Marine generator

Model VS 12.8 Y

Rev.: 1
Date: 03/09/2024
Code: 44156

USE AND MAINTENANCE MANUAL
Original instructions in Italian

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General index

1 GENERAL INFORMATION

1.1 Importance of the Manual

Purpose of the Manual

The Use and Maintenance Manual is an integral part of the machine.

The Manual contains information reserved for personnel authorised to interact with the machine throughout its expected life.

⚠ WARNING

Read the Use and Maintenance Manual carefully before using it and/or performing any work on it.

Compliance with the instructions provided ensures the safety of humans, machines and the environment.

Recipients of the Manual

The Manual is intended for personnel authorised to carry out their tasks in compliance with the required safety requirements.

The list indicates what skills and competencies are required.

- Operator
- Handling Operations Technician

Installer

- Mechanical Maintenance Technician
- Maintenance Electrician
- Manufacturer's Specialized Technician

For more information on duties and areas of expertise, see 1.7 - Personnel qualification.

Original language of the Manual

The Manual was originally written in Italian.

It is possible to translate the Manual into other languages for legislative and/or commercial needs.

Translate into other languages, without alterations, starting from the original Instructions.

Information contained in the Manual

The images contained in the Manual are for informational purpose only.

The Manual may contain slightly different representations of the machine (for example, its colour) compared to the actual equipment purchased.

Such information is of little relevance and in no way compromises understanding and the level of safety.

For greater clarity, some illustrations may represent the machine or some parts without safety devices and protections.

Do not use the machine without safety devices and protections.

1.2 Storage of the Manual

Keep the Manual and the attached documents for the entire life of the machine.

Store all documentation appropriately (for example in a container), away from humidity and heat.

The relevant personnel must know where the Manual is located, so that they can easily access as warranted.

Keep the Manual intact and legible in all its parts.

Do not remove, tear or rewrite parts of the Manual for any reason.

In the event of a change of ownership, always hand over the Manual and the attached documents to the new owner.

1.3 Reproduction and copyright restrictions

All information contained in the Manual (texts, diagrams, images, etc.) are the property of the Manufacturer.

Reproduction (total or partial) of the Manual and its dissemination by any means or support is prohibited without written authorisation by the Manufacturer.

The Manufacturer reserves the right to prosecute any unauthorised reproductions and/or disclosures in the ways and within the times established by current laws.

1.4 Update of the Instruction Manual

The Manual reflects the state of the art at the time the machine was placed on the market.

The Manufacturer is committed to a policy of continuous improvement and evolution of its machines.

This may lead to the release to the market of new models and/or to the redesign of existing models to increase performance capabilities.

This in no way entails the obligation to update previous products and the related use and Maintenance Manuals.

In accordance with its policy of continuous improvement, the Manufacturer reserves the right to make changes to the contents of this Manual without the obligation to communicate it in advance.

NOTICE

It is not permitted to use the information in this Manual to make claims on previously supplied machines.

The Manufacturer is available to receive reports and/or feedback from customers.

1.5 Regulatory compliance

Machines intended for European Community countries comply with applicable EU Directives and are accompanied by the CE Declaration of Conformity.

- **2006/42/EC** Machinery Directive
- **2014/30/EU** Electromagnetic Compatibility Directive
- **2014/35/EU** Low Voltage Directive
- **2000/14/EC** Outdoor Noise Emission Directive
- **Stage V - European Regulation (EU) 2016/1628** Internal combustion engine emissions for stationary and mobile machines
- **UNI EN ISO 12100:2010**
- **UNI EN ISO 8528-13:2016**

1.6 Consultation methods

The Manual is organised into chapters, which logically bring together the information necessary to carry out interventions in safe conditions.

Each chapter is organised into paragraphs covering specific topics.

Each paragraph can be divided into several subparagraphs to clarify and/or delve into particular aspects.

Example of organisation of a chapter

X Chapter heading (e.g. “3 Description and Technical Information”)

X.X Title of the paragraph (e.g. “3.3 General Description”)

X.X.X Subtitle heading (e.g. “3.3.1 Main Components”)

Consult the summary at the beginning of the Manual to easily find the topics of interest.

An icon (for example ) may appear in some paragraphs to indicate the professional figure authorised to carry out the procedure/intervention described.

In some cases a number may appear next to the icon (for example, 1).

The number indicates the quantity of operators/technicians required to carry out the procedure/intervention correctly and safely.

For information on the professional figures associated with the icons and their related tasks, see 1.7 - Personnel qualification.

The following symbols have been used to highlight particularly important information or warnings.

DANGER

The symbol indicates seriously hazardous situations which, if not avoided, could result in serious personal injury or death.

WARNING

The symbol indicates potentially dangerous situations which, if not avoided, could result in serious personal injury.

ATTENTION

The symbol indicates potentially dangerous situations which, if not avoided, could result in moderately serious injuries or damage to machinery.

NOTICE

The symbol indicates particularly relevant technical information.

SAFETY INSTRUCTIONS

The symbol indicates information of particular importance for safety purposes.

1.7 Personnel qualification

The personnel authorised to interact with the machine must possess the skills, knowledge and qualifications required in the specific sector of intervention.

Personnel must possess the psycho-physical requirements required to carry out their tasks, and must be aware of the risks associated with using the machine.

Personnel must only carry out the tasks within their competence, in compliance with current laws regarding safety in the workplace.

OPERATOR:

Personnel appropriately trained in and instructed on the use of the machine.

The operator can use the machine and perform simple adjustments.

The operator IS NOT QUALIFIED to carry out maintenance interventions.

HANDLING OPERATIONS TECHNICIAN:

Appropriately trained and prepared personnel, authorised to transport and handle the machine with the use of compliant vehicles of adequate capacity.

INSTALLER:

Technician having the knowledge, experience and qualification required to carry out the interventions.

MECHANICAL MAINTENANCE TECHNICIAN:

Technician having the knowledge, experience and qualification required to carry out interventions on parts and/or mechanics.

The Mechanical Maintenance Technician can operate the machine as operator.

The Mechanical Maintenance Technician IS NOT QUALIFIED to carry out work on electrical components/systems.

MAINTENANCE ELECTRICIAN:

Technician with the knowledge, experience and qualification required to carry out interventions on electrical components/systems.

The Maintenance Electrician can operate the machine like as operator.

The Mechanical Maintenance Technician IS NOT QUALIFIED to carry out interventions on parts and/or mechanics.

MANUFACTURER'S SPECIALISED TECHNICIAN:

Technician appropriately trained and prepared at the Manufacturer's training centres who can:

- Evaluate the type of work assigned, and recognise possible related risks
- Assess the dangers associated with incorrect and negligent behaviour

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1.8 Glossary

The words used are those of current technical language and, where it is deemed necessary, their meaning is provided below:

WORD	MEANING
Generator unit	Together formed by an internal combustion piston engine and an alternating current generator to create a self-producing electricity plant.
User plant	System consisting of the power supply circuits of the equipment used, including the switching, interruption, protection and sectioning equipment.
Category I electrical system	AC alternating current electrical system with nominal voltage greater than50 V and less than or equal to 1000 V.
Load	The set of numerical values of electrical and mechanical quantities that characterise the demands imposed on a rotating machine by an electrical circuit or a mechanical device, at a given instant.
Thermal switch	General sectioning and general interruption device consisting of a switch with automatic opening due to thermal effect.
Differential switch	General sectioning and general interruption device consisting of a switch with automatic opening by differential effect.
Supplier	Entity (e.g., manufacturer, agent, installer) that provides the equipment or services associated with the machine.
Adjustment	Control action whereby an output variable of the controlled system (regulated variable) is influenced by an input variable of the regulating system to achieve a specific purpose.
Manual adjustment	Adjustment in which the alteration of the manipulated variable is produced by man with manual intervention.
Automatic adjustment	Adjustment in which the alteration of the manipulated variable is produced by a regulating device (automatic regulator) without human intervention.
Danger	Source of possible harm or damage to the health of people or animals.
Protection	Guard or protective device as a safety measure to protect people from a present or latent danger.
Casing	Part intended to ensure the protection of the machine against specific external influences.
Poorly maintained connection	The active parts are not completely covered with an insulation that can only be removed by destruction, the connections present an uncertainty in the connection caused by a labile tightening of the parts and by a development of oxide between the parts.

WORD	MEANING
Direct contact	Contact of people or animals with active parts.
Control circuit	Circuit used to control the operation of the machine.
Equipment	General term covering materials, devices, appliances, accessories and the like used in conjunction with an electrical installation.
Customer	The person who purchases and installs the machine. The Customer (employer) is responsible for the correct use and safety of all personnel authorised to interact with the machine.
Personal Protective Equipment (PPE)	Devices designed and manufactured to be worn or held by a person to protect against one or more risks to their health or safety. ***Definition pursuant to Regulation 2016/425/EU***
Human-machine interaction	Any situation (use, maintenance, etc.) in which authorised personnel find themselves interacting with the machine during its expected life.
Machine	Assembly equipped or intended to be equipped with a drive system other than direct human or animal power, composed of parts or components, at least one of which is mobile and solidly connected to each other for a specific application. ***Definition pursuant to Machinery Directive 2006/42/EC***
Exposed person	Any person who is wholly or partly in a dangerous area. ***Definition pursuant to Machinery Directive 2006/42/EC***
Residual risk	Risk which could not be eliminated or reduced sufficiently through design, and which cannot be completely avoided by integrated protective measures.
Improper use	Use of the machine for purposes and/or in ways other than those envisaged by the Manufacturer.
Intended use	Use in accordance with the information provided in the instructions for use. ***Definition pursuant to Machinery Directive 2006/42/EC***
Reasonably foreseeable misuse	Use other than the one indicated in the instructions for use, but which may result from easily foreseeable human behaviour. ***Definition pursuant to Machinery Directive 2006/42/EC***
Dangerous area	Any area inside and/or near a machine, in which the presence of a person constitutes a risk to the safety and health of that person. ***Definition pursuant to Machinery Directive 2006/42/EC***

1.9 Unit of measurement

The units of measurement adopted refer to the conventions of the INTERNATIONAL SYSTEM OF UNITS OF MEASUREMENT (SI).

The main units of measurement reported in this document are listed below.

Unit of measurement	DESCRIPTION
A	amperes
V	volt
AC	alternating current
CC	constant current
3F + N	3 phases plus neutral
Ah	amp / hour
Hz	hertz
HP	horsepower (1HO = 0.736 kW)
cos φ	power factor
kW	kilowatts
kWm	engine kilowatts
kVA	Kilo-volt-amperes
kg	kilogrammes
l	litres
l/h	litres / hour
mm	millimetres
m	meters
s	seconds
°C	Celsius degrees
LwA	sound power level
Lp	sound pressure
dB(A)	decibels

1.10 Assistance service

For any need (request for spare parts, malfunctions, etc.), contact an authorised retailer/workshop of the Manufacturer.

Always provide the following data:

- Machine model and serial number
- Year of manufacture
- Purchase date
- Operating hours
- Nature of the problem or defect encountered (for example, if they are problems of an electrical or mechanical nature, related to workmanship, etc.)

WARNING

Only the Manufacturer's technical staff or personnel authorised by the Manufacturer have the skills and knowledge necessary to intervene precisely and promptly.

For more information refer to:

www.masegenerators.com

2 SAFETY

2.1 General safety warnings

- Make this Manual available to all personnel authorised to interact with the machine throughout its expected life.
- Read the contents of the Manual carefully before using and/or carrying out any work on the machine.
- Pay attention to the safety warnings and residual risks.

  Compliance with the instructions provided ensures the safety of humans, machines and the environment.
- Comply with and rigorously apply the indications and procedures described in the Manual.
- Comply with the workplace safety regulations in force in the area in which the machine is installed and used.
- Do not remove, tamper with or bypass safety devices and protections for any reason.
- Do not modify the machine in any way to obtain performances other than those expected and authorised by the Manufacturer.
- Comply with the warnings on the safety plates applied to the machine.
- Keep the safety labels clean and perfectly legible.
- Replace the damaged plates and reposition them in the same place of origin.
- Wear the personal protective equipment required by current laws regarding safety in the workplace.
- Install and use the machine only in environments with adequate characteristics (adequate ventilation, absence of heat sources, etc.).
- Do not smoke and/or use open flames (or tools that produce sparks) in work areas or near flammable materials.

2.2 Safety warnings on noise

As required by current laws, it is the responsibility of the customer (employer) to carry out the noise risk assessment to evaluate the exposure level of all staff.

The assessment serves to identify the type of personnel exposed to risk and define the necessary prevention and protection measures.

In particular, the evaluation must take into account the factors listed.

- Noise sources and their relative importance
- Exposure times
- Exposure limit values
- Amount of noise (direct and/or reflected)
- Noise transmitted by structures and not by air
- Interaction between noise emitted by different sources (machines, equipment, warning devices, etc.)
- Availability of hearing protection devices

⚠ WARNING

If the noise values exceed the maximum permitted levels, it is the customer's responsibility to:

- **Make compliant hearing protection devices available to personnel at risk**

Check the correct use of protective devices by staff

2.3 Safety warnings for use and operation

- Entrust the use of the machine only to qualified, appropriately trained and prepared personnel.
- Use the machine only in the presence of suitable psycho-physical conditions.
  Unsuitable psycho-physical conditions can cause damage (even serious) to things or people.
- Do not take substances (drugs, alcohol, etc.) that can alter or limit normal psycho-physical conditions.
- Do not use the machine without performing the required maintenance operations.
- Simulate some test manoeuvers to identify the controls and become familiar with the machine's functions.
- Stop the machine immediately in the event of failures or operating anomalies.
- Do not use and/or continue to use the machine in the presence of malfunctions or operating anomalies.
- Immediately report any operating anomalies or malfunctions.
- Immediately report any anomalies to the devices and safety systems installed.
- Use the machine only with protections and safety devices intact, correctly installed and efficient.
- Do not adopt behaviours and/or operating methods that may compromise the level of safety.
- Use the machine only for the uses intended by the manufacturer.
- Do not place your hands or other body parts near moving parts or live elements.
- Do not climb on the machine or use parts or components to improvise temporary platforms or walkways.
- Do not use parts or components not specifically designed for this purpose (cables, flexible hoses, etc.) as gripping or holding points.
- Wear personal protective equipment appropriate to the type of activity to be carried out.
- Always wear appropriate clothing that complies with the provisions of workplace safety regulations.
- Do not wear clothing or accessories (bracelets, watches, etc.) that could get caught in moving parts or elements.

2.4 Safety warnings for maintenance

- Entrust maintenance only to qualified and authorised technical personnel.
- Perform any interventions with the machine stopped and cut off from power sources.
- Deactivate the upstream electrical power supply in case of interventions inside the machine.
- Wear personal protective equipment appropriate to the type of activity to be carried out.
- Inform all operating personnel before starting any intervention.
- Mark and delimit the intervention areas to avoid access by unauthorised personnel.
- Apply the appropriate signage to indicate “Maintenance in progress”.
- Keep the intervention areas accessible and free from obstacles (tools, materials, etc.).
- Adequately lock all components that could move suddenly and dangerously while performing the work.
- Dismantle all components that cannot be securely locked.
- Replace worn or damaged components only with original spare parts.

  The use of non-original spare parts can alter the functional performance and safety level of the machine.
- Do not lubricate moving parts with the exception of those expressly indicated.
- Use only recommended lubricants (oils, greases).
- Do not mix lubricants of different brands and/or characteristics.
- Do not disperse fluids or polluting materials into the environment.
- Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.
- Entrust the disposal of fluids and polluting materials (spent lubricants, batteries, etc.) to specialised and authorised centres.
- Refer to the specific documentation of the products used (oils, lubricants, etc.) for information on how to use, store and dispose of them.
- Use compliant containers of adequate capacity to flush out fluids from the machine (lubricant, engine oil, etc.) during replacement/change operations.
- Store the containers with the fluids to be disposed of in a protected place, away from the elements and the risk of fire and/or explosion.

2.5 Staff training

The operator authorised to interact with the machine must be adequately trained and prepared.
Education and training are essential to transfer the knowledge, skills and abilities necessary to:

- Use the machine correctly and in safe conditions.
- Check whether the conditions exist to be able to operate safely and without risks.
- Follow the provisions and procedures set out in the emergency and evacuation plan.
- Correctly and safely carry out the interventions within your responsibility.

The operator must carefully read the Use and Maintenance Manual to obtain all the necessary information.
In particular, the operator must:

- Know the location, function and use of all controls
- Know the location, function and use of all safety devices
- Know the functions and characteristics of the machine
- Know and be able to carry out the procedures and safety measures necessary to reduce risks during the human-machine interaction.
- Know and be able to follow the procedures to use the machine correctly and in safe conditions.

2.6 Personal Protective Equipment (PPE)

- Wear the personal protective equipment required by current laws regarding safety in the workplace.
- Do not wear clothing or accessories (bracelets, watches, etc.) that could get caught in moving parts or elements.
- Store personal protective equipment appropriately.
- Report any anomalies and/or problems regarding the state of conservation and efficiency of the protection devices.

⚠ WARNING

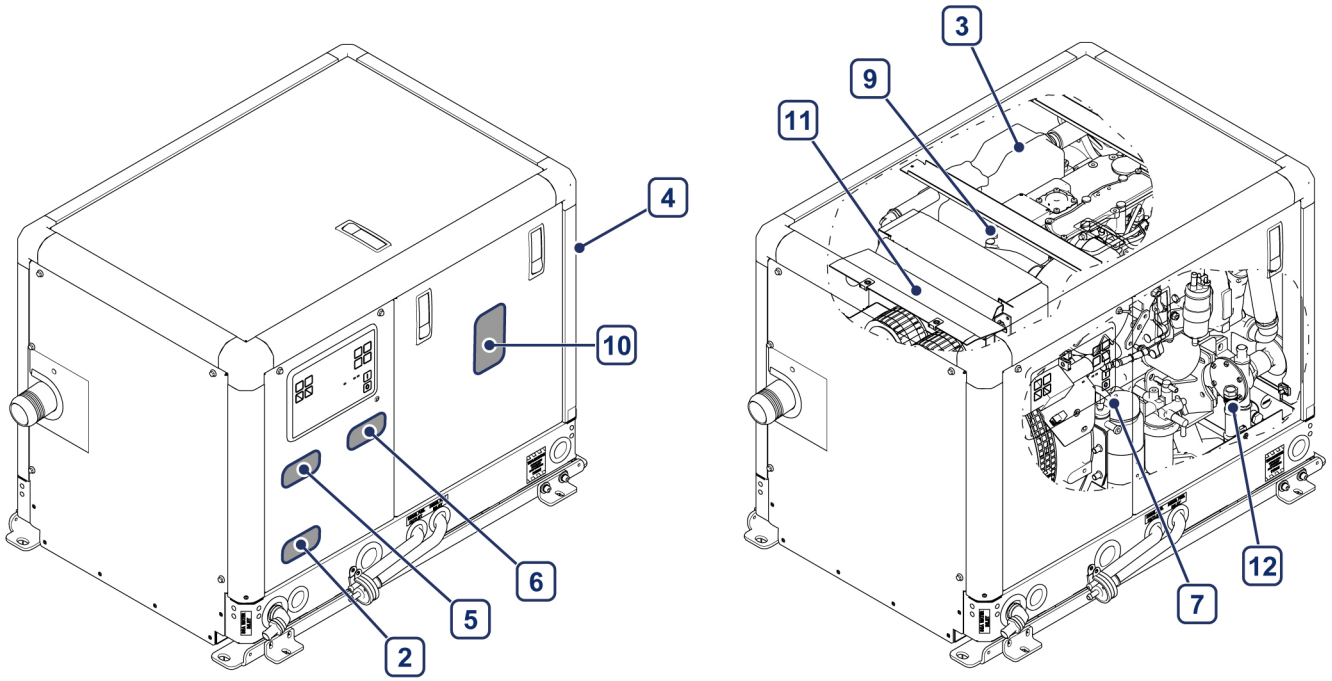
Use only compliant, intact and efficient personal protective equipment.

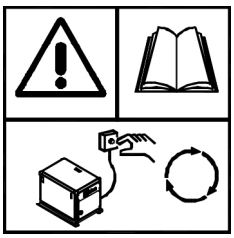
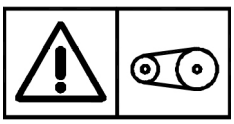
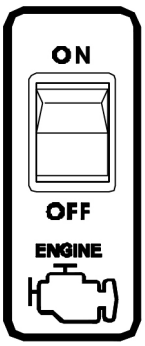
PPE	DESCRIPTION
	Requirement to wear gloves. Use compliant devices to protect the upper limbs against: • Mechanical risks (perforation, cutting, etc.) • Risk of contact with physical agents (radiation, heat, etc.) • Risk of contact with hazardous substances (lubricants, acids, etc.)
	Requirement to use safety footwear. • Use compliant devices to protect the lower limbs against: • Mechanical risks (perforation, cutting, etc.) • Risk of contact with physical agents (radiation, heat, etc.) • Risk of contact with hazardous substances (lubricants, acids, etc.)
	Requirement to wear protective clothing. Use compliant devices to protect the body against: • Risk of entanglement • Risk of contact with physical agents (heat, electrostatic charges, etc.) • Risk of contact with hazardous substances (lubricants, acids, etc.)
	Requirement to wear safety goggles. Use compliant devices to protect the eyes against: • Mechanical risks (dust, splinters etc.) • Risk of contact with physical agents (cold, heat, etc.) • Risk of contact with dangerous substances (vapours, fumes etc.)
	Requirement to wear hearing protection. Use compliant devices to protect the hearing against: • Risk of exposure to noise
	Mandatory use of respiratory protection. Use compliant devices to protect the airways against: • Risk of inhalation of dangerous substances (organic vapours, particulates, etc.)

2.7 Safety pictographs on the machine

WARNING

Do not remove and/or tamper with the safety labels.
Comply with the warnings on the safety plates applied to the machine.
Keep the safety labels clean and perfectly legible.
Replace the damaged plates and reposition them in the same place of origin.



REF.	PICTOGRAPH	DESCRIPTION
1		Risk of electrocution
2		Danger related to the use of the machine The Manufacturer has implemented design solutions and integrated protection systems to minimise risks during human-machine interaction. However, residual risks linked to normal human-machine interaction may remain. Read the Use and Maintenance Manual before interacting with the machine. **DANGER** ***You can start the machine remotely.*** ***Always check that there are no people in the operating areas before starting the machine.***
3		Hot surface hazard Wait for the machine and all components that present a risk of burns to cool before carrying out any intervention.
4		Drive belt hazard Always stop operation before opening the guards.
5		Exhaust fumes contain carbon monoxide and other harmful substances. Do not use the machine in closed and/or poorly ventilated environments. If installing and using the machine in closed environments, check the presence of good ventilation (natural or forced).
6		Position of the machine's main switch.

REF.	PICTOGRAPH	DESCRIPTION
7		Position of the engine lubricating oil level check rod.
8		Earth connection location.
9		Location of lifting points

2.8 Residual risks

The Manufacturer has implemented design solutions and integrated protection systems to minimise risks during human-machine interaction.

However, residual risks linked to normal human-machine interaction may remain.

WARNING

Read the Use and Maintenance Manual carefully before using it and/or performing any work on it.

Compliance with the instructions provided ensures the safety of humans, machines and the environment.

Wear the personal protective equipment required by current laws regarding safety in the workplace.

RISK OF IMPACT AND/OR DRAGGING BY MOVING PARTS

ROTATING PARTS

- Use the machine only with protections and safety devices intact, correctly installed and efficient.
- Wear the personal protective equipment required by current laws regarding safety in the workplace.

RISK OF ACCIDENTAL STARTING

ACCIDENTAL STARTING

You can start the machine remotely.

- Always check that there are no people in the operating areas before starting the machine.
- Always stop operation and isolate the machine from power sources before carrying out any intervention (repairs, maintenance, etc.).

RISK OF INHALING EXHAUST GAS

CARBON MONOXIDE

Carbon monoxide is an odourless, colourless, tasteless and non-irritating poisonous gas that can be inhaled until it reaches lethal concentrations in the body.

The gas is produced by incomplete combustion, in the presence of low oxygen content in the environment.

Inhaling the gas, even for a short time, can cause severe nausea, fainting, coma or death.

- Check the integrity, tightness and efficiency of the exhaust system.
- Only use the machine in the presence of a compliant and functioning carbon monoxide detector.
- Do not use the machine in closed and/or poorly ventilated environments.
- Pay attention when using the machine in calm seas (boat moored or anchored), as gases tend to accumulate.
- Moor the boat so that the exhaust gases escape from the side protected from the wind when using the machine near the dock.
- Always consider and evaluate the presence of other people within the range of exhaust gas emissions.
- Take all necessary measures to avoid directing exhaust gases towards other vessels, buildings or people.

RISK OF BURN/SCALE

HOT ENGINES AND EXHAUST SYSTEMS

- Wait for the machine and all components that present a risk of burns to cool before carrying out any intervention.

EXHAUST SYSTEM MAINTENANCE

- Wait for the engine and exhaust system to cool before carrying out any work.

HOT LIQUID AND STEAM

- Stop the machine and wait for it to cool before removing the fuel tank cap.
- Loosen the tank cap to release any residual pressure.
- Wear the personal protective equipment required by current laws regarding safety in the workplace.

RISK OF FIRE AND/OR EXPLOSION

PREVENTION FROM FIRE AND EXPLOSION

- Install and use the machine only in environments with adequate characteristics (adequate ventilation, absence of heat sources, etc.).
- Only start the machine with the start switch, with no loads applied.
- Stop the machine before refueling.
- Use only suitable fuel.
- Check for the presence of good ventilation (natural or forced) to avoid dangerous concentrations of gases or vapours.
- Do not smoke or use open flames when refueling.
- Do not bring liquids and/or flammable materials near the machine while refueling.
- Do not spill or place liquids and/or flammable materials near hot surfaces.
- Clean the surfaces and/or surrounding areas perfectly from any spills.
- Check for fuel and oil leaks.
- Do not smoke and do not bring open flames near the battery.
- Never place metallic objects between the terminals to check the battery charge level.
- Do not charge the battery if it is very cold, hot or damaged.

RISK OF LEAKAGE OF HIGH PRESSURE FLUIDS

FUEL LEAK

- Avoid direct contact with the fuel.
- Periodically check the integrity and efficiency of all pipes.
- In the event of contact and/or perforation from a high pressure fuel leak, take the required emergency measures.
- Wear the personal protective equipment required by current laws regarding safety in the workplace.

DIRT FROM THE AIR INTAKE

- Avoid direct contact with dust and fragments from the air intake.
- Wear the personal protective equipment required by current laws regarding safety in the workplace.

RISK OF ELECTROCUTION

MOVING ROTOR

- Use the machine only with the protections and electrical safety devices intact and closed correctly.

ELECTRICAL GROUNDING EQUIPMENT

- Check the conformity of the electrical system and all electrical connections (earthing, diverter switch, etc.).
- Entrust the execution of work on the system and electrical components only to qualified and authorised technicians.
- Cut off the machine from power sources before carrying out any work.

DISCONNECTION OF THE ELECTRICAL LOAD

- Disconnect the machine from the electrical load.

A high voltage transferred to the load could cause serious damage to people and the machine.

- Do not use the circuit breaker in place of the line circuit breaker.

BATTERY RISK

BATTERY SHORT CIRCUITS

- Always disconnect the battery before carrying out any type of intervention.

Always remove the negative (-) terminal clamp first.

After completing the work, always reconnect the positive pole terminal (+) first.

- .Use only compliant and specific tools and instruments
- Wear the personal protective equipment required by current laws regarding safety in the workplace.

ADEQUATE VENTILATION IN THE BATTERY AREA

- Do not smoke and do not bring open flames near the battery.
- Check for the presence of good ventilation (natural or forced) to avoid dangerous concentrations of gases or vapours.

RISK OF IRRITATION AND INJURY

BATTERY ELECTROLYTE FLUID

Battery electrolyte is a very corrosive acid that can cause serious personal injury.

- Avoid contact with the battery electrolyte liquid.
- Do not turn the battery upside down or tilt it to avoid the risk of electrolyte leakage.
- Wear the personal protective equipment required by current laws regarding safety in the workplace.
- In case of contact with battery fluids, take the required emergency measures.

CONTACT WITH LUBRICANT LIQUIDS

- Avoid contact with oils and lubricating liquids.
- Comply with the methods of use and the instructions provided in the specific product documentation.
- In case of contact with oils and lubricating liquids, take the appropriate measures.

RISK OF EXPOSURE TO NOISE

RISK DUE TO NOISE

The machine is not a source of particular acoustic disturbance (sound pressure lower than 80 dB(A)).

Noise phenomena with values higher than 80 dB(A) may occur in the case of:

- Using the machine in environments with other sources of noise
- Exposure for a prolonged period of time to the noise produced by the machine with open casings

WARNING

In case of exposure to noise phenomena with values higher than 80 dB(A), always wear the appropriate personal protective equipment (earmuffs).

2.9 Safety devices

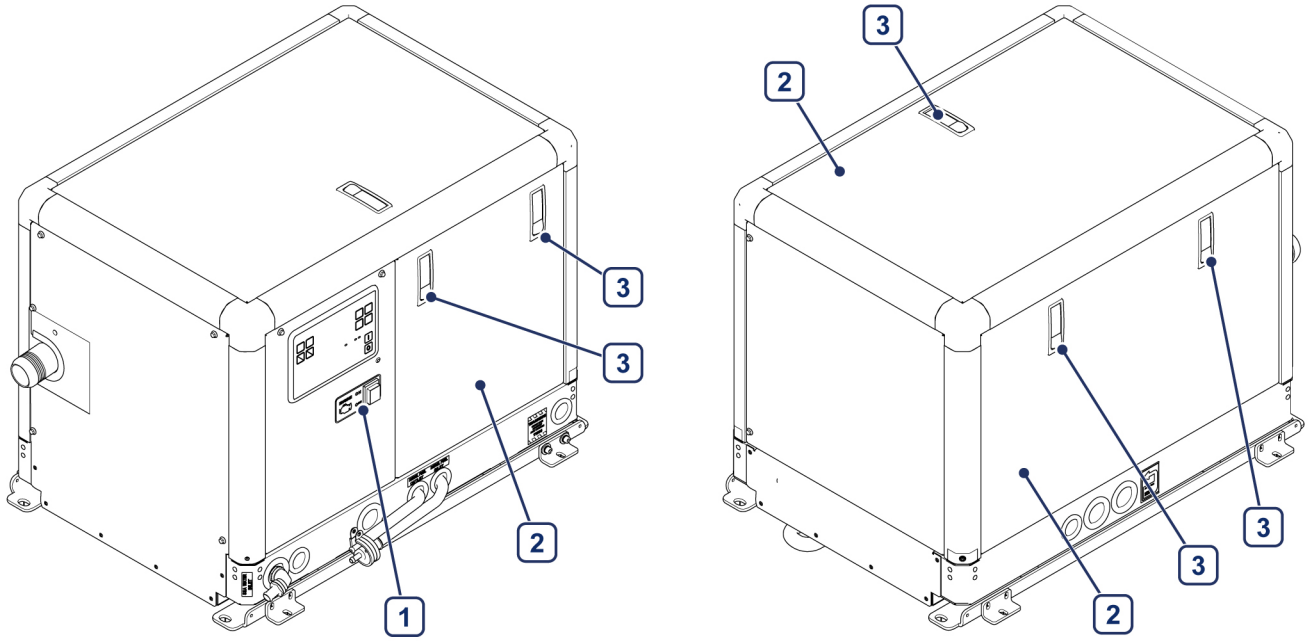
DANGER

Do not remove, tamper with or bypass safety devices and protections for any reason.
Do not use the machine with safety devices and protections that are not perfectly installed and efficient.

DANGER

Access to the internal parts of the machine (with consequent removal of the protective guards) is reserved only to the Manufacturer's technical staff or to the staff of the Authorised Assistance Centres.

1. **Emergency stop button**: used to immediately stop the machine's functions in the event of danger.
2. **Inspection doors**: they can be opened and are used to access the internal parts of the machine.
   Each door (2) is equipped with a specific opening handle (3).



2.10 Emergencies

- Predict and plan a safety and evacuation plan for emergency management.
- Train and inform all staff on safety measures and procedures/behaviours to adopt in case of danger.

FIRE

Stop the machine.

- Inform the Safety Manager immediately.
- Follow the provisions and procedures set out in the emergency and evacuation plan.

SPILLS OF FLUIDS AND/OR MATERIALS

- Stop or contain the release of the fluid/material at the source (if safe conditions allow).
- Avoid direct contact with the fluid/material.
- Eliminate all sources of ignition (e.g., electricity, sparks, etc.) if safety conditions allow.
- Use suitable absorbent material (sand, earth, etc.) to absorb any leaked fluid/material.
- Use devices with adequate characteristics to vacuum any absorbent material used.
- Use suitable containers to collect the absorbent material used.
- Dispose of the absorbent material used in compliance with current laws.

INGESTION

- Call for help.
- Show the product label or packaging.
- Report the amount of substance ingested and the time elapsed since ingestion.
- Do not perform self-care (e.g. induction of vomiting, administration of liquids, etc.) so as not to compromise and/or worsen the situation.

VAPOUR INHALATION

- Immediately leave the area and move to a well-ventilated place.
- Call for help.

ASPIRATION (INHALATION OF LIQUID)

Vomiting caused by ingestion of fuel may pose the risk of aspiration into the lungs resulting in strong local irritation.

- Call for help.

EYE CONTACT

Remove any contact lenses (if possible).

- Wash with plenty of clean water for a few minutes.
- Try to keep your eyelids open while washing.
- Call for help.

CONTACT WITH SKIN

- Wash with plenty of clean water for a few minutes.
- Remove contaminated clothing (if possible).
- Call for help.

WARNING

In the event of high pressure fluid projection and consequent contact, call for help immediately.

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3 DESCRIPTION AND TECHNICAL INFORMATION

3.1 Machine identification and CE marking

Each machine is equipped with an identification plate with the references and instructions essential for commissioning.

The identification plate is normally applied to the command and control panel of the machine.

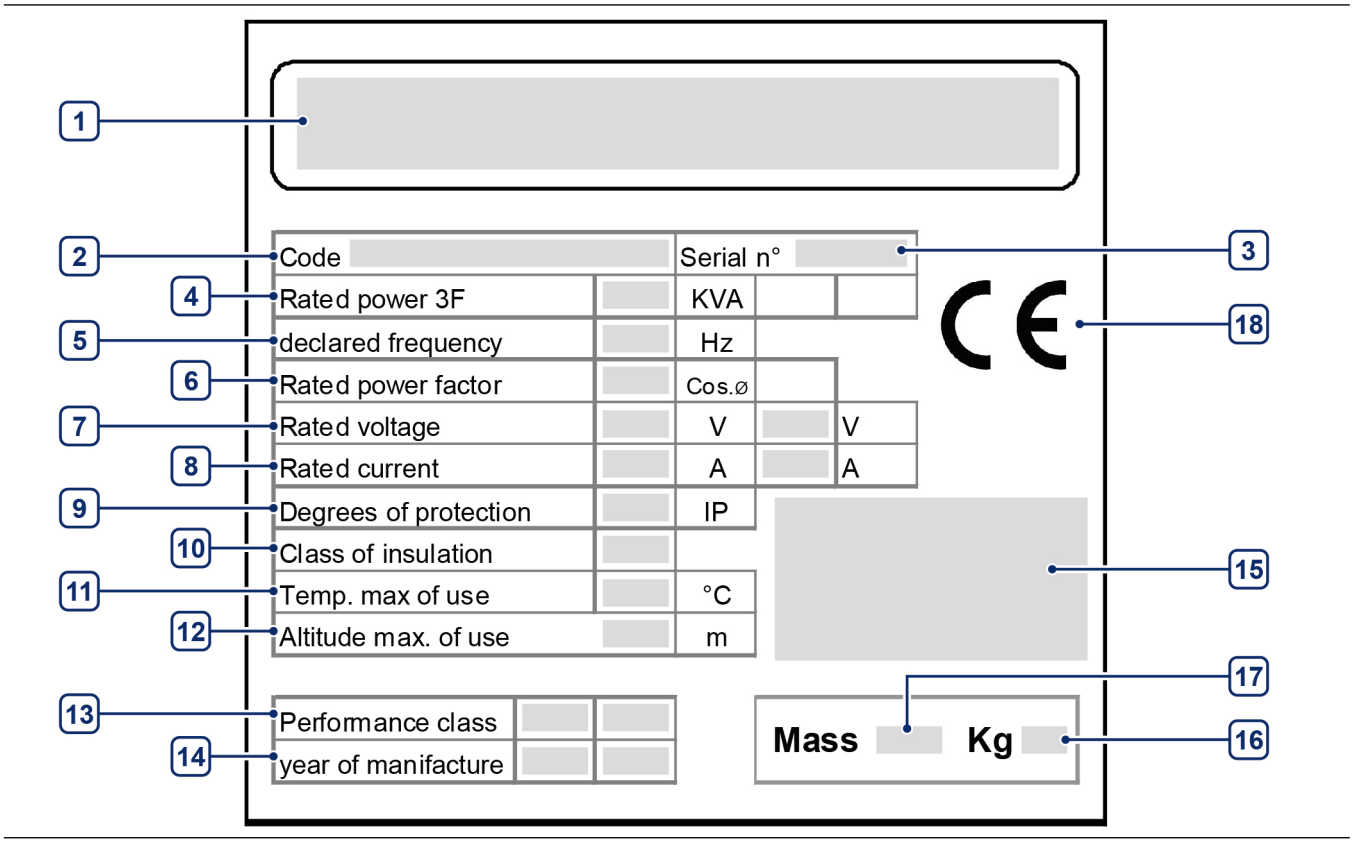
To find the location of the identification plate, see 3.3.1 - Main components.

WARNING

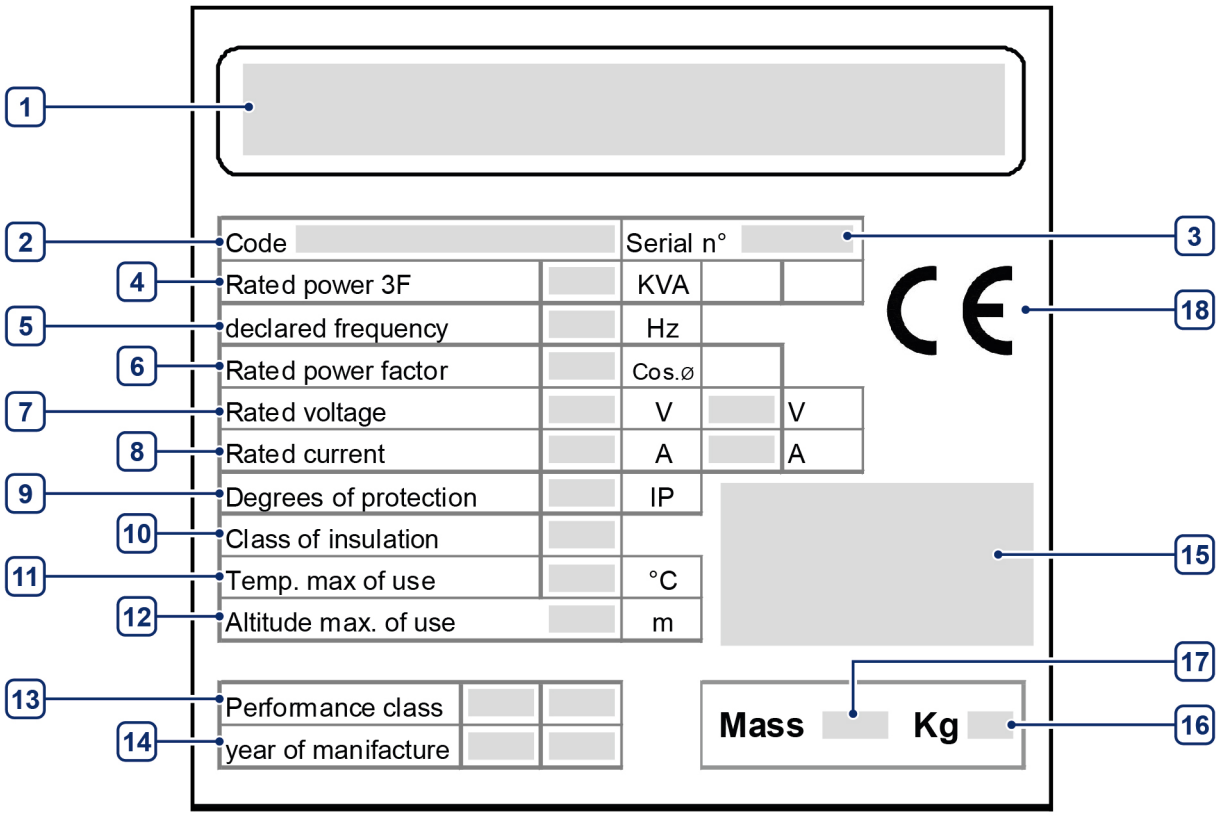
Do not remove and/or tamper with the identification plate.
If the plate is damaged and/or no longer legible, contact the Manufacturer's Assistance Service.

The figure represents an example of an identification plate.

1. Machine name
2. Machine code
3. Serial number
4. Constant power
5. Declared frequency
6. Power factor



7. Rated voltage
8. Rated current
9. Protection rating
10. Insulation class
11. Maximum operating temperature
12. Maximum usage altitude
13. Performance class
14. Year of manufacture
15. Manufacturer - Address
16. Weight
17. Mass
18. CE marking

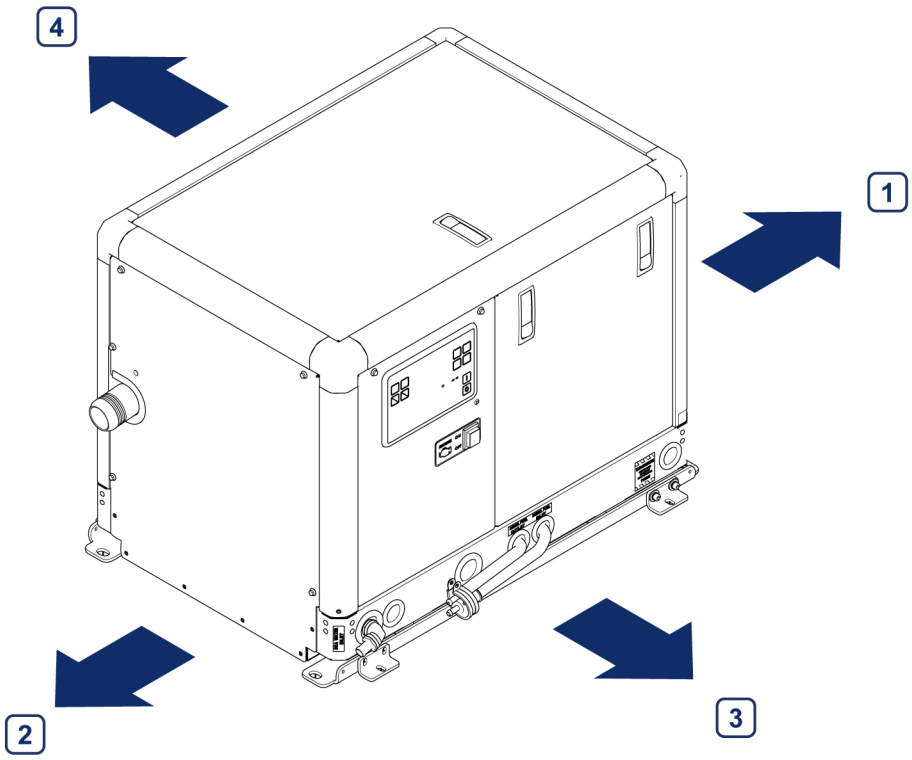


NOTICE

The position of the identification plate on the machine is indicated in the paragraph relating to the main components.

3.2 Machine orientation

The orientation of the machine is defined according to the position of the command and control panel (front area). The figure represents the machine with the indication of the various views.



1. RIGHT
2. LEFT
3. FRONT
4. BACK

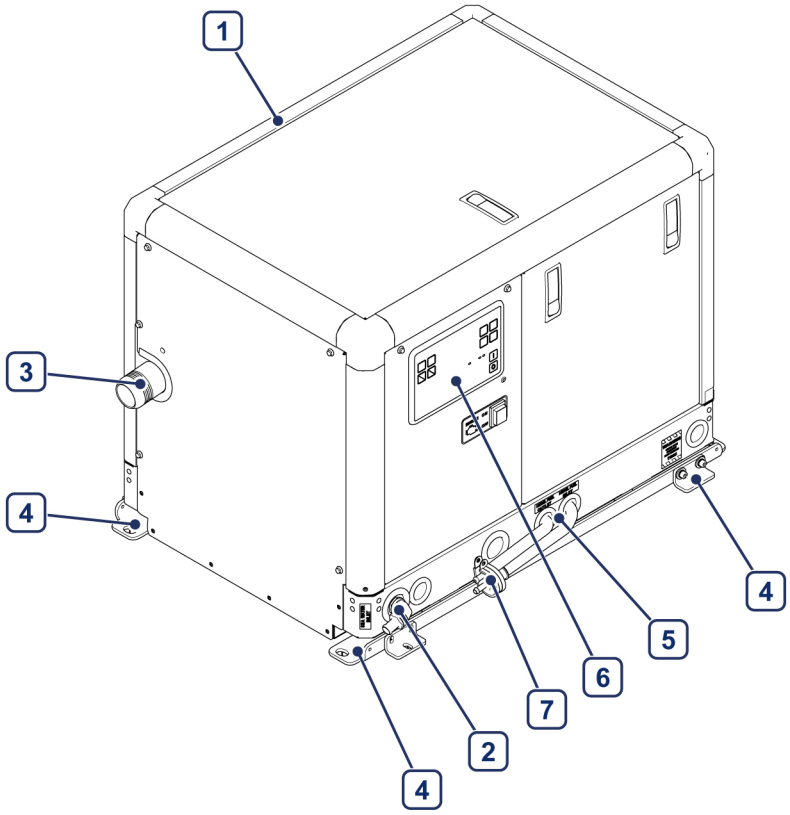
3.3 General description

The generator unit is a machine designed and built to produce electricity from thermal combustion energy.
The generator set mainly consists of a heat engine coupled to an electric generator.
For more information on the main components of the machine, see 3.3.1 - Main components.
This generator unit is of the “marine” type.

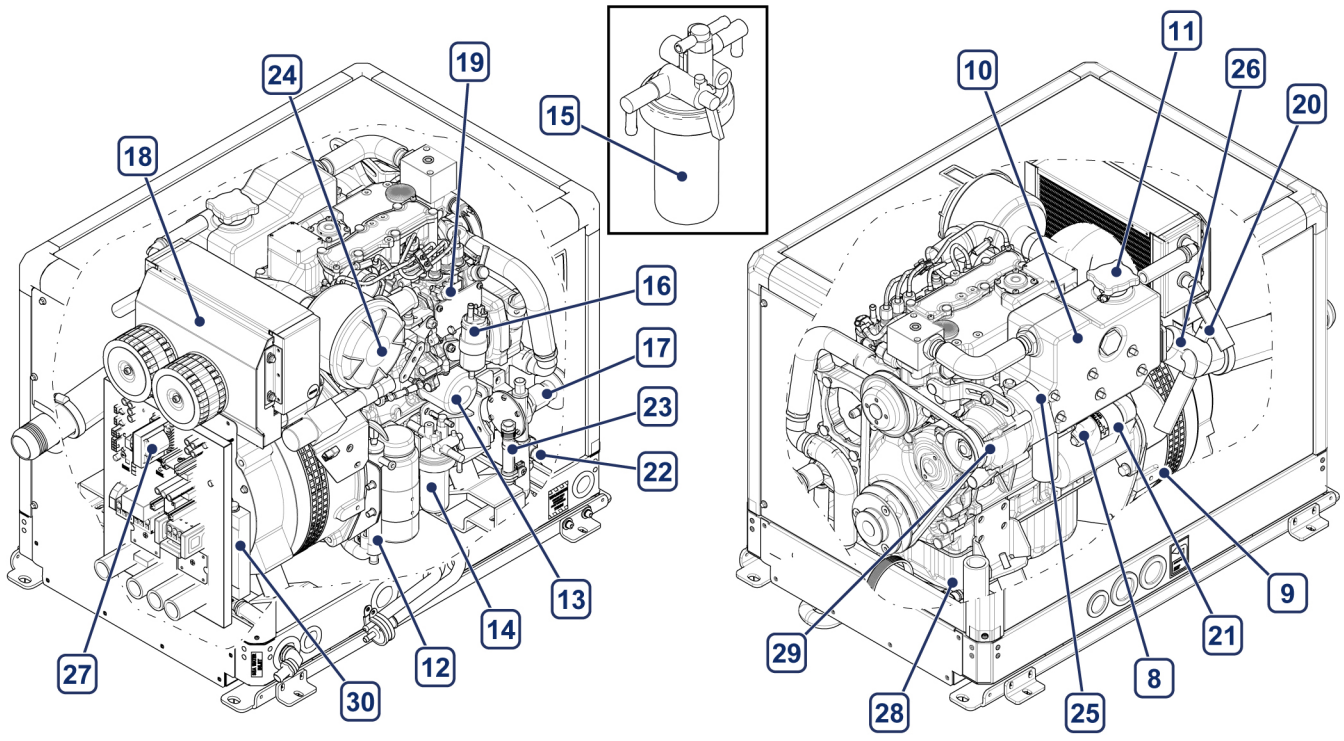
3.3.1 Main components

The machine comprises the following components:

1. Soundproof box
2. Sea water connection
3. Discharge of fumes and cooling water
4. Anchor brackets
5. Connection to the fuel tank
6. Command and control panel
7. Fuel filter (fuel pump)
8. Terminal (+) for connection to the battery
9. Terminal (-) for connection to the battery



10. Exhaust manifold
11. Lubricating oil filler caps
12. Manual pump for lubricating oil extraction
13. Lube oil filter
14. Fuel filter (engine)
15. Fuel filter (engine)
16. Fuel pump
17. Sea water pump
18. Water/air heat exchanger
19. Engine high temperature probe
20. Gas/water mixer high temperature probe
21. Starter motor
22. Water/water heat exchanger
23. Closed circuit
24. Engine air filter
25. Engine oil pressure switch
26. Exhaust mixer
27. Inverter
28. Electronic actuator speed regulator
29. Starter relay
30. Alternator DC charger



3.4 Technical features

3.4.1 Technical data VS 12.8 Y

	VS 12.8 Y
AC Alternator	Permanent magnets (PMG)
Cooling down	Air / Water (intercooler W/A)
Voltage	230 or 240 V
Frequency	50 or 60 Hz
Amps	54 or 52 A
Constant power	12.5 kW
Power factor	cos ø 1
Insulation class	H
Tension stabiliser	±1%
Frequency stability	±1%

Alternator characteristics

	VS 12.8 Y
Model	Yanmar 3TNM74F
Type	Diesel 4 stroke
Cylinders	3
Cylinders block material	Cast iron
Bore	74 mm - 2.9 in
Stroke	77 mm - 3 in
Cubic capacity	993 cc - 60.6 CID
Power	18.4 hp - 13.7 kWm
Revolutions/Minute	2150 - 3150
Compression ratio	23.5 : 1
Injection system	Indirect injection
Head material	Cast iron
Speed regulator	Electronic with actuator
Lubrication system	Forced
Oil sump capacity	2.9 l - 0.7 gl
Glycol capacity	4.5 l - 1.2 gl
Engine stop system	Solenoid valve
Fuel supply pump	Electric
Maximum fuel pump collection	700 mm - 27.5 in
Fuel consumption at full load	4.5 l - 1.2 gl
Starter battery	65 Ah - 12 V
Battery charger	40 Ah - 12 V
Starter motor	1.2 kW - 12 V
Maximum inclination of use	25 °
Sea water pump flow rate	22 l/min - 5.8 gl/min
Sea water inlet pipe diameter	16 mm - 5/8" in
Exhaust pipe diameter	50 mm - 2" in
Fuel delivery and return pipe diameter	8 mm - 5/16" in
Maximum width	737 mm - 29 in
Maximum depth	514 mm - 20.2 in
Maximum height	575 mm - 22.6 in
Dry weight	195 Kg - 430 lb
Noise	55 dBA a 7 m (23 ft)

Engine characteristics

3.4.2 Noise levels

Based on current laws on workplace safety, two types of operator can be defined as regards the risk of exposure to noise.

- Operator NOT EXPOSED

  The sound pressure value is always less than 80 dB(A) during the work cycle.
- Operator EXPOSED

  The sound pressure value is higher than 80 dB(A) even for only short periods during the work cycle.

The machine is not a source of particular acoustic disturbance (sound pressure lower than 80 dB(A)).

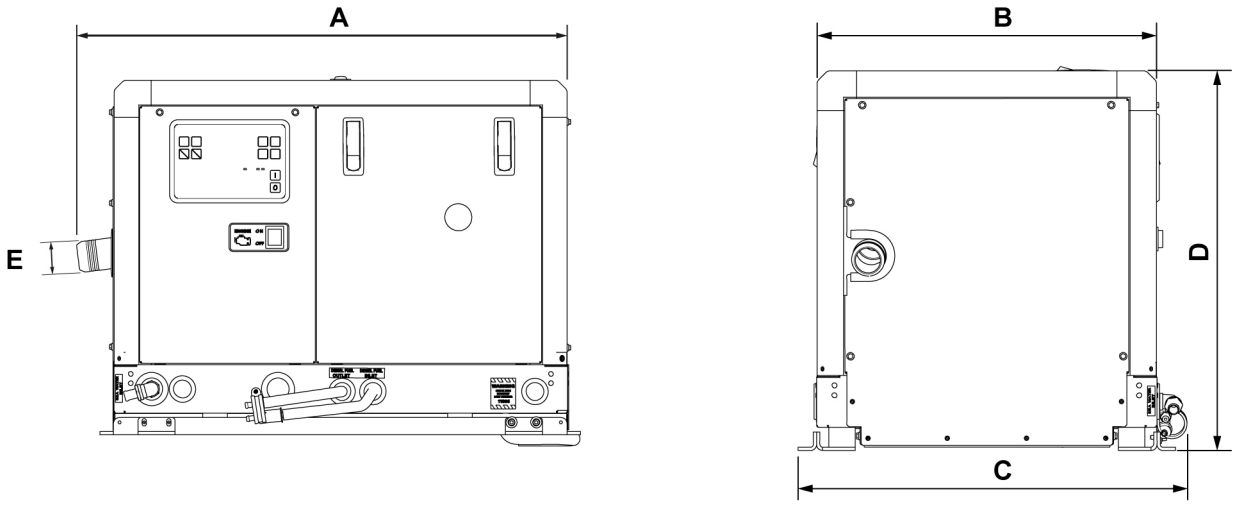
Noise phenomena with values higher than 80 dB(A) may occur in the case of:

- Using the machine in environments with other sources of noise
- Exposure for a prolonged period of time to the noise produced by the machine with open casings

⚠ WARNING

In case of exposure to noise phenomena with values higher than 80 dB(A), always wear the appropriate personal protective equipment (earmuffs).

3.4.3 Overall dimensions



Pos.	mm	in
A	737	29
B	514	20.2
C	515.5	20.3
D	575	22.6
E	Ø 50	Ø 2

3.5 Intended use

The machine has been designed to produce electrical energy starting from thermal combustion energy within the voltage and power limits declared by the Manufacturer.

Any use other than that indicated is to be considered incorrect and, therefore, forbidden.

To operate the combustion engine, only use automotive fuel compliant with ASTM A975 standards.

For the operation of the machine the presence of only one appropriately trained and prepared operator is required.

⚠ WARNING

Do not modify the machine in any way to obtain performances other than those expected and authorised by the Manufacturer.

Any modifications (technical, functional, etc.) must be agreed in advance and authorised by the Manufacturer.

All modifications must, in any case, be carried out only by the Manufacturer's technical personnel or by personnel from Authorised Assistance Centres.

The Manufacturer shall not be liable for damage to things or people resulting from non-compliance with these instructions.

⚠ ATTENTION

Limit idle and/or low load operation as much as possible.

Running idle or at reduced load for prolonged periods causes a less than optimal combustion process.

Fuel leaks may occur in the engine sump with the emission of white smoke which, in the long run, can reduce the lubrication effectiveness of the oil.

⚠ ATTENTION

Operate the machine for at least 1 hour every month with a load between 1/4 and 3/4.

Limit periods of inactivity (even short-term) of the machine as much as possible.

Running the machine regularly allows you to:

- ***Eliminate moisture***
- ***Keep the engine lubricated***
- ***Avoid fuel stagnation resulting in loss of effectiveness (stale fuel)***
- ***Prevent oxidation of electrical contacts***
- ***Increase engine life***
- ***Increase the reliability of the machine***

3.6 Improper or unauthorised use

DANGER

Use for purposes and/or in ways other than those envisaged can cause situations of serious danger to the safety and health of personnel interacting with the machine.

ATTENTION

The Manufacturer shall not be liable for damage to things or people due to improper or incorrect use of the machine.

The list contains a series of prohibitions relating to some possible reasonably foreseeable incorrect uses surmised on the basis of the experience honed.

- NEVER use the machine for purposes and/or in ways other than those intended.
- NEVER modify the machine to obtain performances other than those expected and authorized by the Manufacturer.
- NEVER entrust the use of the machine to personnel without the qualification, training and preparation necessary to operate correctly and safely.
- NEVER use the machine in environments with a potentially explosive atmosphere and/or risk of fire.
- NEVER use the machine without safety guards.
- NEVER remove, tamper with or bypass the safety devices for any reason.
- NEVER replace components with non-original spare parts not foreseen by the Manufacturer.
- NEVER place or store the machine near flammable materials.
- NEVER use the machine near flammable materials.
- NEVER use the machine outdoors or in environmental conditions other than those envisioned.
- NEVER use and/or carry out work on the machine under insufficient lighting and/or visibility conditions.
- NEVER use the machine without performing the required maintenance operations.
- NEVER carry out interventions (repairs, maintenance, etc.) without having stopped operation and cut off the machine from power sources.

3.7 Work area - danger zone

WORKING AREA (A)

Area in front of the machine where the operator authorised to operate the machine is expected to park.

Access to the area (A) with the machine running is only permitted to operate the controls.

DANGEROUS AREA (B)

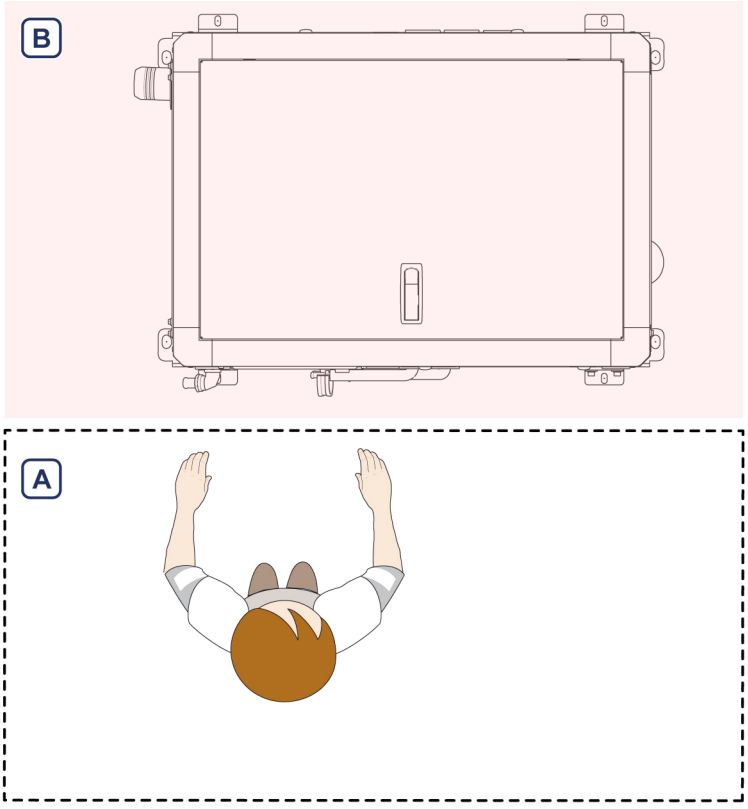
Area inside and/or near the machine where there are risk situations for the safety and health of people.

⚠ DANGER

Do not access and/or stay in the area (B) with the machine running.

Access to the area (B) is permitted only with operation stopped and with the machine isolated from the power sources.

Access to the area (B) is reserved for technicians authorised to carry out repair/maintenance interventions.



4 TRANSPORT AND HANDLING

4.1 General information

NOTICE
The warnings and procedures for transport and handling are provided in the Installation Manual included in the attachment. If such document is missing or if the document is damaged and no longer usable, contact the Manufacturer's Assistance Service.

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5 INSTALLATION

5.1 General information

NOTICE

The warnings and installation procedures are detailed in the Installation Manual provided in the attachment.

If such document is missing or if the document is damaged and no longer usable, contact the Manufacturer's Assistance Service.

If the machine is not installed immediately, arrange for storage.

For more information, refer to 11.1.1 - Short-term storage (machine boxed).

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6 COMMISSIONING

6.1 Preliminary checks

Before putting the machine into service after installation (first start-up), or after a long period of inactivity, perform the following activities and checks.

- Check compliance with the installation specifications and instructions provided by the Manufacturer.
- Check the integrity of the machine and its components.
- Check for any damaged or missing parts.
- Check the correct connection of all power lines.
- Check the integrity and efficiency of the electrical connections.
- Identify the position, function and use of the controls and all safety devices
- Check the integrity and efficiency of the safety devices and protections.
- Check the correct tightening of all the fixing and anchoring components of the machine.
- Check that all electrical utilities are deactivated in order to avoid the accidental starting of the machine under load.
- Check the correct connection of the machine to the earthing system.

SAFETY INSTRUCTIONS

The generator sets have a dedicated terminal for the earth connection.

The generator must have a dedicated earthing, which this must be connected to the porous mass that acts as earth, via a cable of suitable section.

The porous mass must be connected to the bonding of the vessel.

⚠ ATTENTION

Applying heavy loads to a new engine (running-in phase) reduces the life of the engine.

During the first 50 hours of engine operation, apply power reduced to 30% of the maximum indicated power.

Precaution is essential to allow good engine running-in.

6.2 PRE-operational check (daily)

Before starting the machine, perform the following tasks and checks.

- Check the integrity of the machine and its components.
- Check that there are no dents, cracks, fissures in the welds and structural components.
- Simulate some test manoeuvers to identify the controls and become familiar with the machine's functions.
- Check that there are no anomalies or defects in the machine.

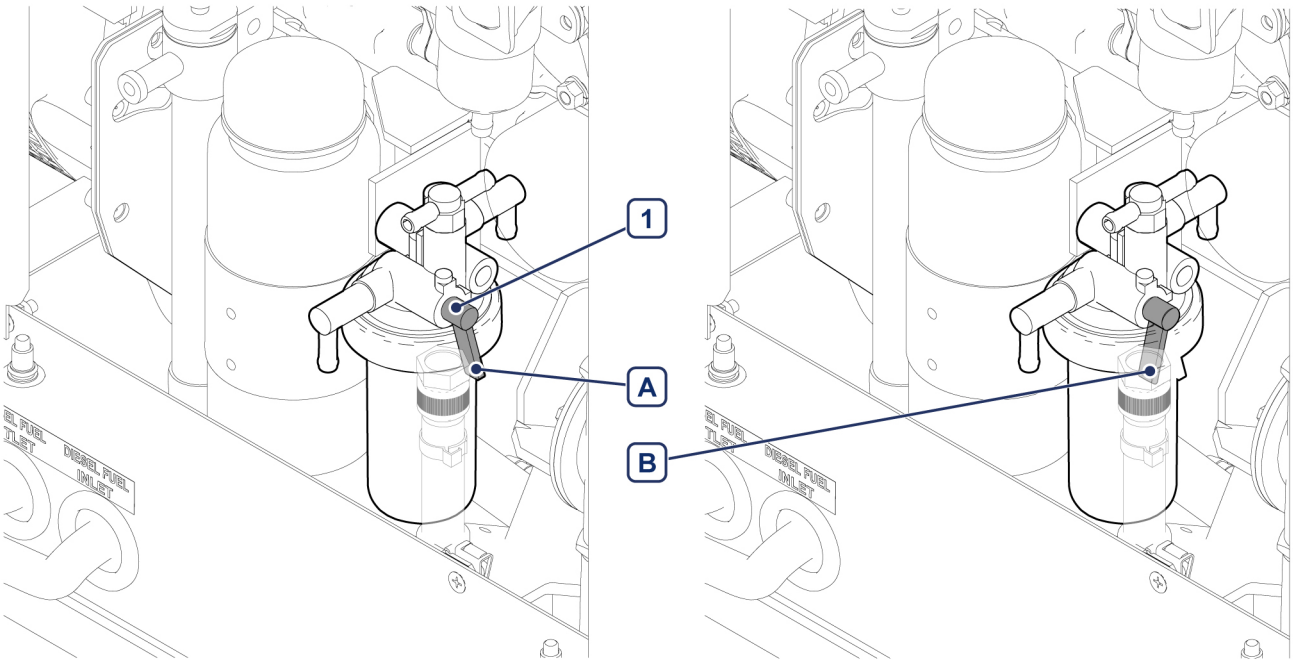
DANGER

Do not start the machine in case of anomalies or defects.

- Check that all switches are correctly positioned.
- Check that all required maintenance operations have been completed.
- Check for fluid and lubricant leaks.
- Check the legibility and correct positioning of the safety plates.
- Check that there are no objects and/or materials in the operational area and in the operator's transit areas.
- Check that there are no signals (alarms, lights on).

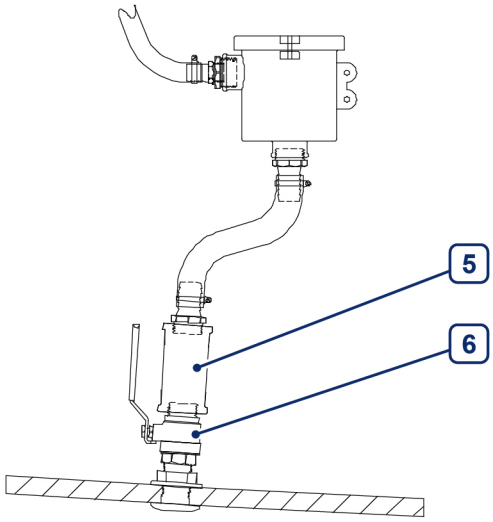
  If marked, perform the DPF filter regeneration operation.
- Check that the fuel tap lever (1) is in the OPEN position (A).

  The lever must not be in the CLOSED (B) position.



- Check that the filling/bleeding operations of the fuel supply system have been carried out.
- Check that the seacock (6) is open.
- If there is a non-return valve on the seacock (5), check that the circuit section from the pump to the valve is filled.

  Fill the circuit section manually.



6.3 Commands and tools

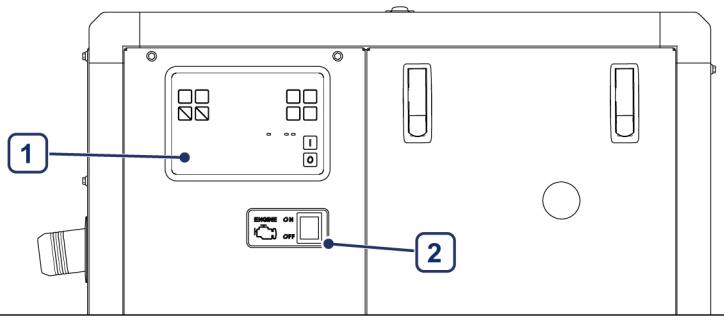
Each machine is equipped with an instrument panel with commands and control devices for operating the machine.
The instrument panel can be located on the machine or remotely.

NOTICE
All information on the instrument panel is detailed in the specific Manual provided in the attachment. If such document is missing or if the document is damaged and no longer usable, contact the Manufacturer's Assistance Service.

6.4 Commands aboard the machine

6.4.1 Control panel

1. Control logic (refer to the attached documentation)
2. Emergency switch



6.5 Operation

6.5.1 Machine start-up

NOTICE

In case of first start-up or in case of start-up after a period of inactivity, bleed the fuel system.
For more information, refer to 9.6.5 - Deaeration of the fuel system.

DANGER

Check that the emergency switch (2) is in the ON position.

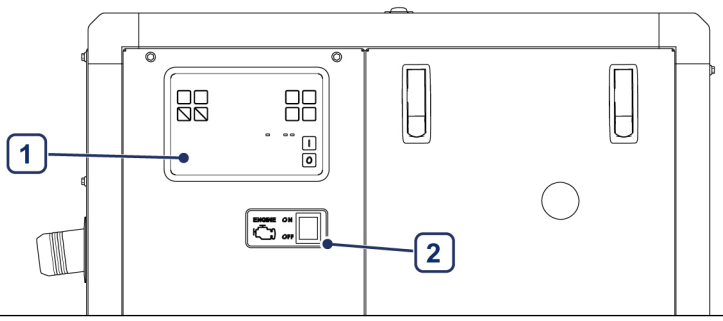
Manual mode

Proceed as indicated.

1. Press the start button on the instrument panel (1).
   The START procedure is activates and involves starting the fuel pump, the glow plug preheater and the engine in sequence.

ATTENTION

Start-ups are managed automatically by the control module.
The starting procedure is performed three times.
If the engine does not start, an alarm appears on the display.



NOTICE

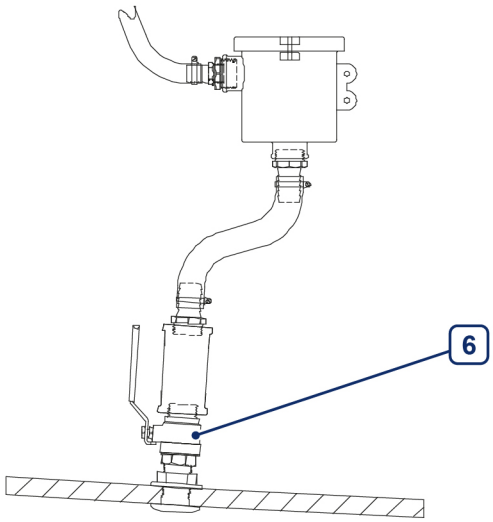
In case of first start-up it may be necessary to repeat the start-up procedure in order to eliminate any air residues from the fuel system.

⚠ ATTENTION

Repeated starting attempts can lead to excessive accumulation of water in the exhaust system, resulting in engine damage.

In the event of difficult starting, do not continue to insist but proceed as indicated.

- ***Close the seacock (6).***
- ***Start the machine.***
- ***Open the seacock (6).***

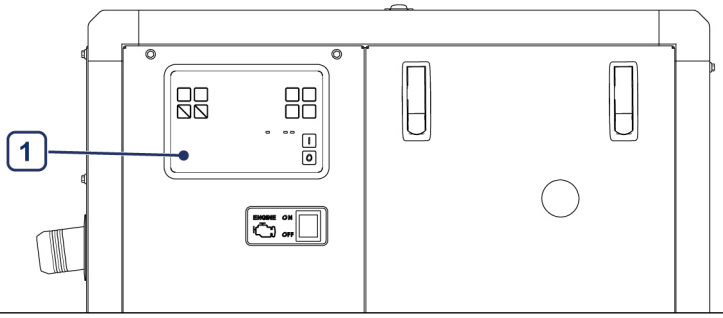


6.6 Machine stop

Proceed as indicated.

1. Disconnect the inserted loads.
2. Run the machine for a few minutes without drawing electricity.
   The operation serves to cool the engine gradually.

1. Press the stop button on the instrument panel (1).



6.7 Emergency stop

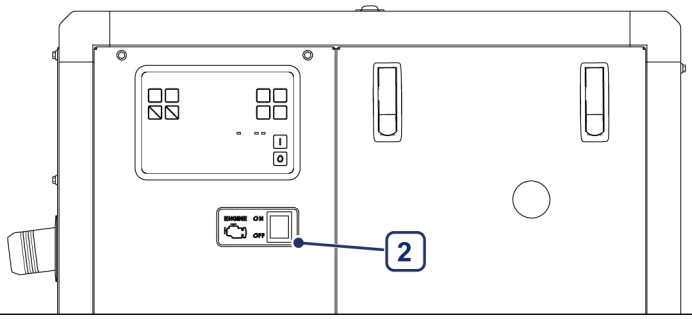
The machine is equipped with an emergency stop button (2) positioned as shown in the figure.
During installation, additional emergency stop buttons can be connected to the machine.
In case of imminent danger, implement one of the methods listed.

- Press the emergency stop button (2).
- Press one of the additional emergency stop buttons.

The machine stops immediately.

WARNING

Do not use the emergency stop button to stop normal machine operation.



6.7.1 Resumption of operation after emergency stop

To restore operating conditions after an emergency stop, proceed as indicated.

1. Identify and eliminate the causes that led to the arrest.
   If necessary, request the intervention of specialised technicians.
2. Adopt one of the methods listed depending on the emergency stop button pressed.
   Emergency stop button (2)
   Press the button to unlock it and return it to the ON condition.

   Additional emergency stop button
   Restore the button operation according to the intended methods.

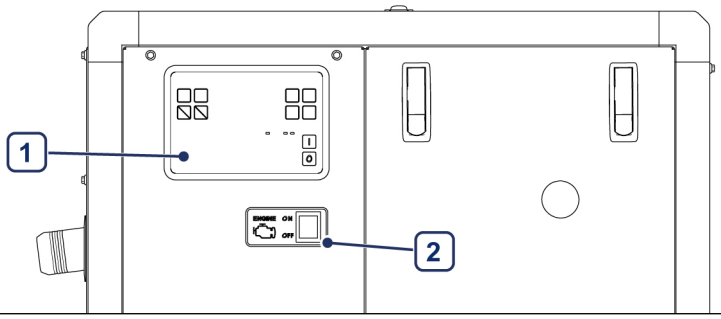
NOTICE

Unlocking/resetting the emergency stop button does not automatically restart operation but only authorises the restart.

3. Press the “RESET” button to reset any alarm signals that appear on the instrument panel display (1).
4. Start the machine.
   For more information, refer to 6.5.1 - Machine start-up.

NOTICE

All information on the instrument panel is detailed in the specific Manual provided in the attachment.



6.8 Machine insulation

DANGER

Accidental starting of the machine can cause serious damage or even death.

Before carrying out any type of work on the machine or connected equipment, cut off the machine from power sources to avoid accidental start-up.

Proceed as indicated.

1. Stop the machine.
   For more information, refer to 6.6 - Machine stop.

2. Press the emergency stop button (2).

NOTICE

Alternatively, you can press one of the additional emergency stop buttons that may be installed.

3. Disconnect the negative (-) battery terminal.
4. Disconnect the positive (+) battery terminal.
5. Apply the appropriate signage to indicate “Maintenance in progress”.
6. Wait for the machine and all its components to cool.

WARNING

When restoring the battery, reconnect the positive terminal (+) first.

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7 ADJUSTMENTS

7.1 General information

NOTICE

The machine does not require any particular adjustments to be made by the customer.

All adjustments and/or calibrations necessary for the correct functioning of the machine have been carried out in the factory by the Manufacturer.

ATTENTION

Changes to the factory calibrations set by the Manufacturer will void the warranty and may compromise the reliability and performance of the machine.

DANGER

In the case of adjustments and/or calibrations that require mechanical interventions, it is necessary to:

- ***Entrust maintenance only to qualified and authorised technical personnel.***
- ***Stop operation and cut off the machine from power sources.***
- ***Wait for the elements that present the risk of burns to cool.***

7.2 Automatic parallel operation between two groups (OPT)

NOTICE

Variable-speed gensets, when installed in pairs, have the possibility of parallel operation.

WARNING

The parallel function can only be activated if the groups are interconnected with the dialogue cable and connected on the same power distribution line.

For more information, refer to 12.1 - Accessories

The parallel function can only be activated if the groups are interconnected with the dialogue cable and connected on the same power distribution line.

WARNING

In case of low load, one of the two groups can be switched off.

Automatic start-up and shutdown management of parallel-connected groups is also available.

For more information, refer to 12.1 - Accessories

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8 MAINTENANCE TABLES

8.1 Maintenance tables

The table shows the scheduled maintenance.

The frequencies are expressed in hours of machine operation.

Icons legend:

● Ordinary maintenance ◈ First time maintenance ✱ Condition-based maintenance

Replacements	Maintenance frequency (in hours)													
	When necessary	Every 4 years	Before each use	50 hours	Every 200 hours	Every 400 hours	6 months	Every 1200 hours	12 months	2400 hours	3200 hours	24 months	36 months	48 months
Water/water exchanger replacement	●													
Coolant system emptying	●													
Filling of empty system with coolant	●													
Emptying the sea water cooling system	●													
Deaeration of the fuel system	●													
Battery replacement	●													
Check engine oil level			●											
Replacement of fresh and salt water pipes and clamps		●												
Replacing fuel lines and clamps		●												
General checks				●										
Check and replacement of sacrificial anodes				◈										
Cleaning the fuel/water separator filter				●										
Coolant level check and top off				◈	●		✱							
Sea water pump					●		✱							
General checks					●		✱							
Sea water pump filter cleaning					●		✱							

Replacements	Maintenance frequency (in hours)													
	When necessary	Every 4 years	Before each use	50 hours	Every 200 hours	Every 400 hours	6 months	Every 1200 hours	12 months	2400 hours	3200 hours	24 months	36 months	48 months
Replacement of sacrificial anodes					●		✱							
Check clamps and hoses					●		✱							
Anti-siphon valve check and clean					●		✱							
Anti-siphon valve check and clean					●		✱							
Sea water pump belt check					●		✱							
Engine oil replacement				◈	●		✱							
Air filter check and cleaning					●		✱							
Water drainage from the fuel filter					●		✱							
In-line fuel filter replacement					●		✱							
Checking fuel pipes				◈	●		✱							
Fuel pump pre-filter replacement					●		✱							
Alternator belt check					●		✱							
Machine electrical check					●		✱							
Efficiency check of emergency stop commands					●		✱							
Checking and resetting the battery electrolyte solution level					●		✱							
Exhaust system inspection					●		✱							

Replacements	Maintenance frequency (in hours)													
	When necessary	Every 4 years	Before each use	50 hours	Every 200 hours	Every 400 hours	6 months	Every 1200 hours	12 months	2400 hours	3200 hours	24 months	36 months	48 months
Water pump check						●			✱					
Sea water pump belt replacement						●			✱					
Engine oil filter replacement						●			✱					
Checking the functionality of thermal contacts						●			✱					
Air filter replacement						●			✱					
Fuel filter replacement						●			✱					
Cleaning the fuel filter cup						●			✱					
Fuel pump filter replacement						●			✱					
Fuel pump control						●			✱					
Alternator belt replacement						●			✱					
Coolant replacement								●				✱		
Check engine compression								●					✱	
Motor solenoid replacement								●					✱	
Valve control								●					✱	
Checking fuel injection nozzles								●					✱	
Fuel pump replacement								●					✱	

Replacements	Maintenance frequency (in hours)													
	When necessary	Every 4 years	Before each use	50 hours	Every 200 hours	Every 400 hours	6 months	Every 1200 hours	12 months	2400 hours	3200 hours	24 months	36 months	48 months
Replacement of water/air exchanger										●			✱	
Inspection and cleaning of water/water exchanger										●			✱	
Exhaust mixer replacement										●			✱	
Check clamps and hoses											●			✱
Cleaning and restoring valve seats											●			✱
Fuel injection pump control											●			✱
Fuel injection timer control											●			✱

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9 MAINTENANCE

9.1 Maintenance precautions

NOTICE

In addition to the recommendations listed, always refer to the warnings in the Chapter 2 - SAFETY.

- Read the Manual carefully before carrying out maintenance operations.
  If you do not understand the information and/or procedures, contact the Manufacturer before starting any work.
- Carry out only the interventions described in the Manual.

⚠ ATTENTION

If interventions not described in this Manual are necessary, contact an AuthoriSed Centre or the Manufacturer's Assistance Service.

- Perform maintenance according to the procedures detailed in the Manual.
- Wear personal protective equipment appropriate to the type of activity to be carried out.
- Entrust maintenance only to qualified and authorised technical personnel.

⚠ WARNING

Entrust maintenance work only to 1 TECHNICIAN.
For safety reasons, access to the intervention area is only allowed to one person.

- Mark and delimit the intervention areas to avoid access by unauthorised personnel.
- Apply the appropriate signage to indicate "Maintenance in progress".
- Perform any interventions with the machine stopped and cut off from power sources.
  For more information, refer to 6.8 - Machine insulation.
- Check that there is no voltage in the circuits, including the auxiliaries and additional services.
- Wait for the elements that present the risk of burns to cool.
- Do not disperse fluids or polluting materials into the environment.
- Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.
- Do not use aggressive cleaning products, petrol, solvents, acidic or abrasive substances.
- Use only non-flammable and non-toxic solvents.
- Do not direct jets of water onto electrical and electronic components.
- Do not spray acids or corrosive substances on the windings and/or electrical parts.
- Spray suitable deoxidising products on the electrical contacts.
- Do not climb on the machine or use parts or components to improvise temporary platforms or walkways.
- Comply with the required tightening torques.
- Comply with the cable numbering.
- Comply with the instructions detailed in the engine documentation provided in the attachment.
- Replace worn or damaged components only with original spare parts.
- Clean the area at the end of maintenance work and remove all the equipment used (rags, tools, etc.).
- Restore all safety devices and protections that may have been deactivated and/or removed.
- Reassemble all components that may have been removed for safety reasons or to access the intervention areas more easily.

9.2 Consumables

⚠ ATTENTION

Use the products (lubricants, coolants) recommended by the Manufacturer.

If it is not possible to find the recommended products on the market, use products with chemical-physical characteristics equal to those recommended.

SAFETY INSTRUCTIONS

RESPECT THE ENVIRONMENT

- *Do not disperse fluids or polluting materials into the environment.*
- *Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.*
- *Refer to the specific documentation of the products used (oils, lubricants, etc.) for information on how to use, store and dispose of them.*
- *Use compliant containers of adequate capacity to flush out fluids from the machine (lubricant, engine oil, etc.) during replacement/change operations.*
- *Store the containers with the fluids to be disposed of in a protected place, away from the elements and the risk of fire and/or explosion.*

SAFETY INSTRUCTIONS

RESPECT THE ENVIRONMENT

In the event of accidental leaks or spills of fluids (oil, fuel, etc.):

- *Use suitable absorbent material (sand, earth, etc.) to absorb any leaked fluid/material.*
- *Use devices with adequate characteristics to vacuum any absorbent material used.*
- *Use suitable containers to collect the absorbent material used.*
- *Dispose of the absorbent material used in compliance with current laws.*

⚠ ATTENTION

For more information on engine consumables, consult the specific documentation provided in the attachment.

For correct engine operation:

- ***Use only recommended lubricants (oils, greases).***
- ***Do not mix lubricants of different brands and/or characteristics.***

Failure to comply with these warnings will void the warranty.

9.2.1 Lubricating oil

The machine is delivered with the lubrication circuit filled to the optimal level with type SAE15W-40 oil.
Always use oil with API and SAE classification specific for the machine's operating environmental temperature.

Environmental temperature	International specifications
Over 25°C	10W-30 or 10W-40 or 15W-40
-10 up to 25°C	10W-30 or 10W-40 or 15W-40
Below -10°C	10W-30 or 10W-40

ATTENTION

For further information on engine oils, consult the specific documentation provided in the attachment.

9.2.2 Cooling liquid

The machine is delivered with coolant at the optimal level.
If it is necessary to top up the level, use blue antifreeze type G11 diluted by 50%.

9.3 Routine maintenance

ATTENTION

Carry out the scheduled maintenance operations foreseen by the Manufacturer.
Correct and regular maintenance allows you to preserve the functional performance and safety level of the machine over time.

9.3.1 General checks

Frequency	Machine Status
50 hours	Machine stopped with power supplies disconnected

Technical Category

1

PPE

Carry out the following checks:

- Check for possible liquid leakage
- Check correct tightening of the brackets
- Check the correct connection of seawater and refrigerant pipes
- Check the correct coolant level
- Check that there are no damaged parts
- Check that the bolts are tightened correctly
- Check that there is no dust inside the air line ducting

9.3.2 General checks

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category

PPE

Carry out the following checks:

- Check for possible liquid leakage
- Check correct tightening of the brackets
- Check the correct connection of seawater and refrigerant pipes
- Check the correct coolant level
- Check that there are no damaged parts
- Check that the bolts are tightened correctly
- Check that there is no dust inside the air line ducting
- Check the sea water intake system
- Check clamps and couplings
- Check the electrical system

9.4 Engine

The paragraph details the maintenance operations to be carried out on the engine.

For further information on the interventions to be carried out on the engine, refer to the specific documentation provided in the attachment.

- Wear personal protective equipment appropriate to the type of activity to be carried out.
- Wait for the engine and exhaust system to cool before carrying out any work.
- Clean the area at the end of maintenance work and remove all the equipment used (rags, tools, etc.).
- Store rags soaked in lubricants and/or other flammable substances in suitable containers.
- Do not disperse fluids or polluting materials into the environment.
- Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.

9.4.1 Check engine oil level

Frequency	Machine Status
Before each use	Machine stopped with power supplies disconnected

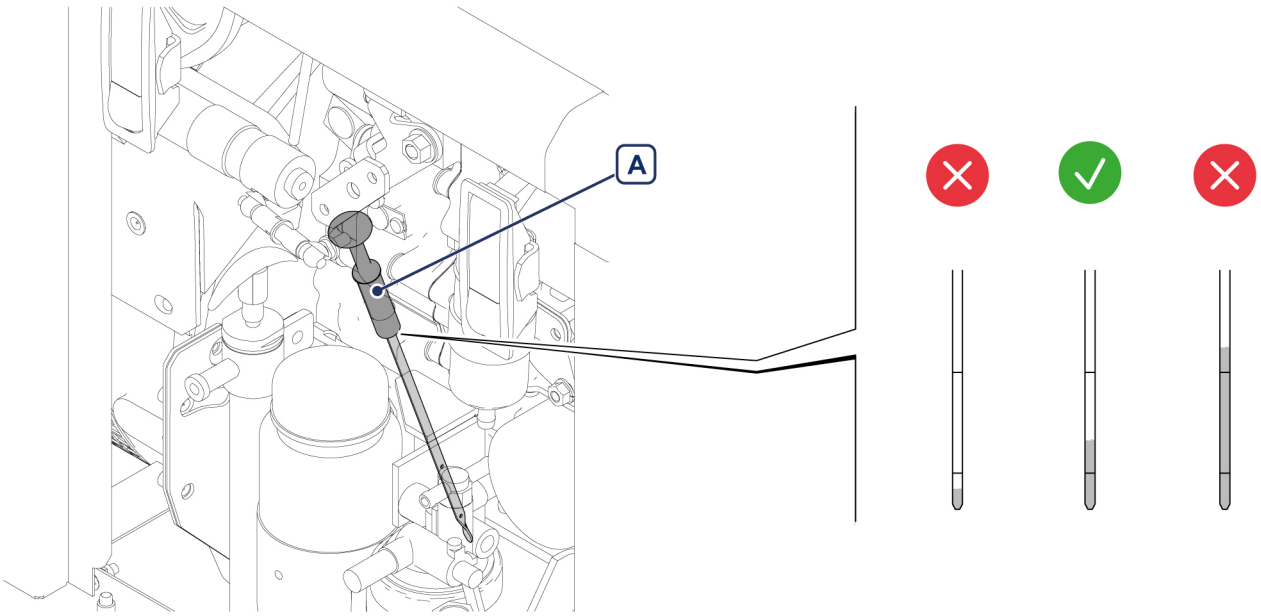
Technical Category

1

PPE

Proceed as indicated.

1. Check that the machine is level.
2. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
3. Access the intervention area.
4. Remove the dipstick (A) and check the oil level.
   The level must be between “MIN” (minimum level) and “MAX” (maximum level).
   If the level is below the minimum limit, top up.
5. If it is difficult to read, clean the dipstick (A) with a clean cloth that does not release lint.
6. Insert the dipstick (A).
7. Remove the dipstick (A) and check the oil level.
8. Insert the dipstick (A).



To top up the oil, proceed as indicated.

1. Remove the cap (B).
2. Pour the oil.

ATTENTION

Do not mix lubricants of different brands and/or characteristics.

If you intend to use a different type of oil, it is necessary to completely empty the tank and introduce new oil.

For more information, refer to *9.4.2 - Engine oil replacement****.***

3. Remove the dipstick (A) and check the oil level.
   The level must be close to the maximum limit.

ATTENTION

Do not exceed the maximum limit indicated.

Too much oil can damage the engine.

4. Insert the dipstick (A).
5. Replace the cap (B).

ATTENTION

Check the correct insertion and tightening of the dipstick (A) and cap (B).

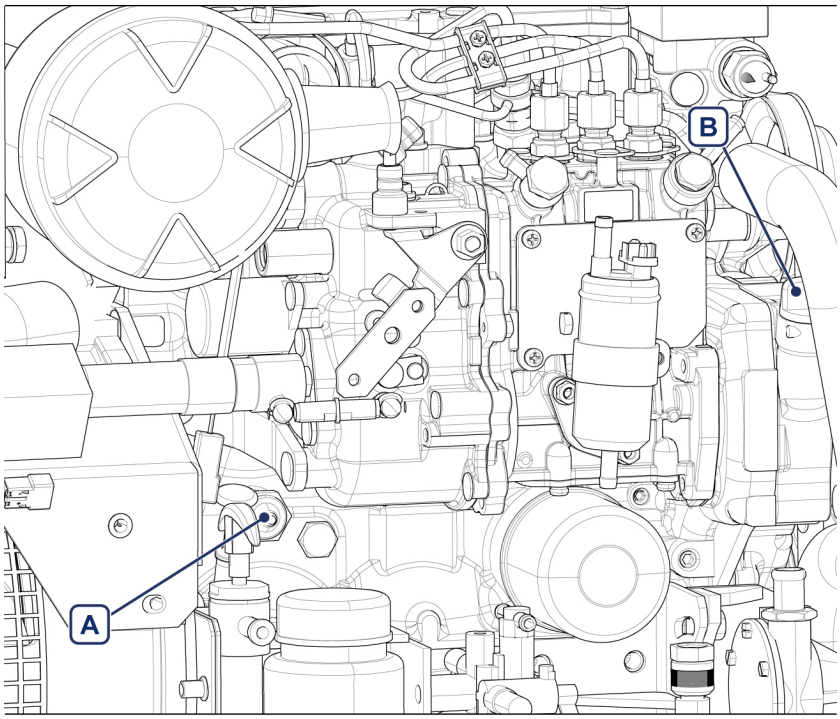
6. Wait a few minutes (approximately 5).
   The precaution is necessary to allow the oil to reach the sump.
7. Remove the dipstick (A) and check the oil level.
   If necessary, add more oil.

ATTENTION

Keep the oil level close to the maximum limit.

If you start the engine with the level close to the minimum limit, the oil may deteriorate more quickly.

8. Close the open guards to access the intervention area.
9. Restore the machine's operating conditions.



9.4.2 Engine oil replacement

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category


1

PPE

Although strongly discouraged, it may happen that the machine runs empty and at a reduced load.

Running idle or at reduced load for prolonged periods causes a less than optimal combustion process.

Fuel leaks may occur in the engine sump with the emission of white smoke which, in the long run, can reduce the lubrication effectiveness of the oil.

Replacing the oil according to the scheduled frequencies is important for the life of the machine.

NOTICE

Carry out the operation with the oil still hot to facilitate flow.

⚠ ATTENTION

Store used oil in suitable containers.

Do not disperse fluids or polluting materials into the environment.

Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.

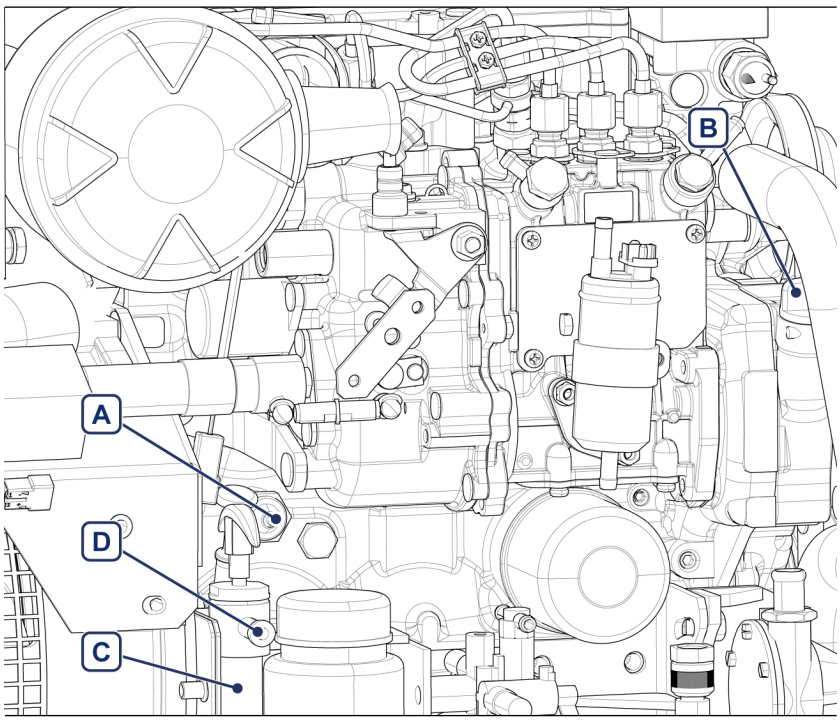
Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Prepare a container of adequate capacity.
4. Place the container under the cap (D) of the oil pump (C).
5. Unscrew the drain plug (D).
6. Remove the dipstick (A).
7. Remove the cap (B).
   The operation serves to facilitate the oil release.
8. Manually activate the pump (C) to drain all the oil.
9. Screw the cap (D).
10. Pour the oil.
    For information on the quantity of oil to add, refer to 3.4.1 - Technical data VS 12.8 Y .
11. Insert the dipstick (A).
12. Remove the dipstick (A) and check the oil level.
    The level must be close to the maximum limit.

ATTENTION

Do not exceed the maximum limit indicated.
Too much oil can damage the engine.

13. Insert the dipstick (A).
14. Replace the cap (B).
15. Close the open guards to access the intervention area.
16. Restore the machine's operating conditions.

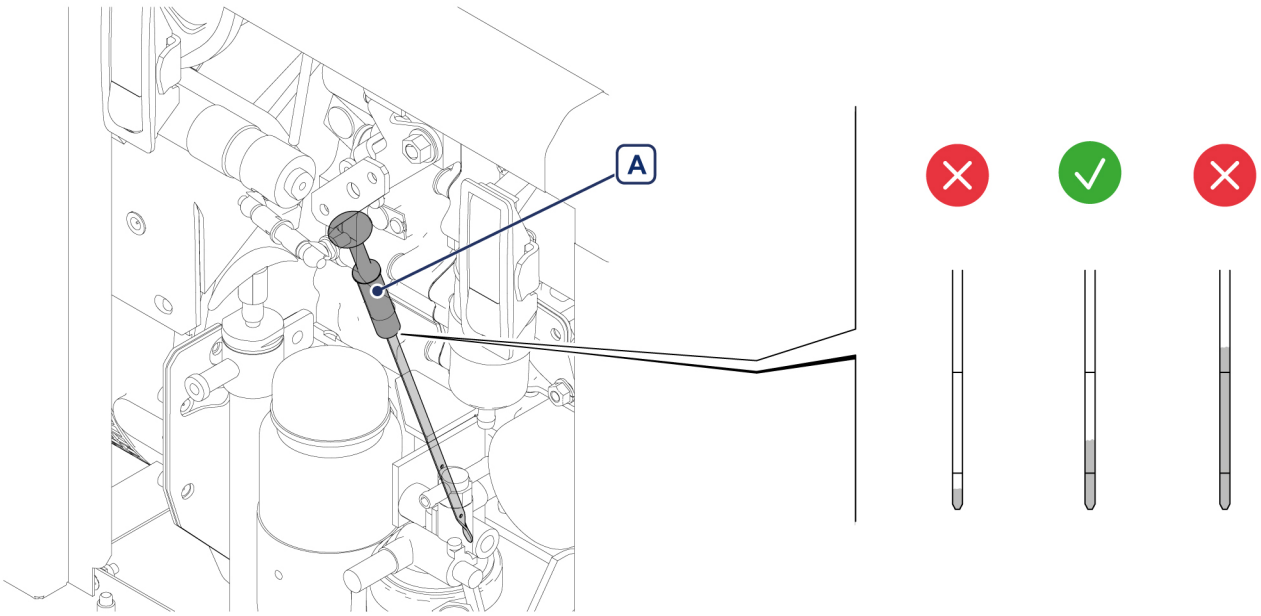


17. Start the engine for a few minutes.
18. Cut off the machine from power sources.
    For more information, refer to 6.8 - Machine insulation.
19. Access the intervention area.
20. Remove the dipstick (A) and check the oil level.
    The level must be between “MIN” (minimum level) and “MAX” (maximum level).
    If the level is below the minimum limit, top up.
    Topping up is used to compensate for the quantity of oil used to fill the filter cartridge.
21. Close the open guards to access the intervention area.
22. Restore the machine’s operating conditions.

⚠ ATTENTION

Do not disperse fluids or polluting materials into the environment.

Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.



9.4.3 Engine oil filter replacement

Frequency	Machine Status
Every 400 hours / 12 months	Machine stopped with power supplies disconnected

Technical Category

PPE

Proceed as indicated.

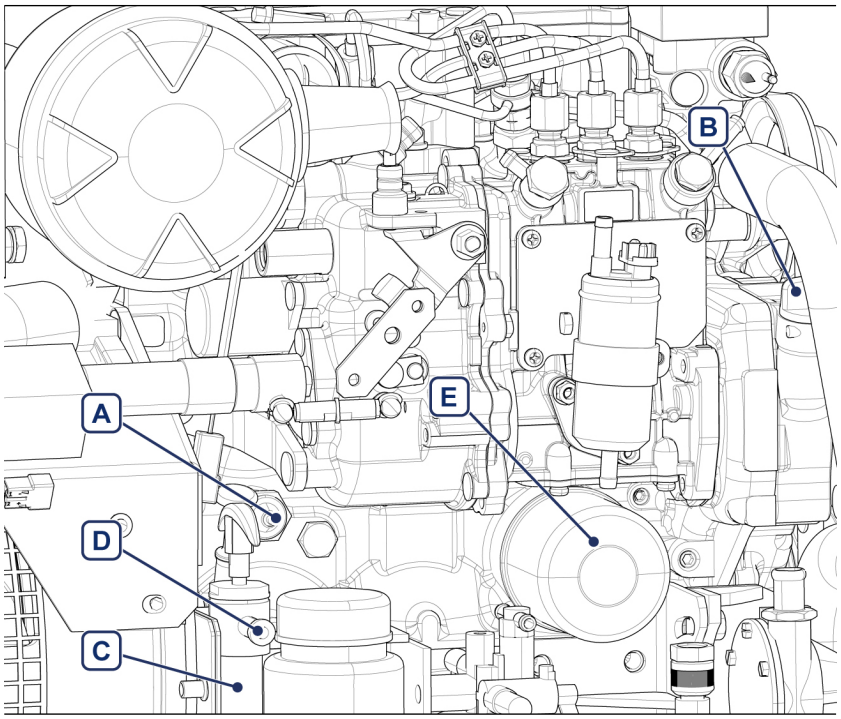
1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Prepare a container of adequate capacity.
4. Place the container under the cap (D) of the oil pump (C).
5. Unscrew the drain plug (D).
6. Remove the dipstick (A).
7. Remove the cap (B).
   The operation serves to facilitate the oil release.
8. Manually activate the pump (C) to drain all the oil.
9. Screw the cap (D).
10. Unscrew the filter cartridge (E).
    Use the appropriate key.
11. Thoroughly clean the surfaces of the filter support.
12. Moisten the sealing gasket of the new filter cartridge (E) with a thin layer of oil.
13. Screw in the new cartridge by hand (E).

ATTENTION

Do not use wrenches or tools to screw the cartridge.
The use of wrenches or tools causes excessive tightening of the cartridge.

ATTENTION

Use only with original spare parts.
The use of non-original spare parts can alter the functional performance and safety level of the machine.



14. Pour the oil.
    For information on the quantity of oil to add, refer to 3.4.1 - Technical data VS 12.8 Y .
15. Insert the dipstick (A).
16. Remove the dipstick (A) and check the oil level.
    The level must be close to the maximum limit.

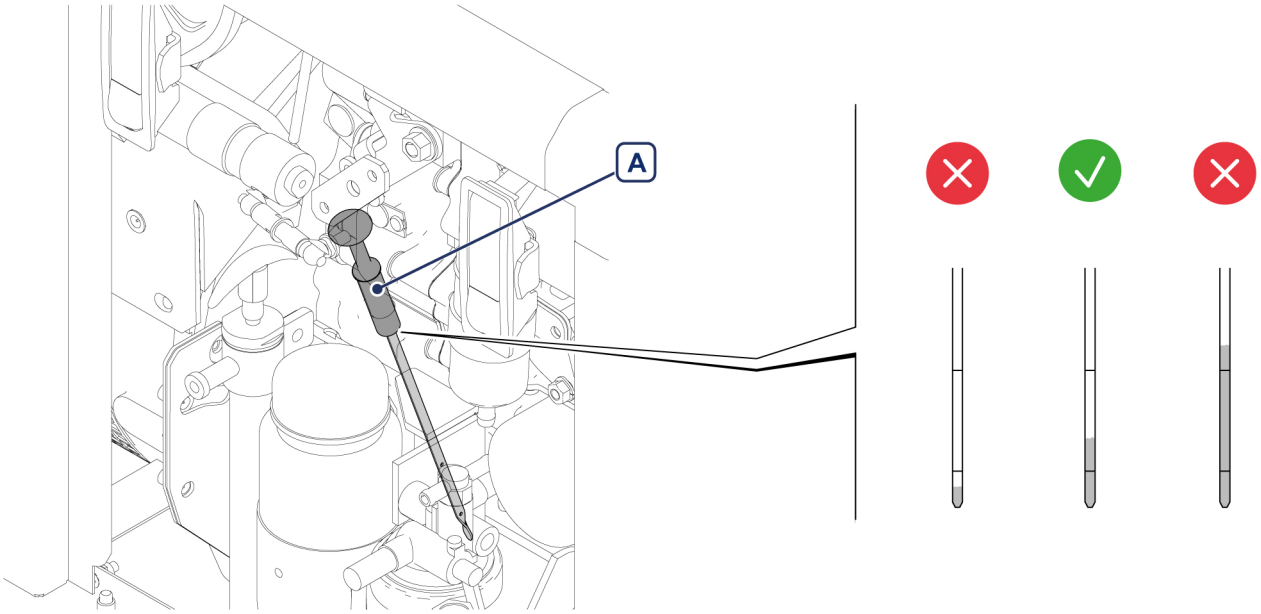
⚠ ATTENTION

Do not exceed the maximum limit indicated.
Too much oil can damage the engine.

17. Insert the dipstick (A).
18. Replace the cap (B).
19. Close the open guards to access the intervention area.
20. Restore the machine's operating conditions.
21. Start the engine for a few minutes.
22. Cut off the machine from power sources.
    For more information, refer to 6.8 - Machine insulation.
23. Access the intervention area.
24. Remove the dipstick (A) and check the oil level.
    The level must be between "MIN" (minimum level) and "MAX" (maximum level).
    If the level is below the minimum limit, top up.
    Topping up is used to compensate for the quantity of oil used to fill the filter cartridge.
25. Close the open guards to access the intervention area.
26. Restore the machine's operating conditions.

⚠ ATTENTION

Do not disperse fluids or polluting materials into the environment.
Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.



9.5 Air intake system

The paragraph details the maintenance operations to be carried out on the air intake system.

9.5.1 Air filter check and cleaning

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category

PPE

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Remove the air filter (B) cover (A).
4. Remove the filter element.

ATTENTION

Be careful not to let dust enter the sleeve.

5. Clean the filter element with dehumidified compressed air (maximum pressure 205 kPa).
   Direct the air jet from inside to outside.

ATTENTION

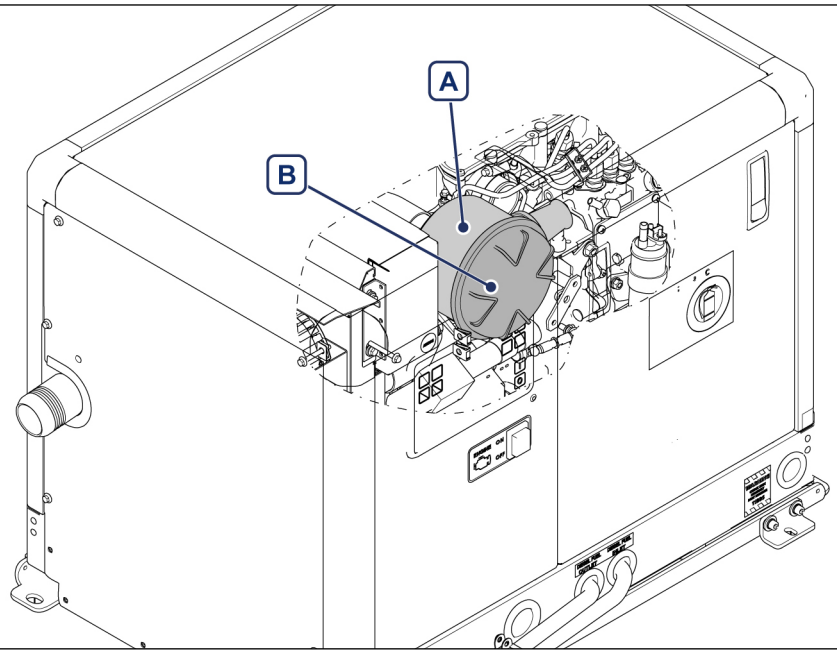
To clean the filter, do not use detergents and/or fuel.

6. Check the condition of the filter.
   In case of anomalies (breakages, tears), make the necessary replacements.
   For more information, refer to 9.5.2 - Air filter replacement.
7. Check the condition of the gasket at the base of the filter.
8. Insert the filter element inside the filter (A).

ATTENTION

Do not hit the filter element with tools and/or utensils.
Mount the filter element correctly.
Incorrect assembly can cause the intake of unfiltered air with consequent damage to the engine.

9. Replace the cover (B).
10. Close the open guards to access the intervention area.
11. Restore the machine's operating conditions.



9.5.2 Air filter replacement

Frequency	Machine Status
Every 400 hours / 12 months	Machine stopped with power supplies disconnected

Technical Category

PPE

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Remove the air filter (B) cover (A).
4. Remove the filter element.

ATTENTION

Be careful not to let dust enter the sleeve.

ATTENTION

Do not disperse fluids or polluting materials into the environment.

Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.

5. Insert the new filter element inside the filter (A).

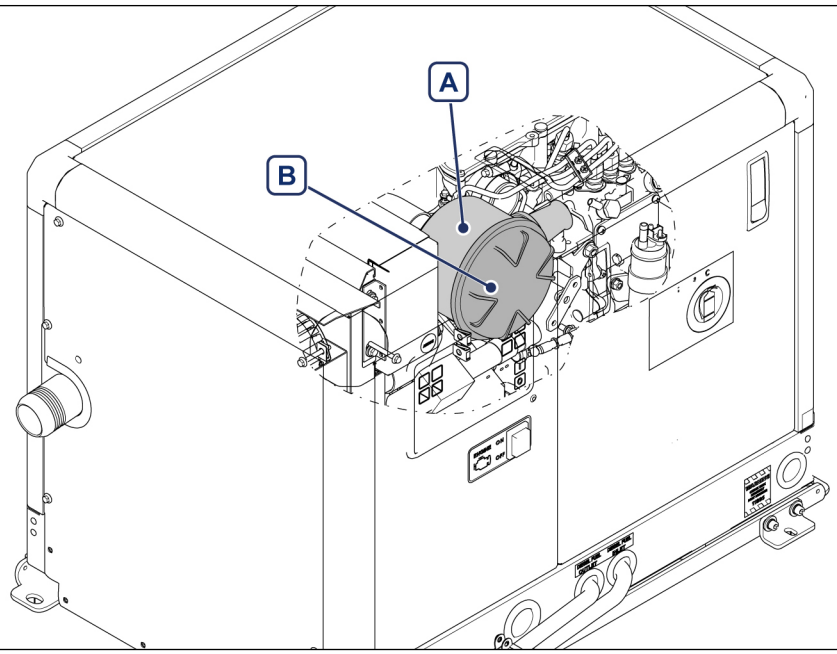
ATTENTION

Do not hit the filter element with tools and/or utensils.

Mount the filter element correctly.

Incorrect assembly can cause the intake of unfiltered air with consequent damage to the engine.

6. Replace the cover (B).
7. Close the open guards to access the intervention area.
8. Restore the machine's operating conditions.



9.6 Fuel supply system

The paragraph details the maintenance operations to be carried out on the fuel supply system.

- Wear personal protective equipment appropriate to the type of activity to be carried out.
- Clean the area at the end of maintenance work and remove all the equipment used (rags, tools, etc.).
- Do not disperse fluids or polluting materials into the environment.
- Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.

9.6.1 Fuel filter replacement

Frequency	Machine Status
Every 400 hours / 12 months	Machine stopped with power supplies disconnected

Technical Category


1

PPE

NOTICE
Replace the water-fuel separator cartridge external to the machine.

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Rotate the lever (A) clockwise to close the fuel filter tap.
4. Unscrew the ring nut (C) and remove the filter cup (B).
5. Replace the cartridge.

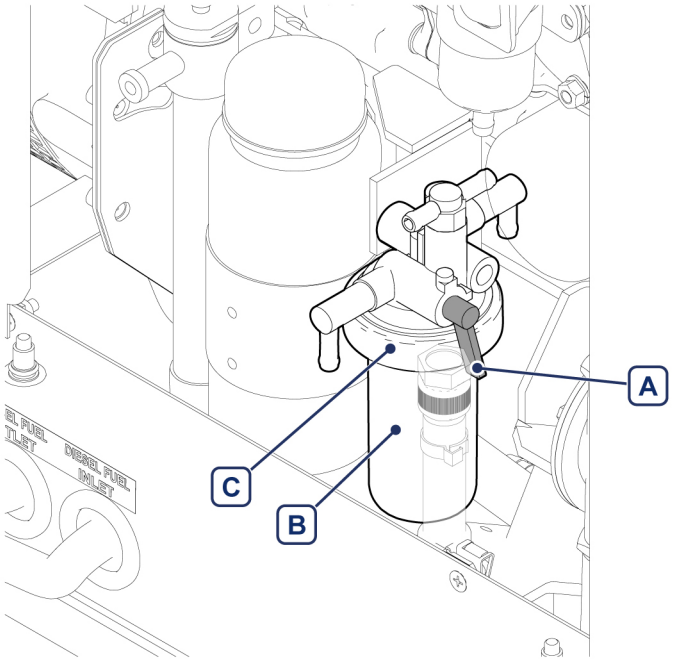
ATTENTION

Use only with original spare parts.
The use of non-original spare parts can alter the functional performance and safety level of the machine.

ATTENTION

Replacing the cartridge according to the scheduled frequency allows you to avoid premature wear of the injection system components.

6. Rotate the lever (A) anticlockwise to close the fuel filter cock.
7. Bleed the fuel system.
   For more information, refer to 9.6.5 - Deaeration of the fuel system.
8. Close the open guards to access the intervention area.
9. Restore the machine's operating conditions.



9.6.2 Water drainage from the fuel filter

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category

1

PPE

NOTICE

Drain the water-fuel separator external to the machine.

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Rotate the lever (A) clockwise to close the fuel filter tap.
4. Unscrew the ring nut (C) and remove the filter cup (B).
5. Empty the glass (B).

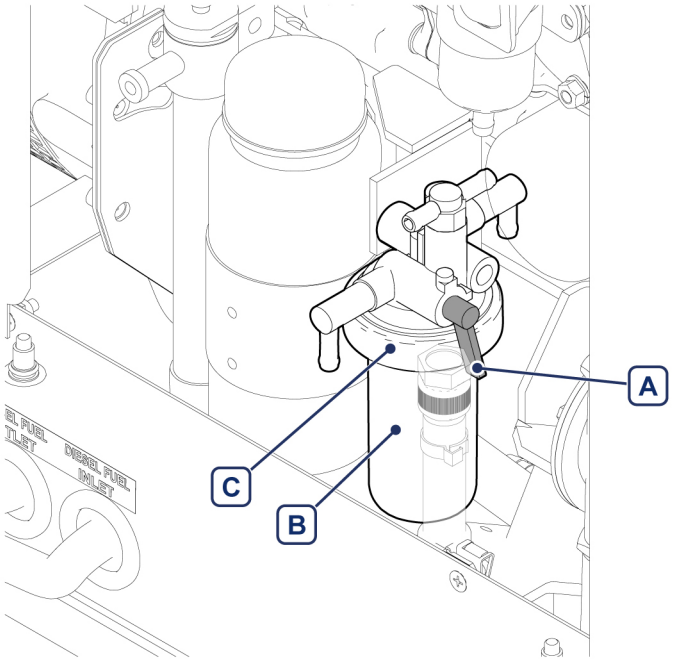
ATTENTION

The liquid contained in the filter bowl is polluting.

Do not disperse fluids or polluting materials into the environment.

Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.

6. Rotate the lever (A) anticlockwise to close the fuel filter cock.
7. Bleed the fuel system.
   For more information, refer to 9.6.5 - Deaeration of the fuel system.
8. Close the open guards to access the intervention area.
9. Restore the machine's operating conditions.



9.6.3 In-line fuel filter replacement

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category

PPE

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Remove the fuel fill hose (A).
4. Remove the filter positioned at the end of the tube.
5. Fit the new filter onto the tube (A).

ATTENTION

Use only with original spare parts.

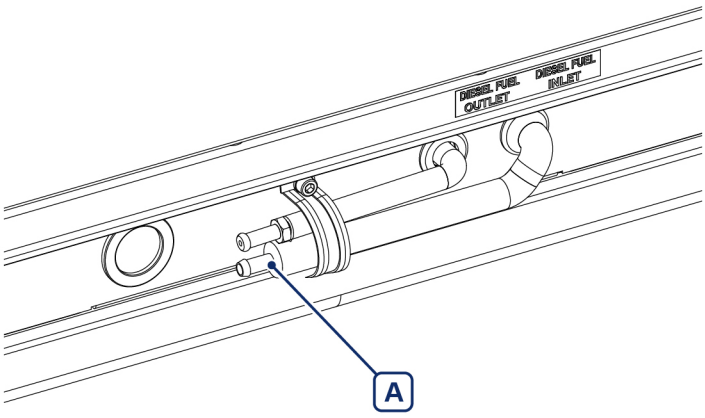
The use of non-original spare parts can alter the functional performance and safety level of the machine.

ATTENTION

Do not disperse fluids or polluting materials into the environment.

Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.

6. Refit the tube (A).
7. Bleed the fuel system.
   For more information, refer to 9.6.5 - Deaeration of the fuel system.
8. Close the open guards to access the intervention area.
9. Restore the machine's operating conditions.



9.6.4 Checking fuel pipes

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category

PPE

DANGER

Periodic inspection and control of the pipes is essential to avoid the risk of fire.

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Check the condition of pipes and clamps.
   In case of anomalies (damage, signs of wear, etc.), make the necessary replacements.
4. Check the correct tightening of the clamps.
   If the clamps are loose, apply a thin layer of oil to the clamp screw and tighten the clamp.
5. Bleed the fuel system.
   For more information, refer to 9.6.5 - Deaeration of the fuel system.
6. Close the open guards to access the intervention area.
7. Restore the machine's operating conditions.

ATTENTION

Do not disperse fluids or polluting materials into the environment.

Dispose of fluids and polluting materials in compliance with the laws in force in the country in which the machine is installed and used.

9.6.5 Deaeration of the fuel system

Frequency	Machine Status
When necessary	Machine stopped with active power supplies

Technical Category


1

PPE

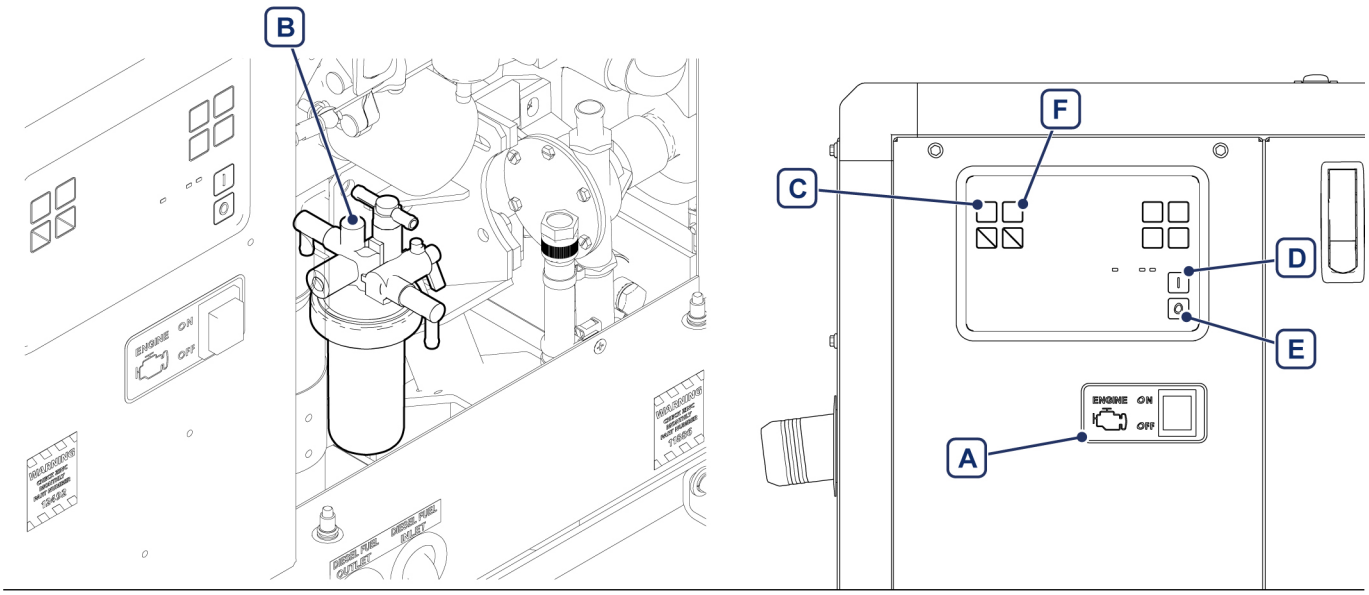
For the engine to function correctly it is necessary to remove the air from the fuel supply and injection circuit.
The presence of air bubbles inside the fuel system causes irregular engine operation.
The fuel system is designed to independently eliminate air bubbles within the circuit.
Bleeding occurs automatically when the machine is started.

If you start the machine for the first time or replace the fuel filter, proceed as indicated.

1. Unscrew the screw (B).
2. Press the button (C) to select “OFF” on the display.
3. Press the start button (D) on the instrument panel.
   The fuel pump starts.
4. Wait for the filter cup to fill.
5. Tighten the screw (B).
6. Let the fuel pump run for approximately 1 minute.
7. Press the stop button (E) on the instrument panel.
8. Press the button (F) to select “MAN” on the display.
9. Press the start button (D) on the instrument panel.
   The engine starts and the deaeration procedure is performed.
10. If necessary, repeat the starting procedure.

DANGER

Before starting the machine, make sure that the emergency switch (A) is ON.



9.7 Cooling system

9.7.1 Cooling water circuit

The cooling circuit is made up of:

- Sea water circuit (open circuit)
- Water/glycol mixture circuit (closed circuit)

The engine is cooled by the water/glycol mixture contained in the closed circuit.

The mixture is cooled by sea water through the water/water heat exchanger.

The open circuit is driven by the sea water pump (A) and is made up of:

- Water/air exchanger (B) for cooling the alternator and engine combustion air
- Water/water exchanger (C) for cooling the closed water/glycol circuit

Inverter cooling plates (D), which, through direct exchange with seawater, maintain the correct inverter operating temperatures.

⚠ ATTENTION

For correct operation, the filter and sockets must not be obstructed.

The cooling of the machines is therefore not influenced by ambient temperature, but is linked to the temperature of the sea water.

The machines have been tested to guarantee zero derating up to a sea water temperature of 31 °C.

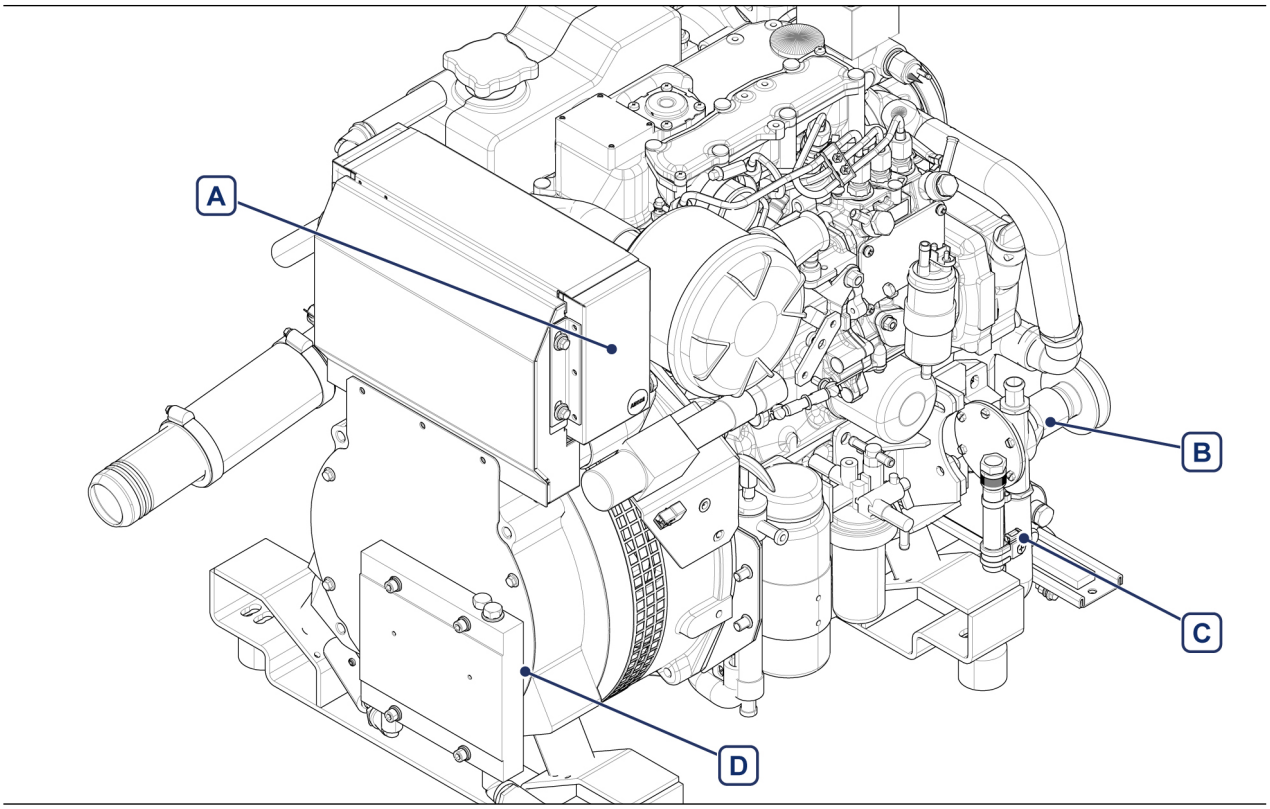
⚠ ATTENTION

For correct operation of the cooling system, it is necessary to keep all the guards and hoods of the machine closed.

⚠ ATTENTION

Do not make any modifications to the soundproofing box.

Making modifications to the soundproofing box can alter the performance of the machine.



9.7.2 Water/glycol mixture circuit (closed circuit)

9.7.2.1 Coolant system emptying

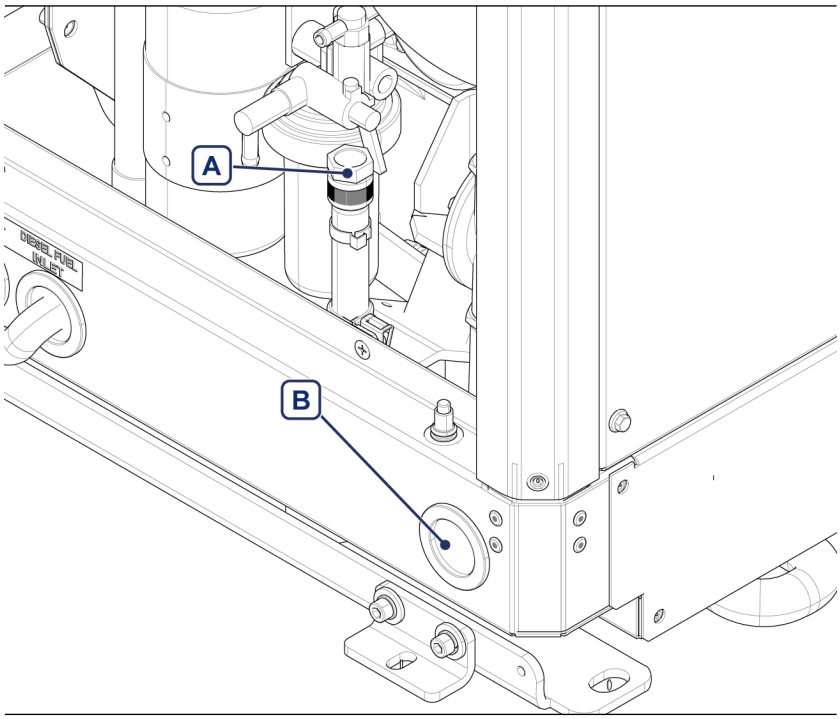
Frequency	Machine Status
When necessary	Machine stopped with power supplies disconnected

Technical Category

PPE

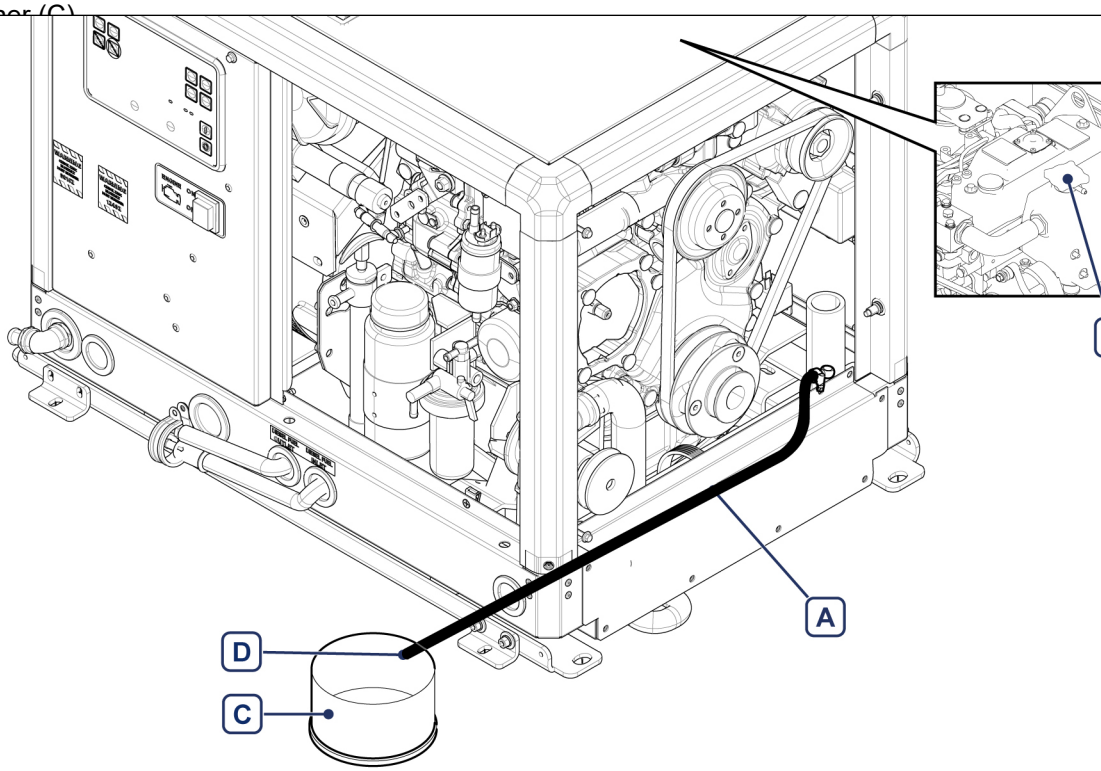
Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer 6.8 - Machine insulation.
2. Access the intervention area.
3. Release the tube (A)
4. Bring the tube (A) outside the machine using hole (B) in the base



5. Bring the tube (A) to the container (C)
6. Remove the cap (D)
7. Remove the cap (E) to system

8. Wait for the circuits to be proceed to fill the 9.7.2.2 - Filling of empty



9.7.2.2 Filling of empty system with coolant

Frequency	Machine Status
When necessary	Machine stopped with power supplies disconnected

Technical Category


1

PPE

NOTICE

If using concentrated coolant, mix the coolant solution thoroughly before filling the system.

Proceed as indicated.

1. Check that all drain points are closed.
2. Add coolant.
   The liquid must reach the lower edge of the filling tube.
3. Start the engine and let it idle for a few minutes.
4. Increase the engine speed and let it run for a few minutes.
5. Stop the engine.
6. Wait for the engine to cool.
7. Check the coolant level.
   For more information, refer to 9.7.2.3 - Coolant level check and top off.

ATTENTION

Do not drain the cooling system in case of prolonged inactivity and/or storage of the engine.
The coolant contains anti-corrosion additives.

ATTENTION

Only start the engine when the system is completely filled.

9.7.2.3 Coolant level check and top off

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category


1

PPE

Proceed as indicated.

1. Wait for the engine to cool.
2. Remove the cap (A).

DANGER

Risk of burns.
Possible release of steam and liquid at high temperatures.
Do not open the filler cap when the engine is hot.

3. Add coolant.
   Introduce the liquid slowly to allow the air to escape.
   For information on the amount of coolant to fill, see 3.4.1 - Technical data VS 12.8 Y .

ATTENTION

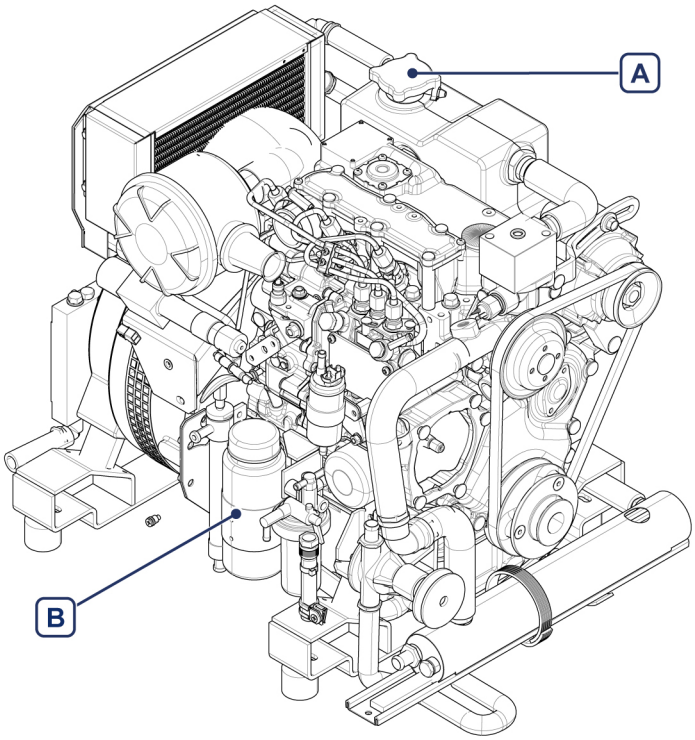
Use only the coolant recommended by the engine Manufacturer.

4. Check for the presence of a minimum quantity of water/glycol mixture inside the expansion tank (B).

ATTENTION

The quantity of water/glycol mixture in the expansion tank (B) must be minimal, so as to allow the volume to vary during machine operation.
The lack of water/glycol mixture in the expansion tank (B) can cause air to be introduced into the cooling circuit.

5. Replace the cap (A).



9.7.3 Sea water circuit maintenance

9.7.3.1 Sea water pump

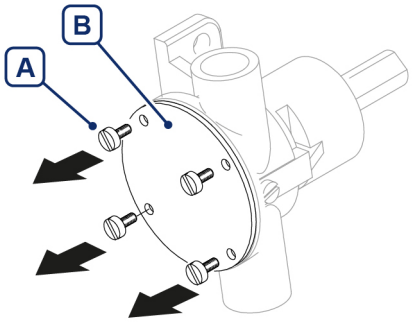
Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category

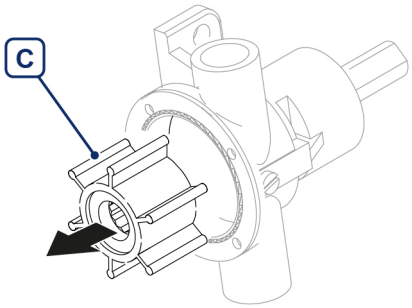
PPE

To replace the rubber impeller of the sea water pump, proceed as indicated.

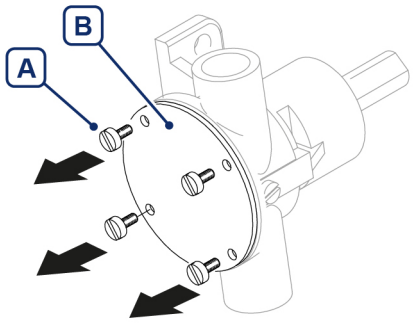
1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Drain the sea water from the cooling system.
   For more information, refer to 9.7.3.4 - Emptying the sea water cooling system.
4. Unscrew the screws (A) and remove the cover (B).



5. Forcefully pull the impeller (C) outwards and remove it.
   Use a pair of pliers.
6. Fit the new impeller.
   Follow the instructions in the Pump maintenance kit.



7. Replace the cover (B) and secure it with the screws (A).
8. Close the open guards to access the intervention area.
9. Restore the machine's operating conditions.



9.7.3.2 Sea water pump filter cleaning

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category

1

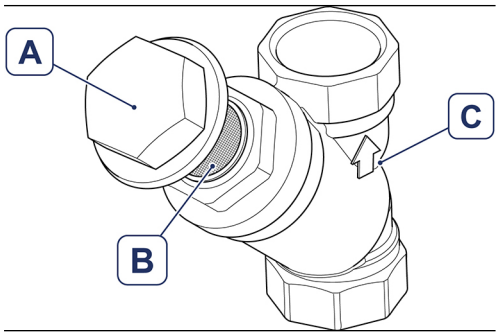
PPE

WARNING

The seawater filter is cleaned every time there is damage to the impeller.

To clean the seawater filter, proceed as follows.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Unscrew cap (A) and remove it.
4. Remove the basket filter (B).
5. Clean the filter (B) and remove any residue.
6. Replace the filter (B) in position.
7. Screw the cap (A).



NOTICE

The direction in which the filter should be mounted is marked on the filter, i.e. arrow (C) pointing downwards.

9.7.3.3 Replacement of sacrificial anodes

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category


1

PPE

The sacrificial anodes are used to protect the metal parts of the machine that come into contact with sea water.

Periodically check the state of wear of the sacrificial anodes, especially in the first months of commissioning of the machine.

Estimated wear varies significantly depending on the port and the area in which the vessel is located.

In case of wear, replace to avoid irreparable corrosion of the exchangers and/or other components due to galvanic currents.

Carry out the first check after 50 hours of operation in order to identify the consumption rate.

Carry out subsequent checks depending on the environmental conditions and the estimated consumption rate.

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Drain the cooling system, refer to 9.7.3.4 - Emptying the sea water cooling system
4. Replace the sacrificial anodes (A).

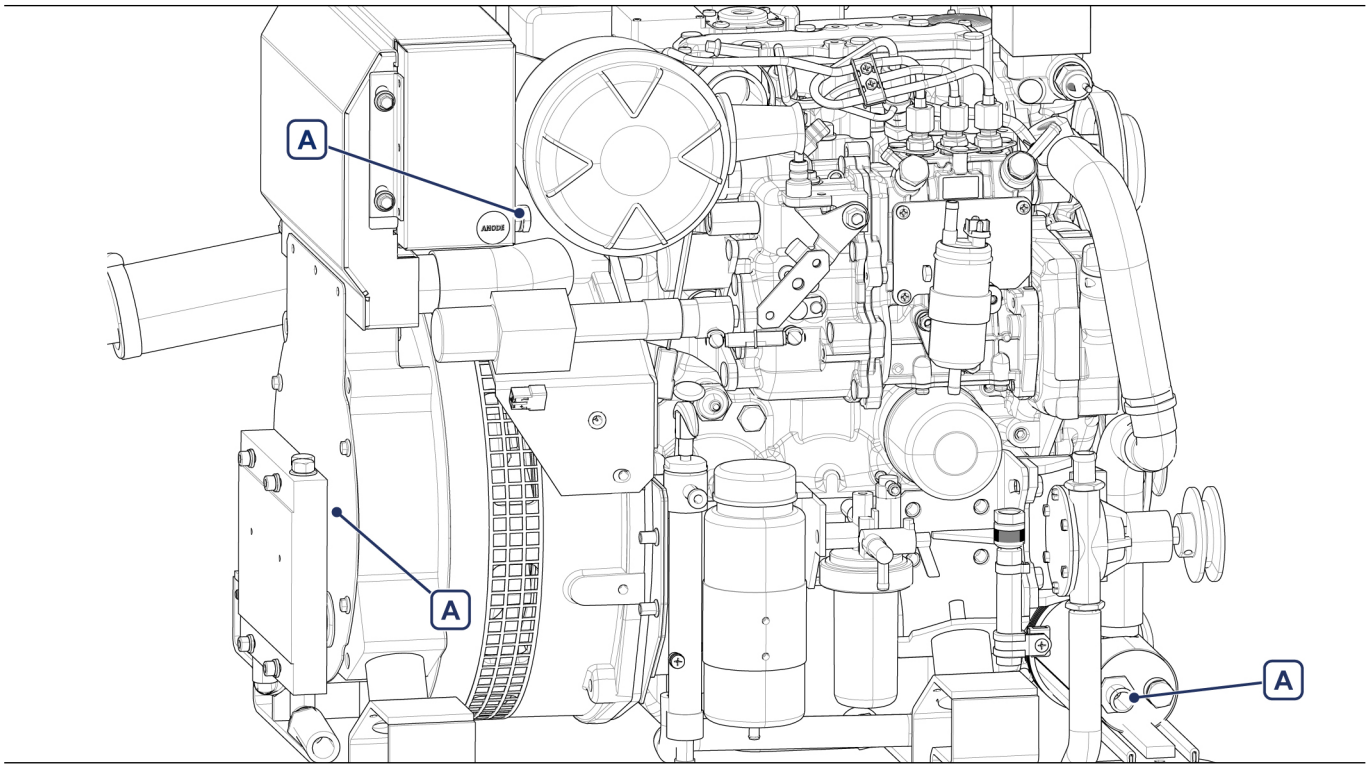
⚠ ATTENTION

Identify the number and location of all sacrificial anodes on the machine.

⚠ ATTENTION

Do not use sealants to mount sacrificial anodes.

5. Close the open guards to access the intervention area.
6. Restore the machine's operating conditions.



9.7.3.4 Emptying the sea water cooling system

Frequency	Machine Status
When necessary	Machine stopped with power supplies disconnected

Technical Category

1

PPE

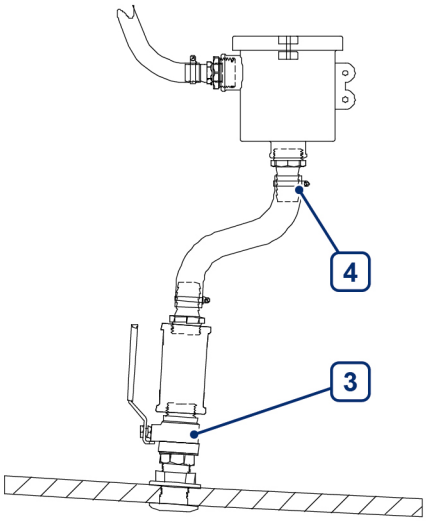
To carry out maintenance on the water-air exchanger or on the cooling system it is necessary to empty the sea water circuit.

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Prepare a container of adequate capacity.
3. Close the seacock (3).
4. Loosen the clamp (4), remove the hose and drain the water into the container.
5. Reconnect the hose and tighten the clamp (4).
6. Close the open guards to access the intervention area.
7. Restore the machine's operating conditions.

ATTENTION

Open the sea water tap (3) before restarting the machine.



9.7.3.5 Check clamps and hoses

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category


1

PPE

To carry out maintenance on the cooling system it is necessary to empty the sea water circuit (9.7.3.4 - Emptying the sea water cooling system).

Proceed as indicated.

1. Drain the sea water from the cooling system.
   For more information, refer to 9.7.3.4 - Emptying the sea water cooling system.
2. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
3. Access the intervention area.
4. Close the seacock (A).
5. Check the condition of sleeves and clamps.
   In case of anomalies (swollen, hardened sleeves, presence of cracks, etc.), replace them.
6. Check the correct tightening of the clamps.
   If there are loose clamps or water leaks, tighten the clamps.

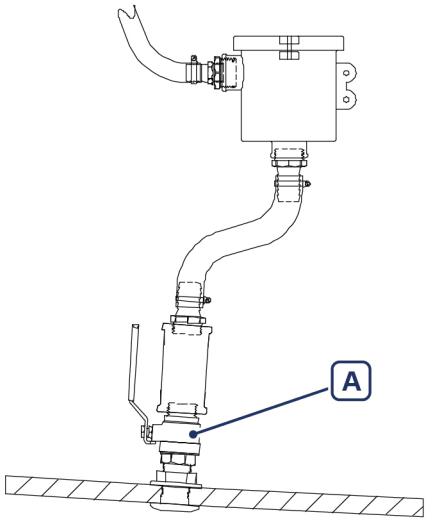
DANGER

Damaged hoses and/or water leaks can cause overheating with the risk of fire.

7. Close the open guards to access the intervention area.
8. Restore the machine's operating conditions.

ATTENTION

Open the sea water tap (A) before restarting the machine.



9.7.3.6 Anti-siphon valve check and clean

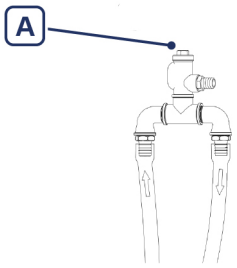
Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category

PPE

Proceed as indicated.

1. Unscrew and remove the cover (A).
2. Remove the ball.
3. Remove salt residues from the ball and its seat. Use soft water.
4. Insert the ball into its valve seat.
5. Replace and tighten the cover (B).



9.7.3.7 Sea water pump belt check

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

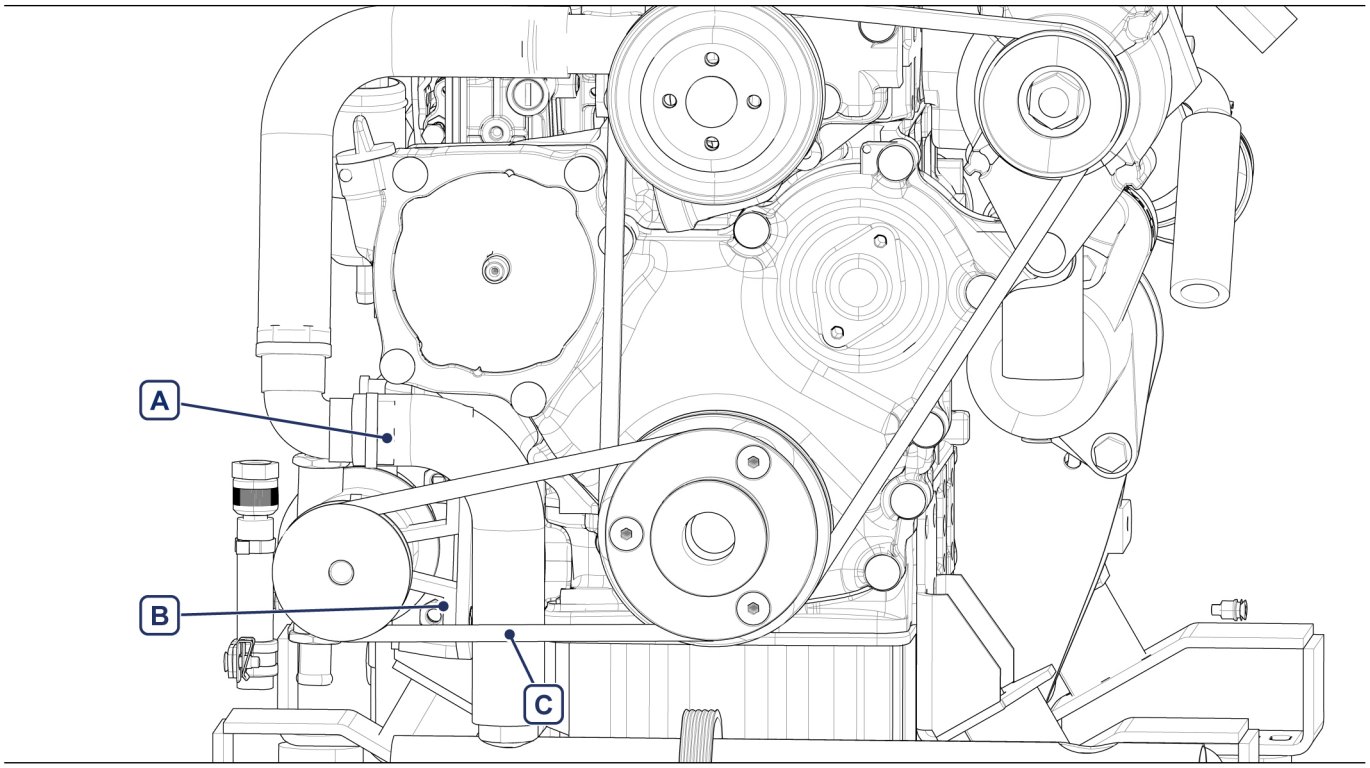
Technical Category

PPE

The belt (C) is used to transmit the rotational motion from the crankshaft pulley to the seawater pump pulley (A).
Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Loosen the adjusting screw (B).
4. Move the sea water pump (A) to adjust the belt tension (C).
   8 kg (17,7 lbs) - 5 mm
   - **Outwards shifting**: increase in belt tension
   - **Inward shifting**: decrease in belt tension

   The arrow in the figure indicates the point to check if the tensioning is correct.
5. Check the belt condition.
   If the belt is worn, replace it.
   For more information, refer to 9.7.3.8 - Sea water pump belt replacement.
6. Close the open guards to access the intervention area.
7. Restore the machine's operating conditions.



9.7.3.8 Sea water pump belt replacement

Frequency	Machine Status
Every 400 hours / 12 months	Machine stopped with power supplies disconnected

Technical Category

PPE

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Loosen the adjusting screw (B).
4. Move the sea water pump (A) inward to decrease the belt tension (C).
5. Remove the belt (C).
6. Insert the new belt (C).

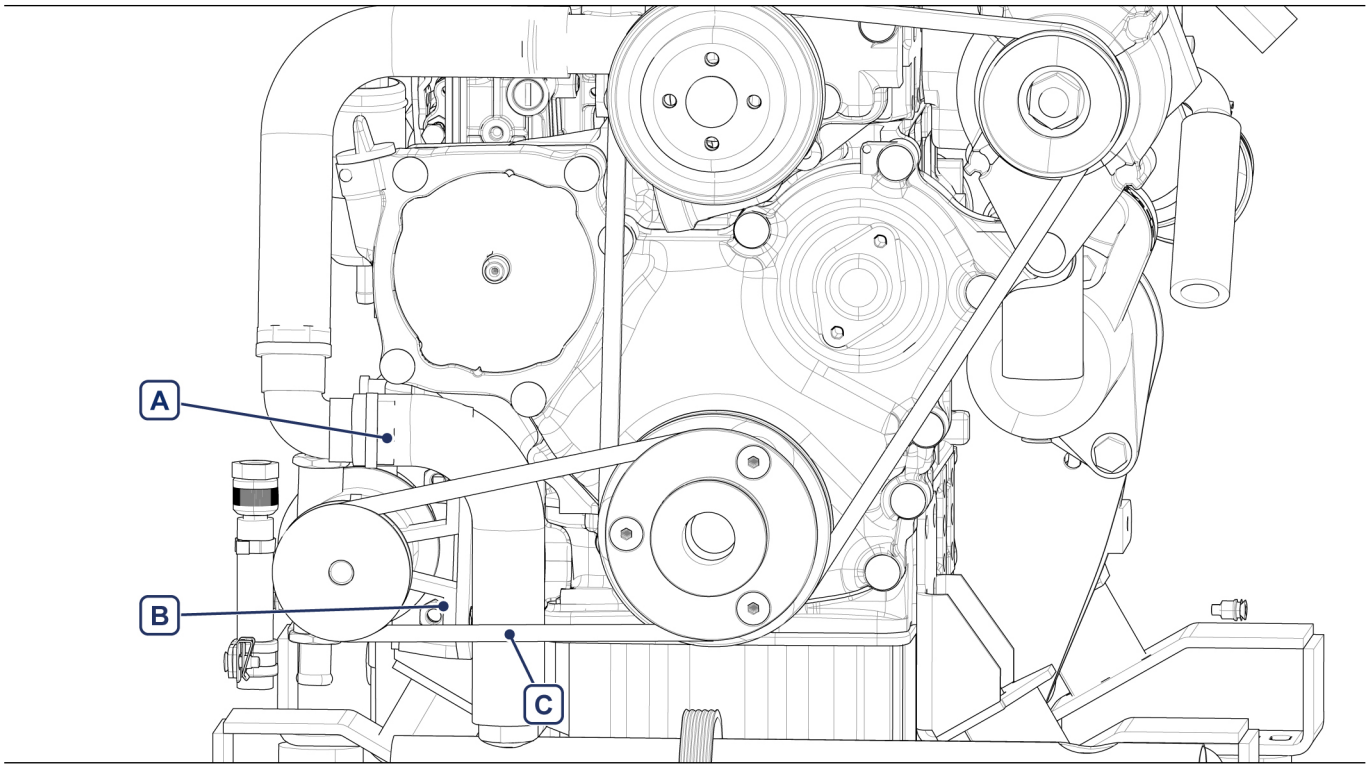
⚠ ATTENTION

Use only with original spare parts.
The use of non-original spare parts can alter the functional performance and safety level of the machine.

7. Adjust the belt tension (C).
   For more information, refer to 9.7.3.7 - Sea water pump belt check.
8. Close the open guards to access the intervention area.
9. Restore the machine's operating conditions.

⚠ ATTENTION

Open the sea water tap before restarting the machine.



9.8 Battery charging alternator

The alternator does not require any particular maintenance operations.

It is sufficient to eliminate any traces of humidity and oxidation which could cause damage in the long run.

DANGER

With the engine running, do not place your hands near the V-belt or pulleys.

9.8.1 Alternator belt check

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category

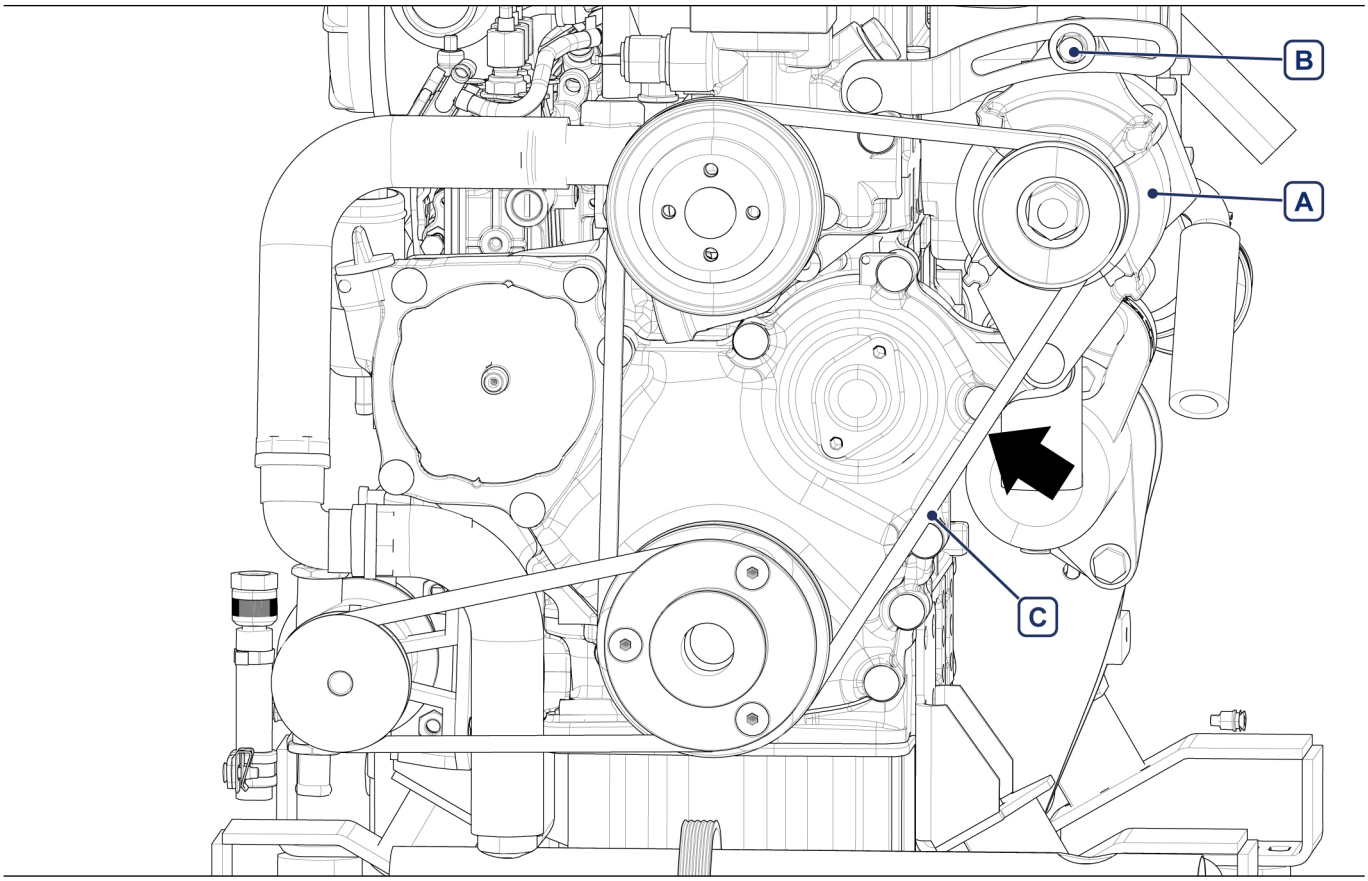
PPE

The belt (C) is used to transmit the rotation motion from the crankshaft pulley to the closed circuit liquid pump and battery charger pulley (A).

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Loosen the adjusting screw (B).
4. Move the DC alternator charger (A) to adjust the belt tension (C).
   8 kg (17,7 lbs) - 5 mm
   - **Outwards shifting**: increase in belt tension
   - **Inward shifting**: decrease in belt tension

   The arrow in the figure indicates the point to check if the tensioning is correct.
5. Check the belt condition.
   If the belt is worn, replace it.
   For more information, refer to 9.8.2 - Alternator belt replacement.
6. Close the open guards to access the intervention area.
7. Restore the machine's operating conditions.



9.8.2 Alternator belt replacement

Frequency	Machine Status
Every 400 hours / 12 months	Machine stopped with power supplies disconnected

Technical Category

PPE

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Remove the belt (D).
   For more information, refer to 9.7.3.8 - Sea water pump belt replacement.
4. Loosen the screws (E).
5. Loosen the adjusting screw (B).
6. Move the battery charger DC alternator (A) inward to decrease the belt tension (C).
7. Remove the belt (C).
8. Insert the new belt (C).

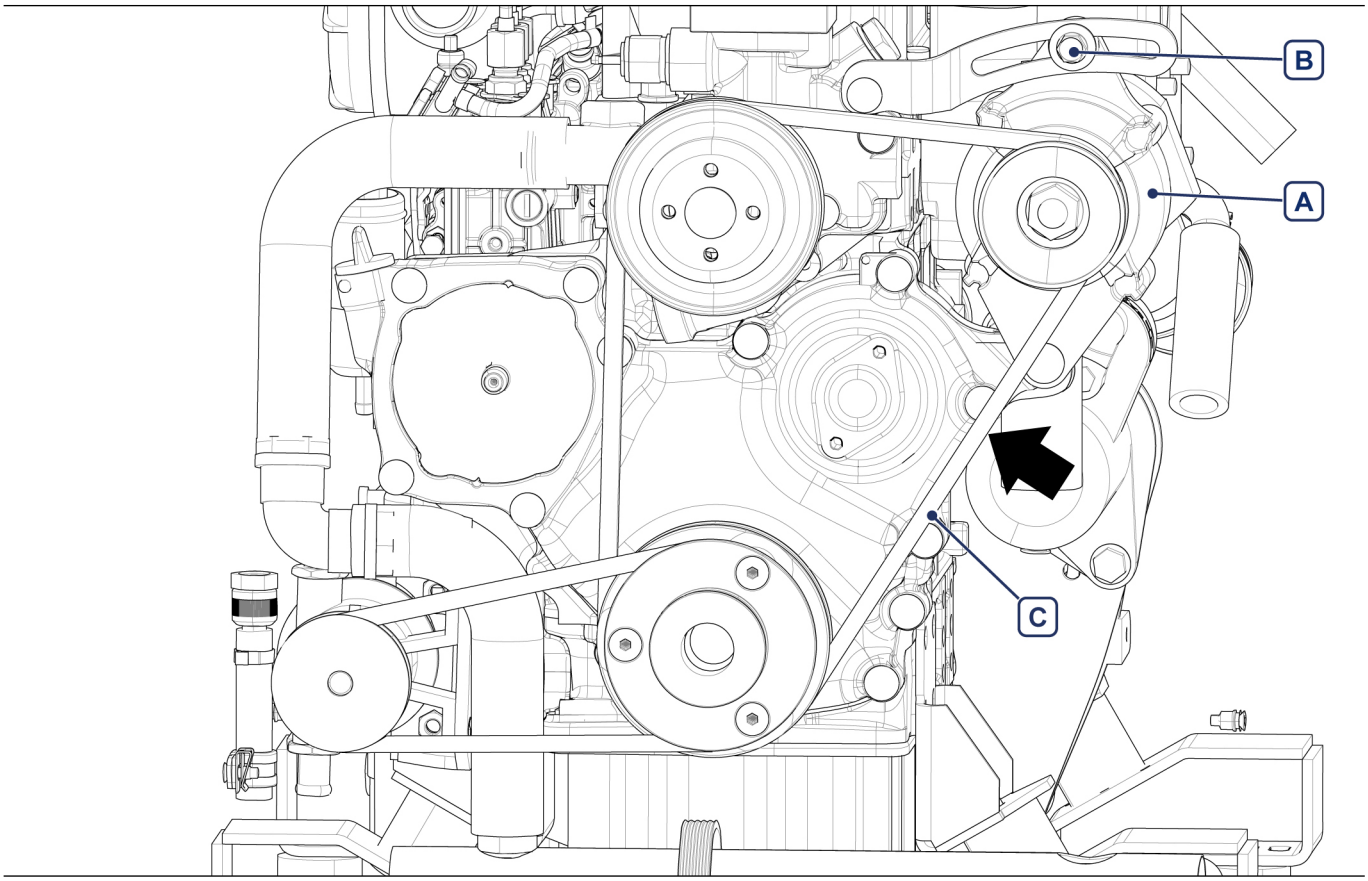
ATTENTION

Use only with original spare parts.
The use of non-original spare parts can alter the functional performance and safety level of the machine.

9. Adjust the belt tension (C).
   For more information, refer to 9.8.1 - Alternator belt check.
10. Tightening the screws (E).
11. Insert the belt (D).
12. Close the open guards to access the intervention area.
13. Restore the machine's operating conditions.

ATTENTION

Open the sea water tap before restarting the machine.



9.9 Electrical system

DANGER

The battery contains a sulfuric acid-based electrolyte.
Battery electrolyte is a very corrosive acid that can cause serious personal injury.
Entrust the maintenance work on the battery only to qualified technical personnel.

9.9.1 Battery replacement

Frequency	Machine Status
When necessary	Machine stopped with power supplies disconnected

Technical Category

PPE

Proceed as indicated.

1. Cut off the machine from power sources.
   For more information, refer to 6.8 - Machine insulation.
2. Access the intervention area.
3. Disconnect the negative terminal clamp from the battery.
4. Disconnect the positive terminal clamp from the battery.
5. Remove the old battery.
6. Insert the new battery.

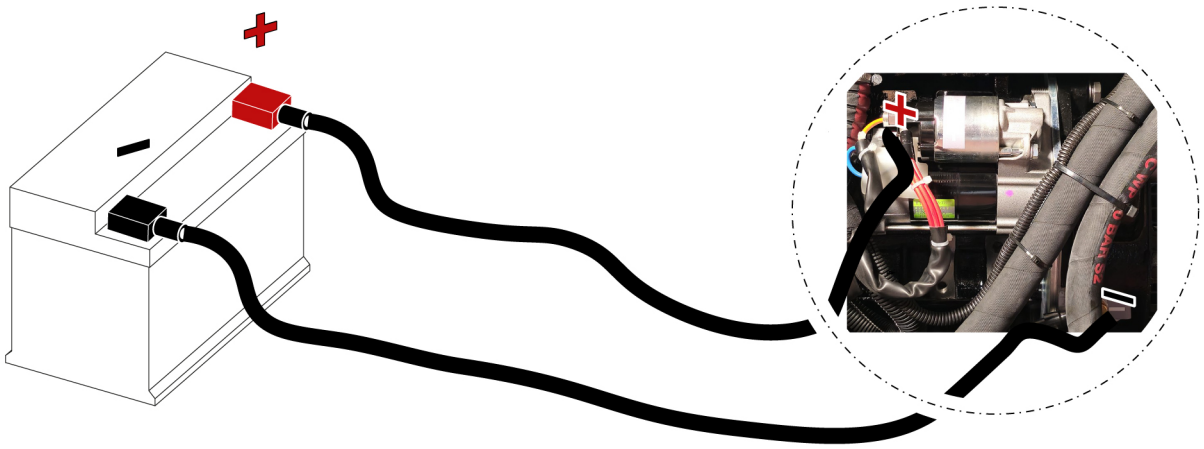
NOTICE

For information on battery characteristics, refer to 3.4 - Technical features.

ATTENTION

The new battery must be charged.

7. Connect the positive terminal clamp to the battery.
8. Connect the negative terminal clamp to the battery.
9. Close the open guards to access the intervention area.
10. Restore the machine's operating conditions.



9.9.2 Machine electrical check

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category

PPE

On an annual basis, check the state of the machine's electrical system.
The tests required by MASE GENERATORS are detailed in the Workshop Manual.

9.9.3 Efficiency check of emergency stop commands

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category

PPE

With the machine turned on, check the efficiency of the emergency stop switch.

1. Place the emergency switch in the "OFF" position; the machine must stop immediately.

9.10 Exhaust gas system

9.10.1 Exhaust system inspection

Frequency	Machine Status
Every 200 hours / 6 months	Machine stopped with power supplies disconnected

Technical Category


1

PPE

For the safety of people aboard the vessel, it is essential to install a carbon monoxide detector on the vessel.

Evaluate and define the most suitable point for installing the detector together with the manufacturer or dealer of the boat.

Check the efficiency and correct functioning of the carbon monoxide detector before using the machine.

Carry out the checks and maintenance required by the manufacturer of the carbon monoxide detector.

⚠ ATTENTION

Do not turn off the carbon monoxide detector but always keep it running.

9.11 Special maintenance

Special maintenance includes interventions, whether occasional or difficult to predict, to be carried out following breakdowns or malfunctions.

These interventions may involve the dismantling of components and/or the removal of protections.

ATTENTION

Entrust special maintenance interventions only to technical personnel authorised by the Manufacturer.

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10 TROUBLESHOOTING

10.1 General information

The tables show some problems that may occur during operation.

For each problem, the causes, remedies and an icon (for example ) are provided to indicate which professional figure is authorised to carry out the procedure/intervention.

For information on the professional figures associated with the icons and their related tasks, see 1.7 - Personnel qualification.

ATTENTION

The operator carries out an initial search to identify the fault and the causes that generated it.

The operator performs the maintenance required to restore the correct functioning of the machine ONLY if authorised to carry out these tasks.

The specialised technician (mechanical maintenance technician, electrician maintenance technician, etc.) performs all restoration operations that are not the responsibility of the operator.

WARNING

For further information on any engine problems, refer to the specific documentation provided in the attachment.

If the solution requires interventions not described in this Manual, contact an Authorised Centre or the Manufacturer's Assistance Service.

The machine turns off during operation

CAUSE	TROUBLESHOOTING	
Protection activation	Check whether the message (icon lights up) appears on the display to indicate that a protection has been activated. Troubleshoot and start operation.	
Fuel loading not done correctly	Check the condition of the fuel supply lines. Check that there are no air bubbles inside the circuit. Check the fuel level in the tank.	
Engine electromagnet not working (sealing winding not working)	Replace the electromagnet	
Mechanical failure (internal engine parts not working)	Contact an authorised service centre of the engine Manufacturer	
Fuel pump not working	Replace the fuel pump	
Dirty fuel filters	Replace the fuel filters	

The starter motor turns, but the main engine does not start

CAUSE	TROUBLESHOOTING	
Fuel loading not done correctly	Check the condition of the fuel supply lines. Check the fuel level in the tank.	
Stop electromagnet not in shooting position	Contact a workshop authorised by the Manufacturer	
Mechanical failure (internal engine parts not working)	Contact an authorised service centre of the engine Manufacturer	
Fuel pump not working	Replace the fuel pump	
Presence of air bubbles inside the fuel circuit	Perform the bleeding operation	
Dirty fuel filters	Replace the fuel filters	
Preheating glow plugs not working	Replace the glow plugs	
Pressure switch not working or pressure switch wire disconnected	Replace the pressure switch or restore the connections	

The unit control logic turns on, but the starter motor does not turn

CAUSE	TROUBLESHOOTING	
Poor condition of cables, battery connection terminals and electrical connections	Contact a workshop authorised by the Manufacturer	
Battery drained or damaged	Check the integrity of the battery. If necessary, recharge or replace the battery.	
DC thermal switches tripping	Reset the thermal switches	
Low battery voltage	Replace or recharge the battery	

The engine runs irregularly

CAUSE	TROUBLESHOOTING	
Clogged fuel filters	Contact a workshop authorised by the Manufacturer	

CAUSE	TROUBLESHOOTING	
Clogged air filter	Check the condition of the air filter	
Presence of air bubbles inside the fuel circuit	Perform the bleeding operation	

The machine does not supply voltage

CAUSE	TROUBLESHOOTING	
Circuit breaker in OFF position	Place the circuit breaker in the ON position	
Damaged AVR fuse	Replace the fuse	
Damaged alternator	Contact a workshop authorised by the Manufacturer	

Low voltage

CAUSE	TROUBLESHOOTING	
Low engine rpm	Calibrate the engine rpm correctly	
Voltage regulator (AVR) not working properly	Calibrate or replace the regulator	

High voltage

CAUSE	TROUBLESHOOTING	
High engine rpm	Calibrate the engine rpm correctly	
Voltage regulator (AVR) not working properly	Calibrate or replace the regulator	

Unstable voltage

CAUSE	TROUBLESHOOTING	
Engine rpm variations	Check the fuel filters. If necessary, replace the filters.	
Voltage regulator (AVR) not working properly	Calibrate the stability of the regulator or replace it	

The engine emits a lot of smoke from the exhaust

CAUSE	TROUBLESHOOTING	
Lubricating oil beyond the maximum limit	Check the lubricating oil level	
Machine overloaded	Contact a workshop authorised by the Manufacturer	
Incorrect injector calibration	Contact a workshop authorised by the Manufacturer	
Clogged air filter	Check the condition of the air filter	

Dead starter battery

CAUSE	TROUBLESHOOTING	
Low battery electrolyte level	Check the electrolyte level and, if necessary, top it up	
Faulty operation of the DC alternator	Contact a workshop authorised by the Manufacturer	
Battery in bad condition	Contact a workshop authorised by the Manufacturer	

11 DECOMMISSIONING

11.1 Periods of inactivity

11.1.1 Short-term storage (machine boxed)

If the machine is not installed immediately, arrange for storage.

Proceed as indicated.

⚠ ATTENTION

Do not remove the packaging but leave the components packaged until installation.

Do not remove the protections and/or any mechanical locks used during the transport and handling phases.

1. Store the machine in a clean and dry place, protected from the elements and heat sources.
2. Identify the storage location in the immediate vicinity of the installation area.
3. Check that the support surface is stable and has an adequate load coefficient.

⚠ ATTENTION

Do not place packages or other material atop the machine.

4. Adopt all necessary measures to avoid contact of the components with dust, humidity and corrosive agents.
5. Periodically check that there are no changes in the storage conditions.

11.1.2 Long-term storage

⚠ ATTENTION

Operate the machine for at least 1 hour every month with a load between 1/4 and 3/4.

Limit periods of inactivity (even short-term) of the machine as much as possible.

Running the machine regularly allows you to:

- ***Eliminate moisture***
- ***Keep the engine lubricated***
- ***Avoid fuel stagnation resulting in loss of effectiveness (stale fuel)***
- ***Prevent oxidation of electrical contacts***
- ***Increase engine life***
- ***Increase the reliability of the machine***

In case of prolonged inactivity (period exceeding 6 months), proceed as indicated.

1. Disconnect the electrical connection.
2. Replace the engine oil.
3. Replace the oil filter cartridge.
4. Replace the fuel filter cartridge.
5. Remove the injector.
6. Put 2 cc of engine oil inside the cylinder.
7. Manually operate the crankshaft pulley to make the engine perform a few revolutions.

8. Refit the injector.
9. Replace the zinc pads.

⚠ ATTENTION

For further information on the interventions to be carried out on the engine, refer to the specific documentation provided in the attachment.

10. Vacuum some antifreeze liquid from the sea water inlet hose.
    The operation serves to protect the exchangers from low temperatures, lubricate the sea water pump impeller and the internal parts of the cooling system.
11. Disconnect the starter battery.
12. Store the battery in a clean, dry place and above 10 °C (50 °F).
13. Carry out a complete battery charge cycle once a month.
14. Protect the positive battery terminal with a film of Vaseline grease to avoid corrosion and oxide formation.

⚠ ATTENTION

Do not leave the battery completely discharged for long periods of time.
The precaution is necessary to avoid irreparable damage.

⚠ ATTENTION

Check the electrolyte level and top up if necessary with distilled water before carrying out the charging cycle.
Repeat the operation when the charging cycle is completed.

15. Disconnect the sea drain hose from the engine manifold.
16. Clean the sea water filter.
17. Close the sea water inlet cock.
18. Remove any sea water from the muffler.
19. Clean and lubricate the siphon break valve, if installed.
20. Remove dust and impurities from the external surfaces of the machine.
21. Store the machine in a clean and dry place, protected from the elements and heat sources.
22. Check that the storage location is free from the risk of fire and/or explosion.

⚠ ATTENTION

Do not store in places subject to sudden temperature changes.
The precaution is necessary to avoid the formation of condensation and/or freezing.

23. Check that the support surface is stable and has an adequate load coefficient.
24. Store the machine in a horizontal position.
25. Protect the machine adequately (suitable cover sheet or inside the original packaging).

⚠ ATTENTION

Do not seal or completely close the protective cover at the base.
Check that there are ventilation holes on the protective cover to avoid condensation inside the casing.
The presence of condensation causes oxidation of metal parts and damage to components and electrical equipment.

26. Do not place packages or other material on top of the machine.

27. Periodically check the integrity of the machine and the protective covers.
28. Periodically check that there are no changes in the storage conditions.

Carry out all periodic maintenance operations regularly, at the required intervals, with particular attention to liquids and elements subject to wear.

⚠ ATTENTION

In case of prolonged inactivity exceeding 6 months or in case of failure to comply with the above instructions, contact the Manufacturer's Assistance Service.

11.1.3 Recommissioning after a prolonged period of inactivity

NOTICE

In addition to the checks listed, also carry out the checks indicated in the paragraph6.1 - Preliminary checks.

1. Check that there are no changes in the construction parts compared to the period before storage.
2. Check the condition of the machine and all components (joints, belts, etc.).
3. Check that there is no deterioration and corrosion.
4. Check the integrity of the cables and electrical connections.
5. Check the integrity of pipes and hydraulic connections.
6. Replace all fluids and restore their levels.
7. Replace the battery.
8. Perform special maintenance with particular attention to the mechanical, hydraulic and electrical parts.

11.2 Disposal

- Disconnect and render power sources (electrical, hydraulic) unusable.
- Drain any fluids present (oils, water and antifreeze mixtures, etc.) into compliant containers of adequate capacity.
- Disassemble all parts and major components.
- Select and separate the components based on the type and construction material (metallic materials, electrical components, etc.).
- Carry out separate disposal in compliance with the laws in force in the country in which the machine is installed and used.
- Entrust the disposal of fluids and polluting materials (spent lubricants, batteries, etc.) to specialised and authorised centres.
- Do not disperse fluids or polluting materials into the environment.

⚠ ATTENTION

Do not reuse parts and/or components of the machine that have been declared no longer suitable.

The Manufacturer shall not be liable for damage to things or people related to:

- ***Reuse of components and parts of the machine declared no longer suitable***
- ***Reuse of components and parts of the machine for purposes and/or functions other than those originally intended.***

12 ACCESSORIES ON REQUEST

12.1 Accessories

A series of accessories can be supplied with the machine upon request:

Remote start panel (m 20 cable)

- spare part code - 037561

Remote start panel with display (m 20 cable)

- spare part code - 039607

Anti-siphon

- spare part code - 03796

Exhaust kit

- spare part code - 04658

Raw water filter kit

- spare part code - 016422

GRP separator and muffler kit

- spare part code - 71155 (muffler)
- spare part code - 71156 (separator)

Plastic drain kit with separator

- spare part code - 010078

Insulated pole kit

- spare part code - 040589

Oil pressure and engine temperature sensor kit

- spare part code - 039678

Parallel cable 10 m

- spare part code - 036625

Parallel instrument panel

- spare part code - 040834

13 WARRANTY AND LIABILITY

13.1 Warranty

The machine and its components are covered by warranty starting from the date of purchase for the entire period of time required by current laws.

The conditions and terms of the warranty are detailed in the certificate provided in the attachment.

Failure to comply (totally or partially) with the conditions provided in the certificate and, in general, with the conditions listed below will result in the warranty becoming void and relieves the Manufacturer of any liability.

- Failure to comply with the installation instructions and standards
- Damage due to environmental disasters
- Accidents
- Defects in the electrical system including the load to which the machine is connected
- Negligence and/or abuse by the operator
- Use of the machine for different purposes and/or in ways different from those defined and approved
- Failure to comply with the operating instructions and information contained in the Use and Maintenance Manual
- Unauthorised modifications to the machine
- Damage caused by repairs carried out by unqualified and unauthorised personnel

All repairs that cannot be carried out directly at the installation site can be carried out in the Manufacturer's facilities or at Authorised Workshops.

The transport costs for transferring the machine from the installation site to the nearest Authorised Workshop are the responsibility of the customer.

13.2 Liability limitation

The Manufacturer shall not be liable for damage or suspension of work due to incorrect uses and/or practices such as:

- Failure to comply with the installation instructions and standards
- Non-compliant electrical system and loads to which the machine is connected
- Use of the machine for different purposes and/or in ways different from those defined and approved
- Use of the machine by personnel who are not adequately trained and prepared
- Failure to comply with the operating instructions and information contained in the Use and Maintenance Manual
- Use of non-original spare parts
- Use of unsuitable fuel
- Use of the machine with safety devices deactivated, removed or ineffective
- Unauthorised modifications to the machine
- Maintenance by unqualified and unauthorised personnel
- Failure to carry out scheduled maintenance

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14 SPARE PARTS

14.1 Recommended spare parts list

The Manufacturer recommends keeping a stock of the following components on hand.

- Air filter cartridge (cod. 912685)
- Alternator belt (cod. 913706)
- Sea water pump belt (cod. 71270)
- Oil filter (cod. 910206)
- Fuel filter cartridge (cod. 912420)
- Fuel filter (cod. 911450)
- Inline fuel filter (cod. 35367)
- Water/air exchanger sacrificial anode (cod. 913778)
- Water/water exchanger sacrificial anode (cod. 913777)
- Sacrificial anode inverter plate (cod. 913854)
- Impeller (cod. 910000)
- Cruise KIT (*) (cod. 913707)

NOTICE

(*) Recommended spare parts kit to keep on board. For further information, contact the Manufacturer's Assistance Service.

14.2 How to order spare parts

⚠ ATTENTION

Replace worn or damaged components only with original spare parts.
The use of non-original spare parts can alter the functional performance and safety level of the machine.

Spare parts can be purchased from the authorised assistance network.
However, for any information you can contact the Manufacturer's Assistance Service.

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15 DOCUMENTATION PROVIDED

15.1 Attached documentation provided

The list shows the documentation released together with this Use and Maintenance manual.

- CE Declaration of Conformity
- Machine Installation Manual
- Instrument Panel User Manual
- Engine Use and Maintenance Manual
- Warranty Certificate
- Warranty postcard
- Electrical diagram.