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# INTRODUCCIÓN

By means of this handbook we intend to provide the basic instructions and information for a proper installation, use and maintenance of the generator set.

All activities involving the internal functioning of the generating set, must be carried out by specialized personnel, with experience in Diesel engines and mechanical and hydraulic installations as well as in electricity generation. This handbook and all the other reference documentation are indispensable in order to train these specialists.

At HIMOINSA we think of you, that is why it is essential that you read all safety regulations and warnings thoroughly before you start the generator set. Only by doing this we can assure you an optimal service in perfect reliability and safety conditions.

HIMOINSA advises that the validity of the information in this handbook refers to the date when it was issued, since several aspects such as the technological developments, new regulations or updates and improvements of the models oblige us to make changes without notice, which may not appear in the current handbook.

This handbook and the rest of the reference documentation are parts of the generator set that you have purchased and must be kept and protected against any agents that may damage them. This documentation must accompany the equipment whenever it is leased to any other users or new owners.

Although all the information in this handbook has been thoroughly verified, HIMOINSA refuses any responsibility for any spelling, typographic or transcription errors.

In accordance with directive 85/374/EEC and its subsequent modification 99/34, HIMOINSA will not be deemed responsible for defective installations, improper uses of the machine and non-fulfilment of the regulations of this handbook.

# **1. SAFETY REGULATIONS**



Before operating the machine, read the following safety regulations carefully, and find out about the local requirements in safety.

The installation, operation, maintenance and repairs must be carried out only by authorized and competent personnel.

The owner is responsible for maintaining the generating set in good safety conditions. The parts and accessories must be replaced if they are not in good working conditions.

- 1.1. General safety precautions.
  - Do not allow non-authorized people to access the plant.

• Do not allow people with pacemakers to access the plant, as it may cause electromagnetic interferences on these devices.

• Do not approach the G.S. if you are wearing loose clothes or objects that may be attracted by the airflow or by the mobile parts of the engine.

- It is forbidden to dismantle or disable any safety devices.
- It is forbidden to lean on the G.S. or to leave objects on it.

For automatic action generating sets:

- Place a red light that switches on when the unit is working in a visible place.
- Place a warning sign alerting of the possibility that an unexpected automatic start up of the



machine may occur.

• Place an obligation sign stating: "All maintenance operations must be carried out with the genset in the LOCK position".

• For the emergency stop of the group, press the "emergency stop" button, located in the group, or the emergency push button to be installed outside the engine room.

1.2. Safety at delivery, storage and unpacking.

• Once you receive the lighting tower, check that the received goods correspond to those on the delivery note and that all the goods are in perfect conditions.

• In order to lift and transport the Tower, lifting machines of the appropriate capacity must be used. All loose and pivoting parts must be safely fixed before lifting it.

 $\bullet$  When moving the G.S., and specially when lifting it, it is highly recommendable to use the available points for this purpose. (1-2)





• It is totally forbidden to use any other lifting points located over the engine, alternator or other components.

 $\bullet$  If the G.S. is damaged for any reason during its transportation, storage, and/or mounting, it must not be started up before being verified by our specialized personnel.

• If you want to store the Tower until its utilization, it is highly recommendable to have a warehouse properly protected against any chemical agents that may damage its components.

• Unpacking must be carried out carefully, avoiding causing any damages to the goods during such operation, especially when using levers, saws or any other metallic tools.

1.3. Safety during installation and initial start-up

• The installation of the generator set and its respective accessories must be carried out by specialized personnel. In the event of any difficulties during the installation, consult with the Technical Department at Himoinsa.

• You must be familiar with the emergency procedures concerning the installation to be followed.

• Always wear a safety helmet, footwear and safety gloves, protective goggles and dry, tight clothes.

• Do not modify the original protections, located on all rotary parts on display, hot surfaces, air intakes, belts and live parts.

• Do not leave dismantled parts, tools or any other accessories on the engine, near the engine or in the area where the generator set is located.

• Do not leave any flammable liquids or rags soaked in flammable liquids near the generator



set, electrical devices or any other parts of the electrical installation (including lamps).

• Take extreme caution to avoid risks of fulguration; make sure there is a grounding installation and that it has been fitted according to the regulations.

• Place a sign stating: "DO NOT PERFORM MANOUVERS" in all sectioning parts that separate the areas of the installation where you are to work.

• Install all the necessary protective measures required for safety in the parts that complete the installation.

• Insulate all connections and wires that are disconnected. Do not leave any terminals of the generator sets unprotected.

• Plug all connection points concerning the generator set and its accessories into the grounding installation.

- Verify and make sure the electrical power connections and the auxiliary services connections are correctly made.
- Check that the cyclical direction of the phases matches the one of the power supply.
- Isolate the position of the emergency stop switches, quick-stop fuel valves, switches and other incidental emergency systems existing in the installation.

• Verify the perfect functionality of the stop devices of the set, especially those in the following devices (in case they are standard supplies): overspeed stop, low oil pressure stop, high water temperature in the engine stop, and the user-installed emergency stop switch, which is usually outside the premises.

• Check the correct ventilation of the premises so that the exhaust gases can be released to the atmosphere, to the exterior of the premises, and verify that they are in a safe position away



from doors, windows and air intakes.

- Check that pipes and silencers are installed in a correct way. They must have expansion joints and be protected against accidental contact.
- Make sure there are no losses or leaks in the oil and fuel pipes.
- Before the starting-up, make sure the generator set has the right amount of lubricant oil, cooling liquid and fuel.
- Single out the position of the fire extinguishers and other protective and emergency devices, and learn how they work.
- Single out the sources of dangers, such as fuel leaks, lubricant oil, acid solutions, condensed drippings, high pressures and other dangers.
- Check that the set is clean and the surrounding area and escape routes are clear and free of obstacles. Check that there are no obstructions on grilles, intakes and outlets.
- Check that there are staff members working at other nearby sets, and that those tasks are not dangerous and may affect the operation of the system.
- 1.4. Safety during operation
  - Do not allow people or animals to access the operating area of the G.S..
  - Do not touch the generator set, especially wires and connections to the alternator when the set is operating, since they are live.
  - Do not touch any parts in motion, until the generator set has stopped completely.



• When the G.S. is in operation, some parts of the engine, conduit(s) and exhaust reach high temperatures. Avoid touching them until they have cooled down completely.

• Always wear ear protectors when the generator set is in operation, in order to avoid ear damage.

• The labels concerning safety must be kept clean and on the locations designated by the manufacturer.

• Fuels and lubricants may be flammable, toxic, explosive and corrosive. We recommend keeping them in their original containers and storing them in protected areas.

- 1.5. Safety during maintenance
  - All checks and/or maintenance of the generator set must be always carried out by specialised personnel.
  - Maintenance operations must be done when the engine is not working.

• Before operating any components of the electrical installation, disconnect the poles from the battery.

- Before opening the electrical panel, specialized personnel must take the following precautions:
  - Stop the generator set if it is in operation, and set the electric panel in the LOCK position.
  - Disconnect the battery/batteries from the generator set.
  - Disconnect the power input.
- Periodically check both the tightness and insulation of connections.



• The different operations and/or maintenance procedures which are not specifically indicated in the user handbooks must be notified to the manufacturer for their approval.

• Do not carry out modifications of the product without having the knowledge and exclusive authorisation by our technical department.

• Follow the recommended manufacturer's directions concerning oil changes and fuel replacements. Do not use oils or fuels that are not specified by the manufacturer.

• Spare parts must conform to the manufacturer's standards. Use original spares only. For spares, contact original spare suppliers only, or workshops in the HIMOINSA assistance network. For a correct determination of the spare parts always refer to the data indicated on the plate of the set, the type of engine and/or alternator and their respective registration numbers.

• Periodically control the condition of the different components of the G.S., especially of antivibration components, the origin of eventual vibrations and/or the increase in humourosity.

• Periodically check if there are any water, oil, fuel and/or acid leaks in the battery/batteries.

• Do not modify the engine or other components of the generator set to obtain performances different from those specified by the manufacturer.

- Do not operate the fuel tank or fuel supply conduits when the engine is hot or in operation.
- Wear protective gloves and goggles:
  - When using pressurized air;
  - During battery maintenance;
  - During the supply of inhibitors or antifreeze products;

- During the replacement or supply of lubricant oil (hot engine oil can cause scalds during emptying). Allow the oil to cool below 60° C.



• Wear protective helmets when operating in an area with suspended loads or equipment at head level.

- Always wear safety footwear and tight clothes.
- When working with parts that may be live, always make sure that your hands and feet are dry. We recommend the use of insulating flooring to perform manoeuvres.
- Wet clothes must be replaced immediately.
- Keep used rags in containers that are anti-flammable or indicated for such effect.
- Do not leave rags on the engine.

• When starting up an engine that has been repaired, take precautions in order to prevent air suction in case there is an excess in revolutions during the start up.

- Always keep the engine clean, removing eventual oil stains, gas oil and/or other cooling liquids.
- Never start up the engine when the fan speed regulator lever has been dismantled.

• Do not carry out tasks that need the presence of several people if you are alone, especially when moving or operating parts such as switches, section switches, fuses and/or other live devices.

Engine cooling circuit.

• Never add coolant to a hot engine; allow the engine to cool down first.

• Periodically check the level of the coolant, and if necessary, add product until the appropriate level is reached. Only use liquids that are recommended in the use and maintenance handbook.



• Remove the radiator cap gently. The cooling conduits are usually pressurised, and therefore the hot liquid may spout if pressure is released very quickly.

• Periodically check the tightness and level of wearing of pump belts/fan.

Lubrication circuit.

• Periodically check the level of the oil in the crankcase, with a cool engine, and add oil whenever necessary, according to the directions found in the use and maintenance handbook.

• Do not smoke or light fires during the oil supply.

#### Fuel circuit

• Do not smoke or light fires during the fuel supply.

• Do not smoke during the fuel replacement, and be careful not to spill fuel on the generator set.

#### Exhaust circuit

• Watch the exhaust circuit, and in the event that any eventual gas leaks are detected, repair immediately. These are possible fire sources.

• Warning: very hot surfaces. Pre-assembled installation parts are protected against accidental contacts. The installer must insulate and/or protect any other additional parts, gas evacuation pipes, the silencer which is supplied separately, etc.



Electric start system

• Disconnect the negative pole from the battery/batteries before operating the engine, in order to prevent the automatic start system of the engine from starting while being operated.

• Keep joints tight and check that the insulation of the wires is satisfactory.

• We recommend connecting first the positive pole to the battery, and next the negative pole (usually grounding), in order to prevent the formation of electrical arches.

Synchronous Generator.

• Do not manipulate the genset when it is in operation. Before manipulating, set the generator to the position of LOCK.

• Ensure the air intakes for the ventilation of the genset are clean, and in some models, lubricate the bearings. Also, make sure that the tightness and the position of the electrical connections are correct.

Control panel

• Before operating the control panel, disconnect the power input and set the generator to the position of LOCK.

• Electrical control panels, as all electrical devices, are damp and dusty. Verify that the anticondensation heaters, if available, are in good working order and that the air ventilation intakes are clean.

• Periodically check that the bolts that fix electrical connections are securely screwed.



1.6. Environmental safety.

• Do not start a G.S. in closed premises, where there is no exhaust installation with outlets. Exhaust gases are harmful and may be lethal.

• Follow the rules and other regulations concerning acoustic installations.

• Replace the exhaust and/or silencer of the engine if the humming level is louder than the allowed by the respective regulation.

• Maintenance operations (oil replacements, fuel tank cleaning, radiator cleaning, washing, battery/batteries replacements, etc.), storage and waste disposals will be carried out according to the existing regulations in the country where they are being used.

1.7. Safety stickers and information.

There are some safety stickers and information all over the genset. Next you can find a brief explanation of their locations and information on each of them:

PICTURE	LOCATION	INFORMATION
	Located on the connections from the alternator to the engine. Whenever there are timing belts or transmission shafts.	They warn of the danger in case an alien object collides with the timing belts or with the components in motion that they connect.



DIBUJO	UBICACIÓN	INFORMACIÓN
	Located on the parts of the genset that heat up during operation.	They indicate those areas which must not be touched while the set is in operation or shortly after having stopped.
	Placed on the coolant tank cap.	They warn of the precautionary measures to be taken when opening this cap. The liquid is hot and may spout and cause scald.
Š	Located on the bonnet and next to the lifting eye.	It indicates the point by which the set must be lifted in order to move it.
DIESEL	Located next to the fuel cap. Depending on the model, it can be either on the bedplate or next to the engine.	It indicates the location of the fuel tank. Tank filling cap.
))) )))	Located on both sides of the bedplate skids.	It indicates the advisable area to move the set by means of a fork-lift truck.
8 <u>7</u> .	Located next to the oil fill dipstick and oil fill cap.	Indicates the location of the oil fill dipstick.



DIBUJO	UBICACIÓN	INFORMACIÓN
	Next to the derivations of the grounding protections.	They are the parts by means of which the genset is protected against possible electric shocks.
L1 L2 L3 LN	Next to the protective thermal-magnetic switches of the genset.	They protect the genset against possible overcurrent that may occur during charge.
AND THE ENGLANCE	On the emergency stop.	It indicates the location of the emergency stop button which allows the simultaneous stop of the genset.
	Located on the control panel.	They warn of electric shock hazard.
	Always located on the thermal-magnetic switch.	They indicate the prohibition of manipulating the genset when the switch is on.



# 2. INADEQUATE USE WARNINGS

The Generator Set that HIMOINSA supplies is aimed at the production of electrical energy according to the conditions and environmental and operating limits established or agreed in this contract. All amendments of such conditions and limits must be notified directly to the manufacturer or made via authorised workshops in order to achieve an optimal performance and, if necessary, to perform modifications and/or new calibrations of the genset.

The Generator Set is a machine that transforms potential thermal energy, contained in the fuel, into electrical energy, and is aimed at supplying distribution installations that must be carried out by specialists according to existing regulations. Although the power in use is much lower than that of a public supply network, the danger of electrical energy is the same. The generator set is a production plant that, apart from the existing dangers of electrical source from a public supply network, also adds other risks derived from the existence of flammable substances (the fuel itself or lubricant oils) of rotatory parts and secondary waste products (exhaust gases and irradiation and cooling heats).

Although it is possible to take advantage of the heat contained in the exhaust gases and the cooling system in order to boost the thermal efficiency of the process, this application must be fitted by specialized technicians to achieve a reliable installation and safe for people and things, and to prevent the expiration of the warranty.

Any other uses that have not been previously agreed with HIMOINSA shall be considered as of improper use and, therefore, they are not acceptable.



# **3. WORKING CONDITIONS**

3.1 Standard environmental conditions for reference

• Diesel engine.

Important: the power of Diesel engines, for stationary applications, refers to the following environmental conditions, according to the ISO 3046/1 standard:

- Room temperature: 25° C
- Room air pressure: 1000 Mbars (750 mm/Hg.)
- Relative humidity: 30%
- Synchronous generator

The environmental conditions used as a reference for alternators, stationary applications, according to the directives IEC 34-I, ISO 8528-3 and CEI 2-3, are the following:

- Room temperature: 40°C (30°C according to NEMA)
- Altitude: 1000m ASL (674 mm/Hg)

3.2. Derating for operative environmental conditions.

For environmental conditions of installation and operation different from those above specified, it is necessary to foresee an eventual loss of power, or 'derating', not only in the engine, but also in the generator that is fitted into it, and therefore, in the electric power provided by the genset.

The user/customer must clearly establish the effective environmental conditions in which the Generator Set will operate when placing the order. Therefore, the derating and declassification must be fixed at the time of signing the agreement, so that both the engine and the generator are correctly sized.



Particularly, the user/customer must report on the following environmental conditions in which the generator set will operate:

• The upper and lower room temperature limits.

• The altitude above sea level or, preferably the minimum and maximum values of barometric pressure in the installation area; in case of mobile sets, the upper and lower limits of altitude above sea level.

• The humidity values in relation to the temperature and air pressure within the installation, paying special attention to the humidity value with respect to the maximum temperature.

• The maximum and minimum temperatures of the cooling water, only in those gensets that are equipped with water-water interchangers (under special request) instead of a radiator.

• Any other environmental conditions that may require special solutions or shorter maintenance cycles, such as:

- Dusty and/or sandy environments
- Maritime environments
- Environments with the possibility of chemical pollution
- Environments with existence of radiations.

- Operating conditions with the presence of great vibration (e.g. earthquake-prone areas, or subject to external vibrations caused by nearby machines).

When the effective conditions are not specified in the contractual base, the power of the genset is interpreted according to the Standard conditions for Diesel engines, as established.



If the effective environmental conditions change subsequently, it will be necessary to contact HIMOINSA, in order to calculate the new power losses and to carry out the necessary calibrations.

For Diesel engines, these deratings are determined by the manufacturers of the respective engine. In order to become familiar with them, contact the technical department at HIMOINSA, or ask your regular supplier.

The alternator derating is not as important as the one of Diesel engines; therefore, the general derating of the generator genset matches the derating of the engine.

Chart 4 is a merely indicative way of determining the derating of alternators. For a higher precision, you must refer to the supplier's documentation.

Room temperature °C	30	35	40	45	50	55	60
Reduction coefficient K1 K1	1,05	1,03	1,00	0,96	0,92	0,88	0,84
Altitude - metres above sea level (m ASL)	1000	1500	2000	2500	3000	3500	4000

#### CHART 4

Coefficients that indicate the reduction in power of an IP21 air-cooled, self-ventilated alternator, depending on the different environmental conditions.

Both K1 and K2 coefficients must be applied to the nominal power of the generator in order to obtain the power in environmental conditions that are different from the standard ones.



#### # Example: alternator measuring

A 64 KW (80KVA) generator set in standard conditions for an engine at 25° C, 100m ASL, 30% relative humidity (RH).

The set consists of:

- A 72kW supercharged engine at 25°C, 100m ASL and 30%RH.

- An alternator with sr = 80kVA supplied at 40°C and 1,000m ASL; being the performance of this alternator 89%.

We want to verify the maximum power that the genset can deliver at 1,000m ASL, and at a temperature of  $45^{\circ}$  C.

The derating coefficient of the engine specified by the engine's manufacturer is 0.75. Therefore, the power of the engine, under the specified conditions, will be 0.75x72 = 54kW. Considering the performance of this alternator, the power of the genset will be 54x0.89 = 48kW.

We shall verify that the alternator is the ideal one. The alternator's derating is given by two coefficients, K1 and K2, shown on Chart 4, or also found in the manufacturer's recommendations of the alternator. The apparent power is the one given by K1xK2xSR, that is: K1=0.96; K2=0.97. The maximum apparent power will be 0.96x0.97x80 = 74,4kVA, and the active power with cos 0.8 will be: 74.4x0.8=59.2 kW. Therefore, the alternator turns to be heavily sized compared to the power that the set can offer (48kW).

#### 3.3. Operational limits.

At the stage of placing the order, the user/customer must report on all the operative conditions that may affect the working order of the genset. Along with the environmental conditions stated above, special attention must be paid to the characteristics of the loads the genset is going to feed, the power, voltage and power factor. The connection sequence of the loads must be determined and indicated with high accuracy.



#### Power

The power of the genset is the active power (expressed in kW), supplied on generator terminals, to the voltage and nominal frequency and for the specified environmental conditions. Below their respective definitions can be found:

The specified features, with a  $\pm$  3% tolerance, are net and can be obtained after 50 hours of operation.

Continuous Power (COP)

It is the continuous power that the generator set can produce continuously for a limited number of hours per year, performing the maintenance intervals described by the manufacturer and in the specified environmental conditions.

#### Prime Power (PRP)

It is the maximum power available, for a cycle with variable power, that the generator set can produce for a limited number of hours per year, performing the maintenance intervals described by the manufacturer and in the specified environmental conditions. The average power produced for a period of 24 hours must not exceed 80% of the PRP. A 10% overload is allowed for 1 hour out of 12 operating hours.

Stand By Power (SBY)

It is the maximum power which, in the established environmental conditions, the genset can produce for a maximum period of 500 hours per year. The load factor must not exceed 90% of the SBY. Overloads are not allowed.



#### Max. Stand-By Power (ISO 3046 FUEL STOP POWER)

It is the maximum power available for a use that has a variable load, for a limited number of hours per year (500 hours), in the specified environmental conditions and within the following maximum working limits:

100% of the load for 25h/year; 90% of the load for 200h/year. Overloads are not allowed.

#### Rate

HIMOINSA gensets are prepared to work at 1,500 rpm or 1,800 rpm at a rate of 50 or 60 Hz, respectively.

Low-power engines are equipped with a mechanical rpm regulator, installed in the injection pump; this is normally adjusted so that motionlessness is 5% and therefore the output rate is 52.5 Hz with no load, and 50 Hz at full load.

In static conditions, the mechanical rpm regulador usually provides an accuracy of  $\pm$  0.5%.

#### Voltage

The voltage regulator is usually ELECTRONIC with features that can control the voltage of the terminals.

For supercharged engines, it is possible to apply an instant voltage equivalent to 80% of the nominal voltage with a transitory fall in speed within 10%.

The specified values, for both naturally aspirated engines and supercharged engines, may vary, as usual, depending on the type of speed regulator and the generator used.

#### Power factor

The power of gensets is the active power, expressed in kW, produced by the terminals of the generator. The nominal power factor is  $\cos = 0.8$ ; therefore, the apparently nominal power will be 1.25 times the Nominal Active Power.

The power factor is a piece of information that depends on the characteristics of the load; HIMOINSA gensets, equipped with an alternator, can produce both the active power and the reactive power required by the load but, whereas the active power is produced by the Diesel engine (transforming mechanical power into electric power by means of the generator), the reactive power is produced by the alternator.

Therefore, for a performance with values different from  $\cos = 0.8$  we must consider:

#### Cos 0.8 <> 1 load.

The alternador works perfectly at active nominal power with the cos values between 0.8 and 1. In order to prevent engine overload, it is required not to exceed the active nominal power.

 $\cos < 0.8 \log d$ .

The alternator, for a certain plate value with reference  $\cos = 0.8$ , overloads more when the  $\cos$  value comes closer to 0. Therefore, the reactive power to be produced increases as the  $\cos$  decreases. The generator reduces its power according to the directions provided by the manufacturer. results

In these conditions the Diesel engine generally in an exuberant power.

For reference purposes, Chart 5 is presented so as to determine these reductions in power. For a higher accuracty refer to the documentation provided by the generator's manufacturer.





Power factor cos	1	0,8	0,7	0,6	0,5	0,3	0
Coefficient of reduction	1,00	1,00	0,93	0,88	0,84	0,82	0,80

## Chart 5. Coefficients that indicate the reductions in power for a generator in a cos function.

## Single-phase loads

The gensets may be supplied with unbalanced loads that can reach the nominal current of each phase. This means that between two phases (for example, L1 and L2) you cannot insert more than 0.58 of the three-phase nominal power of the set: similarly, between one phase and the neutral (eg. L3 and neutral) you cannot insert more than 1/3 (that is, 33%) of the three-phase power of the plate. It is necessary to take into consideration that during the single-phase operation, or with unbalanced loads, the voltage regulator cannot hold the expected voltage tolerances.

#### Charge intakes

When a charge is applied to a generating set, a series of transitory variations of voltage and frequency occur. The scope of such variations depends on the value of the power, both active (kW) and reactive (kVAR) of the variations of the load, depending on the characteristics of the diesel engine and alternator. When charge intake capacity constitutes an important requirement, the customer/user must

$$\sqrt{3}/3=0.58$$



clearly specify it and must provide HIMOINSA with all the necessary information related to the different loads to feed, its possible distribution in groups and the connection sequence. The former is necessary to obtain the best dimensions of the genset and to prevent low-profit oversized gensets or dangerously downsized ones.

Start-up of asynchronous engines

The start-up of asynchronous engines by means of a generator set poses some problems, as engines with squirrel cage motors have start-up voltages that are 8 times higher than the normal intensity of the genset (Iarr =  $8 \times In$ ), and a low power factor.

In these conditions, the current that is absorbed by the asynchronous engine (or by the engines that start simultaneously) during the start-up, must not exceed the maximum current that the generator can produce in short times, taking into account a tolerable fall in voltage and without exceeding overheat limits.

In order to avoid this excessive oversize of the genset, the following systems can be used: Several engines: distribute them in several groups each, according a pre-set sequence, at time intervals of 30-60 seconds.

One engine: whenever the operating machine that is fitted allows it, by using a startup system with reduced voltage (star/triangle or self-transformer), or, for higher powers, single-coil rotor engines and rheostatic starters.

For star/triangle startups, the voltage of each phase turns out to be reduced and the startup voltage (larr) decreases in the same proportion.

 $1/\sqrt{3}=0.58$ 



It is evident that, in the case of an engine with  $larr=6 \times ln$  in direct startup, with a star/triangle startup, it reduces approximately up to 3.5xIn, and as a consequence there is a power request to the genset which is lower than a 6/3.5 ratio.

In all cases, both direct startup and reduced voltage startups, it is necessary to control the devices and equipment that are connected to the circuit in use in order to avoid failures (eg. the opening of contractors) due to a transitory fall in voltage at the time of startup.

# 4. GENERAL DESCRIPTION

The sets are used for two main types of services:

Continuous service sets: Used for the production of electrical energy in areas where there is no other source of production and application for several purposes (motion force, lighting, heating, etc.)

Emergency service sets: They are used to solve energy interruptions that may cause serious problems to people, physical and/or financial damage (hospitals, industrial facilities, airports, etc.) or to face consumption peaks.

Depending on the assigned destination, the sets are subdivided into: Sets for terrestrial use Sets for maritime use

The sets for terrestrial use, depending on the use they are aimed at, have been provided with two types:

Static sets (for fixed installations) Mobile sets (for mobile installations)

Both types can be subdivided at the same time into a wide range of models depending on their variety and user demands:

Manual operation gensets Automatic operation gensets Continuity sets

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This handout provides general information for the installation and use of the HIMOINSA G.S. with manual and automatic operation.

The generator set hereby presented belongs to a production static set. It is important to notice that each genset has a different appearance due to the different sizes and setups of each of their main components.

A standard static set usually consists of:

- 1. Diesel engine
- 2. Radiator
- 3. Dry air filter
- 4. Turbocompressor protection (except models with turbocompressor)
- 5. Fan protection
- 6. Radiator frontal protection
- 7. Single-stand alternator
- 8. Electrical control panel
- 9. Lifting eye
- 10. Bedplate

11. Fuel tank integrated into the chassis

**12**. Grounding connection of components.

- 13. Startup batteries
- 14. Identification stickers
- 15. Silent blocks





Along with the parts above described for the standard static set, the following components can be identified in the soundproof static set:

- 1. Lifting hook
- 2. Radiator filling cap
- 3. Swinging cap of the exhaust outlet.
- 4. Air outlet grille
- 5. Skids for the fitting of lifting
- 6. Hinge with protection
- 7. Door
- 8. Emergency stop button
- 9. Locks
- 10. Control panel





# 4.1. Diesel engines

They operate with a four-stroke diesel cycle, naturally aspirated direct injection, turbocharged and/or aftercooled. The layout of the cylinders depends on the engine model, and it can be in-line or V-type. It is a water-cooled type of engine.

#### 4.2. Monopalier alternator

Generator with a horizontal shaft, synchronous without brushes, autoexcited and autoregulated. The alternator has an automatic voltage regulator. This regulator has got potentiometers in order to adapt the functioning to the different conditions in which the set is used.

#### 4.3. Coupling joint

It is possible to use two-bearing alternators upon request. The engine and the alternator are joined by means of elastic coupling and through a hood coupling in order to guarantee a correct coaxiality of the assembly.

For standard assemblies it is possible to use single-bearing alternators, and the connection is made by means of flexible disks that are fixed directly to the engine wheel.

#### 4.4. Support bedplate

The support bedplate or base consists of a folded metal sheet with a suitable stiffness, which holds the generator set by means of elastic supports (silentblocks) that remove the transmission of vibrations to it, and therefore, to the ground. The fitting to the foundations is usually made by means of long bolts with nothing in between.

The fuel tank is located on this support bedplate which, depending on the model, is equipped with a filling hole, a flow meter (one or two signals), an emptying hole and a vent, and it is connected to the aspiration pipes of the injection pump by means of flexible elements, and fuel returns from the



injection pump and the injectors drain.

Due to the specific needs of our customer, we can supply high capacity tanks separately. However, in this handbook we shall only describe the fuel tanks that are fitted into the supporting base. Moreover, inside the supporting base it is possible to find a suitable housing for the battery/batteries with its respective fixing iron fittings.

#### 4.5. Soundproof bonnet

Depending on our customers' demands and applications, the genset may be equipped with a protective soundproof bonnet. Such bonnet is made of steel sheets of a suitable thickness, accordingly treated in order to allow a perfect finish.

The bonnet is internally covered with a fireproof, sound-absorbing material classified as M-0 material. In air intakes and outlets, the bonnet is equipped with its respective piping, designed for driving air without producing the logical reverberations of a forced air drive.

The engine exhaust is silenced using a high-performance noise-reduction silencer that guarantees a correct noise reduction level.

The bonnet is equipped with perfectly soundproof doors covered with fireproof fibre. The locks are supplied with keys that prevent an improper use by unauthorised personnel, even in the control area of the genset.

# 4.6. Electrical panel with manual start

The HIMOINSA electrical panel is designed to bring together the electrical control equipment, the general protections of the engine and alternator, the alarms and measure and control equipment.

# 4.7. Electrical panel with automatic start

The automatic panels are connected to the power supply and to the set. When the electrical supply is suitable the power supply contactors are locked and the supply to the sets comes from the power



supply.

When the electric supply is poor the power supply contractors unlock and the genset starts automatically. The genset contactors detect voltage in the terminals and switch in order to make use of the genset.

Please contact our commercial department to find out about the possibilities that our control systems can offer.

4.8. Control and protection central Specific handbooks and electric schemes are enclosed with each control panel.



4.9. Mobile gensets

HIMOINSA gensets can be supplied in their mobile version, which can be approved sets or low-speed sets.

Mobile low-speed gensets can only be moved inside a private area.

Approved mobile gensets are equipped with a mobile kit suitable for being moved in public spaces.

The mobile kit can have one or two shafts, depending on the weight of the genset. It has a sturdy steel structure and is equipped with:

- Brake shaft
- Elastic suspension

- Hooking lance with height-adjustable support at the level of the rear wheel in order to facilitate motion, and rear wheels with their respective mudguards

- Reflective signalling.





# 5. INSTALATION

#### 5.1. Important warnings:

Control of material.

When the genset is delivered it is advisable to check that the received material matches the order, and to compare it with the delivery note that is enclosed with the set. Also, check that the material is not damaged. Proceed to open the packagings.

In case any flaws are detected, you must contact the shipping company immediately in order to report the incident to the insurance company.

"Himoinsa specifies that all deliveries are made at the customer's complete risk" Operations prior to the installation of the automatic G.S.

During the operations prior to the installation of the automatically-driven gensets, or when connecting the electrical connections, or in order to avoid unfortunate startups, etc. the following precaution measures must be taken:

Battery/batteries must be disconnected.

The control panel switch must be set to the OFF position.

Safety rules for diesel G.S.

The engine room and installations of the set (foundations, air intake, gas exhaust) must match the "Safety rules" that exist in the country where the genset will be installed.

Installation

For stationary gensets, two types of installation can be considered:

Outdoors assembly Indoors assembly



5.2. Outdoor installations.

The gensets which are assembled outdoors (excluding soundproof sets, that are intended for such applications), must be located in a place which must be as protected against weather conditions, dust, etc. as possible.

For temporary installations, the genset can rest on a well-levelled surface. For long-time installations, it is advisable to build a concrete base.

## 5.3. Indoor installations

## Genset room

For the correct installation of a genset in closed premises, the size of the room must allow:

- The regular operation of the genset.
- An easy access to its components for maintenance and possible repairs.
- The possibility of introducing the genset using the available means of transport. The door through which the genset will be introduced must be centred, so that the set remains centred once it is inside, and there is no need of moving it.
- The existence of holes that allow oil replacement.
- The installation of the exhaust pipe with the minimum possible number of pipe elbows.
- The genset to be placed in the middle of the premises, with respect to perimeter walls, in order to facilitate access.
- The layout of the command panel (in case it is an automatic set) to be in a position that allows the operator to have complete visibility over the instruments when operating it.

The recommended room dimensions are displayed in the following pictures:



Static soundproof set.

#### WORD LIST

- 1. Generating set.
- 2. Control panel.
- 3. Air intake gap.
- 4. Air outlet tunnel.
- 5. Cable wireway.
- 6. Access door.
- 7. Reinforced concrete base.
- 8. Exhaust pipe.
- 9. Flexible pipe.
- 10. Exhaust silencer.

\* May vary depending on the function of the outlet section of the model (see plans of the specific model to be installed).





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PLANTA DE SALA

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Open Skid set.

#### WORD LIST

- 1. Generator set.
- 2. Control panel.
- 3. Air intake gap.
- 4. Air outlet tunnel.
- 5. Tray for cable-running.
- 6. Access door.
- 7. Concrete base.
- 8. Exhaust pipe.
- 9. Flexible sleeve.
- 10. Exhaust silencer.

\* May vary depending on the function of the outlet section of the model (see plans of the specific model to be installed).





The basic elements to be considered are:

- Foundations
- Exhaust installations
- Ventilation
- Fuel installation.
- Electrical connections
- Grounding.
- Heating

#### Foundations

The foundations must be calculated and dimensioned by experts in civil engineering. They must prevent the transmission of vibrations and noise to other parts of the building. The surface on which the set will be placed must be levelled in order to allow its correct operation. For cleaning reasons, it is recommended that the foundations are approximately 10cm above the floor level, and covered with gres industrial sandstone tiles.

#### Exhaust installation

#### Exhaust outlet pipes

The outlet pipes for exhaust gases are usually made of flat steel, with no weldings, or in other special cases, with asbestos-concrete pipes.

The pipes must evacuate the gases to those areas where they cause no danger or damage, and must end with a protection cap to protect them from water entry, or with a similar system. (1) and (2)





In the part where they run through the walls, it is recommended to perform a thermal insulation of the pipes, in order to prevent heat expansion to the walls. (3)

The joints between the different pipe stretches must be perfectly sealed, so that there are no gas leaks. The connection between flange and gasket is the most ideal one. It is also recommended to place a condensation collector, with faucet, on the bottoms point of the pipeslines.



The connection between the engine's collector outlet (or the turboblower exhaust for supercharged types) and the pipe must be made by means of a stretch of flexible tube, so that the actions induced by the engine and the thermal expansions of the pipe are absorbed by the engine without damaging any elements.



The use of flexible element also demands the placement of flanges in the exhaust pipe, independent of the genset. Therefore, the pipelines must be fixed to the walls or ceiling of the engine room, with supports that can bear the weight of the pipe to the engine outlet, so that it does not rest on the parts of the engine (collector, turbo blower), and allow its expansion.

When dealing with very long pipes, it is necessary to insert expansion joints made of sealed flexible elements.

When establishing the trajectory of the exhaust pipe, it is necessary that the pipe is not near the engine air filters, in order to prevent the machine from drawing in hot air. Otherwise, it will be necessary to insulate it.



Whenever there are several gensets, it is advisable that all exhausts do not converge on a common pipe, as there can be problems when some gensets are in operation and others are not. The produced exhaust gases can penetrate in the conduits of the sets that are not in operation and may cause damage.

## A. Exhaust pipes measurement for Standard Static Gensets

The engine's exhaust backpressure has a remarkable influence on the produced power and on the thermal charge.

Excessive backpressure values (measured at the exhaust collector outlet for turbocharged engines, and at the turbine outlet in case of supercharged engines) cause reductions in power, rise in temperature of exhaust gases, fumes, high fuel consumption, cooling water overheat, lubricant degradation, and the ensuing consequences on the engine parts.

The limits that must not be exceeded (referred to the delivery conditions of maximum power at full-throttle) in HIMOINSA genets must be consulted in the factory.

Such limits can be observed considering the dimensions that are suitable for the exhaust installation, that is, the diameter of the pipe and type of silencer.

The pipes must be as short as possible, and with as few pipe elbows as possible. Whenever these are essential, they must be used with a very wide angle of curvature (from 2.5 to 3 times the diameter of the pipe).

Solutions with bends of angles lower than 2.5 times the diameter pose difficulties so they must be avoided.



In order to calculate the total length of the pipe (which is crucial for the exhaust's backpressure), the following considerations must be taken into account:

The rectified length of the pipe elbows must be determined according to the chart and pictures:

Interior diameter of the exhaust pipe (mm)	40	50	65	80	100	125	150	200	250	300
Equivalent rectified length Lo	0.5	0.7	0.9	1.2	1.7	2.2	2.8	4.0	5.4	6.7



The backpressure values due to the exhaust silencers may vary within a wide range, depending on the type of building, dimensions and noise abatement characteristics:

- If it is the one supplied by HIMOINSA, the length must be multiplied by a coefficient of safety, so that the total length to be considered due to backpressure will be:  $L=2 \times 1$ .

- If it has been provided by another supplier, it is recommended to check the value of backpressure derived from the silencer with the supplier. debida al silencioso.



# Example: The exhaust pipe consists of the following parts:

- 5 metres of straight pipe stretches.
- Two pipe elbows type a)
- Three pipe elbows type c)
- A 1m long silencer.

If the inner diameter of the engine exhaust is 80mm, the total length of the exhaust pipe is calculated as follows:

a) for the inner diameter 80mm, according to the chart, l=1.2m.

b) total length of the pipe elbows type a) is, 1X = 1X1.2 = 1.2m. as there are two pipe elbows,  $2 \times 1.2 = 2.4m$ .

c) the total length of the pipe elbows type c) is  $5 \times l=5 \times 1.2 = 6m$ . as there are three pipe elbows,  $3 \times 6 = 18m$ .

d) the total length of the exhaust silencer is L=2X l = 2X1 = 2m.

e) the total length of the exhaust pipe is: 5+2.4+18+2=27.4 metres



• In order to calculate the diameter of the exhaust gases pipe it is possible to use the normogram that can be found below:

For calculation purposes, in this normogram we will use the following backpressure values:
800 mm H<sub>2</sub>O, for aspirated engines.

- 400 mm H<sub>2</sub>O, for supercharged engines.

 $\bullet$  Exhaust gases airflow in kg/h. In order to convert into m3/h, the data must be divided by the exhaust gases density. Request these data to the manufacturer.

Normogram



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# Example: If we take the exhaust pipe from the previous example, with a total length of 27.4 metres (taking into account the rectified length of the pipe elbows and the length equivalent to the exhaust silencer). From the following data of the installation:

- 5 pipe elbows at 90° (2x type A and 3x type C).
- Set model: HIW-210
- Working rate: 50 Hz
- Motor: 8361 SRi 26 (supercharged).
- Insulated pipe.

a) Start from the lower part, with a total pipe length of 27.4m (straight stretches + rectified elbow length), until crossing the straight line relative to the total number of pipe elbows in the installation (5 elbows).

b) Continue and follow a horizontal direction to the right until crossing again the straight line relative to the number of pipe elbows (5 elbows).

c) Continue upwards until crossing the straight line relative to the flow of the exhaust gases, which according to the chart is 1120 kg/h. To convert kg/h into m<sup>3</sup>/h divide the flow expressed in kg/h by the density of the exhaust gases. As a first approximation we can take the density of the exhaust gases with a value of 0.42 kg/m<sup>3</sup>

1120x0.42=2667 m 3/h

d) Continue horizontally to the left. After crossing the straight line, continue upwards until crossing the straight line relative to the overpressure of the pipe, 400 mmH<sub>2</sub>O.

e) Continue upwards until crossing the straight line.

f) Continue to the right until the straight line relative to the insulated pipe. After crossing this last straight line, the pipe diameter, 122 mm, is determined on the right top part. The commercial diameter right above is the one to be considered.



The exhaust pipe cannot have a lower diameter than the collector pipe of the engine exhaust, and also, the straight stretches must have a slight inclination in order to prevent the return of condensates, as shown on the location plan of the genset in the room.

When the diameter of the pipe is higher, the engine joint must have a conic connection element with a conicity below  $30^{\circ}$  in order to avoid excessive load losses.

## B. Exhaust pipes measuring for Soundproof Static Gensets

Check with the HIMOINSA engineering department. There is backpressure in the outlet of the genset which is caused by the internal pipes. It is necessary to know this value so as not to exceed the recommended backpressure when designing the rest of the installation.

#### Exhaust silencer

The exhaust silencer is usually attached to the stretch of pipe that remains inside the room where the genset is located. Whenever possible, it can be separated from the genset.

The silencer used in industrial applications performs a 15 to 20 decibels noise reduction. In order to reduce the noise caused by the resonances of gas pulses in pipes, the position of the silencer can be altered, by reducing the length of the tube that goes into the engine. For example, for a 10m long pipe, the optimal position would be half-way through the distance in relation to the outlet.

In the cases of private installations, such as hospitals or residential areas, where a higher noise reduction is required, special silencers can be used, with a reduction of 25 to 30 decibels, and whenever possible, using special quiet chambers.



#### Ventilation

The ventilation of the engine room where the G.S. is installed is of vital importance for a correct operation and durability of the genset.

The engine room must have the following features:

- Allow the disipation of the heat produced when the genset is in operation by irradiation and convection.

- Guarantee the correct supply airflow, and in the right amount for the engine combustion.

- Allow the engine cooling by means of the radiator, keeping the operating room temperature within the safety limits in order to guarantee a good aspiration of the supply air.

A good ventilation solution applicable to most cases is the one indicated in the charts of the sections of the installation, in which the engine fan draws in the cooling air from the engine room, whereas the hot air is expelled through the expulsion tunnel placed between the radiator and the room window.

The expulsion window must have a bigger or same size as the radiator in case of standard static gensets, and bigger or same as the expulsion grid in case of soundproof sets.

We must prevent the radiator exhaust hot air from coming back to the engine room, making sure the expulsion conducts are leak-proof. Therefore, the air in the engine room is constantly renovated, and the dimensions of intake grilles must be big enough for the cooling and combustion.

In order to achieve a correct air flow, the cool air must be introduced through the grilles that are located on the lower part of the engine room wall. This wall should be the one located opposite the radiator, so that the air flows all over the set before being expelled through the fan.

Make sure there are no areas in the engine room where the air is deposited. This usually happens in rooms with several engines. In those cases, and whenever possible, each group should have its own



air intake grille.

In case you need more details about the air flow required for the different types of HIMOINSA gensets, please refer to the manufacturer.

For safety reasons, in those premises where there are sets in continuous operation, or in those areas where the room tempreature is high, it is advisable to use an auxiliary extractor fan that has enough power to achieve a suitable ventilation. Such extractor fan must be located on top of the room, as close to the radiator as possible.

#### Fuel installation

Generator sets supplied by HIMOINSA include a complete fuel installation, since the fuel tank is located on the bedplate of the genset.

The fuel tank is connected through flexible tubes in order to guarantee their operating durability, depending on the model.

For longer durabilities, and in order to satisfy special demands, it is necessary to use a special tank that is fitted separately. It will be necessary to connect the engine to the new tank, and previously perform the placing of the flexible connections and new suitable pipes that must be firmly fixed. The new fuel tank must be located according to the following criteria, so that the engine injection pump is able to draw in fuel from the new tank:

- Closer than 20m from the engine, in case they are both at the same level.
- Less than 5m deep.

The usual connections are:

- For fuel injections to the engine injection pump.
- For fuel excess returns from the injection pump.
- For drain return of the injectors.



The pipes must not have any welds. They can be made of steel, iron or cast iron. Galvanized steel pipelines must not be used.

Flexible connections must be fitted in order to isolate the static parts of the plant from the new fuel tank, in order to avoid the possible vibrations caused by the engine. Depending on the type of engine, these can be made using the following:

Stretches with a suitable length made of reinforced rubber pipes with flexible insertions that are resistant to gas oil. For the connections with the terminal rubber holders with edges and screw clamps.

Flexible low-pressure type tubes, suitable for gas oil, protected with metal mesh and with screwed terminals for tightly-sealing.

Synthetic resins must be avoided.

In complementary areas of the plant, maximum attention must be paid to the following issues:

- Fix pipes by means of holders, at regular intervals in a way that vibrations and inflexions caused by pipes weight are avoided, especially those made of copper tube.

- Couplings must be avoided. In case of using them they must be tightly-sealed, especially in depression conditions parts (fuel aspiration intake), in order to avoid air filtrations that make the startup more difficult.

- Aspiration pipes below the fuel level must be placed at a distance of 20-30mm from the bottom, in order to avoid a possible deactivation of the circuit due to air insufflations. Also, these must be conveniently separated from each other, in a way that the fuel return flow does not block the supply due to the gas oil impurities from the bottom of the tank or mixed air.

- Thorough cleaning of the used pipes.

- Avoid abrupt variations in the tube section and the use of elbows with a wide angles in pipes.



#### Electrical connections

The gensets are ready for user connections.

When making the connections, you must comply with the conditions specified in the diagrams enclosed with the genset.

#### Genset of manual intervention

The user cables must be connected to the line terminals which, for standard static gensets, are located inside the electrical panel, on the rail terminals or at the bottom of the magnetothermal switch, either inside the panel or in the moldeada box (check the electrical diagrams included in the manual of the panel). For soundproofsets, the connection to the grounding terminals is easily accessible, as they are prepared for such effect and protected with a methacrylate sheet.

#### Genset of automatic intervention

The cables that come from the genset, the external power supply and user shall be connected to their respective terminals, located in the command panel. The power cables of the genset shall be connected directly to alternator terminals of the genset.

The connection to auxiliary services between the set and the command panel shall be made with a multiple cable and using the multiple connectors plugs provided with the set.

Cable dimensions

The choice and dimensions of the cables is responsibility of the person who carries out the installation.

Cable positioning

Power cables, for both manual and automatic sets, must be placed in suitable channelling, tunnels or protective conduct-holder. Do not include 400V and 12V (or 24V) cables in the same channelling.



## Grounding

Metal parts of installations which are exposed to human contact, and due to an insulation flaw or other reasons, may get in contact with voltage, must be connected to land-dispersion device.

The gensets and panels have been equipped with their respective grounding terminals. The connection of these to the land-dispersion must be made with bare copper wires conductors with a minimum section of  $16 \text{mm}^2$ , or if not available, galvanized iron with a 50 mm<sup>2</sup> section. The resistance of such conductor, including the contact resistance, must not exceed 0.15 Ohm.

# Heating

For automatic start gensets, the engine room where they are installed must be conveniently conditioned during the cold season, in a way that the room temperature is not below 10-15° C, a required condition for a quick engine start.

Electric heaters with thermostatic controls ranging from 500 to 1500W, depending on the genset, have also been supplied with those sets. They maintain the water temperature within acceptable values in case a sudden start or power input may damage the engine.



# 6. BEFORE OPERATION

These operations must be performed in the following situations:

- Before the startup.
- After the installation of the set.
- After a general check.
- If maintenance operations have been carried out.
- If the set has been idle for a long time.

During these operations, make sure the set cannot be started.

Water level in the radiator

In case the radiator needs water, it must be refilled with a mix containing at least 50% of anticoolant liquid/corrosion inhibitor Paraflu II type, and the rest with clean water.

Oil lubricant level in the crankcase

The type of oil to be used is: ACEA E3/API CF4/MIL L2104E/F for supercharged engines, and ACEA E2/API CJ4/MIL L2104E/F for aspirated engines. Fill up the crankcase with oil, up to the top mark of the graduated dipstick, but without exceeding it. With the cool engine, and after a short time in operation, recheck the lubricant oil, and if necessary, add the amount that is missing.

Fuel tank level

If the fuel level is below the minimum required for the startup of the genset, it is necessary to add fuel until the tank is full.



**Electrical regulations** 

Before starting up the genset, all electrical connections, startup batteries and earth connections must be checked. The terminals must be firmly connected and all switches must be set to their unlocked positions.

Cyclical direction of the phases

For gensets intervention automatic or in those auxiliary, hand-operated ones for external production lines, make sure the cyclical direction of the alternator phases matches the phases of the external producer in order to avoid reversals in rotation and other inconveniences.

Air filter check-up

It must not have obstructions or porosities that prevent a good air filtering. In case of showing deterioration you must proceed with the maintenance operations of the air filter.

Radiator/intercooler (air/air) check-up

Verify that the surface of the radiator air intake is clean.

Checkup of the liquid level in batteries

Once the batteries are settled and cool, check that the level of liquid is between the maximum and minimum levels.



# 7. GUARANTEE CONDITIONS

PROFESSIONAL USE (commercial) (whichever is first)2.000 working hours:12 months from the date of the sale15 months after leaving the factory:

**RESIDENTIAL USE** (private) (whichever is first)

2.000 working hours:

24 months from the date of the sale:

27 months after leaving the factory:

The coverage of this warranty is ONLY applicable to the end user of the equipment recognized by Himoinsa. In the case of Generating sets, it is only applicable to those generating sets that operate together with an manual or automated control panel manufactured or/and installed by HIMOINSA. The Generating sets of 3,000 rpm have a 6 months warranty or 500 hours of continuous work, or 12 months or 1,000 hours in standby or emergency, whichever period expires first. Except when agreed, the products sold as used will have an only 3 month warranty. This Warranty benefits only the first purchaser and can not be tranferred to a thrid-party (final purchaser) without previous authorization from/of HIMOINSA.



#### **Company Responsabilities**

In those countries where HIMOINSA may have an authorized technical assistance Network (information available at ( www.himoinsa.com) the warranty consists of the replacement or reparation of the damaged parts once checked its due to defective material at origin, manufacturing or/and assembly, therefore , it covers both the replaced parts as well as the manpower used during the normal working hours. The customer shall be charged with transport expenses to the premises of the authorized distributor, where the repairs shall be carried out.

The warranty for the rest of the world consists of free supply on premises San Javier (Murcia # Spain), of the non usable parts due to defective material at origin, manufacturing or/and assembly. If the equipment is sent to our premises, all necessary repair tasks will be carried out free of charge.

In this case, transport both sending and return will be chargeable to the customer.

The warranty will only be given after the technical study of the defective parts. Any part sent or service carried out before the acceptance of the warranty will be billed. All replaced parts have to be returned to Himoinsa and will become of its property.

In case of defects in the motor or alternator, HIMOINSA informs that the assistance of the warranty will be provided by official technical services of the manufacturer of the alternator or motor, who will determine the scope of the warranty.

- The defect shall appear during the normal use of the product and within the warranty period. The company will supply the necessary spare parts for the repair as soon as possible but shall not be deemed responsible for any losses for not having the equipment during this period.

- All claims made based on this warranty, must be processed through your authorized seller or area



distributor, who will process the claim and the scope of the warranty.

This warranty does not cover failures or defects consequence of its normal use or wear, inappropriate use (including overload and overvoltage), negligence, accidental damages, non authorized modifications; lack of or inappropriate maintenance or connection, (inappropriate storage, transrportation or installing); any kind of use of the equipment over the capacity and limits established by the manufacturer or under conditions different from those recommended; failures caused after the failure or defect had or should have been detected; batteries, lamps and fuses damages; damages due of use of parts not supplied or manufactured by the manufacturer. The Warranty also does not cover the rental costs of substitution equipments during repair period nor connection costs and/or connection works of the product with other equipments of the customer.

-The repaired or replaced parts have a (6) six month warranty, this will not modify the warranty of the other elements.

- Equipment or components not manufactured by the company. The company will provide a warranty equal to the one supplier, and limited to the responsibility offered by the company for its equipment.

- All claims to do with the fuel injection system or parts of it, will be referred by HIMOINSA to the manufacturer of the injection system, or to its authorized agent. The manufacturer or authorized agent's report ON THE FAILURE will be binding for both parties : Himoinsa and purchaser.



#### User Responsabilities:

The user is responsible to:

\*Install and operate the product in accordance with the operation and instruction manual provided, and in its case with the assistance of qualified technical perso nnel and in accordance with the current regulations.

\*Carry out a proper maintenance of the equipment; (including the use of appropriate fuel, oil, antifreeze, and lubricant), as well as to replace of the parts and components due to the normal use of the equipment.

\*return the warranty register form properly filled in within 10 days after the start up of the product, or a month after the date of the sale, whichever is first.

\*send written notification to the company or to authorized Technical assistance service in his country, of the failures of the material and justify them within seven days after the failure appeared and in any case before the expiration of the warranty, otherwise the purchaser may lose his warranty rights.

\*if the repair of the defect requires the participation of other equipments not manufactured by HIMOINSA, the purchaser will be the only responsible for the works and costs resulted as well as to provide full access to the products manufactured by HIMOINSA S.L.

\*accept the technical report about the existence or non existence of defects in the material or the assembly.

\*the manpower costs , except for those stated in the section #Co mpany responsibilities#, including those ones derived from the assembly and disassembly of the equipment .

\*the costs and risks from transportation or shipping of the equipment, and any other costs associated with the replacement of the components.



\*Any cost that may exceed the purchasing price of the product.

\*Any other cost, including transport and trips, accommodation, taxes and fees, communication expenses, extra hours among others; except for those stated in section #Company responsibilities# \*payment of the total price of the machine, spare parts and related services related with the product under warranty.

The attendance of sales or technical personnel to the #start-up# or #functioning demonstration# of the equipment will not mean that the present warranty may be extended to the installation or mounting, operation expressly excluded from this warranty; it also does not imply acceptance or understanding of the correct technical installation, assembly or/and connexion of the machine carried out by the purchaser or a third party unconnected with Himoinsa, neither of the dimensioning of the equipment purchased regarding the real power supply need of the purchaser.

The present warranty will not be applicable to the following cases:

-when the documentation (warranty, purchasing invoice, maintenance and use manual) may have been altered in any way or may be illegible.

-if the model and serial number of the generating set have been altered, erased, removed or are illegible.

HIMOINSA shall not be deemed contractually or extra contractually y responsible for any material or immaterial, direct nor indirect damages; consecutive or non-consecutive to the damage on the material covered by the warranty, such as operating losses, expenses and costs due to not having the product, neither for damages to third parties or to other equipment or products.

This Warranty does not limit any other rights that as a consumer, the purchaser may have according to the current legislation. This warranty replaces any other express or implied warranty, including, without limitation any merchantability warranty of the equipment or its suitability for a particular purpose. All claims not covered by the above stipulations will not be accepted by the company.

HIMOINSA Informs the user of the obligation to follow the Maintenance and use Manual and to keep



it together with the rest of the technical documentation of the equipment in observance with the safety at work regulation as well as the convenience of installing specific protections that may prevent overvoltage and overload from the main electrical line, and to protect the equipment by seeking advice of an authorized installer.



# GUARANTEE CERTIFICATE

Ref. Generating set	
Model	
Engine N°	
Delivery day:	
	Está garantizado a partir de esta fecha.
AGENT	
Client	
Date	Client's signature
HIMOINSA, S.L. N.E. 9-80540222 Fálvrica: Ctre Marcia - San Javier, Km. 2 Teláf. 968/19/128 • Fax 968/19/121 30730 SAN JAVIER (Murcia)	Stamp & Signature

	AVISO
WARNING COMMISSIONING	
Model	
Engine N <sup>o</sup> .	
Date .	
Client .	
Date _	
Client's signature	Stamp & Signature
Counterfoil to be returned	d to HIMOINS A signed and dated within 15 days of service missing. (see address in back)

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# COUNTERFOIL of guarantee certificate



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HIMOINS A Ctra. Murcia - San Javier, Km. 23,6 | 30730 SAN JAVIER (Murcia) | Spain Tel. +34 968 19 11 28 | Fax +34 968 19 04 20 info@himoinsa.com | www.himoinsa.com

