EMSA
GENERATOR

DIESEL GENERATOR
MAINTENANCE AND OPERATION MANUAL

DEAR USER OF THE EMSA GENERATOR;

First of all, we would like to thank you for choosing Emsa Generators.
Thanks to the experience of long years, Emsa Jeneratör manufactures efficient, reliable and quality generators.

Do not perform operate, maintain or repair your generator without taking general safety precautions.

Maintenance and Operation Manual has been prepared and developed to help you in operating and maintaining the Emsa Generator system properly.

This manual shall be read by the operator who will be operating the generator carefully.

Emsa Jeneratör reserves the right to make changes on the "DIESEL GENERATOR MAINTENANCE AND OPERATION MANUAL" without prior notice.

AS PER THE REGULATION ON AFTER SALES SERVICES FOR INDUSTRIAL GOODS ISSUED IN THE OFFICIAL GAZETTE NO. 29029 DATED JUNE 13, 2014, THE SERVICE OF GENERATORS ARE DETERMINED AND DECLARED AS 10 YEARS.

Use recommended lubricants, coolants and fuel.

Use genuine spare parts for the engine and generator.

Always contact Emsa Jeneratör authorized services.

Take recommended safety and installation precautions.

Our generators are manufactured as per VDE 0530, BSE 4999 BS5000, IEC 34, TS ISO 8528, TS EN 12601 standards. ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007 management system certificates are accredited by Kiwa&MEYER. Our generators have TS ISO 8528-5, TS EN 12601 certificates.
Our generators comply with CE declaration.

Discover the potential

EN

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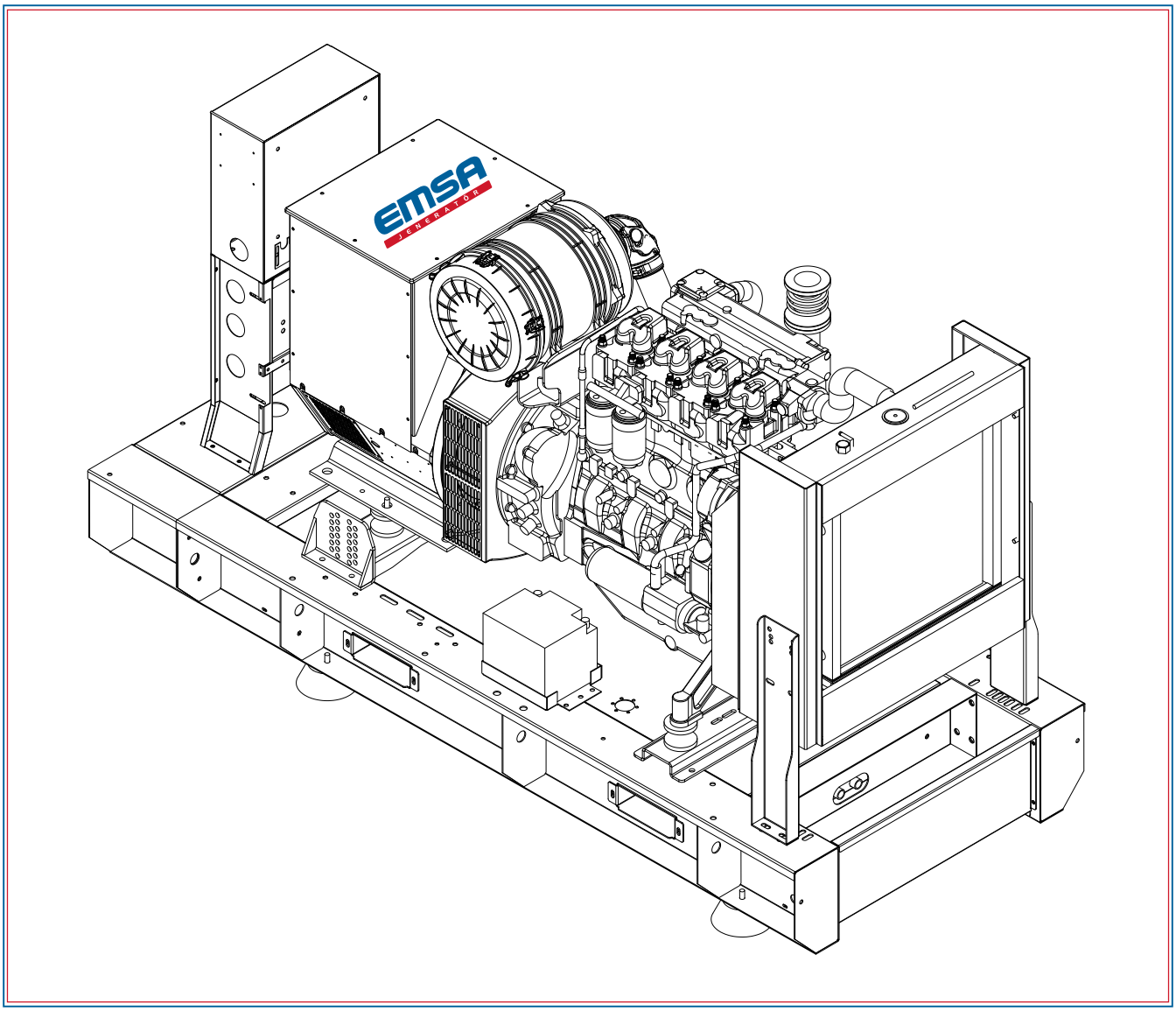
EMSA
GENERATOR

EN

1 INTRODUCTION

INTRODUCTION

EN

Some interventions and maintenance operations may be required to be performed by specially trained, qualified technicians; operators may only carry out tasks up to a certain level.

Maintenance and Operation Manual has been prepared to help the user in operating and maintaining of the generator easily. This is not a repair manual. Generator shall operate with maximum performance and efficiency when the recommendations and rules given in this manual are followed.

This manual provides general information on the installation, operation and maintenance of the generator. Also, general information on the generator you have purchased are provided in the , tables and charts.

Emsa Generator is designed to be activated immediately wherever it is taken if the coolant, antifreeze, fuel, lubricant and charged battery are provided.

It is recommended to perform maintenance more frequently to ensure proper operation of the generator in dirty and dusty environments.

Parts or details shown in the figures and drawings provided in this manual may differ from the generator assembly you have. These images are for informative purposes only.

Maintenance, adjustment and repair operations shall always be performed by the authorized services and qualified persons using genuine parts. Each generator has a model and serial number shown on a plate attached to the the control panel or cabinet (Figure 1). This plate also provides the manufacturing date, voltage, current, power in kVA, frequency, power coefficient and weight of the generator.

ASSEMBLY PLATE

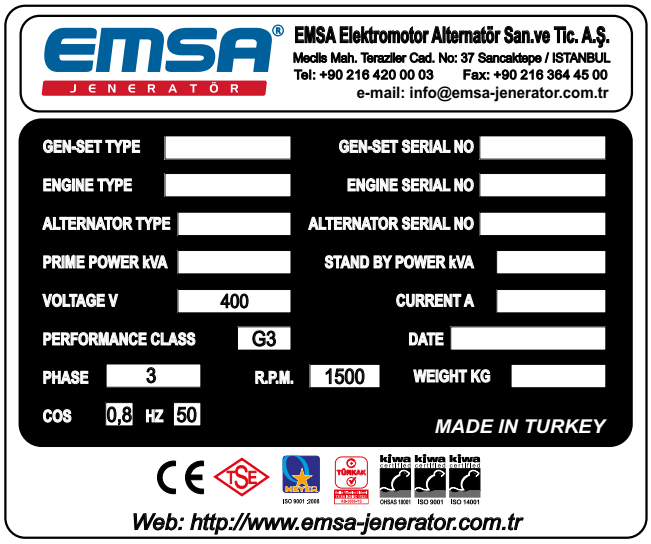

Figure 1 EMSA Generator Data Plate

This plate is required for ordering of spare parts, application of warranty or for provision of service.

MANUFACTURING COMPANY

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SAFETY AND HEALTH

GENERAL

Generator is designed and manufactured to operate safely. However, user is responsible for safety. Possibility of an accident is very low if the safety precautions specified are followed. Securing safety before any technical operation or action is the responsibility of the user performing the operation or the action. Generator shall only be operated by authorized and trained persons.

WARNING

- Read and understand all safety precautions and warnings.
- Read and understand all warnings in the manual before performing any maintenance on the generator or operating the generator.

- Accidents and injuries are possible if the procedures, instructions and safety precautions provided in this manual are not followed.
- Do not operate the generator in case of a known unsafe condition.
- In case of an unsafe condition on the generator, place the danger warning plate, press the emergency stop button and disconnect the negative (-) terminal of the battery and prevent operation of the generator until the condition is corrected.
- Generator assembly shall not be intervened by unauthorized persons. You may put warning signs for this purpose.
- Press the emergency stop button and disconnect the negative (-) terminal of the battery before performing maintenance, repair or cleaning on the generator.
- Generator shall be installed and commissioned by authorized services as per the standards. Maintenance and repair procedures shall be performed by authorized services.

- Learn the location of the emergency stop button. Emergency stop buttons shall only be used for emergency conditions.
- Do not use emergency stop devices and buttons for regular shutdown.

PRESSURIZED AIR AND VAPOUR

- Maximum water pressure (30 psi) may applied for cleaning. Always use safety goggles while cleaning the cooling system.
- Maximum water pressure (30 psi) may be applied for cleaning; air hole shall be clean and personal protection equipment shall be used besides the burr protection.
- Pressurized air and water may cause splashing of dirt and hot water, thus it may cause injuries.

- Wear protective equipment, shoes and goggles when you shall use pressurized air. Use safety goggles or face shield.
- Do not open the filling cap of the radiator until the coolant is cooled. Loosen the cap slowly before opening the radiator cap completely to ensure that the high vapour pressure is reduced.

PRECAUTIONS AGAINST LEAKS

Prevent leaking of the fluids inside the generator during the maintenance or repair procedures of the generator. Prepare required containers and cleaning materials against the risk of leakage before opening parts with fluids in them.

Improper disposal of waste may threaten the environment. All waste chemicals shall be disposed as per the environmental regulations. Always use sealed containers while disposing fluids. Waste chemicals shall not be poured down in drains and water resources.

FIRE EXTINGUISHERS

Completely full BC and ABC type fire extinguishers shall be present beside the generator.

Instructions on using the fire extinguishers shall be provided to the operator. Fire extinguishers shall be inspected regularly by authorized institutions and qualified persons.

USING PROTECTIVE EQUIPMENT

- Use proper protective equipment before intervening the generator.
- You shall use ear protectors to prevent hearing problems due to the noise that occur while the generator is operated.
- Do not wear clothes that may be caught by the rotating parts while the generator is operated.
- All solutions used for cleaning shall be used with protective gloves as per their usage instructions.
- Use protective goggles against possible eye injuries.

PLACEMENT, HANDLING AND DRAWING

Section 4 in the Manual covers the placement, lifting and storage of the generator. Read this section before handling, lifting, placing or towing the generator with trailer. Follow the safety precautions below.

WARNING

- Make the wiring connections as per the relevant standards. Take care about earthing.
- Ensure that the fuel storage system designed for the generators are installed as per the relevant codes, standards and other requirements.
- Engine exhaust gases are dangerous for the staff. Exhaust gases of all generators in confined places shall be discharged with sealed black pipes as per the relevant standards. Hot exhaust muffler and exhaust pipes shall be protected against the contact of flammable materials and the staff. Ensure that the exhaust gases are discharged safely.

SAFETY AND HEALTH

- Do not lift the generator using alternator and engine lifting lugs. Use lifting points on the chassis to lift the generator. Use lifting points on the upper part of the cabinet or the lifting points on the chassis for generators with cabinets.

- Ensure that lifting equipment and support structures are sturdy and that they have the capacity to bear the generator. All staff shall be kept away from the generator when the generator is lifted.
- Pay attention to all traffic rules, standards and other regulations while towing the generator with trailer. These rules also cover the required equipment and speed limits expressly specified in the regulations.
- Do not allow the personnel to ride on the mobile generator. Do not allow the personnel to stand on the draw bar or between the mobile generator and the truck.
- Do not install or operate the generator in an environment classified as dangerous unless it is designed specifically for this purpose.

EXPLOSION AND FIRE

As a part of the generator, fuel and smoke may ignite and explode. Taking proper precautions for the storage of these materials shall reduce the risk of fire and explosion. Keep BC and ABC types of fire extinguishers at hand. Personnel shall be trained for the operation of these extinguishers.

Oil and some cooling mixtures are flammable. Flammable fluids poured on the hot surfaces and areas with live current may cause fire. Fires may cause damage to the property and lives.

WARNING

- Do not collect inflammable materials in the area where your generator is placed. Fuel and lubricants shall be stored in sealed containers and away from unauthorized persons.
- Consider the risk that the diesel engine may be used in an environment where flammable gases may enter the air intake system. These gases may cause the engine to overrev. Injuries and damage to the engine may be experienced.
- Ventilate the generator room properly.
- Flammable materials shall be kept in protective containers. Do not smoke in areas where flammable materials are stored.
- All power cables shall be connected tight and properly. In case of loose or worn cables, contact authorized service for maintenance before operating the engine.
- Arcs and sparks may cause fire. Arcing does not occur when secure connections, correct cables and battery cables maintained regularly are used.
- Do not put any metal object between terminals while checking the battery charge. Use voltmeters or hydrometers.
- Cut off the power supply of the battery charger before connecting or disconnecting the battery.
- The batteries shall be kept clean. Use recommended cables, connections and battery covers while you are using the generator assembly.
- Do not allow anything that may cause fire such as flames, sparks, smoking beside the fuel.
- Do not operate the generator in case of a fuel leakage in the fuel system.
- An emergency exit shall be present for easy exit of the personnel in case of a fire.

- Do not refuel while the generator is running.
- Do not use aerosols for starting aid. Otherwise, explosions and injuries may occur.
- Do not charge overturned batteries; otherwise, explosions may occur.
- Keep the room, ground and generator set clean. In case of fuel, oil, electrolyte or coolant spillage, these shall be cleaned immediately.

MECHANICAL

Generator is designed with its housings in order to protect against moving parts. Still, you shall take precautions to protect the personnel and equipment from other mechanical risks while working in the generator area.

WARNING

- Always use the diesel engine in a well ventilated area. Take the exhaust installation outside if the diesel engine is placed in a confined area. Exhaust gases of the diesel engine contain combustion products harmful to health.
- Your generator is designed with housings in order to protect against moving parts. Still, you shall be careful to protect the personnel and equipment from other mechanical risks while working in around the generator set.

- Do not operate the generator set while the housings are removed. Do not attempt to access under or around the housings for any reason while the generator is operated.
- Keep your hands, long hair, loose clothes and jewellery away from pulleys, belts and other moving and rotating parts.

- Some moving parts may not be visible while the generator is operated.
- Avoid contact to hot oil, hot fuel, hot coolant, hot exhaust installation, hot surfaces, sharp edges and corners against risk of injury.

SAFETY AND HEALTH

CHEMICAL

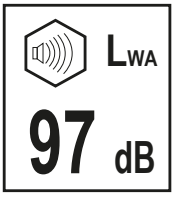
Lubricants, fuel, coolants and electrolytes used in the generator are industrial type. These may be harmful for the personnel if they are not used properly.

WARNING

- Do not contact fuel, oil, coolant and electrolyte to the skin and do not touch these materials. Get medical attention immediately in case of inadvertent contact of electrolyte to the eye specifically. In case of contact with your skin, wash with soapy water.
- Do not wear clothes contaminated with fuel or oil. Wear an apron, face mask and protective goggles resistant against acid while preparing the battery. Clean the affected area with ample amount of pressurized water immediately if the battery electrolyte spills on the skin or the cloth. Wash with soapy water.
- Hot oil may cause injuries. It shall not contact the skin. Hot parts shall not contact the skin, too.
- Engine coolant is hot, too, when the diesel engine is hot. Also, the coolant is under pressure. Hot coolant is present in the radiator and hoses. Any contact with hot coolant or its vapour can cause severe burns.
- Wait until the cooling system parts are cooled before draining the cooling system.
- Electrolyte is an acid. Electrolyte can cause personal injury. Electrolyte shall not contact the skin and the eyes. Use protective goggles during the maintenance of the batteries.
- Wash your hands after contacting the batteries.

NOISE

Noise levels of generators with soundproof canopies are over 93-95L_{WA}. Use noise cancelling ear protectors as per the occupational safety rules during operation and maintenance. It is dangerous. Noise level plate is shown beside.)



Noise levels of open type generators (without noise insulated cabinets) are between 110-120 L_{WA} and this complies with 2000/14/EC directive. Use noise cancelling ear protectors as per the occupational safety rules during operation and maintenance. It is dangerous.

A-weighted noise pressure level in the environment where the generator is operated is over 70 dB(A). This level is specified on the plate with two numbers fixed on the generator cabinet as specified in the EN ISO 4857:2009 standard.

WARNING

WEAR EAR PROTECTORS WHILE WORKING IN THE GENERATOR AREA.

ELECTRICAL

Effective and safe operation of electrical devices is ensured by correct installation, operation and maintenance of these devices.

WARNING

- Generator to load connection shall be performed by an authorized service personnel trained and qualified at this subject and as per the relevant electrical codes and standards.
- Ensure that all your generator is grounded before operating the generator (including mobile generators).
- Stop the generator and disconnect the negative (-) terminal of the battery before making the load connection or disconnecting the load from the generator.
- Do not attempt to make the load connection or disconnecting the load when the generator is on a wet or humid surface.
- Do not contact to the conductors, connection cables and live parts on the generator with any part of your body or with any uninsulated object.

- Reinstall the alternator terminal cover after making the load connection or disconnecting the load. Do not operate the generator unless the cover is placed safely.
- Connect the generator to loads and electrical systems proper to the power and electrical characteristics of the generator.
- Keep all electrical equipment clean and dry. Renew the electrical installation where insulation is worn, broken or cracked. Renew the terminals that are worn, corroded or discoloured. Keep the terminals clean and ensure that the connections are tight.
- Insulate all connections and free cables.
- Use BC and ABC types of fire extinguishers for electrical fires.

SAFETY AND HEALTH

FIRST AID FOR ELECTRIC SHOCKS

WARNING

- Do not touch the electrocuted person by bare hands before disconnecting the power source.
- Save the victim from the electric current.
- If this is not possible, stand on a dry insulating material and take the exposed person away from the conductor by using an insulating material, preferably dry wood.
- If the victim is breathing, bring the victim to the healing position as described below.
- If the electrocuted person has lost consciousness, follow the procedure below to resuscitate him/her.

Opening the Respiratory Tract

1. Tilt the head of the victim backwards and lift his/her jaw up.
2. Remove objects such as dentures and chewing gum that might have escaped into the mouth or throat of the victim.

RESPIRATION

Check if the victim breathes by observing visually, listening and feeling him/her.

BLOOD CIRCULATION

Check the pulse of the victim from his/her neck.

IF THE VICTIM CANNOT BREATH, BUT PULSE IS PRESENT

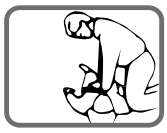
1. Close the nose of the victim tightly.
2. Take a deep breath and join your lips with the lips of the victim.
3. Blow slowly into the mouth, observing that his/her rib cage is elevated. Then stop blowing, and let the rib cage completely descend. Give an average of 10 breaths per seconds to the victim.

4. If you shall leave the victim alone to call for help, give 10 breaths and return as soon as possible and resume breathing.
5. Check the pulse after every 10 breaths.
6. Bring the victim to the healing position when he/she starts to breath.

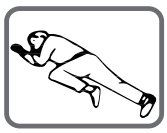
IF THE VICTIM CANNOT BREATH, AND NO PULSE IS PRESENT

1. Call for medical attention or call the nearest health institution. Give two breaths to the victim and start cardiac massage as shown in the figure.
2. Place the palm of your hand 2 fingers up from the junction of the rib cage.

3. Place your other hand with your fingers locked.
4. Holding your arms upright, press down 4-5 cm down 15 times per minute.
5. Repeat the process of giving 2 breaths and 15 heart massages until the medical aid arrives.
6. If improvement on the condition of the victim is observed, continue to giving breath by checking his/her pulse. Check his/her pulse after every 10 breaths.



7. Bring the victim to the healing position when he/she starts to breath.



HEALING POSITION

1. Place the victim sideways.
2. Keep his/her head tilted so that his/her jaw faces forward to keep the respiratory tract open.
3. Ensure that the victim does not roll forwards or backwards.
4. Check his/her breathing and pulse regularly. Repeat the procedure above if any of these two stop.

WARNING

Do not give any liquids such as water until you he/she gains consciousness again.

SAFETY AND HEALTH

PROTECTION AGAINST FIRE

Consider the following items for the selection and installation of fire protection systems.

- Generator room shall not be used for storage.
- Keep BC and ABC types of fire extinguishers in the generator room.
- Do not refuel the fuel tank while engine is running.
- Do not allow smoking, sparks, arc devices or presence or operation of other sources of ignition near the fuel tank or generator set.
- Adequate amount safety precautions shall be taken to prevent leaks in the fuel lines. Engine fuel connections shall be performed with flexible lines (fuel hoses). Do not use copper pipes.

EXHAUST GASES

- Do not connect exhaust systems of two or more engines together.
- Do not let exhaust of the engine to the environment from the brick tiles, concrete block chimneys or from similar structures.
- Exhaust manifold shall be placed inside a housing.
- Do not use exhaust gases for heating a room.
- Isolate exhaust pipes open to the contact of personnel or that is laid near the flammable materials against heat.
- Suspend exhaust system from the ceiling. Forced loading or torsion on the exhaust manifold shall be avoided, especially on the turbocharged engines.

MOVING PARTS

- Connections of the housings, clamps and the brackets on rotating fans, belts etc. shall be tightened securely.
- Protect your jewellery, clothes and hands from the moving parts. Keep them away.

DANGEROUS VOLTAGE

- Using improper cables and/or installation for power generation, transfer and distribution systems may cause fire or electrocution.
- Personnel working on the maintenance of the generator shall stand on a dry wooden platform or an insulated mat, and his/her shoes shall be dry.
- Do not leave the cables lying on the floor of the generator room.
- Use separate ducts or pipes for power wiring, fuel and water pipes.
- Use separate ducts or pipes for AC and DC wiring.
- Make sure that the device is grounded properly.
- Disconnect battery and battery charging connections to prevent inadvertent operation of the generator when you shall apply maintenance of generator with automatic control. Cut off the AC supply of the battery charger before disconnecting the battery. Inadvertent operation of the generator while working on the generator causes injuries to the personnel or deaths.
- Do not unlock electrical locks.
- Electrical connections shall be made by qualified and appropriately trained technicians. Check that all cable connections are made properly.
- Do not perform maintenance and/or repairs on live equipment.

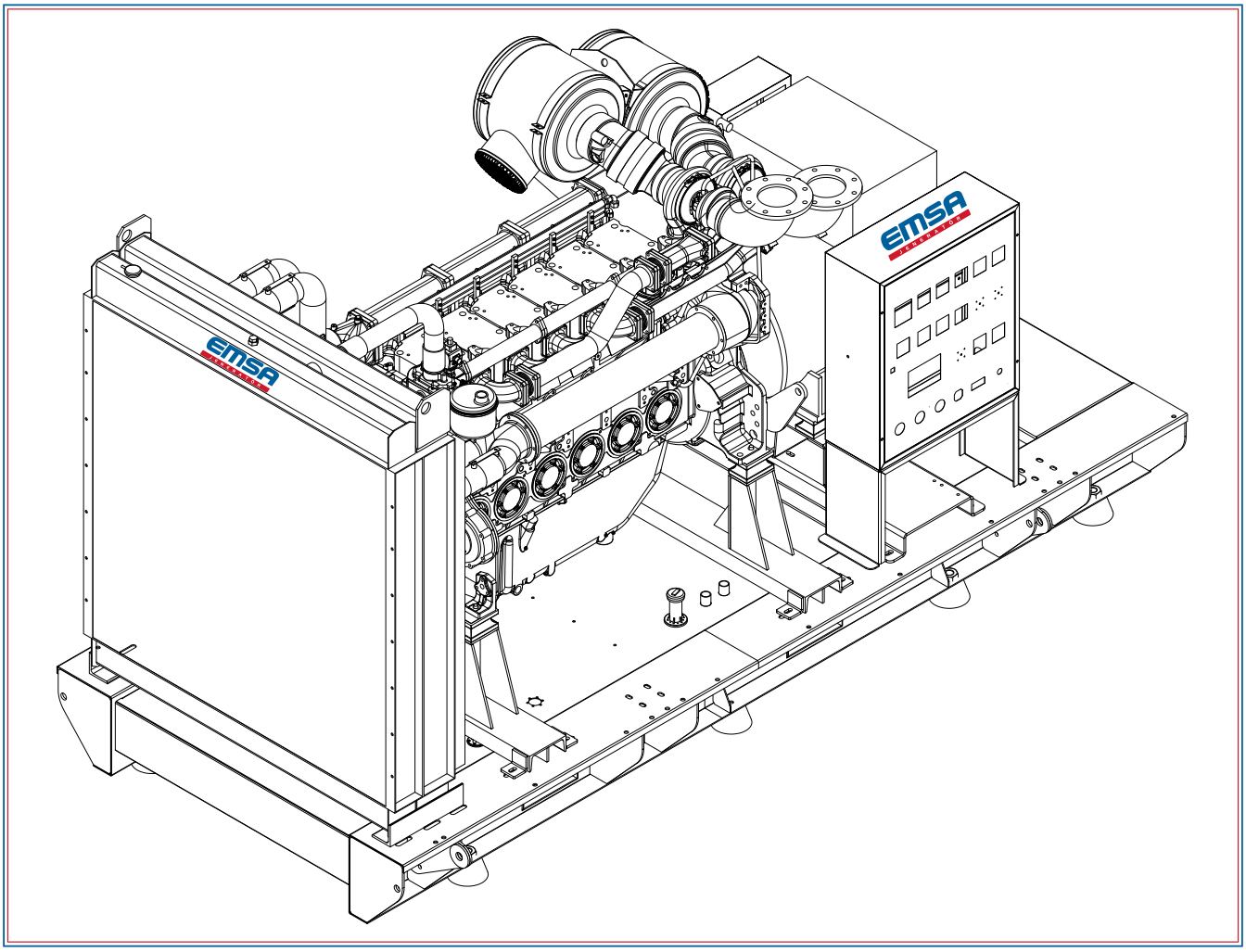
WATER

- Water or humidity contacting especially live parts such the panel or the alternator of the generator will cause electrical arcs. And this may damage the generator or cause injuries that may lead to the death of the personnel.
- Do not operate the generator in case of excessive humidity in the environment where the generator is placed.
- Inform the authorized service. Only the authorized service may operate the generator after taking necessary precautions and removing the humidity from the environment.

COOLANT AND FUEL

- Do not operate the block water heater when there is no water inside the radiator.
- Coolant boils at higher temperatures than water while under pressure. Do not open the radiator cap while the engine is running.
- Open the radiator in a controlled way after the diesel engine has been cooled.
- Do not use copper pipes between the fuel tank and the diesel engine.
- Use black steel pipes for fuel pipes.
- Prefer fuel hose for flexible connections.

3 GENERAL DESCRIPTION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GENERAL DESCRIPTION

DESCRIPTION AND EXPLANATION OF THE GENERATOR

Emsa Generator is designed as a whole to provide high quality and confidence. **Figure-2** and **Figure-2a** show main parts of a typical generator. However, each generator differs in some ways as per the configuration and size of its main parts. This section describes parts of the generator set briefly. Detailed information is provided in the next sections of this book. Each generator has a plate of its own (Figure-1). This plate contains information defining the generator and its operating characteristics. These are information such as model number, serial number, alternator voltage and frequency, output power in kVA, weight and year of manufacture. Model and serial numbers define the specific generator and they are required for the warranty operations and when service or spare parts required.

DIESEL ENGINE

Diesel engine driving the generator is selected as it is specifically manufactured for generators and as it is reliable. Engine is a 4-stroke industrial heavy-duty type engine and it is provided with all accessories to provide reliable power.

Exchangeable dry-type air filter, mechanical or electronic engine speed control governor are some of these accessories.

ENGINE ELECTRICAL SYSTEM

Engine electrical system is a 24 or 12 V D.C. system with negative ground. This system consists of the electrical starter, battery and battery charging alternator. One battery for 12 V electrical system, and two batteries of maintenance-free or less maintenance type are provided for 24 V electrical system. Other types of batteries may also be provided if required. Batteries are described in detail in section 4 of the manual.

COOLING SYSTEM

Engine cooling system is either air cooled or water cooled. Air cooled system includes a high fan that provides cool air to the inside of the engine in order to cool the engine.

Water cooled system consists of the radiator, fan, circulation pump and thermostat.

An internal fan to cool alternator coils is available in the alternator.

ALTERNATOR

Output voltage and power of the generator is generated by a cage protected, self-excited, self-regulated, brushless alternator confirming with IP 21-23 protection standard (protected against particles and dripping). A terminal box made of steel plate is installed on the alternator.

FUEL TANK AND CHASSIS

Engine and alternator are installed on a steel chassis. There is a fuel tank available inside the chassis. A separate fuel tank may be provided for high power generators or as per the request of the customer.

VIBRATION ISOLATORS

Vibration insulators are used to reduce the vibration of the engine and to prevent transfer of vibration to the floor where the generator is placed. These insulators are placed between the engine and alternator legs and the chassis. Special insulators to be installed between the chassis and the floor are provided with the generator. It shall be installed while the generator is placed on the installation area.

MUFFLER AND EXHAUST SYSTEM

Exhaust muffler is installed on the exhaust outlet with the pipe equipment on generators with cabinets. It is provided separately on some models of generator with or without cabinet. It shall be installed so that gas leak is prevented before the commissioning of the generator.

Muffler and exhaust system reduces the noise generated by the engine and directs the exhaust gases for safe discharge.

CONTROL SYSTEM

Manual or automatic control system and panel placed on the generator to protect the generator from possible faults, and to control the output and operation of the generator. These systems are described in detail in section 6 of the manual.

GENERAL DESCRIPTION

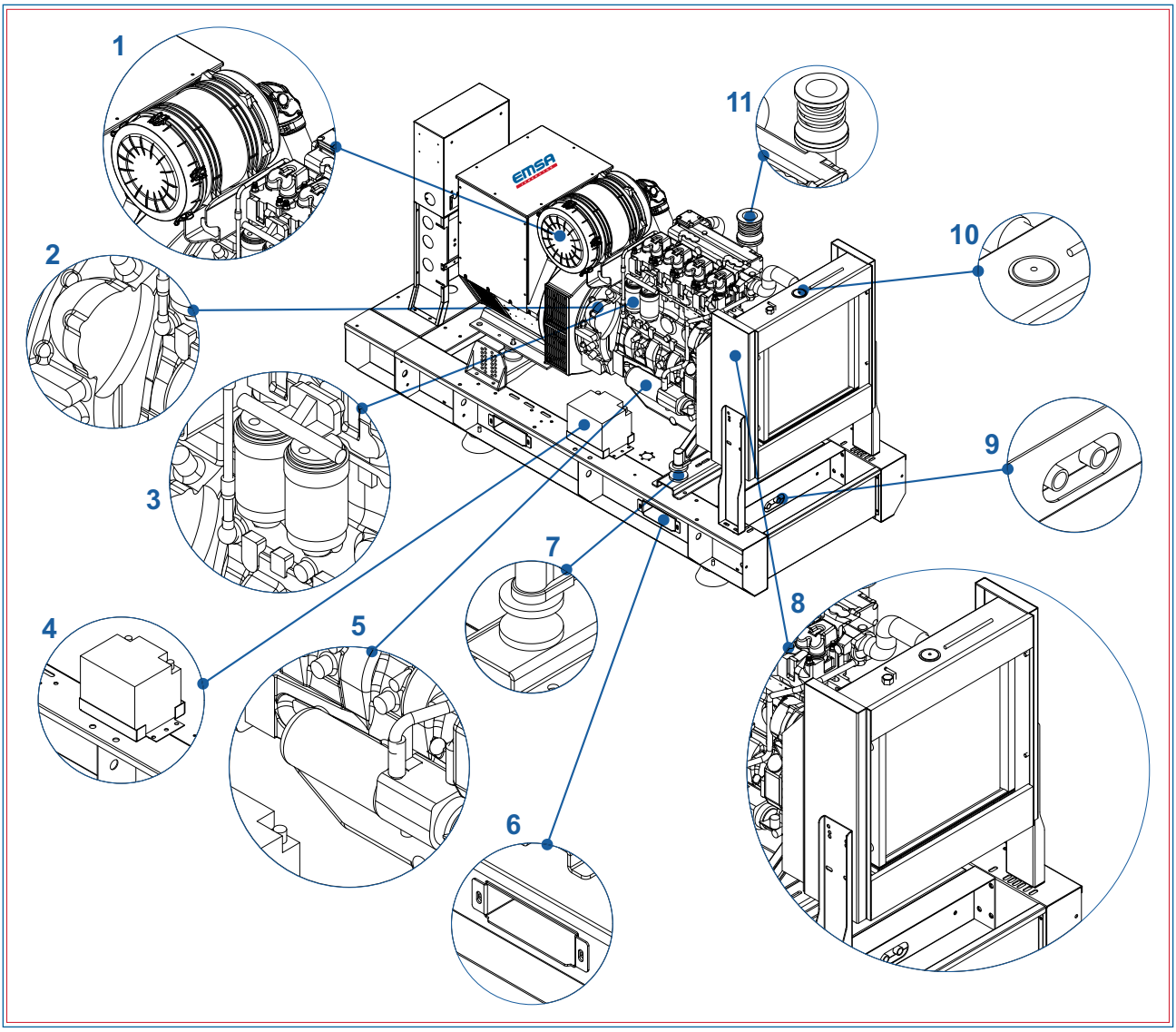


Figure 2 TYPICAL GENERATOR SET

1. AIR FILTER
2. STARTER
3. FUEL FILTER
4. BATTERY ASSEMBLY
5. OIL FILTER
6. LIFT TRUCK LIFTING POINT
7. VIBRATION DAMPENING MOUNT
8. RADIATOR ASSEMBLY
9. DRAIN VALVE
10. RADIATOR FILLING CAP
11. COMPENSATOR

GENERAL DESCRIPTION

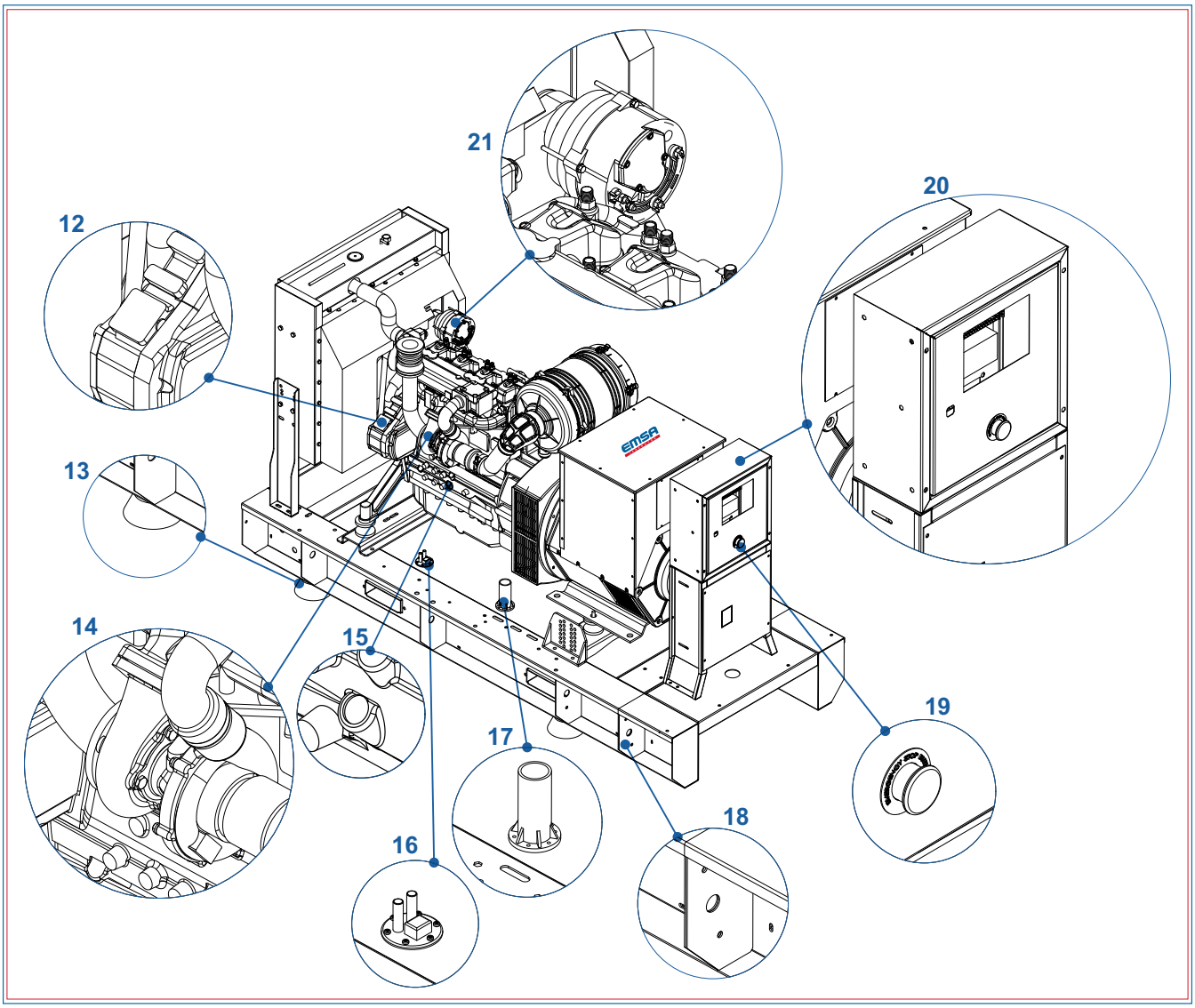
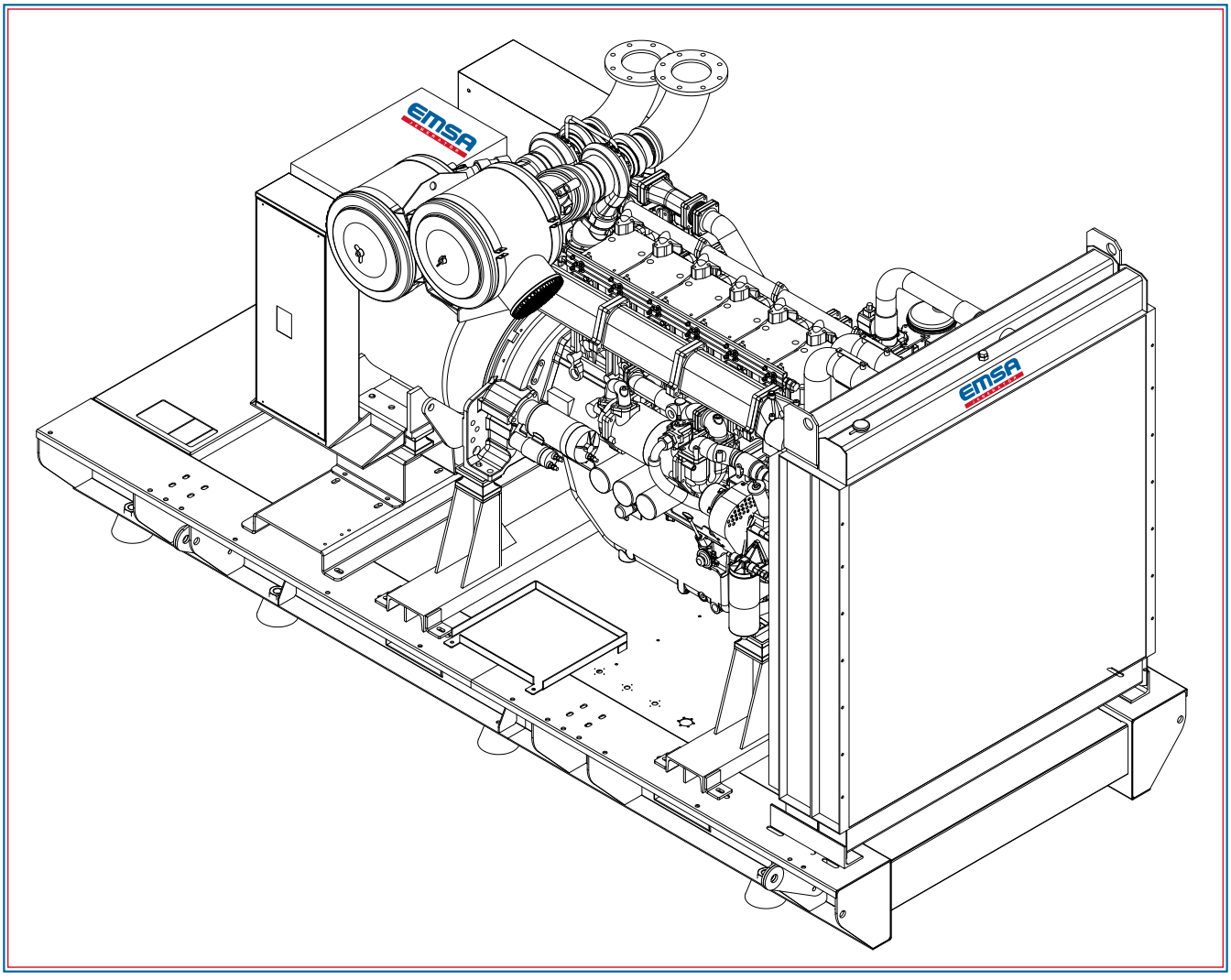


Figure 2a TYPICAL GENERATOR SET

12. OIL FILLER CAP
13. SEISMIC INSULATION BLOCK
14. TURBOCHARGER UNIT
15. OIL DIPSTICK
16. FUEL INTAKE RETURN AND ELECTRONIC FUEL LEVEL UNIT
17. REFUELLING
18. CRANE LIFTING POINT
19. EMERGENCY STOP BUTTON
20. GENERATOR CONTROL PANEL
21. CHARGE GENERATOR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4 LIFTING, PLACEMENT, INSTALLATION AND STORAGE

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

GENERAL

Generator placement may be planned when the dimensions of the generator are known. This section covers the required and important factors for effective and safe placement of the generator.

Following factors shall be considered for the selection of the placement area of the generator and required applications shall be performed.

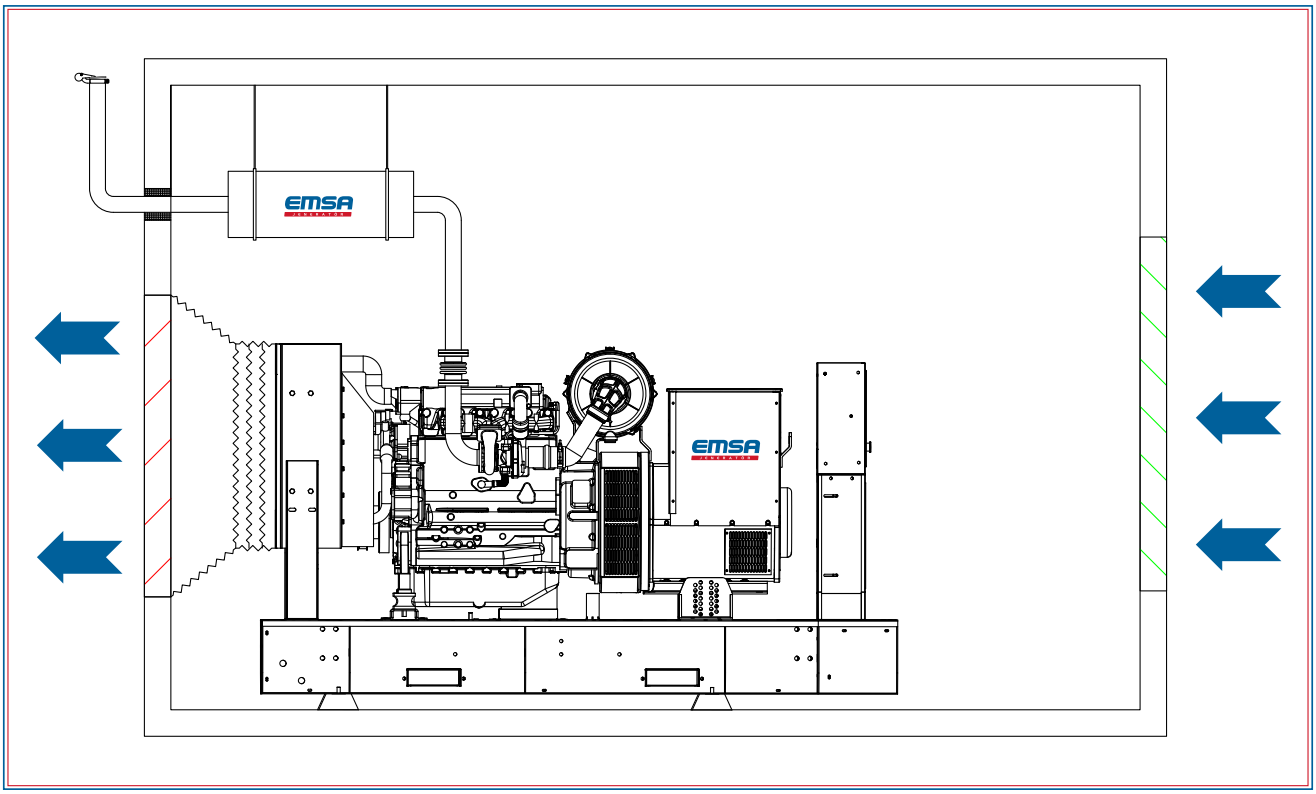


Figure 3

- Adequate Fresh Air Intake,
- Adequate Hot Air Exhaust,
- Proper Exhaust Gas Exhaust,
- Construction of Levelled Concrete Pedestal or Determination of Levelled Concrete Area
- Protection Against Adverse Weather Conditions (Sun, Drifting Rain and Snow, etc.)
- Protection Against Adverse Environmental Conditions (Excessive Dust, Humidity, Moisture, etc.)
- Providing A Clearance of Minimum 1 M. Around the Generator To Ensure Service Operations
- Designing of the Width of the Entrance Door For the Possibility of Removing the Generator From the Possible Installation Area

WARNING

Floor covering on the installation area shall be selected so that it shall not allow occupational accident due to slipping and falling in case of oil leaks, etc.

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

GENERATOR WITH CANOPY

Transport and placement of the generator shall be facilitated significantly and installation costs shall be minimized when the generator is placed inside a cabinet. Cabinet protects the generator against operation by unauthorized persons and against external factors.

Selecting the generator with cabinet shall provide benefits in terms of noise and removal of negative environmental factors.

Generator set with cabinet shall be placed on a level ground. Generator with cabinet may be installed on a concrete and level ground easily.

Generator sets with cabinets shall always be placed outdoors. If the generator with cabinet is installed inside a room, cooling with adequate amount of fresh air shall be provided. Hot air and exhaust gases generated shall be discharged to open air by ducts/installation. Hot air discharge duct system and exhaust installation system shall be designed and applied so that they shall not affect the performance of the generator set.

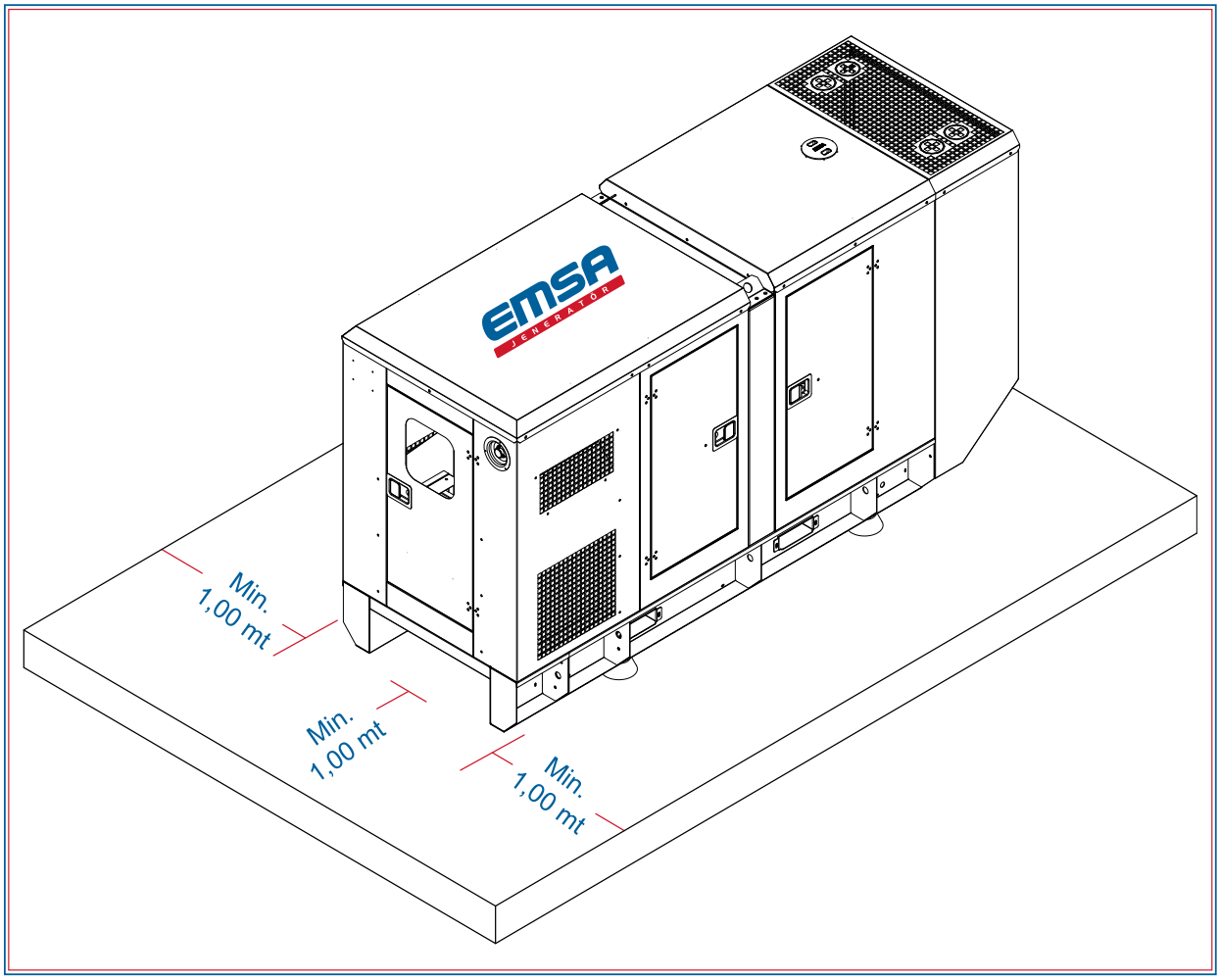


Figure 4

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

TRANSPORTATION OF THE GENERATOR

Generator chassis is specifically designed to facilitate the transportation of the generator. Incorrect lifting of the generator may cause serious damages on the parts.

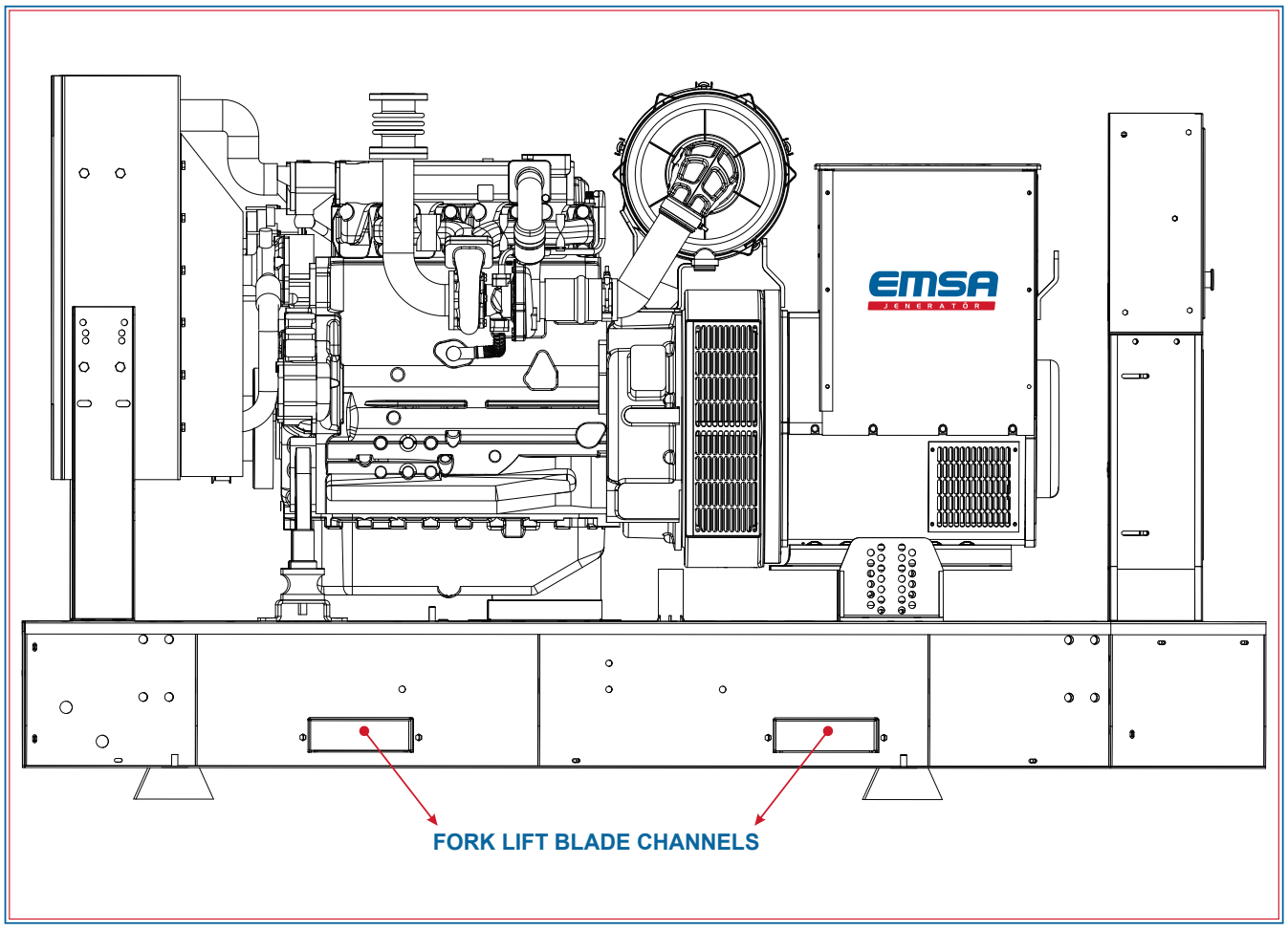


Figure 5

Generator may be lifted using the lift truck lifting points specifically designed on the chassis (Figure-5). It is recommended to drive in a wooden plank under the chassis for safety reasons to prevent damage to the chassis while transporting with a pallet jack.

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

LIFTING AND/OR LOWERING THE GENERATOR

Lifting points designed as two or four points or lifting points on the chassis may be used for lifting and installing the generator set with cabinet (Figure-6).

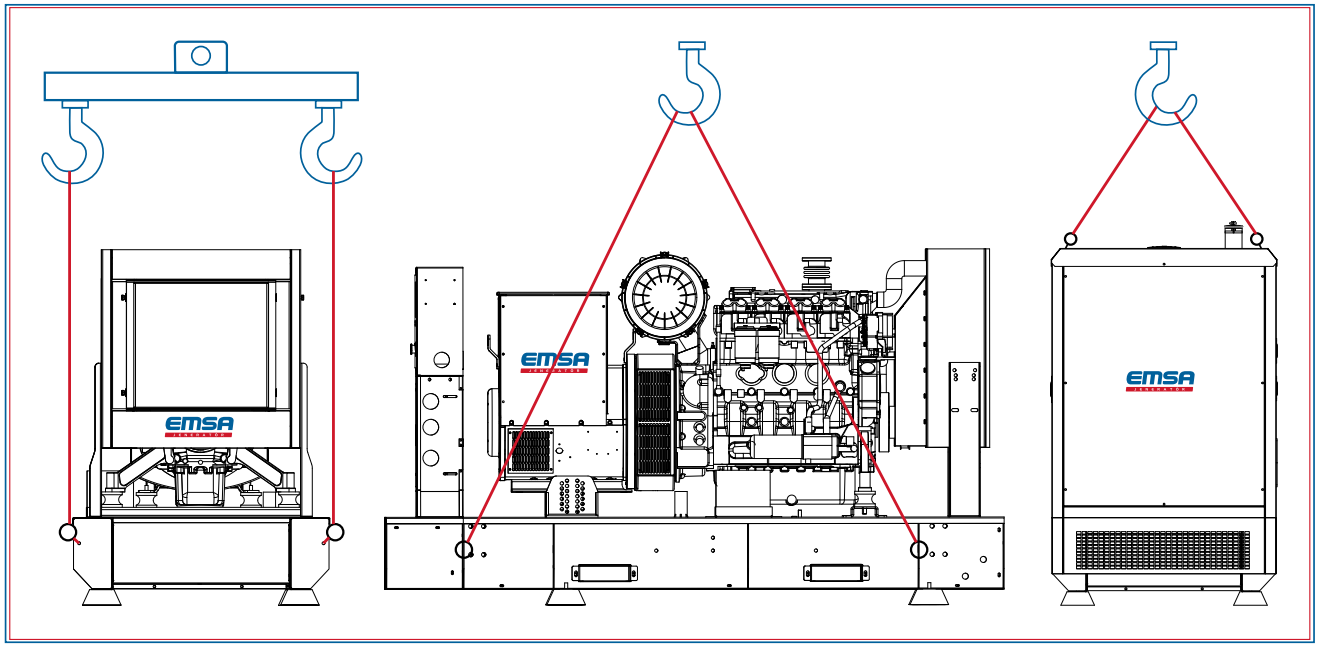


Figure-6 Lifting the generator with crane

A distributing lifting rod is required to prevent damage to the set while lifting from the chassis (Figure-6). This rod shall be placed on the weight center for vertical lifting.

⚠ WARNING

- Do not lift the generator using alternator or engine lifting lugs.
- Use lifting equipment proper for the weight of the generator.
- Keep staff away from the generator when the generator is lifted for transportation.
- Use lifting lug holes on the chassis or cabinet while lifting the generators with or without cabinets using a crane.
- Take required precautions to prevent damage to the parts where the steel rope or chain to be used to lift the generator set contacts the generator set.
- Guiding ropes shall be used to prevent slinging of the generator set lifted from the ground.
- Lower the generator set to a flat, level surface that has a capacity to bear its weight.
- Check the connection points for cracked welds or loose nuts and bolts before lifting.
- Do not lift or lower the generator under heavy wind conditions.

SELECTION OF THE LOCATION OF THE GENERATOR

Following factors shall be considered while selection the location of the generator:

- Adequate ventilation shall be provided.
- It shall be protected against conditions such as rain, snow, flood, direct sunlight, freezing cold or extreme hot conditions.
- It shall be protected against harmful material born on air such as dust, fibers, smoke, oil vapour, steam and engine exhaust smoke that causes wear or conductivity.
- Floor of the generator room shall be flat and have the properties to bear the total weight of the generator.
- It shall be protected against impact of objects that may fall down such as trees or poles.
- There shall be a minimum clearance of 1 meter around the generator and 2 meters over the generator for cooling, service and maintenance of the generator.
- A proper way where the generator may fit shall be available to carry the generator to the room.
- Entrance of unauthorized persons to the generator room shall be limited.

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

- If the generator shall be placed outdoors, it shall be placed inside a cabinet or a room. Also, using a cabinet shall be beneficent if the generator shall be operated indoors or outdoors temporarily. Basement installation plan of a typical generator set is given in Figure-9.
- Check the internal grounding conditions.
- Bury the grounding plate or rod to the nearest location to the generator.

INSTALLATION OF SOUNDPROOF CANOPY

Generator Foundation and Base

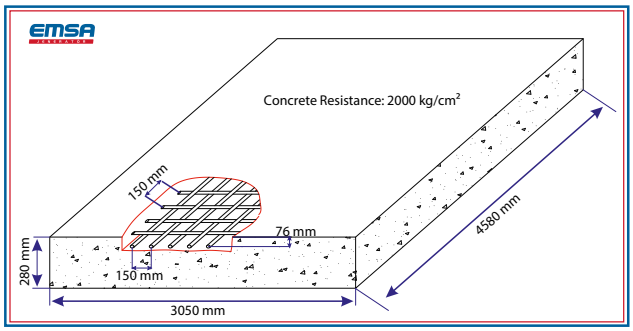
Special base concrete is recommended. However, a smooth concrete floor that may bear the weight of the generator (including oil, antifreeze and fuel) is adequate. This work (including seismic description) and designing of the base concrete shall be the responsibility of a civil engineer.

CONCRETE BASE

It is a good practice to place the generator set on a concrete base. Concrete base shall be designed to bear the weight of the generator set. It shall have a height of 200-300 mm. It is required to allow a space more than 250mm around the generator. Consult a specialist for further details.

Generator installation ground shall bear its static weight and any type of dynamic force caused by the operation of the engine.

If there may be water puddles on the selected ground from time to time, Concrete base shall be raised as per the extent of the risk.



Basic Functions of the Base Concrete

- Bear whole weight of the generator
- Isolating the vibration caused by the generator set

Vibration

Your generator set is equipped with rubber dampeners to minimize the vibration transferred to the ground.

These dampeners consist of a group between the engine/alternator leg and the chassis, and another group between the chassis and the ground.

Also, flexible areas shall be provided on connection points of the generator set such as air duct, exhaust installation and fuel installation. Thus, damages caused by vibration during initial operation, operation and stopping shall be prevented.

Ground

Generator may be installed directly on concrete ground. However, provision of a raised concrete on the area where the generator chassis will stand on shall facilitate servicing.

Improper and weak concrete base may cause undesired vibration.

Inlet-Outlet Noise Cancelling Barriers and Shutters

Inlet-outlet noise cancelling barriers shall be installed on the wall as required by the technique. Shutters installed in front of the barriers shall provide a low resistance in the entrance of air. Therefore, a minimum of 50% air flow area shall be provided. Noise level at a distance of 1m with noise barriers shall be 85 dBA. Thickness of noise barriers shall be increased to lower the noise level more. A wire cage shall be provided to prevent entrance of birds and small animals inside the shutters.

COMBUSTION AIR INTAKE

Engine combustion air shall be clean and cool as much as possible. Combustion air is drawn from the environment of the generator by means of the air filter installed on the engine. However, air around the generator may not be proper due to conditions such as dust, dirt and temperatures. In such a case, it is possible to connect an air intake duct. This duct provides clean air to the air filter on the engine from another environment or from another room.

COOLING AND VENTILATION

Engine and alternator disperse heat and cause increase in the ambient temperature. And increased temperature affects operation of the generator negatively. Thus, adequate ventilation shall be provided to keep the engine and the alternator cool. Air flow shall be as shown in Figure 7. Air shall enter the generator from the alternator side, it shall pass over the engine and through the radiator and leave the room through a bellow-type flexible canvas. If no canvas is used to discharge hot air from the room, it would decrease the effectiveness of the cooling by dispersing hot air in the generator room.

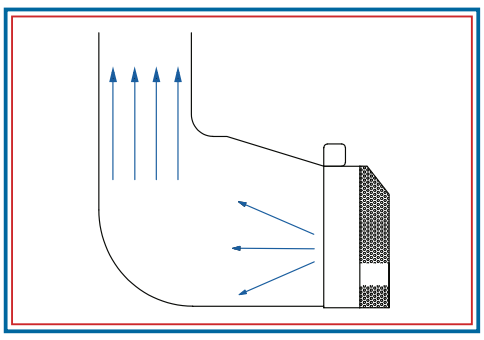


Figure-7 Direction of air discharged from the radiator with air ducts

Avoid making sharp corners on radiator hot air discharge duct or flue (Figure-8). It shall be arranged to direct the air discharged (Figure-7).

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

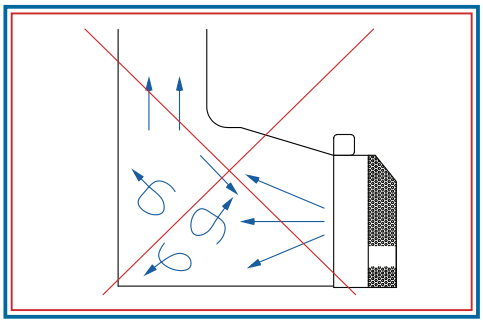


Figure-8 Weak ventilation mechanism

Air entrance and exit windows shall have adequate dimensions to facilitate the entrance and exit of air to/from the room. Roughly calculated, air entrance and exit windows shall have a dimension that is 1.5 times the radiator area. Air entrance and exit windows shall have shutters to protect the generator from weather conditions. These shutters may be fixed, but it shall be preferred that they are movable for cold climates. Shutters may be closed when the generator is not operated. Thus hot air that facilitate initial operation and loading shall be kept inside the room. If the shutters inside a generator room with automatic control system are movable, these may be moved automatically. Thus, it may be provided that shutters are opened immediately when engine is started and that shutters are closed when the engine is stopped.

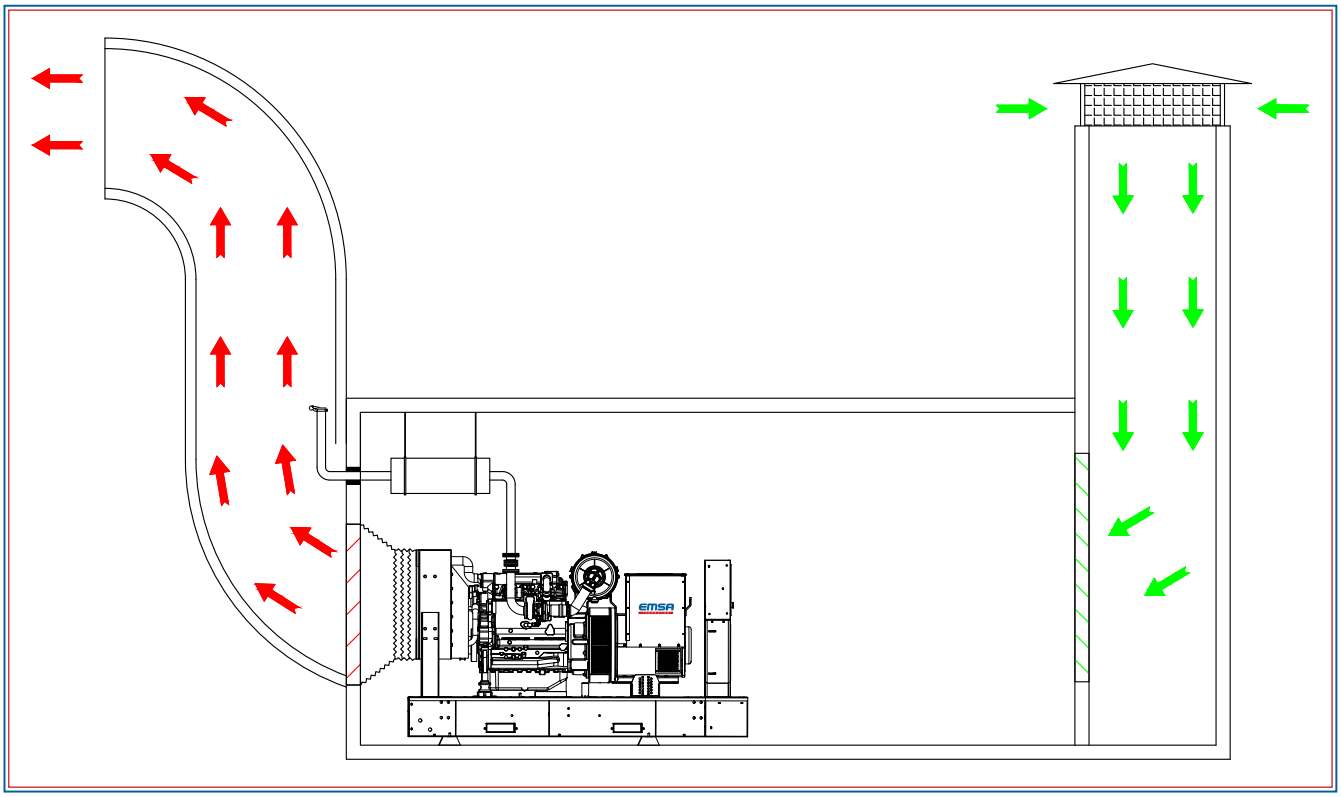


Figure-9 Basement installation plan of a typical generator set

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

ROOM INSTALLATION DIMENSIONS FOR A GENERATOR WITHOUT CABINET

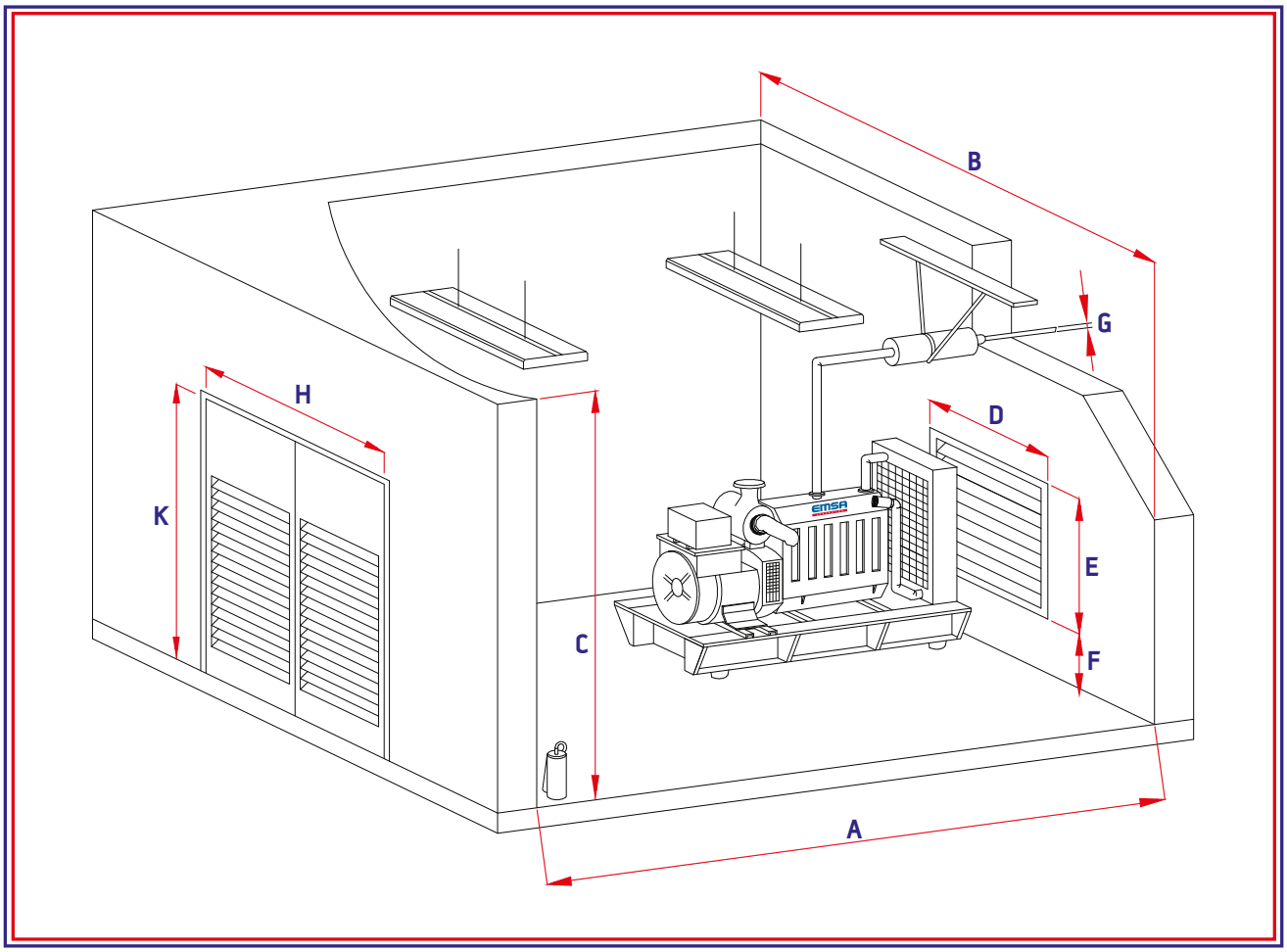


Figure-10 Level room installation plan of a typical generator set

MODEL	ROOM DIMENSIONS (mm)			HOT AIR EXIT AREA DIMENSIONS (mm)			MUFFLER EXIT DIAMETER (mm)	DOOR DIMENSIONS (mm)	
	WIDTH (B)	LENGTH (A)	HEIGHT (C)	(D)	(E)	(F)	(G)	(H)	(K)
E KB XX 0010	2900	3100	2500	1000	1000	350	50	2000	2400
E KB XX 0017	2900	3100	2500	1000	1000	350	50	2000	2400
E KB XX 0022	2900	3100	2500	1000	1000	350	50	2000	2400
E RC XX 0013	2900	3100	2500	1000	1000	350	50	2000	2400
E RC XX 0017	2900	3100	2500	1000	1000	350	50	2000	2400
E YD XX 0022	2900	3100	2500	1000	1000	350	50	2000	2400
E YD XX 0030	2900	3100	2500	1000	1000	350	50	2000	2400
E PR XX 0010	2900	3100	2500	1000	1000	350	50	2000	2400
E PR XX 0015	2900	3100	2500	1000	1000	350	50	2000	2400

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

MODEL	ROOM DIMENSIONS (mm)			HOT AIR EXIT AREA DIMENSIONS (mm)			MUFFLER EXIT DIAMETER (mm)	DOOR DIMENSIONS (mm)	
	WIDTH (B)	LENGTH (A)	HEIGHT (C)	(D)	(E)	(F)	(G)	(H)	(K)
E PR XX 0023	2900	3100	2500	1000	1000	350	50	2000	2400
E KB XX 0030	2900	3100	2500	1000	1000	350	50	2000	2400
E DZ XX 0040	3000	4000	2500	1200	1200	300	70	2000	2400
E DZ XX 0060	3000	4000	2500	1200	1200	300	70	2000	2400
E DZ XX 0072	3000	4000	2500	1200	1200	300	70	2000	2400
E DZ XX 0082	3000	4000	2500	1200	1200	300	70	2000	2400
E DZ XX 0110	3000	4000	2500	1200	1200	300	70	2000	2000
E RC XX 0035	3000	4000	2500	1200	1200	300	70	2000	2400
E RC XX 0050	3000	4000	2500	1200	1200	300	70	2000	2400
E RC XX 0070	3000	4000	2500	1200	1200	300	70	2000	2400
E RC XX 0082	3000	4000	2500	1200	1200	300	70	2000	2400
E PR XX 0033	3000	4000	2500	1200	1200	300	70	2000	2400
E PR XX 0050	3000	4000	2500	1200	1200	300	70	2000	2400
E PR XX 0066	3000	4000	2500	1200	1200	300	70	2000	2400
E PR XX 0072	3000	4000	2500	1200	1200	300	70	2000	2400
E PR XX 0088	3000	4000	2500	1200	1200	300	70	2000	2400
E PR XX 0112	3000	4000	2500	1200	1200	300	70	2000	2400
E DZ XX 0150	3200	4500	2500	1200	1200	350	70	2000	2400
E DZ XX 0175	3200	4500	2500	1200	1200	350	70	2000	2400
E DZ XX 0220	3200	4500	2500	1200	1200	350	70	2000	2400
E RC XX 0110	3200	4500	2500	1200	1200	350	70	2000	2400
E RC XX 0125	3200	4500	2500	1200	1200	350	70	2000	2400
E RC XX 0150	3200	4500	2500	1200	1200	350	70	2000	2400
E RC XX 0175	3200	4500	2500	1200	1200	350	70	2000	2400
E PR XX 0150	3200	4500	2500	1200	1200	350	70	2000	2400
E PR XX 0165	3200	4500	2500	1200	1200	350	70	2000	2400
E PR XX 0200	3200	4500	2500	1200	1200	350	70	2000	2400
E PR XX 0220	3200	4500	2500	1200	1200	350	70	2000	2400
E BD XX 0275	3500	4500	3000	1500	1500	400	100	2000	2400
E BD XX 0330	3500	4500	3000	1500	1500	400	100	2000	2400
E BD XX 0360	3500	4500	3000	1500	1500	400	100	2000	2400
E SD XX 0220	3500	4500	3000	1500	1500	400	100	2000	2400
E SD XX 0285	3500	4500	3000	1500	1500	400	100	2000	2400
E SD XX 0330	3500	4500	3000	1500	1500	400	100	2000	2400
E PR XX 0250	3500	4500	3000	1500	1500	400	100	2000	2400
E PR XX 0275	3500	4500	3000	1500	1500	400	100	2000	2400

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

MODEL	ROOM DIMENSIONS (mm)			HOT AIR EXIT AREA DIMENSIONS (mm)			MUFFLER EXIT DIAMETER (mm)	DOOR DIMENSIONS (mm)	
	WIDTH (B)	LENGTH (A)	HEIGHT (C)	(D)	(E)	(F)	(G)	(H)	(K)
E PR XX 0300	3500	4500	3000	1500	1500	400	100	2000	2400
E PR XX 0330	3500	4500	3000	1500	1500	400	100	2000	2400
E DT XX 0360	4000	4500	3000	1500	1650	350	120	2500	2500
E DT XX 0400	4000	4500	3000	1500	1650	350	120	2500	2500
E DT XX 0430	4000	4500	3000	1500	1650	350	120	2500	2500
E DT XX 0460	4000	4500	3000	1500	1650	350	120	2500	2500
E DT XX 0525	4000	4500	3000	1500	1650	350	120	2500	2500
E DT XX 0550	4000	4500	3000	1500	1650	350	120	2500	2800
E DT XX 0575	4000	4500	3000	1650	1650	350	120	2500	2800
E DT XX 0615	4000	4500	3000	1650	1650	350	120	2500	2800
E DT XX 0640	4000	4500	3000	1650	1650	350	120	2500	2800
E DT XX 0675	4000	4500	3000	1650	1650	350	120	2500	2800
E DT XX 0700	4000	4500	3000	1650	1650	350	120	2500	2800
E DT XX 0825	4500	4500	3000	1800	1800	350	120	3000	3000
E SD XX 0385	4000	4500	3000	1650	1650	350	120	2500	2800
E SD XX 0460	4000	4500	3000	1650	1650	350	120	2500	2800
E SD XX 0515	4000	4500	3000	1650	1650	350	120	2500	2800
E SD XX 0570	4000	4500	3000	1650	1650	350	120	2500	2800
E SD XX 0640	4000	4500	3000	1650	1650	350	120	2500	2800
E SD XX 0715	4000	4500	3000	1650	1650	350	120	2500	2800
E SD XX 0825	4500	4500	3500	1800	1800	350	120	3000	3000
E SD XX 0950	4500	4500	3500	1800	1800	350	120	3000	3000
E SD XX 1050	4500	4500	3500	1800	1800	350	120	3000	3000
E PR XX 0400/ E PR XX 0550	4000	4500	3500	1450	1450	350	120	2500	3000
E PR XX 0630/ E PR XX 0700	4000	4500	3500	1500	1500	350	200	2500	3000
E PR XX 0825	1900	6400	3500	1750	1750	300	200	3000	3000
E PR XX 0900	1900	6400	3500	1750	1750	300	200	3000	3000
E PR XX 1002	2250	7200	3500	2000	2000	400	200	3000	3000
E PR XX 1125	2250	7200	3250	2000	2000	400	200	3000	3000
E PR XX 1125	2160	5060	2110	2000	2000	400	200	3000	3000

WARNING

Models, specifications (capacity, weight, dimensions, etc.) and visuals of all products in this manual may differ based on the project.

EMSA Jeneratör reserves the right to make changes on all information without prior notice.

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

EXHAUST

Engine exhaust system is intended to direct the exhaust smoke to prevent risks or disturbances, and to reduce the noise. A proper exhaust muffler shall be installed to the exhaust pipe to reduce the engine noise level.

⚠ WARNING

- Engine exhaust gases are dangerous to inhale. Exhaust gases of all generators in confined places shall be discharged with sealed pipes as per the standards.
- Keep hot exhaust muffler and exhaust pipe away from flammable material and ensure that they are secure for the safety of the staff.
- It shall be ensured that back pressure does not exceed the back pressure value allowed by the manufacturer of the engine while designing the exhaust system. Excessive back pressure may cause damage to the engine. Exhaust pipes shall be short and straight as much as possible to reduce back pressure.
- Any required elbow shall have a curve with a radius that is 1.5 times the pipe inner diameter. It shall be proper to use pipes with diameters 1 inches wider at every 6 meters or every 3 elbows for reducing the back pressure.
- To prevent that engine vibration is transferred to the exhaust pipe system and the building and to allow for the expansion due to heating, a flexible connection shall be used between the exhaust manifold and exhaust pipe system.
- Weight of the exhaust pipes shall be supported by structures around (especially by the ceiling) to prevent weight being imposed on the engine manifold or the turbocharger outlet. Weight of the exhaust system shall be born on the building. Tensioning elements may be used for this purpose.
- Exhaust system components installed inside the generator room shall be insulated to reduce the noise level and the temperature dispersed. Muffler and exhaust pipes shall be placed away from flammable materials.
- To prevent ingress of rain to the open exhaust exit, flap type rain covers with counterweights may be used in different applications.
- Each generator shall have an exhaust system of its own. It is not possible to combine exhausts of generators using a single exhaust pipe.
- Exhaust shall be made of metal pipe.

FUEL SYSTEM

Fuel supply to diesel engine may be provided as follows.

1. Directly from the fuel tank on its chassis
2. From the prismatic or cylindrical external fuel tank outside the chassis

One of the most important issues for diesel engine is using clean fuel that does not contain foreign material. Dirt in the fuel causes damage to the fuel injection system. Water inside the fuel causes rusting or corrosion of some parts in the fuel system.

SPECIFICATIONS OF THE FUEL

Viscosity: 1.3 – 5.8 centistrokes 1.3 – 5.8 mm for each s. at 40 °C

Cetane Number: Min. 40 over 0 °C; and over 40 °C min. 45

Sulphur Content: Shall not exceed 0.5 % volumetrically.

Water and Sediment: Shall not exceed 0.05 % volumetrically

Density: 0.816 – 0.876 g/cc 15 °C

Acid Content: Shall not exceed 0.1 MgKOH at every 100 ml

Viscosity: 3100 gr or more

ASTM No. 2 diesel fuel is recommended to be used as fuel.

⚠ WARNING

- Fuel storage systems of the generators shall comply with the standards.
- Do not allow anything that may cause fires such as flames, sparks, smoking beside the fuel. Use warning signs.

DAILY FUEL TANK:

Daily fuel tank keeps the daily fuel required by the generator ready for use. Thus, daily fuel tank shall be inside the generator room. Steel chassis of the generator is manufactured as a tank-chassis to contain the daily fuel tank **(except for powers over 900 kVA or special applications).**

Note: Please contact our authorized sales representatives for greater power requirements or for special applications.

MAIN FUEL TANK:

A main fuel tank may be connected in addition to the daily fuel tank to operate the generator for a longer time. Main fuel tank shall be placed in a proper place outside the room to facilitate the refuelling and maintenance operations. However, main fuel tank shall not be kept at extreme cold conditions as fuel flow shall be limited with the increased viscosity in cold environments. An air escape outlet (ventilation) shall be put on the fuel tank to reduce the air pressure created during vaporization, expansion and refuelling. This air escape outlet also prevents creation of vacuum inside the tank during the consumption of the fuel. Bottom of the fuel tank shall be inclined. This prevents water and sediment collection at a single point, thus damage to the fuel system. A drain valve shall be provided on the bottom point of the fuel tank to drain water and sediments.

FUEL LINE:

Black steel pipes resistant against environmental conditions or materials proper for fuel such as flexible hoses may be used for fuel piping. Flexible fuel hoses shall be connected between the engine and fuel tank to avoid leaks and damages caused by engine vibration. Fuel supply line shall be taken from at least 10-50 mm above the bottom of the fuel tank and from a point away from the fuel return line.

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

WARNING

- Use black steel pipes or flexible connection elements for fuel system.
- Do not fill the fuel tanks full. Keep at least 10% of the fuel tank capacity empty to allow expansion of fuel at high ambient temperatures.
- Natural flow due to gravity from fuel pipes to the engine shall not be present when the engine is stopped.
- Fuel temperature is a critical factor for proper running of the engine. Engine output power is reduced as it a fuel temperature above 71°C reduces the heat amount per volume due to expansion.
- Connection pipe from main fuel tank to daily fuel tank shall be bigger than or equal in size to the pipe of the daily fuel tank.
- Usage of fuel-water seperator filter in fuel system lines shall protect injectors and the fuel pump.
- Main fuel tank may be above or under the daily fuel tank.

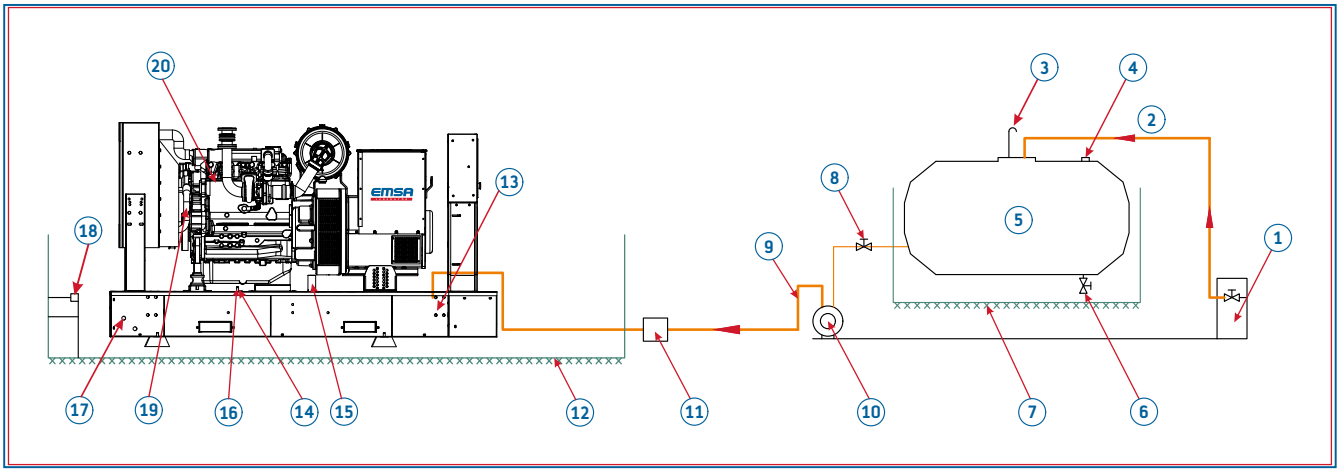


Figure-11 Installation of general fuel piping from main fuel tank to daily fuel tank

1. Filling cabinet
2. Filling line to the main fuel tank
3. Vent
4. Main fuel tank level indicator
5. Main fuel tank
6. Drain valve
7. Fuel-fluid collection tank
8. Exit valve
9. Supply line to the daily fuel tank
10. Electric fuel transfer pump
11. Electric fuel cut-off valve
12. Fuel-fluid collection tank
13. Daily fuel tank (inside the chassis)
14. Fuel level control switches
15. Manual filling
16. Fuel level indicator
17. Drain valve
18. Fuel leak alarm (optional)
19. Engine fuel filter
20. Engine fuel pump

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

FUEL PIPE RECOMMENDATIONS

Generator Power Stand-By (kVA)	Maximum Length of the Fuel Pipe (m)	Maximum Vertical Height (m)	Maximum Number of Pipe Fittings	Recommended Pipe Diameter (inch)
0-800	6	0.9	6	1 “
800-1500	6	0.9	6	1 1/2”
1500-2200	6	0.9	6	2”

Table-1 Table for recommended fuel installation pipe diameters

Positive static fuel pressure shall be applied on the fuel pump intake for fuel tank applications that shall be installed as per the standby generator assemblies.

Check valves shall be used if the fuel tank height is 2 m above the centre of the crankshaft. Maximum fuel level cannot exceed 2 m above the centre of the crankshaft and minimum fuel level shall be 15 cm above the fuel injection pump. Engine damage may occur if fuel level exceeds 2 m. Proper fuel pressure cannot be provided in the intake of the fuel pump if fuel level is less than 15 cm. In other words, fuel level in the tank shall not be above the injectors and it shall not be more than 180 cm below the fuel pump. (Figure-12a)

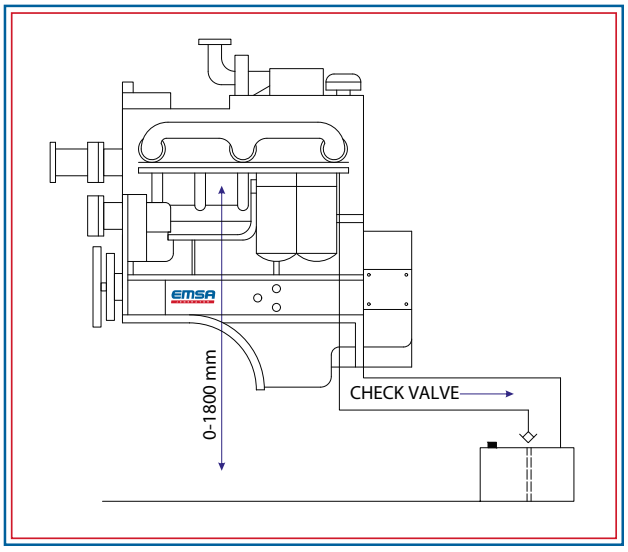


Figure-12a Typical fuel diagram with the fuel tank installed below the engine

If fuel tank is taken approximately 1.5 m above the injectors, 2 check valves (as in Figure-12b) shall be placed to protect the engine from hydraulic locking.

These valves have a protection capacity from 0 to 1.5 m. If the fuel tank shall be above 1.5 m, a float tank shall be provided. Tank installed away and at height is shown in (Figure-12c).

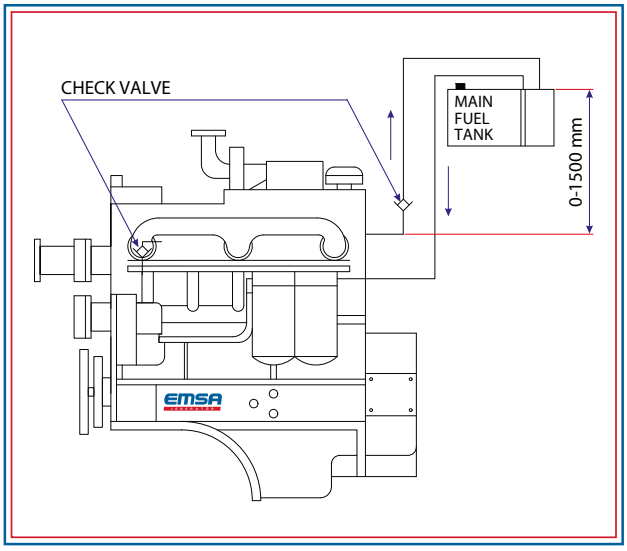


Figure-12b Fuel tank placed approximately above the fuel return and check valve connection

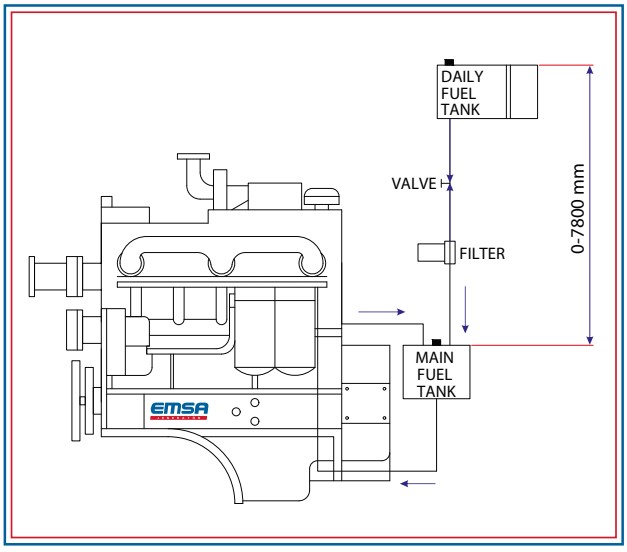


Figure-12c Elevated fuel tank and the float tank used

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

Tank installed away and under the engine level is shown in (Figure-12d).

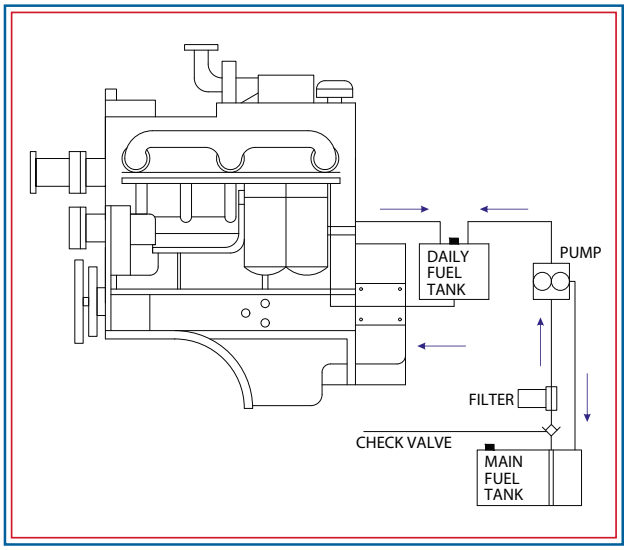


Figure-12d Fuel tank installed below 1500 mm

OIL AND ANTIFREEZE USED IN THE GENERATOR

Lubrication system of diesel engines is one of the most important parts of the engine. Correctly performed engine maintenance (oil replacement periods, filter replacement periods and provision of due care for the type of the oil used) increases the life of the engine and reduces operation costs.

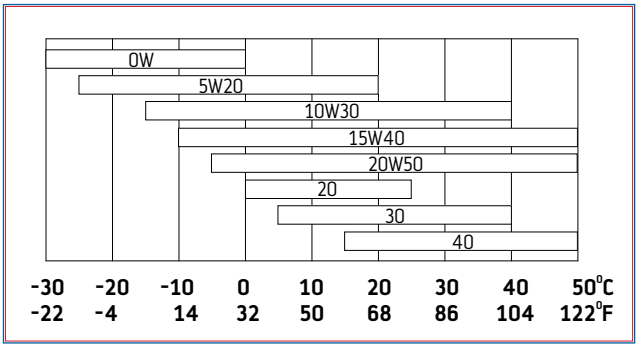
Recommended oil; 15W/40 Turbo Diesel

Antifreeze; Super 4 seasons

VISCOSITY-TEMPERATURE DIAGRAM:

You may check if the oil used is proper for the temperatures in your region from the chart below.

Antifreeze is not provided in the radiator of your generator in the factory. Add antifreeze with the ratio required by your regional conditions (50% in average) while adding water to your radiator. Using water with antifreeze in your engine whole year is important in terms of the service of life of your engine and its coolant pipes.



BATTERIES

MAINTENANCE TYPE BATTERIES:

WARNING

- Do not allow anything that may cause fires such as flames, sparks, smoking beside the batteries.
- Wear an apron, face mask and protective goggles resistant against acid while preparing the battery. Clean the affected area with ample amount of pressurized water immediately if the battery electrolyte spills on the skin or the cloth.
- Remove your jewellery such as bracelets, rings on your hands and wrists before using conducting tools on the battery.
- Connect the negative terminal last while connecting the battery; and disconnect the negative terminal first while disconnecting it.
- Adding water to the battery and maintenance of the battery shall be performed outdoors.
- Batteries shall be placed near the generator as much as possible. Placing the batteries away from the generator may cause voltage drops. And this reduced the starting capacities of the batteries.

ADDING ELECTROCLYTE TO THE BATTERY FOR THE FIRST TIME

- Remove the protective cover on battery covers.
- Remove air discharge covers.
- Fill the battery with battery electrolyte with a specific density of 1.280 at 20 °C up to 15 mm above the upper point of the plates. Battery and electrolyte temperature shall be above 10 °C.
- Keep the battery waiting for 15 minutes. Then boiling shall start in battery cells (compartments) and gas bubbles shall be observed on the surface of the electrolyte. Reinstall air discharge covers.
- Check the battery with a hydrometer after waiting for 15 minutes.
- Minimum charging period is 6 hours. Check the charge current and electrolyte level every 1 hour. It is charged if no change is observed after 1 hour.
- Check the electrolyte level 2 hours after the charging operation and add distilled water so that it shall be 10 mm above the plates.

BATTERY MAINTENANCE

- Keep the upper surface and terminals of the battery clean.
- Cover the battery terminals and connections with petroleum jelly carefully.
- Tighten the terminals securely.
- Check the electrolyte level regularly. Electrolyte level shall always be 10 mm above the plates.
- Regularly check for wear on the charging alternator belt and the tensioning of the belt.
- Ensure that battery is not discharged.

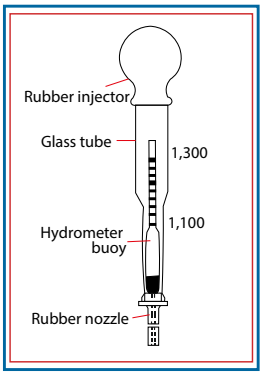
LIFTING, PLACEMENT, INSTALLATION AND STORAGE

TESTING THE BATTERY

- Visually check the battery before testing it.
- Oxidation occurs on battery terminals and connection points in time. Oxidation wears battery terminals and prevents charging. Remove the terminal and clean the oxidation with boiled water. Then connect it again and cover with petroleum jelly or grease.
- Do not allow loose connections.

HYDROMETER TEST

- Specific density of the sulphuric acid in the battery and the charge status may be measured using a hydrometer.
- Do not add distilled water if battery water level is reduced. Use pure water only.
- Keep the barrel part of the hydrometer upright and draw adequate amount of electrolyte upwards. It shall float freely in the tube. Reading shall be performed at eye level.



Evaluation is as follows:

1.270 1.280 specific density, fully charged

1.220 1.230 specific density, half charged

1.150 1.220 specific density, discharged

MAINTENANCE-FREE TYPE BATTERIES:

Make sure that the batteries are not discharged and electrical connections are made correctly. Batteries do not require any maintenance other than this.

ELECTRICAL CONNECTIONS:

Electrical connections and their maintenance shall only be performed by qualified and experienced authorized services.

⚠ WARNING

Make the electrical connections as per the relevant electrical codes and standards.

WIRING

- Electrical connections shall be performed with flexible wires due to the vibration on the generator.
- Wires shall be placed inside conduits and they shall have cross-sections and types proper for the generator output voltage and current.
- While deciding for the wire cross-section, tolerances for ambient temperature, placement method and proximity to the other wires shall be provided. Moreover, wires shall be selected as per TSE or VDE standards.
- It shall be checked very carefully if all connections are correct.
- As it is not possible to generate the harmonics or anticipate their amount in advance in the planning stage of the facility, neutral conductors shall either be dimensioned with high values or the cross-section of the neutral conductor shall at least be equal to the cross-section of the phase conductor.
- Another point that shall be considered during wire selection is that if loads with starting current are present (such as electrical motors) beside the distance between the load and the generator.

On low voltage networks, voltage may drop to undesired levels on the load side as voltage drop shall increase greatly while starting if the distance is very long. You may select a load wire with a better cross-section using the formula given below to prevent this.

$$\Delta u = \sqrt{3} \times L \times I \times (R \cos\phi + X \sin\phi)$$

Δu = Absolute voltage drop (Volt)

L = Line length (m)

I = Line current (A)

R = Cable resistance (ohm/m)

X = Cable reactance (ohm/m)

If the distance is short in low voltage networks;

If the voltage is known,

$$A = \frac{1{,}73.L.I.Cos\phi}{k.\Delta u}$$ formula

If the power is known,

$$A = \frac{L.P}{k.\Delta u.U}$$ formula may be used to select a load wire with proper cross-section.

A = Line cross-section (mm^2)

L = Line length (m)

I = Line current (A)

Δu = % voltage drop (It shall not exceed 3% for power lines.)

k = Conductivity (For copper, k=56).

P = Power (W)

U = Voltage between phased in the network (V)

PROTECTION:

Wires connected to the generator with the distribution system shall be protected with a circuit breaker that shall disconnect automatically in case of overload or short circuit.

LOADING:

It is very important to provide stable load to the generator while planning the distribution panel. If a load on a phase is much higher

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

than the load on other phases, this causes alternator coils overheat, destabilization of output voltage between phases and damage to the delicate three-phased (3-phased) devices connected to the system. No phase current shall exceed the nominal current of the generator. Available distribution system may be rearranged to ensure that these loading conditions are provided.

POWER FACTOR:

Generator provides the specified power and operates properly if the load power factor is from 0.8 to 1.0. Generator is overloaded if the load power factor is below 0.8. Power factor correction elements such as capacitors may be used to correct this power factor. However, in such a case, power factor correction elements shall be deactivated when generator is loaded. Exact power shall be determined by calculating both active and reactive powers while determining the generator power.

GROUNDING/CONDITIONS FOR GROUNDING:

Faults, damages that may occur on the insulation of electrical devices cause that the metal parts of the devices that are not related with the power system out of the main current circuit of the devices are placed under voltage. Sometimes, insulation is ruptured and causes these insulated parts are also placed under voltage as the device is exposed to rupture voltage when voltage level reaches excessive values. Grounding shall be performed to protect both human lives and the devices (Figure-14).

What is expected from a good grounding?

- That it is continuous and uninterrupted
- That it has the capacity to bear the fault currents
- That it has low impedance value to limit the voltage drop
- That ground dissipation resistance value is low
- That ground specific resistance is low.

Power companies have different grounding methods as per their network types. Thus, power companies around the world select the proper one for themselves amongst the TT, TN and IT systems for the transmission and distribution systems.

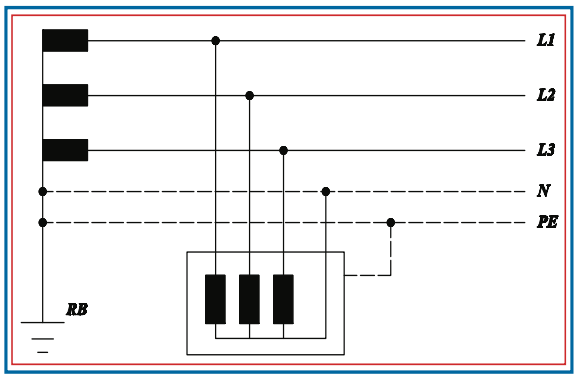


Figure-13 TN Type Network

TN type networks are the most common network types today. Star point of the network is grounded in such networks. Device bodies and metal parts are connected to the protective conductor PE. PE is also connected to the grounded part on the star point.

In case of phase-ground contact, voltage against ground values of PE or PEN protection lines and connected devices are increased. By keeping the value of these voltages, i.e. the RB resistance, below 2 ohms, it will be possible to obtain the desired value, in other words a value under the allowed contact voltage.

While creating a project for the grounding facility;

- Location of the grounding facility is determined.
- Measurements are performed to determine the ground specific resistance.
- Electrode type to be used in the grounding operation to be performed is determined.
- Short circuit current of the facility and the opening time of the protection elements to be connected to the system are determined.
- Dissipation resistance is calculated.
- Cross-section of grounding conductor is calculated.
- Selection made and values calculated are verified.
- Step and contact voltages are calculated and it is examined if the prospected system is suitable.

All conductors and connection points are inspected manually and visually before starting operation.

Grounding resistance Rt shall be < 4 ohm. If this value cannot be obtained, proper ground resistance shall be obtained by performing the operations above.

The most important issue while grounding is that the areas for the network ground and the ground for the generator shall have a distance of 20 m at least. This distance is required to prevent the grounding systems affecting each other.

And for the most common grounding systems performed with the grounding rods, the lengths of the grounding rods used and the distance between these rods are important. For grounding systems performed with more than one grounding rods, the distance between the points where these rods are driven in the ground shall be at least two times the length of a rod. For a grounding operation where a grounding rod with a length of 1.5 m is used, the other rod shall be driven at least 3 m away from the first rod.

Generator body shall always be grounded. Ground connection shall be flexible to prevent disconnections due to vibration. Grounding wires shall meet the standards and shall have a capacity to carry full load current at least.

LIFTING, PLACEMENT, INSTALLATION AND STORAGE

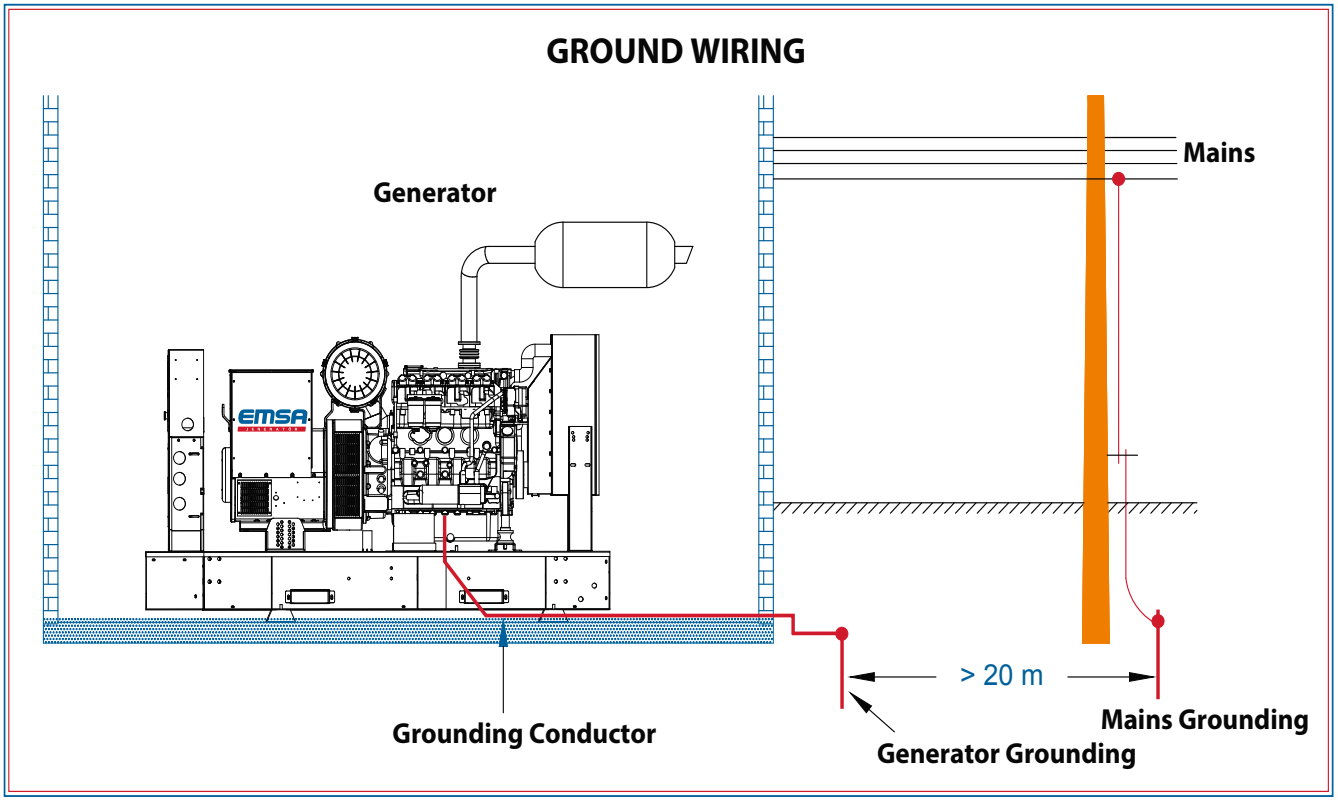


Figure-14

PARALLEL OPERATION:

Extra equipment shall be connected to operate a standard generator in parallel with other generators and the grid. Please contact our authorized sales representatives for such special applications.

INSULATION TEST:

An insulation test shall be performed when your generator is not operated for a long period of time. Test the insulation resistance of coils before operation when the generator is not operated for a long period of time. At this time, Automatic Voltage Regulator (AVR) connection and all control oriented connections shall be disconnected. And rotating diodes shall be short circuited or disconnected. A 500 V Megger or a similar measurement device may be used. Connect the Megger between the output terminal and ground (chassis). Insulation resistance against the ground shall be above 1 MΩ. Dry the alternator coils if the insulation resistance is below 1 MΩ.

Insulation test shall be performed by qualified and authorized services and personnel only.

NOISE ABSORBERS

It is getting more important to take the noise of the generators under control today. There are various equipment to take the noise of the generator under control.

Please contact our authorized sales representatives for such special applications.

⚠ WARNING

• Wear ear protectors while working in the generator area.

EXHAUST SILENCERS:

Exhaust silencer reduces the level of the noise generated by the engine.

CABINETS:

Soundproof canopies reduce the noise level of the generator.

OTHER NOISE SUPPRESSORS:

Other equipment such as noise shutters, fan silencers,

and noise absorbing walls may be used for generators indoors. These also reduce the noise level of the generator.

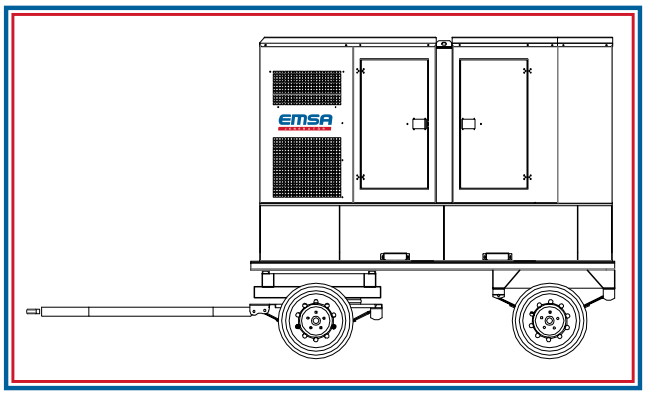
LIFTING, PLACEMENT, INSTALLATION AND STORAGE

TOWING THE GENERATORS WITH TRAILERS

PREPARATION FOR TOWING:

All connection elements on the truck and the generator with trailer shall be checked for loose nuts, bent metal, cracks, wear, etc.

Check the condition of all tires. Check if all flashers and headlamps work.



TOWING:

Remember that the weight of the trailer shall affect manoeuvres and stopping distance while towing the generator with trailer.

⚠ WARNING

- Follow all traffic rules, standards and other regulations while towing the generator with trailer. These rules also cover the required equipment and speed limits expressly specified in the regulations.
- Do not allow the personnel to ride on the mobile generator.
- Do not allow the personnel to stand on the draw bar or between the mobile generator and the truck.
- Avoid slopes and soft terrain and obstacles such as pits and stones.
- Ensure that the ground behind and below the mobile generator is clean before making a backwards manoeuvre.

PARKING:

Park the generator with trailer on a dry ground that may bear its weight. If it shall be parked on a slope, park diagonally on the slope and use chocks to prevent it from sliding downwards. Do not park on a ground with a slope over 15°.

STORAGE

Storage of engine and alternator for a long period of time may have adverse effects. These effects may be minimized by preparing and storing the generator properly. Take support required from authorized services for periods over 1 month.

STORAGE OF THE ENGINE:

An engine protection procedure that includes cleaning of the engine and using protective fluids may be applied. Contact the authorized service.

STORAGE OF THE ALTERNATOR:

Humidity builds up on the coils while the alternator is stored. Store the generator in a dry place to reduce this humidity. Heat the air to keep the coils dry if possible. Alternator that has not been used for a long period of time shall be taken through the insulation test before operation.

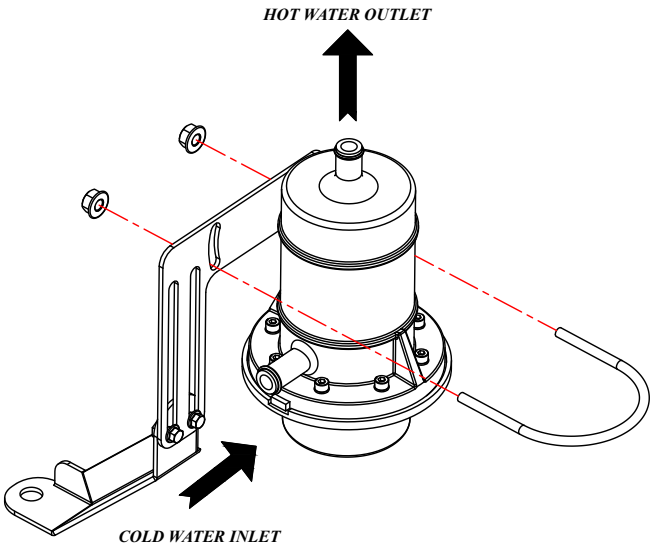
STORAGE OF THE BATTERY:

Battery shall be inspected every 8 weeks while it is stored, and it shall be fully charged if required. Automatically activating generators have charge rectifiers. This feature is optional for manual generators.

ENGINE BLOCK COOLANT HEATER

A block (jacket) coolant heater is used to start the engine quickly and have it take the load. Heater heats the block coolant of the engine when generator is not operated. Thus, heater shall be active in all seasons.

Automatically activating generators have block coolant heaters. This feature is optional for manual generators.



DIMENSIONS

Height (H)	Depth (D)	Weight
215 mm	135 mm	795 gr

5 DIESEL ENGINE MAINTENANCE

DIESEL ENGINE MAINTENANCE

A good maintenance schedule extends the service of the generator. What type of maintenance shall be applied on the generator at what period is given in the Periodical Maintenance Chart. Periodical Maintenance Chart is provided together with this manual for each generator. Maintenance and repair procedures shall only be performed by authorized services. In general, generator shall always be kept clean. Do not allow materials such as water, fuel and oil collect on and inside the generator. Keep the floor of the generator always clean.

BLEEDING THE FUEL SYSTEM

Loosen the nut on the outlet of supply pump marked with 1. Keep pumping the hand primer no.1 until fuel reaches nut no. 1. Complete the operation by tightening nut no. 1 when fuel reaches the nut.

Same operation may be performed by loosening the bolt on the fuel filter in some models (if applicable). This differ as per the engine.

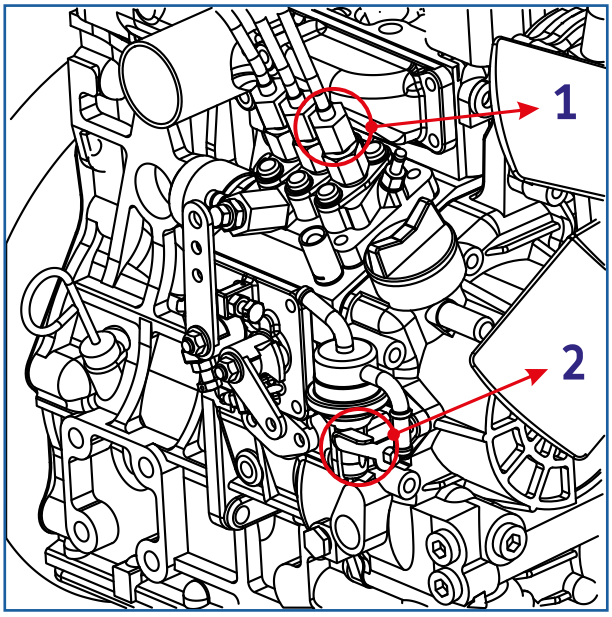


Figure-15

INSPECTION/ADJUSTMENT/REPLACEMENT OF CHARGE GENERATOR AND FAN BELTS

Inspection

Inspect belts for wear and cracks to maximize the engine performance. Replace belts that are worn or damaged.

For applications that require more than one drive belts, replace belts as paired sets. Replacing only one belt of a paired set shall cause the new belt to carry more load because the older belt is stretched. Additional load may cause the new belt to break.

If the belts are too loose, vibration may cause unnecessary wear on the belts and pulleys. Loose belts may slip enough to cause overheating.

Use a proper gauge to inspect the belt tension correctly.

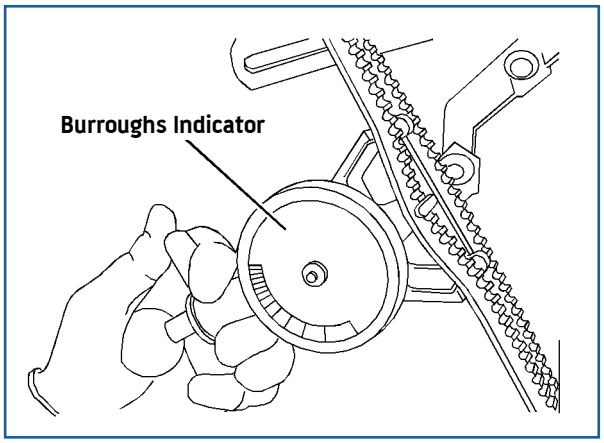


Figure-16a

Fit the gauge at the center of the longest free length and check the tension. Correct tension is 535 N (120 lb). If the belt tension is below 250 N (56 lb), set the belt to 535 N (120 lb).

If twin belts are installed, check and adjust the tension on both belts.

Adjustment

1. Loosen the pivot bolt of the charge generator.

2. Loosen the connecting bolt. Move the alternator in order to increase or decrease the belt tension. Tighten the charge generator pivot bolt and connecting bolt to 22 Nm (16 lb ft)(1).

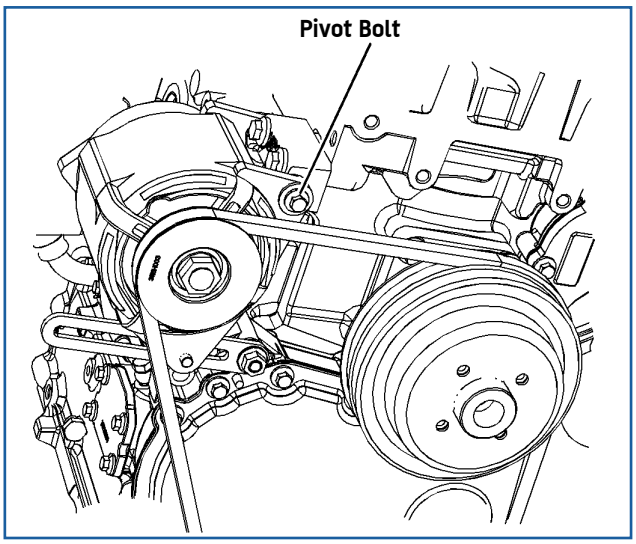


Figure-16b

DIESEL ENGINE MAINTENANCE

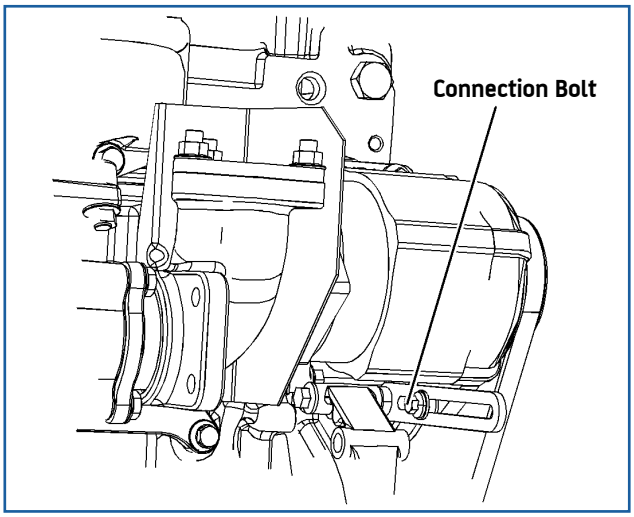


Figure-16c

REPLACEMENT OF THE BATTERY

- Switch the engine to the OFF position. Remove all electrical loads.
- Turn off all battery chargers. Disconnect all battery chargers.
- NEGATIVE **"-"** wire connects the NEGATIVE **"-"** battery terminal to the NEGATIVE **"-"** terminal on the starter. Disconnect the wire from the NEGATIVE **"-"** battery terminal.
- POSITIVE **"+"** wire connects the POSITIVE **"+"** battery terminal to the POSITIVE **"+"** terminal on the starter. Disconnect the wire from the POSITIVE **"+"** battery terminal.

Note: Always recycle batteries. Never discard a battery. Dispose of used batteries to a suitable recycling centre.

- Remove the used battery.
- Install the new battery.

Note: Ensure that the system is OFF before disconnecting the wires.

- Connect the wire from the starter to the POSITIVE **"+"** battery terminal.
- Connect the NEGATIVE **"-"** wire to the NEGATIVE **"-"** battery terminal.

⚠ WARNING

Batteries may produce flammable gases. Sparks may ignite the flammable gases. And this may cause injuries or death.

Make sure that the batteries in confined areas are ventilated properly. Follow the procedures below to prevent short circuits/sparks beside the batteries. Do not smoke when the batteries are connected.

The battery cables or the batteries should not be removed with the battery cover in place. The battery cover should be removed before any servicing is attempted.

Removing the battery cables or batteries while the cover is in place may cause battery explosions that may lead to personal injuries.

REPLACEMENT OF COOLING SYSTEM COOLANT

⚠ WARNING

Do not drain the coolant while the engine is hot and system is under pressure as dangerous hot coolant may come out.

Note: Following information is a general procedure for the replacement of coolant. Contact authorized service for detailed information and procedure.

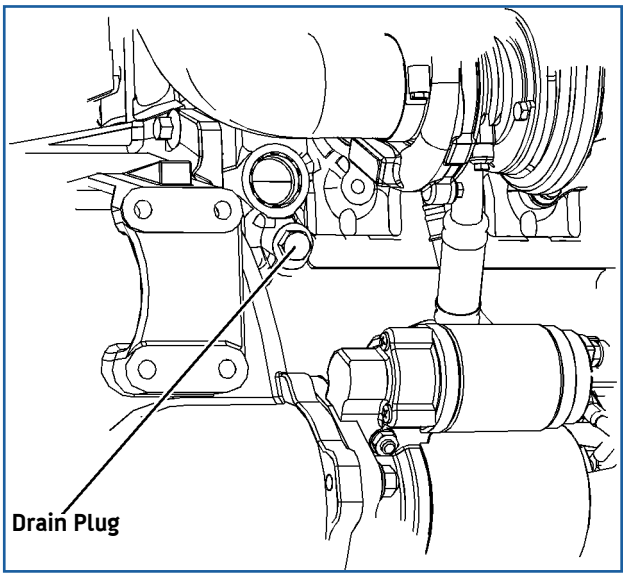


Figure-17a

- Ensure that the application is performed on level ground.
- Remove the cooling system filler cap.
- Remove the drain plug from the side of the cylinder block to drain the engine. Ensure that the drain hole is not restricted.
- Open the radiator drain tap or remove the drain plug on the bottom of the radiator to drain the radiator. Disconnect the hose on the bottom of the radiator if no radiator drain tap or drain plug is available in the radiator.
- Flush the coolant system with clean water.
- Install drain plugs and close the radiator drain tap. Install the radiator hose if it is removed before.
- Fill the system with an approved antifreeze mixture. Refit the filler cap.
- Start the engine and check for any coolant leaks.

⚠ WARNING

Do not fill the cooling system faster than 5 L (1.3 US gal) per minute to avoid air locks. Cooling of air system air locks may damage the engine.

DIESEL ENGINE MAINTENANCE

Engines with no Coolant Return Tank

Check the coolant level when the engine is stopped and cool.

WARNING

Pressurized System: Hot coolant may cause serious burns. To open the cooling system filler cap, stop the engine and wait until the cooling system components are cool. Loosen the cooling system pressure cap slowly in order to relieve the pressure.

- Remove the cooling system pressure cap slowly in order to relieve the pressure.
- Keep the coolant level on correct mark for your application. Keep the coolant level on correct mark on the sight glass if a sight glass is available on the engine.

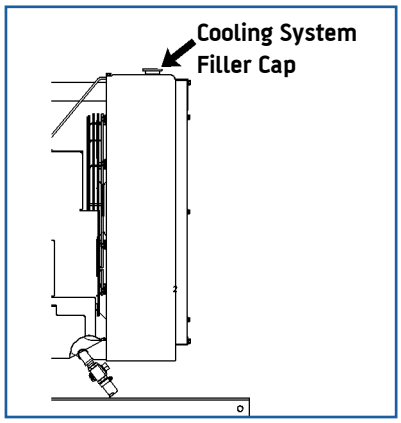


Figure-17b

- Clean the cooling system filler cap and inspect the gasket. If the gasket is damaged, discard the old filler cap and install a new filler cap. If the gasket is not damaged, use a suitable pressurizing pump in order to pressure test the filler cap. Correct pressure is stamped on the front side of the filler cap. If the filler cap cannot retain the correct pressure value, install a new filler cap.
- Inspect the cooling system for leaks.

CLEANING/REPLACEMENT OF ENGINE AIR FILTER ELEMENT

WARNING

- Never run the engine without air filters installed. Never run the engine with damaged air filters. Do not use elements with damaged pleats, gaskets or seals. Dirt entering the engine may cause serious damage to the engine components. Air filters prevent ingress of dust and foreign materials to the intake manifold.
- Do not clean air filters while the engine is operated, this will cause dust ingress to the engine.

Servicing the Air Cleaner Elements

Note: Following procedure is for a typical air filter system.

If the air cleaner element becomes blocked, the air pressure can split the material of the air cleaner element. Unfiltered air will cause premature wear on the internal components of the engine. Contact authorized service for correct air filter element.

- Pre-air filter (if available) and dust bowl are used to catch dust and dirt daily. Clean the dust and dirt as required.
- Operating conditions (dust, dirt and burrs) may require more frequent service for the air filter elements.
- Air filter element shall be replaced at least once a year. This replacement shall be performed regardless of the number of cleaning operations.

Replace the contaminated air filter element with a clean air filter element. Inspect the air filter elements for tears and/or holes on the filtering materials thoroughly before installing the filter to its place. Inspect the gasket or the seal of the air filter element for damage. Procure proper air filter elements for replacing the elements.

Dual Element Air Cleaners

An external air filter element and an internal air filter element is present on the air filters with dual elements. External air filter element may be used for a maximum of six times if it is properly cleaned and inspected. External air filter element shall be replaced at least once a year. This replacement shall be performed regardless of the number of cleaning operations.

Internal air filter element cannot be maintained or washed.

Contact authorized service for the replacement instructions of the internal air filter elements. When the engine is operated in dusty or dirty environments, air filter elements may require more frequent replacement.

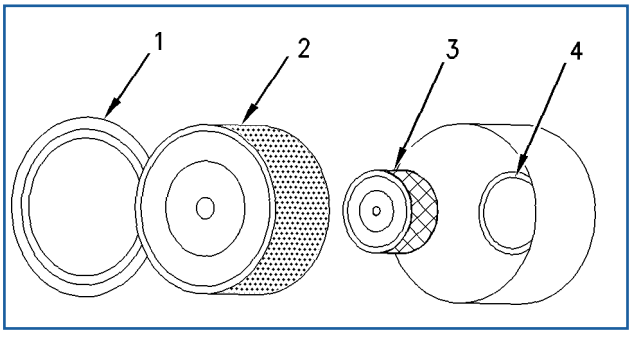


Figure-18a

1 Cover
2 External air filter element
3 Internal air filter element
4 Air inlet

- Remove the cover. Remove the external air filter element.
- Internal air filter element shall be removed and discarded after every third replacement of the external air filter element.
- Close the air intake side with a tape to prevent ingress of dust.
- Clean the interior and body of the air filter over with a clean, dry cloth.
- Open the air intake side you have closed with a tape. Install the internal air filter element. Install the new or cleaned external air filter element.
- Install the air filter cover correctly.
- Reset the air filter indicator.

Cleaning of the External Air Filter Elements

WARNING

Consider the following points if you will attempt to clean the filter element:

- Do not tap the air filter element to remove the dust.
- Do not wash the filter element.
- Use low pressure compressed air to remove the dust from the filter element. Air pressure shall not exceed 207 kPa (30 psi). Direct the air flow to the top and bottom of the filter pleats through the filter element. Be careful to prevent damage to the pleats.
- Do not use air filter elements with damaged pleats, gaskets or seals. Dirt entering the engine may cause damage to engine compartments.
- Contact authorized service to get information on maximum times that an external filter element may be cleaned. Inspect the air filter elements for tears and/or holes on the filtering materials when the external air filter element is cleaned. External air filter element shall be replaced at least once a year. This replacement shall be performed regardless of the number of cleaning operations.

WARNING

Do not clean air filter elements by tapping on them or smashing them. This may damage the seals. Do not use elements with damaged pleats, gaskets or seals. Damaged elements may cause dirt ingress. And this may cause engine damage.

Visually inspect external air filter elements before cleaning. Inspect the seals, gaskets or external covers of the air filter elements for damage. Discard any damaged air filter elements.

There are two general methods to clean external air filter elements:

- Compressed air
- Vacuum cleaning

Pressurized Air

Pressurized air can be used to clean external air filter elements that have not been cleaned more than two times. Pressurized air cannot remove deposits of carbon and oil. Use filtered, dry air with a maximum pressure of 207 kPa (30 psi).

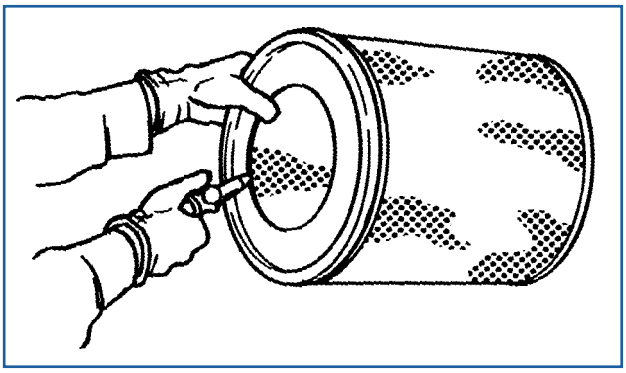


Figure-18b

Note: When the external air filter elements are cleaned, always begin with the clean side (inside) in order to force dirt particles toward the dirty side (outside).

Adjust the air hose so that air flow through the filter inside the element to prevent damage to the filter pleats. Do not aim the air flow directly at the external air filter element. Dirt may be pushed deeper inside the pleats.

Vacuum Cleaning

It is good practice to clean external air filter elements daily using vacuum for dry and dusty environments. Cleaning with pressurized air is recommended before vacuum cleaning. Vacuum cleaning cannot remove deposits of carbon and oil.

Inspection of the External Air Filter Elements

Inspect the clean, dry external air filter element. Use a 60 W blue light inside a dark room or in a similar place. Place the blue light inside the external air filter element. Rotate the external air filter element. Inspect the external air filter element for tears and/or holes. Inspect the external air filter element as per the light passing through the filter material. To verify the result, compare with a new external air filter element with the same part number if required.

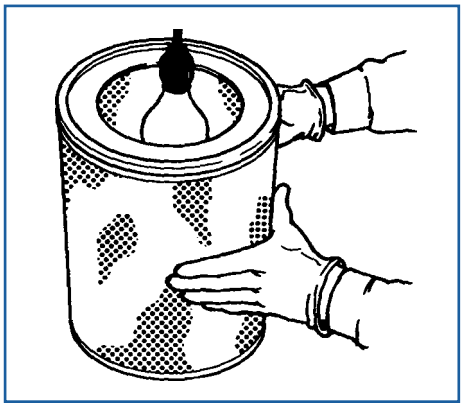


Figure-18c

DIESEL ENGINE MAINTENANCE

Do not use a external air filter element that has any tears and/or holes in the filter material. Do not use a external air filter element with damaged pleats, gasket or seal. Discard any damaged external air filter elements.

Single Element Air Cleaners

WARNING

Never run the engine without air filters installed. Never run the engine with damaged air filters. Do not use elements with damaged pleats, gaskets or seals. Dirt entering the engine may cause serious damage to the engine components. Air filters prevent ingress of dust and foreign materials to the intake manifold.

Do not clean air filters while the engine is operated, this will cause dust ingress to the engine.

A wide variety of air filters may be installed for usage with this engine. Contact authorized service for the correct procedure for replacement of the air filter.

AIR FILTER INDICATOR

Inspection

Some engines may be equipped with a different type of service indicator.

Some engines may be equipped with a differential pressure indicator. Intake air differential pressure indicator indicates the difference between the pressure before the air enters the air filter element and the pressure after the air leaves the air filter element. As the air filter element becomes dirty, the pressure differential rises. If your engine is equipped with a different type of service indicator, follow the OEM recommendations while maintaining the air filter service indicator.

Service indicator may be installed on the air filter element or away from the filter.

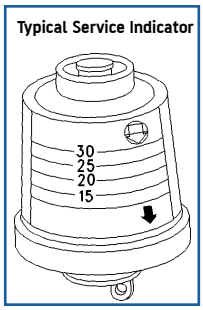


Figure-18d

Observe the service indicator. When any of the conditions below occur, air filter element shall be cleaned or replaced.

- If the yellow diaphragm enters the red zone.
- If the red piston locks in the visible position.

REPLACEMENT OF ENGINE OIL AND FILTER

WARNING

Hot oil and components may cause personal injuries. Avoid contact of hot oil and components with skin.

Do not drain the oil when the engine is cold. As the oil cools, suspended waste particles settle on the bottom of the oil pan. The waste particles will not be removed with the drained cold oil. Drain the oil pan when the engine is off. Drain the oil pan while the oil is hot. This method ensures that the waste particles in the oil are drained properly.

Failure to follow this recommended procedure will cause the waste particles to be recirculated through the engine lubrication system with the new oil.

Drain the Engine Oil

Note: Ensure that the vessel that will be used is large enough to collect the waste oil.

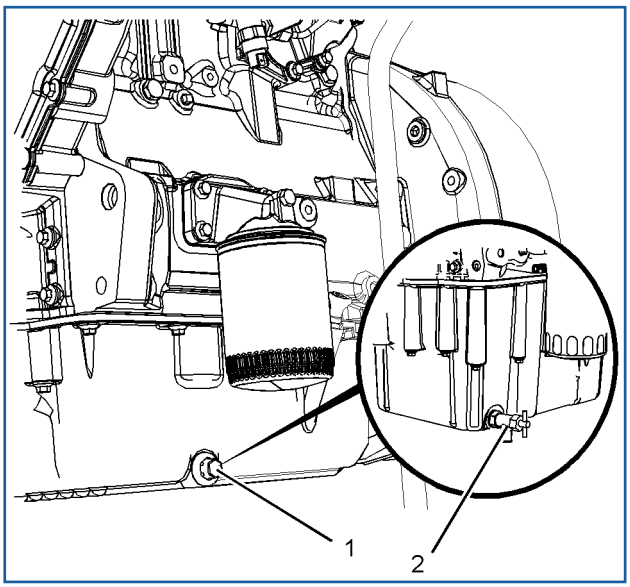


Figure-19a

After running the engine at the normal operating temperature, stop the engine. Use one of the methods below to drain the engine sump oil:

- If the engine is equipped with a drain valve (2), rotate the drain valve switch counter-clockwise to drain the oil. Rotate the drain valve switch clockwise to close the drain valve after the oil is drained.
- If the engine is not equipped with a drain valve, remove the oil drain plug (1) in order to allow the oil to drain.

After the oil has drained, the oil drain plugs shall be cleaned and installed. If required, renew the O-ring seal on the drain plug.

Some oil pan types have oil drain plugs on both sides of the oil pan because of the form of the pan. This type of oil pan requires the engine oil to be drained from both plugs.

DIESEL ENGINE MAINTENANCE

Tighten the drain plug to a torque of 34 Nm (25 lb ft).

Replacement of Spin-on Type Oil Filters

WARNING

Oil filters are manufactured as per specific standards. Usage of an oil filter element that is not recommended may cause serious damage on engine bearings, crankshafts and other parts. Many unfiltered particles enter the engine lubrication system. Use recommended suitable oil filters only.

- Remove the oil filter (5) with a suitable tool.
- Clean the sealing surface of the oil filter housing (3). Make sure that the union (6) on the oil filter housing is intact and that it is not damaged.
- Apply clean engine oil to the O-ring seal (4) on the oil filter.

WARNING

Do not fill oil filters with oil before installation. Oil may not be filtered and it may be contaminated. This may cause overheating and premature wear on engine parts.

- Install the new oil filter (5). Install the oil filter by rotating it until the O-ring contacts the sealing surface (3). Then rotate the oil 3/4 of a full turn. Remove the container and discard the waste oil as per local regulations.

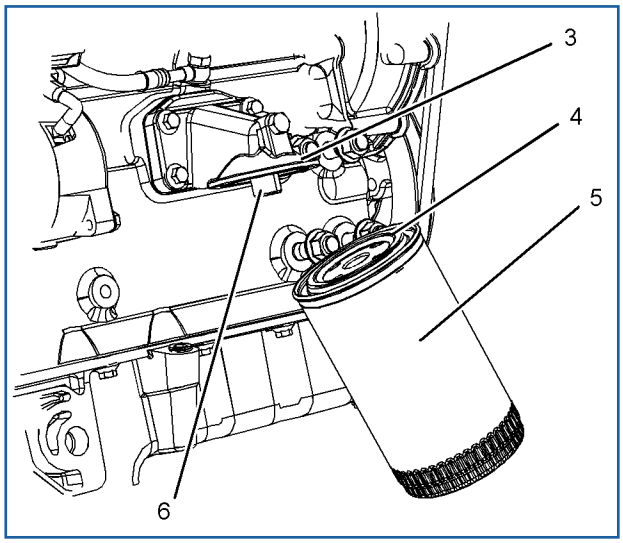


Figure-19b

Fill the Engine Crankcase

- Remove the oil filler cap. Fill the oil pan with the required quantity of oil.

WARNING

If equipped with an auxiliary oil filter system or a remote filter system, follow the OEM instructions or the filter manufacturer's recommendations. Under filling or over filling of the oil pan with oil may cause engine damage.

To prevent crankshaft bearing damage, crank the engine with the fuel OFF. In this way, oil filters shall be filled before the operation of the engine. Do not crank the engine for more than 30 seconds.

- Start the engine and run at "LOW IDLE" for 2 minutes. Perform this procedure in order to ensure that the lubrication system has oil and that the oil filters are filled. Inspect the oil filters for oil leaks.
- Stop the engine and wait until the oil is drained back to the oil pan for a minimum of 10 minutes.

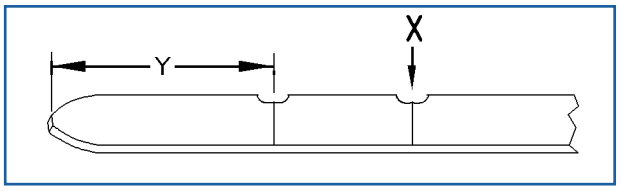


Figure-20a

(Y) "ADD" mark. (X) "FULL" mark.

- Remove the oil level gauge in order to check the oil level. Maintain the oil level between the "ADD" and "FULL" marks on the engine oil level dipstick.

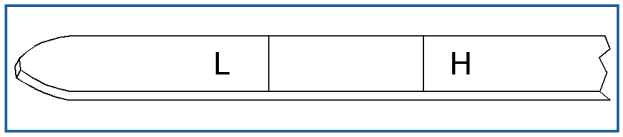


Figure-20b

(L) "Low" mark. (H) "High" mark.

- Some dipsticks may have "H" and "L" marks as shown in the figure. Maintain the oil level between the "L" and "H" marks on the engine oil level dipstick. Do not fill the oil pan over the "H" mark.

DIESEL ENGINE MAINTENANCE

TYPE 3 SPIN-ON FUEL FILTER

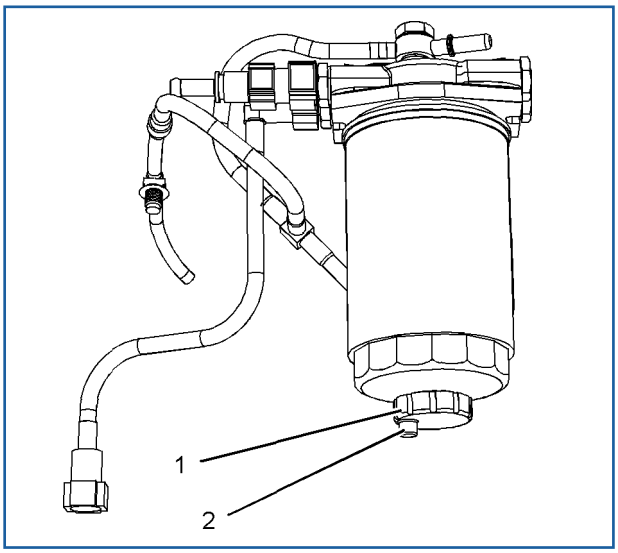


Figure-21a

- Clean the external housing of the filter assembly. Install a suitable tube on the drain (2). Rotate the drain valve (1) counter-clockwise. Drain the fuel to the container and remove the pipe. Ensure that the fuel drain (2) on the new spin-on filter is closed.

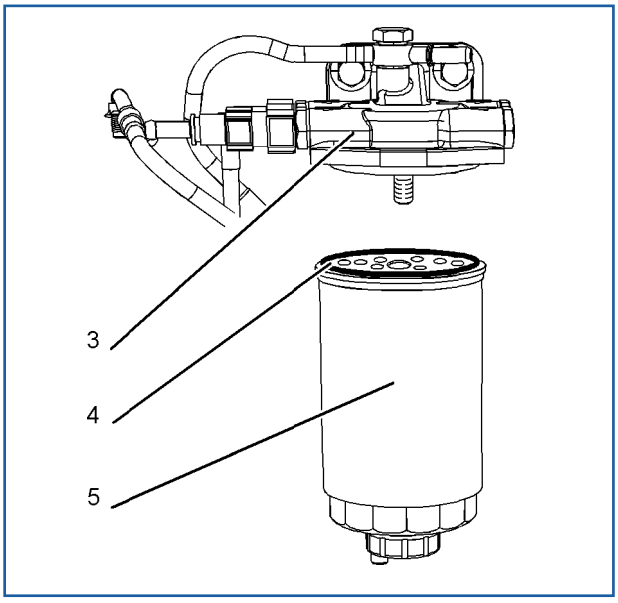


Figure-21b

- Use a suitable tool to remove the spin-on filter (5) from the filter housing (3).
- Lubricate the sealing ring (4) with clean engine oil.
- Install the spin-on filter (5) to the filter housing (1).
- Tighten the spin-on filter by hand until the sealing ring contacts the filter head. Rotate the spin-on filter 90 degrees.
- Turn the fuel supply valve ON, if applicable, and remove the container.
- The primary fuel filter and the auxiliary fuel filter shall be replaced at the same time.
- Manually pump fuel to the fuel system.

6 OPERATION OF THE GENERATORS

OPERATION OF THE GENERATORS

INSPECTIONS AND OPERATIONS REQUIRED BEFORE THE OPERATION OF THE GENERATOR

- Inspect the engine and generator visually in general. Ensure that air intake and exit and exhaust gas exit may be performed easily in the specified areas.
- Open the radiator cover and check the coolant level. Add antifreeze-water mixture if coolant is missing. Coolant level shall be 30 mm below the coolant filling neck.
- Engine coolant shall contain antifreeze as per the coldest weather conditions in the region. Mixture of 50% antifreeze and 50% water shall provide proper protection almost at all regions.
- Check air filter indicator. Replace the air filter if required. Keep the window shutter and fresh air intake shutters of the radiator open.
- Remove foreign material on the engine and alternator such as spanners, tools, rags, papers, etc.
- Inspect the fuel level in the daily fuel tank. Add fuel if it is missing. Check the engine oil level with the dipstick. Add suitable oil if it is inadequate. Oil level shall be near the maximum level line.
- Check for breaks, cracks, tears, leaks and looseness. Do not operate the generator in case of a fault before correcting the fault.
- Check if the circuit breaker output switch is deactivated (OFF), if available.
- Check if the emergency stop button is pressed.
- Check the electrolyte levels in cells by opening the battery covers if you are using batteries that require maintenance. Top up the cells lacking electrolyte so that the pure water is 1 cm over the separator. Do not add tap water, acidic water, or acid to the cells.
- Check the battery connection cables. Always tighten loose battery terminals and keep the terminals clean.
- Check the radiator air exit hood, open it if it is blocked and remove anything that is blocking air in front of it.

GENERATOR CONTROL SYSTEMS

Electronic control systems are used to control and monitor generator operation. Any one of the standard control systems may be used as per the requirements of the generator. Control panel allows the operation and stopping of the generator and monitoring of operation conditions and output voltage. Also, it stops the generator automatically in case of low oil pressure, high engine temperature and in various fault conditions.

OPERATION OF THE GENERATOR WITH AUTOMATIC CONTROL

Control panel has automatic, manual and test (to operate the generator with or without load) operating modes. This device monitors the operation of the generator and issues a warning when a fault is detected.

To operate in automatic mode;

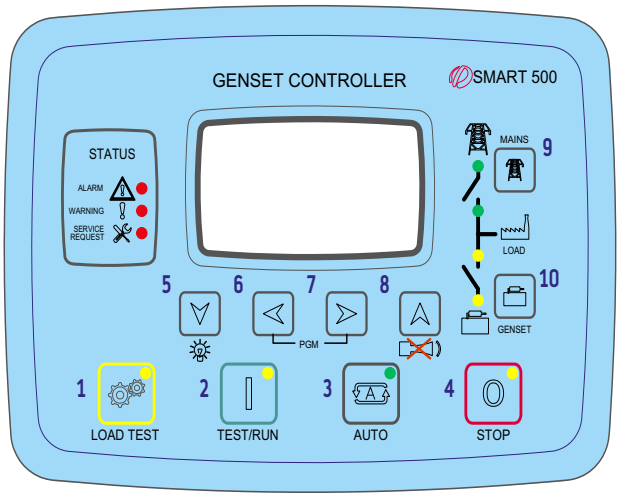
- Press the AUTO button and bring the automatic transfer device on the front panel of the generator to Automatic position.
- When the mains voltage is within normal limits, generator is in stand-by mode. If any one of the mains phases is cut-off or it the mains voltage drops or increases excessively, generator is activated and starts to supply the installation within 14-15 seconds. When the mains voltage is restored or it is returned back to normal limits, system is started to be supplied by the mains within 1 minutes. In such a case, engine of the generator operates for 2 more minutes to cool down and then stops.

AUTOMATIC TRANSFER DEVICES

SMART 500 AUTOMATIC TRANSFER DEVICE

SMART 500 is an automatic control and transfer device designed for diesel engines. Device starts the generator automatically in case of a mains fault, and transfers the load to the generator automatically. Parameters may be programmed with an operator or technician password from the front panel or from the PC interface software.

When the device detects a fault, it flashes the relevant fault LED and displays the relevant fault message on the LCD display and stops the engine if required. Parameters programmed on the device are recorded on a non-volatile memory so they shall not be affected by power outages.



DEVICE SETTINGS

Unit may be programmed with the buttons on the control panel and the LCD display or with the PC interface software.

OPERATION OF THE GENERATORS

EN

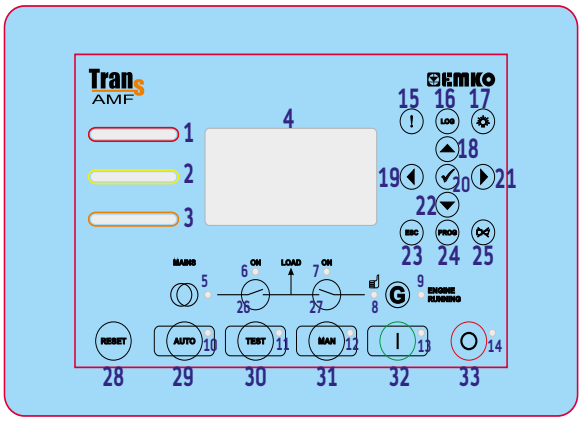
BUTTON FUNCTIONS

BUTTON	DESCRIPTION
1	Switches to TEST mode. Generator starts and takes the load.
2	Switches to OPERATION mode. Generator starts and waits without taking the load.
3	Switches to AUTO mode. Generator operates and takes the load when required.
4	Switches to OFF mode. The generator is stopped.
5	Switches to the next screen in the same group. Activates LAMP TEST if it is hold pressed.
6	Switches to previous screen group.
7	Switches to next screen group.
8	Switches to the previous screen in the same group. Resets ALARM RELAY.
9	Manual control of MAINS CONTACTOR in OPERATION mode
10	Manual control of GENERATOR CONTACTOR in OPERATION mode
6 and 7	Switches to PROGRAMMING mode if these two buttons are pressed for 5 seconds.
5 and 8	Service time counters are reset if these two buttons are pressed for 5 seconds simultaneously.

TRANS-AMF AUTOMATIC TRANSFER DEVICE

TRANS-AMF is an automatic control and transfer device designed for diesel engines. Device starts the generator automatically in case of a mains fault, and transfers the load to the generator automatically. Parameters may be programmed with an operator or technician password from the front panel or from the PC interface software.

When the device detects a fault, it flashes the relevant fault LED and displays the relevant fault message on the LCD display and stops the engine if required. Parameters programmed on the device are recorded on a non-volatile memory so they shall not be affected by power outages.



DEVICE SETTINGS

Unit may be programmed with the buttons on the control panel and the LCD display or with the PC interface software.

BUTTON FUNCTIONS

BUTTON	DESCRIPTION
1	**Red Alarm Warning;** Alarms that may stop the engine are indicated with this warning. Alarm information is displayed alternatively on the bottom line of the LCD display (4).
2	**Yellow Alarm Warning;** Temporary (electrical) alarms are indicated with this warning when they occur. Alarm information is displayed alternatively on the bottom line of the LCD display (4).
3	**Maintenance Alarm;** This warning is displayed when maintenance period is over, and the alarm information is displayed alternatively on the bottom line of the LCD display (4).
4	**LCD display**
5	**Mains OK Warning;** This LED shall illuminate if the mains voltage and frequency is within the specified limits.
6	**Mains Contactor Off Warning;** This LED indicates if the mains contactor is on or off. Also, this LED indicates that the load is supplied by the mains. If conf. input is selected as Mains Contactor Fault, this LED operates as per the condition of the input.
7	**Generator Contactor Off Warning;** This LED indicates if the generator contactor is on or off. Also, this LED indicates that the load is supplied by the generator. If conf. input is selected as Generator Contactor Fault, this LED operates as per the condition of the input.
8	**Generator OK Warning;** This LED shall illuminate if the generator voltage and frequency is within the specified limits. Also, this LED indicates that the generator is ready to take on the load.
9	**Engine Running Warning;** This LED indicates when any starter cut-off parameter occurs after cranking. If cranking cannot be performed and this LED is illuminated, Engine Starter Cut-off parameters shall be checked.
10	**Automatic Operation Mode LED**

OPERATION OF THE GENERATORS

BUTTON	DESCRIPTION
11	**Test Operation Mode LED**
12	**Manual Operation Mode LED**
13	**Start LED**
14	**Stop and Off Mode LED**
15	**Alarm condition indication button;** Alarms that occur on the panel are listed by pressing this button. If no alarm has occurred on the panel and alarm is reset, this button is not functional.
16	**Event records indication button;** Panel stores last 50 event records in its memory. You may access these records by pressing this button. Event records are displayed with values measured at the time that they have occurred. Navigation between event records is performed with direction buttons.
17	**Lamp test button;**
18	**Direction buttons;** Navigation between event records, and changing of the values are performed with these buttons.
19	
21	
22	
20	**Confirmation Button;** It is used to confirm and store parameter changes. Also, language may be changed with this button other than the program menu.
23	**ESC button;** It is used to return back to the previous program menu.
24	**Program button;** It is used for accessing the programming menus.
25	**Horn mute button;** Both the conf. output selected as horn and the internal buzzer on the panel give an audible warning when an alarm occurs. Muting the audible warning is provided with this button.
26	**Mains contactor On / Off button;** Functional in manual operation mode only, it is indicated with LED no. (6).
27	**Generator contactor On / Off button;** Functional in manual operation mode and when the generator is ready to take on the load only, it is indicated with LED no. (7).
28	**Reset (Fault Clear) button;** It is used to clear the faults occurred after being corrected.

BUTTON	DESCRIPTION
29	**Automatic Operation Mode Selection;** Panel is switched to automatic (AUTO) mode with this button, it is indicated with LED no. (10). Panel monitors the mains voltage in automatic mode, disconnects the load from the mains and starts the engine when the voltage goes out of the set limits, and ensures that the load is supplied by the generator when generator voltage reaches the set limits. Panel shall not start the engine even if the mains voltage goes out of the limits if the conf. input is selected as prohibit operation of the generator in Remote Start or Automatic Mode, or if the Operation schedule is activated and it is not in the specified time period.
30	**Test Operation Mode Selection;** Panel is switched to test mode with this button, it is indicated with LED no. (11). Mains voltage shall be within the set limits in order to select the test mode. Engine is started when the panel is switched to test mode, generator takes on the load when it is ready if Test on Load feature is selected in the program parameters, or resumes operation without load if this parameter is selected as Test Without Load. Panel switches automatically to the AUTO mode and resumes to supply the load if the mains go out of the set limits in test mode. If exercise parameters are activated and set in the program menu, panel shall be switched to Test mode automatically in this period.
31	**Manual Operation Mode Selection;** Panel is switched to manual mode with this button, it is indicated with LED no. (12). Start (32), Stop (33), Mains (26) and Generator (27) Load transfer operations may be performed manually with the buttons on the panel in manual mode. Electrical locking in Mains and Generator load transfer is performed by the panel and contactors are prevented from closing at the same time. Remote Start/Stop input and operation schedule functions do not operate in manual mode.
32	**Start Button;** This button is used to start the engine in manual mode, it is indicated with LED no. (13). If an alarm has occurred on the panel, this button is not functional until the alarm is corrected and cleared using the Reset (22) button.

OPERATION OF THE GENERATORS

BUTTON	DESCRIPTION
33	**Stop Button and Off Mode Selection;** Operated generator is stopped with the Stop button, it is indicated with LED no. (14). When the stop button is pressed for the first time, engine shall resume operation for the set cooling period, and then stop when this period ends. You shall press the same button again to stop the engine without waiting for this period. Stop button also ensures that the panel is switched to off mode. Start/Stop and load transfer operations are not performed in off mode.

MAINTENANCE OF THE DEVICE:

Device shall be repaired by qualified persons. De-energize the device first in order to access internal parts of the device.

Do not clean the device solutions containing hydrocarbons (such as petroleum, Trichlorethylene). Cleaning the device with such solutions may reduce mechanical reliability of the device.

Use a cloth dampened with ethyl alcohol or water to clean the external plastic part of the device.

The life cycle of the device is 10 years in average.

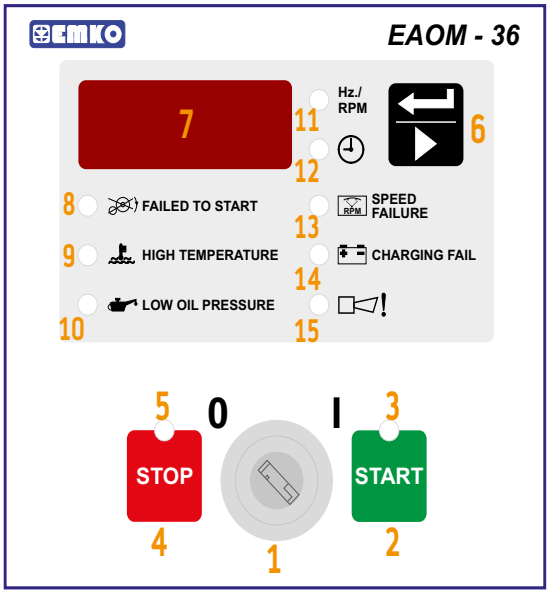
⚠ WARNING

Contact authorized service for issues required expertise such as programming the devices or changing of the parameters.

OPERATION OF THE GENERATOR WITH MANUAL CONTROL

- Bring the ignition switch from “0” to “1”.
- Warning lamps of the manual control device shall illuminate at this time.
- Then, press “START” button once to operate the engine. Engine of the generator shall start.
- Check whether the warning lamps on the panel illuminate and whether the values on the indicators are normal.
- Run the generator at idle for 1 minute. Generator shall heat in this period.
- Consumers (loads) in the installation shall be off at this time.
- Bring the main switch to position “1”.
- Bring the inverter switch from “MAINS” to “GENERATOR”.
- Activate consumers one by one.
- Check the current and voltage on phases using the ammeter and voltmeter commutator.
- Bring the inverter switch to “MAINS” position when mains voltage is restored.
- Run the engine at idle for 1 minute to allow cooling of the engine. Then, press the stop switch on the device and wait until the engine stops. Finally, bring the ignition switch to position “0”.

BUTTON FUNCTIONS



BUTTON	DESCRIPTION
1	**On/Off Switch** This is used for switching the device on and off. Device is off and does not use power when the switch at position 0.
2	**Start Button** This is used to start the generator and to make changes on the program parameters.

OPERATION OF THE GENERATORS

BUTTON	DESCRIPTION
3	**Start LED** Operation of the engine from the start operation until the engine is stopped is monitored by this LED.
4	**Stop Button** This is used to stop the engine and to make changes on the program parameters.
5	**Stop LED** This LED allows you to observe that the engine is not operated and/or it is stopped.
6	**Enter Button** You may access Program menus by pressing this button for 5 seconds. When the button is pressed shortly each time, engine speed, alternator frequency and operating hours are displayed on the display (7). Storage of parameter values and navigation to the next parameter in the program menus are performed with this button.
7	**Value Screen** Program parameters, measured values and fault codes are displayed here.
8	**Starting fault** This LED flashes and panel switches to fault mode if the engine is not started after the number of start attempts defined in parameter P10. Fault is reset by switching On/off switch (1) to 0 (off) position and then switching it back to 1 (on.)
9	**High Temperature Fault** This LED flashes and panel switches to fault mode when the coolant temperature exceeds sensor value. Fault is reset by switching On/off switch (1) to 0 (off) position and then switching it back to 1 (on.)
10	**Low Oil Pressure Fault** This LED flashes and panel switches to fault mode when oil pressure is reduced. Fault is reset by switching On/off switch (1) to 0 (off) position and then switching it back to 1 (on.)
11	**Generator Frequency and Speed** This LED illuminates when alternator frequency and engine speed are displayed in the value screen (7). Enter button (6) is used to access the values.

BUTTON	DESCRIPTION
12	**Engine Operating Hours** This LED illuminates when engine operating hours are displayed in the value screen (7). Enter button (6) is used to access the values. Engine operating hours are increased by hours whenever engine is operated with EA0M-36.R and it is displayed on the screen.
13	**Speed Fault** This LED flashes and panel switches to fault mode when alternator frequency and engine speed exceed the set limit values. Fault is reset by switching On/off switch (1) to 0 (off) position and then switching it back to 1 (on.)
14	**Charging Alternator Fault** This LED flashes and panel switches to fault mode when charging alternator voltage exceeds the set limit values. Fault is reset by switching On/off switch (1) to 0 (off) position and then switching it back to 1 (on.)
15	**General Alarm** This LED flashes for all alarms other than the ones specified above. Code of the alarm occurred is displayed in the value display (7) by highlighting this LED with the enter button (6).

MAINTENANCE OF THE DEVICE

Device shall be repaired by qualified persons. De-energize the device first in order to access internal parts of the device.

Do not clean the device solutions containing hydrocarbons (such as petroleum, Trichlorethylene). Cleaning the device with such solutions may reduce mechanical reliability of the device.

Use a cloth dampened with ethyl alcohol or water to clean the external plastic part of the device.

The life cycle of the device is 10 years in average.

POINTS TO BE CONSIDERED IN OPERATION

It is important for problem-free operation of your operation that the load distribution on phases is balanced both on manual and automatic controlled generators. It is the user's responsibility to keep the load distribution between phases at a tolerance range of -/+ 15%. Faults caused by inadequate or lacking maintenance or by negligence are not covered under warranty.

OPERATION OF THE GENERATORS

LOCATION AND PLACEMENT OF THE AUTOMATIC TRANSFER SWITCH PANEL

Points to be considered for the placement of power panel (transfer switch).

- Place the power panel near the main distribution panel as much as possible.
- Panel shall be kept in a clean, dry, well-ventilated place away from excessive heat.
- Adequate amount of work area shall be provided around the panel. Panel covers shall be easily opened and panel shall be easily intervened.
- Currents drawn from the generator shall be distributed evenly to three phases as much as possible. Max. difference between phases shall be +/-15%.
- Information on transfer of current by power cables to be used for generators are given in Section 4. Electrical Connections.
- Operating connection of the generator shall be performed correctly so that it can function properly. This connection type is shown in Figure-22. There are two cable inputs to the panel. One is the mains input for mains control and the other is the generator output. Mains line taken from the electric meter output or from the compensation panel, if applicable, is connected to the consumer via the mains contactor. The point to be considered here is that the generator shall be connected after the meter.

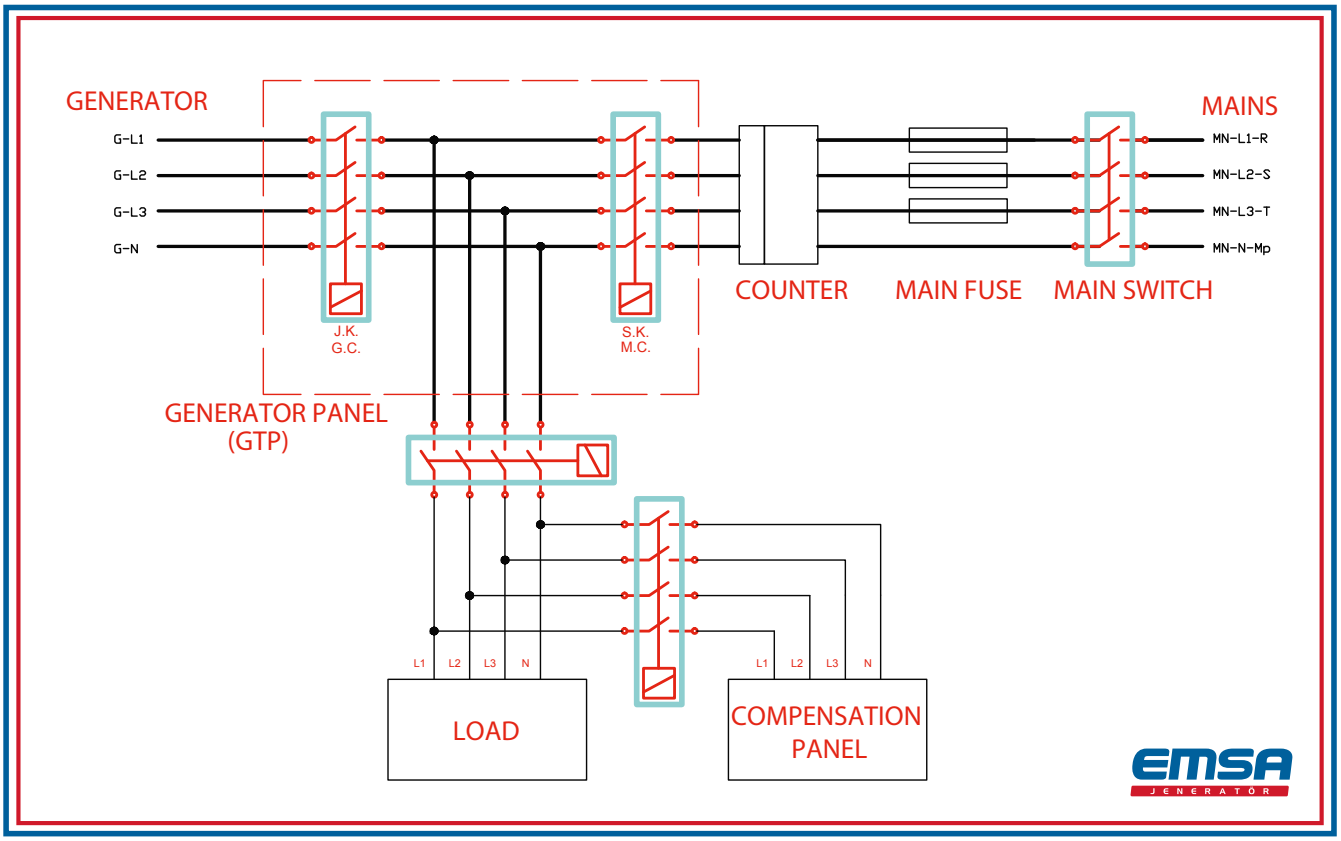


Figure-22 Connection Method of the Generator to Operation

OPERATION OF THE GENERATORS

ATS SYSTEMS OVERVIEW

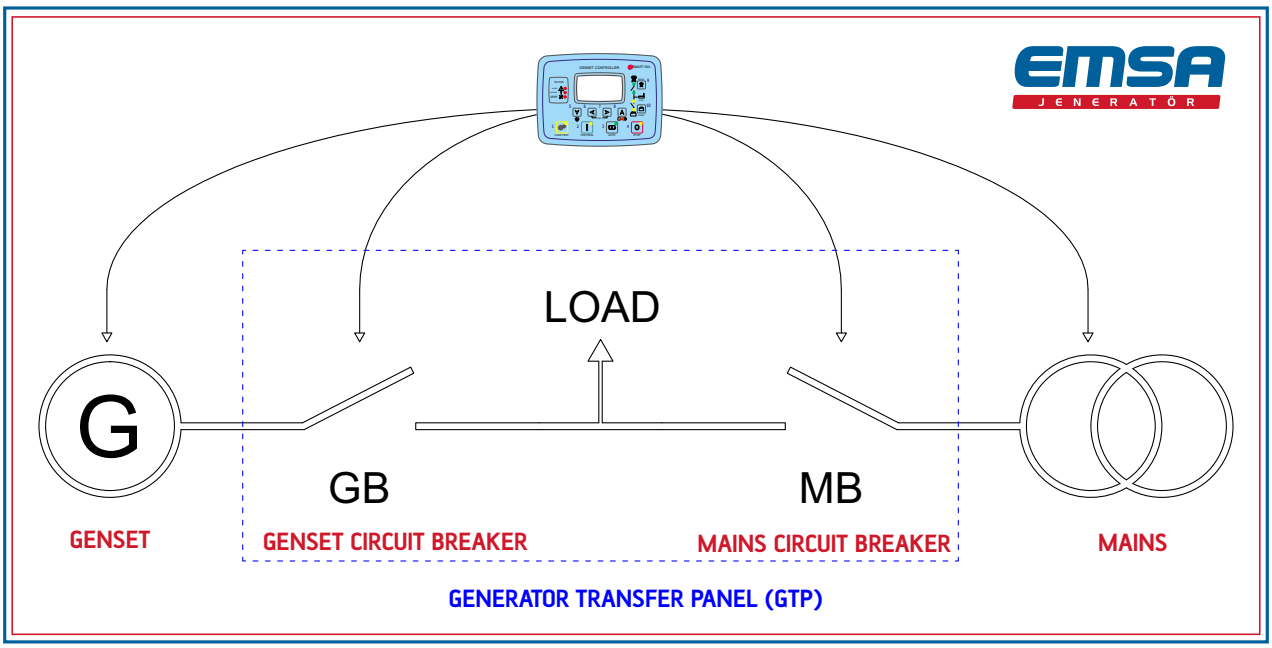
Automatic generators manufactured by Emsa Jeneratör is offered with a remote control system that is designed with the DATAKOM SMART 500 generator control device and hardware.

The automatic remote control system includes the diesel engine, alternator controller and protection functions, furthermore the DATAKOM SMART 500 controller device with a microchip is able to follow a mains source, evaluation, the AMF operation scenario mode that is initialized to automatically operate the generator in an event that the mains source is out of range.

Another component of the automatic generator system is the transfer system and DATAKOM SMART 500 controller system may control the transfer system automatically or manually. Therefore the transfer system that will allow the load to be fed with the mains or the generator is controlled automatically.

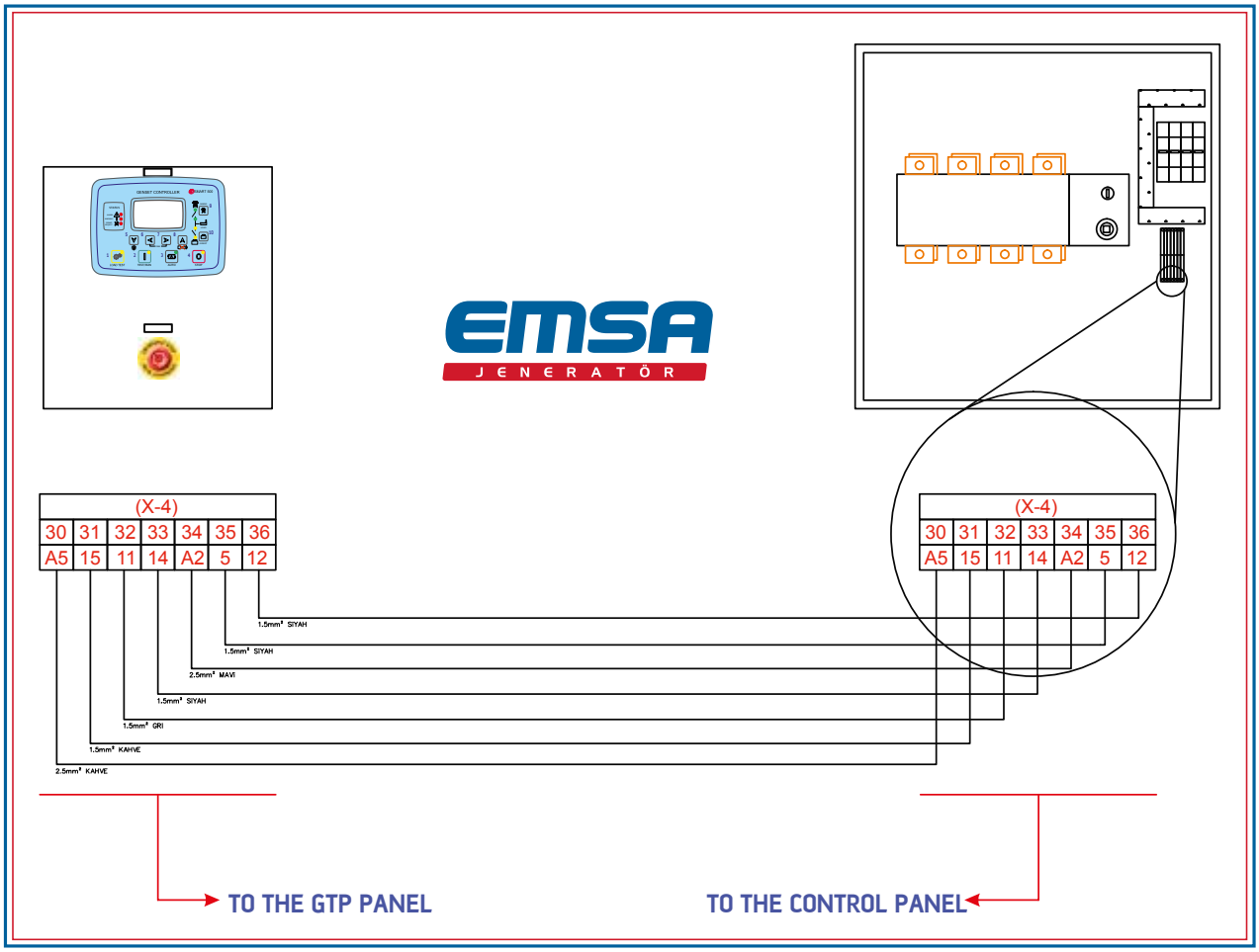
Emsa transfer systems are offered with contactor at AG, inverter switch or (ACB) engine switch based on the generator power and customer requests. Emsa transfer systems, in addition to 3 pole or 4 pole options, have a very wide product series with different brands such as SMART GRID, ABB, LG/LS.

The transfer systems consist one circuit breaker for controlling mains source, one circuit breaker for controlling generator source and auxiliary hardware. The System is designed with the principle to connect the Mains and generator source breakers output side in parallel and having a load output through the connection point. For inverter type switches, even though there is only one physical switch, it consists a package of one switch that consists two switches combined. Builds with contactor and air circuit breakers, the circuit breakers are placed separately.



OPERATION OF THE GENERATORS

The load is fed by mains energy by closing the mains breaker if there is mains energy, or fed by generator energy by closing the generator breaker if mains energy is not available. Closing and opening the breakers are decided by the micro processor based generator control device within the generator control panel. Both breakers may not be closed at the same time. One must be open in order to close the other.



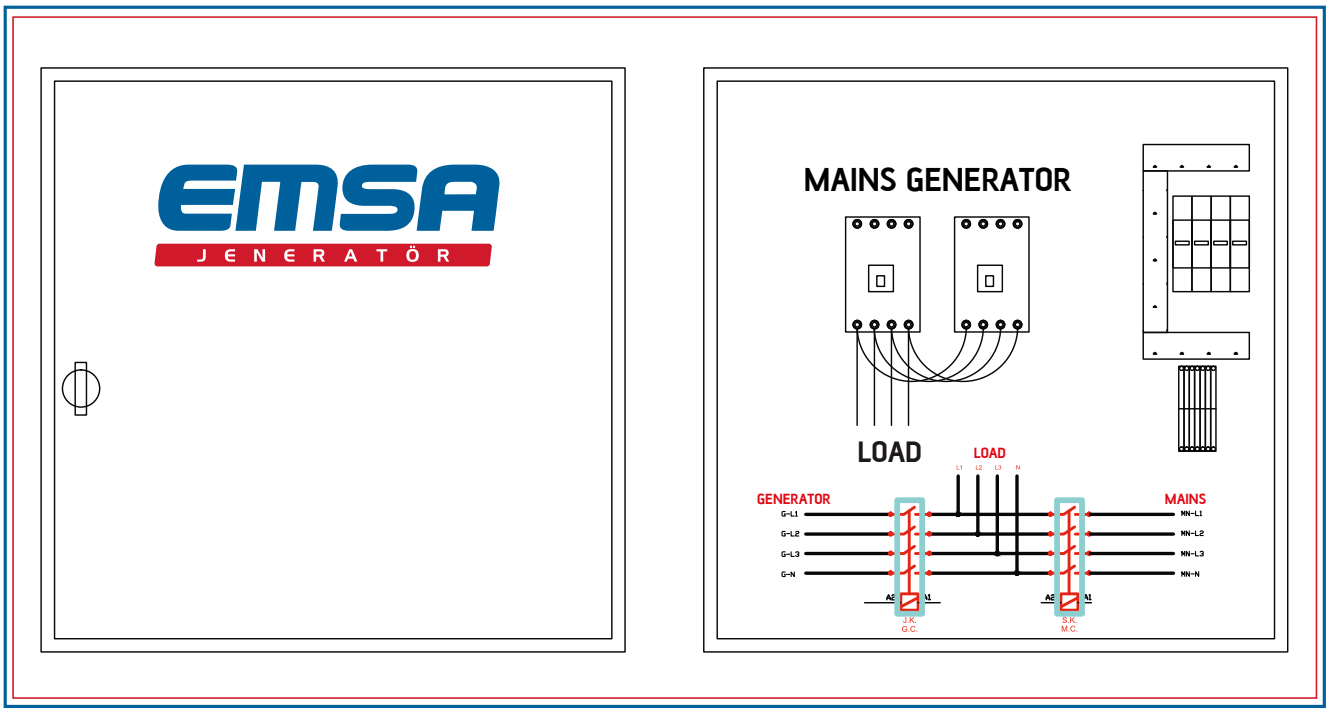
Generator and Transfer Panel Connection

OPERATION OF THE GENERATORS

Contactor systems;

Contactor systems consist two contactors and auxiliary hardware that is capable to match the generator and mains source standby power. The electric locking in the system comes as standard, the mechanical lock is optional. The transfer system includes the generator body heater and a fuse and its related hardware for battery charge, and are ready to be used at the connection terminal. The connection between the system and automatic generator system consists a compatible and simple terminal group. This terminal group P-N feed output for generator charge and body heater, 3P+N mains references to ensure that the generator controller system follow the mains and 2 input connectors for controlling the mains contactors.

Emsa contactor transfer systems are manufactured with SMART GRID 4P for 10kVA – 50kVA 400V models, LG/LS - ABB brand for 10kVA -550kVA 400V models with 3 or 4 pole options.



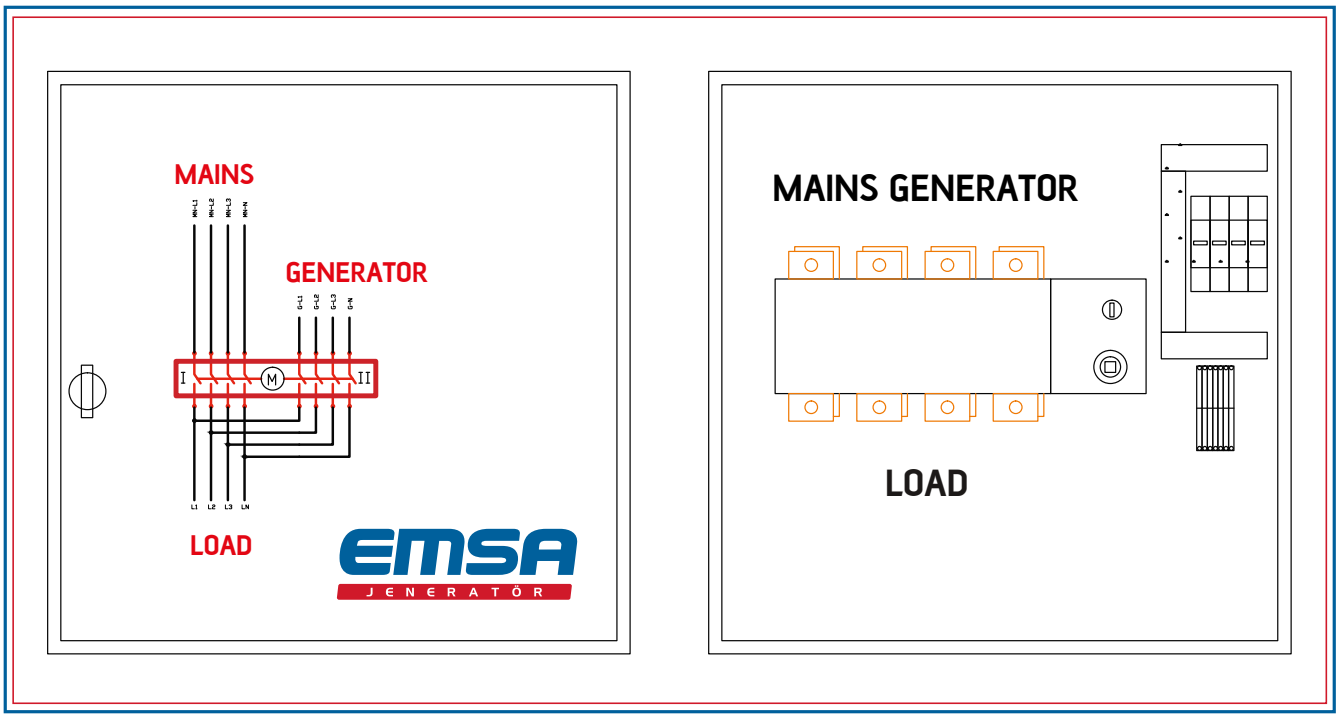
Wall Type / Contactor Transfer Panel

OPERATION OF THE GENERATORS

Inverter switch systems;

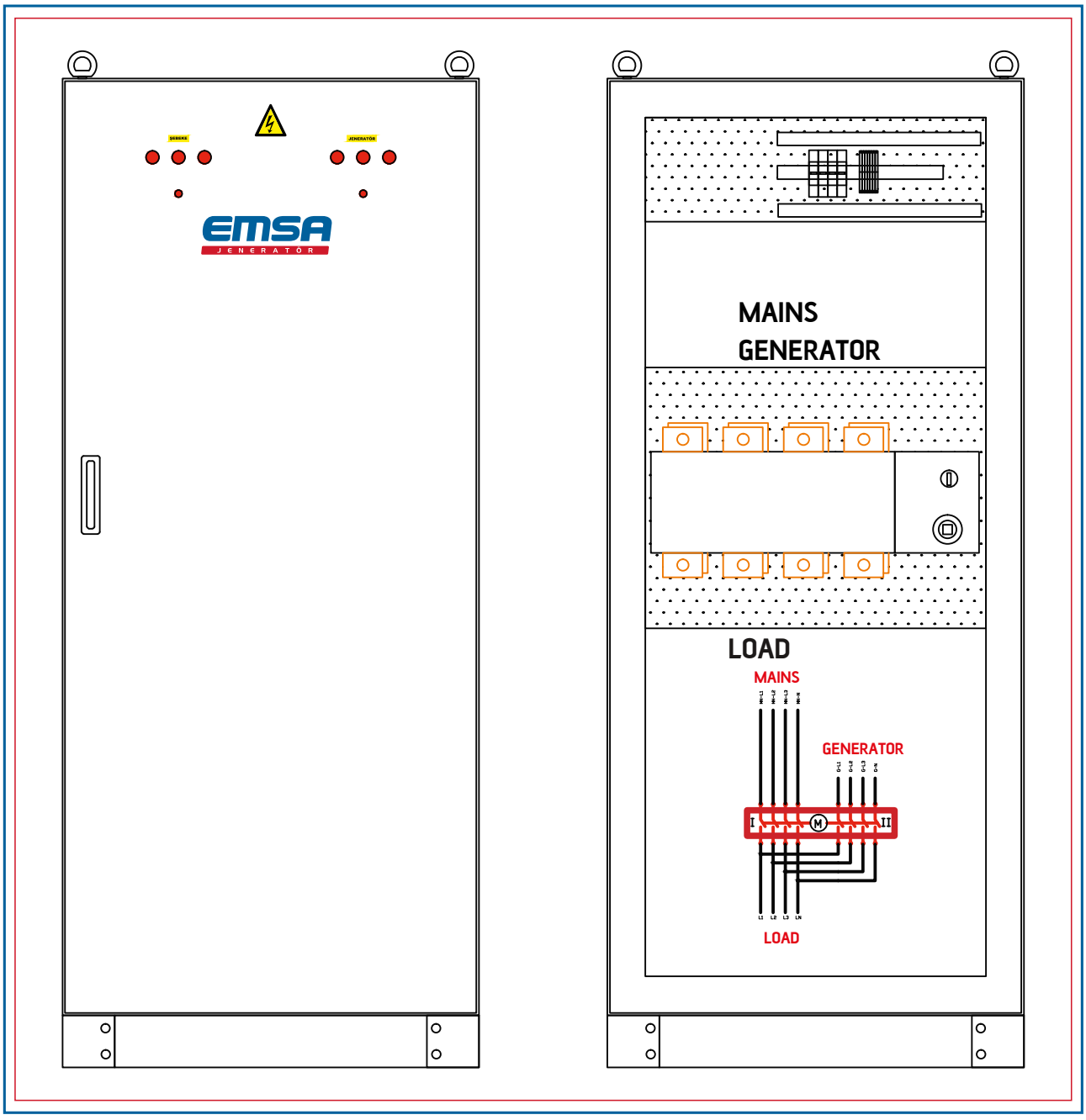
Inverter switch systems consist one inverter switch and auxiliary hardware that is capable to match the generator and mains source standby power. The system have electric and mechanic locking as standard. The transfer system includes the generator body heater and a fuse and its related hardware for battery charge, and are ready to be used at the connection terminal. The connection between the system and automatic generator system consists a compatible and simple terminal group. This terminal group P-N feed output for generator charge and body heater, 3P+N mains references to ensure that the generator controller system follow the mains and 2 input connectors with a switch for selecting between the generator and mains.

Emsa inverter switch transfer systems are manufactured with SMART GRID 4P for 60kVA – 900kVA 400V models, ABB brand for 10kVA-1700kVA 400V models with 3 or 4 pole options.



Wall Type / Inverter Switch Transfer Panel

OPERATION OF THE GENERATORS



Standing Type / Inverter Switch Transfer Panel

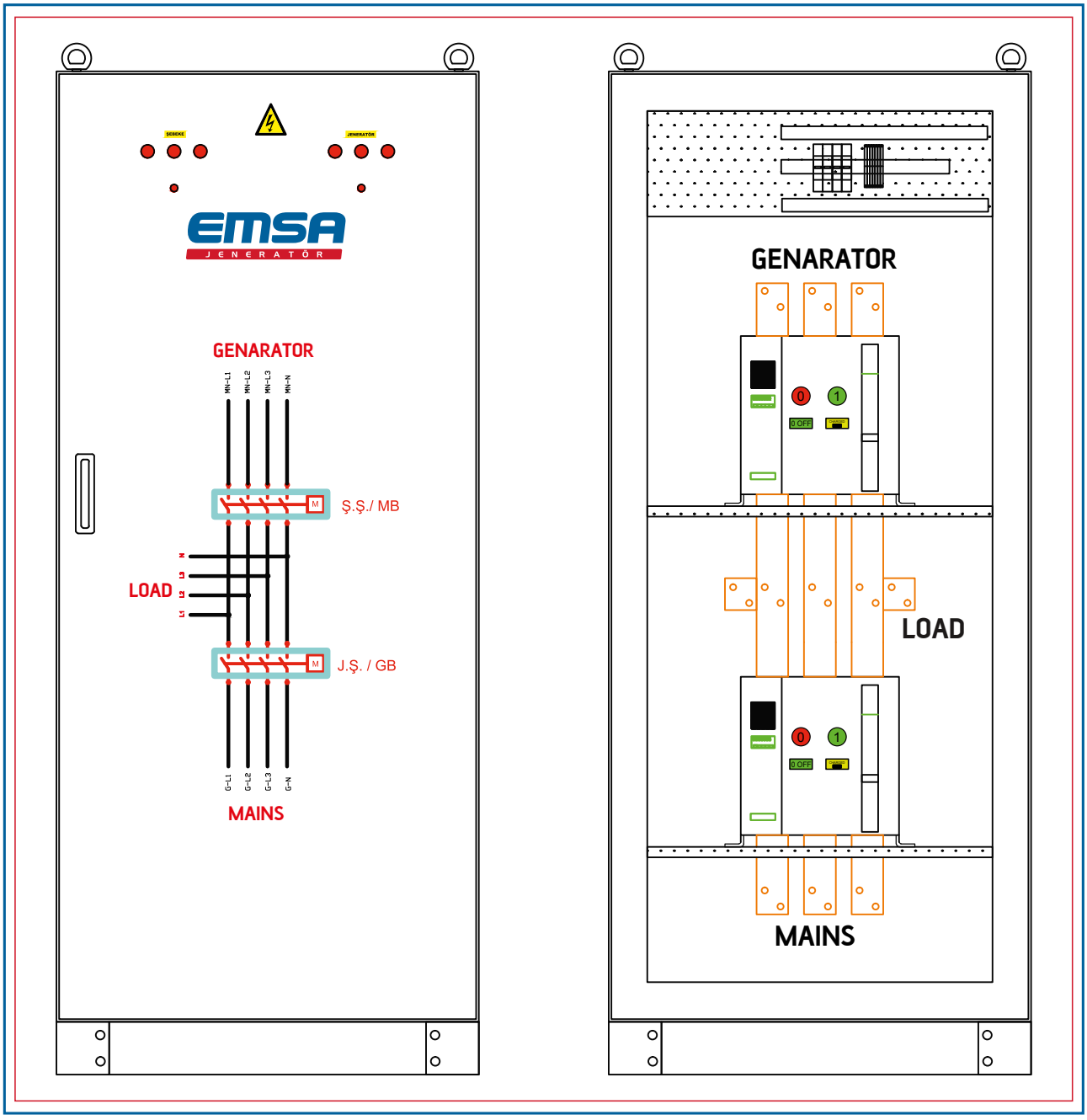
Air Circuit Breakers (ACB) systems;

Air circuit breakers systems consist two air circuit breakers and auxiliary hardware that is capable to match the generator and mains source standby power. The electric locking in the system comes as standard, the mechanical lock is optional. The transfer system includes the generator body heater and a fuse and its related hardware for battery charge, and are ready to be used at the connection terminal. The connection between the system and automatic generator system consists a compatible and simple terminal group. This terminal group F-N feed output

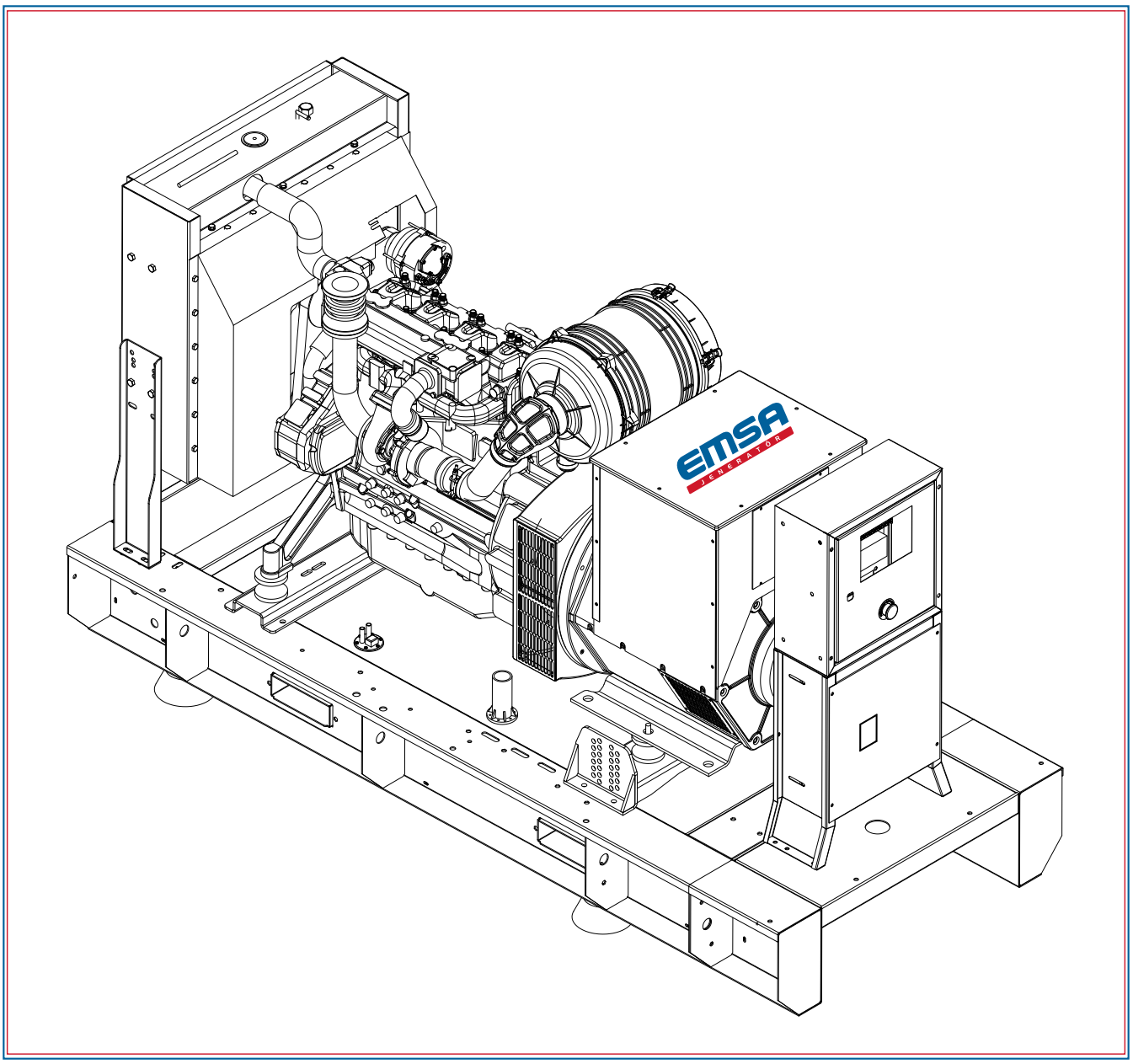
OPERATION OF THE GENERATORS

for generator charge and body heater, 3xF+N mains references to ensure that the generator controller system follow the mains and 2 input connectors for mains and generator engine drive switch controller.

Emsa air circuit breakers transfer systems are manufactured with ABB and LG/LS brand for 350kVA-2500kVA 400V with 3 or 4 pole options.



Standing Type / Inverter Switch Transfer Panel


EMSA
GENERATOR

EN

7 POSSIBLE REASONS OF FAULTS AND TROUBLESHOOTING

POSSIBLE REASONS OF FAULTS AND TROUBLESHOOTING

ALTERNATOR FAULTS AND TROUBLESHOOTING

FAULT:

• Alternator has no output voltage.

REASON:

• Loss of magnetism in stator windings.

If the alternator is equipped with excitation winding, contact the same ends of a 9.5 V dry battery to the + and – terminals.

• Loose contact on the panel or terminal connections.

Open the panel cover and check whether the cable ends are loose, and similarly whether the terminal ends are loose.

• Disconnection in the warning button.

Check all connections, especially the alternator line terminal connections.

• Fault in rotating diodes.

Test the diodes one by one with the diode test section of the multimeter, and replace the faulty diodes.

• Engine speed is too low.

Increase the speed of the drive machine to nominal value.

• Regulator board is faulty.

Replace the board that is not regulating.

FAULT:

• Voltage is lowered as the alternator is loaded.

REASON:

• Regulator board is faulty.

Set the output voltage to 400 V with the regulator potentiometer at idle operation. Replace the board if voltage is dropped as the alternator is loaded after this setting.

• Speed loss of the drive machine is too high.

Check the power of the drive machine.

• Alternator is overloaded.

Do not load above the nominal value.

• Rotating diodes are faulty.

Check the diodes with multimeter. Replace the faulty ones.

FAULT:

• Voltage is increased as the alternator is loaded.

REASON:

• A motor rotating in reverse is present in the circuit.

Change the locations of generator output cables.

FAULT:

• Generator voltage is too high.

REASON:

• One terminal of regulator connected to a phase is disconnected.

Check the terminal connections.

• Disconnection in voltage setting potentiometer.

Check the terminals of the potentiometer.

• Regulator board is faulty.

Replace the board that is not regulating.

• Load between phases is unbalanced.

Balance the load.

FAULT:

• It is not possible to read the voltage from one or two phases.

REASON:

• Disconnection in voltage control switch terminals.

Check the terminals of the switch.

• Disconnection in the stator coils.

Open the terminal box cover and lift the star connection bridge. Check for disconnection or short circuit between coils.

FAULT:

• Coils are excessively heated.

REASON:

• Generator is loaded above nominal value.

Operate at nominal load.

• There may be a short circuit between the coils.

Check for short circuit between coils in the terminal box.

FAULT:

• Fluctuation on the generator output voltage.

REASON:

• Regulator board does not perform regulating function.

Replace the regulator board.

• Short circuit in the coils.

Open the terminal box, and check the coils with multimeter. Short circuit is present in case of difference in resistance.

• One or more of the bridge diodes are faulty.

POSSIBLE REASONS OF FAULTS AND TROUBLESHOOTING

DIESEL ENGINE FAULTS AND TROUBLESHOOTING

FAULT:

• Starter rotates the diesel engine slowly.

REASON:

• Battery discharged
• Weak contact of battery cables
• Starter fault
• Incorrect lubricating oil viscosity

FAULT:

• Oil pressure is too low

REASON:

• Oil viscosity is incorrect
• Not enough oil in the sump
• Pressure indicator faulty
• Oil filter is dirty

FAULT:

• Blue or white exhaust smoke

REASON:

• Oil viscosity is incorrect
• Heater is faulty
• Diesel engine is cold
• Valve setting is incorrect
• Fuel timing setting is incorrect

FAULT:

• Diesel engine is difficult to start or will not start

REASON:

• Starter cannot rotate the diesel engine
• Fuel circuit has air in it
• Fuel tank is empty
• Fuel pipe is blocked
• Fuel control solenoid is faulty
• Fuel filter is dirty
• Heater does not operate
• Exhaust pipe is blocked
• Poor fuel quality
• Fuel tank ventilation is blocked
• Fuel pre-pump is faulty
• Injectors are faulty or their setting is incorrect
• Oil sensor / switch or connection are faulty

FAULT:

• Oil pressure is too high

REASON:

• Oil viscosity is incorrect
• Oil pressure indicator is faulty

FAULT:

• Engine does not provide adequate power.

REASON:

• Fuel pipe clogged
• Fuel filter is dirty
• Air filter is dirty
• Air in fuel system
• Poor fuel quality
• Exhaust pipe is blocked
• Fuel pre-pump is faulty
• Governor is faulty
• Engine temperature is high
• Engine temperature is low
• Injectors are faulty or their setting is incorrect
• Fuel tank ventilation is blocked
• Fuel timing setting is incorrect
• Valve setting is incorrect

FAULT:

• Engine operation is irregular

REASON:

• Fuel pipe clogged
• Fuel governor is faulty
• Fuel filter is dirty
• Fuel pump is faulty
• Air filter is dirty
• Air in fuel system
• Injectors are faulty or their setting is incorrect
• Fuel tank ventilation is blocked
• Valve settings are incorrect
• Engine is overheated
• Heater system is faulty
• Resistance in the movement of fuel governor.

POSSIBLE REASONS OF FAULTS AND TROUBLESHOOTING

FAULT:

• Engine is overheated

REASON:

• Exhaust pipe is blocked
• Cooling fan is faulty
• Radiator cores are dirty or pipe is blocked inside
• Air circulation is inadequate
• Air filter or pipe is blocked
• Injectors are faulty or their setting is incorrect
• Heater system is faulty
• Oil level in the sump is low
• Coolant level is inadequate

FAULT:

• Sump pressure is high

REASON:

• Sump ventilation pipe blocked
• Valve setting is incorrect (worn on the snap ring and the liner)

FAULT:

• Not firing (engine will crank but will not start)

REASON:

• Fuel pipe clogged
• Fuel filter is dirty
• Air in fuel system
• Fuel pump is faulty
• Engine temperature is very low
• Valve settings are incorrect
• Injectors are faulty or their setting is incorrect
• Heater is faulty
• Oil sensor / switch or connection are faulty

FAULT:

• Engine is pinking

REASON:

• Injectors are faulty or their setting is incorrect
• Valve settings are incorrect
• Fuel pump fault
• Poor fuel quality
• Engine temperature is very low
• Heater system is faulty

FAULT:

• Fuel consumption is high

REASON:

• Air filter is dirty
• Poor quality fuel
• Exhaust pipe is blocked
• Heater system is faulty
• Valve settings are incorrect
• Engine temperature is very low
• Injectors are faulty or their setting is incorrect

FAULT:

• Exhaust gas is black

REASON:

• Air filter is dirty
• Motor is overloaded
• Poor quality fuel
• Exhaust pipe is blocked
• Engine temperature is very low
• Valve settings are incorrect
• Injectors are faulty or their setting is incorrect

FAULT:

• Vibrating operation

REASON:

• Fan is damaged
• Resistance in the movement of fuel governor
• Injectors are faulty or their setting is incorrect
• Engine temperature is very low
• Valve settings are incorrect

FAULT:

• Engine stops after starting

REASON:

• Air in fuel system
• Fuel filter is dirty
• Air filter or intake system is blocked
• Oil sensor / switch or connection are faulty
• Stop solenoid retainer coil is faulty

8 OTHER TECHNICAL DATA

OTHER TECHNICAL DATA

DIESEL ENGINE SPECIFICATIONS

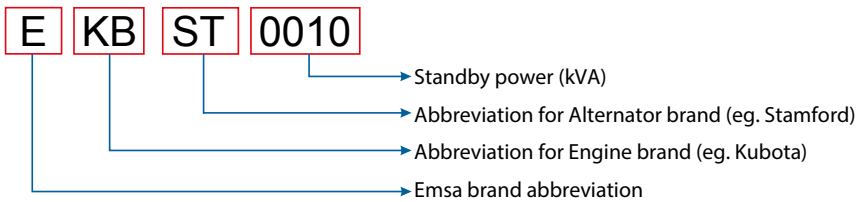
MODEL	D226B-3D TD226B-3D	WP4	WP6	WP10	WP12
Time	4 stroke	4 stroke	4 stroke	4 stroke	4 stroke
Cylinder arrangement	V Type, Inline	V Type, Inline	V Type, Inline	V Type, Inline	V Type, Inline
Bore/Stroke (mm)	105/120	105/130	105/130	126/130	126/155
Displacement (liter)	3.12	4.5	6.75	9.726	11.596
Engine Speed (r/min)	1500	1500	1500	1500	1500
Engine Oil Capacity (liters)	7	10	18	23	23
Coolant Capacity (liters)	16	17	25	52	60
Firing Order	1-3-2	1-3-2-4	1-5-3-6-2-4	1-5-3-6-2-4	1-5-3-6-2-4
Rotation Direction From the Front	Counter-clockwise	Counter-clockwise	Counter-clockwise	Counter-clockwise	Counter-clockwise
Exhaust Gas Temperature	≤ 550 °C	≤ 550 °C	≤ 550 °C	≤ 600 °C	≤ 600 °C
Cooling Fan Air Flow (m^3/min)	≤ 171.1 Engine speed: 1.500 RPM Fan speed: 2.200 RPM	≤ 171.1 Engine speed: 1.500 RPM Fan speed: 2.200 RPM	≤455 Engine speed: 1.500 RPM Fan speed: 2.100 RPM	≤574.14 Engine speed: 1.500 RPM Fan speed: 1.800 RPM	≤ 535.8 Engine speed: 1.500 RPM Fan speed: 1.300 RPM

DIESEL ENGINE SETTING AND TIGHTENING VALUES

MODEL	D226B-3D TD226B-3D	WP4	WP6	WP10	WP12
Intake Valve Clearance While the Engine is Cold (mm)	0.2 + 0.05	0.2 + 0.05	0.2 + 0.05	0.28 ± 0.03	0.33 ± 0.03
Exhaust Valve Clearance While the Engine is Cold (mm)	0.3 + 0.05	0.3 + 0.05	0.3 + 0.05	0.38 ± 0.03	0.38 ± 0.03
Injection Pressure (Mpa)	25	25	25	25~26	25~26
Cylinder Head Bolt Torque (N - M)	230-300	230-300	230-300	240~340 (Main Bolt) 90~160 (Spare Bolt)	240~340 (Main Bolt) 90~160 (Spare Bolt)
Main Bearing Bolt Torque (N - M)	180-230	180-230	180-230	265 ± 25	265 ± 25
Connecting Rod Bolt Torque (N - M)	85-135	85-135	85-135	170~250 (Manual Tightening) 155~230 (Automatic Tightening)	170~250 (Manual Tightening) 155~230 (Automatic Tightening)
Flywheel Bolt Torque (N - M)	285-295	285-295	285-295	230~280 (Manual Tightening) 230~300 (Automatic Tightening)	230~280 (Manual Tightening) 230~300 (Automatic Tightening)

MODEL CODES AND GENERAL INFORMATION

EMSA DIESEL GENERATOR



OTHER TECHNICAL DATA

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OIL AND WATER CAPACITIES OF THE GENERATOR

OIL AND WATER CAPACITIES OF SHANGHAI DONGFENG DIESEL GENERATOR

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E SD XX 0220	220	176.0	200.0	160.0	6135AZD-3*	44.7	25.00	46.00	380
E SD XX 0285	285	228.0	259.1	207.3	6135AZLD*	57.8	25.00	49.00	580
E SD XX 0330	330	264.0	300.0	240.0	6135BZLD	66.7	40.00	53.00	580
E SD XX 0385	385	308.0	350.0	280.0	G128ZLD11	77.5	40.00	60.00	750
E SD XX 0460	460	368.0	418.1	334.5	SC15G500	94.7	35.00	61.00	775
E SD XX 0515	515	412.0	468.1	374.5	12V135AZLD-1	103.1	62.00	127.00	1100
E SD XX 0570	570	456.0	518.1	414.5	12V135BZLD	114.3	62.00	132.00	1100
E SD XX 0640	640	512.0	581.8	465.4	12V135BZLD-1	128.2	62.00	132.00	1100
E SD XX 0715	715	572.0	649.9	519.9	12V135BZLD-2	130.5	62.00	160.00	1100
E SD XX 0825	825	660.0	749.9	599.9	SY630	146.0	62.00	160.00	1200
E SD XX 0950	950	760.0	863.6	690.8	SY680	167.9	62.00	160.00	1536
E SD XX 1050	1050	840.0	954.5	763.6	SY720	184.6	62.00	160.00	1536

OIL AND WATER CAPACITIES OF BAUDOUIN DIESEL GENERATOR

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E BD XX 0017	17	13.6	15.5	12.4	WP2.1D18E2	4,8	9	7	92
E BD XX 0022	22	17.6	20.0	16.0	WP2.1D22E2	6,1	9	7	92
E BD XX 0030	30	24.0	27.3	21.8	WP2.1D30E200	6,1	9	9	92
E BD XX 0035	35	28.0	31.8	25.5	WP2.1D33E200	6,9	9	9	132
E BD XX 0250	250	200.0	227.3	181.8	WP10D200E200	47,3	24	53	580
E BD XX 0275	275	220.0	250.0	200.0	WP10D238E200	50,9	24	53	580
E BD XX 0330	330	264.0	300.0	240.0	WP10D264E200	65,0	24	53	580
E BD XX 0360	360	288.0	327.2	261.8	WP10D320E200	71,4	24	53	580
E BD XX 0425	425	340.0	386.3	309.1	WP13D385E200	82,5	36	25	750
E BD XX 0485	485	388.0	440.9	352.7	WP13D405E200	93,7	36	25	750
E BD XX 0550	550	440.0	500.0	400.0	6M26D447E200	107,5	50	79	1000
E BD XX 0605	605	484.0	549.9	440.0	6M26D484E200	118,2	50	79	1000
E BD XX 0720	720	576.0	654.5	523.6	6M33D572E200	140,6	60.5	41.63	1250
E BD XX 0770	770	616.0	699.9	559.9	6M33D633E200	149,8	60.5	126.63	1250
E BD XX 0900	900	720.0	818.1	654.5	12M26D748E200	171,4	113	180	1550
E BD XX 1000	1000	800.0	909.0	727.2	12M26D792E200	190,4	113	180	1550

OTHER TECHNICAL DATA

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E BD XX 1125	1125	900.0	1022.6	818.1	12M26D902E200	211,9	113	198	2000
E BD XX 1250	1250	1000.0	1136.3	909.0	12M26D968E200	233,8	113	210	2000
E BD XX 1385	1385	1108.0	1259.0	1007.2	12M33D1108E200	255,4	146	75.94	2500
E BD XX 1500	1500	1200.0	1363.5	1090.8	12M33D1210E200	274,9	146	75.94	2500

OIL AND WATER CAPACITIES OF DEUTZ (226B) DIESEL GENERATOR

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E DZ XX 0040	40	32.0	36.4	29.1	D226B-3D	8.1	7.25	17.20	132
E DZ XX 0060	60	48.0	54.5	43.6	TD226B-3D	13.6	7.25	17.20	132

OIL AND WATER CAPACITIES OF DEUTZ (WP) DIESEL GENERATOR

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E DZ XX 0072	72	57.6	65.4	52.4	WP4D66E200	13,84	10,00	15.30	180
E DZ XX 0082	82	65.6	74.5	59.6	WP4D66E200	15,47	10,00	15.30	180
E DZ XX 0110	110	88.0	100.0	80.0	WP4D81E200	20,76	10,00	15.30	180
E DZ XX 0150	150	120.0	136.4	109.1	WP4D108E200	28,05	10,00	16.30	280
E DZ XX 0175	175	140.0	159.1	127.3	WP6D140E200	32,79	20	28	380
E DZ XX 0220	220	176.0	200.0	160.0	WP6D152E200	39,03	20	28.00	380

OIL AND WATER CAPACITIES OF DEUTZ (1015) DIESEL GENERATOR

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E DT XX 0290	290	232.0	263.6	210.9	BF6M1015-LA GA	52.3	36.00	62.00	565
E DT XX 0315	315	252.0	286.3	229.1	BF6M1015C-LA G1A	55.3	36.00	62.00	565
E DT XX 0360	360	288.0	327.2	261.8	BF6M1015C-LA G2A	63.9	36.00	62.00	760
E DT XX 0400	400	320.0	363.6	290.9	BF6M1015C-LA G3A	70.1	36.00	62.00	760
E DT XX 0430	430	344.0	390.9	312.7	BF6M1015C-LA G4	79.6	36.00	62.00	760
E DT XX 0460	460	368.0	418.1	334.5	BF6M1015CP-LA G	83.9	36.00	67.00	760
E DT XX 0525	525	420.0	477.2	381.8	BF8M1015C-LA G1A	92.8	48.00	87.00	1145
E DT XX 0550	550	440.0	500.0	400.0	BF8M1015C-LA G2	98.7	48.00	87.00	1145
E DT XX 0575	575	460.0	522.7	418.1	BF8M1015CP-LA G1A	107.4	48.00	87.00	1145

OTHER TECHNICAL DATA

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E DT XX 0615	615	492.0	559.0	447.2	BF8M1015CP-LA G2	117.4	48.00	87.00	1145
E DT XX 0640	640	512.0	581.8	465.4	BF8M1015CP-LA G3	125.2	48.00	93.00	1145
E DT XX 0675	675	540.0	613.6	490.9	BF8M1015CP-LA G4	132.9	48.00	93.00	1145
E DT XX 0700	700	560.0	636.3	509.0	BF8M1015CP-LA G5	137.8	48.00	93.00	1145
E DT XX 0825	825	660.0	749.9	599.9	HC12V132ZL	155.3	48.00	111.00	1250

OIL AND WATER CAPACITIES OF VOLVO DIESEL GENERATOR

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E VL XX 0094	94	75.2	85.4	68.4	TAD 530 GE	18,89	13.00	19.70	180
E VL XX 0109	109	87.2	99.1	79.3	TAD 531 GE	22,57	13.00	19.70	180
E VL XX 0142	142	113.6	129.1	103.3	TAD 532 GE	31,47	11.00	20.20	280
E VL XX 0167	167	133.6	151.8	121.4	TAD 731 GE	33,64	20.00	23.80	380
E VL XX 0205	206	164.8	187.3	149.8	TAD 732 GE	40,09	34.00	41.80	380
E VL XX 0226	224	179.2	203.6	162.9	TAD 733 GE	44,47	34.00	41.80	380
E VL XX 0274	278	222.4	252.7	202.2	TAD 734 GE	51,12	29.00	42.00	580
E VL XX 0305	305	244.0	277.2	221.8	TAD 1341 GE	55,47	36.00	44.00	1050
E VL XX 0351	351	280.8	319.1	255.2	TAD 1341 GE	60,9	36.00	44.00	1050
E VL XX 0387	387	309.6	351.8	281.4	TAD 1342 GE	68,09	36.00	44.00	1050
E VL XX 0414	414	331.2	376.3	301.1	TAD 1343 GE	73,41	36.00	44.00	1050
E VL XX 0452	452	361.6	410.9	328.7	TAD 1344 GE	80,8	36.00	44.00	1050
E VL XX 0501	501	400.8	455.4	364.3	TAD 1345 GE	89,47	36.00	44.00	1050
E VL XX 0556	556	444.8	505.4	404.3	TAD 1641 GE	100,67	42.00	93.00	1050
E VL XX 0651	651	520.8	591.8	473.4	TAD 1642 GE	117,17	48.00	93.00	1050
E VL XX 0700	700	560.0	636.3	509.0	TWD 1643 GE	125,49	48.00	166.00	1050

OIL AND WATER CAPACITIES OF RICARDO DIESEL GENERATOR

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E RC XX 0035	35	28.0	31.8	25.5	K4100D	8.6	14.00	18.00	132
E RC XX 0050	50	40.0	45.5	36.4	K4100ZD	11.8	14.00	18.00	132
E RC XX 0070	70	56.0	63.6	50.9	R4105ZD	15.0	16.00	25.00	180
E RC XX 0082	82	65.6	74.5	59.6	R4105ZD	18.0	16.00	25.00	180
E RC XX 0094	94	75.2	85.4	68.4	R4105IZD	20,2	16.00	25.00	180

OTHER TECHNICAL DATA

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E RC XX 0110	110	88.0	100.0	80.0	R6105ZD	23.9	19.00	40.00	280
E RC XX 0125	125	100.0	113.6	90.9	R6105ZD	27.2	19.00	40.00	280
E RC XX 0150	150	120.0	136.4	109.1	R6105AZLD	30.5	19.00	40.00	280
E RC XX 0175	175	140.0	159.1	127.3	R6105IZLD	33.5	19.00	40.00	380

OIL AND WATER CAPACITIES OF YANGDONG DIESEL GENERATOR

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E YD XX 0022	22	17.6	20.0	16.0	YND485D	5.6	6.7	19	92
E YD XX 0030	30	24.0	27.3	21.8	YSD490D	7.6	7.6	19	92

OIL AND WATER CAPACITIES OF PERKINS DIESEL GENERATOR

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E PR XX 0010	10	8.0	9.1	7.3	403A-11G	3.0	4.90	4.90	92
E PR XX 0015	15	12.0	13.6	10.9	403A-15G1	3.7	6.00	6.00	92
E PR XX 0023	22	17.6	20.0	16.0	404A-22G1	5.3	10.60	7.00	92
E PR XX 0033	33	26.4	30.0	24.0	1103A-33G	7.2	8.30	10.20	132
E PR XX 0050	50	40.0	45.5	36.4	1103A-33TG1	10.8	7.90	10.20	132
E PR XX 0066	66	52.8	60.0	48.0	1103A-33TG2	13.9	7.90	10.20	180
E PR XX 0072	72	57.6	65.4	52.4	1104A-44TG1	14.8	8.00	13.00	180
E PR XX 0088	88	70.4	80.0	64.0	1104A-44TG2	18.7	8.00	13.00	180
E PR XX 0112	112	89.6	101.8	81.4	1104C-44TAG2	22.6	8.00	12.60	180
E PR XX 0150	150	120.0	136.4	109.1	1106A-70TAG1R	30.2	18.00	21.00	280
E PR XX 0150	150	120.0	136.4	109.1	1106A-70TAG1	30.2	18.00	21.00	280
E PR XX 0165	165	132.0	150.0	120.0	1106A-70TAG2R	33.4	16.50	21.00	280
E PR XX 0165	165	132.0	150.0	120.0	1106A-70TAG2	33.4	16.50	21.00	280
E PR XX 0200	200	160.0	181.8	145.4	1106A-70TAG3R	40.5	16.50	21.00	380
E PR XX 0200	200	160.0	181.8	145.4	1106A-70TAG3	40.5	16.50	21.00	380
E PR XX 0220	220	176.0	200.0	160.0	1106A-70TAG4R	44.5	16.50	21.00	380
E PR XX 0220	220	176.0	200.0	160.0	1106A-70TAG4	44.5	16.50	21.00	380
E PR XX 0250	250	200.0	227.3	181.8	1506A-E88TAG2	50.9	41.00	11.00	580
E PR XX 0275	275	220.0	250.0	200.0	1506A-E88TAG3	56.0	41.00	11.00	580
E PR XX 0300	300	240.0	272.7	218.2	1506A-E88TAG4	60.0	41.00	11.00	580

OTHER TECHNICAL DATA

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E PR XX 0330	330	264.0	300.0	240.0	1506A-E88TAG5	65.0	41.00	21.00	580
E PR XX 0400	400	320.0	363.6	290.9	2206C-E13TAG2	75.0	40.00	51.40	970
E PR XX 0450	450	360.0	409.1	327.2	2206C-E13TAG3	85.0	40.00	51.40	970
E PR XX 0500	500	400.0	454.5	363.6	2506C-E15TAG1	99.0	62.00	58.00	970
E PR XX 0550	550	440.0	500.0	400.0	2506C-E15TAG2	106.0	62.00	58.00	970
E PR XX 0630	630	504.0	572.7	458.1	2806C-E18TAG1A	126.0	62.00	61.00	1100
E PR XX 0650	650	520.0	590.9	472.7	2806C-E18TAG1A	126.0	62.00	61.00	1100
E PR XX 0700	700	560.0	636.3	509.0	2806C-E18TAG2	132.0	62.00	61.00	1100
E PR XX 0825	825	660.0	749.9	599.9	400623TAG2A	157.0	113.40	105.00	1600
E PR XX 0900	880	704.0	799.9	639.9	400623TAG3A	172.0	113.40	105.00	1600
E PR XX 0900	900	720.0	818.1	654.5	400623TAG3A	172.0	113.40	105.00	1600
E PR XX 1002	1002	801.6	910.8	728.7	4008TAG1A	195.0	153.00	149.00	1725
E PR XX 1125	1125	900.0	1022.6	818.1	4008TAG2A	215.0	153.00	162.00	1950
E PR XX 1125	1250	1000.0	1136.3	909.0	4008-30TAG3	244.0	153.00	162.00	2500
E PR XX 1375	1375	1100.0	1249.9	999.9	401246TAG0A	259.0	177.00	210.00	2500
E PR XX 1385	1385	1108.0	1259.0	1007.2	401246TWG2A	259.0	177.00	196.00	2500
E PR XX 1500	1500	1200.0	1363.5	1090.8	401246TAG2A	283.0	177.00	196.00	2500
E PR XX 1656	1656	1324.8	1505.3	1204.2	401246TAG2A	310.0	177.00	207.00	2500
E PR XX 1880	1880	1504.0	1708.9	1367.1	401246TAG3A	370.0	177.00	207.00	3000
E PR XX 2028	2028	1622.4	1843.5	1474.8	4016TAG2A	370.7	237.20	316.00	3000
E PR XX 2264	2264	1811.2	2058.0	1646.4	4016TAG2A	421.7	237.20	316.00	3500
E PR XX 2500	2500	2000.0	2272.5	1818.0	4016-61TRG3	470.0	237.20	260.00	4000

OIL AND WATER CAPACITIES OF KUBOTA DIESEL GENERATOR

MODEL	POWER				ENGINE MODEL	Fuel Consumption at Full Load	Oil Capacity	Water Capacity	Fuel Tank Capacity
	Stand By		Prime						
	kVA	kW	kVA	kW		litre / hour	litres	litres	litres
E KB XX 0010	10	8.0	9.1	7.3	D1105-BG	2.3	5.1	8	92
E KB XX 0017	16	12.8	14.5	11.6	D1703-M-BG	3.5	5.6	8	92
E KB XX 0023	22	17.6	20.0	16.0	V2203-M-E3BG	4.7	7.6	10	92
E KB XX 0030	30	24.0	27.3	21.8	V33-E2B2	7.2	8.4	10	92

WARNING

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OTHER TECHNICAL DATA

CROSS-SECTIONS OF CABLES TO BE USED

In some cases, the air to be drawn by the engine may be taken from outside as the room is not suitable. Following points shall be considered in such cases.

Stand By (kVA)		max. A	power cable 1 pc. / phase	power cable 2 pcs. / phase	power cable 3 pcs. / phase	power cable 4 pcs. / phase	power cable 5 pcs. / phase	power cable 6 pcs. / phase	power cable 7 pcs. / phase	power cable 8 pcs. / phase
min.	max									
10	25	36	4 mm^2	-	-	-	-	-	-	-
25	33	47	6 mm^2	-	-	-	-	-	-	-
33	45	65	10 mm^2	-	-	-	-	-	-	-
45	60	87	16 mm^2	-	-	-	-	-	-	-
60	80	115	25 mm^2	-	-	-	-	-	-	-
80	99	143	35 mm^2	-	-	-	-	-	-	-
99	123	178	50 mm^2	-	-	-	-	-	-	-
123	152	220	70 mm^2	-	-	-	-	-	-	-
152	184	265	95 mm^2	-	-	-	-	-	-	-
184	215	310	120 mm^2	-	-	-	-	-	-	-
215	246	355	150 mm^2	50 mm^2	-	-	-	-	-	-
246	281	405	185 mm^2	70 mm^2	-	-	-	-	-	-
281	333	480	240 mm^2	95 mm^2	-	-	-	-	-	-
333	430	620	-	120 mm^2	70 mm^2	-	-	-	-	-
430	457	660	-	150 mm^2	70 mm^2	-	-	-	-	-
457	551	795	-	185 mm^2	95 mm^2	-	-	-	-	-
551	610	880	-	240 mm^2	120 mm^2	70 mm^2	-	-	-	-
610	735	1060	-	-	150 mm^2	95 mm^2	70 mm^2	-	-	-
735	842	1215	-	-	185 mm^2	120 mm^2	95 mm^2	70 mm^2	-	-
842	984	1420	-	-	240 mm^2	150 mm^2	120 mm^2	95 mm^2	70 mm^2	-
984	1123	1620	-	-	-	185 mm^2	150 mm^2	120 mm^2	95 mm^2	70 mm^2
1123	1331	1920	-	-	-	240 mm^2	185 mm^2	150 mm^2	120 mm^2	95 mm^2
1331	1663	2400	-	-	-	-	240 mm^2	185 mm^2	150 mm^2	120 mm^2
1663	1965	2835	-	-	-	-	-	240 mm^2	185 mm^2	150 mm^2
1965	2245	3240	-	-	-	-	-	-	240 mm^2	185 mm^2
2245	2661	3840	-	-	-	-	-	-	-	240 mm^2

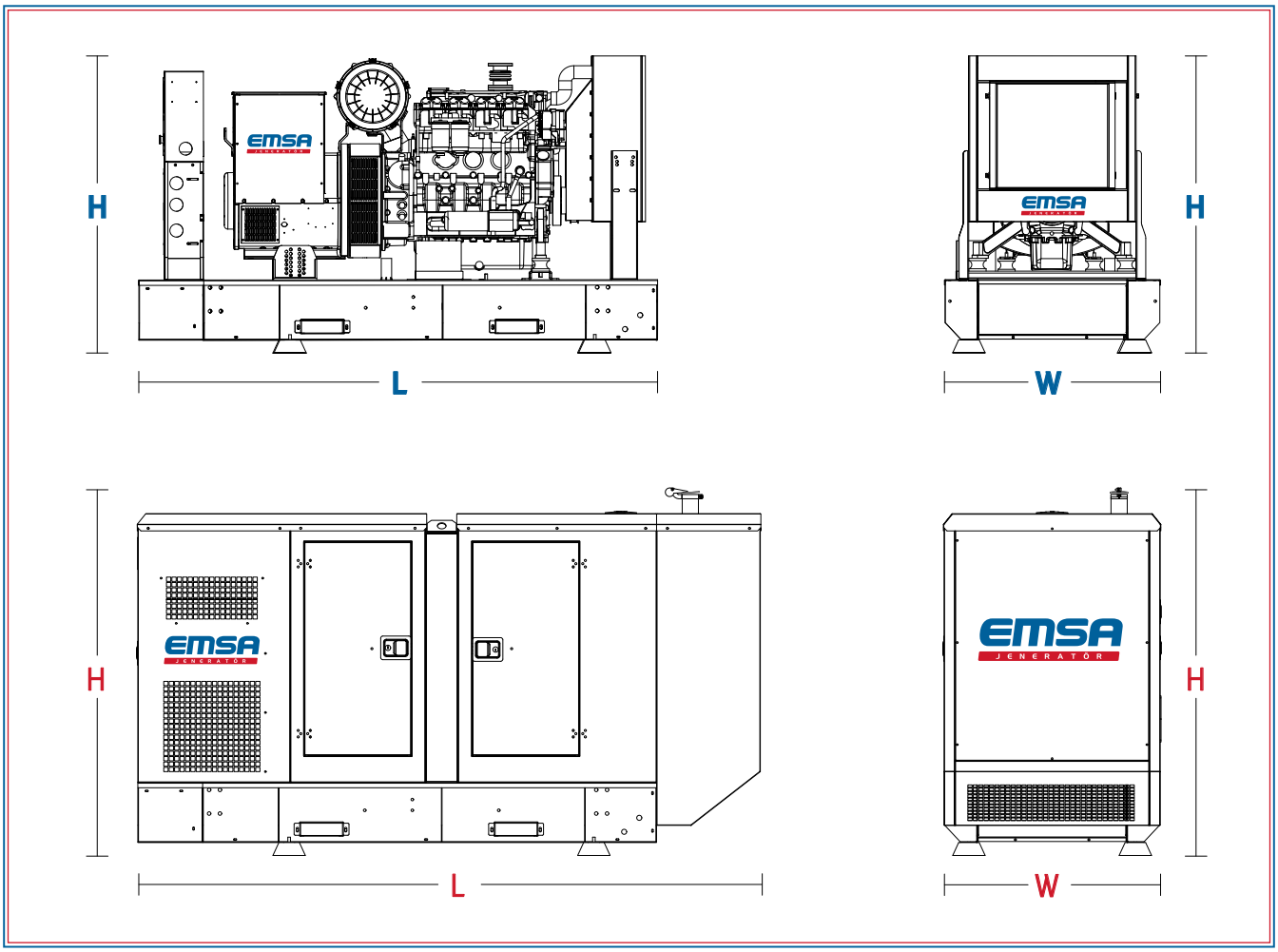
WARNING

- 100mt. Recommended up to the distance above.
- “Phase cross-section / 2” may be used for neutral line.

OTHER TECHNICAL DATA

EN

GENERATOR DIMENSIONS



MODEL	GENERATOR DIMENSIONS (WITH CABINET)				GENERATOR DIMENSIONS (WITHOUT CABINET)			
	WIDTH (W)	LENGTH (L)	HEIGHT (H)	WEIGHT (KG)	WIDTH (W)	LENGTH (L)	HEIGHT (H)	WEIGHT (KG)
E KB XX 0010	900	2200	1400	650	900	1850	1150	435
E KB XX 0017	900	2200	1400	750	900	1850	1150	545
E KB XX 0022	900	2200	1400	775	900	1850	1150	570
E KB XX 0030	900	2200	1400	850	900	1850	1150	590
E RC XX 0013	900	2200	1400	725	900	1850	1150	520
E RC XX 0017	900	2200	1400	730	900	1850	1150	535
E YD XX 0022	900	2200	1400	790	900	1850	1150	585
E YD XX 0030	900	2200	1400	830	900	1850	1150	625
E PR XX 0010	900	2200	1400	745	900	1850	1200	540
E PR XX 0015	900	2200	1400	760	900	1850	1200	555
E PR XX 0023	900	2200	1400	820	900	1850	1200	615

OTHER TECHNICAL DATA

MODEL	GENERATOR DIMENSIONS (WITH CABINET)				GENERATOR DIMENSIONS (WITHOUT CABINET)			
	WIDTH (W)	LENGTH (L)	HEIGHT (H)	WEIGHT (KG)	WIDTH (W)	LENGTH (L)	HEIGHT (H)	WEIGHT (KG)
E DZ XX 0040	1000	2900	1650	1105	1000	2400	1390	825
E DZ XX 0060	1000	2900	1650	1195	1000	2400	1390	920
E DZ XX 0072	1000	2900	1650	1340	1000	2400	1480	1060
E DZ XX 0082	1000	2900	1650	1410	1000	2400	1480	1110
E DZ XX 0110	1000	2900	1650	1410	1000	2400	1480	1130
E RC XX 0035	1000	2900	1650	1045	1000	2400	1450	765
E RC XX 0050	1000	2900	1650	1135	1000	2400	1450	855
E RC XX 0070	1000	2900	1650	1315	1000	2400	1450	1035
E RC XX 0082	1000	2900	1650	1315	1000	2400	1450	1035
E PR XX 0033	1000	2900	1650	1080	1000	2400	1450	800
E PR XX 0050	1000	2900	1650	1185	1000	2400	1450	905
E PR XX 0066	1000	2900	1650	1210	1000	2400	1450	930
E PR XX 0072	1000	2900	1650	1285	1000	2400	1450	1005
E PR XX 0088	1000	2900	1650	1305	1000	2400	1450	1025
E PR XX 0112	1000	2900	1650	1430	1000	2400	1450	1150
E DZ XX 0150	1050	3580	2000	1770	1050	3100	1680	1400
E DZ XX 0220	1050	3580	2000	2120	1050	3100	1680	1750
E RC XX 0110	1050	3580	2000	1710	1050	3100	1760	1340
E RC XX 0125	1050	3580	2000	1715	1050	3100	1760	1345
E RC XX 0150	1050	3580	2000	1820	1050	3100	1760	1450
E RC XX 0175	1050	3580	2000	1860	1050	3100	1760	1490
E PR XX 0150	1050	3580	2000	1950	1050	3100	1620	1450
E PR XX 0165	1050	3580	2000	1970	1050	3100	1620	1490
E PR XX 0200	1050	3580	2000	2125	1050	3100	1620	1640
E PR XX 0220	1050	3580	2000	2130	1150	3340	1930	1740
E BD XX 0275	1150	3900	2720	2820	1150	3340	1930	2340
E BD XX 0330	1150	3900	2720	2830	1150	3340	1930	2350
E BD XX 0360	1150	3900	2720	2900	1150	3340	1930	2420
E SD XX 0220	1150	3900	2720	2800	1150	3340	2130	2320
E SD XX 0285	1150	3900	2720	2950	1150	3340	2130	2470
E SD XX 0330	1150	3900	2720	3110	1150	3340	2130	2630
E PR XX 0250	1150	3900	2720	2820	1150	3340	1930	2470
E PR XX 0275	1150	3900	2720	2820	1150	3340	1930	2560
E PR XX 0300	1150	3900	2720	2820	1150	3340	1930	2580
E PR XX 0330	1150	3900	2720	2880	1150	3340	1930	2640
E DT XX 0360	1600	3600	2550	3215	1600	3000	1940	2665

OTHER TECHNICAL DATA

MODEL	GENERATOR DIMENSIONS (WITH CABINET)				GENERATOR DIMENSIONS (WITHOUT CABINET)			
	WIDTH (W)	LENGTH (L)	HEIGHT (H)	WEIGHT (KG)	WIDTH (W)	LENGTH (L)	HEIGHT (H)	WEIGHT (KG)
E DT XX 0400	1600	3600	2550	3340	1600	3000	1940	2745
E DT XX 0430	1600	3600	2550	3460	1600	3000	1940	2750
E DT XX 0460	1600	3600	2550	3460	1600	3000	1940	2750
E DT XX 0525	1600	4000	2700	3980	1600	3500	2140	3285
E DT XX 0550	1600	4000	2700	3980	1600	3500	2140	3285
E DT XX 0575	1600	4000	2700	3980	1600	3500	2140	3285
E DT XX 0615	1600	4000	2700	4080	1600	3500	2140	3420
E DT XX 0640	1600	4000	2700	4150	1600	3500	2140	3490
E DT XX 0675	1600	4000	2700	4200	1600	3500	2140	3535
E DT XX 0700	1600	4000	2700	4250	1600	3500	2140	3540
E DT XX 0825	2100	4970	2700	6100	1600	3500	2140	5000
E SD XX 0385	1600	4000	2700	3660	1600	3500	2140	2980
E SD XX 0460	1600	4000	2700	3730	1600	3500	2060	3050
E SD XX 0515	1900	4850	2950	5180	1900	4000	2095	4390
E SD XX 0570	1900	4850	2950	5370	1900	4000	2135	4570
E SD XX 0640	1900	4850	2950	5680	1900	4000	2310	4880
E SD XX 0715	1900	4850	2950	6080	1900	4000	2310	5280
E SD XX 0825	2100	4850	3050	6150	1900	4000	2420	5350
E SD XX 0950	2100	4850	3050	6360	1900	4000	2420	5660
E SD XX 1050	2100	4850	3050	6520	1900	4000	2420	5820
E PR XX 0825	1900	6400	3345	8100	1800	4450	2765	6900
E PR XX 0900	1900	6400	3345	8350	1800	4450	2765	6900
E PR XX 1002	2250	7200	3250	9250	2160	5060	2110	8350
E PR XX 1125	2250	7200	3250	9400	2160	5060	2110	8500
E HN XX 0900	1900	5400	3190	7375	1900	5400	3190	6325

WARNING

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EN

OTHER TECHNICAL DATA

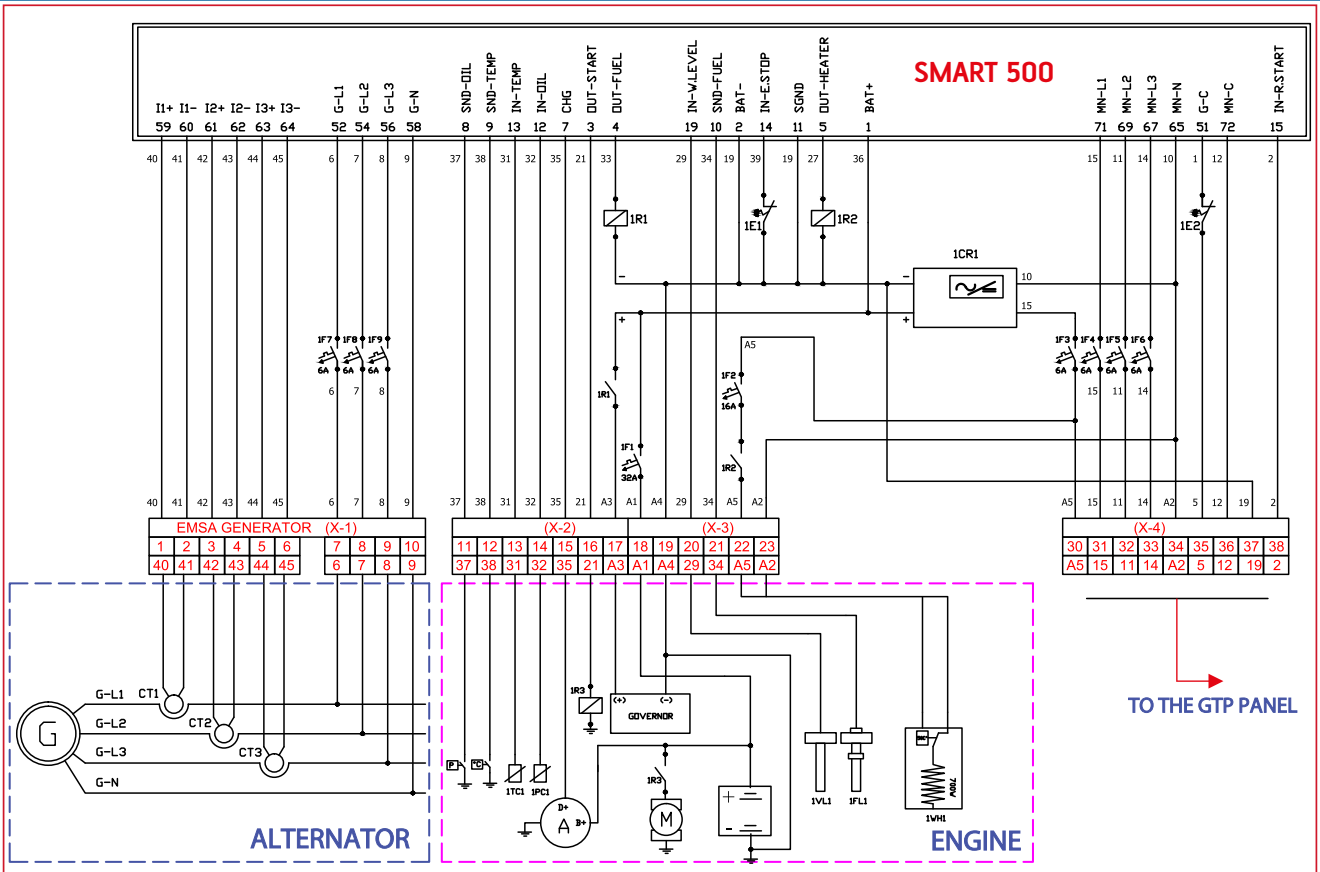
MAINTENANCE INSTRUCTIONS

GENERATOR MAINTENANCE SCHEDULE

MAINTENANCE OPERATION	MAINTENANCE TIME												IN CHARGE OF THE OPERATION
	Daily	Monthly	50 hours	150 hours	300 hours	500 hours	1000 hours	2000 hours	5000 hours	10000 hours	Once in every 6 months	Once in every 12 months	
Check the Diesel Engine Lubricating Oil Level	✓										In an event where the first 50 Working hours is up in 6 months, after 6 months, the 50 hours maintenance shall be performed.	After initial maintenance, if the 150 Working hours is not up in 1 year, after 1 year 150 hours maintenance shall be performed.	Operator
Check the Diesel Engine Cooling Water Level	✓												Operator
Check the Generator Set Fuel Level (min. 1/4)	✓												Operator
Perform the Generator Set Perimeter and General Clean up		✓											Operator
Check the Diesel Engine Temperature		✓											Operator
Discharge Fuel Until Clean Fuel Run Through the Fuel Filter		✓	✓										Operator
Check for Abnormal Vibration Check by Running the Generator in Test Mode		✓											Operator
Check the Torque Values for Engine Cover Studs			✓										Authorized Service
Check the Diesel Engine "V" Belt Tension and Wear			✓	✓	✓	**Once in every 150 hours**							Authorized Service
(If Any) Check Diesel Engine Fuel Pump Oil Level			✓	✓	✓	**Once in every 150 hours**							Authorized Service
Change the Diesel Engine Oil and Oil Filter (with 15W/40 Turbo Diesel Oil)			✓	✓	✓	**Once in every 150 hours**							Authorized Service
Change the Oil Filter (Based on the Gauge)					✓	Check the Gauge							Authorized Service
Perform Valve Clearance Adjustment and Controls							✓						Authorized Service
Change Diesel Engine Fuel Filter			✓	✓	✓	**Once in every 150 hours**							Authorized Service
Clean the Crankcase Air Discharge Mechanism						✓							Authorized Service
Perform Injector Test and Adjustment							✓						Authorized Service
Perform Compression Pressure Check								✓					Authorized Service
Check the Circulation Pump						✓	✓						Authorized Service
Check the Turbocharger							✓		✓				Authorized Service
Perform Fuel Pump Test and Adjustment							✓		✓				Authorized Service
Check the Cylinder Covers.									✓				Authorized Service
Check the Jackets for Wear									✓				Authorized Service
Clean the Cooling Water Passage										✓			Authorized Service
Perform Main Bearing and Rod Bearing Clearance Check										✓			Authorized Service
Check the Piston for Wear										✓			Authorized Service
Check the Crankshaft for Wear										✓			Authorized Service
Check the Crank Mill for Wear										✓			Authorized Service
Check Driver Gear Group for Wear Yapınız										✓			Authorized Service
Perform General Maintenance for Fuel Pump							✓		✓	✓			Authorized Service
Replace the Diesel Engine Oil Pump										✓			Authorized Service
Replace the Crank Seals									✓	✓			Authorized Service
Replace Alternator Bearing									✓				Authorized Service

OTHER TECHNICAL DATA

ELECTRIC DIAGRAMS

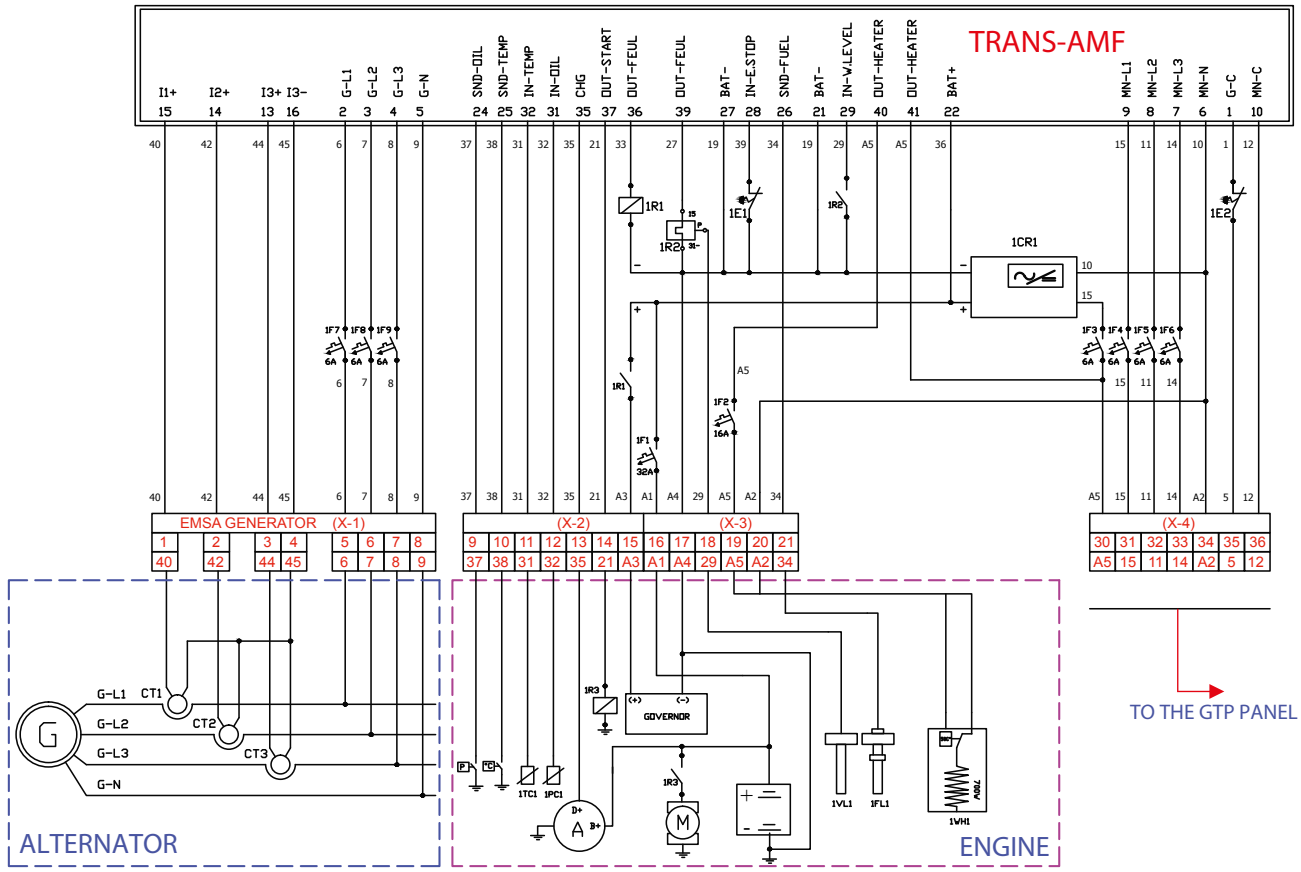


NO	EQ.	DESCRIPTION
1	SMART 500	GEN-SET CONTROLLER
2	1CR1	BATTERY CHARGER
3	1R1	STOP RELAY
4	1R2	WATER HEATER RELAY
5	1R3	STARTER RELAY
6	1R4	MAINS CONTACTOR RELAY
7	1R5	GENERATOR CONTACTOR RELAY
8	GOVERNOR	GOVERNOR
9	1VL1	WATER LEVEL SENDER
10	1FL1	FUEL LEVEL SENDER
11	1TC1	TEMPERATURE SENDER
12	1PC1	OIL PRESSURE SENDER
13	1WH1	WATER HEATER
14	CT1/2/3	CURRENT TRANSFORMER
15	1E1/1E2	E.STOP NC CONTACT
16	1F1/... /1F9	MCB
17	1ATS1	CHANGEOVER SWITCH

NO	SYM.	CABLE CLR
1	A1	4 mm² RED
2	A2	2,5 mm² BLUE
3	A3	2,5 mm² RED
4	A4	2,5 mm² BLACK
5	A5	2,5 mm² BROWN
6	A6	2,5 mm² YELLOW
7	A7	0,75 mm² PROT.

KLMNS	NO	C.NO	DESCRIPTION
(X-1)	1	40	L1 CT(S1)
	2	41	L1 CT(S2)
	3	42	L2 CT(S1)
	4	43	L2 CT(S2)
	5	44	L3 CT(S1)
	6	45	L3 CT(S2)
	7	6	GEN L1
	8	7	GEN L2
	9	8	GEN L3
	10	9	GEN LN
(X-2)	11	37	OIL PRESSURE SENDER
	12	38	TEMPERATURE SENDER
	13	31	HIGH TEMPERATURE SWITCH
	14	32	LOW OIL PRS. SWITCH
	15	35	CHARGE ALTERNATOR
	16	21	OUTPUT STARTER
	17	A3	OUTPUT STOP-FUEL
(X-3)	18	A1	BATTERY (+)
	19	A4	BATTERY (-)
	20	29	LOW WATER LEVEL SWITCH
	21	34	FUEL LEVEL SENDER
	22	A5	WATER HEATER PHASE
	23	A2	WATER HEATER NEUTRAL
(X-4)	30	A5	MAINS HEATER PHASE
	31	15	MAINS L1
	32	11	MAINS L2
	33	14	MAINS L3
	34	A2	MAINS LN
	35	5	OUTPUT GEN CONTACTOR
	36	12	OUTPUT MAINS CONTACTOR
	37	19	BATTERY -
	38	2	REMOTE START IN

OTHER TECHNICAL DATA



NO	MALZ./EQ.	ACIKLAMA / DESCRIPTION
1	TRANS-AMF	JEN. KONTROL UNITESI / GEN-SET CONTROLLER
2	1CR1	AKU SARJ REDRESORU / BATTERY CHARGER
3	1R1	STOP ROLESI / STOP RELAY
4	1R2	ISITICI ROLESI / WATER HEATER RELAY
5	1R3	MARS ROLESI / STARTER RELAY
6	1R4	SEBEKE KONT. ROLESI / MAINS CONTACTOR RELAY
7	1R5	JEN. KONT. ROLESI / GENERATOR CONTACTOR RELAY
8	GOVERNOR	GOVERVOR / GOVERNOR
9	1VL1	SU SEVIYE PROBU / WATER LEVEL SENDER
10	1FL1	YAKIT SEVIYE SENSORU / FUEL LEVEL SENDER
11	1TC1	HARARET SENSORU / TEMPERATURE SENDER
12	1PC1	YAG BASINC SENSORU / OIL PRESSURE SENDER
13	1WH1	BLOK ISITICI / WATER HEATER
14	CT1/2/3	AKIM TRAFOSU / CURRENT TRANSFORMER
15	1E1/1E2	A.STOP NC KONTAK / E.STOP NC CONTACT
16	1F1/... /1F9	OTOMATIK SIGORTALAR / MCB
17	1ATS1	OTOMATIK TRANSFER UNITESI / CHANGEOVER SWITCH

NO	SYM.	KABLO RENK/CABLE CLR
1	A1	4 mm² KIRMIZI / RED
2	A2	2,5 mm² MAVI / BLUE
3	A3	2,5 mm² KIRMIZI / RED
4	A4	2,5 mm² SIYAH / BLACK
5	A5	2,5 mm² K.RENGI / BROWN
6	A6	2,5 mm SARI / YELLOW
7	A7	0,75 mm² EKR. / PROT.

KLMNS	NO	C.NO	ACIKLAMA / DESCRIPTION
(X-1)	1	40	L1 CT(S1)
	2	42	L2 CT(S1)
	3	44	L3 CT(S1)
	4	45	L3 CT(S2)
	5	6	JEN L1 / GEN L1
	6	7	JEN L2 / GEN L2
	7	8	JEN L3 / GEN L3
	8	9	JEN LN / GEN LN
(X-2)	9	37	YAG BAS. GOST / OIL PRESSURE SENDER
	10	38	HARARET GOST / TEMPERATURE SENDER
	11	31	HARARET ARIZA / HIGH TEMPERATURE SWITCH
	12	32	YAG BASINC ARIZA / LOW OIL PRS. SWITCH
	13	35	SARJ IKAZ / CHARGE ALTERNATOR
	14	21	MARS CIKIS / OUTPUT STARTER
	15	A3	STOP-YAKIT CIKIS / OUTPUT STOP-FUEL
(X-3)	16	A1	AKU (+) / BATTERY (+)
	17	A4	AKU (-) / BATTERY (-)
	18	29	SU SEVIYE ARIZA / LOW WATER LEVEL SWITCH
	19	A5	ISITICI FAZ / WATER HEATER PHASE
	20	A2	ISITICI NOTR / WATER HEATER NEUTRAL
	21	34	YAKIT SEVIYE GOST. / FUEL LEVEL SENDER
(X-4)	30	A5	SEBEKE ISITICI FAZ / MAINS HEATER PHASE
	31	15	SEBEKE L1 / MAINS L1
	32	11	SEBEKE L2 / MAINS L2
	33	14	SEBEKE L3 / MAINS L3
	34	A2	SEBEKE LN / MAINS LN
	35	5	JENERATOR KONT. CIKIS / OUTPUT GEN CONTACTOR
	36	12	SEBEKE KONT. CIKIS / OUTPUT MAINS CONTACTOR

OTHER TECHNICAL DATA

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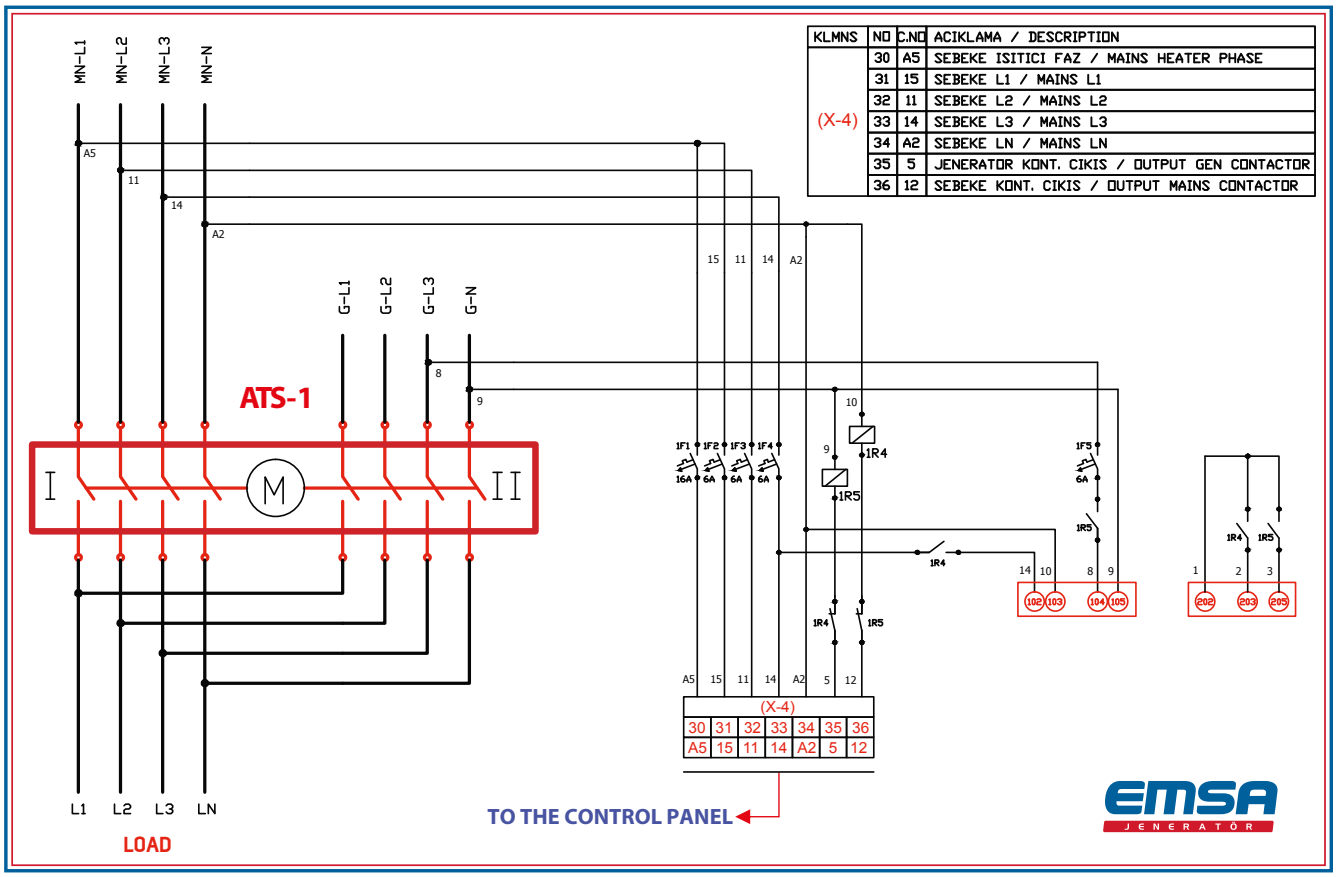
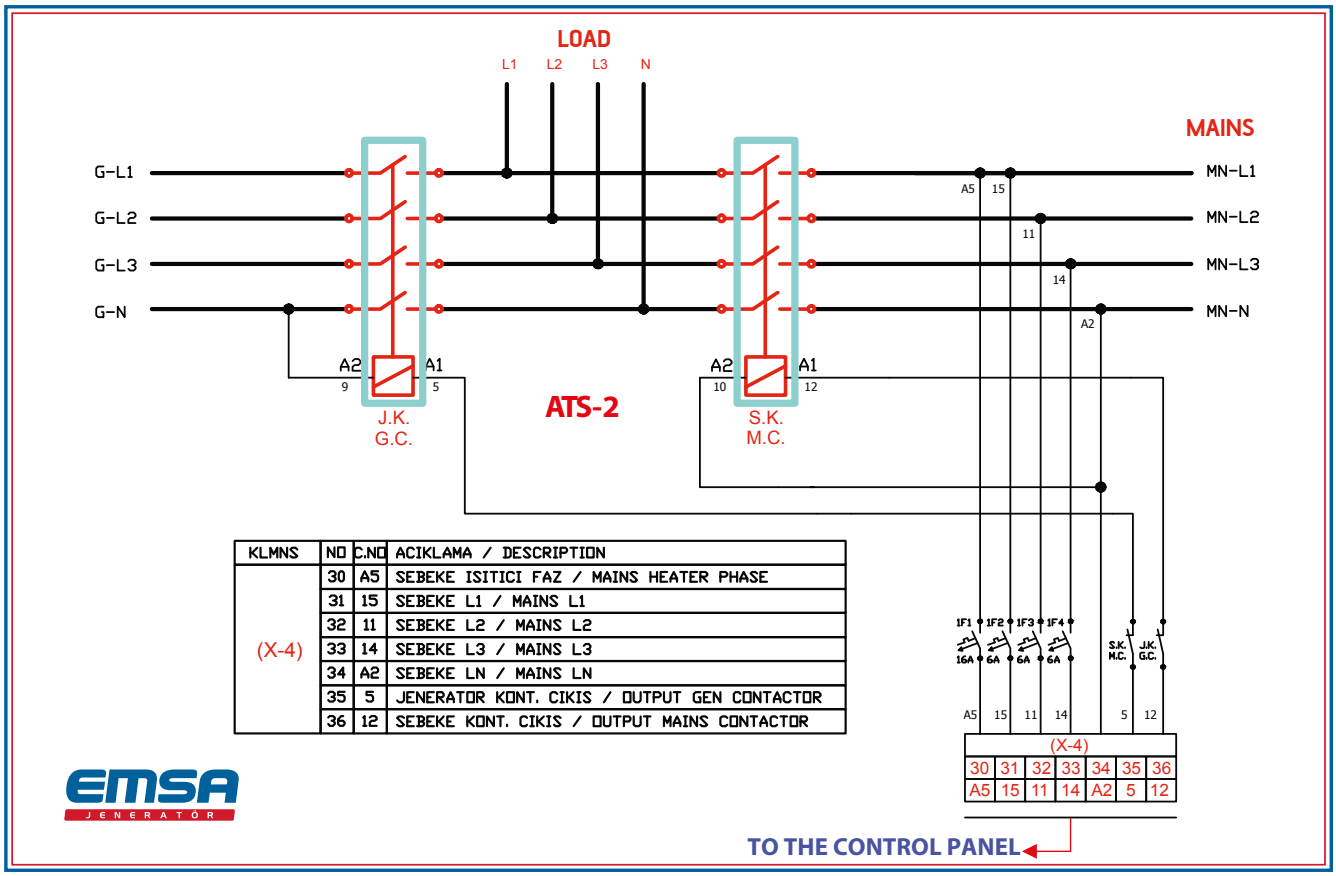


KLMNS	NO	C.NO	ACIKLAMA / DESCRIPTION
(X-4)	30	A5	SEBEKE ISITICI FAZ / MAINS HEATER PHASE
	31	15	SEBEKE L1 / MAINS L1
	32	11	SEBEKE L2 / MAINS L2
	33	14	SEBEKE L3 / MAINS L3
	34	A2	SEBEKE LN / MAINS LN
	35	5	JENERATOR KONT. CIKIS / OUTPUT GEN CONTACTOR
	36	12	SEBEKE KONT. CIKIS / OUTPUT MAINS CONTACTOR



KLMNS	NO	C.NO	ACIKLAMA / DESCRIPTION
(X-4)	30	A5	SEBEKE ISITICI FAZ / MAINS HEATER PHASE
	31	15	SEBEKE L1 / MAINS L1
	32	11	SEBEKE L2 / MAINS L2
	33	14	SEBEKE L3 / MAINS L3
	34	A2	SEBEKE LN / MAINS LN
	35	5	JENERATOR KONT. CIKIS / OUTPUT GEN CONTACTOR
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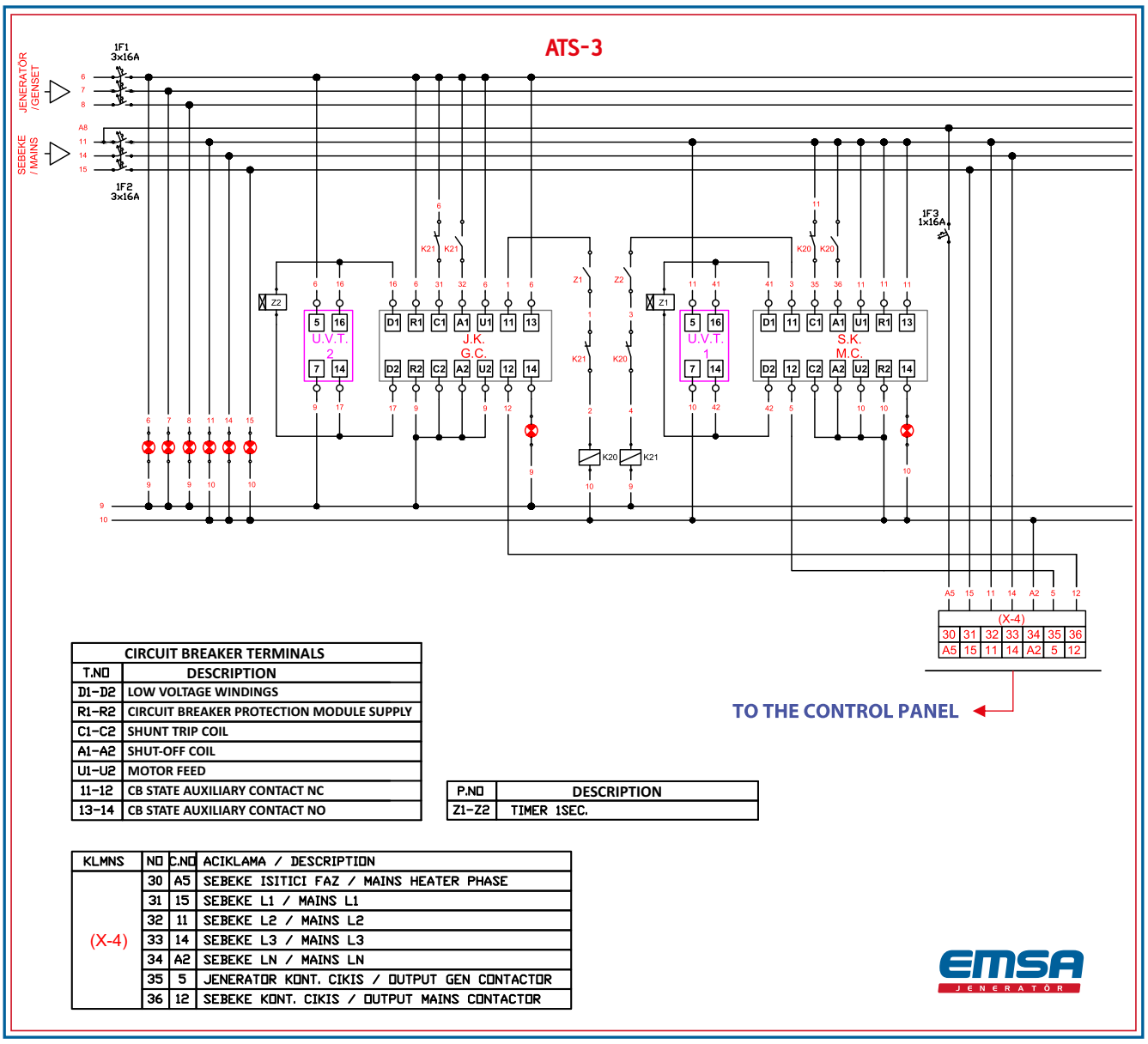
OTHER TECHNICAL DATA



CIRCUIT BREAKER TERMINALS	
T.NO	DESCRIPTION
D1-D2	LOW VOLTAGE WINDINGS
R1-R2	CIRCUIT BREAKER PROTECTION MODULE SUPPLY
C1-C2	SHUNT TRIP COIL
A1-A2	SHUT-OFF COIL
U1-U2	MOTOR FEED
11-12	CB STATE AUXILIARY CONTACT NC
13-14	CB STATE AUXILIARY CONTACT NO

P.NO	DESCRIPTION
Z1-Z2	TIMER 1SEC.

KLMNS	NO	C.NO	ACIKLAMA / DESCRIPTION
(X-4)	30	A5	SEBEKE ISITICI FAZ / MAINS HEATER PHASE
	31	15	SEBEKE L1 / MAINS L1
	32	11	SEBEKE L2 / MAINS L2
	33	14	SEBEKE L3 / MAINS L3
	34	A2	SEBEKE LN / MAINS LN
	35	5	JENERATOR KONT. CIKIS / OUTPUT GEN CONTACTOR
	36	12	SEBEKE KONT. CIKIS / OUTPUT MAINS CONTACTOR

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9 QUALITY STANDARDS

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QUALITY STANDARDS

Our generators are manufactured as per VDE 0530, BSE 4999 BS5000, IEC 34, TS ISO 8528, TS EN 12601 standards. ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007 management system certificates are accredited by Kiwa & MEYER.

Our generators have TS ISO 8528-5, TS EN 12601 certificates. Our generators comply with CE declaration.

DECLARATION OF CONFORMITY
(UYGUNLUK BEYANI)

CE

MANUFECTURER *(ÜRETİCİNİN)*

NAME (ADI) : EMSA ELEKTROMOTOR ALTERNATÖR SANAYİ VE TİCARET A.S.

ADRESS (ADRES) : MECLİS MAHALLESİ TERAZİLER CADDESİ NO:37 SANCAKTEPE-İSTANBUL / TURKEY

TEL : +90216.4200003 **FAX : + 90 850 2054562**

web www.emsa-jenerator.com.tr www.emsa.gen.tr

e-mail info@emsa-jenerator.com.tr info@emsa.gen.tr

WHERE BY DECLARE THAT BELOW EQUIPMENT CONFIRM BELOW STANDART AND DIRECTIVE

(AŞAGIDAKİ MAMUL LİSTESİNDEKİ ÜRÜNLERİN BELİRTİLEN STANDARTLARA UYGUN OLARAK TASARLANDIĞINI, DİREKTİF GEREKLERİNİ KARŞILAYACAK ŞEKİLDE ÜRETİLDİĞİNİ BEYAN EDERİZ.)

LIST OF EQUIPMENT (ÜRÜN LİSTESİ) : **10- 2500 kVA DIESEL GEN SETS; TOWER LIGHT** *(10-2500 KVA DİZEL JENERATÖR, MOBİL IŞIK KULESİ)*

DIRECTIVES / *(DİREKTİFLER)*

2006/42/EC	**MACHINERY DIRECTIVE** *(MAKİNA DİREKTİFİ YÖNETMELİĞİ)*
2004/108/EC	**EMC DIRECTIVE** *(ELEKTROMANYETİK UYUMLULUK YÖNETMELİĞİ)*
2006/95/EC	**LOW VOLTAGE DIRECTIVE** *(BELİRLİ GERİLİM SINIRLARI DAHİLİNDE KULLANILMAK ÜZERE TASARLANMIS ELEKTRİKLİ TECHİZAT İLE İLGİLİ YÖNETMELİK)*
2000/14/EC	**ON THE APPROXIMATION OF THE LAWS OF THE MEMBER STATES RELATING TO THE NOISE EMISSION IN THE ENVIRONMENT BY EQUIPMENT FOR USE OUTDOORS** *(AÇIK ALANDA KULLANILAN TECHİZAT TARAFINDAN OLUSTURULAN ÇEVREDEKİ GÜRÜLTÜ EMİSYONU İLE İLGİLİ YÖNETMELİK)*

DIESEL GEN SETS &TOWER LIGHT POWER 400 KW IS AWAILABLE FOR THOSE UP *(DİZEL JENERATÖR, MOBİL IŞIK KULESİ GÜCÜ 400 KW ' A KADAR OLANLAR İÇİN GEÇERLİDİR.)*

ANNEX VI INTERNAL CONTROL OF PRODUCTIONWITH ASSESSMENT OF TECHNICAL DOCUMENTATION AND PERIODICAL CHECKING

(EK VI TEKNİK BELGELERİN DEĞERLENDİRİLMESİ VE PERİYODİK KONTROLLER İLE İÇ ÜRETİM KONTROLÜ)

NOTIFIED BODY INVOLVED: *(ONAYLANMIS KURULUS)* **ENTE CERTIFICAZIONE MACCHINE SRL** Via Ca' Bella, 243 - loc. Castello di Serravalle 40053 Valsamoggia (BO) ITALY

NOTIFIED BODY NUMBER: 1282

RELATED STANDARDS *(İLGİLİ STANDARTLAR): EN12601; EN60204-1; TS ISO 8528-1 ... -12; EN12100-1; EN12100-2; EN61000-6-4; EN61000-6-2; EN61000-4-11; EN61000-4-6; EN61000-4-5; EN61000-4-2; EN55011; EN55016-2-1; EN55016-2-3; EN61000-3-2; EN61000-3-3; EN55014-1; EN61000-6-2; EN61000-4-3; EN61000-4-4; EN61000-4-8; EN61000-4-11; TS EN ISO 3744; TS EN ISO 3746*

RESPONSIBLE PERSON TO KEEP TECHNICAL DOCUMENTAT *(DOKÜMANLARI MUHAFAZA EDEN YETKİLİ KİŞİLER)*

NAME (ADI SOYADI)	Rasim YILDIZ	Nuri BENLİ
TITLE (UNVANI)	CHAIRMENT OF THE BOARD	DEPUTY DIRECTOR (DİREKTÖR YARDIMCISI, ALTYAPI)
PLACE / DATE (YER/TARİH)	İSTANBUL / TURKEY	
SINGLE *(İMZA)*		

Emsa Elektromotor Alternatör Sanayi Ve Tic. A.Ş.

Turkey Discover the potential

www.emsa.gen.tr

10 WARRANTY CONDITIONS AND RESPONSIBILITIES OF THE CUSTOMER

WARRANTY CONDITIONS AND RESPONSIBILITIES OF THE CUSTOMER

DEAR USER OF THE EMSA GENERATOR;

Consider the following points to prevent your generator from being void of warranty prematurely, to ensure that it operates without any problem and that it has a long service life.

- Operations performed shall not be covered under warranty if warranty certificate or invoice is not presented.
- Generator shall be void of warranty if any person other than Emsa Jeneratör authorized services intervenes the generator for whatever reason.
- Inspections and maintenance operations specified in the maintenance schedule shall be performed in time and completely. Faults caused by the lack of periodical are not covered under warranty. Generator shall be installed as described in the operation manual. Otherwise, any faults that occur are not covered under warranty.
- Customer shall be responsible for faults that occur when dirty fuel, fuel with water content or fuel that do not comply with the standards are used.
- Lubrication oil shall be selected as per the criteria described in the operation manual. Faults that may occur otherwise shall be considered out of warranty cover.
- Battery is void of warranty in case of breaking, adding excessive electrolyte, or hardening the battery by leaving it discharged.
- Do not start and stop the diesel engine when the generator is under load for generators with manual control. Start and stop operations shall be performed when the generator is not under load after disconnecting the load. Otherwise, faults that may occur on the diesel engine and alternator shall be out of warranty cover.
- Emsa Jeneratör shall not be held responsible for damages on components used in automatically controlled generator sets and supplied by the mains power such as mains contactors, block coolant heaters, battery charge rectifiers, etc. due to overcurrent, low or high voltage.

WARNING

EMSA Jeneratör reserves the right to make changes on all models, specifications, colors, visuals related with equipment and accessories, product specifications and all other information without prior notice. Our company shall not be held responsible for any misspelling related with the product information.

WARRANTY CONDITIONS AND RESPONSIBILITIES OF THE CUSTOMER

WARRANTY CONDITIONS / RESPONSIBILITIES OF THE CUSTOMER

- Customers of EMSA JENERATÖR shall not allow any service or persons other than the Emsa Jeneratör's authorized services to intervene the generator in the cover of the warranty. Such an intervention renders the generator out of the warranty cover provided by Emsa Jeneratör.
- The guarantee period for the generators sold start with the date of invoice and it is 2 years. Operating hours of engines in the generator sets under warranty cover are 1000 hours.
- Purchased generators shall be commissioned by the Emsa Jeneratör Authorized Services. Generator shall be out of warranty cover if the customer has the generator commissioned by himself or by another service. Commissioning operation performed by checking the operating conditions of the generator (layout, installation, electrical connections, cable cross-sections, ventilation, exhaust outlets, fuel lines, etc.) applies for the location where the commissioning is performed and for the point where the electrical connections are made. As the environmental operating conditions shall also change if it is required to change the location where the commissioning is performed, it shall be inspected and commissioned again by Emsa Jeneratör authorized services to ensure proper operation of the generator and to resume the warranty period.
- All maintenances specified in the periodical maintenance chart for all generators within the warranty period shall be performed by EMSA Jeneratör's authorized services. Maintenance chart for the generator and maintenance manuals are delivered to the customer together with the generator. Customer is responsible for procuring these documents again if these maintenance manuals and charts are lost.
- Customer shall cover all fees for maintenance, correction of faults and problems other than the ones caused by manufacturing errors.
- Faults caused by negligence, misuse and keeping the generator under proper conditions including the responsibility for unloading the generator (after delivery on truck up to the commissioning (start) phase) are in full responsibility of the customer.
- For deliveries on truck, transportation of the generator and keeping the generator under proper conditions including the responsibility for unloading the generator (after delivery on truck up to the commissioning (start) phase) are in full responsibility of the customer.
- If the generator purchased shall not be commissioned within 2 months, it shall be stored by providing the storage conditions for that generator. You may get information and help required for the storage conditions of your generator from Emsa Jeneratör Authorized Services. Storage (conservation) operation of a generator within warranty period shall always be performed by Emsa Jeneratör.
- If the service personnel providing the warranty service is asked to do overtime by the customer, costs incurred due to overtime shall be paid by the customer.
- Costs for entrances, barriers, walls, rails, floors, ceilings, decks or similar structures made to access the generator, for rental cranes or similar machines, ramps built or similar structures, trucks or similar vehicles and fees incurred for taking off or connecting the generator as a whole are the responsibility of the customer.
- Customer has the right to ask and examine the authorization of the personnel who has come for service operations. This is also a duty of the customer.
- Customer is responsible to present the warranty certificate and commissioning form of the generator to the service personnel when requested in order to receive the warranty service. Thus, aforementioned documents shall be kept inside the generator room where it can be reached easily.
- To resume warranty of a generator under the cover of warranty when it is relocated, Emsa Jeneratör authorized services shall be asked for commissioning after performing the installation of the generator in its new location. Relocation and recommissioning operations performed by unauthorized persons shall render the generator void of warranty. Customer shall pay the costs of a second commissioning operation required when installation preparations are not performed or completed.
- Customer is responsible to ensure adequate ventilation and exhaust outlet and to ensure that dimensions of the generator room complies with the norms.
- Customer is responsible for faults that occur when chemicals that shall be added to the cooling system to prevent pitting, erosion and residues in the cylinder liner or cylinder block are not added.
- Additional equipment and projects other than the original equipment and project may not be applied on the generators purchased within the warranty period. If additional operations planned (synchronization, additional control unit, panel, transfer panel, etc.) are performed without the approval of Emsa Jeneratör, generator shall be rendered out of warranty.
- Genuine spare parts of Emsa Jeneratör shall be used for all generator under warranty cover. Customer is responsible for faults that occur when genuine spare parts are not used.
- Emsa Jeneratör shall not be held responsible for faults caused by drawing more current than the nominal current of the generator through the mains contactor selected as per the generator power.
- Faults that may occur due to environmental effects shall not be considered under warranty cover. Natural disasters such as earthquakes, floods, torrents and similar events.
- Mains lower and upper limits are determined based on the values where our generator and the installation of the customer may operate properly for all our generators. If customer asks for changing of the mains voltage limits, this change may be performed as charged and out of warranty cover when a report declaring that customer assumes all responsibilities that may be caused by such a change is issued.

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WARRANTY CONDITIONS AND RESPONSIBILITIES OF THE CUSTOMER

CUSTOMER SERVICES

Operating since 1977 to meet the requirement for uninterrupted power, Emsa Jeneratör is always there for you to provide best service to all its customers by keeping the customer satisfaction at maximum level.

0 850 225 36 72

www.emsa-jenerator.com.tr

AUTHORIZED SERVICES

EMSA HEADQUARTERS

Meclis Mahallesi Teraziler Caddesi No:37
Sancaktepe / İstanbul - Turkey
Tel: (0216) 420 00 03
Fax: (0850) 205 45 62
info@emsa.gen.tr / export@emsa.gen.tr

FACTORY

Organize Sanayi Bölgesi 20. Cadde No:24
Odunpazarı / Eskişehir - Turkey
Tel: (0216) 420 00 03
Fax: (0850) 205 45 62
info@emsa.gen.tr / export@emsa.gen.tr

SERVICE AND SPARE PARTS

Meclis Mahallesi Teraziler Caddesi No:37
Sancaktepe / İstanbul - Turkey
Tel: (0216) 420 00 03
Fax: (0850) 205 45 62
servis@emsa.gen.tr

www.emsa.gen.tr

WARRANTY CERTIFICATE

EN

Manufacturer's or Importer's	**Seller's:**
Name: EMSA ELEKTROMOTOR ALT.SAN.VE TİC.A.Ş.	Name:
Address: Meclis Mah. Teraziler Cad. no : 37 Sancaktepe/İST.	Address:
Telephone: 0850 225 3672	Phone:
Fax: 0850 205 4562	Fax:
e-mail: info@emsa.gen.tr	e-mail:
Authorized Signature:	Invoice Date and Number:
Company Stamp:	Delivery Date and Place: DELIVERY NOTE DATE
	Authorized Signature:
	Company Stamp:

PRODUCT	
Type : DIESEL GENERATOR	Warranty Period : 2 YEARS
Brand : EMSA	Maximum Repair Period : 20 WORK DAYS
Model :	Label and Serial Number :

WARRANTY CONDITIONS

1) Warranty period starts from the date the product is delivered and is 2 (two) years.

2) The entire product, including all its components are included in the warranty.

3) If the item turns out to be defective, in accordance with the Law on Protection of Consumers No. 6502 Article 11, the consumer is entitled to:

a) Renege on contract,

b) Request discount on sale price,

c) Request free repair,

d) Request the sold product to be replaced with a non-faulty one,

can be invoked.

4) If the consumer opts for the right of free repair, the seller is obliged to conduct or have conducted the repair of the product without requesting cost of workmanship, replaced parts or any other fee. Consumer may use the right of free repair against the manufacturer or the importer as well. The seller, the producer, and the importer are jointly liable for the exercise of this right of the consumer.

5) In the event that the consumer selects the right of free of charge repair, if

- the product fails again during warranty period,
- maximum term necessary to repair is exceeded,
- it is determined that repair is not possible by a report issued by authorized service station, seller, manufacturer or importer;

consumer may request the refund of the product cost, a discount amounting to the fault or replacing the product with a non-faulty one, if possible. The seller may not refuse such a claim of the consumer. The seller, the producer, and the importer are jointly liable in the event that this claim is not met.

6) Repair period for the product shall be 20 workdays maximum or 30 workdays maximum for automobiles and trucks. This duration starts from the date that the malfunction is notified to the authorized service station within the warranty period or the date of the good's delivery to the authorized service station outside the warranty period. If the product's malfunction cannot be removed within 10 work days manufacturer or importer is obliged to present the consumer with the use of another product with similar characteristics until the product repair is completed. In case the product has a failure during the warranty period, the period during the repair process is added to the warranty period.

7) The malfunctions occurring due to the product being used against the conditions specified in the user manual are not covered in warranty.

8) Consumer can apply to Consumer Arbiter Committee or Consumer Court where the consumer action is conducted in cases of disputes arising from issues regarding using the warranty rights.

9) If this Warranty Certificate is not provided by the seller, the user may apply to Ministry of Customs and Market Surveillance Head Office.

NOTES

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GENERATOR

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EMSA ELEKTROMOTOR ALTERNATÖR SANAYİ VE TİCARET A.Ş.
Meclis Mahallesi Teraziler Caddesi No: 37 Sancaktepe / İstanbul - TURKEY
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E-mail: info@emsa.gen.tr