failure occurs, the generator set will not take the charge again.

Press (1) or the emergency button to stop the unit intentionally.

- ***MANUAL mode:***

The manual mode is activated when pushbutton (2) is pressed. The LED of the upper part of the button (2) will light up indicating that it is operational.

Press (6) to start up the unit.

If the mains fails, a remote start-up signal is received or the button to “force the generator set” is pressed  (7),the loads will be transferred to the generator set (module 7320: the unit will continue working at load regardless of the condition of the electrical grid).

The loads may be transferred back to the electrical grid by pressing the button to “force the grid” (11).

To end this operation mode press the button (4).

Once you have pressed the button (4) when there is a correct supply from the electrical grid (without the remote start-up signal being activated), the stopping process described in automatic mode will begin.

Press (1) or the emergency button to stop the unit intentionally.

- ***TEST mode (7320):***

This operation mode is selected when you press the button (3). It is used to check the generator set is functioning correctly.

Press the start-up button (6) to start the generator set.

In this working mode a failure in the electrical grid is simulated, transferring the loads to the generator set.

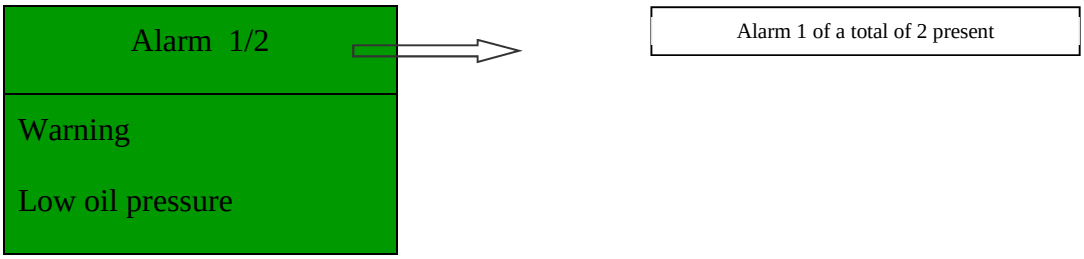
To complete this mode press the button (4). If there is a correct supply from the electrical grid (without the remote start-up signal being activated), the stop process described in the automatic mode will begin and the loads will be transferred to the electrical grid.

Press (1) or the emergency button to stop the unit intentionally.

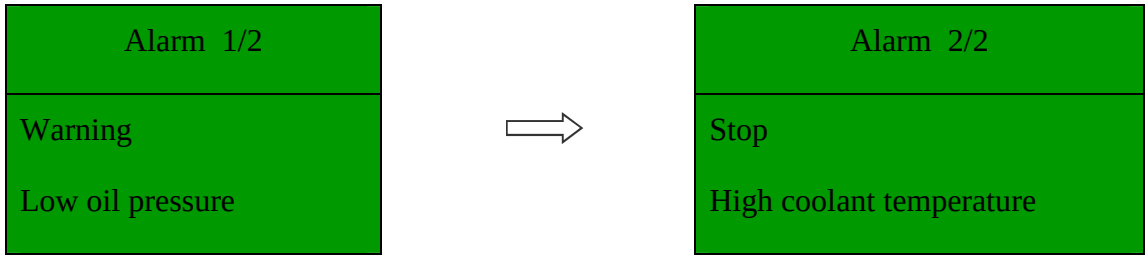
ALARMS:

When an alarm occurs, you can press the button (5) to silence the acoustic warning and turn off the LED indicator (8).

By default the display shows the status screen, and when an alarm occurs it will be shown as follows:



If the unit stops due to an alarm, while a warning is enabled, all the alarms will be shown cyclically:



The warnings do not mean the generator will stop.

Press (1) to reset the alarms that cause the stoppage. If the cause of the alarm has not disappeared, you cannot reset the board.

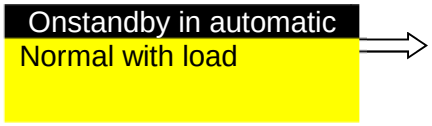
INCIDENT	DESCRIPTION OF THE ALARM
ALARM Warning Battery charge failure.	No voltage is detected in the battery charge alternator.
ALARM Warning Low battery voltage	Battery voltage out of range.
ALARM Warning High battery voltage	
ALARM Warning Failure to stop	After a command to stop the engine continues to function. It may indicate a fault in the oil pressure sensor
ALARM Warning Auxiliary inputs	The auxiliary inputs can be configured and will show the message indicated by the user.
ALARM Warning Low fuel level	The fuel level is below the limit.
ALARM Warning CAN ECU fault	The engine's electronic control unit has detected an alarm and this is indicated for screen (electronic engines only).
ALARM Warning kW overload	The power (kW) generated is above the limit.
ALARM Warning Earthing current fault	The earthing current is above the limit (optional).
ALARM Warning Negative line sequence	Indicates a current imbalance in the generator.
ALARM Warning Low oil pressure	Engine oil pressure is below the limit.
ALARM Warning High engine temperature	Engine temperature outside the limits.
ALARM Warning Low engine temperature	
ALARM Warning Low speed	Engine speed outside the limits.
ALARM Warning Overspeed	
ALARM Warning Low generator frequency	Generator frequency outside the limits.
ALARM Warning High generator frequency	
ALARM Warning Low generator voltage	Generator voltage outside the limits.
ALARM Warning High generator voltage	
ALARM Warning Emerg. overcurrent	Generator current above the limits.

INCIDENT	DESCRIPTION OF THE STOPPAGE
ALARM Stop Earthing current fault	The earthing current is above the limit (optional).
ALARM Stop Start failure	The engine has not started after three tries.
ALARM Stop Emergency fault	The emergency stop button has been pressed. The generator will not be available until the emergency button is unlocked.
ALARM Stop Low oil pressure	Engine oil pressure below the limit.
ALARM Stop High engine temperature	Engine temperature above the limit.
ALARM Stop Line sequence	Line sequence different from that selected.
ALARM Stop Low speed	Engine speed outside the limits.
ALARM Stop Overspeed	
ALARM Stop Low generator frequency	Generator frequency outside the limits.
ALARM Stop High generator frequency	
ALARM Stop Low generator voltage	Generator voltage outside the limits.
ALARM Stop High generator voltage	
ALARM Stop Pressure sensor fault	Oil pressure sensor not detected.
ALARM Stop Auxiliary input	An auxiliary input configured as a stop has been activated and has caused the unit to stop. The message indicated by the user will be shown.
ALARM Stop Loss of the speed sensor	The pick up speed signal is not being received.
ALARM Stop CAN data fault	The module is configured to use the CAN bus and does not detects data in it.
ALARM Stop ECU stop	The engine's electronic control unit has detected an alarm and this is indicated on the screen (electronic engines only).
ALARM Stop kW overload	The power (kW) generated is above the limit.
ALARM Stop Negative line sequence	Indicates a current imbalance in the generator.
ALARM Stop Opening due to overcurrent	Generator current above the limit.
Note: If the values configured as Stop are exceeded, the corresponding alarm will be displayed and the shared alarm LED (8) will light up.	

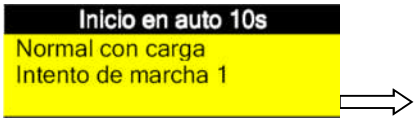
INCIDENT	DESCRIPTION OF THE ELECTRIC OPENING
ALARM Electric opening Generator overcurrent	Generator current above the limit.
ALARM Electric opening Auxiliary inputs	The auxiliary inputs can be configured and will show the message indicated by the user.
ALARM Electric opening kW overload	The power (kW) generated is above the limit.
ALARM Electric opening Earthing current fault	The earthing current is above the limit (optional).
ALARM Electric opening Negative line sequence	Indicates a current imbalance in the generator.
Note: The electric openings are recorded and stop the generator in a controlled manner: first they open the generator breaker to eliminate the load and then carry out the sequence to cool and stop the engine.	

–

– **Typical messages in the information display:**



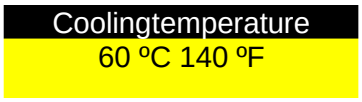
This message indicates that the generator set is ready to work in the event of a mains failure or a remote start-up command.



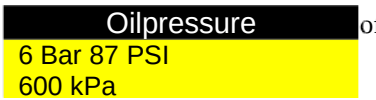
This message indicates that the generator set has received the start-up command in automatic mode due to a mains failure.

This message is displayed when the generator set is working in automatic mode. It shows the voltage measured between line and neutral (L-N), the highest current of the three lines, the nominal frequency, the voltage between lines (L-L) and the total active power (kW).

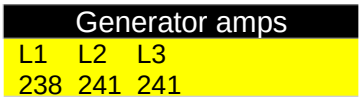
Display of measurement parameters:



temperature, in degrees Centigrade (ºC) and in degrees Fahrenheit (ºF)



of the engine oil, in Bar, PSI and kPa



of each of the lines, in amperes (A)

– **Events log:**

To see the events log repeatedly press the button until it is shown in the display.

This screen records the stoppage alarms that have occurred in the generator, but not the warnings. The screen shown will be similar to the following:

"On 12 September at 08:25:46, 2007, the module detected that the oil pressure was below the minimum value and has stopped the generator set. It is the first event of a total of 50 stored.

To pass from one event to another press the button .To exit the main screen press .

– **Viewing information:**

The display order of the screens is the following:

- Status screen
- Instruments screen (engine, generator set and grid)
- Alarms screen
- ECU DTCs (only for engines with electronic control)
- Events log
- Programmer (if enabled)
- About

You can move between the different screens by pressing the button . Once you have selected a screen, the display will stay on it. After a period of inactivity, the display will change to the status screen.

In the instruments screen, the various values will be shown automatically without you having to press any button. Alternatively, you can move among the various values by pressing or . These deactivates the autoscroll and if no button is pressed it returns to the status screen. To reinstate the autoscroll press or until the title of the instruments screen is shown.

If an alarm is activated while the instruments screen is displayed, the display will jump to the alarm screen automatically.

The content of the instruments screen is the following:

Engine:

- Engine speed
- Oil pressure
- Cooling temperature
- Battery voltage
- Hours of operation of the unit
- Oil temperature*
- Coolant temperature*
- Air intake temperature*
- Exhaust gas temperature*
- Fuel temperature*
- Turbo pressure*
- Fuel pressure*
- Fuel consumption*
- Fuel consumed*
- Fuel level*
- Auxiliary sensors (if any and if configured)
- Need for engine maintenance (if configured)
- Link with the electronic control unit of the engine*

** When the module is connected to an engine electronic control unit that is correctly configured and compatible.*

Generator set:

- Voltage L-N
- Voltage L-L
- Frequency
- Currents
- Earthing current (optional)
- Power (kW)
- Active power (kVA)
- Power factor:
- Reactive power (kVAr)
- Energy (kWh, kWAh, kVArh)
- Line sequence

Electrical grid (DSE 7320):

- Voltage L-N
- Voltage L-L
- Frequency

About:

- Module
- Version
- USB ID – Identifier for connection to PC via USB
- Version of analogue instrumentation
- Version of firmware update

If at any moment the instruments screen shows *****, it means that this parameter is not available (the engine does not provide this parameter).

If at any moment the instruments screen shows ####### with the generator set in OFF/AUTOMATIC mode (with the engine stopped), it means the module is not connected to the engine at that precise moment. Press button (6) to show the value.

– **Alarm or indication LED:**

PICTOGRAM	DESCRIPTION		PICTOGRAM	DESCRIPTION
	Remote start-up			Int. trip. Magnetothermic switch and differential
	Remote shut-off			Low water level alarm
	Warning alarm			Low fuel level alarm
	Stoppage alarm			High alternator temp.
	Overload alarm			Remote shutdown
	Int. trip. Magnetothermic switch			Alarm due to water in fuel separator
	Int. trip. Differential			

– **Configuration of the current date and time:**

The date and time can be configured. When the battery is disconnected, the time and date values are still updated. When the battery is reconnected the values will be correct.

The date and time values are used in the events log, so it is important they are correct. To enter the date and time follow these steps:

Simultaneously press the buttons and . Then enter the PIN number using the push-buttons or , to select the correct values and use the push-buttons and to change from one digit to another. To finish, press the button .

Press the button until you reach the instruments screen and then until you reach the "Date and time" parameter. Then press the button : the digits will start to blink. Press the push-buttons or to adjust to the desired values.

Press the button to confirm the value entered.

Hold down to exit the editor at any time.

14.5.2. Lightning

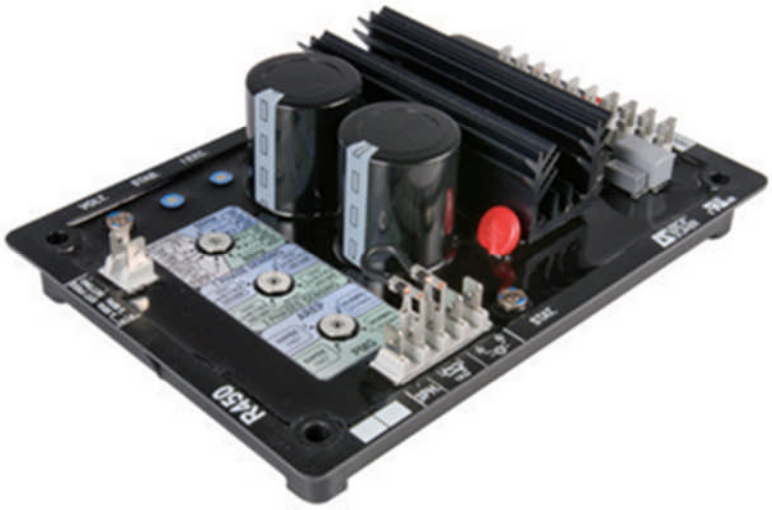
The SILENT ENERGY RENTAL series is lit with 12 V or 24 V lamps.

Picture 40: Interior illumination

14.5.3. Silent blocks in doors

Picture 41: Silent blocks in doors

14.5.4. AVR in switchboard



Picture 42: AVR in switchboard

a) Adjusting the voltage on gensets with 50/60 Hz selector switch

You must operate as per the following instructions in order to adjust the voltage.

-**When operating at 50 Hz:** In order to adjust the voltage it must be done through the potentiometer (PR1) installed inside the control panel (on the right side above the frequency selector switch).

Picture 43: Voltage potentiometer and frequency selector switch

-**When operating a 60 Hz:** In order to adjust the voltage it will be necessary to adjust it from the AVR. The AVR could be installed either in the control panel or in the Alternator..

When adjusting the voltage at 60 Hz, the voltage a 50 Hz will be modified. So it will be necessary to adjust the voltage when operating 50 Hz, using the procedure described before “when operating at 50 Hz”.

Certain operating values could be out of range of the operating values controlled by the control card. In case you believe that you need to modify this parameters please contact with GESAN.

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16. ANNEX 4: DERATING OF ENGINE POWER RATING:

Engine power rating is declared for the following conditions in accordance with the norms ISO-8528-1:2005 and ISO-3046-1:2002.

- Air pressure: 100 kPa
- Temperature: 25ºC
- Relative humidity: 30%

If site ambient conditions are different from standard, derating of engie power rating is possible. This derating depends on the characteristics of every engine. Please consult those derating in his technical sheets.

According to norm ISO-3046-1:2002, the derating of engine power rating could be found are:

16.1. DERATING OF POWER RATING OF TTURBOCHARGED ENGINES WITHOUT CHARGE AIR COOLING:

Altitude from sea	Barometric pressure	Temperature (ºC)											
m	kPa	-10	0	5	10	15	20	25	30	35	40	45	50
0	101,3	1,33	1,23	1,18	1,13	1,09	1,05	1,01	0,97	0,94	0,90	0,87	0,84
100	100,1	1,32	1,22	1,17	1,12	1,08	1,04	1,00	0,96	0,93	0,90	0,86	0,83
200	99,5	1,31	1,21	1,16	1,12	1,08	1,03	1,00	0,96	0,92	0,89	0,86	0,83
300	98,7	1,31	1,20	1,16	1,11	1,07	1,03	0,99	0,95	0,92	0,89	0,85	0,82
400	96,7	1,29	1,18	1,14	1,09	1,05	1,01	0,97	0,94	0,90	0,87	0,84	0,81
500	95,5	1,27	1,17	1,13	1,08	1,04	1,00	0,96	0,93	0,89	0,86	0,83	0,80
600	94,4	1,26	1,16	1,12	1,07	1,03	0,99	0,96	0,92	0,89	0,85	0,82	0,79
700	93,2	1,25	1,15	1,11	1,06	1,02	0,98	0,95	0,91	0,88	0,85	0,82	0,79
800	92,1	1,24	1,14	1,10	1,05	1,01	0,97	0,94	0,90	0,87	0,84	0,81	0,78
900	90,9	1,23	1,13	1,08	1,04	1,00	0,96	0,93	0,89	0,86	0,83	0,80	0,77
1000	89,9	1,22	1,12	1,07	1,03	0,99	0,96	0,92	0,88	0,85	0,82	0,79	0,76
1100	88,8	1,20	1,11	1,06	1,02	0,98	0,95	0,91	0,88	0,84	0,81	0,78	0,76
1200	87,7	1,19	1,10	1,05	1,01	0,97	0,94	0,90	0,87	0,84	0,80	0,78	0,75
1300	86,7	1,18	1,09	1,04	1,00	0,96	0,93	0,89	0,86	0,83	0,80	0,77	0,74
1400	85,6	1,17	1,08	1,03	0,99	0,96	0,92	0,88	0,85	0,82	0,79	0,76	0,73
1500	84,5	1,16	1,07	1,02	0,98	0,95	0,91	0,87	0,84	0,81	0,78	0,75	0,73
1600	83,5	1,15	1,06	1,01	0,97	0,94	0,90	0,87	0,83	0,80	0,77	0,75	0,72
1700	82,4	1,14	1,05	1,00	0,96	0,93	0,89	0,86	0,82	0,79	0,77	0,74	0,71
1800	81,5	1,13	1,04	1,00	0,96	0,92	0,88	0,85	0,82	0,79	0,76	0,73	0,70
1900	80,5	1,12	1,03	0,99	0,95	0,91	0,87	0,84	0,81	0,78	0,75	0,72	0,70
2000	79,5	1,11	1,02	0,98	0,94	0,90	0,87	0,83	0,80	0,77	0,74	0,72	0,69
2200	77,6	1,08	1,00	0,96	0,92	0,88	0,85	0,82	0,79	0,76	0,73	0,70	0,68
2400	75,6	1,06	0,98	0,94	0,90	0,87	0,83	0,80	0,77	0,74	0,71	0,69	0,66
2600	73,7	1,04	0,96	0,92	0,88	0,85	0,81	0,78	0,75	0,73	0,70	0,67	0,65
2800	71,9	1,02	0,94	0,90	0,86	0,83	0,80	0,77	0,74	0,71	0,68	0,66	0,63
3000	70,1	1,00	0,92	0,88	0,85	0,81	0,78	0,75	0,72	0,70	0,67	0,64	0,62
3200	68,4	0,98	0,90	0,87	0,83	0,80	0,77	0,74	0,71	0,68	0,66	0,63	0,61
3400	66,7	0,96	0,88	0,85	0,81	0,78	0,75	0,72	0,69	0,67	0,64	0,62	0,60
3600	64,9	0,94	0,87	0,83	0,80	0,76	0,73	0,71	0,68	0,65	0,63	0,60	0,58
3800	63,2	0,92	0,85	0,81	0,78	0,75	0,72	0,69	0,66	0,64	0,61	0,59	0,57
4000	61,6	0,90	0,83	0,80	0,76	0,73	0,70	0,68	0,65	0,62	0,60	0,58	0,56

Note: *Environmental conditions of T=298 K y P=100 kPa.*
In order to know the particular engine power rating derating, refer to manufacturer technical specifications.

16.2. DERATING OF ENGINE POWER RATING OF TURBOCHARGED ENGINES WITH CHARGE AIR COOLING:

Altitude from sea	Barometric pressure	Temperature (ºC)											
m	kPa	-10	0	5	10	15	20	25	30	35	40	45	50
0	101,3	1,28	1,22	1,19	1,16	1,13	1,11	1,08	1,06	1,04	1,01	0,99	0,97
100	100,1	1,27	1,21	1,18	1,15	1,12	1,10	1,07	1,05	1,03	1,00	0,98	0,96
200	99,5	1,26	1,20	1,17	1,14	1,12	1,09	1,07	1,04	1,02	1,00	0,98	0,96
300	98,7	1,25	1,19	1,16	1,14	1,11	1,09	1,06	1,04	1,02	0,99	0,97	0,95
400	96,7	1,23	1,17	1,15	1,12	1,09	1,07	1,04	1,02	1,00	0,98	0,96	0,94
500	95,5	1,22	1,16	1,13	1,11	1,08	1,06	1,03	1,01	0,99	0,97	0,95	0,93
600	94,4	1,21	1,15	1,12	1,10	1,07	1,05	1,02	1,00	0,98	0,96	0,94	0,92
700	93,2	1,20	1,14	1,11	1,09	1,06	1,04	1,01	0,99	0,97	0,95	0,93	0,91
800	92,1	1,19	1,13	1,10	1,08	1,05	1,03	1,01	0,98	0,96	0,94	0,92	0,90
900	90,9	1,18	1,12	1,09	1,07	1,04	1,02	0,99	0,97	0,95	0,93	0,91	0,89
1000	89,9	1,17	1,11	1,08	1,06	1,03	1,01	0,99	0,96	0,94	0,92	0,90	0,88
1100	88,8	1,15	1,10	1,07	1,05	1,02	1,00	0,98	0,96	0,93	0,91	0,89	0,88
1200	87,7	1,14	1,09	1,06	1,04	1,01	0,99	0,97	0,95	0,92	0,90	0,89	0,87
1300	86,7	1,13	1,08	1,05	1,03	1,00	0,98	0,96	0,94	0,92	0,90	0,88	0,86
1400	85,6	1,12	1,07	1,04	1,02	0,99	0,97	0,95	0,93	0,91	0,89	0,87	0,85
1500	84,5	1,11	1,06	1,03	1,01	0,98	0,96	0,94	0,92	0,90	0,88	0,86	0,84
1600	83,5	1,10	1,05	1,02	1,00	0,97	0,95	0,93	0,91	0,89	0,87	0,85	0,83
1700	82,4	1,09	1,04	1,01	0,99	0,96	0,94	0,92	0,90	0,88	0,86	0,84	0,82
1800	81,5	1,08	1,03	1,00	0,98	0,96	0,93	0,91	0,89	0,87	0,85	0,83	0,82
1900	80,5	1,07	1,02	0,99	0,97	0,95	0,92	0,90	0,88	0,86	0,84	0,83	0,81
2000	79,5	1,06	1,01	0,98	0,96	0,94	0,92	0,89	0,87	0,86	0,84	0,82	0,80
2200	77,6	1,04	0,99	0,96	0,94	0,92	0,90	0,88	0,86	0,84	0,82	0,80	0,79
2400	75,6	1,02	0,97	0,95	0,92	0,90	0,88	0,86	0,84	0,82	0,80	0,79	0,77
2600	73,7	1,00	0,95	0,93	0,90	0,88	0,86	0,84	0,82	0,80	0,79	0,77	0,75
2800	71,9	0,98	0,93	0,91	0,89	0,87	0,85	0,83	0,81	0,79	0,77	0,75	0,74
3000	70,1	0,96	0,91	0,89	0,87	0,85	0,83	0,81	0,79	0,77	0,76	0,74	0,72
3200	68,4	0,94	0,89	0,87	0,85	0,83	0,81	0,79	0,77	0,76	0,74	0,72	0,71
3400	66,7	0,92	0,88	0,86	0,83	0,81	0,80	0,78	0,76	0,74	0,73	0,71	0,69
3600	64,9	0,90	0,86	0,84	0,82	0,80	0,78	0,76	0,74	0,73	0,71	0,69	0,68
3800	63,2	0,88	0,84	0,82	0,80	0,78	0,76	0,74	0,73	0,71	0,69	0,68	0,66
4000	61,6	0,87	0,82	0,80	0,78	0,76	0,75	0,73	0,71	0,70	0,68	0,66	0,65

Note: *Environmental conditions of T=298 K y P=100 kPa.*
Intercooler reference conditions: T=330 K, Tc=300 K y P=70 kPa.
In order to know the particular engine power rating derating, refer to manufacturer technical specifications.

16.3. DERATING OF ENGINE POWER RATING OF NATURALY ASPIRED ENGINES:

Altitude from sea	Barometric pressure	Humidity: 30%										
		Temperature (ºC)										
		-10	0	5	10	15	20	25	30	35	40	45
0	101,30	1,14	1,10	1,09	1,07	1,05	1,03	1,02	1,00	0,98	0,97	0,95
100	100,00	1,12	1,09	1,07	1,05	1,03	1,02	1,00	0,98	0,97	0,95	0,93
200	98,90	1,11	1,07	1,05	1,04	1,02	1,00	0,99	0,97	0,95	0,94	0,92
400	96,70	1,08	1,04	1,03	1,01	0,99	0,98	0,96	0,94	0,93	0,91	0,90
600	94,40	1,05	1,01	1,00	0,98	0,96	0,95	0,93	0,92	0,90	0,88	0,87
800	92,10	1,02	0,98	0,97	0,95	0,93	0,92	0,90	0,89	0,87	0,86	0,84
1000	89,90	0,99	0,95	0,94	0,92	0,91	0,89	0,88	0,86	0,85	0,83	0,82
1200	87,70	0,96	0,92	0,91	0,89	0,88	0,86	0,85	0,83	0,82	0,80	0,79
1400	85,60	0,93	0,90	0,88	0,87	0,85	0,84	0,82	0,81	0,79	0,78	0,76
1600	83,50	0,90	0,87	0,85	0,84	0,82	0,81	0,80	0,78	0,77	0,75	0,74
1800	81,50	0,87	0,84	0,83	0,81	0,80	0,79	0,77	0,76	0,74	0,73	0,72
2000	79,50	0,85	0,82	0,80	0,79	0,77	0,76	0,75	0,73	0,72	0,71	0,69
2200	77,60	0,82	0,79	0,78	0,76	0,75	0,74	0,72	0,71	0,70	0,68	0,67
2400	75,60	0,79	0,76	0,75	0,74	0,72	0,71	0,70	0,69	0,67	0,66	0,65
2600	73,70	0,77	0,74	0,73	0,71	0,70	0,69	0,67	0,66	0,65	0,64	0,62
2800	71,90	0,74	0,72	0,70	0,69	0,68	0,66	0,65	0,64	0,63	0,62	0,60
3000	70,10	0,72	0,69	0,68	0,67	0,65	0,64	0,63	0,62	0,61	0,59	0,58
3200	68,40	0,70	0,67	0,66	0,64	0,63	0,62	0,61	0,60	0,59	0,57	0,56
3400	66,70	0,67	0,65	0,63	0,62	0,61	0,60	0,59	0,58	0,57	0,55	0,54
3600	64,90	0,65	0,62	0,61	0,60	0,59	0,58	0,57	0,55	0,54	0,53	0,52
3800	63,20	0,62	0,60	0,59	0,58	0,57	0,56	0,55	0,53	0,52	0,51	0,50
4000	61,50	0,60	0,58	0,57	0,56	0,55	0,53	0,52	0,51	0,50	0,49	0,48

Note: *Environmental conditions of T=298 K y P=100 kPa. Relative humidity 30%*
In order to know the particular engine power rating derating, refer to manufacturer technical specifications.

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