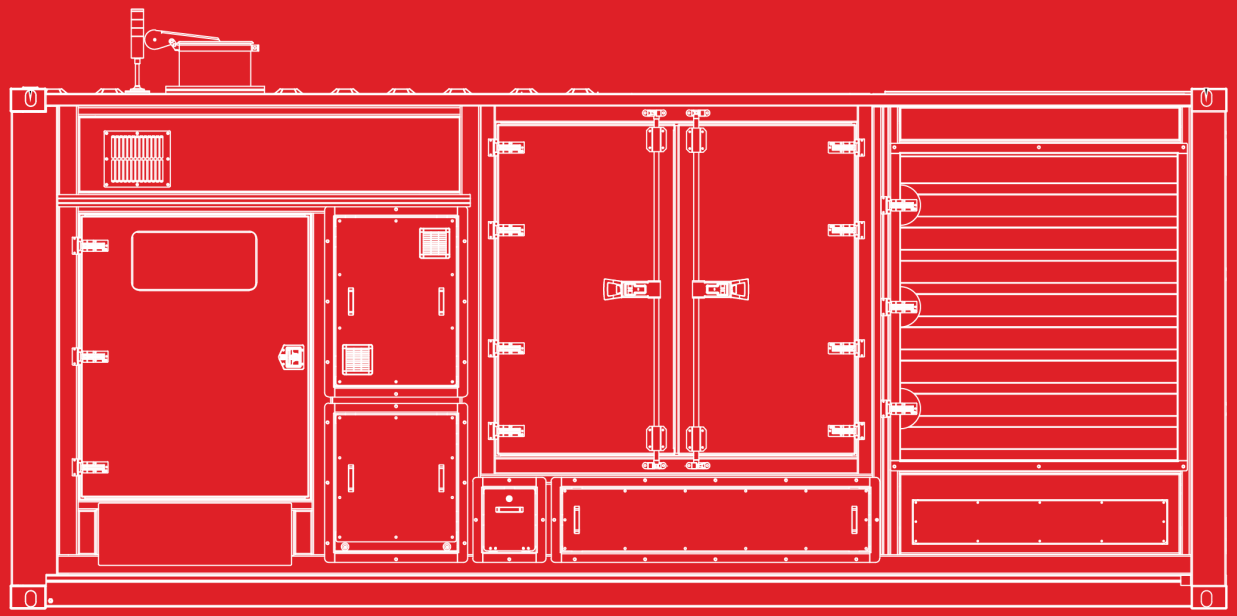
# INSTALLATION USE AND MAINTANANCE MANUAL



**HRYW-1275 D5/6**
**DIESEL GENERATOR SETS**
**YANMAR DUAL-FREQUENCY**

HIMOINSA
A YANMAR COMPANY

# 1. INDEX

# 1. INTRODUCTION

This manual aims to provide the information and basic instructions for proper installation, transport, maintenance and use of your generator set.

It is essential that all the safety rules and warnings are read carefully before, during and after the generator set has been put into operation; only in this way can we ensure optimum, regular service under perfect conditions of reliability and safety.

This a general document used for a wide range of products with a variety of optional features. It is possible that there are components, instructions or safety standards mentioned in this manual which are not applicable or are insufficient for the specific genset that has been acquired. In this case you must evaluate and determine which instructions are valid for your genset, supplementing them if necessary. Consult the HIMOINSA Technical Department in the event of any doubts.

HIMOINSA S.L. considers it necessary to highlight that the validity of the information described in this manual may depend on the date it was issued, since aspects such as technological advances and updates to the regulations in force, require us to implement modifications without notice.

This manual and the other reference documents form an integral part of the generator set which has been acquired and must be preserved and protected against any agents that could damage them. This documentation must accompany the equipment when it is transferred to another user or to a new owner.

The manual must always be kept nearby for reference purposes in case of doubt. Although the information in this manual has been verified in detail, HIMOINSA waives any liability due to any calligraphic, typographical or transcription errors.

In accordance with European Directives concerning the Protection of Consumers and Users, HIMOINSA is excluded from any liability resulting from the defective installation and/or the improper use of the machine or from failure to comply with the rules contained in this manual.

# 2. SAFETY REGULATIONS

Before working on the machine, it is important to carefully read the safety standards indicated and find out about any local requirements in terms of safety.

Installation, operation, maintenance and repairs must only be carried out by authorized and competent personnel, with the owner of the generator set responsible for ensuring these operations are conducted safely. Parts and accessories must be replaced if they are not in safe operating conditions.

Taking the contents of this manual as our premise, detailed below are the basic criteria for the safety of the reader and that of others, which should be carefully followed.

## 2.1 GENERAL SAFETY PRECAUTIONS

For your own safety and that of others, pay particular attention to the following basic safety criteria:

- Do not allow unauthorized persons to access the generator set or people with pacemakers, due to possible electromagnetic interference on cardiac stimulation devices.
- Do not approach the generator set while wearing loose clothing or objects that may be attracted by the flow of air or the genset's moving parts.
- Do not smoke or cause sparks near the generator set or the external fuel installation.
- Exercise extreme caution with exhaust gases because depending on the fuel used these gases may contain carbon monoxide, a colourless, odourless gas which is very dangerous and harmful if inhaled.
- It prohibited to by-pass and/or remove the safety devices as well as modify the settings of the generator set.
- It is forbidden to lean on the generator set or leave objects on it.

In the case of gensets which are automatically operated, it is also recommended to:

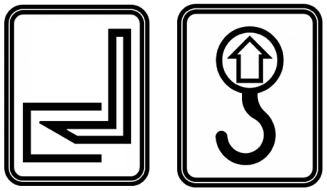
- Place a red light in a visible position and turn it on when the genset is running.
- Place a warning sign indicating the possibility of the machine unexpected starting automatically.
- Place an obligation sign indicating that “All maintenance operations must be performed with the genset in the LOCKED position”.
- To perform an emergency stop of the genset, press the “emergency stop” button located on the outer sides of the genset or internally or adjacent to the protection and control panel, depending on the genset.

**NOTE:**

**In order to locate the place in which some of the components listed below are installed, go to Section 3.1. Composition of the generator set.**

## 2.2 SAFETY DURING RECEIPT, STORAGE AND UNPACKING

- Upon receipt of the generator set check that the material received corresponds to the delivery order, and that the merchandise is in perfect condition.
- When lifting and transporting the genset, lifting devices with sufficient capacity must be used, following the instructions in Section 4.2 Unloading and Handling and Section 4.3 Transportation. All loose or pivoting parts must be securely fastened before lifting the equipment.
- When moving the generator set, and especially during elevation, we recommend using the points indicated specifically for these functions, having previously checked the optimal condition of said lifting points.



- It is strictly forbidden to use other lifting points, located on the engine, alternator or any other components.
- If the generator set is damaged for any reason during transport, storage, and/or assembly, it should not be put into operation without being checked first by our specialized staff.
- If you wish to store the genset until it is needed, it is advisable to use premises which are duly protected from chemical agents that can damage the machine’s components.
- Unpacking should be carried out with care, avoiding any damage to the materials during the operation, especially when using levers, saws or other metallic tools.

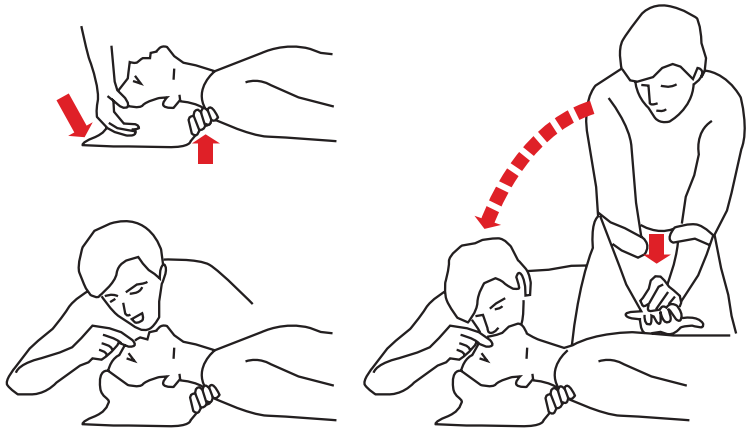
## 2.3 SAFETY DURING INSTALLATION AND COMMISSIONING

- Installing the Generator Set and its accessories must be performed by qualified personnel. In the event of any difficulty during installation, consult HIMOINSA’s Technical Department.
- It is important to know the emergency procedures related to the installation to be carried out, as well as positioning a fire extinguisher near the generator set. Consult the fire department for more information related to fire prevention.
- The doors are fitted with anti-panic security locks, opening quickly from the inside by pressing a button.
- The doors include a locking or anti-closing system, preventing possible unwanted movements once open. To close the doors, raise the fastening lever in a vertical direction, and close the door.
- The genset incorporates water drainage ducts to prevent, in case of rain, water from entering the engine compartment. The bottom corners of the container are designed with rainwater drainage points.
- Always wear a protective helmet, safety shoes and gloves, protective goggles and dry, tight clothes.
- Do not modify the original protection devices, located on all the exposed rotary parts, hot surfaces, air intakes, belts and live parts.
- Do not leave disassembled parts, tools or any other accessories on the engine, nearby or in premises of the generator set.
- Never leave flammable liquids or rags soaked with flammable liquids near the genset, near electrical appliances or electrical installation parts (including lamps).

- Take all possible precautions to avoid risk of electrocution; connect to earth some of the points provided on the generator set and its accessories, ensuring this earthing is carried out in compliance with the relevant legislation. For more information, go to Section 6.1. General instructions. Earthing.
- Place a sign stating “IT IS PROHIBITED TO PERFORM OPERATIONS” on all insulation devices that isolate parts of the installation on which work must be carried out.
- Install the necessary safety protection devices on the parts that complete the installation.
- Insulate all the connections and disconnected wires. Do not leave the generator set’s power terminals uncovered.
- Check and make sure the electrical connections for power and the auxiliary services are properly executed.
- Make sure that the power cables are installed in compliance with the requirements of all corresponding regulations, as the use of unsuitable cables may result in serious damage to both the equipment and people due to the hazardous electrical conditions.
- Check that the cyclic direction of the phases matches that of the network.
- Locate the position of the emergency stop buttons, the fast interceptor fuel valves, switches and any other possible emergency systems on the installation.
- Check the perfect operation of the genset’s stop devices. In particular the following devices (if provided as standard): stop due to overspeeding, low oil pressure, high engine water temperature and the emergency stop button installed by the user, in general outside the premises.
- Ensure that all exhaust fumes are expelled correctly into the atmosphere and from a safe position away from doors, windows and air inlets.
- Change the exhaust system caps, in the event of receiving a genset with flat caps and install tilting caps. For more information, go to Section 6.1. General instructions. Exhaust system.
- Check that the pipes and silencers are installed properly, that they have expansion joints and are protected against accidental impacts.
- Inspect for leaks in the fuel and oil pipes.
- In the event your genset is supplied with an engine coolant heater, connect it to the network via the incorporated plug, as this will allow faster cold starts to be performed.
- Locate sources of danger, for example leakage of fuel, lubricating oil, acid solutions, condensate drip, high pressures and other hazards.
- Before putting the machine into operation, make sure the generator set is provided with the right amount of lubricating oil, coolant and fuel.
- Identify the position of fire extinguishers and other safety and emergency devices and learn how to operate them.
- Check the genset is clean, as well as ensuring the surrounding area and escape routes are clean and unobstructed. Check for blockages in the openings as well as the inlet and outlet conduits.
- Check if there are staff working on other equipment in the area and if such work is dangerous and affects the operation of the installation.
- In the case of installations under environmental or operating conditions which are different to those for which the genset was designed, which can be found in the data sheet or on the identification plate of the genset, go to Section 5.3. Derating for operating environmental conditions to consider the possible correction factors to be applied.

## 2.4 SAFETY DURING OPERATION

- Do not allow access to the operating area of the generator set by persons who are unfamiliar with the safety conditions, children or animals.
- The person in charge of generator set operations and functioning must remain alert and ready to respond to and interpret a situation appropriately, and never work while physically or mentally fatigued or under the influence of medication, drugs or alcohol.
- It is advisable to have a minimum of two people present during operations that may pose a health risk, especially due to electrical hazards.
- Do not touch the generator set, especially cables, copper terminals and alternator connections, while the genset is running, as they are live. In the case of an electrical discharge, the first thing to do is stop the genset. If this is not possible, try to free the victim from the source of electrical energy using a non-conductive element. If the victim is partially or totally unconscious, perform cardiopulmonary resuscitation (CPR) and seek medical attention immediately.



- Do not touch moving parts until the generator set has completely stopped.
- Check the fuel level in the tank, always ensuring it is at the necessary level for the use which will be given to the generator set.
- Never connect loads which are above the power range of the generator set.
- The lines of the anticipated loads to which the generated power will be supplied will always be connected to the genset before commissioning.
- Do not operate the genset if the air filter is not installed.
- Do not supply power to the battery charger if the batteries are not properly connected; the electronic devices could be damaged irreparably. Never disconnect the batteries while the engine is running.
- Stop the generator set immediately if any kind of abnormal operation is detected, such as excessive vibration, leaks, smoke or loss of output power.
- Keep the doors of the generator set closed, where it is not necessary for them to be open, since the cooling system is designed for genset operation with all the doors closed.
- The exhaust fumes produced by the generator set are dangerous to health; inhalation can be very harmful due to the concentration of carbon monoxide. Check that all exhaust fumes are discharged correctly and that the genset is properly ventilated.
- Maintain adequate ventilation to ensure your generator set functions properly. A lack of proper ventilation could cause injury or damage to property due to excessive heat in the engine, in less time than expected.
- During operation, the genset reaches high temperatures in some parts of the engine, in ducts and the exhaust, avoid touching them until they are cold.
- During operation of the generator set, wear ear protectors to prevent hearing damage.
- Labels related to safety must be kept clean and in the places predetermined by the manufacturer.
- The fuels and lubricants can be flammable, toxic, explosive and corrosive. We recommend keeping them in their original containers, never in glass containers, and storing them in protected places. If you smell fuel, do not start the genset or stop the genset if it is in operation.

## 2.5 SAFETY DURING MAINTENANCE

- Any checks and/or maintenance on the generator set should always be performed by qualified personnel.
- Maintenance operations must be carried out with the engine stopped. If you are stopping the genset after it has been running for some time,
- allow it to cool down. Take care not to burn yourself as some components may be extremely hot when the genset has recently stopped.
- Before operating on any components of the electrical system, disconnect the batteries.
- All the doors on soundproofed gensets are protected against electric shock by means of equipotential conductors, which must not be removed under any circumstances. In the event they have to be removed for cleaning purposes or the replacement of doors, do not forget to install the same conductors.
- Before opening the electrical panel, authorized personnel should take the following precautions:
  - Stop the generator set if it is in operation and put the electrical panel into the locked position.

  - Disconnect any batteries from the generator set.
  - Disconnect the mains input to the panel.
- Periodically check both the tightening and isolation of the connections.
- With regards the various operations and/or maintenance procedures not specifically listed in the user manual, the manufacturer must be notified for approval.
- Do not make modifications to the product without the express knowledge and authorization of our Technical Department.
- Respect the characteristics recommended by the manufacturer with regards oil changes and fuel use. Do not use oils or fuels other than those specified by the manufacturer.
- Always keep the engine clean, removing oil, fuel and/or coolant stains. Do not use a high-pressure washer to clean the engine and the equipment, as some of the components may be damaged.
- Spare parts must correspond to the requirements defined by the manufacturer. Use only original spare parts. For spare parts only contact authorized spare parts distributors or workshops which are part of the HIMOINSA assistance network. To correctly identify the spare parts required, always specify the data indicated on the genset's identification plate, the type of engine and/or alternator and their respective serial numbers.
- Periodically check the status of the different components of the generator set, in particular anti-vibration devices, and the source of any vibrations and/or increases in noise levels.
- Periodically check for leakages of water, oil, fuel, and/or battery acid.
- Do not adjust the engine or other components of the generator set to obtain performance characteristics which differ to those envisaged by the manufacturer.
- Do not work on the fuel tank or the fuel supply conduits when the engine is hot or running.
- Wear protective gloves and goggles:
  - When using compressed air.
  - During the supply of inhibitors or antifreeze products.
  - During the replacement or supply of lubricating oil (hot engine oil may cause burns when being emptied. Allow the oil to cool below 60°C).
- Wear a helmet when working in areas with suspended loads or equipment at head height.
- Always wear safety shoes and tight clothing.
- When working on live parts, always check that your hands and feet are dry. We recommend using insulating platforms to carry out the work.
- Change your clothes immediately if they get wet.
- Keep smeared rags in containers which are flameproof or suitable for this purpose.
- Do not leave rags on the engine.
- When starting an engine after repairs have been carried out, take precautions to stop the air intake if there is an excess in revolutions during the start up.
- Never start the engine with the speed control lever disengaged.
- Do not perform work alone which requires the presence of several people, especially when work must be performed on moving parts such as: switches, disconnectors, fuses and/or other live devices.

### 2.5.1. ENGINE COOLING CIRCUIT

- Never add coolant to a hot engine; first let the engine cool.
- Periodically check the coolant level and, if necessary, top up to the correct level
- using only liquid recommended in the engine's use and maintenance manual.
- Remove the radiator cap slowly. Typically, the cooling circuits are under pressure, therefore hot liquid could be released violently if the pressure is discharged very quickly.
- In the event you want to remove the radiator fluid, there is an extraction valve available which has been designed for this use.
- Never use sea water or other corrosive or electrolytic products as a coolant.
- Periodically check the tension and state of wear of the pump/fan belts.

### 2.5.2. LUBRICATION CIRCUIT

- The crankcase should always have a minimum level of oil. Due to the Murphy auto-fill oil system, it is only necessary to check, periodically, that the oil tank contains enough for the system to work properly. It is also possible to check the oil level in the crankcase using the dipstick marked with the corresponding identification sticker.
- If the oil is extracted for maintenance purposes, when it is replaced,

fill the oil tray following the instructions in the engine use and maintenance manual, meeting the quality requirements of the combustion engine.

- Do not smoke or light fires while supplying the oil.

### 2.5.3. FUEL CIRCUIT

- The fuels used are highly flammable substances and can cause fires and explosions. Use extreme caution in the vicinity of the genset, with the exhaust installation and during fuel replacement, remembering that it strictly forbidden to smoke, start fires and cause sparks. Pay attention not to spill fuel on the generator set.
- Always use the recommended fuels. Fuel of inferior quality or with a composition differing to that specified may damage the engine, affecting performance and service life.
- Avoid filling the fuel tank while the engine is running.
- When filling the tank make sure no dirt or moisture enters the fuel system.
- Do not smoke or light fires during refuelling or replacement of fuel and pay attention not to spill fuel on the generator set.

### 2.5.4. AUTO-FILL OIL SYSTEM

- To facilitate any maintenance operations, the auto-fill oil system incorporates a check valve coupled to the crankcase, allowing the oil transfer to be cut.
- The auto-fill system will be delivered calibrated, meaning no operation will need to be performed.
- In the case of emptying and filling the oil crankcase, the auto-fill system must be calibrated properly.

**NOTE:**

**For more details refer to the Murphy auto-fill system manual.**

### 2.5.5. LIQUID COLLECTION TRAYS

- Any possible spills of fluids within the genset (fuel, oil, coolant or water) are adequately collected in vessels located on the base of the container, protected by easily removable metal grids or liquid collection trays located below the radiators, in the upper part of the container.
- It is advisable to regularly make sure there is no fluid in the collection vessels. If necessary, drain the vessels using the corresponding drainage holes, in the corners of the genset.
- Never empty the liquid collection vessels onto the ground; do so into a suitable vessel.
- The collection tray located on the bedplate (container base) below the air intake piping, is not fitted with a cap due to the accumulation of water caused by the passage of air through the filter, thus avoiding having to remove the grid to empty the vessel too often. Keep in mind that water will fall in this area, under the genset.

### 2.5.6. EXHAUST CIRCUIT

- Visually check the exhaust circuit, if any gas leakage is detected, conduct repairs immediately, because inhalation is very harmful to health, as well as being a potential source of fire.
- Warning: Very hot surfaces. Installation parts which are pre-assembled at the factory are protected from accidental impacts. The installer must insulate and/or protect accessory parts, the gas evacuation piping at the premises, the silencer external to the genset if included, etc.
- Drain the exhaust piping through the condensate discharge points, in the event they are incorporated.

### 2.5.7. ELECTRIC START SYSTEM

- To prevent the engine's automatic start system from activating while working is being carried out on the engine, use the disconnector installed for this purpose, if included, or disconnect the negative cable (-) before working on the engine.
- Keep connections tight and make sure the cable insulation is satisfactory.
- To prevent the danger of arcing, we recommend always connecting the positive terminal to the battery first, then the negative terminal (usually earth).

### 2.5.8. SYNCHRONOUS GENERATOR

- Do not carry out interventions with the genset in operation. Before intervening, put the genset into the LOCK position.
- Ensure the air inlets ventilating the generator are kept clean and, with some models, lubricate the bearings. In particular, check that the tightness and position of the electrical connections are correct.

### 2.5.9. CONTROL PANEL

- Before working on the control panel, disconnect the power supply and the battery/batteries, putting the genset into the LOCK position.
- The electrical control panels, like all electrical equipment, have moisture and dust. Check the correct operation of the anti-condensation heaters, where provided, and clean the air inlets used for ventilation.
- Periodically check that the pins securing the electrical connections are well tightened.

### 2.5.10. BATTERIES

- The batteries incorporated in the generator set are maintenance free.
- Periodically check the connections of the battery terminals to ensure they are clean, tight and protected from the weather.
- Never invert the positive and negative terminals of the batteries when connecting them. An inversion may result in serious damage to the
- electrical equipment. Follow the wiring diagram supplied by the manufacturer.
- To disconnect the batteries use the disconnector, in the event it is included, as it is installed for this purpose or disconnect the negative cable (-).
- Use extreme caution when replacing the batteries. Always wear protective clothing, gloves and goggles as the electrolyte inside the batteries is diluted sulphuric acid which is harmful if it comes into contact with skin or eyes. In the event it comes into contact with skin, remove all contaminated clothing and wash the affected areas with soap and water. In the event it comes into contact with eyes, rinse with water for 15 minutes and seek immediate medical assistance.
- In some countries the batteries are considered hazardous waste. Use appropriate containers or contact any organisations responsible for the collection of this waste.

## 2.6 ENVIRONMENTAL SAFETY

- Do not start the genset in confined areas without installing an exhaust pipe which vents fumes outside. Exhaust gases are harmful and can be lethal.
- Observe the rules and regulations concerning acoustic installations.
- Never run the engine without an air filter or without an exhaust.
- Replace the engine's exhaust pipe and/or silencer if the noise level emitted is higher than that permitted by corresponding legislation.
- Maintenance (oil changes, cleaning the fuel tank, cleaning the radiator, washes, battery changes, etc.), storage and waste disposal must be carried out according to the regulations in the country of use.

### 2.6.1. INFORMATION SHEET ON THE ENVIRONMENT AND WASTE DISPOSAL IN ACCORDANCE WITH EN 82079-1

Only suitably qualified personnel may carry out generator set-related waste disposal work. By suitably qualified personnel, we mean staff who, thanks to their training and experience in the maintenance and repair of stationary diesel engines, are familiar with the health and environmental risks associated with the equipment and parts that are used in gensets.

Before starting work, a qualified electrician must check the electrical safety. Five safety regulations must be observed:

Before starting work, a qualified electrician must check the electrical safety. Five safety regulations must be observed:

1. Turn the unit off. (Disconnect the voltage)
2. Make sure it cannot be reconnected.
3. Check that there is no voltage.
4. Ground and short-circuit. (Installations from 1000 volts and above)
5. Cover or separate any adjacent live parts.

The safety data sheets of all equipment must be consulted and observed.

The following health and environmental risks may result from not disposing of waste properly:

- Burns
- Chemical injuries
- Intoxication
- Contusions
- Soil pollution
- Water pollution
- Air pollution

Contaminated materials such as starting batteries, used oil, coolants, fuel, detergents, filters and contaminated cloths should be disposed of professionally. Please consult your local waste disposal authority as to the appropriate recycling points.

To dispose of the generator set, we recommend that it be decommissioned without dismantling.

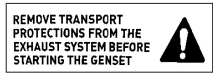
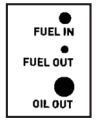
## 2.7 SAFETY AND INFORMATION STICKERS

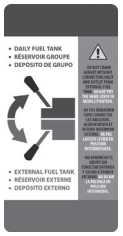
The generator set has several safety and information stickers affixed to it in order to attract the attention of the operator or technician regarding potential dangers and with explanations on how to act safely.

A brief explanation of the location and information about each one is given below:

| Drawing | Location | Information |
|---|---|---|
|  | Located near the connections between the alternator and the engine. Where there are timing belts or transmission shafts | Warn of danger if a foreign object interferes with the genset's timing belts or any moving elements connected to them |
|  | Located on parts of the genset that heat up during operation | Indicate which areas not to touch while the genset is running or shortly after it has stopped |

| Drawing | Location | Information |
|---|---|---|
|  | Located on the coolant filler cap | Warn that caution must be taken when opening the cap; the liquid is hot and can be discharged under pressure causing burns |
|  | Located on the lifting points and next to the lifting hook | Indicates the point from which the genset must be lifted in order to move it |
|  | Located next to the fuel cap. Depending on the model, it will be on the canopy or on the fuel tank | Indicates the location of the fuel tank and the filler cap |
|  | Located next to the fuel cap. Depending on the model, it will be on the canopy or next to the engine | Indicates that the tank must not be topped up while the genset is in operation |
|  | On either side of the bedplate skids | Indicates the recommended area for transporting the genset by forklift truck |
|  | Located next to the oil dipstick and oil filler cap | Reports the location of the oil dipstick |
|  | Located in the engine | Indicates that it is compulsory to read the instruction manuals before any kind of operation |
|  | Next to the branch circuits of the earth protection devices | These are the points where the genset is protected from possible electrical discharges |
|  | Next to the circuit breakers protecting the genset | Output terminals for connecting the load, corresponding to each of the phases and neutral |
|  | Located on the outer sides of the genset, inside or adjacent to the protection and control panel | Indicates the position of the emergency stop button that allows the equipment to be simultaneously stopped |

| Drawing | Location | Information |
|---|---|---|
|  | Located in the protection and control panel | Warn of danger due to the presence of voltage |
|  | Always located next to the motorised circuit breaker | Reports that it is prohibited to manipulate the genset with the switch connected |
|  | Located on the external part of soundproofed gensets, next to the protection and control panel | Informs and warns about the noise emitted by the soundproofed genset, indicating the specific acoustic power value for each of the generator sets |
|  | Located on the external part of standard static gensets, on an easily visible part of the alternator | Informs and warns about the noise emitted by the standard static genset, recommending the use of helmets and indicating the specific acoustic power value for each of the generator sets |
|  | Positioned on the protection and control panel, above the motorised circuit breaker | Warning and reminder about replacing the exhaust system covers before starting the genset |
|  | Located in the protection and control panel | Reports that it is necessary to check that there is a sufficient level of fuel in the tank before each start |
|  | Located inside the container doors, next to the locking pins | Reports that, when the doors have been opened, to close them it is necessary to loosen the locking pin |
|  | Located above the fuel and oil connecting valves on the side of the protection and control panel container | Notes the function performed by each of the fuel and oil quick connecting valves |
|  | Located on the exhaust silencers | Inform and warn that the container doors must be kept closed while the genset is in operation |

| Drawing | Location | Information |
|---|---|---|
|  | Positioned on the bracket where the three-way valve is located | Make known and warn that when starting up the genset, the external tank must be correctly connected and the three-way valve lever must NOT be in the central position |

**NOTE:**

**It is possible that some of the stickers indicated are not necessary for your generator set model, and are not included with the genset.**

# 3. GENERIC DESCRIPTION

When we sat down to design the HRYW-1275 D5/6 dual-frequency generator, our aim was to offer the rental market an exceptionally competitive product in terms of fuel consumption thanks to YANMAR's patented "ASSIGN" combustion techno-logy which has a highly reliable mechanical control system that considerably re-duces smoke emissions.


The generator set is driven by a variable speed (switchable) internal combustion engine, capable of operating at two speeds (DUAL version). The engine used is industrial 4-stroke diesel type, with compression ignition, arrangement of the cylinders in a V, turbocharged and aftercooled, by means of an aftercooler, and with a 24 Volt electrical system, equipped with all the accessories that provide power supply with great reliability.

To generate the electricity demanded, alternators have been used with a horizontal axis, synchronous brushless, self-excited and self-regulated through automatic voltage regulators. In the alternator box it is possible to modify the connections obtaining different output voltages.

The engine and alternator are coupled and mounted on the supporting bedplate or frame, formed by a thin sheet structure made of high strength steel, which in turn can incorporate a fuel tank integrated with its relevant accessories and the battery system with its corresponding clamping fittings. This coupling between the generator set and the bedplate includes elastic supports (anti-vibration elements) designed to reduce engine vibration transmitted to the foundations on which the generator set is installed.

The fuel tank can be included inside the genset or be external to it. Installation must be performed properly according to the instructions in this manual.

The cooling circuit is divided into two radiant masses. The radiator's H-shaped configuration provides room in its central section for a high-capacity, variable-speed electric fan which is controlled by a frequency converter that adapts the speed of the fan to the cooling requirements. The radiator is accessed from the top of the generator set.

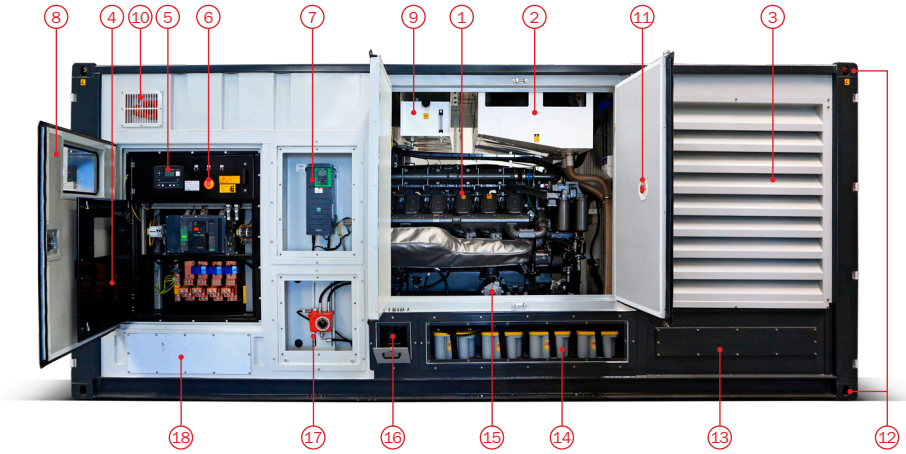
The canopy of the container is made of sheet steel of suitable thickness, duly treated to provide a perfect finish. Inside it is coated with a fire retardant sound-absorbing material. In the air inlet and outlet areas, the canopy is provided with corresponding ducts, designed to channel air without the logical reverberations occurring in a forced air conduction. The engine exhaust is muffled using a high attenuation silencer that guarantees an appropriate reduction in noise emission levels. The container is equipped with soundproof doors covered with fireproof fibre, which includes anti-panic locks, which allow the container to be opened from inside. The door locks are provided with a key to ensure non-authorised persons cannot operate the equipment, even from the control part of the genset.

The generator set is equipped with a control and operation panel, consisting of a control unit and a series of buttons; and a protection panel incorporating a motorised circuit breaker, which adapts to the output rate.

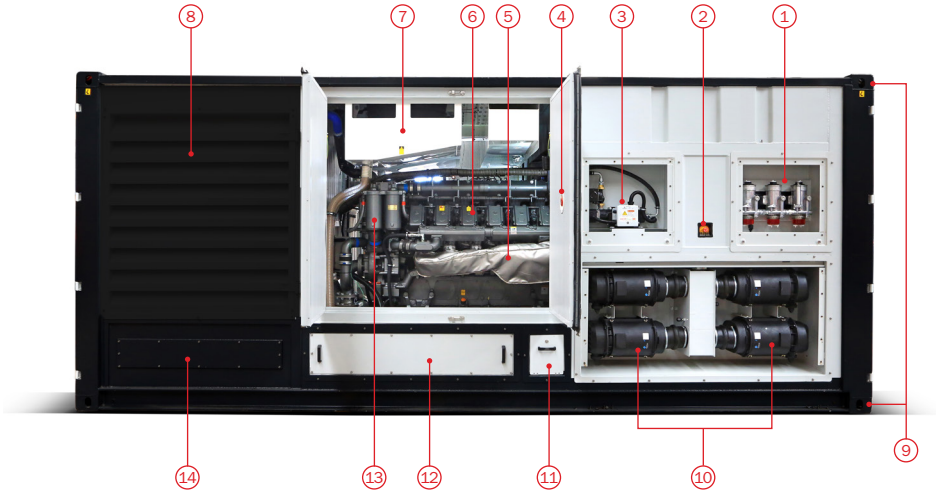
## 3.1 COMPOSITION OF THE GENERATOR SET

The images shown below correspond to a particular model, it is possible that your genset has a different appearance due to the different configurations of each of the components that the genset is composed of, which can vary depending on the order.

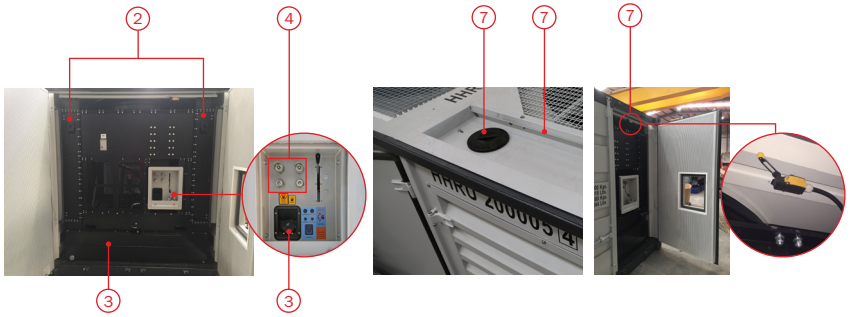
A standard HRYW-1275 D5/6 consists of:




| |
|---|
| 1. Engine |
| 2. Extraction fans |
| 3. Air inlet/access door for radiant mass cleaning |
| 4. Door with power panel viewing window |
| 5. Controller |
| 6. Emergency stop button |
| 7. Electro-radiator frequency inverter |
| 8. Door with viewing window for control panel, alarms and measurements |
| 9. Kit oil tank for automatic oil filling (if fitted, depending on version) |
| 10. Smoke detector with a light alarm and a siren |
| 11. Panic lock |
| 12. ISO corners for hoisting and anchoring during transportation |
| 13. Fuel tank |
| 14. Batteries |
| 15. Manual oil extraction pump |
| 16. Batteries disconnector |
| 17. Kit valve for automatic oil filling (if fitted, depending on version) |
| 18. Power cables output |




| |
|---|
| 1. Water separator filter (if fitted, depending on version) |
| 2. Emergency stop button |
| 3. Cooler pre-heater (if fitted, depending on version) |
| 4. Panic lock |
| 5. Heat insulated engine parts (exhaust manifold, compensator and turbo) |
| 6. Engine |
| 7. Extraction fans |
| 8. Air inlet/access door for radiant mass cleaning |
| 9. ISO corners for hoisting and anchoring during transportation |
| 10. Air filter for dusty environments |
| 11. Batteries disconnector |
| 12. Batteries |
| 13. Fuel filters |
| 14. Fuel tank |




| |
|---|
| 1. Fuel tank |
| 2. Radiant masses |
| 3. Fuel tank filler cap |
| 4. 3-way valves |
| 5. Radiator access from the roof |
| 6. Electric fan |
| 7. Sensor to shut the machine down if the door is opened |

## 3.2 DIMENSIONS AND TECHNICAL SPECIFICATIONS

The information regarding the characteristics of the HRYW-1275 D5/6 is included in the generator set's data sheet.

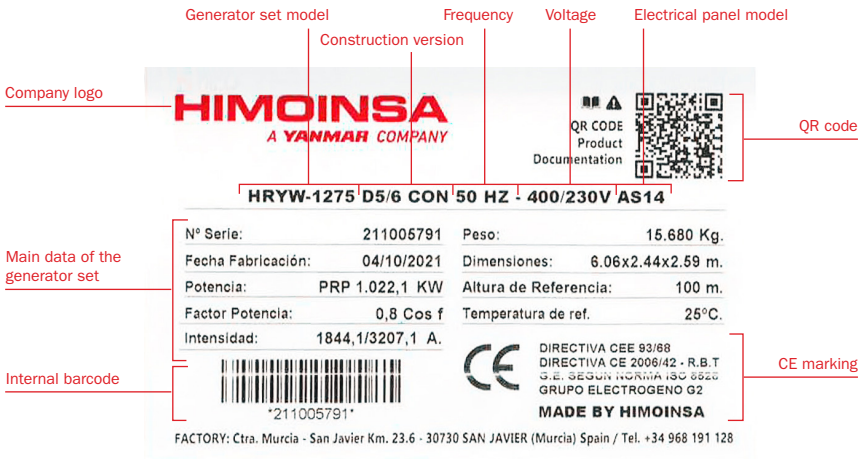
**NOTE**

**For other power outputs and components, consult the factory.**


| Dimensions | |
|---|---|
| (L) Length | 6,058 mm |
| (H) Height | 2,591 mm |
| (W) Width | 2,438 mm |

## 3.3 IDENTIFICATION PLATE

Generator sets, as well as their components, incorporate identification plates that provide the following information:




The identification plate of the generator set is located on the protection panel.

## 3.4 NOISE

Information about the Noise Protection Level of the genset and the Level of Sound Pressure Emissions at the Operator's Workstation is specific to each generator set. This data can be found in:

- Weighted sound power level: check this value in the EC declaration and the marking on the equipment.
- Uncertainty: check with the manufacturer for each model.
- Sound pressure level: check with the manufacturer for each model.

Sound Power Level measured according to Directive 2000/14/EC as amended by Directive 2005/88/EC.

# 4. UNLOADING, HANDLING AND TRANSPORTATION

## 4.1 MPORTANT WARNINGS

### 4.1.1 CHECKING THE MATERIAL

When receiving the genset it is a good idea to check that the material received corresponds to that requested, against the delivery note accompanying the genset, and verify that the material is not damaged. To do so, open the corresponding packaging.

If damage is discovered, notify the transport company immediately so that they can report the corresponding event to the insurance company. HIMOINSA states that all deliveries shall be at the sole risk of the Customer.

### 4.1.2 SAFETY

Unloading, handling and transportation of the generator set must be carried out by suitably qualified personnel using the appropriate lifting machinery and materials for this kind of load.

To avoid the risks involved in these activities, it is important to ensure the correct use of work equipment by trained personnel, checking that the equipment and lifting elements used (safety hooks or clamps, slings, chains, etc.) are in good condition and are adequate for the loads to be moved, as well as monitoring and displaying information so that loads do not pass above other workers or third parties.

Before each operation, it is necessary to check the position and proper grip of the lifting elements and the good condition of the attachment points; always using the lifting points and skids intended for such operations as directed in this manual, previously verifying the proper condition of the points mentioned.

Do not load any other objects in addition to the generator set that could modify its weight and centre of gravity.

## 4.2 UNLOADING AND HANDLING

### 4.2.1 GENERAL INSTRUCTIONS

It is necessary to check and comply with the safety requirements specified in Section 4.1. Important warnings.

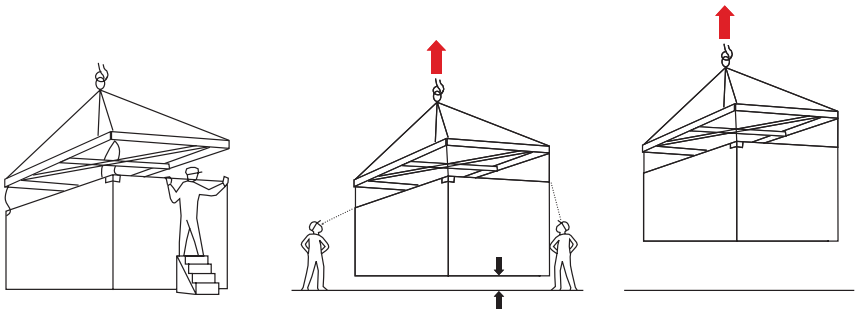
According to the weight of the genset, it is necessary to check that the machinery and the lifting elements which are going to be used are able to carry the load in a safe and controlled manner, keeping the genset in a level horizontal position.

Before unloading, it is important to ensure the floor is able to support the load of the generator set. If in doubt, we recommend laying evenly distributed pieces of wood of sufficient strength.

We recommend placing the genset in a clear, easily accessible position which is as close as possible to the installation or transportation area. Similarly, prior consideration should be given to the movement of the load and the route taken, so that there are no obstacles or power lines which may be affected by the loads.

### 4.2.2 INSTRUCTIONS FOR THE USE OF SLINGS

We recommend checking the correct attachment of the lifting apparatus to the marked lifting points, tighten slightly while checking the stability and safety of the operation and make sure the container is properly secured after being raised off the ground.

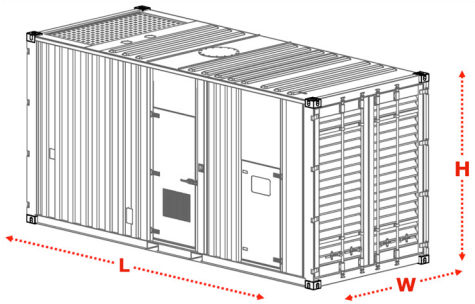


Having performed these checks, proceed with the lifting and handling of the container, with smooth controlled movements, avoiding tilting.

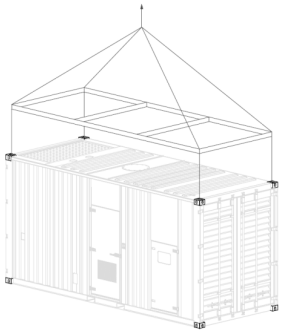
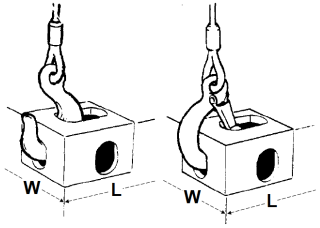
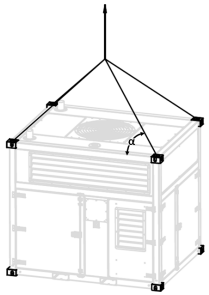
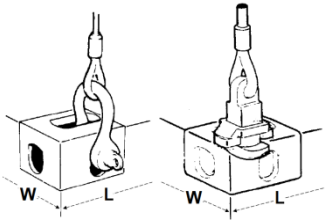
Choose a location in accordance with Section 4.2. Unloading and handling. General instructions. Once it is placed on the ground, after checking the correct stability of the container, the slings may be loosened and removed.

The standard containers used are of the type ISO Series 1, complying with the specifications set out in ISO 668 and have lifting points or corner pieces according to ISO 1161.

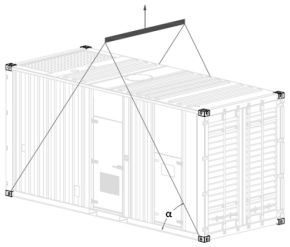
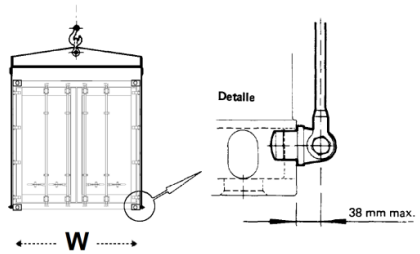
To ensure the safety of the materials and persons, the following lifting operations are recommended for unloading and handling the container, as envisaged by ISO 3874 according to the type of container, in a controlled, level manner and avoiding any possible tilting of the genset. Where, in the case of a container, any of the three possibilities would be valid:




**Elevation using the upper lifting points**

| | Acceptable containers | Types of couplings |
|---|---|---|
|  | 40’<br>30’<br>20’<br>10’ | **Regular hook:** Introduced from the inside out.<br>**Safety hook:** Introduced from the inside out.<br>  |
|  | Acceptable containers<br>10’ (α=60°) | **Shackle**.<br>**Manual coupling bolt:** They cannot be rotated while the container is suspended by them.<br>  |

**Elevation using the lower lifting points**

| | Acceptable containers | Types of couplings |
|---|---|---|
|  | 40’ (α=45°)<br>30’ (α=45°)<br>20’ (α=45°)<br>10’ (α=60°) | ·The lifting device may only support four corner pieces, without coming into contact with any other part of the container.<br>·The maximum distance between the sling or chain and the container shall be 38 mm.<br>  |

## INSTRUCTIONS FOR THE USE OF FORKLIFT TRUCKS

### 4.3 TRANSPORT

Due to the characteristics of this machine, the use of forklift trucks is not permitted.

# 5. OPERATING CONDITIONS

## 5.1 WARNINGS IN THE CASE OF MISUSE

The generator set which HIMOINSA has supplied is designed for the production of electrical energy according to the environmental and operating conditions and limits indicated or agreed in the contract. Any modifications to such conditions and limits must be communicated directly to the factory or via the organization of authorized repair centres to obtain optimum performance and, if necessary, to make changes and/or new calibrations to the genset.

The generator set is a machine which converts the potential thermal energy contained in the fuel into electrical power; and is intended to supply distribution installations which must be carried out by experts pursuant to current regulations. While the power levels available may be lower than those of a public supply system, the danger posed by the electrical energy is the same. The generator set is a production control unit which, in addition to the risks of an electrical nature that are similar to those of the power supply from the public grid, also presents dangers arising from the presence of fuel substances (fuel itself or lubricating oils), rotating parts and waste by-products (exhaust fumes and cooling and irradiation heat).

While it is possible to exploit the heat contained in the exhaust fumes and in the cooling circuit to increase the thermal efficiency of the process, this application must be set up by specialized technicians in order to obtain a reliable and safe installation for people and materials and to avoid invalidating the warranty.

Any other use that has not been previously agreed with HIMOINSA should be considered as improper and as such is not acceptable.

## 5.2 STANDARD REFERENCE ENVIRONMENTAL CONDITIONS

The reference environmental conditions for generator sets, according to ISO 8528-1, are:

- Ambient temperature 25°C (298 K)
- Ambient pressure 100 kPa (100 masl)
- Relative humidity 30%

## 5.3 DERATING FOR OPERATING ENVIRONMENTAL CONDITIONS

In the event of environmental conditions of installation and operation, other than those indicated in the previous section, it will be necessary to carry out appropriate power losses or “derating”, both for the engine and the alternator which it is coupled to, and therefore the electrical power supplied by the assembly.

When making a quote request, the User/Customer should clearly state the actual environmental conditions in which the generator set will operate. Since derating and declassification must be fixed at the time of drawing up the contract, so that both the engine and the generator are dimensioned properly.

In particular, the User/Customer must communicate the following environmental conditions under which the generator set will operate:

1. The lower and upper ambient temperature limits.

2. The altitude above sea level or, preferably, the minimum and maximum barometric pressure values in the installation site; in the case of mobile gensets, the minimum and maximum limits of altitude above sea level.

3. Humidity values in relation to the temperature and pressure of the installation site, with special attention to the value of relative humidity at the maximum temperature.

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

- Dusty and/or sandy environments
- Marine type environments
- Environments with potential chemical pollution
- Environments with radiation
- Operating conditions in the presence of large vibrations (e.g. areas subject to earthquakes or other external vibrations generated by nearby machines)

**NOTE:**

**When the actual environmental conditions are not specified in the contract phase, the power of the genset is understood to refer to the standard conditions for the generator set according to ISO 8528-1.**

If the actual environmental conditions change in the future, it will be necessary to contact the HIMOINSA organization to calculate the new power losses and to make the necessary calibrations.

For diesel engines, this derating is determined by the corresponding engine manufacturers, to find out this information contact HIMOINSA’s Technical Department or request it from your usual dealer.

Derating the alternator is less important than the combustion engine; as such, the derating of the generator set generally resembles the derating of the engine.

**EXAMPLE: SIZING OF THE ALTERNATOR**

A generator set of 64 kW (80 kVA) under standard conditions with the engine at 25 °C, 100 masl and 30% relative humidity.

The genset consists of:

- A supercharged engine of 72 kW at 25 °C, 100 masl and 30% RH.
- An alternator of 80 kVA delivered at 40 °C and 1000 masl; with a performance of 89%.

You want to check the maximum power that the genset can deliver at 1500 masl and a temperature of 45 °C.

Where the reduction coefficients for the indicated alternator are:

**Tabla 1**
Alternator power reduction coefficients according to the various environmental conditions

| **Ambient temperature (°C)** | **30** | **35** | **40** | **45** | **50** | **55** | **60** |
|---|---|---|---|---|---|---|---|
| Reduction coefficient $K_1$ | 1.05 | 1.03 | 1.00 | 0.96 | 0.92 | 0.88 | 0.84 |
| **Altitude (masl)** | **1000** | **1500** | **2000** | **2500** | **3000** | **3500** | **4000** |
| Reduction coefficient $K_2$ | 1.00 | 0.97 | 0.95 | 0.92 | 0.89 | 0.86 | 0.83 |

The engine derating coefficient indicated by the manufacturer of the engine is 0.75 for the environmental conditions required by the genset. Therefore, engine power, under the specified conditions, will be:

$P_{engine} = 0.75 \cdot 72 = 54$ kW

Given the performance of the alternator, the power of the genset is:

$P_{genset} = 54 \cdot 0.89 = 48$ kW

Finally, it is necessary to check that the alternator is appropriate for the power that the genset is able to deliver, which has just been calculated.

To do this, it is necessary to obtain the alternator derating via the reduction coefficients $K_1$ and $K_2$ shown in Table 1 above or otherwise as directed by the manufacturer of the alternator.

Therefore, for the environmental conditions of the genset (45 °C and 1500 masl) the following reduction of apparent maximum reference power is obtained for the alternator:

$S_{alternator} = K_1 \cdot K_2 \cdot S_{ref} = 0.96 \cdot 0.97 \cdot 80 = 74.4$ kVA

Therefore, the active power for a power factor of 0.8 will be:

$P_{alternator} = 74.4 \cdot 0.8 = 59.2$ kW

It is evident that the alternator is oversized with respect to the power that the genset can deliver (48 kW) under the environmental operating conditions required.

**NOTE**

**For greater precision, refer to the manufacturer's documentation.**

## 5.4 OPERATING LIMITS

The User/Customer should communicate, during the quote request phase, all the operating conditions that may affect the operation of the generator set. In addition to the environmental conditions described in the previous paragraph, special attention should be given to the characteristics of the loads to be connected, the power, the voltage and the power factor. It is necessary to determine and indicate the load connection sequence with a great deal of accuracy.

### 5.4.1 POWER

The generator set power is the active power (expressed in kW) delivered via the generator's terminals, at the voltage and frequency and under the environmental conditions established.

According to ISO 8528-1, the various power outputs of the generator sets are defined as follows:

**CONTINUOUS POWER (COP)**

This is the maximum power available for use under constant loads for an unlimited number of hours per year between the maintenance intervals prescribed by the manufacturer and under the established environmental conditions.

**PRIME POWER (PRP)**

This is the maximum power available for use under variable loads for an unlimited number of hours per year between the maintenance intervals prescribed by the manufacturer and under the established environmental conditions. The average consumable power over a period of 24 hours must not exceed 70% of the PRP.

**EMERGENCY STANDBY POWER (ESP)**

This is the maximum power available for use under variable loads in the event of a network power outage or under test conditions for a limited number of 200 hours per year between the maintenance intervals prescribed by the manufacturer and under the established environmental conditions. The average consumable power over a period of 24 hours must not exceed 70% of the ESP.

**DATA CENTER POWER (DCP)**

The manufacturer declares a grid outage load factor of 100% for 24h and an average annual grid outage load factor of less than 75%. No data re overload margins are available. It can run for an unlimited number of hours per year. Applicable in countries with a stable grid.

### 5.4.2 CHARGING OUTLETS

When a load is applied to a generator set, this often causes voltage and frequency transients. The extent of such deviations depends on the power value, both active (kW) and reactive (KVAR) of the load variations, depending on the genset's characteristics (power and dynamic characteristics).

The genset's characteristics are result of the combination of the characteristics of the combustion engine and alternator.

If further information is required, you may request the load impacts reports produced according to standard ISO 8528-5 by contacting the HIMOINSA Technical Department.

When the capacity of the charging outlet is an important requirement, the Customer/User should clearly indicate this to HIMOINSA and must provide all the information related to the various loads to be fed; their possible division into gensets and the connection sequence. All this helps achieve the best dimensioning of the genset and avoid both uneconomic oversizing and dangerous undersizing.

**POWER FACTOR (COS φ)**

The power factor is defined as the ratio between the active power (kW) and apparent power (kVA), describing the amount of electricity consumed which has been transformed during operation. Therefore, it is a value which depends on the characteristics of the load.

HIMOINSA generator sets, equipped with an alternator, can deliver both the active power and reactive power required by the load but, while active power is delivered by the combustion engine (transforming mechanical power into electrical power by means of the generator) reactive power is delivered by the alternator.

If the rated power factor is 0.8, the rated apparent power will be 1.25 times the rated active power.

For operation with values other than 0.8, the following should be taken into account: LOAD WITH COS φ BETWEEN 0.8 AND 1

At rated active power, the alternator works perfectly with cos φ values between 0.8 and 1. To avoid overloading the engine, it is essential not to exceed the rated active power.

LOAD WITH COS φ < 0.8

The alternator, for the reference plate value of cos φ = 0.8, is overloaded more as it approaches cos φ of 0. Therefore, the reactive power to be delivered increases as the cos φ decreases. The generator reduces power according to the indications supplied by the manufacturer. Under these conditions the combustion engine generally presents high power.

By way of example, Table 2 is presented for the determination of these reductions in power.

**Tabla 2**

Coefficients indicative for reducing power of a generator according to cos φ

| Power factor (cos φ) | 1 | 0.8 | 0.7 | 0.6 | 0.5 | 0.3 | 0 |
|---|---|---|---|---|---|---|---|
| Turndown ratio | 1.00 | 1.00 | 0.93 | 0.88 | 0.84 | 0.82 | 0.80 |

**NOTE**

**For greater precision, refer to the documentation provided by the manufacturer of the genset.**

### 5.4.3 SINGLE PHASE LOAD

The generator sets can become loaded with unbalanced loads reaching a maximum of the nominal current in each phase.

This means that between two phases (e.g. between L1 and L2) no more than 0.58 of the three-phase rated power of the genset can be introduced given that:

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

Similarly, between one phase and neutral (e.g. between L3 and neutral) no more than 0.33 of the plate three phase nominal power can be introduced:

$$\frac{1}{3} = 0.333$$

It should be remembered that during single phase operation or with unbalanced loads, the voltage regulator cannot maintain the expected voltage tolerances.

### 5.4.4 START UP OF ASYNCHRONOUS ENGINES

Starting asynchronous motors by means of a generator set present problems, as engines with squirrel cage rotors have starting currents eight times the rated current ($I_{start\text{-}up}$=8 $I_n$), and a low power factor.

Under these conditions, the current absorbed by an asynchronous engine (or by engines which start simultaneously) during starting, must not exceed the maximum current that the generator can deliver in a short time, with a tolerable voltage drop and not exceeding overtemperature limits.

To prevent excessive oversizing of the generator set, the following systems can be employed for the cases raised:

VARIOUS ENGINES

Divide them among several gensets which are each introduced according to a preset sequence, at intervals of 30-60 seconds.

A SINGLE ENGINE

Where permitted by the coupled operating machine, using a reduced voltage starter system (star/delta or auto-transformer) or, for higher power engines with wound rotor and rheostatic starter.

In the case of star/delta starting, the voltage in each phase is reduced and the starting current ($I_{start\text{-}u}$) is reduced at the same rate, this being:

$$\frac{1}{\sqrt{3}} = 0.58$$

Therefore, in the case of an engine starting currents six times the nominal value $I_{start\text{-}up} = 6 \cdot I_n$ of direct starting, with star/delta starting $I_{start\text{-}up}$ this will be reduced to approximately 3.5 times the $I_n$, and consequently the power required to generator will be reduced by 58%.

$$I_{start\text{-}up} = \frac{1}{\sqrt{3}} \cdot 6 \cdot I_n = 3.5 \cdot I_n$$

In all cases, both with direct starting and reduced voltage starting, it is necessary to control the devices and users connected to the user circuit, trying to avoid possible failures (e.g. contactors opening) caused by a transitory voltage drop during starting.

### 5.4.5 LOW LOAD PROFILE

The endothermic engines that are used in generator sets have been designed to use as much power as possible, from 30 to 100% of the declared maximum power.

The actual engine load depends on the power that the installation demands. The engine and its components are primarily designed to operate in the high load or power range rather than in continuous low load mode.

CONSEQUENCES OF OPERATING UNINTERRUPTEDLY IN LOW LOAD MODE

Operating uninterruptedly in low load mode can lead to higher oil consumption and consequently to a manifestly greater deposit of carbonized oil or oil residue in the engine, as well as in the suction and exhaust system.

The emergence and persistence of residue has a negative impact on the functional behaviour and on the lifetime of the engine. As a result, maintenance tasks tend to increase.

In addition, when an engine is operating in low load mode, it cools down, which means that the fuel is only partially burned, which can in turn produce a white smoke with high hydrocarbon emissions.

Due to the low fuel temperature, the percentage of unburned fuel in the oil increases. These problems are due to the fact that the piston rings, the piston itself and the cylinder do not dilate enough to ensure a good seal and as a result the oil rises and is expelled through the exhaust valves. This means that the diesel oil passes into the crankcase, degrading the quality and the properties of the lubricant.

Frequent and continued use of generator sets with power loads of less than 30% of the maximum power value can lead to the following failures over time:

- Increase of exhaust smoke.
- Presence of traces of fuel in the engine oil.
- Excessive wear of the turbocharger.
- ·Oil leaks in the body of the turbocharger.
- Increased pressure in the gearbox and the crankcase (Blowby).
- Excessive deposit of carbon residue on the surfaces of the valves, valve seats, pistons and the exhaust manifold.
- Hardening of the surfaces of the cylinder liners.
- If such a system exists, lower efficiency of the exhaust gas treatment system (ATS) which may activate the forced regeneration cycle of the DPF.

**RECOMMENDED CORRECTIVE MEASURES**

To avoid any incident and ensure the correct use of the generator set, HIMOINSA recommends that you avoid operating it uninterruptedly in low load mode, or that you reduce such usage to minimum periods of time. The use of generator sets in low load conditions for more than 15 minutes should be avoided.

During the weekly operation tests, the no-load operating time should be limited to a maximum of 15 minutes, until the battery charge values have returned to normal.

The generator sets should be operated once a year for several hours at full load to clean the engine, in other words, to eliminate the carbonized oil deposits in the engine and exhaust system. This may require a reactive load. The load should be increased during the course of the four hours of the operation, from zero to full load.

If the failures mentioned above appear, along with long-term use of the generator with little energy load, operate the power generator at full load, if possible using a Resistive Load Bank before replacing any component.

# 6. INSTALLATION

Generator set installation should be performed by qualified personnel under observance of the regulations in the country where the installation is taking place.

## 6.1 GENERAL INSTRUCTIONS

To perform the installation, a number of general considerations should be taken into consideration, regardless of where the generator set is located. These considerations should be followed together with the specific recommendations for each installation, shown in Section 6.2. Outdoor installations.

As a general rule, all elements that are physically connected to the generator must be flexible and have flexible connecting elements to absorb any vibrations generated, thus avoiding possible damage.

### 6.1.1 GENSET LOCATION

It is important to check that the doors of the generator set can be opened completely, allowing access to materials for maintenance and inspections, so it is possible to completely remove the genset; and that the cooling system works properly.

The correct location of the generator set is very important, it is also necessary to take into account the proximity of the electrical switchboard, proper external fuel supply, the evacuation of exhaust fumes, disturbances caused by noise and exposure to exhaust fumes of other engines or airborne contaminants.

In general, the area where the generator set is installed must be duly enclosed to prevent access to persons who are not expressly authorized, being necessary to position appropriate no-entry and danger signs for both installations outdoors and indoors.

**NOTE**

**In the case of use in areas other than the reference environmental conditions, go to Section 5.3. Derating for operating environmental conditions.**

### 6.1.2 FOUNDATIONS

The foundation must be calculated and sized by civil engineering specialists. The surface area where the generator is installed must be able to support a minimum of 150% of the weight of the equipment (where appropriate), together with the accessories and fluids, as well as keeping the assembly in a level horizontal position and in the most restrictive cases, prevent the transmission of vibrations to surrounding structures, taking into account that generator sets incorporate vibration isolators (anti-vibration elements) for this function.

To assess the need for the construction of foundations, it is necessary to take into account the genset's total wet weight, type (indoor or outdoor) and durability of the installation (provisional or stationary), restrictions related to the vibration, the type of soil and possible variations due to seasonal and climatic changes.

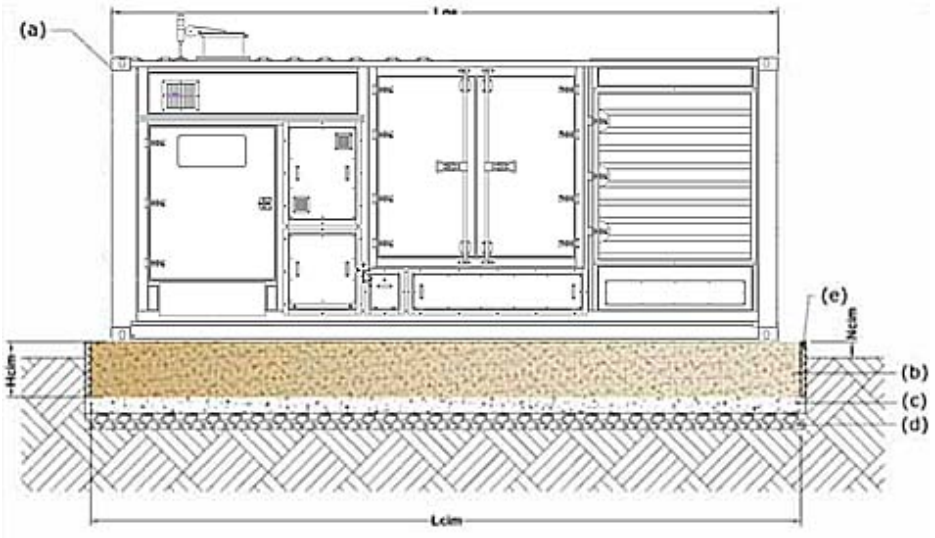
By way of example, in the event the use of concrete foundations is required, the depth that will support the weight of the equipment is obtained as follows:

$$H_{foundation} = \frac{W}{\rho_{concrete} \cdot L_{foundation} \cdot w_{foundation}}$$

Where:

- $H_{foundation}$ Height or depth of the foundation (m)
- $W$ Total wet weight of the equipment (kg)
- $\rho_{concrete}$ Density of the concrete (kg/m$^3$)
- $L_{foundation}$ Length of the foundation (m)
- $w_{foundation}$ Width of the foundation (m)

It is recommended that the dimensions of the foundation base exceed the dimensions of the base of the generator by at least 150 mm on all sides. In addition, to facilitate maintenance and service activities, we recommend raising the foundation above ground level by at least 100m, as shown in the following foundation example:




SIDE VIEW

Where:

| |
|---|
| (a) Generator set in container |
| (b) Foundation slab |
| (c) Underconcrete |
| (d) Compacted stone paving |
| (e) Polyethylene or polyurethane insulation |

### 6.1.3 VENTILATION

Ventilation of the generator set plays a key role in the functioning and durability of the machine.

Inappropriate ventilation may cause excessive temperatures around or inside the gensets, causing overheating and loss of efficiency in the operation of the genset components and therefore the genset in general.

Adequate ventilation must have the following characteristics:

- Allows emanated heat dissipation during operation of the genset by radiation and convection, introducing fresh, clean air and expulsing hot air from the fan outlet.
- Ensures a sufficient volume of air to supply the flow required by the radiator and aftercooler, as well as the proper flow of feed air, in the quantity necessary for combustion of the engine.
- Allows the engine to cool through the radiator and aftercooler keeping the ambient operating temperature of the generator set within safety margins, to ensure good feed air aspiration.
- Check that the direction of the prevailing wind is the same as the air flow in the genset, avoiding the possible recirculation of hot air.

The following principles should be taken into account:

- Heat from other sources should be considered in the design of the ventilation system.
- The genset's ventilation system is designed with all the doors closed, both in the case of the canopy and the premises.
- The generator set will be installed depending on the direction of the prevailing winds, whether indoors or outdoors.
- The altitude at which the genset is installed should be taken into account. As the altitude increases, air density decreases, requiring greater airflow than a genset operating at sea level.
- The temperature of the engine air intake is less than or equal to the ambient temperature.

The outlet should be directed so that, guided by the prevailing winds, no hot air recirculation occurs, preventing the latter from being guided in the direction of the fresh air intakes to the generator set or the premises housing the genset. If this is not possible it will be necessary to use blocking walls, exterior ducting or deflector panel.

In the event details are required regarding the flow of air required for different types of HIMOINSA gensets, ask the factory for data.

### 6.1.4 EXHAUST SYSTEM

For the evacuation of exhaust fumes from the generator set, tubes are normally used made of smooth steel, seamless pipes, or, in special cases, with stainless steel pipes.

The proper evacuation of exhaust fumes must be carefully considered since these fumes can be very harmful to health. They should be directed into the atmosphere through an open and preferably high place, away from windows, doors or vents and away from combustible materials or substances, where smoke, noise, odours and high temperatures do not cause discomfort or damage.

Therefore, it is important to take into account as far as possible the prevailing winds to blow away the fumes from the buildings and areas likely to cause damage or discomfort to both individuals and to other machines, even the generator set itself. The genset can be supplied with flat caps in the exhaust system, to prevent possible damage to the system during transport of the genset.

In that case, once the genset has been installed, the flat caps will have to be replaced by the chosen exhaust system, depending on where the installation is performed. For more information, go to Section 6.2. Outdoor installations or to Section 6.3. Indoor installations, as appropriate.

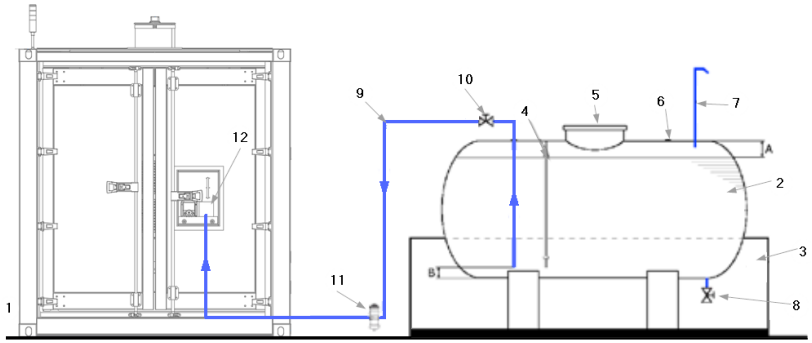
It is important to perform this change, since keeping the exhaust system blocked can cause serious consequences for the machine and for people.

### 6.1.5 FUEL INSTALLATION

Generator sets may include a fuel tank which is installed inside, and is supplied directly, with it only being necessary to control the fuel level according to the use given to the genset.

In some cases, for reasons of autonomy because of the use given to the genset or to minimize refuelling operations, the installation is provided with a separate larger reservoir with an electric pump, which maintains the fuel level in the tank of the genset or supply the genset directly. The location, materials, dimensions, components, installation, ventilation and inspection will be performed by the customer, who must comply with current regulations governing oil installations for own use in the country where the installation is to be carried out.

Therefore, you may want to install a fuel storage tank outside the genset, which always keeps the tank inside the genset at the necessary level for proper operation. To do this, upon request, the generator set incorporates a fuel transfer pump, it being necessary to connect the fuel supply line from the storage tank to the connection point of the genset.



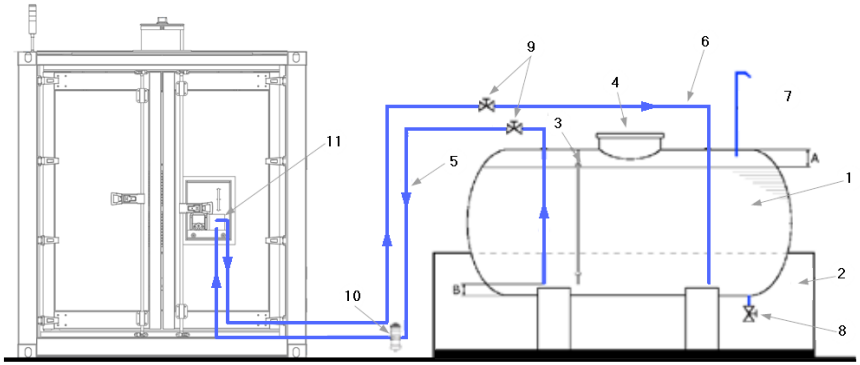

| |
|---|
| 1. Internal supply tank |
| 2. Storage tank |
| 3. Collection vat |
| 4. Fuel level indicator |
| 5. Maintenance hatch |
| 6. Storage tank supply |
| 7. Vent line |
| 8. Drainage line |
| 9. Supply line |
| 10. Shutoff valve |
| 11. Fuel filter |
| 12. Fuel transfer connection point |

It is advisable to install the storage tank supply line as deep as possible, at a distance (B) not less than 5 cm from the bottom of the tank, thus avoiding the supply of air when the fuel level in the tank is low.

In turn, when filling the tank it is recommended that a clearance (A) of at least 5% is maintained to prevent spills due to fuel expansion caused by warming, always avoiding the penetration of dirt and/or moisture into the system.

It is recommended that the fuel storage tank is placed as close to the engine as possible, with a maximum of 20 metres of separation from the engine, with both at the same level. Consult the documentation of the fuel transfer pump for more detailed information on other possible configurations.

Another possibility is to feed the generator set directly from an external storage and supply tank.



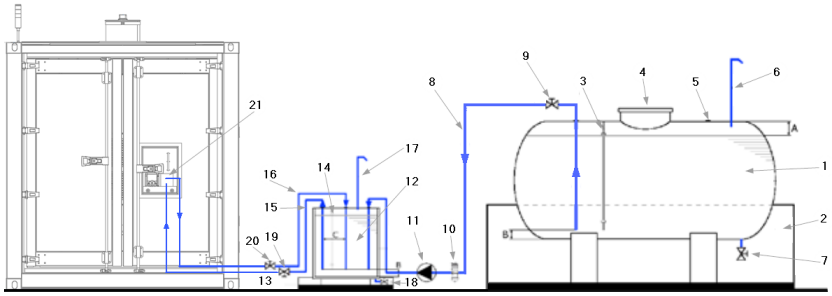

| |
|---|
| 1. Storage and supply tank |
| 2. Collection vat |
| 3. Fuel level indicator |
| 4. Maintenance hatch |
| 5. Supply line |
| 6. Return line |
| 7. Vent line |
| 8. Drainage line |
| 9. Shutoff valves |
| 10. Fuel filter |
| 11. Fuel connection point |

You are best advised to maintain a clearance between the supply line and the return line inside the tank to prevent the fuel from heating up and to stop any impurities from getting in, which could be harmful to the operation of the engine. The separation between the two lines (C) is the maximum possible, with a minimum of 50 cm, whenever possible, thus preventing fuel from being supplied with impurities or fuel temperature increases, both of which can alter the functioning of the genset. The distance (B) between the fuel lines and tank bottom should be at low as possible, although not less than 5 cm.

Similarly, when filling the tank it is recommended to keep a clearance (A) of at least 5% of the total capacity of the tank and position the fuel storage tank as close to the engine as possible, with a maximum of 20 metres of separation

from the engine, with both at the same level. Ensure that the maximum level of fuel in the supply tank is below the height of the injectors. Consult the documentation of the fuel supply pump for more detailed information on other possible configurations.

In the case of separation which is greater than that specified in the documentation of the pump, installations at a different level to the generator set or due to the requirements of the regulations related to the installation of fuel tanks, the use of an intermediate tank between the genset and the main tank may be needed.




| |
|---|
| 1. Storage tank |
| 2. Fuel storage collection vat |
| 3. Fuel level indicator |
| 4. Maintenance hatch |
| 5. Storage tank supply |
| 6. Storage tank vent line |
| 7. Storage tank drainage line |
| 8. Intermediate tank supply line |
| 9. Intermediate tank supply shutoff valve |
| 10. Fuel filter |
| 11. Fuel transfer pump |
| 12. Intermediate tank |
| 13. Intermediate tank collection vat |
| 14. Fuel level indicator |
| 15. Generator set supply line |
| 16. Generator set return line |
| 17. Intermediate tank vent line |
| 18. Intermediate tank drainage line |
| 19. Genset supply shutoff valve |
| 20. Genset return shutoff valve |
| 21. Genset fuel connection point |

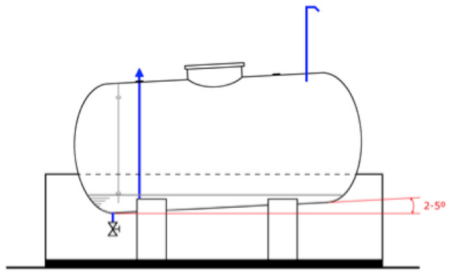
The fuel transfer pump should be appropriate for the chosen location of the fuel storage tank; as well as the placement of the intermediate supply tank, the latter being in line with the specifications of the fuel pump inside the generator set.

As above, it is recommended that the supply and return lines inside the intermediate tank (C) be installed with greater separation, with a minimum of 50 cm, if possible. The distance (B) between the fuel lines and tank bottom shall not be less than 5 cm and a clearance (A) must be kept of at least 5% of the total tank capacity.

It is recommended that the fuel storage tank is placed as close to the engine as possible, with a maximum of 20 metres of separation from the engine, with both at the same level; ensuring that the maximum level of fuel in the supply tank is below the injectors.

Consult the documentation of the fuel supply pump for more detailed information on other possible configurations.

It may be useful to install the tank at a slight angle (between 2° and 5°), placing the fuel supply line, drainage line and level meter at the lowest point.




The design of the fuel system shall be specific to the characteristics of the installed generator set and its components; taking into account the quality, temperature, pressure and necessary volume of the fuel to be supplied, as well as preventing any air, water, impurity or humidity from getting into the system.

Fuel storage is essential if the generator set is to function properly. It is therefore advisable to use clean tanks for fuel storage and transfer, periodically emptying the tank to drain decanted water and any sediment from the bottom, avoiding long storage periods and controlling the temperature of the fuel, as excessive temperature increases can reduce the density and lubricity of the fuel, decreasing the maximum power output.

**NOTE**

**The average service life of good quality diesel is 1.5 to 2 years, provided proper storage is always carried out.**

Fuel lines, both supply and return, should prevent overheating, which could be harmful due to the formation of vapour bubbles that can affect the ignition of the engine. Pipelines should be black iron with no welding. Avoid galvanized steel, copper, cast iron and aluminium pipelines as they can cause problems for fuel storage and/or supply.

Flexible connections have to be used with the combustion engine to isolate the fixed parts of the installation from any possible induced vibrations. Depending on the characteristics of the combustion engine, these flexible lines can be carried out by:

- Sections, of suitable length, of reinforced rubber pipes with flexible inserts which are resistant to diesel oil using tubing connections with edges and closed with screw clamps for connections to the terminal.
- Low pressure type flexible pipes, suitable for diesel oil, protected by wire mesh and screw terminals for sealing.
- In addition, the design of the fuel line must take into account:
- The piping must be fixed by means of brackets at regular intervals so that the vibrations and inflections caused by the weight of piping are avoided. Consider positioning the installation in low conduits in the vicinity of the genset.
- Avoid, as far as possible, creating pipeline connections. In the event they need to be carried out, they must be sealable, especially in parts which are subject to depression (fuel suction inlet), to prevent air infiltration which can make it more difficult to start.
- The suction pipelines under the fuel level should be at least 5 cm from the bottom, and suitably distanced from the fuel return pipeline to avoid the possible suction of impurities in the diesel oil at the bottom of the tank; guaranteeing an air-free fuel supply at all times.
- Avoid sharp changes in the direction of the piping using elbows with large curvature radii.
- Avoid having transit areas close to the components of the exhaust system, heating pipes or electrical wiring.
- It is recommended to have shut-off valves at appropriate points to allow thorough cleaning, repair or replacement of pipes without the need to empty the entire system. Keep in mind that operating the engine with the supply or return line closed may cause serious damage.

**NOTE**

**It is important to consult, and follow, with particular attention the provisions set out in regulations related to the installation of fuel systems, given that in some countries fuel is classified as a “dangerous product”. Also, it is important to consult the technical specifications of the installation components included in the genset, following its assumptions.**

### 6.1.6 ELECTRICAL CONNECTIONS

The gensets are designed to be connected to users. Upon connection, it is necessary to respect the conditions indicated in the diagrams that are supplied with the genset.

The selection and sizing of the cables is the responsibility of the installer that carries out the installation, depending on the type of cable and the regulations that apply in the country in which the installation is taking place.

The power cables must be connected to the line terminals situated at the lower part of the electrical panel, which must be located on appropriate protective conduits, tunnels or conductor bearing cubicles. It is recommended to separate cables with different voltages, respecting a minimum distance between layers of 25 cm, always placing the cables with the highest voltage in the deepest area, thus avoiding possible magnetic interference.

### 6.1.7 EARTHING

The metal parts of the installations which are exposed to contact with people, because of an insulation fault or other accidental causes, could become live. To ensure the protection of people, the electric installation and the equipment, the customer must earth the generator set.

To carry out the earthing, the generator sets contain a main earthing terminal located inside the container, and additional earthing points, usually in the corners of the bedplate and inside the panel, if included. The customer must connect their earthing rod to the genset’s earthing installation via an insulated copper conductor with a minimum section of 16 $mm^2$ or with a bare copper conductor with a minimum section of 25 $mm^2$.

The materials, dimensions and depth of the earthing rod should be chosen so as to withstand corrosion and have appropriate mechanical strength. It should be installed vertically into the ground. The resistance of the earthing rod depends on its size, its shape and the resistivity of the soil in which it is embedded. This resistivity usually varies from one place to another, and varies according to the depth.

The choice and dimensioning of the conductors and earthing rod will be the responsibility of the installer performing the installation and must take into account relative local and national regulations.

## 6.2 OUTDOOR INSTALLATIONS

After consulting the general installation instructions, shown in the previous paragraph and the relevant regulations, in the case of installing the generator set outside particular attention should be given to the noise generated, to the environmental conditions, the exhaust fumes and the influence of seasonal and meteorological changes on soil characteristics and the environment.

In cold environments, the starting time and charge acceptance could be affected. It is advisable to include auxiliary heating devices for coolant, fuel or oil.

### 6.2.1 GENSET LOCATION

We recommend positioning the generator set in a location which is as isolated as possible, avoiding locking the doors of the canopy or container and ensuring there are no elements that may hinder the entry and exit of air.

Choose a location with adequate ventilation and in areas not prone to severe flooding during storms, also avoiding other heat sources from being located close to the genset (boilers, other engines...). It is not necessary to protect against rain water, as the container is designed to drain all the water entering the container, as discussed in Section 2.3. Safety during installation and commissioning.

Protect the genset from exposure to airborne contaminants such as vapours, engine exhaust fumes, abrasive or conductive dust, oil mist, smoke, lint and other contaminants.

The minimum clearance around the genset must be 1.5 metres horizontally and 3 metres vertically, from the top of the container, although a vertical distance of 5 metres is recommended.

**IMPORTANT**

**Due to the design of the cooling system, when the genset is operating, the electric fan will generate an outgoing air flow, in a vertical direction and at high speed. As a result, it is not advisable to put the genset under any surface. If this is necessary, it should be placed under surfaces which are as far away as possible from the container, which are high strength and have no loose or dangling objects that can fall or cause damage or injury.**

**Avoid the transit areas of motor vehicles or forklift trucks and prevent possible impacts from falling objects like trees or poles.**

### 6.2.2 VENTILATION

Provided the necessary genset separation margins are respected as detailed above, the ventilation system will operate as established with sufficient air flow in and out. It is important that the genset is suitably positioned to ensure the entry of dry, clean, cool (ambient temperature) air and with the proper flow; and in turn, prevent exhaust fumes from being channelled towards the genset's air inlet.

The outlet must be positioned so that the air flow is not directed towards the air inlet holes. If this is not possible it will be necessary to use blocking walls, exterior ducting or deflector panel. In the event wind and noise barriers need to be installed, follow the recommendations given in Section 6.3 Indoor installations. Ventilation.

### 6.2.3 EXHAUST SYSTEM

Check the direction of the prevailing wind and ensure that exhaust fumes do not pose a danger, especially in windy conditions, avoiding any discomfort or damage.

In the event the genset is supplied with flat caps on the exhaust system, once the genset has been installed these flat caps will have to be replaced with tilting exhaust caps, which will be delivered with the generator set.

It is important to perform this change, since keeping the exhaust system blocked can cause serious consequences for the machine and for people.

**NOTE**

**When transporting the genset, before travelling long distances, we recommend replacing the exhaust system and placing the flat caps, avoiding possible damage to the tilting caps during transport.**

In the case of accessing the top of the container using a ladder, the genset contains a support at the top to prevent the ladder from slipping.

**NOTE**

**To make changes or add items to the exhaust system, refer to the specifications detailed in Section 6.3. Indoor installations. Exhaust system.**

# 7. USING THE GENERATOR SET

## 7.1 CHECKS PRIOR TO STARTING

These operations must be performed in the following situations:

- Before commissioning.
- After installation of the genset.
- After a comprehensive revision.
- After maintenance operations.
- After a long period of inactivity.

**IMPORTANT**

**During these operations, ensure that the genset cannot start unintentionally, that it is locked and the starter batteries are disconnected. To perform some operations, it is necessary to access the top of the container. For this reason we have installed a bracket which is designed to support the ladder.**

### 7.1.1 EXHAUST SYSTEM

Check the correct installation of the tilting caps on the exhaust system, ensuring they are correct attached and move properly.

### 7.1.2 RADIATOR WATER LEVEL

When there is insufficient water, it must be replaced with a mixture containing a maximum of 50% glycol, as antifreeze solution or corrosion inhibitor, and the rest clean water. Consult the engine documentation to find out the precise coolant composition recommended.

The genset incorporates an alarm for low water level in the radiator.

The filler cap is located on top of the canopy. To access the upper area via a ladder, a bracket has been incorporated where the ladder can be supported to prevent it from sliding.

The type of oil to be used is specified in the generator set's data sheet. For other types of oil, refer to the engine manual.

### 7.1.3 LUBRICATING OIL LEVEL IN THE TANK

Due to the incorporated auto-fill system oil, it is only necessary to control the oil level in the tank, located inside the genset, which is indicated by the level tube for the tank. The genset also contains a visual alarm on the control panel, notifying the user when there is a low oil level in the tank.

The oil filler cap is located on top of the oil tank. It is possible to check the oil level in the crankcase using the engine dipstick.

### 7.1.4 FUEL TANK LEVEL

The fuel tank must always have a sufficient level of fuel that is required for operation, it is the responsibility of the user to check and verify that level before each start.

Check that the operating conditions of the combustion engine are met with regards fuel, the absence of losses in the fuel installation and the resistance and sealing testing.

If the fuel level is below the minimum required for operating the genset, it is necessary to add fuel until the tank has been refilled.

Check that the fuel filters do not contain water or particles.

If the genset includes the option of a three-way valve that allows external supply, check that the fuel connection is correct. Do so as follows:

- Check that the fuel inlet and outlet hoses from the external tank are properly connected to the quick connections of the three-way valve.
- Check that the lever is always fully engaged (i.e., either at the internal or the external tank position), never at the middle position.

**CAUTION**

DO NOT start up the genset with the handle of the three-way valve set at the external tank position and NOT connected. Otherwise excess pressure will build up in the fuel return line, which may damage the engine.

If these instructions are not followed, any costs will be to the account of the client.

### 7.1.5 ELECTRICAL RULES

Before starting up the genset, check the electrical connections, starter batteries and earthing. The cable connections should be well tightened and free of corrosion. Open all the switches.

### 7.1.6 CYCLIC DIRECTION OF THE PHASES

In gensets with parallel application, either automatic or standby manual intervention for external production lines, check that the cyclic direction of the phases of the alternator corresponds to the cyclic direction of the phases of the external producer, avoiding reverse engine rotation and other problems.

### 7.1.7 CHECKING THE STATUS OF THE AIR FILTER

The filters must be unobstructed and without porosities that prevent good air filtration. If damage is present, appropriate maintenance operations must be performed.

### 7.1.8 CHECKING THE STATUS OF THE RADIATOR AND AFTERCOOLER

Visually check from the exterior of the container that the air inlet surface of the radiators is free of dirt.

### 7.1.9 CHECKING THE EARTHING

Check that both the generator, as well as the installation that will be connected to the genset, are earthed (connections, earthing rod…).

## 7.2 CHECKS AFTER STARTING THE GENERATOR SET

The following checks must be performed:

- Electrical checks (voltage, current, frequency, rotary field, etc.).
- Mechanical checks (oil pressure, water temperature, absence of noise, etc.).
- Safety checks (emergency stop, oil pressure, water temperature, etc.).

## 7.3 COMMISSION

Perform all the checks described in the preceding sections verifying that the circuit breakers and differential switches are in the OFF position. It is not recommended to run the generator set for long periods under low load conditions, of less than 30%.

For commissioning of the generator set all the doors of the container should be closed, thus ensuring the proper functioning of the cooling system.

### 7.3.1 ELECTRIC FAN SPEED ADJUSTER

The operation of this device is performed autonomously, no commissioning operation is needed.

## 7.4 ELECTRICAL PANEL BOARD

### 7.4.1 PROTECTION PANEL

Composed of a motorised circuit breaker, a differential switch, the power cables terminals and the earthing terminal.

For more details, consult the wiring diagrams.

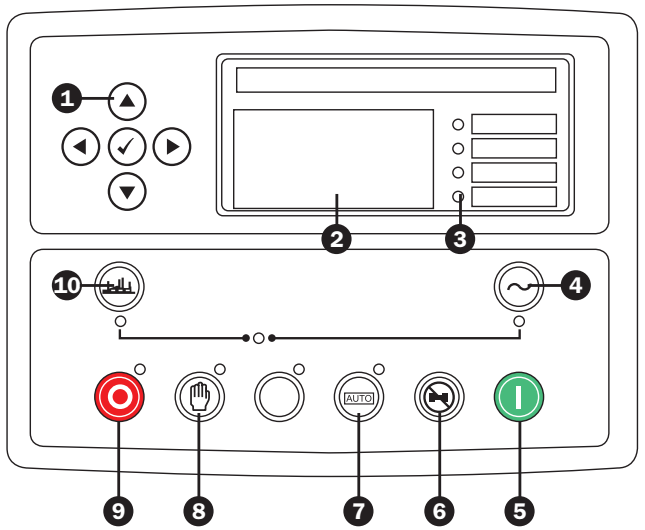
### 7.4.2 OPERATION PANEL

Composed of the operation switches, a visual alarm indicating the oil level in the tank and the emergency stop button.

For more details, consult the wiring diagrams.

### 7.4.3 DEEPSEA CONTROL UNIT

FRONT OF THE VISUALIZATION MODULE




CONTROL UNIT BUTTONS

| |
|---|
| 1.Navigation buttons |
| 2. General Display |
| 3. Programmable LEDs |
| 4. Switch open button |
| 5. “Start” button |
| 6. Cancel Audible Alarm button |
| 7. Automatic mode button |
| 8. Manual mode button |
| 9. “Stop” button |
| 10. Switch close button |

The information displayed on the controller screen, together with four the LED indicators can be edited using the configurator.

With regards the LED indicators on the control panel:

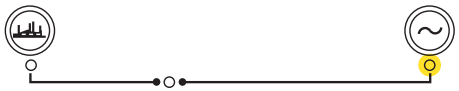


**Fig.1**
*LED generator available*

**Fig.2**

*LED generator charging*

**NOTE**

**For more detailed information or any consultation, refer to the Deep Sea control module manual.**

### 7.4.4 OPERATIONS:

STARTING AND STOPPING:

To start the generator set with the settings previously made, turn the "ON/OFF" button, once the control unit has turned on "MANUAL MODE" will be activated and the "START" button must be pressed, it is possible to check the status of the generator set on the display screen.

To stop the generator set press the "STOP" button; it is possible to check the status of the generator set on the display screen.

It is possible that after extended periods of operation, when stopping the genset the fan unit will continue to operate, cooling the genset before stopping after a while.

CHANGE 50/60 HZ (DUAL FREQUENCY DUAL VERSION GENSETS)

Whenever a frequency change is made the steps below should be followed:

1. When the genset is stopped, with the control panel still switched on, carry out the desired change by turning the "50/60 Hz" button.

2. Make a start-up request in the same way as that indicated in "Starting and stopping"; after 10 seconds, shown on the screen, the genset will not start.

3. Stop the genset, following the instructions for Starting and stopping and wait 30 seconds.

4. After 30 seconds, make a start request again, the generator will start operating at the requested speed.

**IMPORTANT**

**It is important to check that the connection made to the alternator coincides with that indicated on the "Y/Y-Y" button, to obtain the desired voltage. This operation should always be performed after a frequency change, regardless of the state of the genset prior to the change, when functioning (stopping the genset to make the change following the instructions in the Starting and stopping operation) or after a long period stopped.**

**NOTE**

**For other operations, refer to the Deep Sea control module manual.**

# 8. MAINTENANCE

A suitable maintenance and revision programme, performed only by qualified technicians, is essential to maximize the reliability of the engine, minimizing repairs and reducing long-term costs.

To carry out an effective maintenance programme, it is recommended that any data obtained during operation be collected, using the timer operation of the generator set to keep accurate records of all the services performed. This record will also be important for warranty issues.

For specific maintenance plans related to the Generator set acquired, refer to the appropriate documentation for the engines, alternators and certain accessories. These plans vary according to:

- Hours of operation
- Fuel quality
- Machine location
- Type of load supplied
- Environmental conditions

Therefore, once the genset has been received and taking into account the above elements, these maintenance plans should be studied to determine the maintenance intervals which need to be carried out.

It is important to perform continuous cleaning of the generator set, also avoiding the accumulation of fluids on both the internal and external surfaces as well as the acoustic materials installed. To perform the cleaning do not use flammable solvents, it is recommended that aqueous liquids for industrial cleaning are used.

It is recommended that the genset be started at least once a month if it is not used over long periods, allowing its status to be checked.

**NOTE**

**The fact that a self-filling oil system has been installed does not exempt the owner from carrying out the maintenance indicated in the engine manual**

**IMPORTANT**

**Before any operation, stop the generator and wait until it cools down for at least 15 minutes.**

# 9. WARRANTY

## 9.1 LIMITED WARRANTY PERIODS

PROFESSIONAL USE (commercial):

Generator Sets, Prime Power Applications, Rental, Continuous (whichever period expires first)

- 4000 working hours
- 24 months from start-up
- 30 months after leaving the factory

DOMESTIC USE (private):

Generator Sets Stand-by Applications, Limited Continuous (whichever period expires first)

- 1000 working hours (500 hours/year)
- 24 months from start-up
- 30 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 generator sets, it is only applicable to those generator sets that operate together with a manual or automated control panel manufactured and/or installed by HIMOINSA.

## 9.2 COMPANY RESPONSIBILITIES

- In those countries where HIMOINSA has an authorized technical assistance network (information available at www.himoinsa.com) the warranty consists of the replacement or repair of the damaged parts once it has been ascertained that the damage is due to defective material at origin or during the manufacturing or the assembly process. The warranty therefore covers both the replaced parts as well as the manpower used during normal working hours. The customer shall be charged with shipping costs 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, the shipping costs, 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 engine or the alternator, HIMOINSA informs that the assistance covered by the warranty will be provided by the official technical services of the manufacturer of the alternator or the engine, 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 that are the consequence of normal use or wear, inappropriate use (including overload and overvoltage), negligence, accidental damages, non-authorized modifications; lack of maintenance or inappropriate maintenance or connections, (inappropriate storage, transportation or installation); any kind of use of the equipment over and above

the capacity and limits established by the manufacturer or under conditions that differ from those recommended; failures caused after another failure or defect had or should have been detected; damage to batteries, lamps and fuses; damages due to the 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.

### 9.3 USER RESPONSIBILITIES

The user is responsible for:

- Installing and operating the product in accordance with the operation and instruction manual provided, and in its case with the assistance of qualified technical personnel and in accordance with the current regulations.
- Carrying 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.
- Returning the warranty register form properly filled in within 10 days after the commissioning of the product, or a month after the date of the sale, whichever is first.
- Sending written notification to the company or to the authorized technical assistance service in his or her country, of the failures of the material and the justification thereof, within seven days after the failure were to appear and in any case before the expiration of the warranty. Otherwise, the purchaser may lose his or her warranty rights.
- If the repair of the defect requires the participation of other equipment not manufactured by HIMOINSA, the purchaser will be solely responsible for the resultant work and costs. Furthermore, he or she must also provide full access to the products that were manufactured by HIMOINSA S.L.
- Accepting 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 "COMPANY 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 at commissioning or performance demonstrations of the equipment will not mean that

this warranty may be extended to the installation or the assembly. Performance is expressly excluded from this warranty. Nor does it imply acceptance or understanding of the correct technical installation, assembly or connection of the machine, carried out by the purchaser or by a third party unrelated to HIMOINSA, nor of the dimensioning of the purchased equipment with regard to the real power supply needs 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 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 that he or she is obliged 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 safety in the workplace regulations. And also, that they are advised to install specific protections that prevent overvoltage and overload from the main electrical line, and to protect the equipment by seeking the advice of an authorized installer.

# 10. APPENDIX I: EQUIVALENCES OF THE DIFFERENT UNITS WITH INTERNATIONAL SYSTEM UNITS

| **Length (m)** | | |
|---|---|---|
| 1 Å | $1 \cdot 10^{-10}$ | m |
| 1 µ | $1 \cdot 10^{-6}$ | m |
| 1 in | 0.0254 | m |
| 1 ft = 12 in | 0.3048 | m |
| 1 yd = 3 ft = 36 in | 0.9144 | m |
| 1 mi (mile) | $1.6093 \cdot 10^{3}$ | m |
| 1 M (nautical mile) | $1.8533 \cdot 10^{3}$ | m |

| **Angle (rad)** | | |
|---|---|---|
| 1 ° | π/180 | rad |
| 1 ‘ | $\pi/(1.08 \cdot 10^{-5})$ | rad |
| 1 “ | $\pi/(6.48 \cdot 10^{-6})$ | rad |
| 1 r (rev.) | 2 π | rad |

| **Speed (m/s)** | | |
|---|---|---|
| 1 km/h | 0.2778 | m/s |
| 1 ft/h | $8.4667 \cdot 10^{-5}$ | m/s |
| 1 ft/min | $5.08 \cdot 10^{-3}$ | m/s |
| 1 ft/s | 0.3048 | m/s |
| 1 mile/h | 0.44704 | m/s |

| **Acceleration (m/s2)** | | |
|---|---|---|
| 1 $ft/s^2$ | 0.3048 | $m/s^2$ |
| 1 g | 9.8106 | $m/s^2$ |

| **Pressure (Pa)** | | |
|---|---|---|
| 1 bar | $1 \cdot 10^{5}$ | Pa |
| 1 $kg/cm^2$ | $9.8066 \cdot 10^{4}$ | Pa |
| 1 atm | $1.0133 \cdot 10^{4}$ | Pa |
| 1 $kp/cm^2$ | $9.8067 \cdot 10^{4}$ | Pa |
| 1 torr | 133.32 | Pa |
| 1 mmHg | 133.32 | Pa |
| 1 $mmH_2O$ (mmca) | $9.8066 \cdot 10^{3}$ | Pa |
| 1 $dyn/cm^2$ | $1 \cdot 10^{-1}$ | Pa |
| 1 inHg | $3.3866 \cdot 10^{3}$ | Pa |
| 1 PSI ($lbf/in^2$) | $6.8948 \cdot 10^{3}$ | Pa |
| 1 $lb/ft^2$ | 0.4788 | Pa |

| Surface (m2) | | |
|---|---|---|
| 1 $in^2$ | $6.4516 \cdot 10^{-5}$ | $m^2$ |
| 1 $ft^2$ | 0.0929 | $m^2$ |
| 1 $yd^2$ | 0.8361 | $m^2$ |
| 1 acre | $4.0469 \cdot 10^{3}$ | $m^2$ |
| 1 $mi^2$ (mile) | $2.59 \cdot 10^{6}$ | $m^2$ |

| Mass flow rate (kg/s) | | |
|---|---|---|
| 1 m/s | $1 \cdot 10^{-3}$ | kg/s |
| 1 lb/h | $1.26 \cdot 10^{-4}$ | kg/s |
| 1 ton/h (short) | 0.252 | kg/s |
| 1 ton/h (long) | 0.2822 | kg/s |

| Volumetric flow rate ($m^3$/s) | | |
|---|---|---|
| 1 l/s | $1 \cdot 10^{-3}$ | $m^3/s$ |
| 1 $ft^3/s$ | 0.02832 | $m^3/s$ |
| 1 $yd^3/s$ | 0.7645 | $m^3/s$ |
| 1 USgal/h | $1.0515 \cdot 10^{-6}$ | $m^3/s$ |
| 1 UKgal/h | $1.2628 \cdot 10^{-6}$ | $m^3/s$ |

| Temperature (K) | | |
|---|---|---|
| T °C | T + 273.15 | K |
| T °F | 5/9 (T-32)+273.15 | K |
| T °R | 5/9 | K |

| Volume ($m^3$) | | |
|---|---|---|
| 1 l | $1 \cdot 10^{-3}$ | $m^3$ |
| 1 $in^3$ | $1.6387 \cdot 10^{-5}$ | $m^3$ |
| 1 $ft^3$ | 0.02832 | $m^3$ |
| 1 $yd^3$ | 0.7645 | $m^3$ |
| 1 US gal | $3.7853 \cdot 10^{-3}$ | $m^3$ |
| 1 UK gal | $3.546 \cdot 10^{-3}$ | $m^3$ |

| Mass (kg) | | |
|---|---|---|
| 1 grain | $6.48 \cdot 10^{-5}$ | kg |
| 1 lb | 0.4536 | kg |
| 1 ton (short) | 907.18 | kg |
| 1 ton (long) | $1.016 \cdot 10^{3}$ | kg |
| 1 dram | $1.77 \cdot 10^{-3}$ | kg |
| 1 oz | 0.02835 | kg |

| Force (N) | | |
|---|---|---|
| 1 kp | 9.8067 | N |
| 1 dyn | $1 \cdot 10^{-5}$ | N |
| 1 lbf | 4.4482 | N |

| Power (W) | | |
|---|---|---|
| 1 J/s | 1 | W |
| 1 kcal/s | 4187 | W |
| 1 BTU/h | 0.2928 | W |
| 1 cv | 735.5 | W |
| 1 ft lbf/min | 0.0226 | W |
| 1 kgf·m/s | 9.807 | W |
| 1 erg/s | $1 \cdot 10^{-7}$ | W |
| 1 hp | 745.7 | W |

| Energy, heat, work (J) | | |
|---|---|---|
| 1 Nm | 1 | J |
| 1 Ws | 1 | J |
| 1 dyncm | $1 \cdot 10^{-7}$ | J |
| 1 erg | $1 \cdot 10^{-7}$ | J |
| 1 cal | 4.1868 | J |
| 1 kWh | $3.6 \cdot 10^{6}$ | J |
| 1 hp h | $2.6845 \cdot 10^{6}$ | J |
| 1 cv h | $2.65 \cdot 10^{6}$ | J |
| 1 BTU | $1.0551 \cdot 10^{3}$ | J |
| 1 therm | $1.0551 \cdot 10^{8}$ | J |
| 1 Therm | $4.1868 \cdot 10^{6}$ | J |
| 1 PSI ($lbf/in^2$) | $6.8948 \cdot 10^{3}$ | J |
| 1 ft·lbf | 1.3558 | J |
| 1 kgf·m | 9.807 | J |
| 1 electron-volt | $1.6 \cdot 10^{-19}$ | J |



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