

CE

MANUALE USO, MANUTENZIONE E INSTALLAZIONE

I

USE, MAINTENANCE AND INSTALLATION MANUAL

GB

**INVERTERS
GENERATORS**

IS 3.5 B

IS 5.0 B

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Modello / Modelo
N° matricola / Matricula
Codice / Còdigo

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DEFINITIONS USED

The terms used are current technical terms, and where considered necessary the meaning is described below

- **Generator**
An assembly of an internal combustion piston engine and an alternate current, synchronous, 2-4 pole, self-excited generator, joined together to create a station for self-production of electrical energy.
- **User system**
Composed of the power supply circuits of the user equipment, including the relevant sectioning, handling, breaking, transformation, protection, etc. devices which do not form part of the production, transmission and distribution systems.
- **Category 1 electrical system**
A system where the rated voltage is greater than 50 V and smaller than 1000 V including alternate current.
- **Load**
A set of numerical values of electrical and mechanical magnitudes which characterise the requirements imposed on a rotary machine by an electrical circuit or by a mechanical device at a certain instant.
- **Thermal switch**
Main cut-out and breaking device made up of a switch which opens automatically by thermal effect.
- **Differential switch**
Main cut-out and breaking device made up of a switch which opens automatically by differential effect.
- **Skilled person**
A person with technical know-how or sufficient experience to allow him to avoid the dangers inherent in electricity.
- **MASE specialised personnel**
A person able to evaluate the job assigned to him and recognise the possible dangers on the basis of training at the MASE training centres, with professional experience and knowledge of the equipment in question and of the possible dangers deriving in the event of negligent behaviour.
- **Supplier**
A body (e.g. manufacturer, agent, installer) which supplies the equipment or services relating to the machine.
- **Control**
Control action by which an output variable of the controlled system (controlled variable) is affected by an input variable of the controlling system in order to achieve a certain goal.
- **Manual control**
Control where the change of a variable handled is produced by a person through manual intervention.
- **Automatic control**
Control where the change of a variable handled is produced by a controlling device (automatic controller) without the intervention of a person.
- **Danger**
Source of possible harm or damage to health.
- **Protection**
Guard or protection device as safety measure to protect persons from a present or potential danger.
- **Casing**
Part intended to assure protection of the equipment against specific outside influences and protection in every sense against contacts.

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Connection in bad state

The live parts are not fully covered with insulation removable by destruction only, the connections are not secure because of unstable tightening of the parts and a development of oxide between the parts.

- Direct contact

Contact of persons or animals with live parts.

- Control circuit

Circuit used to control machine operation.

- Equipment

General term which comprises materials, devices, equipment, accessories and similar used in conjunction with an electrical installation.

PRELIMINARY PRESCRIPTIONS

FIELD OF EMPLOYMENT:

THE GENERATOR IS PROPER FOR TO PRODUCE IN WAY AUTONOMOUS ELECTRIC ENERGY IN THE LIMITS OF TENSION AND WATT DECLARED BY THE BUILDER.



Consult this manual carefully before proceeding to the use and to any operation on the genset.

FAILURE TO RESPECT THE SPECIFICATIONS CONTAINED IN THIS USE AND MAINTENANCE MANUAL WILL RESULT IN FORFEITURE OF THE GUARANTEE ON THE PRODUCT.

This manual was drawn up by the manufacturer and forms an integral part of the generator equipment, definition used as indicated in Directive 98/37/EC; the information contained in the manual is addressed to all the persons involved in the operating life cycle of the generator, and is necessary to inform both those who effectively carry out the different operations and those who coordinate the activities, to arrange the necessary logistics and to regulate access to the place where the generator will be installed and operated.

This manual was drawn up by the manufacturer with the purpose of providing essential information and instructions for proper use and maintenance in conditions of safety. It constitutes an integral part of the generator equipment and must carefully be protected from any agent which may damage it for the entire life cycle of the generator. The manual must accompany the generator if transferred to another user or owner.

It is opportune to remember the supplied generator group needs installation. The technician will release, at the end of the work, a declaration to the meaning of the normative applied.

The manual defines the purpose for which the generator was constructed and contains all the information necessary to guarantee safe and proper use. Constant observance of the instructions contained in this manual guarantees the safety of the operator, protection against damage to persons or things, operating economy and a longer life of the generator.

The drawings are provided by way of example. Even if the generator in your possession differs from the illustrations contained in this manual in elements of little significance, for example the colour, the safety of the generator and the information provided are nevertheless guaranteed.

To facilitate consultation, it has been divided into sections identifying the main concepts; for a quick look at the topics, consult the index.

Ongoing improvement and development of the product may have led to modifications to the generator which are not included in this publication.

Whenever a problem concerning the generator or this publication arises, consult with Mase Generators SPA for the latest information available.

1 GENERAL INFORMATIONS**1.1 CONFORM USE**

The generator is suitable for independent production of electrical energy within the voltage and wattage limits declared by the manufacturer.

Any other use outside the already stated field of use is prohibited: the generator is intended for marine use.

The generator has been designed to operate independently (without operator) if not for sporadic checks.

The limits of use are:

- operating temperature: -10°C (14°F), +40°C (104°F)
- relative humidity: 30% - 90%
- the generator is suitable for marine operation.

Installations are subject to approval by **mase** or by an installer authorised by **mase**.

Arbitrary modifications to the machine are prohibited for safety reasons.

Original spare parts must be used on pain of losing machine conformity.

All the operations that require dismantling of special parts may only be carried out by technicians authorised by the local dealer or the manufacturer.

Only **mase** technicians or personnel trained by **mase** have the necessary knowledge of the generator and the special equipment as well as the experience to carry out any operation in the most economical and reliable way.

1.2 RESIDUAL RISKS

The generator has been designed taking into account the safety regulations set out in the EC directives and standards; nonetheless, the following residual risks remain:

- injury caused by contact with hot parts during maintenance.
- injury caused by electrocution during maintenance on the electric panel.
- risks connected with long periods of exposure to the noise of the generator (with open cowling).
- risks due to contact with the generator lubricants during maintenance.
- risks due to the fire hazard the fuel represents.

Because of the typical intrinsic danger of the Generators, you are reminded that, although the generator has been designed, constructed and tested in accordance with the safety regulations, only proper and careful use can guarantee full safety; to this end, the various precautions to be taken during use of the Generator are listed below.

SAFETY INSTRUCTIONS

The electromechanics equipments, included the generating sets, switch, command electric equipments and accessories, can cause damages to people and, if they are installed, used or maintained with not qualified operations, they can put in serious danger the life of people. To avoid accidents is necessary to know the potential risks and operate with caution. Read and follow all the precautions and the instructions for the safety. **PRESERVE THESE INSTRUCTIONS.**

The manual shows varied typologies of precautions and instructions for the safety: Danger, Warning, Caution.

1.3 SAFETY SIMBOLS



Indicates that particular attention must be paid in order to prevent serious risks which could lead to death or possible harm to the health of personnel.



A condition which may occur during the lifetime of a product, system or plant considered at risk regarding damage to persons, property, the environment or economic loss.



Indicates that particular attention must be paid in order to prevent serious consequences which could result in damage to tangible goods, such as the resources or the product.

Other symbols on this manual



Particular important instructions



Indicates components and non inclusive parts with the base configuration.



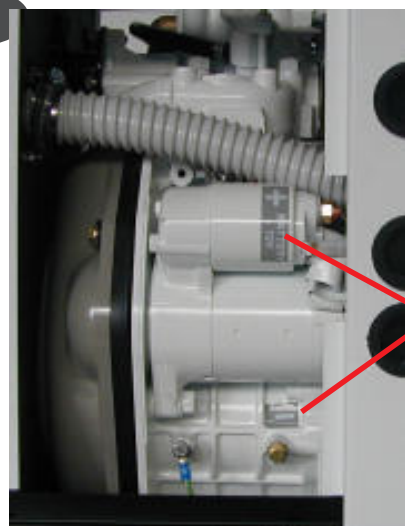
Carefully consult this manual before using or carrying out any operation on the generator.



The routine maintenance operations, must be carried out by qualified personnel who have the appropriate equipment and protections.

1.4 SYMBOLS ON THE GENERATOR GROUP

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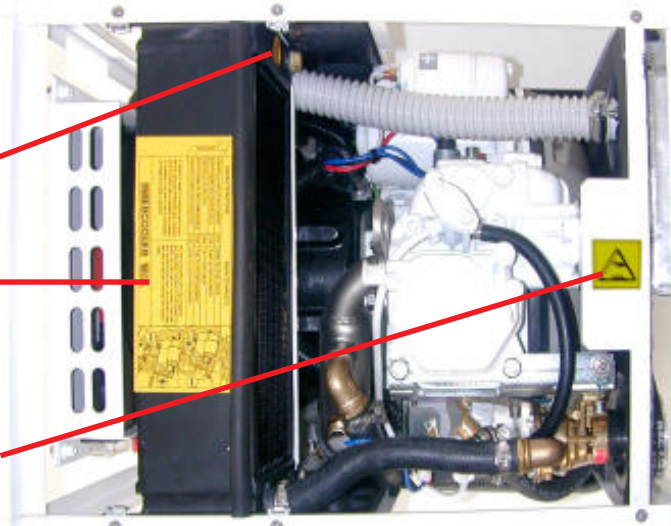
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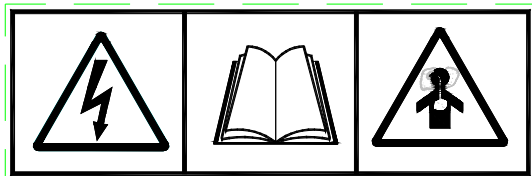
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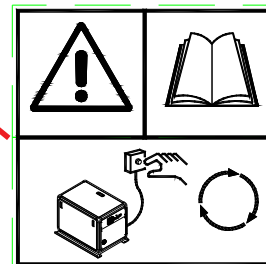


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Cod. 40179



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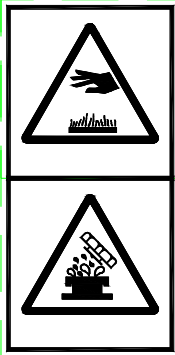
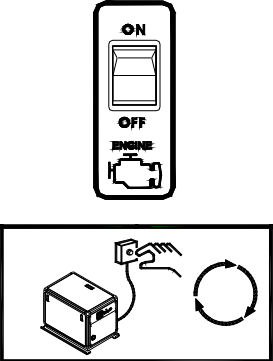

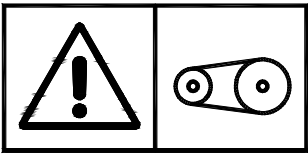

Cod. 42118








Cod. 42656




1.5 SAFETY LABEL INFORMATION

- These labels warn the user of any danger which may cause serious injury. Carefully read the meaning and the precautions described in this manual.
- If the label detaches or becomes illegible, replace it with a new one which can be requested from an authorised mase dealer.

Danger Symbols	Description
	<p>HOT PARTS</p> <p>Hot engine and exhaust system. Can cause severe injury or death. Do not work on generator set until it is allowed to cool.</p> <p>Servicing exhaust system. Hot parts can cause severe injury or death. Do not touch hot engine parts. An engine becomes hot while running and exhaust system components become extremely hot.</p> <p>Hot coolant and steam. Before removing the pressure cap, stop the generator set and allow it to cool. Then loosen the pressure cap to relieve pressure.</p>
	<p>ACCIDENTAL STARTING</p> <p>Accidental starting. Can cause severe injury or death. The generator is started from a remote control panel. In order to prevent accidental starting, set the emergency switch to the (OFF) position. Disconnect the negative pole from the starter battery.</p> <p>Disabling generator set. Accidental starting can cause severe injury or death. Before working on the generator set or connected equipment, disable the generator set as follows: 1) Disconnect power to battery charger, if equipped. 2) Remove battery cables (remove negative (-) lead first). 3) Reconnect negative (-) lead last when reconnecting battery. Follow these precautions to prevent starting of generator set by the remote start/stop switch or by the onboard switch.</p>
	<p>Hazardous voltage. Moving rotor. Can cause severe injury or death. Operate generator set only with all guards and electrical enclosures in place.</p>
	<p>MOVING PARTS</p> <p>Rotating parts. Can cause severe injury or death. Do not operate generator set without all guards, screens, and covers in place.</p>
	<p>PREVENTING FIRE</p> <ul style="list-style-type: none"> • Be sure to use the proper diesel fuel. • Be sure to stop the engine before refueling. • If you spill fuel, wipe off such spillage completely. • Never place oil or other flammable materials (such as straws, withered grass) close to the engine during running or shortly after shutting it down. • Check fuel oil and engine oil for leakage from their piping lines to cause fires.

Danger Symbols	Description
	<p>PREVENTING FIRE</p> <hr/> <p>Can cause severe injury or death.</p> <ul style="list-style-type: none"> • Start • Start the engine only from a starter switch without any load or in neutral position of the clutch of machine unit. <p>The machine unit suddenly starts to move or generates power to cause serious personal injury.</p> <ul style="list-style-type: none"> • Keep the machine unit sufficiently away from a building and flammable materials during engine running. It may cause fires due to hot exhaust gas and engine body. • Keep sparks, open flames or any other form of ignition (match, cigarette, etc.) away when fueling / refueling. Fire and or an explosion may result. <p>FIRE</p> <hr/> <p>Can cause severe injury or death.</p> <p>In case of fire, do not open the chest</p> <p>Extinguish the generator fire and immediately unload the whole content of the portable extinguisher through the hole indicated by the label.</p>
	<p>EXHAUST SYSTEM</p> <hr/> <p>Carbon monoxide.</p> <p>Can cause severe injury or death.</p> <p>The exhaust system must be leakproof and routinely inspected.</p> <p>Carbon monoxide symptoms.</p> <p>Carbon monoxide can cause severe nausea, fainting, or death.</p> <p>Carbon monoxide is a poisonous gas which is present in exhaust gases.</p> <p>Inspecting exhaust system.</p> <p>Carbon monoxide can cause severe nausea, fainting, or death.</p> <p>In addition to routine exhaust system inspection, install a carbon monoxide detector.</p> <p>Consult your boat builder or dealer for approved detector installation. Inspect your detector before each generator set use. Test the carbon monoxide detector function per the manufacturer's instructions and keep it operational at all times.</p> <p>Installing exhaust system.</p> <p>Carbon monoxide can cause severe nausea, fainting, or death.</p> <p>In addition to routine exhaust system inspection, install a carbon monoxide detector.</p> <p>Use the following precautions when installing and operating generator set.</p> <p>Do not install exhaust outlet where exhaust can be drawn in through portholes, vents, or air conditioners.</p> <p>If the generator set exhaust discharge outlet is near the waterline, water could enter the exhaust discharge outlet and close or restrict the flow of exhaust.</p>

Danger Symbols	Description
	<p>EXHAUST SYSTEM</p> <p>Carbon monoxide. Group generator use. Carbon monoxide can cause severe nausea, fainting, or death.</p> <p>Carbon monoxide is an odorless, colorless, tasteless, non irritating gas, able to, if inhaled only also for brief time to provoke the death. Be especially careful if operating the generator set when moored or anchored under calm conditions as gases may accumulate. If operating the generator set dockside, moor the ccraft so that the exhaust discharges on the lee side (the side sheltered from the wind). Alway be aware of others-make sure your exhaust is directed away from other boats and buildings.</p>
	<p>HAZARDOUS VOLTAGE / ELECTRICAL SHOCK</p> <p>Hazardous voltage. Moving motor. Can cause severe injury or death. Operate generator set only with all guards and electrical enclosures in place.</p> <p>Grounding generator set. Hazardous voltage can cause severe injury or death. Electroconduction is possible whenever electricity is present. Open main circuit breakers of all power source before servicing equipment. Configure the installation to electrically ground the generator set and electrical circuits when in use. Never contact electrical leads or appliances when standing in water or on wet ground, as the chance of electroconduction increases under such conditions.</p> <p>Disabling generator set. Hazardous voltage can cause severe injury or death. To disable the generating set from load, turn off the the automatic switch of the line or disconnect the output cables from the commutation switch and block the final part of cables. Hazardous voltage to load during an ispection cold cause severe damages to people and to equipment. Do not use the emergency button instead the automatic switch of the line.</p>
	<p>Battery short circuit. Explosion can cause severe injury or death. Short circuits can cause severe damages to people and/or equipment. Disconnect the battery before doing installation operations o generator set maintenances. Remove all jewels before doing maintenance on the maintenance. Remove negative (-) lead first when disconnecting battery. Reconnect negative (-) lead last when reconnecting battery. Never connect negative battery lead (-) to positive lead (+) of starting solenoid.</p>

Danger Symbols	Description
 	<p>BATTERY</p> <hr/> <p>Do not touch the electrolytic battery acid</p> <p>Sufficient ventilation of the battery area.</p> <ul style="list-style-type: none"> • Keep the area around the battery well ventilated, paying attention to keep sparks, open flame and any other form of ignition away. During engine running or charging battery, hydrogen gas is produced from the battery and can be easily ignited. <p>Battery acid. Sulfuric acid in batteries can cause severe injury or death. Sulfuric acid in battery can cause permanent damage to eyes, burn, skin, and hole in clothing. Always wear splash-proof safety goggles when working near the battery. If battery acid is splashed in the eyes or skin, wash immediately the affected area with large quantity of clean water. Seek immediate medical aid in case of eyes contact.</p> <p>Do not intentionally make the battery spark by short-circuiting to check its remaining charge. It will cause fires. If the battery electrolyte frozen, recharge the battery after warming up to thaw it.</p>
	<p>SAFETY CLOTHING</p> <hr/> <p>Do not expose your skin to high pressure fuel spray Be careful so as not to bring your skin in contact with high pressure fuel spray from broken fuel injection pipe to penetrate your skin to cause inflamed. If exposing to the spray should occur, obtain prompt medical treatment.</p> <p>Beware of dirt from air blowing Wear protective equipment such as goggles to protect your eyes when blowing compressed air or steam. Dust or flying debris can hurt eyes.</p>

1.6 REFERENCE DOCUMENTS

The instructions for use provided with each generator are made up of a collection of documents of which this manual represents the General Part. The following documents are normally provided separate.

- a **CE** declaration of conformity.
- b Instruction manual for use and maintenance of the generators,(this manual).
- c Engine use and maintenance manual.
- d List of **mase** Service Centres.
- e **mase** Warranty certificate.
- f Warranty card.
- g EPA certificate (Engine manufacturing)

1.7 REFERENCE REGULATIONS AND LEGISLATIVE PROVISIONS

The generator groups, built by **mase**, destined to the countries of the European Community, are conforming to the applicable **EC** directives, and they are provided of a **EC** Declaration of Conformity.

EN 12601: Reciprocating internal combustion engine driven generating sets.

98/37/EC and subsequent amendments:
Essential machine requirements for safety and health protection ("Machine" directive).

Directive 2006/95/EC (73/23/EC and subsequent amendments contained in the directive **93/68/EC**):
Guarantee of safety of electrical material intended for use within certain voltage limits, ("Low Voltage" Directives).

EN 60204.1: Electrical equipment of machines.





1.8 MARKING

The generator identification plate carries all the identification data conforming to **ISO 8528** and in accordance with the provisions for **EC** marking for those cases where required. Below is a facsimile of the identification plate fixed on the hull of each generator.

1.9 IDENTIFICATION OF THE GENERATOR UNIT

- 1 - Machine name
- 2 - Machine code
- 3 - Serial number
- 4 - Rated power
- 5 - Declared frequency
- 6 - Rated power factor
- 7 - Rated voltage
- 8 - Rated current
- 9 - Degree of protection
- 10 - Class of isolation
- 11 - Temperature max. of use
- 12 - Altitude max. of use
- 13 - Performance class
- 14 - Year of construction
- 15 - Manufacturer - Adress
- 16 - Weight

1	[Empty box for Machine name]				3
2	Code	Serial n°			
4	Rated power 3F	KVA			
5	declared frequency	Hz			
6	Rated power factor	Cos.φ			
7	Rated voltage	V	V		
8	Rated current	A	A		
9	Degrees of protection	IP			
10	Class of insulation				
11	Temp. max of use	°C			
12	Altitude max. of use	m			
13	Performance class				
14	year of manufacture				
		Mass	Kg		16



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INFORMATION

The machine code number, the serial number and the year of construction must always be indicated when contacting the manufacturer for information, order of spare parts, etc..

2 GENERAL CHARACTERISTICS

The generators have been designed for use in the marine field, using highly reliable 3000 rpm air/water-cooled diesel engines. Particular attention has been paid to the degree of protection against external agents, engine protection and protection of the electrical parts against overload or overheating, adopting automatic systems able to stop the generator in the event of malfunctioning.

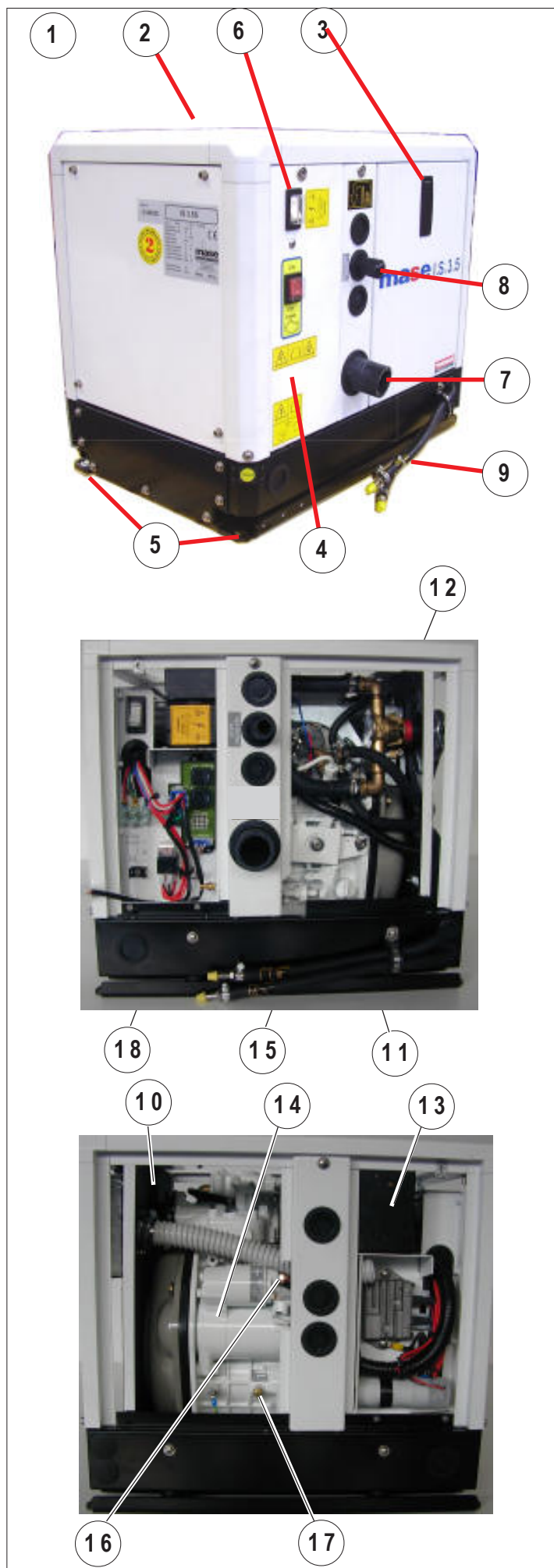
The generator is particularly quiet thanks to an internally insulated soundproof casing and an advanced soundproof system for combustion smoke exhaust.

The alternators used are the synchronous self-energized type.

2.1 COMPOSITION OF GENERATOR UNIT

The generator unit is essentially composed by the following components.

- 1 - Fixed frame
- 2 - Upper openable cowling
- 3 - Beside openable cowling
- 4 - Electric connection cowling
- 5 - Anchorage stirrup
- 6 - Emergency button
- 7 - Exhaust gas and cooling water connection
- 8 - Seawater intake connection
- 9 - Tank connections
- 10 - Engine air filter
- 11 - Check / refill oil cap
- 12 - Seawater pump
- 13 - Water/air radiator
- 14 - Starting motor
- 15 - rpm regulation screw
- 16 - Battery connection lead (+)
- 17 - Battery connection lead (-)
- 18 - Remote control panel connector
- 19 - Zinc anode
- 20 - Fuel pump filter
- 21 - Fuel pump

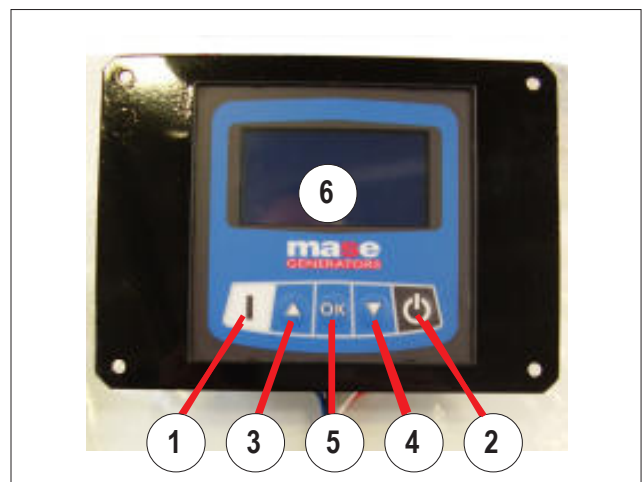




2.2 REMOTE COMMAND AND CONTROL PANEL (STANDARD VERSION)

Each generator is fitted with an instrument panel for commands and controls with the following components:

- 1) START BUTTON
- 2) STOP BUTTON
- 3) MENU NAVIGATION BUTTON
- 4) MENU NAVIGATION BUTTON
- 5) MENU SELECTION BUTTON
- 6) DISPLAY



2.3 TECHNICAL CHARACTERISTICS TABLE

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MODEL		IS 3.5	IS 5.0	
GENERAL FEATURES				
MAX POWER (LTP) ¹		3	5	kW
CONTINUOUS POWER (PRP) ²		2,7	4	kW
POWER FACTOR (Cos Φ)		1		
SINGLEPHASE VOLTAGE		230		
RATED FREQUENCY		50		
GRADE OF PROTECTION		IP 23		
MAX TEMP. OF USE		40 - 104		
MIN TEMP. OF USE		-5 - 23		
MAX INCLINATION DURING USE (PERIODICAL 3 min)		30°		
MAX INCLINATION OF USE (CONTINUOUS)		20°		
SEA-WATER PUMP FLOW		20 - 5,3		L/min - gal/min
DIMENSIONS	L	590 - 23.2	675 - 26.6	mm - in.
	W	406 - 16	468 - 18.4	mm - in.
	H	515 - 20.3	565 - 22.2	mm - in.
MASS		96 - 211	130 - 286	kg - lbs
ENGINE				
TYPE		4 STROKE		
MANUFACTURER		YANMAR		
MODEL		L 70 N	L 100 N	
DISPLACEMENT		320	435	cm ³ - in ³
POWER		6,1 - 4.5	8,8 - 6.5	CV - kW
n° OF CYLINDERS		1	1	
RATED SPEED		3000		
SPEED CONTROL		MECCANIC		
INDUCTION SYSTEM		NATURAL		
FUEL		DIESEL		
INJECTION SYSTEM		DIRECT		
FUEL FEEDING PUMPS		ELECTRIC		
MAX PREVALENCE FUEL PUMP		700 - 27.5		
FULL LOAD CONSUMPTION		1,3 - 0,34	1,65 - 0,43	L/h - gal/h
COOLING		AIR		
LUBRIFICATION SYSTEM		FORCED		
OIL SUMP CAPACITY		1,1 - 0,28	1,68 - 0,52	L - gal
COMBUSTION AIR FLOW		400 - 14	550 - 19.4	L/min - cfm
ELECTRIC PLANT		12		
STARTING MOTOR		12 - 0,8		
STARTING BATTERY		12 - 45		
BATTERY CHARGER		12 - 10		
STOPPING SYSTEM		ELECTROVALVE		
ALTERNATOR				
TYPE		SYNCHRONOUS, SELF EXCITED, SELF-REGULATED		
n° OF POLES		2		
MAX CURRENT		13	21,7	A
ISOLATION CLASS		H		
VOLTAGE REGULATOR		CAPACITOR		
VOLTAGE STABILITY		± 10%		
FREQUENCY STABILITY		± 5%		
COOLING		AIR		

⁽¹⁾ Limited - time running power (LTP) ISO 8528-1

It is the maximum power that, under the environment conditions established by the norm ISO 3046/1, the generator group it is able to disburse for a maximum of 500 hours for year, of which a maximum of 300 hours among the interval of maintenance prescribed by the builder. It is accepted the operation to this power conditions the duration of the group.
An overload of the 10% is admitted only for regulation.

⁽²⁾ Prime power (PRP) ISO 8528-1

It is the available maximum power for a variable power cycle that the generator group is able to disburse for a boundless number of hours for year among the interval of maintenance prescribed by the builder and under the environment conditions established by the norm ISO 3046/1. The middle power during a period of 24 hours, doesn't have to exceed 80% of the PRP.
An overload of the 10% is admitted only for regulation.

3 INSTALLATION

3.1. Characteristics of the installation space

The generator must be installed in a sufficiently aired space, supplying a little amount of air necessary for the combustion of the motor.

The space must be separate and acoustically insulated from living areas.

The generator should be positioned so that normal maintenance operations can easily be carried out.

Propulsion motors are recommended for installation in the area as long as they comply with the above-mentioned conditions.

3.2. Fastening the unit to the ground

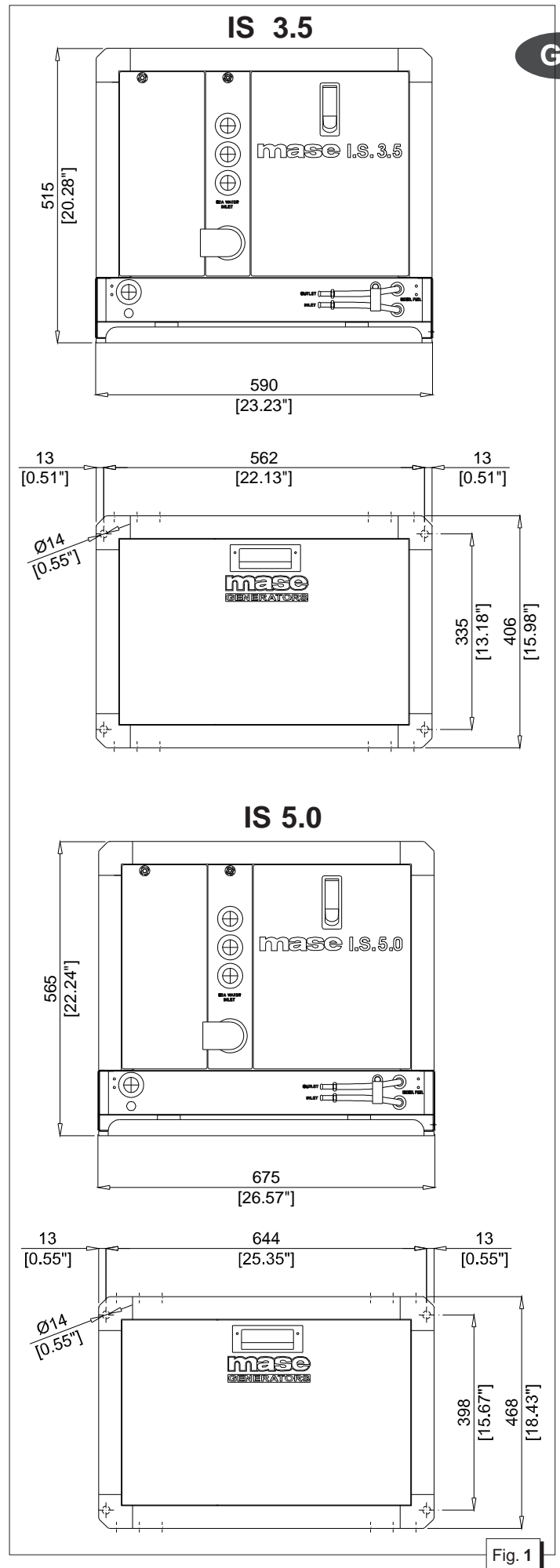
To fasten the unit securely, a base should be installed to absorb vibrations and support the weight.

Drill holes in the base according to the instructions in fig. 1.

3.3. Ventilation

The generator is equipped with an internal forced cooling system through a water/air exchanger.

The air needed for combustion is taken in through the opening on the base (fig. 2) so care must be taken to ensure that this opening is always free.



GB

Fig. 1

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3.4. COOLING WATER CIRCUIT

In electric generator, the motor is cooled by an open-circuit system in which sea water circulates.

The capacity of the sea water circuit is 1200 lt / h .

On installation a sea water feed circuit should be fitted for cooling and a waste system to expel the mixture of flue gas and water.

3.4.1. Sea water feed system

Boats usually use one of two systems to collect water (fig. 3):

- 1 - Direct infeed system
- 2 - System with baffle

MASE recommend the direct infeed system ref. 1 fig. 3 since this system prevents water under pressure entering the suction ducts and instead forms a pressure which can easily be overcome by the water pump of the electric generator.

IMPORTANT

Do not apply any type of protective hood to the direct infeed system.

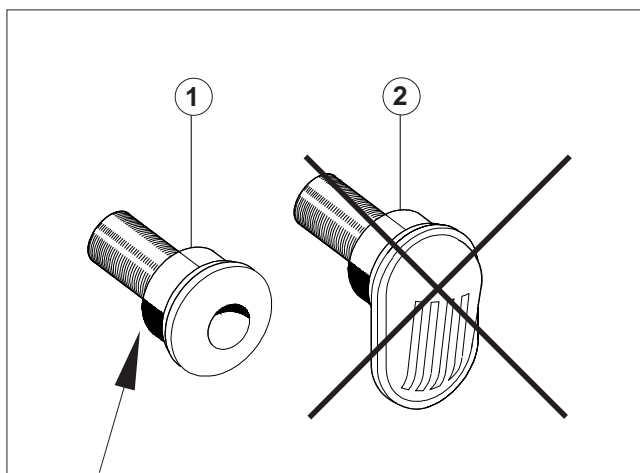
THE DIRECT INFEED SYSTEM SUPPLIED BY MASE HAS BEEN MODIFIED TO PREVENT SOLID BODIES ENTERING THE SYSTEM AND BLOCKING IT. IF OTHER MATERIALS AVAILABLE ON THE MARKET ARE USED, MORE CARE AND MORE FREQUENT CLEANING IS NECESSARY.

The baffle system might cause the following problems:

- a** - If it is installed with the slots facing the prow.
In this case, during navigation and with the electric generator off, pressure is accumulated in the water infeed duct which might cause the system to fill up, even as far as the exhaust port, allowing water to enter the cylinders.
- b** - If it is installed with the slots facing the stern.
In this case a depression might accumulate in the water infeed duct during navigation, preventing the water pump from starting up the cooling plant, or limiting the capacity and subsequently causing the electric generator to overheat.



Fig. 2



3.4.2 Components

- 1 - Direct sea intake 1/2"

IMPORTANT

If the unit is installed more than 1 metre above the water-line, a check valve should be fitted after the sea intake (fig. 6, ref. 1) to prevent the water circuit emptying when the motor is off. If this empties, the rotor of the water pump might be damaged during start up; for the same reason, when the unit is first started up, the suction tube from the valve to the pump should be filled manually.

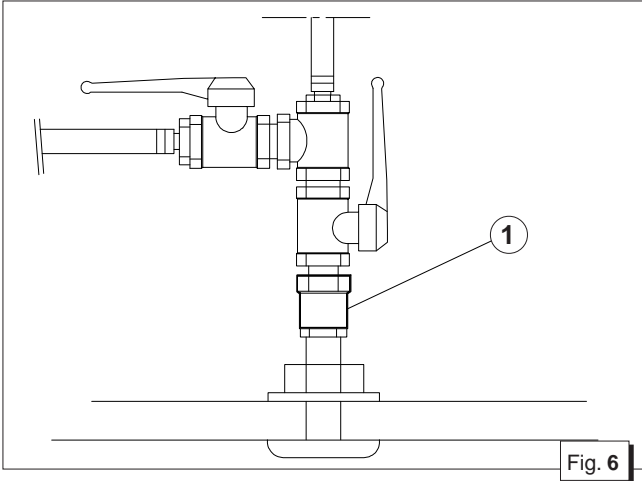


Fig. 6

- 2 - Ball tap (general) 1/2"

- 3 - Ball tap (drainage) 1/2"

This is used to drain the cooling system of the electric generator for general maintenance or when a long period of inactivity is expected.

- 4 - Water filter (can be inspected)

This must provide efficient protection for the cooling circuit from the entrance of mud, sand and seaweed.

IMPORTANT

The filter mesh should be very fine. Mesh 2 - 470 micron is recommended, other sizes do not give good filter performance.

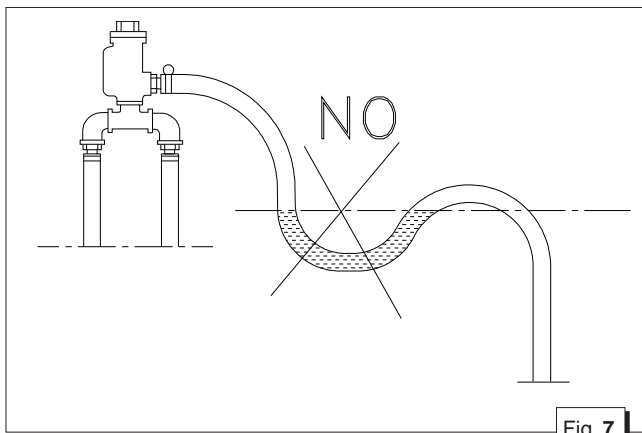


Fig. 7

- 5 - Anti-siphon valve: this valve returns the cooling circuit to atmospheric pressure when the motor is switched off, to prevent the siphon phenomenon.

It must be installed when the generator is fitted with the drainage mixer on or beneath the water line, and should be positioned at least 50 cm above water level. (see fig. 8/9)

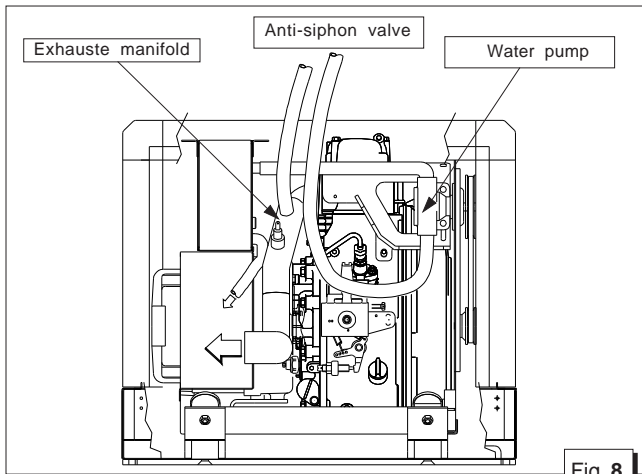


Fig. 8

IMPORTANT

The drainage duct of the anti-siphon valve must run beneath the valve itself in order to prevent water accumulating in the duct, which should always remain empty to allow air to pass through when the unit is switched off. (see fig. 7)

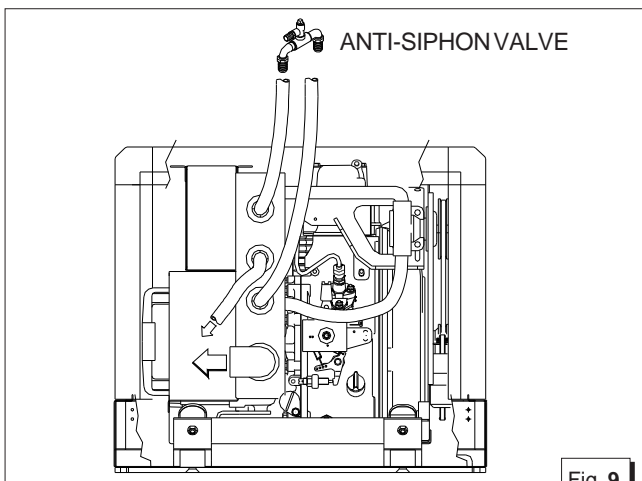
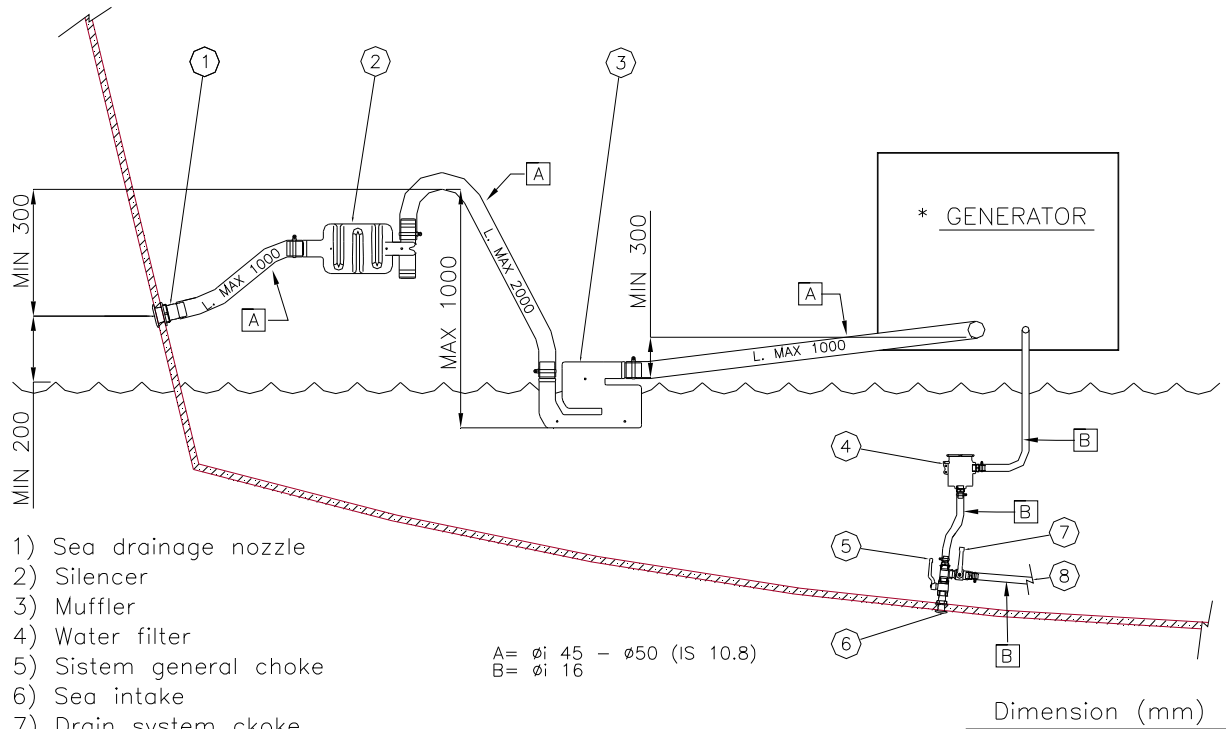


Fig. 9

N.B.: The drainage duct should be taken into the bilge because during normal operation small quantities of water might be leaked from the duct. The box already includes 2 holes to connect the anti-siphon valve (fig. 9). Fix the anti-siphon valve in vertical position.

3.4.3 Typical installation with electric generator above the water-line (fig. 4)



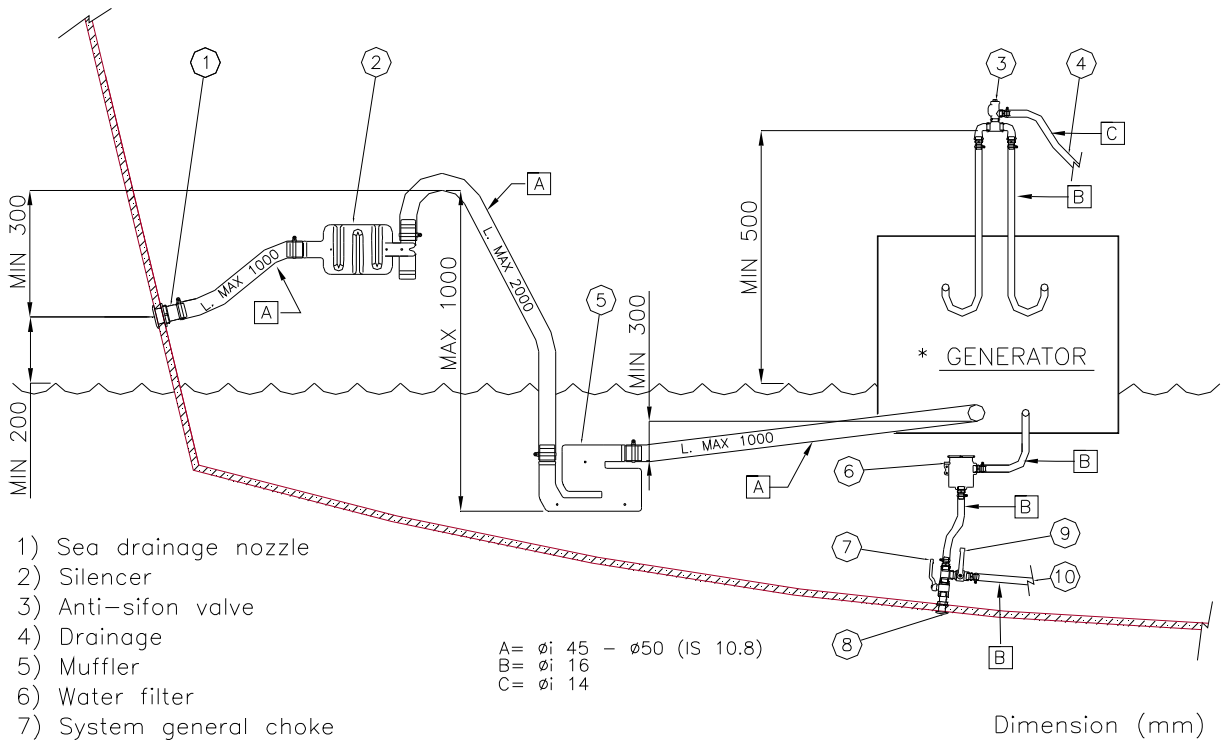
- 1) Sea drainage nozzle
- 2) Silencer
- 3) Muffler
- 4) Water filter
- 5) Sistem general choke
- 6) Sea intake
- 7) Drain system choke
- 8) Drain pipe

A= ϕ i 45 - ϕ 50 (IS 10.8)
 B= ϕ i 16

Dimension (mm)

* Generator upside water line

3.4.4 Typical installation with electric generator below the water line (fig. 5)



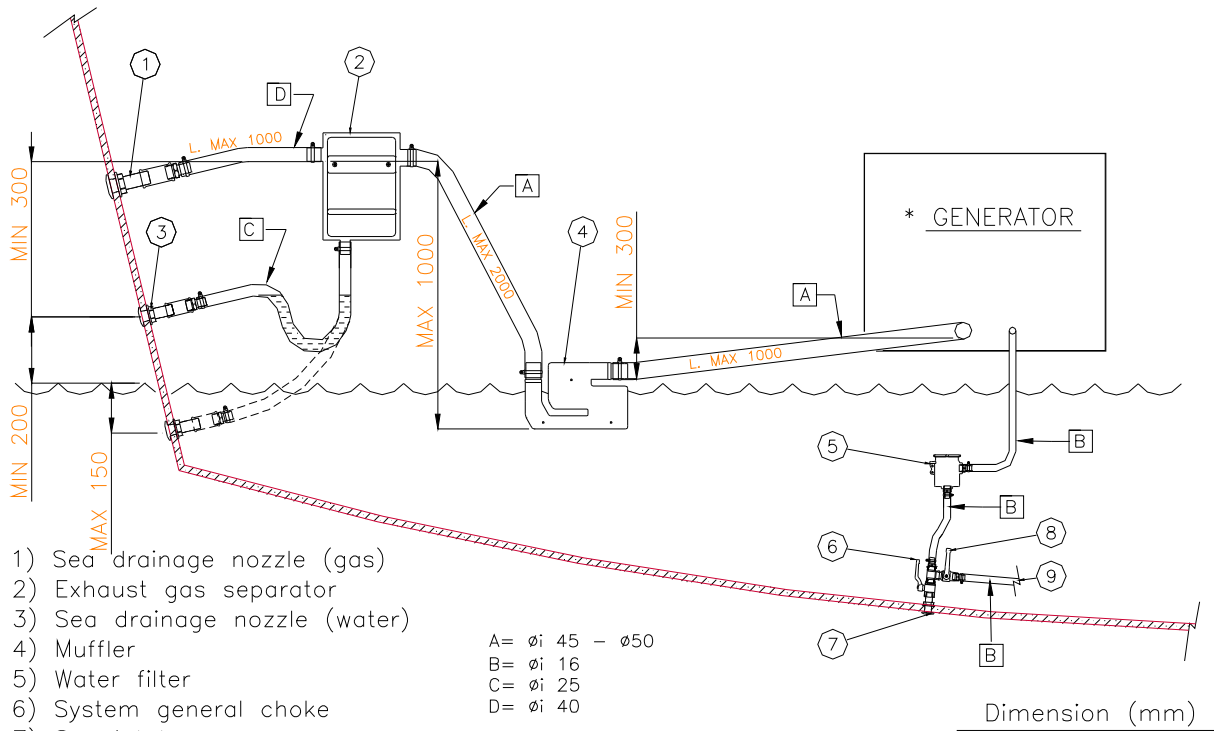
- 1) Sea drainage nozzle
- 2) Silencer
- 3) Anti-sifon valve
- 4) Drainage
- 5) Muffler
- 6) Water filter
- 7) System general choke
- 8) Sea intake
- 9) Drain system choke
- 10) Draining pipe

A= ϕ i 45 - ϕ 50 (IS 10.8)
 B= ϕ i 16
 C= ϕ i 14

Dimension (mm)

* Generator downside water line

TYPICAL INSTALLATION WITH GENERATOR ABOVE THE WATERLINE WITH mase WATER/GAS SEPARATOR



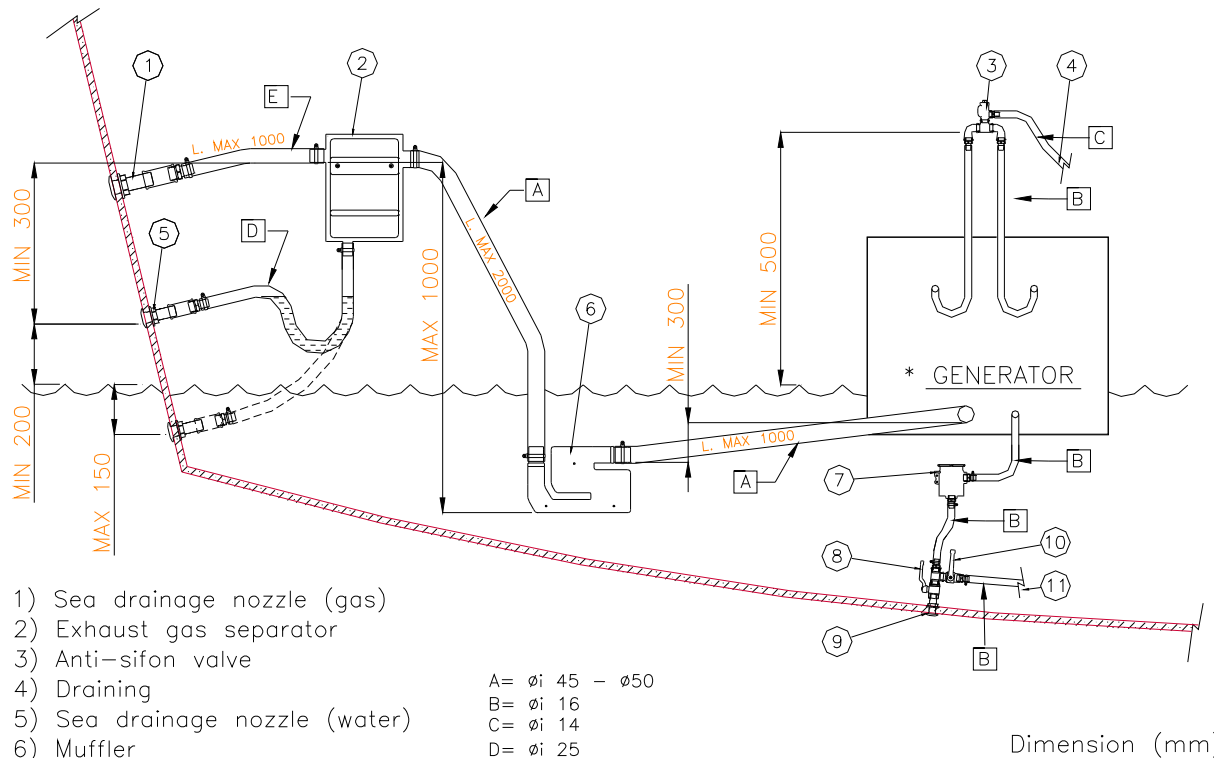
- 1) Sea drainage nozzle (gas)
- 2) Exhaust gas separator
- 3) Sea drainage nozzle (water)
- 4) Muffler
- 5) Water filter
- 6) System general choke
- 7) Sea intake
- 8) Drain system choke
- 9) Draining pipe

A= ϕ_i 45 - ϕ_{50}
 B= ϕ_i 16
 C= ϕ_i 25
 D= ϕ_i 40

Dimension (mm)

* Generator upside water line

TYPICAL INSTALLATION WITH GENERATOR UNDER THE WATERLINE WITH mase WATER/GAS SEPARATOR



- 1) Sea drainage nozzle (gas)
- 2) Exhaust gas separator
- 3) Anti-siphon valve
- 4) Draining
- 5) Sea drainage nozzle (water)
- 6) Muffler
- 7) Water filter
- 8) System general choke
- 9) Sea intake
- 10) Drain system choke
- 11) Draining pipe

A= ϕ_i 45 - ϕ_{50}
 B= ϕ_i 16
 C= ϕ_i 14
 D= ϕ_i 25
 E= ϕ_i 40

Dimension (mm)

* Generator downside water line

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3.4.5. Drainage system

The flue gas/water drainage system of the generator must be separate from that of the main motors

IMPORTANT

The length of the tube from the highest point of the drain duct to the muffler should not exceed 2 meters. This is to prevent the water left in the drainage duct returning to the motor after filling the tank muffler, when the unit is turned off.

- 1 - Tank muffler (capacity 3.5 litres)
This dampens the noise of the drainage and stops the water flowing back towards the motor. The muffler should be installed no less than 1 metre away from the generator and positioned at a height less than or equal to that of the base plate of the generator.
- 2 - Silencer
This further reduces noise. It should be installed no more than 1 metre from the sea drainage nozzle.
- 3 - Sea drainage nozzle; It should be installed so that it is always above the water line.

3.5 Fuel circuit

The unit is fed by diesel fuel through the tubes marked "DIESEL" and "DIESEL RETURN" (fig.10, ref.1-2). This latter is used for the return of the excess fuel. **It is necessary to install a filter in connections to the fuel tank**, it is also advisable to fit a tap onto the power supply line downstream of the tank and a single-acting valve (check valve only for a difference in height of 50 cm or more) to prevent the fuel system emptying for any reason. Use a valve with a 50 millibar opening. The fuel pipes should be in hydrocarbon-resistant rubber, of inner diameter 6 mm.

IMPORTANT

The unit is fitted with automatic diesel oil drainage. If manual drainage is necessary, press the "ON" button and 30 second before set going the unit.

IMPORTANT

The fuel filter must be a "cartridge-type" with a filtering grade of 5 to 10 micron

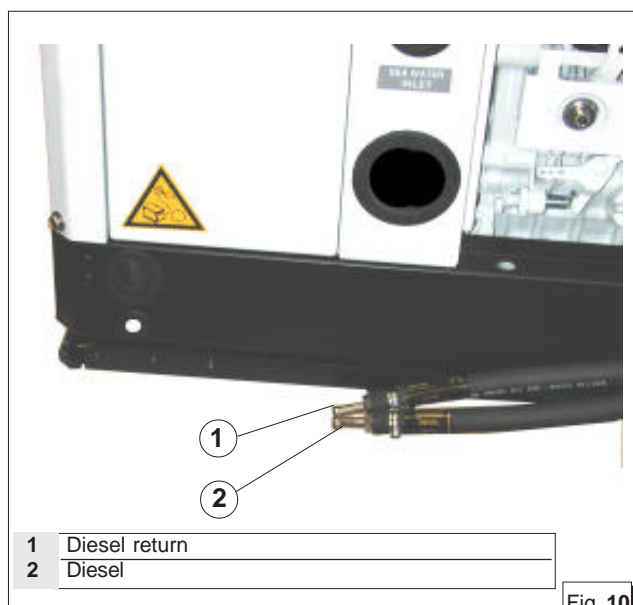


Fig. 10

3.6 ELECTRICAL CONNECTIONS

3.6.1. Battery connection

To start off the unit an independent battery of 12V is needed, capacity 45 Ah min.

It should be connected to the clamp of the generator as shown in fig. 11 with cables of section 25 mm² up to distances of 5 metres and with cables of section 35 mm² for longer distances, and following the sequence of operations described below:

- First connect the positive pole (+) of the battery to the terminal marked with the symbol (+) on the generator, (the starter).
 - Then connect the negative pole (-) of the battery to the terminal marked with the symbol (-) on the generator.
 - Wipe the connections with special mineral grease to protect against oxidation and corrosion.
- The generator includes an electronic device to automatically recharge the start-up battery, giving 10 A, at a voltage of 12 V, when fully charged.



Fig. 11

IMPORTANT

Install the battery in a well-ventilated area, away from the generator and from any device which might produce heat or sparks.

Periodically check the state of the connections of the terminals and the water level of the battery. If the cables need to be disconnected, follow the instructions for connection in reverse order.

Do not invert the poles of the connecting cables since serious damage might be caused to the generator and the battery.

Do not connect other loads to the battery.

In order to reduce galvanic currents to a minimum, the (-) of the battery of the electric generator should not be connected to the (-) of the other batteries on board.

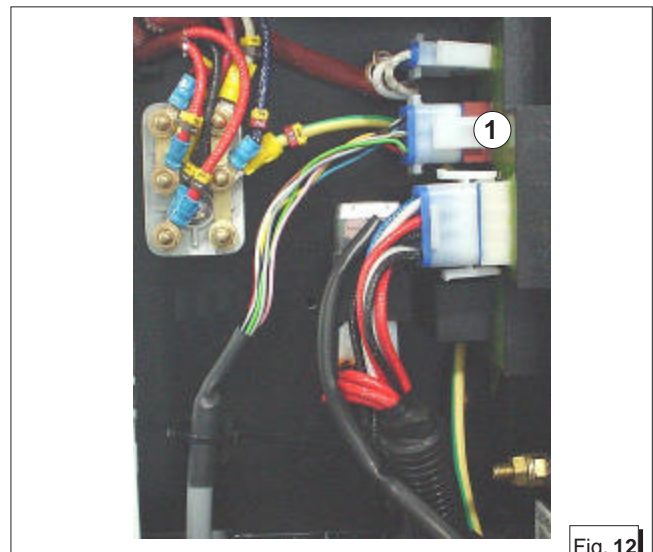
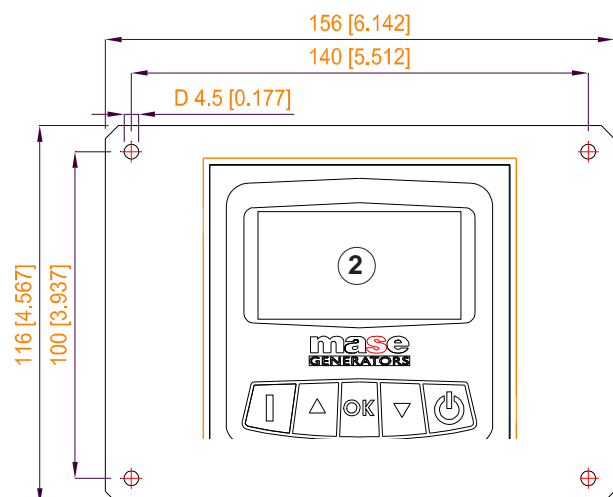


Fig. 12

3.6.2. Control panel connection

Connect the cable to connector (ref.1) using the cable provided already connected to the control panel. Insert the control panel cable through the hole.

On control panel (ref.2) there is a display and buttons for starting, stopping and menu navigation.



CAUTION

Control panel must be absolutely installed because it's essential for generator functioning. Do not use different devices other than the supplied one, as they can not be compatible with generator.

Remove battery connection before installing control panel.

Control panel is supplied with a 10 meters length cable. Do not modify this cable as it may cause improper functioning of the panel circuit.

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IMPORTANT

The control panel is indispensable for operating the unit and must be installed; do not use devices other than the control panel supplied with the unit since they might not be compatible with the generator. Make the connections with the battery disconnected.

CAUTION

The control panel is provided with a connecting cable 10 metres long. This cable should not be modified since it might cause the panel circuit to function incorrectly.

3.6.3. A.C. Connection

This connection can be done through the power terminal board (fig. 15, ref. 1) placed inside the derivation box.

⚠ WARNING

Generator earthing.

High voltage may cause serious injury or death.

Electroconduction is possible whenever electricity is present.

De-energise the main magnetothermal switches of all the power outputs before repairing the equipment. Configure the installation for earthing of the generator and the electrical circuits when in use.

Avoid contact with the electrical conductors or equipment when standing in water or on wet ground, since there is a higher risk of electroconduction in these conditions.

⚠ WARNING

Short-circuits. High voltage may cause serious injury or death.

Short-circuits may cause physical injury and/or damage to the equipment. Avoid contact with the electrical connectors through tools or jewellery. Take off wrist watches, rings or any other jewellery before working on the electrical circuits.

⚠ WARNING

Feedback to utility. Feedback voltage may cause serious injury or death.

Connect the generator to the electrical system of the structure/boat only through an approved electrical system and after opening the main switch of the structure/boat. The feedback circuit may cause serious injury or death of the personnel working on the power lines and/or personnel near the working area.

- Make sure that the sum of the generator loads doesn't overcome the nominal power of the generator group.

- Despite the group is provided with a thermal switch, it's recommend to interpose magnetothermal protections or similar between generator and electric users.

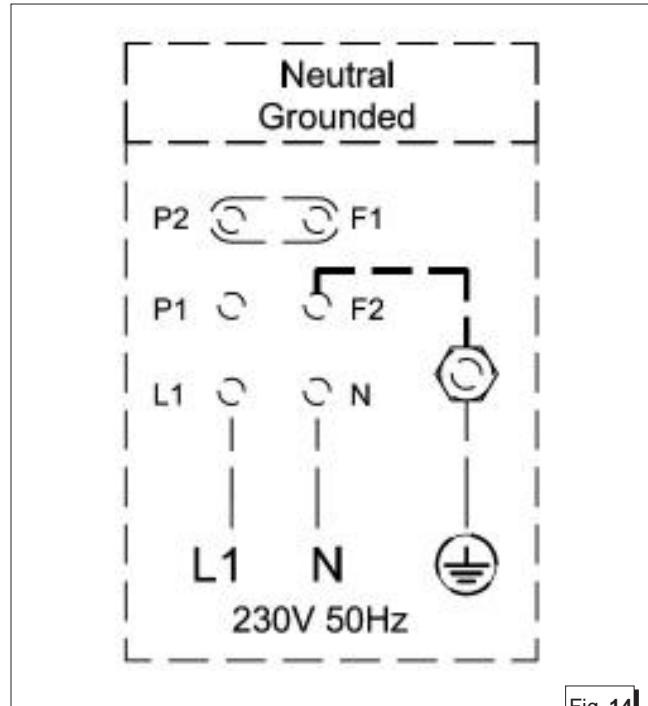


Fig. 14

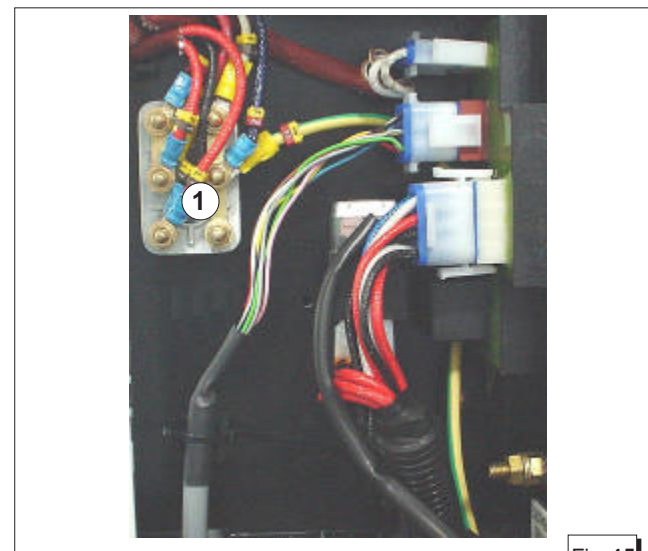


Fig. 15

- To make both parallel and serial connections, use the special bridges provided in the accessories to the electric generator on the terminal board fig. 15 ref. 1.

3.6.4 GENERATOR - NETWORK SWITCHING

A switch must be interposed on the utility line to allow switching the utilities from the generator to an external power supply line.

The switch must be dimensioned on the basis of the entity of the loads involved;a broad diagram is shown in ref.2.

⚠ DANGER

Do not connect the generator to a public electrical system (e.g. wharfs, ports, houses, other boats, etc.). The feedback circuit may cause serious injury or death of the personnel working on the power lines and/or the personnel near the working area.

⚠ DANGER

The generator may only be installed by qualified technicians. Malfunctioning due to improper installation may cause injury or death.

⚠ DANGER

Do not modify the default electrical connections for other applications. If necessary, contact our distributors.

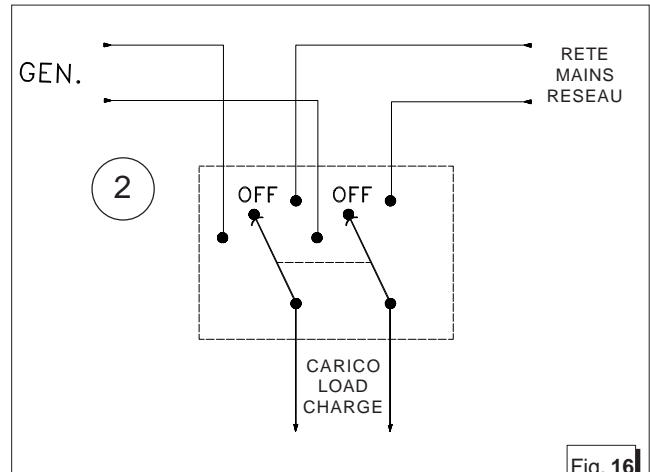


Fig. 16

3.6.5 EMERGENCY STOP

The generator can be stopped by setting the switch (ref.3) to the "0" position (OFF).



Fig. 17

4.1 PRELIMINARY CHECKS

Before beginning with any starting procedures, it is extremely important to “familiarise” yourself with the generator and its controls.

Furthermore, visually inspect the generator and the installation.

Any source of real or potential risk must be eliminated before proceeding.

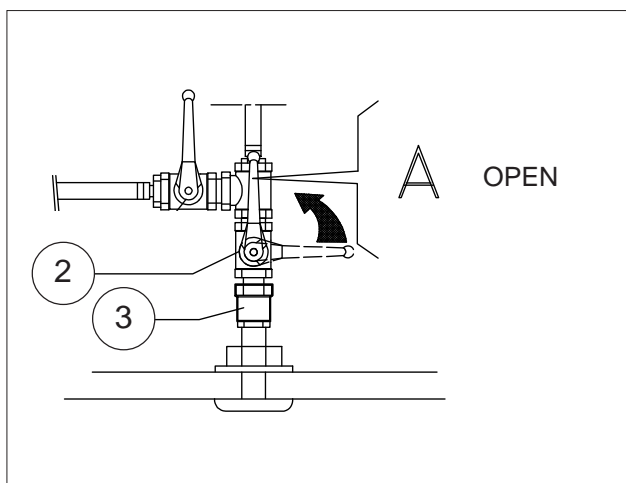
- Identify the position of the emergency stop buttons, switches and other emergency systems on the generator.
- Learn the specific emergency procedures pertaining to the installation in question.
- Check the oil level by means of the dipstick (**ref. 1**). See table for recommended oils (**chap.6.5**)
- Check that all the anchoring points of the generator are properly tightened.
- Check that all the electrical utilities are off to prevent starting the generator on load.
- Check that the water and fuel pipes are properly connected
- Check that all the electrical connections have been properly made and that no connections are in a bad state.
- Check that the seawater cock is open (**ref. 2**)
- If a check valve has been fitted on the seawater intake (as recommended in the installation manual), check that the section of the water circuit leading from the pump to the valve has been manually primed (**ref.3**).

4.2 FUELLING

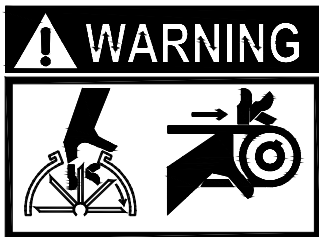
The fuelling operations must be carried out extremely carefully and the tank must not be filled over the maximum level.



- **Fuel is a toxic and flammable liquid, and must therefore be kept in hermetically sealed containers and stored in inaccessible places.**
- **Fuelling must always be carried out with the engine off and the selector in the OFF position.**
- **Do not smoke and do not use naked flames during fuelling.**
- **Fuel in well-ventilated places.**
- **Avoid contact of fuel with the skin and do not inhale the fumes.**



4.3 STARTING THE GENERATOR



CAUTION

Before starting the generator check that all the doors is closed.

Before starting the generator ensure that all the preliminary checks have been carried out.

Start

Press the ON/OFF pushbutton (ref.1) to turn on the module. It will show "mase" logo on display.

Press and hold pressed the START pushbutton (ref.2) in order to preheat the glow plugs (pre-starting) and then start the engine. Release only when the engine is started, paying attention to not exceed 5 seconds for each starting attempt and doing a pause of about 30 seconds between them.

CAUTION

Repeated unsuccessful starting attempts may cause excessive accumulation of water in the exhaust system with possible serious damage to the engine.

In case of have difficulty in starting the engine, absolutely do not persist for a long time before first having closed the seawater intake cock (Ref.3).

During the running-in period (the first 50 hours), do not apply loads exceeding 70% of the rated power of the generator.

INFORMATION

For more detailed information, consult the manual provided by the engine manufacturer, which accompanies each generator.

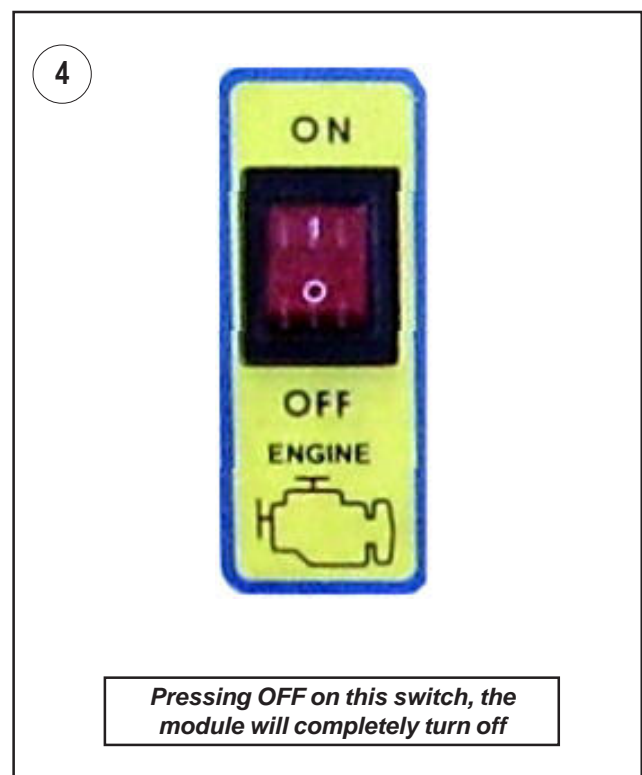
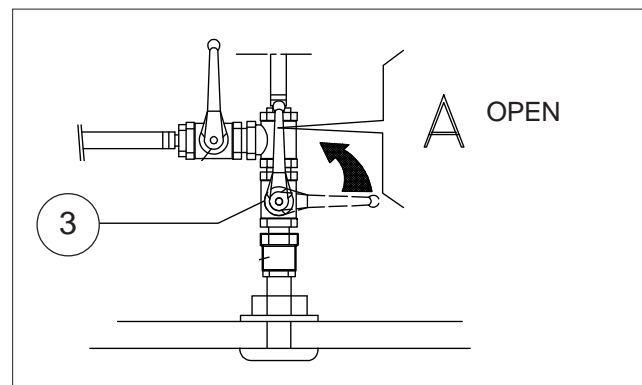
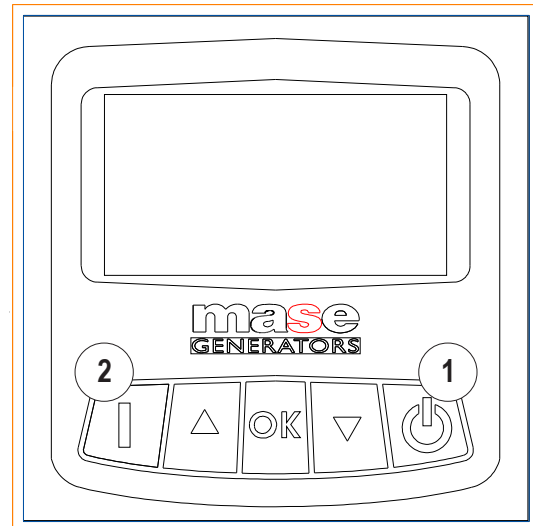
4.4 STOPPING LHE GENERATOR

Stop the generator by pressing the STOP button on the control panel (ref.1).

The generator can be stopped also by setting the switch (ref.4) to the "OFF" position.

CAUTION

Before stopping the generator, it is advisable to run it for a few minutes without drawing current in order to allow gradual cooling of the engine and the alternator.



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5 SAFETY SWITCHES AND WARNING SIGNALS

The generators are equipped with a set of safety switches which protect it against improper use and problems which may jeopardise its integrity.

5.1 PROTECTION AGAINST SHORT-CIRCUITS AND OVERLOAD

The generator is protected against short-circuits and electrical overload.

A magnetothermal switch (**ref.1**) cuts the power when a short-circuit occurs or when the power delivered exceeds the rated value.

Before restoring the contact, remove the cause of the cutout.

5.2 PROTECTION AGAINST SHORT-CIRCUITS OF LOW-VOLTAGE ELECTRICAL SYSTEM.

In the event of a short-circuit of the low-voltage electrical system, two fuses 3A - 30A (**ref.2**) break the circuit stopping the generator. In this case the warning lights of the engine protection module will all be off and it will not be possible to reattempt starting.

INFORMATION

If one of the above safety switches trip, find and eliminate the cause and then press the STOP button to reset the control panel (otherwise the signal would remain in memory inhibiting engine starting).



ALARM CHART FOR CBU MODULE

Alarm code	Symbol	Alarm name	Description
0		Emergency stop	Means that the emergency pushbutton is pressed.
3		Missing engine stop	Means that, after engine is stopped, the electronic board detects active parameters as the engine is still running.
4		Mechanical failure	If generator is running, means that all detected parameters are simultaneously missing.
11		High engine digital temperature	Means that the digital sensor detects high temperature
14		Digital low oil pressure	Means that the digital sensor detects low oil pressure
15		Digital oil gauge failure	Means that there is not wiring connection to digital gauge for oil pressure, with engine turned off.
16		High level battery	Means that the battery voltage is too high.
17		Low level battery	Means that the battery voltage is too low.
20		Generator: low frequency	Means that the generator frequency is too low.
21		Generator: high frequency	Means that the generator frequency is too high.
22		Generator: low voltage	Means that the generator voltage is lower than the set alarm threshold.
23		Generator: high voltage	Means that the generator voltage is higher than the set alarm threshold.
24		Alternator high temperature	Means that the high engine temperature contact is open.

5.3 ENGINE PROTECTION MODULE

CBU device (Can-Bus transmission unit) controls and driving the genset.

Large display and the control push-buttons allow an easy use and monitoring of the CBU unit.

Displayed information

- Voltage Vac
- Frequency Hz
- Hourmeter
- Battery voltage of the genset
- Voltage of onboard batteries
- Low oil pressure alarm
- High engine temperature alarm
- High alternator temperature alarm
- Displayed stop alarms
- Storage and back-up of alarms
- Maintenance (first 50 hours)

Input / Output signals - Commands - Checks

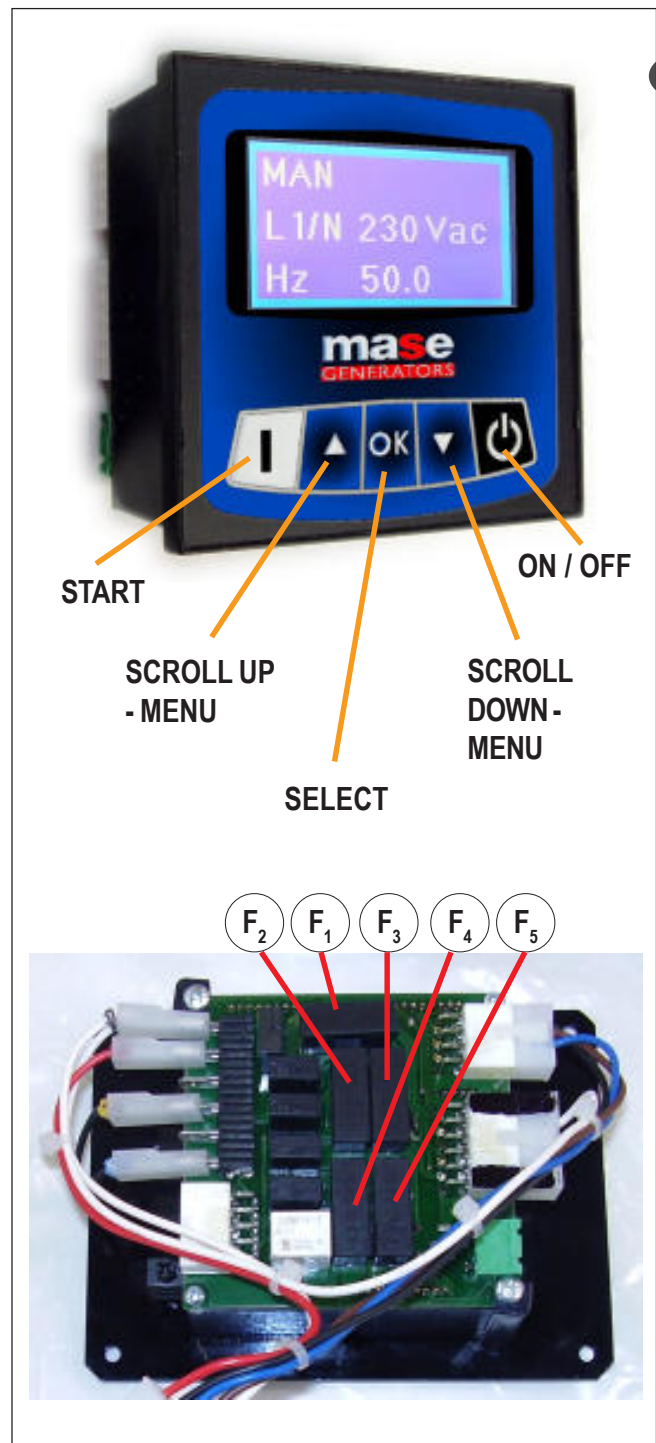
- Connector mod. 485 for MODBUS protocol (It allows monitoring and driving the genset by the boat main control monitor)
- Output all included alarms (optional)
- Input voltage of onboard batteries (from 12V up to 24V) (optional)
- Input battery voltage of the genset
- Input Start/Stop from remote panel
- Switch off button
- Scroll through display buttons
- Emergency pushbutton (predisposition)

CAUTION

The low oil pressure protection does not give an indication of the oil level. The oil level must daily be checked in order to prevent damage to the engine. The engine correctly works if it doesn't exceed inclinations max of 30° for up to 3 minutes and 25° without limits of time, in comparison to both longitudinal and transversal axles. If the engine works to greater inclinations, it risks an insufficient lubrication and/or aspiration of oil from the filter air.

INFORMATION

If one of the above safety switches trip, find and eliminate the cause and then press the STOP button to reset the control panel (otherwise the signal still in memory inhibiting engine starting).



5.4 FUSES

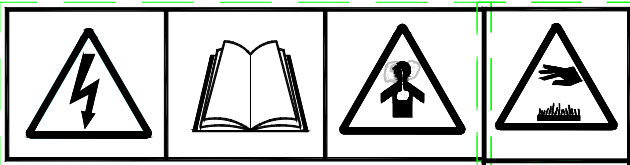
- Protection module fuses

On the printed circuit of the engine protection module there are five fuses to protect the module. Remove the frontal panel unscrewing the 4 screws to enter in it.

- F₁ : 5A 5x20mm for relay "ALARMS"
- F₂ : 5A 5x20mm for relay "IP" (insulated poles)
- F₃ : 5A 5x20mm for relay "RUNS"
- F₄ : 5A 5x20mm for relay "GLOWS"
- F₅ : 5A 5x20mm for relay "EV" (solenoid)

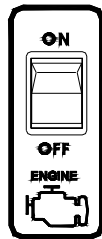
6.1 PREAMBLE

It is recommended to strictly follow the instructions in the manual provided by the engine manufacturer, which accompanies each generator. It is important to regularly check and carry out maintenance on the generator. The operations to carry out must be decided based on the hours of operation. In order to carry out maintenance, the side doors and top door must be removed.



⚠ WARNING

The generator is started from a remote control panel. In order to prevent accidental starting, set the emergency switch to the (OFF) position. Disconnect the negative pole from the starter battery.



⚠ WARNING

Any maintenance operation on the generator must be carried out with the engine off, after leaving it to cool down sufficiently. Carefully read paragraph 1.5 "General danger information" in the manual. Periodically check the electrical safety switches, such as the emergency button, the earthing system, etc.

6.2 ROUTINE ENGINE MAINTENANCE

The periodic operations to be carried out on the engine are indicated in the table "Service schedule" in paragraph 6.18. For more detailed information, consult the manual provided by the engine manufacturer, which accompanies each generator.

6.3 ENGINE OIL CHECK

- Check the oil level by means of the cap/dipstick (ref.1). The oil level must always be between the MAX and MIN notches engraved on the dipstick.
- When checking the oil level, ensure that the generator is positioned horizontally.



6.4 ENGINE OIL CHANGE ✂

Use diesel engine oil

Top up the engine oil through the hole (**chap.6.3, ref.1**).
To change the oil in the engine oil sump, take out the dipstick (**chap.6.3, ref.1**).
Suct exhaust oil with a manual pump (**ref.2**).
It is advisable to drain the oil when it is still sufficiently warm so that it flows easily.

⚠ CAUTION

- *Dispose of the used oil in an appropriate manner, since it is a polluting product.*
- *Take the used oil to special waste collection centres for disposal.*
- *Wear gloves to protect the hands from contact with oil. In case of accidental contact with engine oil, thoroughly wash the affected part with soap and water.*
- *Do not top-up with oil or refuel above the maximum level. An excessive quantity of oil may cause damage to the engine.*

i INFORMATION

Always check proper viscosity of the engine oil in relation to the range of temperatures in which the generator operates, as indicated in chap 6.5.

6.5 OIL FILTER ✂

To replace the engine oil filter cartridge, follow the procedure below:

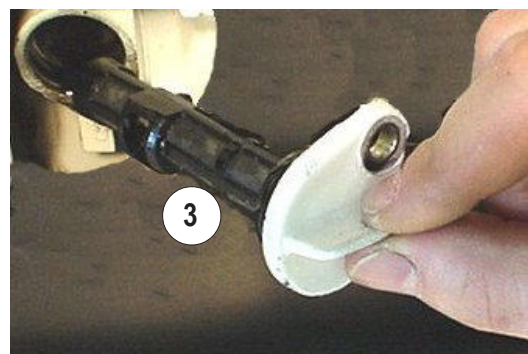
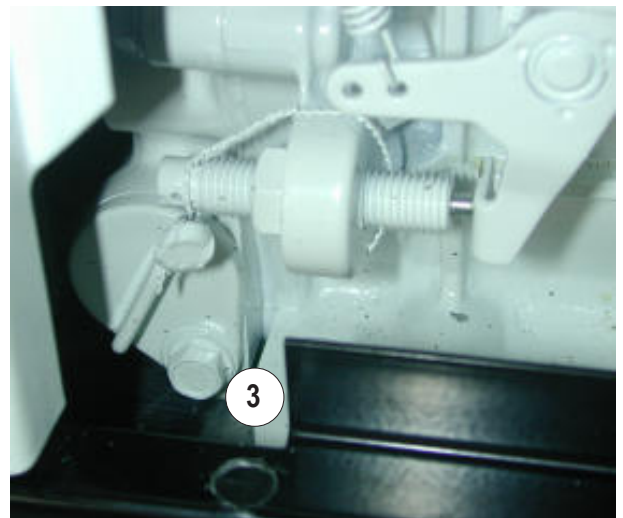
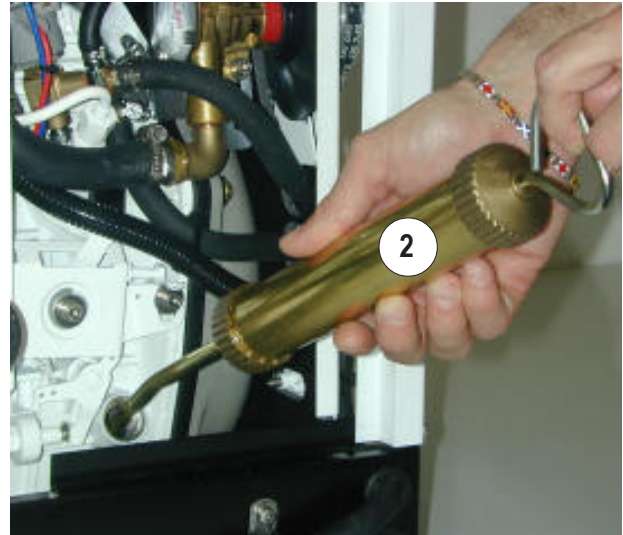
- Remove and extract the filter (**ref.3**).
- Screw in the new filter after cleaning the rubber seal and seating surface and ensure it is in perfect condition.

⚠ CAUTION

When the operation has been completed, thoroughly clean all the parts of the generator soiled with oil and fuel.

i INFORMATION

For engine safety reasons, use only original spare parts.



S.A.E. grade service	5W								
	5W30								
	10W								
	10W30								
	20W								
	20W40								
	20								
	30								
	40								
		-30	-20	-10	0	10	20	30	40
	Ambient temperature (°C)								

GB

6.6 REPLACING / CLEANING THE FUEL PUMP FILTER

This operation is carried out following the steps below:

- Remove the pipe (ref.1)
- Slide out the filter (ref.2)
- Clean or replace it

For reassembly repeat the operations in reverse order.
After replacing the filter, the fuel system has to be bled by carrying out the operations described in paragraph 6.8.

WARNING

Do not let the fuel come into contact with the skin. Wear gloves and protective goggles during maintenance operations.

In the event of contact with fuel, immediately and thoroughly wash the affected part with soap and water. When the operation has been completed, thoroughly clean off all traces of fuel and take the cloths used to special waste collection centres.

6.7 REPLACING THE LINE FUEL FILTER

Follow the instructions given in the manual of the type of fuel filter installed.

See also Chap. 3.6.1 "Fuel filter".

6.8 BLEEDING THE FUEL SYSTEM

INFORMATION

The fuel system is developed to eliminate air bubbles penetrated inside the system, automatically. For automatic bleeding, activate the fuel pump for few minutes before starting the engine. To activate the fuel pump turn on the engine module and then press and keep pressed START (ref.3) until "pre-heating glow plug" icon disappear from display.

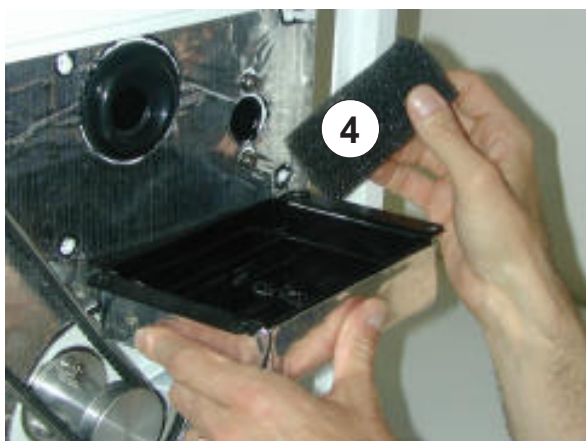
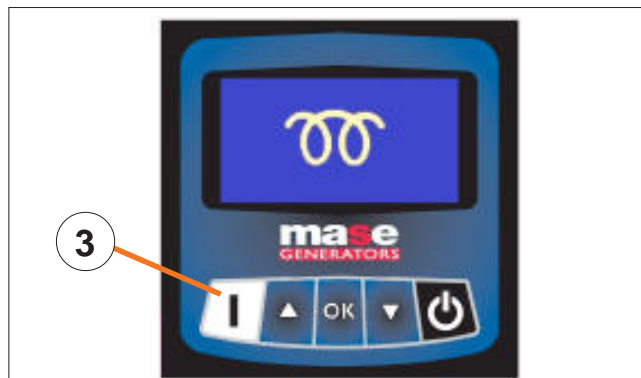
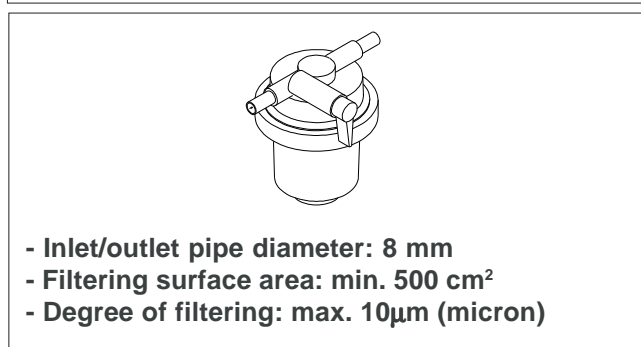
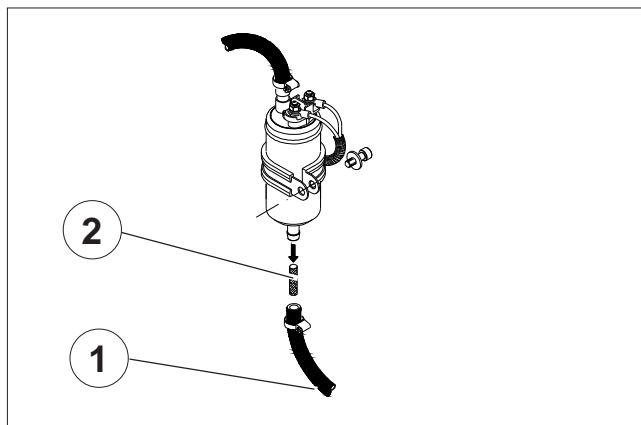
If there are air bubbles in the fuel system, the engine will not function regularly or will be unable to reach the rated rpm. Air may penetrate the fuel circuit through a not perfectly sealed joint (pipe, filters, tank) or when the fuel in the tank is at minimum level.

6.9 AIR FILTER

The IS series generators are fitted with a dry air filter (ref.4), which prevents foreign bodies from entering the combustion chamber. It is sufficient to clean the filter mass with diesel fuel once a year to remove any impurities.

CAUTION

Take the liquids used to wash the filter to special waste collection centres for disposal.



6.10 DRAINING THE COOLING SYSTEM

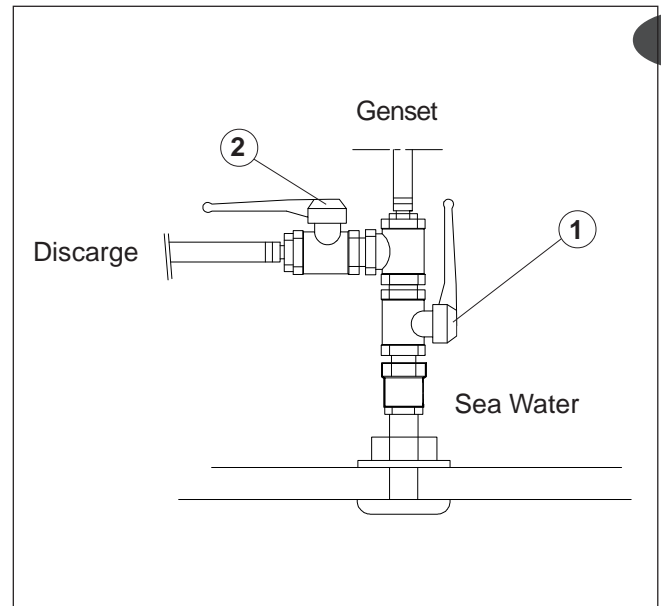
In order to carry out maintenance on the water/air exchanger or the cooling system, the seawater intake circuit must be drained.

Carry out this operation as follows:

- Close the seawater intake cock (**ref.1**).
- Open the drain tap (**ref.2**) until all the water has drained out.
- Close the drain tap.

CAUTION

Reopen the seawater intake cock before starting the generator.



GB

6.11 REPLACING THE ZINC ANODE

A sacrificial zinc anode (**ref. 4**) has been fitted in the water/air heat exchanger (**ref.3**) to protect it against galvanic currents.

Periodically check the state of wear and replace it if necessary, in order to prevent galvanic currents from irreparably corroding the exchanger. It is recommended to check the zinc anode at least once a month when the generator is new in order to check how fast it wears, and then act accordingly.

It is in any case advisable to replace the zinc anode at least once a year.



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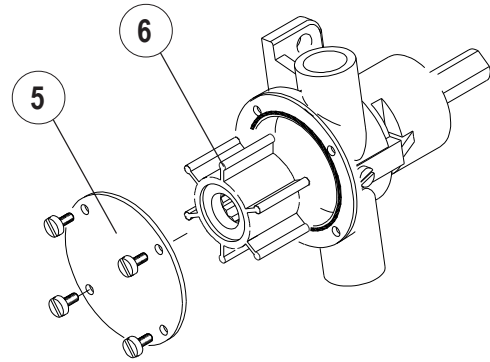
6.12 SEAWATER PUMP MAINTENANCE

At least once a year check the integrity of the rubber seawater pump impeller.

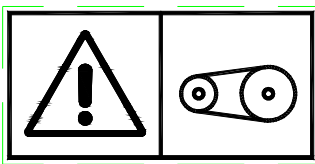
Before opening the seawater pump to inspect the impeller, drain the seawater from the cooling system as described in **paragraph 6.10**.

To access the impeller, remove the cover (**ref.5**) and use pliers to extract the impeller (**ref.6**), pulling it hard towards the outside.

To refit a new impeller, repeat the operations described above working in reverse order.



6.13 CHECKING / REPLACING THE V-BELT ✂



⚠ WARNING

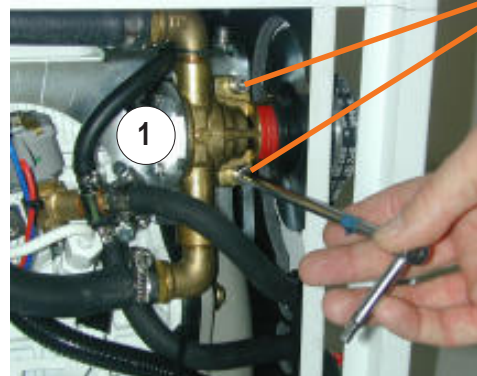
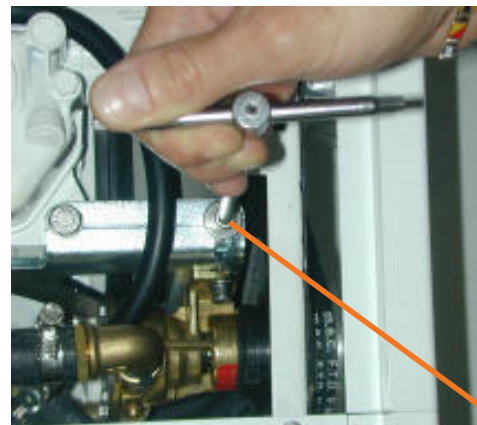
Do not open the doors or hold the hands close to the V-belts and pulleys when the engine is running.

A V-belt is used to transmit the rotation motion from the drive shaft pulley to the seawater pump pulley (**ref.1**). A too tight belt accelerates wear, while a too slack belt results in the pulleys running in idle and insufficient water circulation.

Adjust the belt tension as follows:

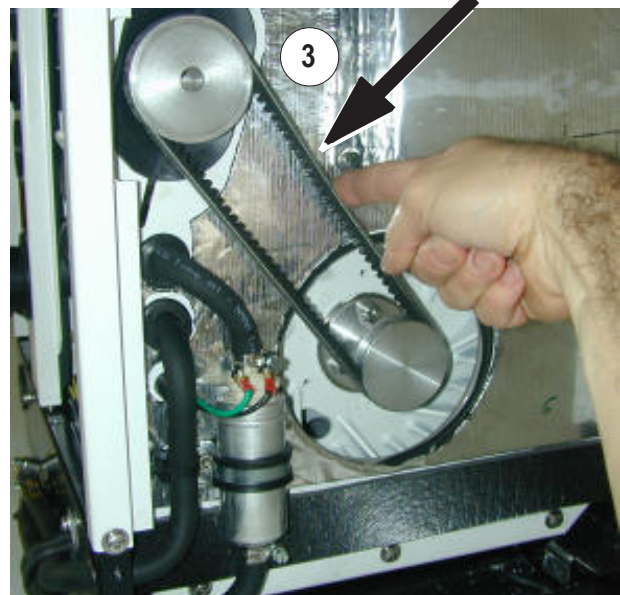
Loosen the two adjusting screws (**ref.2**) and move the seawater pump towards the outside to increase tension or towards the inside to decrease it. Tighten the screws and check the tension.

The belt tension is correct when it sags about 5mm (**ref.3**) under a thrust force of 8kg (17,7lbs).



3

8Kg - 5mm



I INFORMATION

To prevent the belt from idling, do not spill any oil on it. If oil is spilled, clean it off with petrol.

6.14 ALTERNATOR MAINTENANCE

The alternator used on this model generator is type synchronous, self-excited. This type of brushless alternator without manifold does not require any particular maintenance.

Periodic inspections and maintenance are limited to eliminating any traces of moisture and oxidation which may damage it.

6.15 BATTERY CHARGER



Before installing a new battery, it is important that it first be fully charged to charge it completely.

⚠ WARNING

The battery must be activated by personnel who has sulphuric acid for batteries and suitable equipment available.

At least once a month check the level of the electrolyte and, if necessary, top up with distilled water. If the generator is not used for a long period of time, it is advisable to disconnect it and store it in a dry place at a temperature above 10°C (50°F), and to carry out a full recharging cycle once a month.

⚠ WARNING

When topping up the batteries with distilled water, wear rubber gloves and protective goggles to prevent accidental contact of sulphuric acid with the skin. In the event of accidental contact, thoroughly wash the affected part with soap and water and consult a doctor.

⚠ CAUTION

If the battery is left completely flat for long periods of time, it may be irreparably damaged.

i INFORMATION

Before proceeding with recharging the batteries, check the level of electrolyte and, if necessary, top up with distilled water. This operation must be repeated when the charging cycle has been completed. Cover the positive terminal with Vaseline to protect it against corrosion and the formation of oxide.

6.16 CHECKING / REPLACING THE ALTERNATOR V-BELT ✕

Description
Seawater pump impeller
Seawater pump gasket
Seawater pump belt
Oil filter
Fuel filter
Zinc anode
Fuses

OPTIONAL

A kit with recommended spare parts is available and may be ordered from the Mase Service Network or Technical Service.

6.17 PERIODS OF INACTIVITY ✕

Start up the generator at least once a month. If the generator is not to be used for a long period of time, carry out the following operations:

- Change the engine oil.
- Replace the oil filter cartridge (see **par.6.5**).
- Replace the fuel filter cartridge (see **par.6.6, 6.7**).
- Remove the injector and pour 2 cc of engine oil into the cylinder and let the engine turn a few times by manually operating the drive shaft pulley.
Refit the injector.
- Replace the zinc pads (see **par.6.11**)
- Aspirate some antifreeze into the seawater intake pipe in order to protect the exchangers against low temperatures, and lubricate the seawater pump impeller and the metal parts in the cooling system.
- Disconnect the starter battery and store it in a dry place (see **par. 6.15**)
- Disconnect the sea exhaust pipe from the engine manifold.
- Clean the seawater filter.
- Close the seawater intake cock.
- Drain the seawater from the exhaust.
- Clean and lubricate the antisiphon valve (siphon break), if installed.
- Clean the outside of the generator, removing all dust and impurities.
- Cover the generator with a nylon sheet and store it in horizontal position in a dry and ventilated place.

6.18 PERIOD CHECKS AND MAINTENANCE



PERIOD CHECKS AND MAINTENANCE

Perform service at intervals indicated	Before starting	Every 50 hrs. or 1 Month	Every 200 hrs. or 3 Month	Every 400 hrs. or 6 Month	Every 500 hrs. or Yearly	Every 1000 hrs. or Yearly
Fuel system						
Replace the fuel filter element			○			
Check the fuel injection nozzle					●	
Check the fuel injection timing					●	
Check the fuel injection pump						●
Lubrication system						
Check the oil level	○					
Replace the oil		○ 1 st time	○			
Replace the oil filter element		○ 1 st time		○		
Cooling system						
Inspect exhaust system components for cracks and corrosion (exhaust line, hose clamps, silencer and outlet flapper)	○					
Check function of siphon break (if equipped)		○ 1 st time	○			
Adjust seawater pump belt tension		○ 1 st time	○			
Replace seawater pump impeller			○			
Check condition of anticorrosion zinc		○	○			
Check thermostat function					●	
Check correct airflow in the cooling system						●
Intake / Exhaust system						
Check the air cleaner element			○			
Replace air cleaner element					○	
Check exhaust system		○				
Clean exhaust/water mixing elbow			○			
Electrical system						
Check and tighten electrical connections		○				
Clean battery cables					○	
Check the electrolyte level in the battery		○				
Engine and mounting						
Check for leakage of water and oil	○	○				
Check tightness of mounting bolts/vibromounts				●		
Check and adjusting intake / exhaust valve clearance						●
Check and adjust the injection fuel pump						●
Remote control system, etc.						
Check remote control operation		○	○			
Test run generator set		○				

○ In presence of this symbol it is possible to effect the technical support autonomously .

● In presence of this symbol it is obligatory to effect the technical support in an authorized retailer /workshop

6.19 ANOMALIES, CAUSES AND REMEDIES

The starter motor turns but the main engine does not start

- Check that there is fuel in the tank. (Fill up)
- Check if the stop electromagnet is in the firing position. (Consult Service Centre)
- Check that the emergency button is in ON position. (Turn it on ON position)
- Check that the DC thermal breakers are on. (Restore)
- Bleed the air bubbles from the fuel circuit.

The engine protection module is not activated when the START button is pressed

- Check that the thermal protection switch is open. (Restore the contact pushing the button)
- Check battery cables and clamps, and electrical connections. (Reconnect)
- Check integrity of the battery. (Recharge or replace)

The generator switches off during the operating period

- Check if a protection has been activated with the relevant light coming on. (Remove the cause and retry starting)
- Check if there is fuel in the tank. (Fill up)

There is a high grade of smoke at the engine exhaust

- Check that the oil level in the sump does not exceed the MAX index. (Restore level)
- Check that the generator is not in overload.
- Check calibration of the injectors. (Consult Service Centre)

The engine runs irregularly

- Check the fuel filters. (Replace)
- Bleed the air bubbles from the fuel circuit.

The alternator voltage is too low

- Check the engine rpm: 3120 rpm (52 Hz) without utilities connected.
- Check that there is not a too heavy load. (Reduce the load)
- Capacitor breakdown. (Contact Service Centre)
- Alternator failure. (Contact Service Centre)
- Check all electrical connections. (Contact Service Centre)

Starter battery flat

- Check the electrolyte level in the battery. (Restore the level)
- Check functioning of the DC alternator.
- Check integrity of the battery.

The generator does not deliver power

- Check that the magnetothermal switch is in the "ON" position. (Contact Service Centre)
- Capacitor breakdown. (Contact Service Centre)
- Alternator failure. (Contact Service Centre)
- Check all electrical connections. (Contact Service Centre)

6.20 HOW TO ORDER THE SPARE PARTS

In order to ensure a good functioning of the generator, we recommend to use original spare parts only.

The spares can be purchased from the **mase** authorized assistance network (consult the **SERVICE** manual enclosed with the generator).

You can get **any further information** contacting the **mase** central Service.

7 TRANSPORT. STORAGE. LIFTING AND. HANDLING AND PACKAGING

7.1 TRANSPORT AND STORAGE

Packaging: Supplied directly by Mase Generators. The total weight of the packed generator is given in Paragraph 2.3 “Table of technical characteristics”.

Transport: During transport the generator (with or without packaging) must be protected against atmospheric agents, it must not be turned upside down and must be protected against knocks.

⚠ CAUTION

It is strictly prohibited to pollute the environment with the packaging

Storage: The generator must be stored in horizontal position and away from atmospheric agents and humidity.

7.2 LIFTING AND HANDLING OF THE PACKED GENERATOR UNIT

⚠ CAUTION

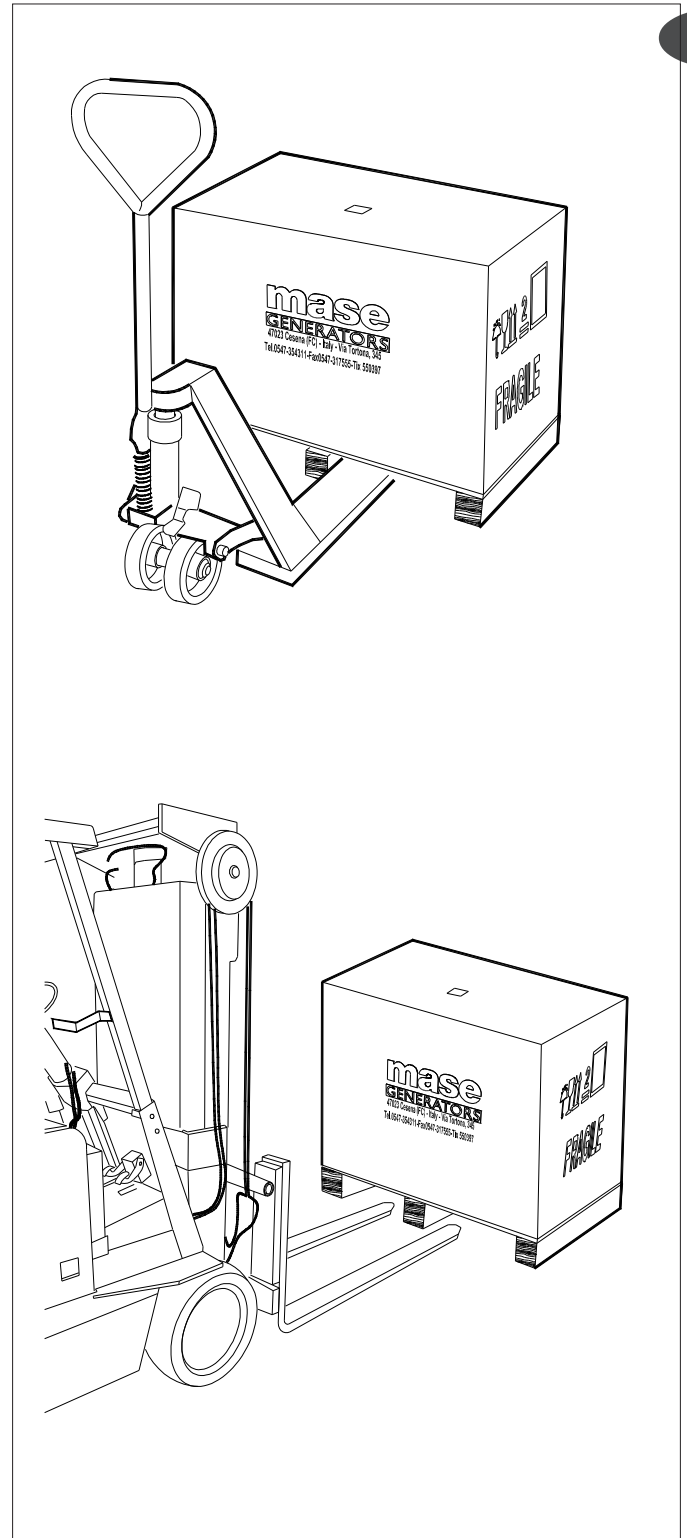
Always check that the capacity of the lifting means and its accessories is greater than the weight of the generator printed on the identification plate.

Use a lift truck to handle the generator (with capacity greater than the weight of the generator indicated in the table of technical characteristics (par. 2.3) of the Use and Maintenance Manual), inserting the forks under the base at the lower part of the generator.

For handling on level ground, a transpallet is sufficient with a suitable capacity according to the table of technical characteristics (par.2.3) of the Use and Maintenance Manual.

ⓘ INFORMATION The centre of gravity of the generator corresponds to about the centre of its geometrical volume.

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8 GUARANTEE AND RESPONSIBILITY

8.1 GUARANTEE

- The **mase** generators and all their components are guaranteed free of defects and are covered by the guarantee for a period as required by current legislation from the date of installation.
- Not covered by the guarantee are: failed observance of the installation regulations, damage caused by natural disasters, accidents, defects of the electrical system including the load to which the generator is connected, negligence, improper use or abuse by the operator and damage caused by repairs carried out by unqualified personnel.
- Repairs that cannot be carried out at the place of installation can be carried out at **mase** laboratories or at authorised workshops. Transport expenses will be borne by the Customer.
- Under no circumstances does the Customer have the right to claim compensation for damages or side effects caused by use of the machine in a manner not conform to what is described in this manual.

8.2 LIMITS OF RESPONSIBILITY

MASE GENERATORS S.p.A is responsible for anything regarding the safety, reliability and performance of the Generator on the condition that:

- The generator is used by persons trained through the use and maintenance manual.
- The installation is carried out according to **mase** instructions.
- The service procedures are carried out exclusively by **mase** specialised technical personnel.
- The electrical system and the loads to which the generator is connected is in conformity with the applicable CEI regulations.
- The Generator is installed and used in accordance with the installations provided in this manual.
- Use original spare parts specific to each model.
- Use suitable fuel.
- Diesel fuel conforming to standards ASTM A975.

9 DISPOSAL

9.1 DISPOSAL OF THE WASTE MATERIALS DERIVING FROM MAINTENANCE AND SCRAPPING

- The packaging used for transport is biodegradable and thus easy to dispose of by companies authorised for paper collection.
- The electrical components must be taken to companies authorised for the collection of electronic material.
- All the painted metal parts must be taken to companies authorised for the collection of metals.

WARNING

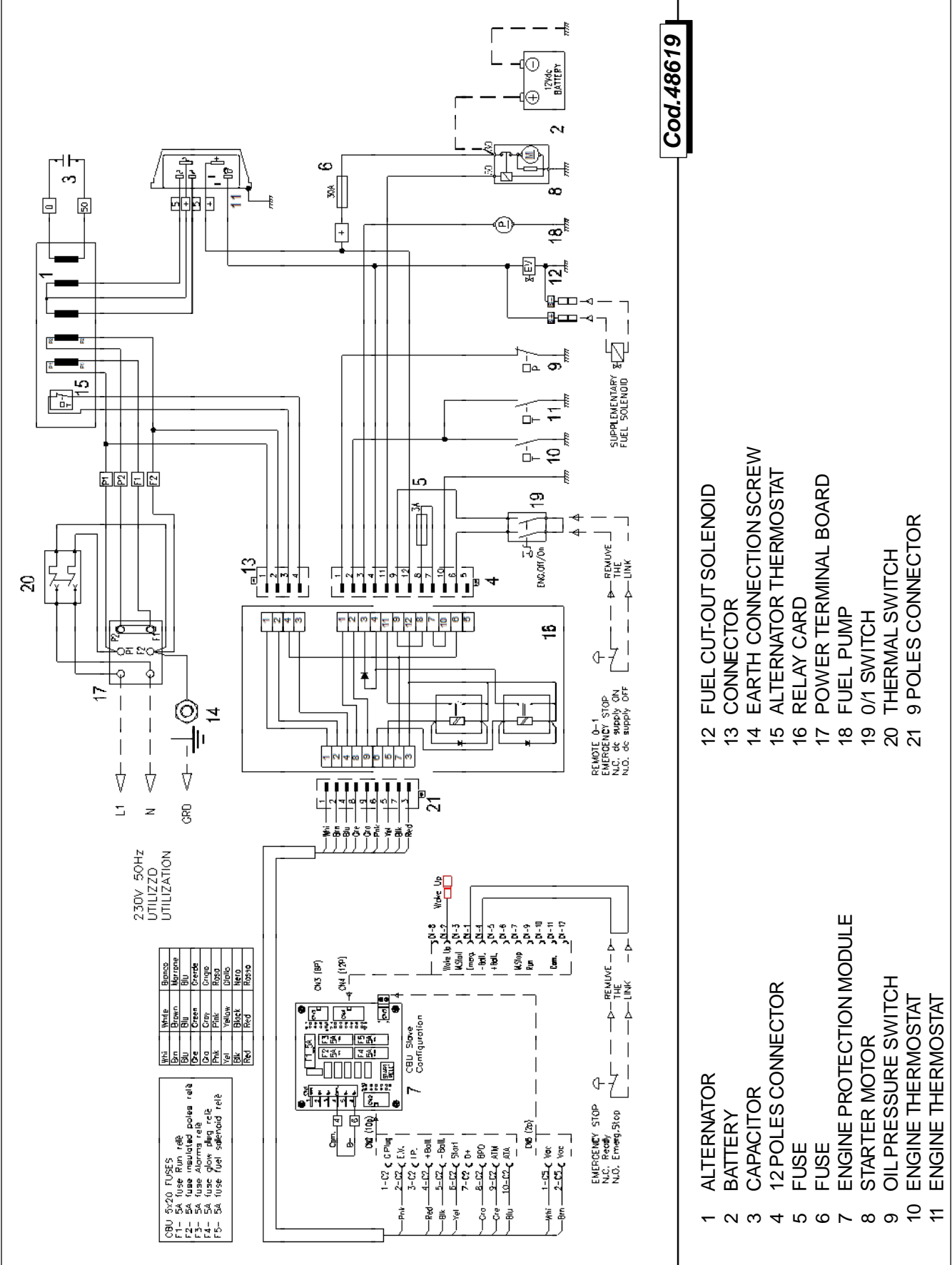
Please note that the system and its components contain materials that, if dispersed in the environment, may cause significant ecological damage.

The following materials must be delivered to specific collection centres authorised for their disposal:

- *Starting battery*
 - *Exhaust lubrication oils;*
 - *Mixtures of water and anti-freeze;*
 - *Filters;*
 - *Auxiliary cleaning material (e.g.: rags smeared or soaked with fuel and/or chemical cleaning products).*
- Any other material not listed above must be taken to companies authorised for the collection of industrial waste.

10 WIRING DIAGRAM

10.1 WIRING DIAGRAM



Cod.48619

1 ALTERNATOR
2 BATTERY
3 CAPACITOR
4 12 POLES CONNECTOR
5 FUSE
6 FUSE
7 ENGINE PROTECTION MODULE
8 STARTER MOTOR
9 OIL PRESSURE SWITCH
10 ENGINE THERMOSTAT
11 ENGINE THERMOSTAT

12 FUEL CUT-OUT SOLENOID
13 CONNECTOR
14 EARTH CONNECTION SCREW
15 ALTERNATOR THERMOSTAT
16 RELAY CARD
17 POWER TERMINAL BOARD
18 FUEL PUMP
19 0/1 SWITCH
20 THERMAL SWITCH
21 9 POLES CONNECTOR

1 ALTERNATOR
2 BATTERY
3 CAPACITOR
4 12 POLES CONNECTOR
5 FUSE
6 FUSE
7 ENGINE PROTECTION MODULE
8 STARTER MOTOR
9 OIL PRESSURE SWITCH
10 ENGINE THERMOSTAT
11 ENGINE THERMOSTAT

1 ALTERNATOR
2 BATTERY
3 CAPACITOR
4 12 POLES CONNECTOR
5 FUSE
6 FUSE
7 ENGINE PROTECTION MODULE
8 STARTER MOTOR
9 OIL PRESSURE SWITCH
10 ENGINE THERMOSTAT
11 ENGINE THERMOSTAT



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