NANNI GENERATOR SET

USER MANUAL

DGBXXT090041

Q2400 Series

Q00 TRACKED CHANGES

TRACKED CHANGES

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Please note all changes and pages associated.
For further clarity, please add a line in front of each change

Q00 TRACKED CHANGES

S00 SUMMARY

S00 SUMMARY

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S00 SUMMARY

INTRODUCTION

Before starting the unit, make sure this manual is applicable to the model to be commissioned. Refer to the identification plate if you are not sure of the designation. If you do not have the correct manual, please contact your authorized Nanni dealer.

All information and specifications in this manual are based on the technical data available at the time of publication. Changes and updates may be made by Nanni without notice.

The illustrations serve as a general guide and may differ from the equipment in some details.

If any details of the equipment are not shown or described in this manual, or if you have any questions regarding the operation of any equipment, your authorized Nanni dealer will be pleased to inform you of the correct maintenance and operating procedures. Contact an authorized NANNI INDUSTRIES S.A.S. dealer for maintenance of your engine. A list of dealers is available on our website:

www.nannienergy.com

Read this manual carefully to learn how to properly operate and maintain your unit. Failure to do so could result in personal injury or property damage. This manual should be considered an integral part of the unit and should remain with the unit, even when it is sold.

The right and left sides are determined by standing at the drive end or flywheel (rear) of the motor and facing the front of the motor.

Record the motor serial numbers and option codes (if applicable). Your Nanni agent also needs these numbers when ordering parts. File the identification numbers in a secure place. Some engine accessories, such as air filters and some instruments, are optional. These accessories may be supplied by a third party. This manual only covers the engine and options available through the Nanni distribution network.

Document of origin : Translation of the French original document.

S01 INTRODUCTION

ABOUT THIS MANUAL

This manual contains important information, tips, suggestions and warnings. Please read it carefully and familiarize yourself with the engine before starting.

For your own safety and the longest life of the engine, follow the instructions and warnings contained in this manual and in any literature supplied with the boat. Ignoring them could damage the engine or cause injury to you or others.

Please make sure this manual is always in the boat. It must always be accessible to anyone using the engine, i.e., anyone renting, borrowing or buying the engine from you.

NOTE!

This manual is not intended to replace the service manual (workshop manual). On the following pages the reader will find numerous descriptions of the generator set, its operation and maintenance, as well as tips and guidelines for troubleshooting.

Specific and important maintenance repairs are described in the workshop manual.

CONTENTS & UPDATES

All information and specifications contained in this manual are based on technical data applicable at the time of publication. Changes and updates may be made by Nanni without notice.

The illustrations are intended as a general guide, and may vary from the equipment mounted in the engine in some details.

If any details of the equipment are not shown or described in this manual, or if you have any questions about the operation of any equipment, your authorized NANNI dealer will be happy to inform you of the correct maintenance and operating procedures.

S02 SAFETY

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SAFETY SIGNALS

A SIGNAL WORD

DANGER, WARNING, or CAUTION
Is used in conjunction with the safety-alert symbol.

DANGER
Identifies the most serious hazard with lethal possible consequences.

WARNING
Identifies serious hazard with possible large injury consequences.

CAUTION
Identifies precautions to undertake which if not followed could lead to the above mentioned safety warnings. Damage to equipment could happen.

NOTICE
Is used for specific attention to sensitive actions on equipment. Other signals still applying.

IMPORTANT
Is a signal with a meaning of care to apply to equipment.

Safety Information

This symbol on the engine or in this manual is an alert to the potential for personal injury. Follow recommended precautions and safe operating practices.

Replacement Of Missing Or Damaged Safety Signs

Replace missing or damaged safety signs. There can be additional safety information contained on parts and components sourced from suppliers that is not reproduced in this Operator Manual.

Read Safety Instruction

Carefully read all safety messages in this manual and on your genset safety signs.

Keep safety signs in good condition. Be sure new equipment components and repair parts include the current safety signs.

Replacement safety signs are available from your dealer. There can be additional safety information contained on parts and components sourced from suppliers that is not reproduced in this Operator Manual.

Keep your equipment in proper working condition.

DANGER !

WARNING !

CAUTION !

IMPORTANT !

NOTE !

Please keep in mind that above safety labels have no degree of danger. Any irresponsible action could lead to a real danger situation.

Learn how to operate the equipment and how to use controls properly. Do not let anyone operate it without instruction.

Unauthorized modifications to the equipment may impair the function and/or safety and affect its life span

If you do not understand any part of this document and need assistance, contact your NANNI representative.

ENGINE - GENSET SAFETY ICONS

Some stickers are fixed directly on the engine. They are intended to help you to quickly identify the location of certain components and avoid possible hazards when working on the engine.

Ensure that these stickers are always visible and replace them if torn or washed up.

Refers to important informations and instructions to follow before handling the engine

Indicates possible electrical hazards.

Indicates hot parts entailing substantial risks of burns

Indicates an area containing pressurised fluids

Indicates hazardous rotating parts.

Stipulates that no flames or sparks should be created in the vicinity.

Indicates where to check the coolant level

Indicates where to check the engine oil level

Indicates the coolant drain orifice

Indicates the oil drain orifice

SAFETY PRECAUTIONS

HOT EXHAUST PRECAUTIONS

Servicing machine or attachments with engine running can result in serious personal injury. Avoid exposure and skin contact with hot exhaust gases and components

Exhaust parts and streams become very hot during operation. Exhaust gases and components reach temperatures hot enough to burn people, ignite, or melt common materials.

WORK IN VENTILATED AREA

Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.

If you do not have an exhaust pipe extension, open the doors and get outside air into the area.

WASTE DISPOSAL

Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used in engines include such items as oil, fuel, coolant, fluids filters and batteries.

Use leak-proof containers when draining fluids ; Do not pour waste into the sea, ground, down a drain, or into any other water source.

Contact your local environmental or recycling center, or your dealer for information on the proper way to recycle or dispose of waste.

UNWANTED ENGINE START

Avoid possible injury or death from engine runaway. Do not start engine by shorting across the starter motor solenoid terminals posts. Engine will start if normal circuitry is bypassed. Start engine from operator's seat.

S02 SAFETY

SAFE MAINTENANCE PRACTICE

Understand service procedures before doing work. Keep work area clean and dry. Never lubricate, service, or adjust engine while it is running. Keep hands, feet, hair and clothing away from moving parts.

Fix damage immediately. Replace worn or broken parts. Remove any build up of grease, oil, or debris. On self-propelled equipment, disconnect battery ground (-) before making adjustments on electrical systems or welding.

WORK IN CLEAN AREA

Clean work area and machine before starting a job. Make sure you have all necessary tools to do your job. Have the right parts on hand. Read all instructions thoroughly ; do not attempt short-cuts

PROTECTIVE CLOTHING

Wear close fitting clothing and safety equipment appropriate to the job. Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating the engine.

SERVICE ENGINES SAFELY

Tie long hair behind your head. Do not wear a neck tie, scarf, loose clothing, or necklace when you work near moving parts. If these items were to get caught, severe injury could result. Remove rings and other jewellery to prevent electrical shorts and entanglement in moving parts.

PROPER USE OF TOOLS

Use tools appropriate to the work. Makeshift tools and unfollowed procedures can create safety hazards. Do not use U.S mechanical tools on metric fasteners (i.e. a 1/2 inch wrench on a 13 mm nut).

Use power tools only to loosen threaded parts and fasteners. For loosening and tightening hardware, use the correct size tools. Avoid bodily injury caused by slipping wrenches. Use only service parts meeting manufacturer specifications..

SUPPORT ENGINES PROPERLY

Always lower the attachment or implement to the base before you work on an engine. If the work requires that the engine be lifted, provide secure system. If left in a raised position, hydraulically supported device can settle or leak down.

Do not support engines on any kind of props that may crumble. Do not work under an engine that is solely supported by a jack. Follow recommended procedures in this manual.

SAFE ILLUMINATED WORK AREA

Illuminate your work area adequately and safely. Use a portable safety light for working inside the engine room. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.

PROPER LIFTING EQUIPMENT

Lifting heavy components incorrectly can cause severe injury or equipment damage. Use expertise of staff holding relevant(s) legal capacity to operate heavy lifting equipment, with the know-how of using slings and chains.

S02 SAFETY

NOISE PROTECTION

Prolonged exposure to loud noise can cause impairment or loss of hearing. Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises

GENSET OUTPUT GENERATED POWER

Genset will deliver a sizeable amount of electrical power which can be lethal if not handled properly. Thus, any service, connection or repair on the alternator can only done by a certified marine electrician

GUARDS REQUIREMENTS

Rotating cooling system fans, belts, pulleys, and drives can cause serious injury. Keep all guards in place at all times during the engine operation. Wear close-fitting clothes.

Stop the engine and be sure that fans, belts, pulleys, and drives are stopped before making adjustments, connections, or cleaning near fans and their drive components.

STAYING CLEAR OF ROTATING DRIVE LINES

Entanglement in rotating driveline can cause serious injury or death. Keep all shields in place at all times. Make sure rotating shields turn freely

Wear close-fitting clothing. Stop the engine and be sure that all rotating parts and drive lines are stopped before making adjustments, connections, or performing any type of service on engine or driven equipment.

PAINT REMOVAL BEFORE HEATING

Avoid potentially toxic fumes and dust. Hazardous fumes can be generated when paint is heated by welding, soldering, or in using a torch.

Paint removal :

- Remove paint a minimum of 100 mm (4 in.) from area to be affected by heating. If paint cannot be removed, wear an approved respirator mask before heating or welding.
- If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area.
- Allow fumes to disperse at least 15 minutes before welding or heating.
- Do not use a chlorinated solvent in areas where welding will take place.
- Do all work in an area that is well ventilated to carry toxic fumes and dust away.
- Dispose of paint and solvents properly.

HIGH - PRESSURE FUEL SYSTEM OPENING RISK

High-pressure fluid remaining in fuel lines can cause serious injury. Do not disconnect or attempt repair of fuel lines, sensors, or any other components between the high-pressure fuel pump and nozzles on engines with High Pressure Common Rail (HPCR) fuel system.

Only technicians familiar with this type of system can perform repairs. Consult your engine representative.

AVOID HIGH - PRESSURE FLUIDS

Inspect hydraulic hoses periodically – at least once per year – for leakage, kinking, cuts, cracks, abrasion, blisters, corrosion, exposed wire braid or any other signs of wear or damage. Replace worn or damaged hose assemblies immediately with approved replacement parts.

Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard.

S02 SAFETY

SAFE COOLING SYSTEM SERVICE

Explosive release of fluids from pressurized cooling system can cause serious burns. Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.

AVOID HEAT NEAR PRESSURIZED FLUID LINES

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials.

Pressurized lines can accidentally burst when heat goes beyond the immediate flame area.

Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source.

WELDING NEAR ELECTRONIC CONTROL UNIT (ECU)

If welding is required around the engine, or in the engine room, ask first for a permission from the person in charge. Do not jump-start engine with arc welding equipment. Currents and voltages delivered are too high and may cause permanent damage. Direct welding onto the engine is forbidden.

1. Disconnect the negative (-) battery cable(s).
2. Disconnect the positive (+) battery cable(s).
3. Connect the positive and negative cables together. Do not attach to engine support frame.
4. Clear or move any wiring harness sections away from welding area.
5. Connect welder ground close to welding point and away from control units.
6. After welding, reverse Steps 1-5.

STATIC ELECTRICITY RISK

The removal of sulphur and other compounds in Ultra-Low Sulphur Diesel (ULSD) fuel decreases its conductivity and increases its ability to store a static charge. Refineries may have treated the fuel with a static dissipating additive.

However, there are many factors reducing the effectiveness of the additive over time. Static charges can build up in ULSD fuel while it is flowing through fuel delivery systems. Static electricity discharge in presence combustible vapours could result in a fire or explosion.

Therefore, it is important to ensure that the entire system used to refuel your engine (fuel supply tank, transfer pump, transfer hose, nozzle, and others) is properly grounded and bonded.

Consult your fuel or fuel system supplier to ensure that the delivery system is in compliance with fuelling standards for proper grounding and bonding practices.

HANDLE FUEL SAFELY - AVOID FIRES

Handle fuel with care: it is highly flammable. Do not refuel the engine while smoking or when near open flame or sparks. Always stop engine before refuelling.

Prevent fires by keeping engine room clean of accumulated trash, grease, and debris. Always clean up spilled fuel. Use only an approved fuel container for transporting flammable liquids.

Do not store fuel container where there is an open flame, spark, or pilot light such as within a water heater or other appliance.

BE PREPARED FOR EMERGENCIES

Be prepared if a fire starts. Keep a first aid kit and fire extinguisher handy. Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.

HANDLE STARTING FLUID SAFELY (ETHER)

Starting fluid is highly flammable. Keep all sparks and flame away if using it. Keep starting fluid away from batteries and cables.

To prevent accidental discharge when storing the pressurized can, keep the cap on the container, and store in a cool, protected location. Do not incinerate or puncture a starting fluid container. Do not use starting fluid on an engine equipped with glow plugs or an air intake heater.

Never Use it on Genset

HANDLING BATTERIES SAFELY

If not handled properly, batteries are a potential source of hazards. Excess of gases in batteries may explode. Keep sparks and flames away from batteries. Never use a cigarette lighter to observe electrolyte level. Use a flashlight to do it.

Use a flashlight to do it. Never check battery charge in shorting posts with a metal part. Use a voltmeter or hydrometer.
Always remove grounded (-) battery clamp first and replace grounded clamp last. Sulfuric acid in battery electrolyte is poisonous and strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid hazards and acid burns in :

- Filling batteries in a well-ventilated area
- Wearing eye protection and rubber gloves
- Avoiding use of air pressure to clean batteries
- Avoiding breathing fumes when electrolyte is
- Avoiding spilling or dripping electrolyte
- Using correct battery booster or charger procedure.

If acid is spilled on skin or in eyes:

- Flush skin with water
- Apply baking soda or lime to help neutralize the acid
- Flush eyes with water for 15-30 minutes.
- Get medical attention immediately.

If acid is swallowed:

- Do not induce vomiting
- Drink large amounts of water or milk, but do not exceed 2 L (2 qt.)
- Get medical attention immediately.

PREVENT BATTERY EXPLOSIONS

Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode. Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer. Do not charge a frozen battery: it may explode. Warm up battery to 16°C (60°F) before doing it.

Battery posts, terminals, and related accessories contain lead and lead compounds. Rinse hands after handling batteries.

FROST PROTECTION - WINTERIZATION

See Maintenance Section 08 - Raw Water System - Risk of icing conditions / Protection against frost.

When the engine has been set for winterization, place "DO NOT OPERATE" labels onto taps, valves, parts of equipment which have been turned off. Place a large and visible reminder on the wheelhouse dashboard.

S02 SAFETY

LIVE WITH SAFETY

Before returning engine to customer, make sure engine is functioning properly, especially the safety systems. Make sure that all guards and shields are in place.

PREVENT ACCIDENTS

When engine is OFF, always set the transmission lever to neutral position.

S03 FLUIDS

FUELS

STORING FUEL

DANGER !

Fuels and some fluids on board ships are easily flammable. Handle fuels with care and respect all safety rules. Do not refuel the tank while the engine is running. Do not smoke during the filling process or in the engine compartment. Ventilate the engine compartment before starting. Wear protective gloves and eye protective glasses. Avoid synthetic clothing which can melt when ignited. Always keep a fire extinguisher nearby.

If there is a very slow turnover of fuel in the fuel tank or supply tank, it may be necessary to add a fuel conditioner to prevent water condensation. Contact your NANNI dealer for proper service or maintenance recommendations.

DIESEL FUEL

Consult your local fuel distributor for properties of the diesel fuel available in your area.
In general, diesel fuels are blended to satisfy the low temperature requirements of the geographical area in which they are marketed.
Diesel fuels specified to EN 590 or ASTM D975 are recommended. Renewable diesel fuel produced by hydro-treating animal fats and vegetable oils is basically identical to petroleum diesel fuel. Renewable diesel that meets EN 590, ASTM D975, or EN 15940 is acceptable for use at all percentage mixture levels..

Required Fuel Properties

In all cases, the fuel shall meet the following properties:

- **Cetane number of 40 minimum**. Cetane number greater than 47 is preferred, especially for temperatures below –20 °C (–4 °F) or elevations above 1675 m (5500 ft.).
- **Cloud Point** should be below the expected lowest ambient temperature or Cold Filter Plugging Point (CFPP) should be a maximum 10°C (18°F) below the fuel cloud point.
- **Fuel lubricity** should pass a maximum scar diameter of 0.52 mm as measured by ASTM D6079 or ISO 12156-1. A maximum scar diameter of 0.45 mm is preferred.
- **Diesel fuel quality and sulfur content** must comply with all existing emissions regulations for the area in which the engine operates. DO NOT use diesel fuel with sulfur content greater than 10 000 mg/kg (10 000 ppm).

E-Diesel fuel

DO NOT use E-Diesel (Diesel fuel and ethanol blend).
Use of E-Diesel fuel in any NANNI engines may void the machine warranty

CAUTION !

Avoid severe injury or death due to the fire and explosion risk from using E-Diesel fuel.

Sulphur Content for Tier 3 and Stage III A Engines

- Use of diesel fuel with sulphur content less than 1000 mg/kg (1000 ppm) is RECOMMENDED.
- Use of diesel fuel with sulfur content 1000—2000 mg/kg (1000—2000 ppm) REDUCES the oil and filter change interval.
- BEFORE using diesel fuel with sulfur content greater than 2000 mg/kg (2000 ppm), contact your NANNI

dealer.

Sulphur Content for Tier 2 and Stage II Engines

- Use of diesel fuel with sulfur content less than 2000 mg/kg (2000 ppm) is RECOMMENDED.
- Use of diesel fuel with sulfur content 2000—5000 mg/kg (2000—5000 ppm) REDUCES the oil and filter change interval.[1]
- BEFORE using diesel fuel with sulfur content greater than 5000 mg/kg (5000 ppm), contact your NANNI dealer.

Sulfur Content for Other Engines

- Use of diesel fuel with sulfur content less than 5000 mg/kg (5000 ppm) is RECOMMENDED.
- Use of diesel fuel with sulfur content greater than 5000 mg/kg (5000 ppm) REDUCES the oil and filter change interval.

IMPORTANT!

Do not mix used diesel engine oil or any other type of lubricating oil with diesel fuel.
Improper fuel additive usage may cause damage on fuel injection equipment of diesel engines.

LUBRICITY OF DIESEL FUEL

Most diesel fuels manufactured in the United States, Canada, and the European Union have adequate lubricity to ensure proper operation and durability of fuel injection system components. However, diesel fuels manufactured in some areas of the world may lack the necessary lubricity.

IMPORTANT!

Make sure the diesel fuel used in your machine demonstrates good lubricity characteristics.

Fuel lubricity should pass a maximum scar diameter of 0.52 mm as measured by ASTM D6079 or ISO 12156-1.
A maximum scar diameter of 0.45 mm is preferred.

HANDLING AND STORING DIESEL FUEL

CAUTION !

Reduce the risk of fire. Handle fuel carefully. DO NOT fill the fuel tank when engine is running. DO NOT smoke while you fill the fuel tank or service the fuel system.

Fill the fuel tank at the end of each day's operation to prevent water condensation and freezing during cold weather.

Keep all storage tanks as full as practical to minimize condensation.

Ensure that all fuel tank caps and covers are installed properly to prevent moisture from entering. Monitor water content of the fuel regularly.

When using biodiesel fuel, the fuel filter may require more frequent replacement due to premature plugging.

Check engine oil level daily prior to starting engine. A rising oil level may indicate fuel dilution of the engine oil.

IMPORTANT!

The fuel tank is vented through the filler cap. If a new filler cap is required, always replace it with an original vented cap.

When fuel is stored for an extended period or if there is a slow turnover of fuel, add a fuel conditioner to stabilize the fuel. Keeping the free water drained and treating the bulk fuel storage tank quarterly with a maintenance dose of a biocide will prevent microbial growth. Contact your fuel supplier or NANNI dealer for recommendations.

RECOMMENDED FUEL

Approved fuel

Diesel approved by NANNI Industries on the engines of the firm are as follows :

- EN 590 (Europe),
- ASTM D975 (U.S.A and territorial waters assimilated, particularly in the Caribbean and Pacific areas),
- BS 2869 Part 1 Class A1 (G.B),
- JIS KS2204 Fuel N°02 (Japan).

These regulations are in compliance with ISO 8217 DMX.

European standard EN15940

Paraffin-based fuel that complies with European standard EN15940 can be used for all NANNI Kubota bases engines including EU Stage V.

The newly approved fuels are paraffin-based fuels that comply with European standard EN15940, including GTL (Gas to Liquid) and HVO (Hydrotreated Vegetable Oil).

Paraffinic fuels are produced from natural gas, coal, vegetable oil, animal, and vegetable fats, etc., and their main component is paraffin.

Fuels synthesized from vegetable oils and fats are called HVO, and fuels synthesized from natural gas are called GTL.

IMPORTANT!

When using these fuels, please comply with the various regulations in the area where it is used.

EN15940 (Effect on engine)

CAUTION !

1. **Paraffinic fuel is lower fuel density than diesel, so engine output may decrease.**
2. **Rubbers and elastomers used in engine parts, such as NBR, may harden and shrink more than diesel.**

BIODIESEL FUEL

Biodiesel fuel is comprised of monoalkyl esters of long chain fatty acids derived from vegetable oils or animal fats. Biodiesel blends are biodiesel mixed with petroleum diesel fuel on a volume basis.

Environmental laws and regulations can encourage or prohibit the use of biofuels. Operators should consult with appropriate governmental authorities prior to using biofuels.

IMPORTANT!

Biodiesel is not recommended by NANNI.
Raw pressed vegetable oils are NOT acceptable for use as fuel in any concentration in NANNI engines. Their use could cause engine failure.

TESTING DIESEL FUEL

A fuel analysis program can help to monitor the quality of diesel fuel. The fuel analysis can provide critical data such as calculated cetane index, fuel type, sulphur content, water content, appearance, suitability for cold weather operations, bacteria, cloud point, acid number, particulate contamination, and whether the fuel meets EN590 or ASTM D975 or equivalent specification.

MINIMIZING THE EFFECT OF COLD WEATHER ON DIESEL ENGINES

NANNI diesel engines are designed to operate effectively in cold weather.
However, for effective starting and cold-weather operation, a little extra care is necessary. The following information outlines steps that can minimize the effect that cold weather may have on starting and operation of your engine. See your NANNI dealer for additional information and local availability of cold-weather aids.

Use Winter Grade Fuel

When temperatures fall below 0°C (32°F), winter grade fuel (No. 1-D in North America) is best suited for cold-weather operation. Winter grade fuel has a lower cloud point and a lower pour point.
Cloud point is the temperature at which wax begins to form in the fuel. This wax causes fuel filters to plug. Pour point is the lowest temperature at which movement of the fuel is observed.

NOTE!

On average, winter grade diesel fuel has a lower Btu (heat content) rating. Using winter grade fuel may reduce power and fuel efficiency, but should not cause any other engine performance effects. Check the grade of fuel being used before troubleshooting for low-power complaints in cold-weather operation.

Air Intake Heater

An air intake heater is an available equipment for some engines to aid cold weather starting.

Ether

An ether port on the intake is available to aid cold weather starting.

CAUTION !

Ether is highly flammable and not recommended by NANNI. Do not use ether when starting an engine equipped with glow plugs or an air intake heater.

Coolant Heater

An engine block heater (coolant heater) is an available option to aid cold weather starting.

Seasonal Viscosity Oil and Proper Coolant Concentration

Use seasonal grade viscosity engine oil based on the expected air temperature range between oil changes and a proper concentration of low silicate antifreeze as recommended. (See DIESEL ENGINE OIL and ENGINE COOLANT requirements in this section.)

Biodiesel

Use B5 or lower blends at temperatures below 0°C (32°F). Use only winter grade petroleum diesel fuel at temperatures below -10°C (14°F).

Winter-fronts

Use of fabric, cardboard, or solid winter-fronts is not recommended with any NANNI engine. Their use can result in excessive engine coolant, oil, and charge air temperatures. This can lead to reduced engine life, loss of power and poor fuel economy. Winter-fronts may also put abnormal stress on fan and fan drive components potentially causing premature failures.

If winter-fronts are used, they should never totally close off the grill frontal area. Approximately 25% area in the center of the grill should remain open at all times. At no time should the air blockage device be applied directly to the radiator core.

DIESEL ENGINE COOLANTS

Failure to follow applicable coolant standards and drain intervals can result in severe engine damage that may not be covered under warranty. Warranties, including the emissions warranty, are not conditioned on the use of NANNI coolants, parts or service

RECOMMENDED COOLANTS

Other ethylene glycol or propylene glycol base coolants may be used if they meet the following specification:

- Pre-mix coolant meeting ASTM D6210 requirements
- Are nitrite-free
- Coolant concentrate meeting ASTM D6210 requirements in a 40—60% mixture of concentrate with quality water

If coolant meeting one of these specifications is unavailable, use a coolant concentrate or pre-mix coolant that has a minimum of the following chemical and physical properties:

- Provides cylinder liner cavitation protection according
- Is formulated with a nitrite-free additive package
- Protects the cooling system metals (cast iron, aluminum alloys, and copper alloys such as brass) from corrosion

WATER QUALITY

Water quality is important to the performance of the cooling system. Deionized or demineralized water is recommended for mixing with ethylene glycol and propylene glycol base engine coolant concentrate.

COOLANT DRAIN INTERVALS

Drain and flush the cooling system and refill with fresh coolant at the indicated interval, which varies with the coolant used.

IMPORTANT!

Do not use cooling system sealing additives or antifreeze that contains sealing additives.
Do not mix ethylene glycol and propylene glycol base coolants.
Do not use coolants that contain nitrites.

OPERATING IN WARM TEMPERATURE CLIMATES

NANNI engines are designed to operate using recommended engine coolants.

Always use a recommended engine coolant, even when operating in geographical areas where freeze protection is not required.

IMPORTANT!

Water may be used as coolant in emergency situations only.
Foaming, hot surface aluminium and iron corrosion, scaling, and cavitation occur when water is used as the coolant, even when coolant conditioners are added.
Drain cooling system and refill with recommended engine coolant as soon as possible.

WATER QUALITY FOR MIXING WITH COOLANT CONCENTRATE

Engine coolants are a combination of three chemical components: ethylene glycol (EG) or propylene glycol (PG) antifreeze, inhibiting coolant additives, and quality water.

Water quality is important to the performance of the cooling system. Deionized or demineralized water is recommended for mixing with ethylene glycol and propylene glycol base engine coolant concentrate.

All water used in the cooling system should meet the following minimum specifications for quality:

Chlorides	<40 mg/L
Sulfates	<100 mg/L
Total solids	<340 mg/L
Total dissolved I hardness	<170 mg/L
pH	5.5—9.0

IMPORTANT!

Do not use bottled drinking water because it often contains higher concentrations of total dissolved solids.

Freeze Protection

The relative concentrations of glycol and water in the engine coolant determine its freeze protection limit.

Ethylene Glycol	Freeze Protection Limit
40%	-24°C (-12°F)
50%	-37°C (-34°F)
60%	-52°C (-62°F)
Propylene Glycol	**Freeze Protection Limit**
40%	-21°C (-6°F)
50%	-33°C (-27°F)
60%	-49°C (-56°F)

DO NOT use a coolant-water mixture greater than 60% ethylene glycol or 60% propylene glycol.

TESTING COOLANT FREEZE POINT

The use of a hand-held coolant refractometer is the quickest, easiest, and most accurate method to determine coolant freeze point. This method is more accurate than a test strip or a float-type hydrometer which can produce poor results.

A coolant refractometer can be used to provides an economical solution to accurate freeze point determination in the field.

To use this tool:

1. Allow cooling system to cool to ambient temperatures.
2. Open heat-exchanger cap to expose coolant.
3. With the included dropper, collect a small coolant sample.
4. Open the lid of the refractometer, place one drop of coolant on the window and close the lid.
5. Look through the eyepiece and focus as necessary.
6. Record the listed freeze point for the type of coolant (ethylene glycol coolant or propylene glycol) being tested.

Part Number 945400245

Image with a Drop of 50/50 Coolant Placed on the Refractometer Window

LUBRICANTS

ENGINE OIL AND FILTER SERVICE INTERVALS — TIER 3 AND STAGE IIIA — OEM APPLICATIONS

Recommended oil and filter service intervals are based on a combination of oil pan capacity, type of engine oil and filter used, and sulphur content of the diesel fuel.
Actual service intervals also depend on operation and maintenance practices.

Approved Oil Types:

- API CK-4, API CJ-4, API CI-4 PLUS, API CI-4, ACEA E9, ACEA E7, ACEA E6, ACEA E5, and ACEA E4

Use oil analysis to evaluate the condition of the oil and to aid in selection of the proper oil and filter service interval. Contact your NANNI dealer or other qualified service provider for more information on engine oil analysis.

Change the oil and oil filter at least once every 12 months even if the hours of operation are fewer than the otherwise recommended service interval.

Diesel fuel sulfur content affects engine oil and filter service intervals.
- Use of diesel fuel with sulfur content less than 1000 mg/kg (1000 ppm) is RECOMMENDED.
- Use of diesel fuel with sulfur content 1000—2000 mg/kg (1000—2000 ppm) REDUCES the oil and filter service interval.
- BEFORE using diesel fuel with sulfur content greater than 2000 mg/kg (2000 ppm), contact your NANNI dealer or qualified service provider.
- DO NOT use diesel fuel with sulfur content greater than 10 000 mg/kg (10 000 ppm).

IMPORTANT!

To avoid engine damage:
- **Reduce oil and filter service intervals by 50% when using biodiesel blends greater than B20. Oil analysis may allow longer service intervals**
- **Use only approved oil types**

Oil pan capacity	Oil Pan Size (L/kW)		
	Greater than or equal to 0.10	Greater than or equal to 0.12	Greater than or equal to 0.14
Fuel Sulfur	Less than 1000 mg/kg (1000 ppm)		
Periodicity	250 hours	250 hours	250 hours
Fuel Sulfur	1000—2000 mg/kg (1000—2000 ppm)		
Periodicity	200 hours	200 hours	250 hours
Fuel Sulfur	2000—5000 mg/kg (2000—5000 ppm)		
Periodicity	150 hours	175 hours	250 hours
Fuel Sulfur	5000—10 000 mg/kg (5000—10 000 ppm)		
Periodicity	125 hours	125 hours	125 hours

Oil analysis may extend the service interval of “Other Oils”, to a maximum not to exceed the higher interval. Oil analysis means taking a series of oil samples at 50-hour increments beyond the normal service interval until either the data indicates the end of useful oil life or the maximum service interval.

DIESEL ENGINE OIL — TIER 3 AND STAGE IIIA

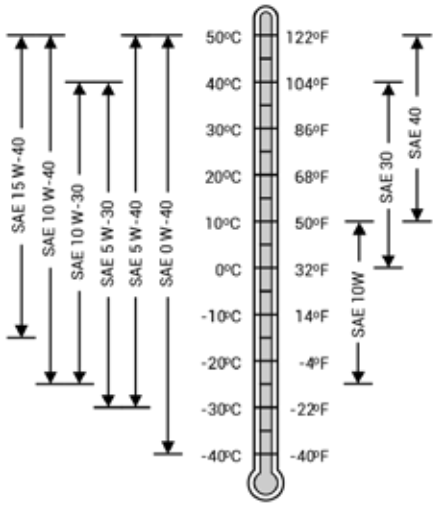
Failure to follow applicable oil standards and drain intervals can result in severe engine damage that might not be covered under warranty. Warranties, including the emissions warranty, are not conditioned on the use of NANNI parts, or service.
Use oil viscosity based on the expected air temperature range during the period between oil changes.

Oils may be used if they meet one or more of the following standards:

- API Service Category CK-4
- API Service Category CJ-4
- API Service Category CI-4 PLUS
- API Service Category CI-4
- ACEA Oil Sequence E9
- ACEA Oil Sequence E7
- ACEA Oil Sequence E6
- ACEA Oil Sequence E5
- ACEA Oil Sequence E4

Multi-viscosity diesel engine oils are preferred.

Diesel fuel quality and fuel sulfur content must comply with all existing emissions regulations for the area in which the engine operates.



Oil Viscosities for Air Temperature Ranges

DO NOT use diesel fuel with sulfur content greater than 10 000 mg/kg (10 000 ppm).

OIL FILTERS

Filtration of oils is critically important for proper operation and lubrication. NANNI brand oil filters have been designed and produced specifically for NANNI applications.

NANNI filters adhere to engineering specifications for quality of the filter media, filter efficiency rating, strength of the bond between the filter media and the element end cap, fatigue life of the canister (if applicable), and pressure capability of the filter seal. Non-NANNI branded oil filters might not meet these key NANNI specifications.

Always change oil filters regularly as specified in this manual

FUEL FILTERS

The importance of fuel filtration cannot be overemphasized with modern fuel systems. The combination of increasingly restrictive emission regulations and more efficient engines requires fuel system to operate at much higher pressures.

Higher pressures can only be achieved using fuel injection components with very close tolerances. These close manufacturing tolerances have significantly reduced capacities for debris and water.

NANNI brand fuel filters have been designed and produced specifically for NANNI engines.

To protect the engine from debris and water, always change engine fuel filters as specified in this manual.

ALTERNATIVE AND SYNTHETIC LUBRICANTS

Conditions in certain geographical areas may require lubricant recommendations different from those printed in this manual.

Some NANNI brand coolants and lubricants may not be available in your location.

Consult your NANNI dealer to obtain information and recommendations.

Synthetic lubricants may be used if they meet the performance requirements as shown in this manual.

The temperature limits and service intervals shown in this manual apply to NANNI branded fluids or fluids that have been tested and/or approved for use in NANNI equipment.

Re-refined base stock products may be used if the finished lubricant meets the performance requirements.

S03 FLUIDS

LUBRICANT STORAGE

Your equipment can operate at top efficiency only when clean lubricants are used.

Use clean containers to handle all lubricants.

Store lubricants and containers in an area protected from dust, moisture, and other contamination. Store containers on their side to avoid water and dirt accumulation.

Make certain that all containers are properly marked to identify their contents.

Properly dispose of all old containers and any residual lubricant they may contain.

MIXING OF LUBRICANTS

In general, avoid mixing different brands or types of oil. Oil manufacturers blend additives in their oils to meet certain specifications and performance requirements.

Mixing different oils can interfere with the proper functioning of these additives and degrade lubricant performance.

Consult your NANNI dealer to obtain specific information and recommendations.

DISPOSING OF WASTE FLUIDS

Prior to contemplate any draining, make sure that all adequate gear such as : funnel(s), hose(s), suitable container(s) and so on, are at hand.

Use leak-proof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Wear gloves and eye protection glasses. Follow all safety rules. Wait for engine to cool down.

Do not let waste to drip on the ground, down a city drain, or into any water source. Improperly disposing of engine coolants, oils, or other chemical fluids is a threat against environment and is an offence in many countries.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your Nanni engine representative or service dealer.

S03 FLUIDS

ENGINE IDENTIFICATION

Both the engine and the alternator have an identification plate showing important informations.

Keep these plates accessible and in good condition. Record and keep serial number and designation. These numbers should always be quoted when ordering service and replacement parts. Depending of type of engine, identification plate are as follows :

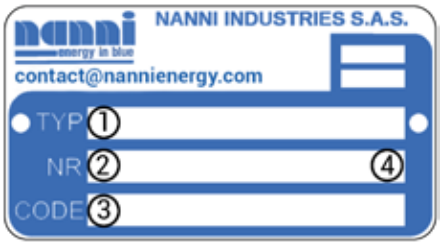
Or :

TYP	Indicates the commercial designation of the engine.
NR	Indicates the engine serial number.
CODE	Lists various specifications of the engine.

NOTE!

ID plates may differ in appearance from models shown above without any change in equipment itself.

Example :



1 : Type of engine

2 : Engine serial number

3 : Engine code

4 : Nanni engine serial number

S04 WARRANTY

ENGINE HOMOLOGATION

The engine type can be exhaust emission certified. It means that Nanni guarantees that all engines of the same type that are manufactured are approved and certified by the authorities in accordance with different exhaust emissions standards.

For the engine to be in accordance with this standards, special requirements for maintenance and service are to be followed :

Only Nanni replacement parts must be used.
Maintenance intervals must be observed.
The engine must not be modified in any way except with accessories and service kits approved by Nanni Industries S.A.S. France.
Service of the fuel system must always be carried out by an authorized Nanni workshop.
No modifications to the air intake and exhaust system may be undertaken.
Seals may only be broken by authorized personnel.
The operation instructions stated in the relevant manuals should be follow by the user.

Nanni's responsibility for the engine specification being in accordance with the certification will be void if one or several of this conditions are breached.

ENGINE RESPONSIBILITY

Nanni designs its engines to have minimum environmental impact. This objective, however, can only be achieved with your full cooperation.

Our operating and maintenance instructions are to help you to protect your engine and adopt environmentally responsible behaviour.

Ensure you only use the fuels and oils recommended. Using another type of fuel or oil could cause major malfunctions, an higher fuel consumption, a reduced engine service life, and a greater discharge of exhaust gases.

When draining the oil and changing the oil or fuel filter, dispose of the waste in an appropriate container. These fluids cause major damage to flora and fauna if discharged into nature. Use an absorption kit in the event of accidental discharge of oil or fuel into the water.

S04 WARRANTY

WARRANTY

This manual is supplemented by a Warranty Information Booklet. We recommend that you read this publication thoroughly.

Pay special attention to the applicable duty cycle and to the resulting limitations. Failure to comply with the warranty conditions will void the Warranty.

The validity of the Warranty is also dependent on proper installation and maintenance operation being carried out by an authorized Nanni representative.

NOTE!

Late or improper maintenance or use of spare parts other than NANNI original spare parts will invalidate NANNI's responsibility for the engine accordance with homologation and will void the Warranty.

Modifications to the engine's settings, as well as any other technical modification (accessories, spare parts, additional equipment, etc) **ARE FORBIDDEN WITHOUT WRITTEN AUTHORIZATION FROM NANNI INDUSTRIES S.A.S.**

Any modification will void the Warranty. Damage caused by failure to follow operation instructions or incorrect operation is also not covered by the warranty.

PROPOSITION 65 STATE OF CALIFORNIA

WARNING!

Diesel engine exhaust and some of its constituents are know to the state of California to cause cancer, birth defects, and other reproductive harm.

Battery posts and terminals, related devices do contain lead or Lead compounds, chemicals known to State of California t cause cancer, birth defects or other reproductive harm. Thoroughly wash your ands after handling any of the above components

EPA WARRANTY

EPA and CARB warranties only apply to new engines having the certification label affixed to the engine and sold as stated above in the geographic areas.

The presence of an EU number signifies that the engine has been certified with the European Union countries per Directive 97/68/EC. The EPA and/or CARB emissions warranties do not apply to the EU countries.

When applied onto engine, Emission Control label must never be removed from engine block neither covered with a layer of paint. This label is the evidence showing that the engine is meeting U.S emissions regulations. It must be kept available at anytime once the vessel has entered waters being in the scope of the North American Emission Control Area (ECA).

Emission Control System(s) Laws

The U.S. EPA and CARB prohibit the removal or rendering inoperative of any device or element of design installed on or in engines/equipment in compliance with applicable emission regulations prior to or after the sale and delivery of the engines/equipment to the ultimate purchaser.

European Union (EU) Declaration of Emissions Conformity

The presence of an EU number on the label signifies that the Marine Diesel Engine has been certified with the European Union countries per Directives 97/68/EC as amended by Directive 2004/26/EC. The EU engine family is listed on the Emissions Label.

When installed in accordance with the manufacturer's instructions, Nanni Industries Marine Diesel Propulsion Engines without integral exhaust certified under Directive 97/68/EC as amended by Directive 2004/26/EC produce exhaust emissions of carbon monoxide, hydrocarbons, nitrogen oxides and particle emissions complying with the requirements of the Recreational Craft Directive 2003/44/EC.

ALTERNATOR IDENTIFICATION

The characteristics of the alternator are mentioned on its type nameplate affixed to its casing. Never remove it or cover it with paint.

If the nameplate went to be missing at some stage, it would become very difficult to quickly determine the corresponding characteristics of the alternator.

Above : I.D plate of an alternator.

NOTE!

The generator sets are designed for long term service. There are no serviceable parts inside the alternator for the end user. In the event of a fault, consult your nearest NANNI representative.

The alternator identification plate provides to the marine electrician in charge of the installation, all the information needed to define the entire electrical system on board the vessel.

NOTE!

Any modification to the alternator will void the warranty and will be in opposition to safety regulations.

IMPORTANT!

To ensure than your generating set will always deliver efficient operation when required, start the engine and run it loaded between 50-70 % for 30 minutes every two weeks.

DO NOT allow the generator set to run unloaded for an extended period of time.

S05 COMPONENTS

S05 COMPONENTS

GENERATOR SET MAIN COMPONENTS

LIST OF COMPONENTS

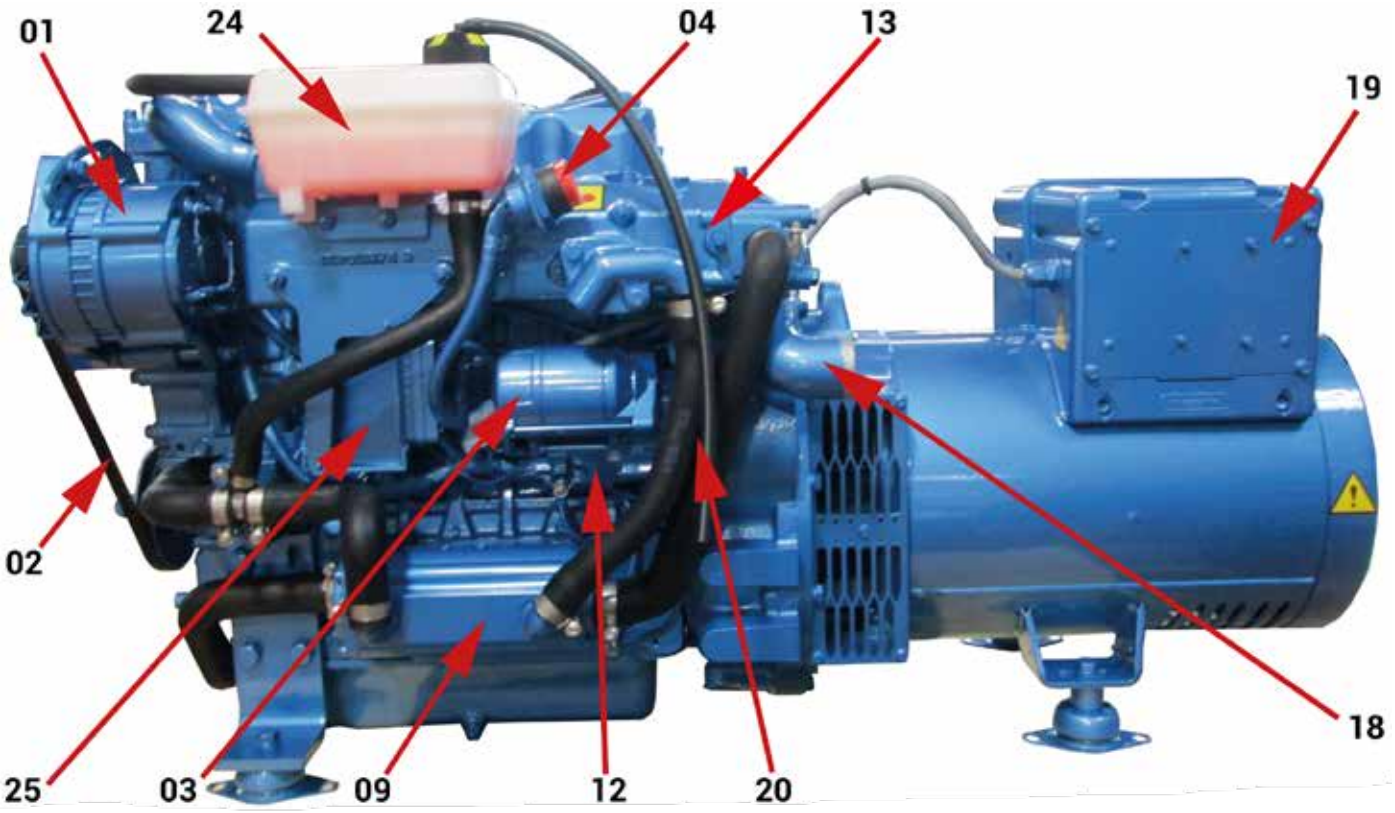
NOTE!

Minor details may differ from those shown. Some components may not be included in the order. Illustrations are not contractual.

Items	COMPONENTS
1	Engine alternator
2	Alternator belt
3	Starter motor
4	Control panel connector
5	Air filter
6	Fuel filter
7	Coolant drain plug
8	Fuel injection pump
9	Heat exchanger
10	Coolant fill plug
11	Coolant pump
12	Starter solenoid
13	Cooled exhaust manifold
14	Fuel priming pump
15	Oil filter
16	Oil filler cap
17	Oil dipstick
18	Exhaust elbow
19	Alternator
20	Oil pressure sensor
21	Raw water pump
22	Engine nameplate
23	Alternator nameplate
24	Expansion tank
25	Electronic Control Unit

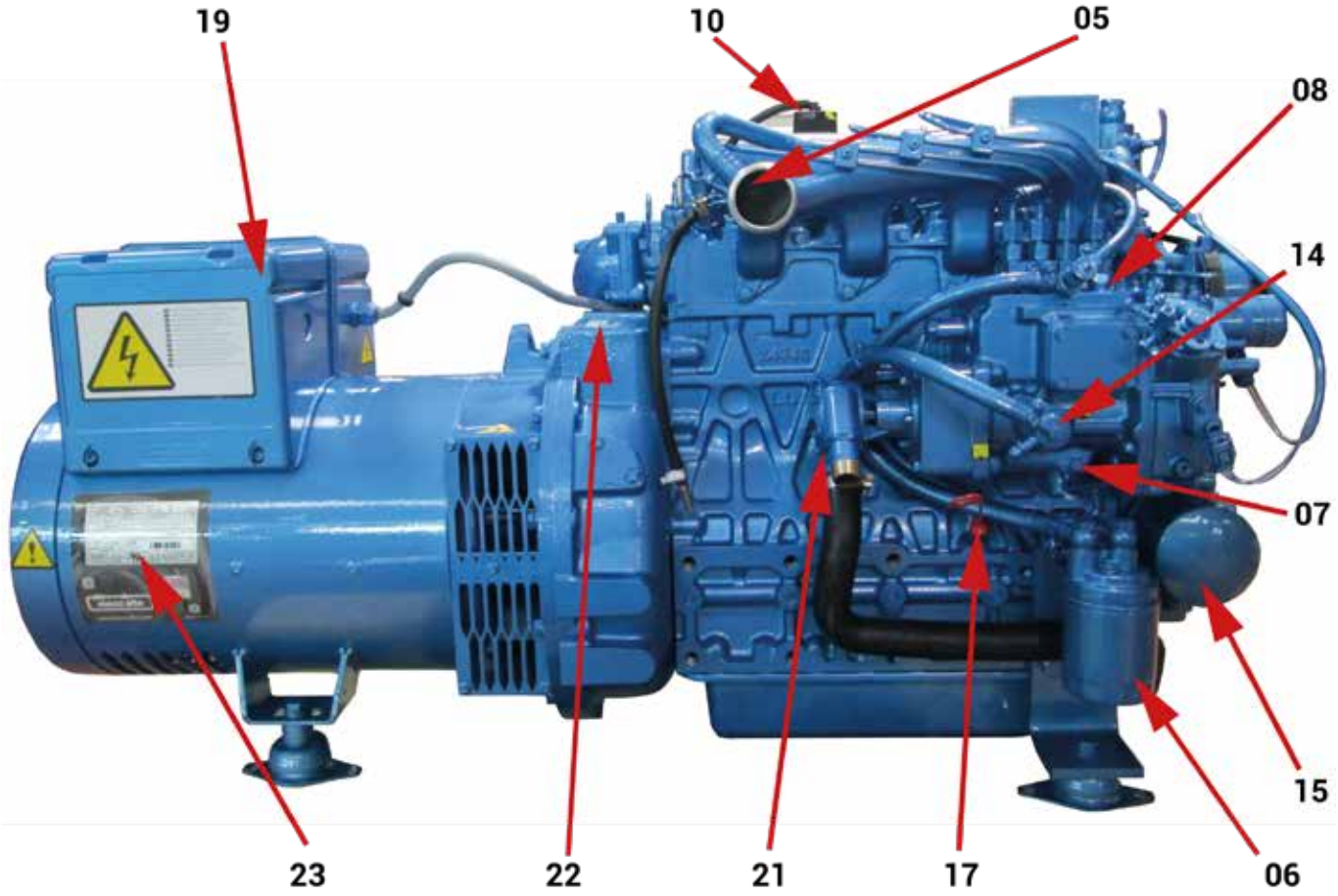
S05 COMPONENTS

VIEW N°1 OF THE GENERATOR SET

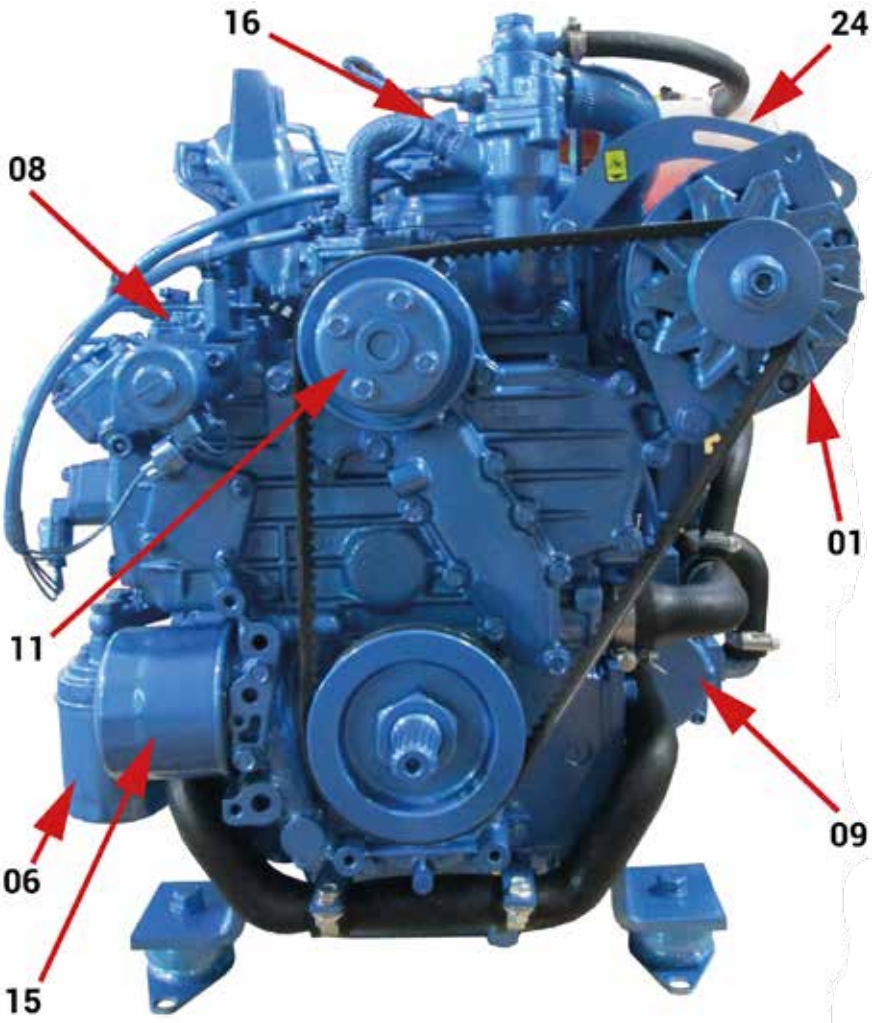


S05 COMPONENTS

VIEW N°2 OF THE GENERATOR SET



VIEW N°3 OF THE GENERATOR SET



NOTE!

- **Always lift the generating set in using the lifting eyelets. Adjust the lifting slings to lift the unit horizontally.**
- **For safety and operational reasons, never insert any objects or block the vents of the generator.**
- **Do not stand under the unit while it is being lifted/ installed.**

S06 STARTING & RUNNING

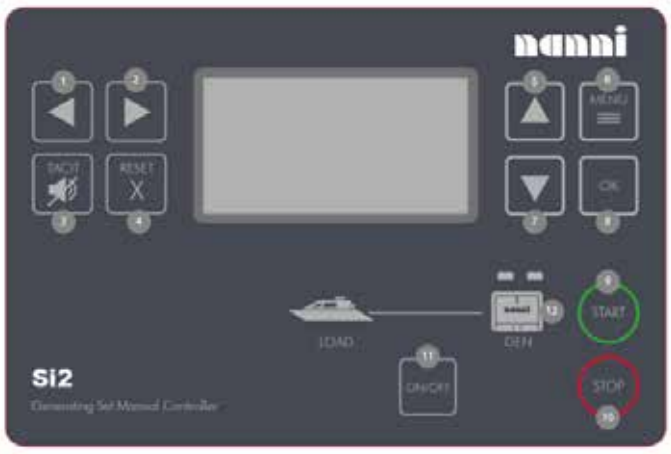
COMMAND PANEL SI-2

This panel integrates all the information necessary for the operation and monitoring of the generator set. The control panel is delivered complete in working condition and does not require any internal wiring by the user. The connection to the generator engine is made via a dedicated extension cable or installed on the sound Proof.

IMPORTANT!

The control panel must be integrated in a dash protected from splashing water.

DESCRIPTION OF THE GENERATOR SET CONTROL PANEL



Pos.	Pic.	Description
1		**LEFT button.** Use this button to move left or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed. **Note!:** **This button will not change the mode if the controller mode is forced by one of binary inputs listed in the Reference Guide – "Operating modes" chapter.**
2		**RIGHT button.** Use this button to move right or to change the mode. The button can change the mode only if the main screen with the indicator of currently selected mode is displayed. **Note!:** **This button will not change the mode if the controller mode is forced by one of binary inputs listed in the Reference Guide – "Operating modes" chapter.**
3		**HORN RESET button.** Use this button to deactivate the horn output without acknowledging the alarms.
4		**FAULT RESET button**. Use this button to acknowledge alarms and deactivate the horn output. Inactive alarms will disappear immediately and status of active alarms will be changed to "confirmed" so they will disappear as soon as their reasons dismiss.
5		**UP button**. Use this button to move up or increase value.
6		**PAGE button.** Use this button to switch over display pages.
7		**DOWN button**. Use this button to move down or decrease value.
8		**ENTER button.** Use this button to finish editing a set-point or moving right in the history page
9		**START button.** Works in MAN mode only. Press this button to initiate the start sequence of the engine.
10		**STOP button.** Works in MAN mode only. Press this button to initiate the stop sequence of the Gen-set. Repeated pressing of button will cancel current phase of stop sequence (like cooling) and next phase will continue.
11		**GCB button.** Works in MAN mode only. Press this button to open or close the GCB.
Indicators and others		
12		**GENERATOR status indicator.** There are two states – Gen-set OK (indicator is green) and Gen-set failure (indicator is red). Green LED is on if the generator voltage and frequency is present and within limits. Red LED starts flashing when Gen-set failure occurs. After FAULT RESET button is pressed, Red LED goes to steady light (if an alarm is still active) or is off (if no alarm is active).

DISPLAY SCREENS & PAGES STRUCTURES

The displayed information is structured into “pages” and “screens”. Use PAGE button to switch over the pages.

- The page Measurement consists of screens which display measured values like voltages, current, oil pressure etc., computed values like i.e. gen-set power, statistic data and the alarm list on the last screen.
- The page Set-points contains all set-points organized to groups and also a special group for entering password.
- The page History log shows the history log in the order that the last record is displayed first.

STARTING & USE

STARTING AND STOP BUTTONS

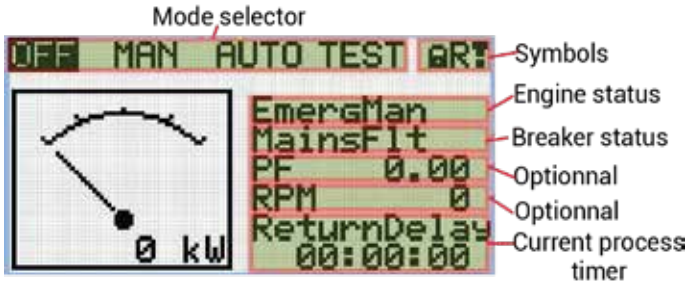
These buttons are used to start and stop the engine.

	**START button.** Works in MAN mode only. Press this button to initiate the start sequence of the engine.
	**STOP button.** Works in MAN mode only. Press this button to initiate the stop sequence of the Gen-set. Repeated pressing of button will cancel current phase of stop sequence (like cooling) and next phase will continue.

IMPORTANT!

For more information please refer to the Si-2 User Manual reference: DGBXXT09028A.

MAIN SCREEN



Symbols

- Padlock – active when LBI ACCESS LOCK is active
- R – active when there is active remote connection to controller
- Exclamation mark – active when there is any alarm in alarm list

BEFORE STARTING

FUEL SYSTEM

Fuel is drawn from the tank by the fuel feed pump and injected into the combustion chamber by the injection pump. A fuel filter is placed between the fuel supply pump and the injection pump.

The injection pump delivers more fuel than is required for combustion. The unburned fuel is returned to the tank through an overflow pipe.

CAUTION!

The injection pump is an extremely sophisticated device. The entry of water into the fuel system will result in a major failure of the injection pump and the entire fuel system.

A fuel prefilter with a water separator must be installed between the fuel tank and the engine fuel filter. The prefilter should be installed as close as possible to the engine fuel filter. It should never be installed on top of the engine because vibration affects the fuel/water separation process.

If the fuel tank is located under the engine fuel injection pump, an additional electrical supply pump must be installed between the prefilter and the engine fuel pump.

RAW WATER

The raw water system cools the engine coolant and the exhaust gases.

The raw water is drawn into the heat exchanger by the engine's raw water pump. The raw water is discharged via the exhaust elbow, where it is mixed with the exhaust gases.

The anti-siphon prevents raw water from entering the cylinders via the raw water/exhaust system.

NOTE!

A siphon is mandatory if the exhaust elbow is below the waterline at full load or less than 200 mm above. An anti-siphon is mandatory on all sail-boats and when there is a risk of water entering the engine.

A raw water filter must be installed between the raw water intake and the engine raw water pump.

ELECTRIC SYSTEM

The electrical harness of the generating set must be kept away from any splash of water and must be correctly fixed as high as possible in the hold.

The electrical diagrams related to the generator set are in the Maintenance chapter.

PRELIMINARY CHECKS

DANGER!

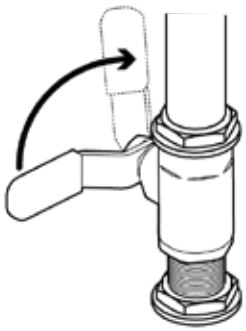
All covers must be put back in place beore starting the genset.

CAUTION!

Open the sea cock before starting the engine. The raw water pump impeller will be damaged if it runs dry, even for a few seconds, and may cause the engine to overheat.

Perform the following before starting the engine:

1. Open the sea cock. Prime if required.



2. Start the compartment fan (if applicable) for at least five minutes. Otherwise, open the bilge.
3. Check the fuel level.
4. Turn the control lever to Neutral.
5. Open the fuel valve. Prime if necessary.
6. Check engine and transmission oil level and adjust if necessary.
7. Check coolant level, and adjust if necessary.
8. Check mechanical cables and lubricate as needed.
9. Check for fluid leaks.
10. Check alternator belt tension.
11. Apply power to the electrical system.

STARTING THE GENSET

CAUTION!

Do not force continuous starting for more than 10 seconds at a time. Allow it to cool for 2 minutes between starting attempts. Failure to do so may cause the starter to overheat and burn out.

NOTE!

If the engine does not start after 3 attempts, remove the key and drain the water from the airlock. Failure to do so may result in water seeping into the cylinders. When you first start the engine, let it idle for several minutes and check for leaks or malfunction.

COLD CLIMATE START-UP

NOTE!

Engine coolant heaters should be used when temperatures are at or below 0°C (32°F).

Turn on the engine coolant heater for at least 2 hours before starting the engine. Additional information on cold weather operation is available from your Nanni engine distributor or authorized dealer.

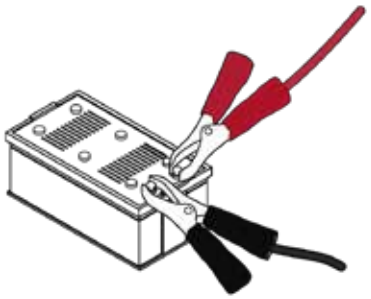
Synthetic oils improve flow at low temperatures, especially in Arctic conditions.

STARTING WITH BACK-UP BATTERIES

CAUTION!

Be sure to use batteries with the same voltage rating as the motor system voltage.

1. Connect the jumper cable to the positive (+) pole of the discharged battery, then to the positive (+) pole of the booster battery.
2. Connect the jumper cable to the negative (-) pole of the booster battery. Connect the other end to a bolt on the engine block.
3. Start the engine following the starting procedure.
4. Let the engine idle for a few minutes to charge the battery.
5. Stop the engine and remove the cables in the reverse order of installation.



Beware of polarities !

RUNNING

WHILE RUNNING

NOTE!

Never press the START button while the engine is running.

The starter solenoid would engage the pinion and start the starter, against the already moving flywheel. This action will destroy the starter.

Check the alarm lights after starting and regularly while navigating.

FUNCTIONAL ANOMALIES

Stop the engine of the unit (if possible), if there are signs of trouble. Symptoms that may be early signs of engine problems include:

- Sudden drop in oil pressure
- Abnormal coolant temperature
- Unusual noise or vibration
- Sudden loss of power
- Excessive black exhaust fumes
- Excessive fuel consumption
- Abnormal oil consumption
- Fluid leaks...

If it is not possible to stop the generator during navigation or to repair it, try to reduce the load delivered by the generator and check the whole system once back in port. If necessary, consult your local Nanni representative.

AFTER RUNNING

HOW TO STOP THE GENSET

CAUTION!

Never shut down the generator set using an "Emergency Stop" type device on the boat. This could damage the electrical system.

Turn off all devices powered by the generator set, turn the starting key on the generator set panel counterclockwise: the engine will stop and all indicators will go out.

AFTER GENSET STOP

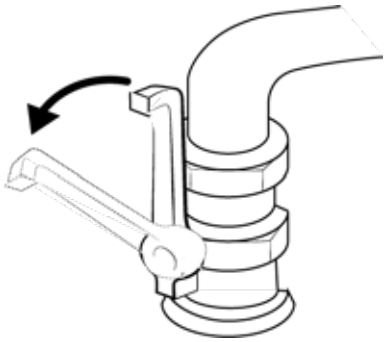
CAUTION!

After the generator set is shut down, some components and fluids remain hot and pressurized for several minutes. If possible, limit work on the engine immediately after it has stopped. Let it cool down first.

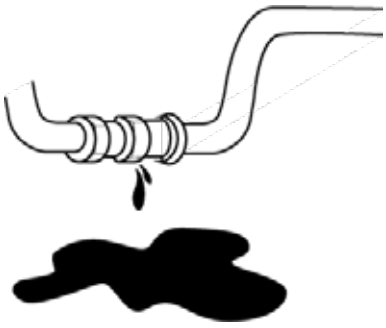
After engine stop:

1. Close the through-hull to prevent the engine from filling with raw water.

2. Close the fuel valve.



3. 3. Inspect the generator set for leaks.



CAUTION!

Do not forget to open the sea cock before restarting the group.

COLD CLIMATE PRECAUTIONS

See maintenance chapter fore more details.

CAUTION!

Keep the battery fully charged. An improperly charged battery may burst due to freezing.

S 07 MAINTENANCE

S 07 MAINTENANCE

S 07 MAINTENANCE

GENSET MAINTENANCE

ABOUT THIS MANUAL

This manual describes the preventive maintenance operations to be performed by the owner or operator of the equipment. It is not a workshop repair manual.

Performing a series of preventive maintenance operations in accordance with the maintenance intervals will ensure optimal reliability and life of the motor.

During the warranty period, it is essential to have all work performed by an authorized Nanni workshop. In addition, all service should be recorded in the Nanni after-sales system.

However, some regular checks, in particular those carried out each time the unit is used, are the duty of the end user. Nevertheless, some operations are described for emergency cases, or if there is no qualified repair shop nearby.

Repairs or adjustments to the engine by technicians not trained in marine techniques are prohibited for obvious safety reasons. Operations related to the timing and injection system are the exclusive responsibility of Nanni's trained representatives. These operations may be contrary to EPA standards or other worldwide environmental regulations.

NOTE!

The hour meter cannot be reset: it displays the total number of hours the engine has been running since the factory acceptance tests.

WARNING!

Perform maintenance with the engine stopped and cold. Remove the ignition key, put it in your pocket and turn off the power.

Read this chapter and take all necessary safety precautions before considering any maintenance or repair work. Make sure you understand how to perform each operation.

CAUTION!

Clean the engine before servicing. Watch for any oil or fluid spillage, which is a sign of leakage.

CAUTION!

Do not allow oil, fuel or grease deposits to build up around the unit as they may increase the risk of fire in the engine compartment. These deposits may hide malfunctions.

GENERALITIES

S 07 MAINTENANCE

MAINTENANCE INTERVALS

COMPONENTS	PERIODICITY					
	Daily	25 hours	Every 250 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
Fuel system						
Water in fuel - Prefilter / Draining - Cartridge	○		●			
Fuel filter (1)		●	●			
Injectors					○	
Lube system						
Oil level (1)	○					
Oil engine (1)		●	●			
Oil filter (1)		●	●			
Cooling system						
Level of cooling system (1)	○					
Cooling fluid (1)				●		
Thermostat check (1)				●		
Tared plug exchanger (1) (5)				●		
Exchanger - «O» ring seals (5)				●		
Inter-cooler - «O» ring seals (4)				●		
Raw water system						
Check & cleaning of raw water filter.	○					
Rotoer raw water pump (1)				●		
Zinc anodes (1)		○	○			
Air intake circuit & Exhaust.						
Turbococharger check (3)				○		
Waste Gate free movement and oiling (3)				○		
Thermal Protection of Turbococharger (3)				○		
Intake air filter (1)			○		●	
Exhaust elbow (1)			○			
Electricity						
Battery electrolyte level	○					
Harness connectors check		○	○			
Alternator belt tension check- Replacement (1)		○	○			●
Command panel : Indicators & Alarms lights		○	○			
Engine (Generalities)						
Engine flrxible mounts -Replacement		○	○		●	
Status of ducts / Clamps - Nuts		○	○			
Visual check (Leak cooling fluid, Fuel, oil, Sea water, etc...)	○					
Valves check					○	
Alternator						
Check all screws / Fitting bolts (2)		○	○			
Clean the cooling system (2)	○					
Status of protective vents (2)	○					
Overall cleaning (2)				○		

(1) Operations must be performed in accordance with the operation and maintenance manuals for your engine. For all technical information specific to your engine, refer to the operation and maintenance manual.
(2) Operation to be performed in accordance with the manufacturer's operation and maintenance manual.
(3) Only Q3300 & Q3800 are concerned
(4) Only Q3800 is concerned
(5) Q1100 series are out of scope

○ CHECK/AJUST/CLEAN/SERVICE/REPLACE AS REQUIRED ● REPLACE

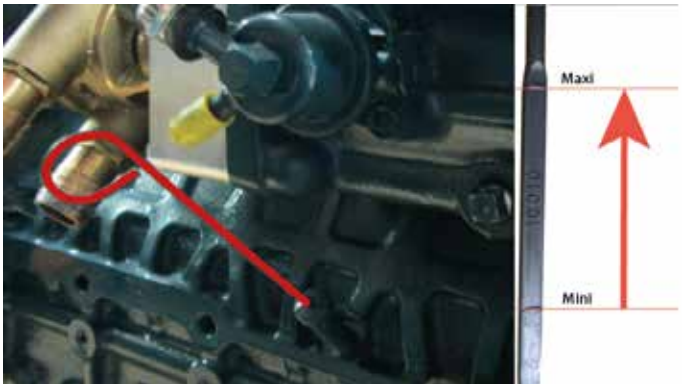
ENGINE OIL LEVEL CHECK

WARNING!

Stop the engine before oil level checking.

Oil Level Engine.

- To check the oil level, draw out the dipstick (Red circle), wipe it clean, reinsert it, and draw it out again. Check to see that the oil level lies between the two notches (Mini - Maxi).



- If the level is too low, add new oil to the specified level.

IMPORTANT!

When using an oil of different maker or viscosity from the previous one, drain old oil. Never mix two different types of oil.

NOTE!

Be sure to inspect the engine, locating it on a horizontal place. If placed on gradients, accurately, oil quantity may not be measured.

Be sure to keep the oil level between upper and lower limits of the dipstick. Too much oil may cause a drop in output or excessive blow-by gas. On the closed breather type engine in which mist is sucked through port, too much oil may caused oil hammer. While too little oil, may seize the engine's rotating and sliding parts.

ENGINE COOLANT LEVEL CHECK

Remove the expansion bowl cap (1) and check to see that the coolant level between the low and maxi level marks.

If coolant level is too low, check the reason for decreasing coolant level.

IMPORTANT!

If coolant is decreasing by evaporation, replenish only fresh, soft water. If coolant is decreasing by leak, replenish coolant of the same manufacture and type in the specified mixture ratio (mix of 50% fresh, soft water and 50% antifreeze). If the coolant brand cannot be identified, or not the same as the previous one, drain out all of the remaining coolant and refill with a totally new brand of coolant mix.

WARNING!

Do not remove the heat exchanger cap until coolant temperature is below its boiling point. Then loosen the cap slightly to relieve any excess pressure before removing the cap completely.

IMPORTANT!

During filling the coolant, air must be vented from the engine coolant passages. Be sure to close the heat exchanger cap securely. If the cap is loose or improperly closed, coolant may leak out and the engine could overheat. Do not use an antifreeze and scale inhibitor at the same time. Never mix the different type or brand of antifreeze.

ENGINE OIL REPLACEMENT

WARNING!

When changing or inspecting, be sure to level and stop the engine.

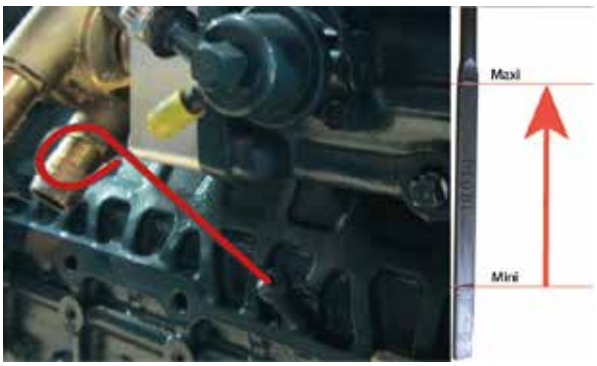
ENVIRONMENT!

Use a suitable container. Used oil must be disposed of as specified in national and international laws and regulations.

- Remove the oil dipstick

- Insert inside the hole a pipe connect with an electrical pump.
- When completely drain remove the hose and the electric pump
- Put back the oil dipstick

Oil filling



- Open the oil filling plug (**3**) and fill with new oil to the upper mark on the dipstick (Maxi). Then close the oil filling plug and run the engine few minutes; Stop the engine en check the level again. Adjust the oil level if necessary.

IMPORTANT !

When using an oil of different maker or viscosity from the previous one, remove all of the old oil. Never mix two different types of oil. Use the proper SAE Engine Oil according to ambient temperature.

Above 25 °C (77 °F)	SAE 30 or SAE 10W-30 SAE 10W-40
0 °C to 25 °C (32 °F to 77 °F)	SAE 20 or SAE 10W-30 SAE 10W-40
Below 0 °C (32 °F)	SAE 10W or SAE 10W-30 SAE 10W-40

Engine oil capacity litres (US Gal)	
Oil pan depth: 124 mm (4.88 in.)	9.5 (2.5)
90 mm (3.5 in.) (4.88 in.)	7.6 (2.0)

Fuel Type	Engine oil classification (API classification)
High Sulfur Fuel [0.05 % (500 ppm) ≤ Sulfur Content < 0.50 % (5000 ppm)]	CF (If the "CF-4, CG-4, CH-4, or CI-4" engine oil is used with a high-sulfur fuel, change the engine oil at shorter intervals. (Approximately half))
Low Sulfur Fuel [Sulfur content < 0.05 % (500 ppm)] or Ultra Low Sulfur Fuel [Sulfur Content < 0.0015 % (15 ppm)]	CF, CF-4, CG-4, CH-4 or CI-4

OIL FILTER REPLACEMENT

WARNING!

Be sure to stop the engine before replacing filter cartridge.

ENVIRONMENT!

Use a suitable container. Used oil must be disposed of as specified in national and international laws and regulations.

- Remove the oil filter cartridge (1) with the filter wrench.
- Apply a slight coat of oil onto the new cartridge gasket.
- To install the new cartridge, screw it in by hand. Over tightening may cause deformation of rubber gasket.
- After the new cartridge has been replaced, the engine oil normally decrease a little. Thus see that the engine oil does not leak through the seal and be sure to read the oil level on the dipstick. Then, replenish the engine oil up to the specified level.

IMPORTANT!

To prevent serious damage to the engine, replacement element must be highly efficient. Use only a NANNI genuine filter or its equivalent.

CHECK FUEL HOSES AND CLAMP BANDS

WARNING!

Stop the engine before check.

If the clamp (**2**) is loose, apply oil to the threads and tighten it properly.

The fuel hose (**1**) material is rubber and deteriorates naturally. Replace the fuel hose together with the clamp in a 2-years interval.

But if the fuel hose and clamp has damages before 2 years, replace them.

After replacement, bleed the fuel system. (See chapter fuel filter replacement)

Option 2

AIR FILTER BOX CONTROL & CLEAN

Remove the air filter box from the engine

Wash it with soap and water

Dry it with compressed air and reinstall on the engine; The pressure of compressed air must be less than 210 kPa (2.1 kgf/cm2, 30 psi). Tighten the clamp.

CAUTION!

Make sure that the box is completely empty of water and perfectly dry before to reinstall. Some water suck by the engine may damage it. Do not oil nor grease it. Do not operate the engine without the filter element.

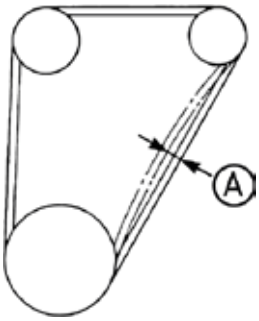
ALTERNATOR BELT

Belt tension

WARNING!

Stop the engine before work on alternator belt

Measure the deflection (A), depressing the belt halfway between the crankshaft pulley and alternator pulley at specified force 98 N (10 kgf - 22 lbf).



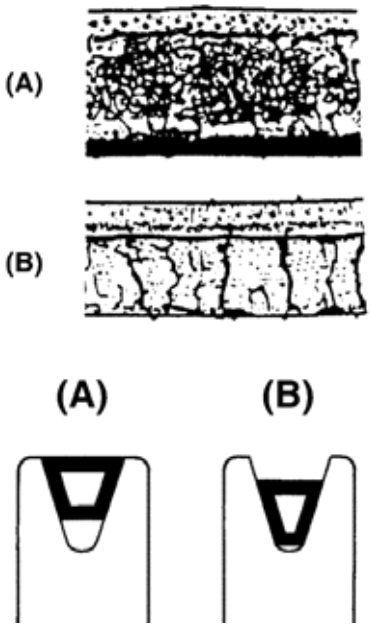
IMPORTANT!

If the measurement is not within the factory specifications, loosen the alternator mounting screws and relocate the alternator to adjust.

Deflection (A)	
Factory specification	7.0 to 9.0 mm
	0.28 to 0.35 in.

Belt damage and wear

- Check the fan belt for damage.
- If the fan belt is damaged, replace it.
- Check if the fan belt is worn and sunk in the pulley groove.
- If the fan belt is nearly worn out and deeply sunk in the pulley groove, replace it.



(A) Good - (B) Bad

Belt replacement

Removal

1. Loosen the bolt (**1**) en the tensioner guide
2. Loosen the bolt (**2**) holding the nut behind
3. Release the belt (**3**) by pushing the alternator, then remove the belt.

Installation

1. Install the new Alternator belt (**3**) as show on the picture below.
2. Push on the alternator and tighten the bolt (**1**).
3. Tighten the bolt (**2**) holding the nut behind.
4. Check the deflection and adjust if necessary.

FUEL FILTER CARTRIDGE REPLACEMENT

WARNING!

Stop the engine before replacing the fuel filter cartridge. Isolate the fuel circuit before replacing the filter.

IMPORTANT!

Water and dust contained in the tank and circuit are collected in this cartridge. Therefore it must be replaced during the first maintenance visit and every 250 hours of operation or year whichever come first.

ENVIRONMENT!

Use a suitable container. Used oil must be disposed of as specified in national and international laws and regulations.

- Remove the used filter cartridge (**1**) with the filter wrench.
- Apply a thin film of clean fuel to the new cartridge seal surface before installation.
- Hand tighten.
- Loosen the bleed screw to vent the air (2).
- Prime the circuit using the hand pump (3) until the air has been removed from the circuit.
- Tighten the bleed screw and continue pumping until circuit resistance is achieved. Start the engine and check for fuel leaks.

Bleeding the fuel system

Fill the tank with fuel. Loosen the air vent plug (**1**) of the

fuel filter by a few turns. Open fuel bleeding cock (**2**).

Engine with the electrical fuel feed pump

Turn the key to the AC position and supply the fuel with the pump for 10 to 15 seconds.

Engine with the mechanical fuel feed pump

Set the stop lever on STOP position and crank the engine with the starter for 10 to 15 seconds.

Close the air vent cock correctly after you bled the air.

Tighten the plug (**1**) when the bubbles do not come up.

Close the air vent cock (**2**) on top of the fuel injection pump.

NOTE!

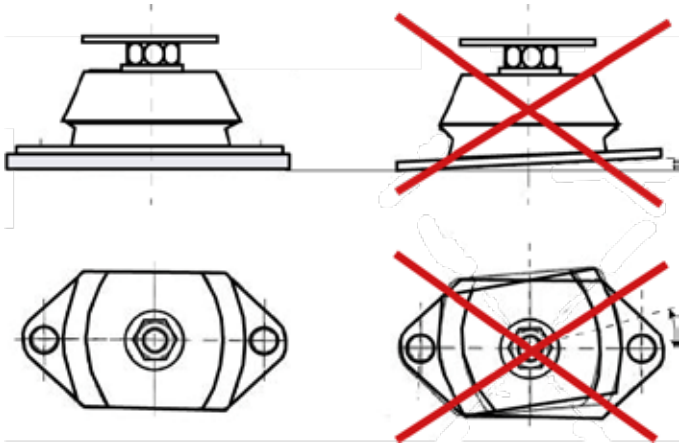
Always keep the air vent cock on the fuel injection pump closed unless when you release the air. If not, it can cause the engine to stop.

ENGINE FLEXIBLE MOUNTS

On new gensets or on gensets that are out of adjustment, make sure that the front and rear flexible mountings are set properly.

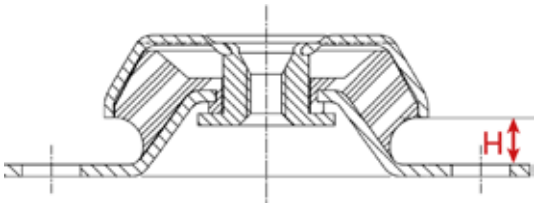
Check that the four flexible mountings are correctly positioned, then fix the mountings to the engine bed.

Twist or stress on the rubber mountings is not acceptable.



CAUTION!

Flexible mounting must be replaced every 2 years. Respect the minimal value H (8mm - 0,315 in.); if the value is below replace the engine mount.



Exhaust elbows inspections

Aluminum wet exhaust elbow:

Removal

Unscrew and remove the 4 bolts (**1**) .

Remove the exhaust elbow (2) with its gasket (**3**).

Inspect the exhaust inside and outside for corrosion and/ or leaks. Replace if necessary.

Installation

Install if necessary a new exhaust elbow with a new gasket.

Tighten the 4 bolts.

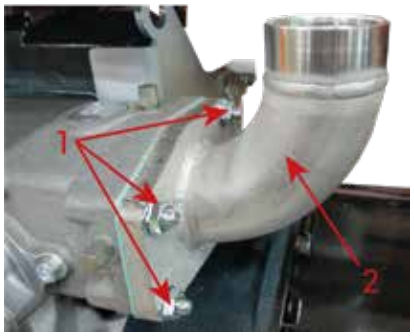
IMPORTANT!

On this type of elbow, there is no anode so no control or replacement to perform of the zinc anodes.

Stainless steel dry exhaust elbow:

Removal

Unscrew and remove the 4 nuts (**1**).



Remove the exhaust elbow (2) with its gasket (**3**).

Inspect the exhaust inside and outside for corrosion and/ or leaks. Replace if necessary.

Installation

Install if necessary a new exhaust elbow with a new gasket.

Tighten the 4 nuts.

IMPORTANT!

This type of elbow has no anode. There is no control or replacement to perform on the zinc anodes.

RAW WATER AND COOLANT SCREWS, CLAMPS, AND HOSES TIGHTENING

IMPORTANT!

Check that the hoses are correctly attached during the first maintenance visit (20 hours or at the latest 30 days after commissioning whichever comes first) and then every 250 hours of use or every year, whichever comes first.

If the hose clamps are loose, apply oil to the threads and tighten them securely.

The hoses are rubber made, in contact with heat, oil, fuel, etc.... and tend to age. They should be inspected and replaced if necessary. If any cracks appear replace immediately. Also replace the collars and tighten them firmly.

CAUTION!

To avoid serious engine damage, prevent dust and foreign object from getting inside hoses.

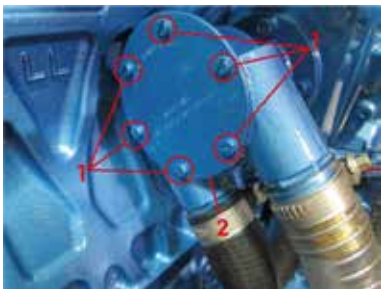
RAW WATER IMPELLER PUMP REPLACEMENT

CAUTION!

Before replacing the seawater pump impeller, make sure that the sea water valves are all closed and the engine is stopped.

Close the seawater suction and discharge valves.

Unscrew and remove the 6 screws from the cover (**1**)and the cover (**2**) from the seawater pump.



Remove the paper seal and clean the contact surface.

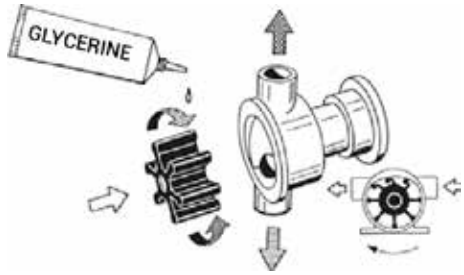
Pull the impeller (**3**) out of the seawater pump using a pliers.

Inspect the inside of the pump for wear, and clear away debris. Change worn out components as necessary.

Change the impeller shaft seal as necessary.

Lubricate the lip seal with glycerin (do not lubricate mechanical seal).

Lubricate the inside of the pump with the glycerin included in the kit. 6. Install the new impeller with a rotating movement in the direction that the impeller will turn in, please refer to the illustration.



Lubricate the gasket with glycerine. Install the O-ring/ gasket and cover..

CAUTION!

Do not use any petroleum-based products to lubricate the inside of the pump. Only use glycerine. Other products can damage the impeller, which will damage the pump and lead to engine failure. Do not run the impeller without water or lubricant, this can cause engine failure or a fire.

COOLANT FLUID REPLACEMENT

WARNING!

Do not remove the heat-exchanger pressurized cap when the engine is hot. Then loosen the cap slightly to release the excess pressure before removing it completely.

ENVIRONMENT!

Use a suitable container. Used oil must be disposed of as specified in national and international laws and regulations.

Coolant drain

1. Stop the engine and allow it to cool.
2. To drain the coolant, remove the drain plugs (**1**) on the engine block on the bottom of the injection pump.

3. Remove expansion bowl cap (**2**) and the plug (**3**) on the exhaust gas manifold.

4. Unscrew clamps (**4**) and remove the hoses (**5**) and (**6**).

5. When all the liquid has been drained, refit the drain plugs and hoses. Fill the circuit with clean water without calcareous and a cleaning agent for the cooling system.

Coolant filling

1. Fill in the expansion tank by the opening (**2**) until maximum level.
2. Let the coolant filling the circuit and fill again to the maximum level.
3. Repeat the step 1 and 2 until total coolant the level is stabilized to the maximum level.
4. Reinstall the pressurized plug (**2**).
5. Start the genset and let it few minutes.
6. Stop the genset and allow it to cool. Check the coolant level in the expansion bowl and add coolant if necessary.

CAUTION!

Do not start the engine without coolant. Use a mixture of 50% clean, fresh, non calcareous water and 50% antifreeze to top up the exchanger.

CAUTION!

For the water-antifreeze mixture, the proportion of antifreeze must be 50%. Tighten the radiator plug securely. If the cap is loose or not properly raised, water may drip and the motor may overheat.

CAUTION!

Do not use antifreeze and scale inhibitor at the same time. Never mix different types or brands of coolants or antifreeze. This coolant must be replaced every 2 years or 500 hours whichever comes first.

ANTI-FREEZE

There are two types of anti-freeze available: use the permanent type (PT) for this engine.

Before adding anti-freeze for the first time, clean the heat exchanger interior by pouring fresh, soft water and draining it a few times.

The procedure for mixing water and anti-freeze differs according to the make of the anti-freeze and the ambient temperature

Basically, it should be referred to SAE J1034 standard, more specifically also to SAE J814c.
Mix the anti-freeze with fresh, soft water, and then fill into the heat-exchanger.

IMPORTANT!

When the anti-freeze is mixed with fresh, soft water, the antifreeze mixing ratio must be 50 %.

Vol % Anti-freeze	Freezing point		Boiling point*	
	°C	°F	°C	°F
40	-24	-11.2	106	222.8
50	-37	-34.6	108	226.4

** At 1.013 × 100000 Pa (760 mmHg) pressure (atmospheric). A higher boiling point is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.*

IMPORTANT!

The above data represents industrial standards that necessitate a minimum glycol content in the concentrated anti-freeze.

IMPORTANT!

When the coolant level drops due to evaporation, add fresh, soft water only to keep the anti-freeze mixing ratio less than 50 %. In case of leakage, add anti-freeze and fresh, and soft water mixed in the specified ratio.

IMPORTANT!

Anti-freeze absorbs moisture. Keep unused anti-freeze in a tightly sealed container.

IMPORTANT!

Do not use cleaning agents when anti-freeze has been added to the coolant (Anti-freeze contains an anti-corrosive agent, which will react with the cleaning agent forming sludge which will affect the engine parts.).

HOSES & CLAMPS REPLACEMENT

NOTE!

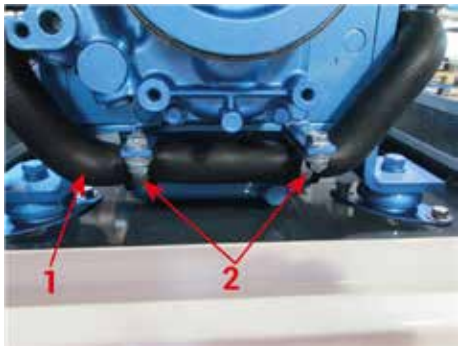
The pictures shown may differ from your model.

Coolant & Sea water circuit

WARNING!

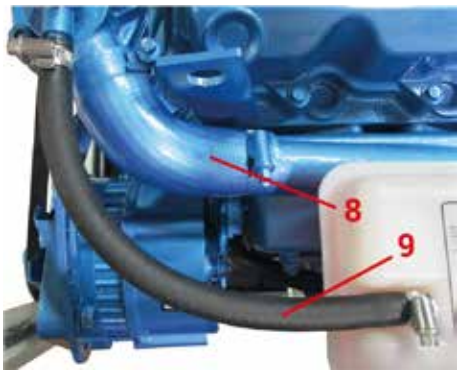
Do not remove the heat-exchanger cap when the engine is hot. Then loosen cap slightly to the stop to relieve any excess pressure before removing cap completely.

1. Drain the coolant.
2. Unscrew all the clamp bands.
3. Remove the 2 RSGU clamps (2).



4. Remove the sea water hose (3)

5. Remove the coolant hose (4), (5), (6), (7), (8) & (9)



6. Inspect and replace the sea water, coolant hoses and clamp bands if necessary.
7. Tighten the clamp bands.

Specification	
Clamp bands - Torque	5 N·m (3.69 ft-lbs)

8. Fill with clean water and anti-freeze until the coolant level is just below the port. Install the radiator cap securely.

Fuel circuit

1. Loosen the clamps (2) and remove the fuel hoses (1).

2. Replace new fuel hoses (1) using hoses kit and 7 new clamps.
3. Tighten the clamp (2).

WARNING!

Stop the engine when attempting the check and change prescribed above.

4. When bleeding fuel system (see fuel filter replacement)

Specification	
Clamp bands - Torque	3 N·m (2.21 ft-lbs)

IMPORTANT!

Except when venting the air, be sure to keep closed the air vent coupling bolt of the fuel injection pump. Otherwise, the engine may stall.

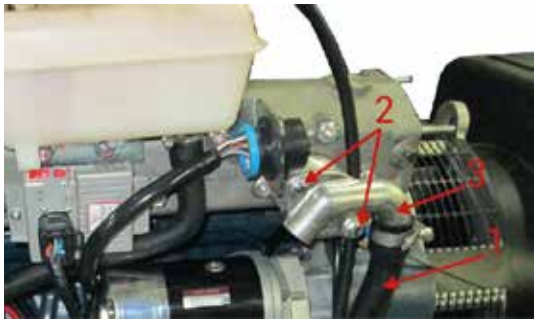
THERMOSTAT REPLACEMENT

WARNING!

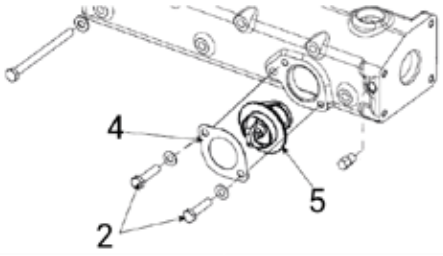
Stop the engine before replacing the thermostat. Do not remove the thermostat from the heat exchanger until the coolant temperature is too high. The thermostat replacement must be done every 2 years or 400 hours whichever comes first.

Thermostat removal:

1. Drain the coolant (see concerned chapter).
2. Unscrew the clamp and remove the coolant hose (see chapter hoses and clamps replacement)
3. Remove the two screws(**2**) holding the thermostat cover and remove the thermostat cover (**3**) with its gasket (**4**).



4. Remove the thermostat (**5**) with its gasket (**4**).



Thermostat installation:

1. Reinstall the thermostat (**5**) in the correct position (Label facing downwards).
2. Reinstall the cover (**3**) with a new gasket (**4**), then refit and tighten the two screws (**3**).
3. Fill the coolant with liquid as recommended by NANNI (see related chapter).
4. Bleed the circuit and start the engine to check for leaks.

Thermostat Valve Opening Temperature

1. Push down the thermostat valve and insert a string between the valve and the valve seat.
2. Place the thermostat and a thermostat in a container with water and gradually heat the water.

3. Hold the string to suspend the thermostat in the water. When the water temperature rises, the thermostat valve will open, allowing it to fall down from the string. Read the temperature at this moment on the thermometer.
4. Continue heating the water and read the temperature when the valve has risen by about 6 mm (0.2 in.).

Specifications	
Thermostat's valve opening temperature	69.5 to 72.5°C (157.1 to 162.5 °F)
Temperature at which thermostat completely opens	85 °C (185 °F)

CAUTION!

If the measurement is not acceptable, replace the thermostat.

PRESSURIZED FILLING CAP REPLACEMENT

1. Remove the cap from the heat exchanger tapped plug.

2. Reinstall a new heat exchanger cap.

WARNING!

Do not remove the heat exchanger cap while the coolant temperature is too high. Then loosen the cap slightly to release the residual pressure before removing it completely.

CAUTION!

Close the heat exchanger cap carefully. If the cap is loosened or improperly closed, the coolant may leak and cause the engine to overheat.

CAUTION!

The pressurized cap replacement must be done every 2 years or 500 hours whichever comes first.

HEAT EXCHANGER MAINTENANCE

WARNING!

Do not remove the heat exchanger cap (1) when the engine is hot. Then loosen the cap slightly to release the excess pressure before removing it completely.

Coolant draining.

- See chapter coolant replacement.

Coolant hoses removal

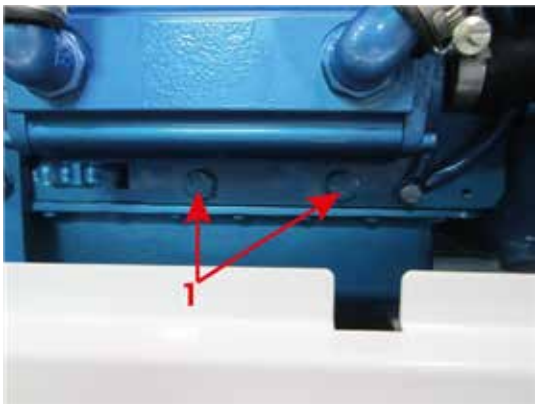
- See chapter hoses & clamps replacement

Raw water hoses removal

- See chapter hoses & clamps replacement

Heat Exchanger removal

Unscrew and remove the 3 bolts (**1**) and remove the heat exchanger with its support.

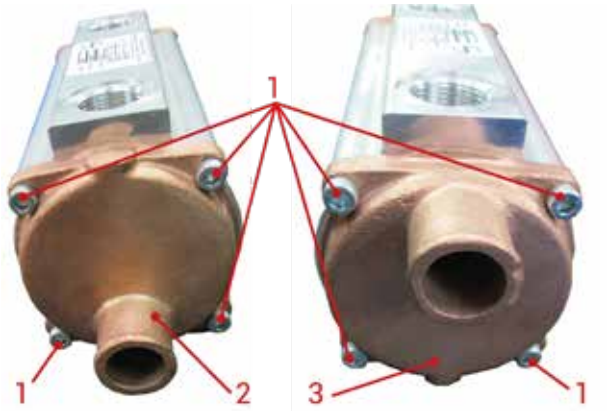


WARNING!

Do not start the engine without coolant or the isolated seawater circuit.

Heat Exchanger Dismantling

1. Unscrew and remove the 8 screws (1).



2. Remove the inlet cover (2).
3. Remove the outlet cover (3).
4. Remove the 2 O-rings (**4**) and push the tube stack (**5**) to take out of the heat exchanger body (**6**)

Heat Exchanger Core Cleaning.

1. Clean the cooler core on the outside with paraffin base engine detergent.
2. Remove any internal deposit using a round rod.
3. Replace the cooler corer if it is damaged.

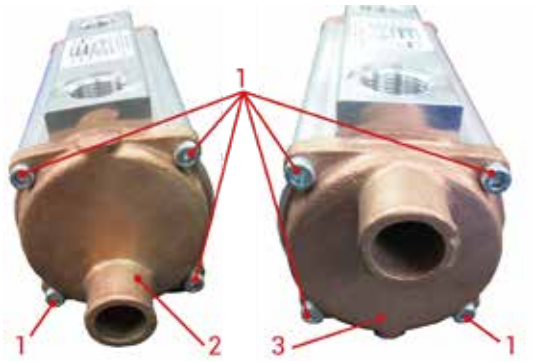
CAUTION!

Do not use caustic soda as this could damage the core.

Heat exchanger reassembly

1. Place new O-rings (1) at both ends of the tube stack. Insert it in the exchanger body.

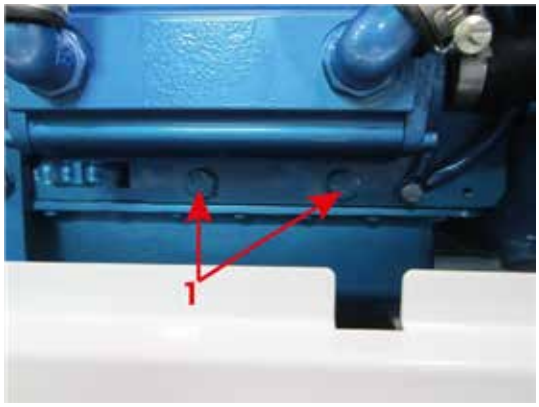
2. Put the 2 covers in place (**2** and **3**) using the 8 screws (**1**).



3. Tighten the screws to the required torque.

Heat exchanger Installation

1. Install the heat exchanger and its support assembly using the 3 bolts (**1**) with their 3 GROWER Washer.



2. Tighten the bolts.

Coolant hoses installation

- See chapter hoses & clamps replacement

Raw water hoses installation

- See chapter hoses & clamps replacement

Coolant circuit filling.

WARNING!

Do not start the engine without coolant. Use a mixture of 50% clean, fresh, non calcareous water and 50% anti-freeze to top up the exchanger. For the water-antifreeze mixture, the proportion of antifreeze must be 50%. Tighten the heat exchanger cap securely. If the cap is loose or not properly raised, water may drip and the engine may overheat. Do not use antifreeze and scale inhibitor at the same time. Never mix different types or brands of coolants or antifreeze.

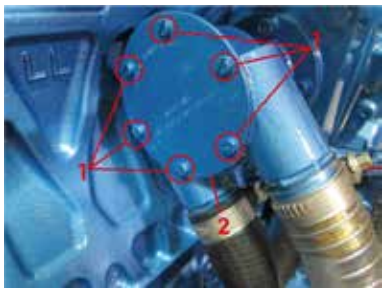
- See chapter coolant replacement.

RAW WATER PUMP IMPELLER REPLACEMENT

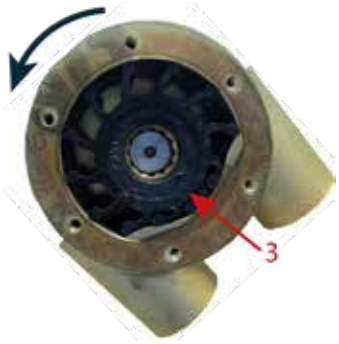
WARNING!

Before replacing the seawater pump rotor, make sure that the seawater valves are all closed and that the engine cannot be started.

1. Remove the 6 screws (**1**) from the cover, and then the cover (**2**) from the pump.



2. Remove the fiber seal.



3. Remove the rotor (**3**) from the pump body with a pair of pliers.

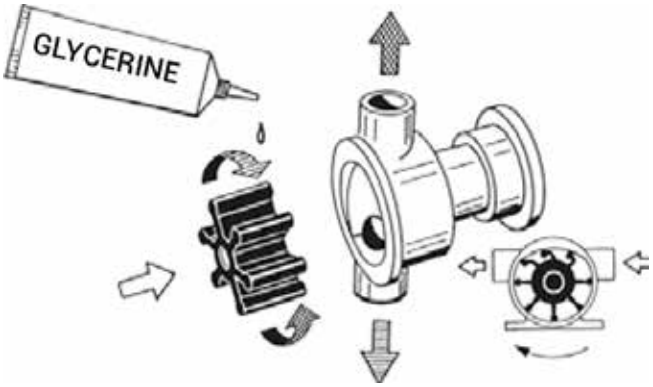
4. Inspect the inside of the pump for damage and remove any dirt. Replace worn components if necessary.

5. Replace the impeller shaft seal if necessary.

6. Lubricate the lip seal with glycerine (do not lubricate the mechanical seal).

7. Lubricate the inside of the pump with the glycerine included in the kit.

8. Install the new rotor with a turning motion in the direction it will turn.



9. Lubricate the seal with glycerine.

10. Install the new gasket and cover.

CAUTION!

Do not use petroleum-based products to lubricate the inside of the pump. Use only glycerine. Other products can damage the rotor, which will damage the pump and cause engine failure.
Do not run the pump dry and unlubricated, as this may cause engine failure or fire.

SEA WATER PUMP REPLACEMENT

WARNING!

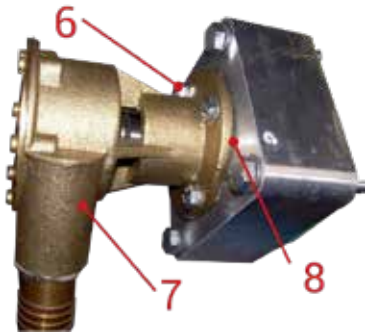
Never work on the seawater circuit without taking care to isolate the suction and discharge valves.

Sea Water Pump Removal

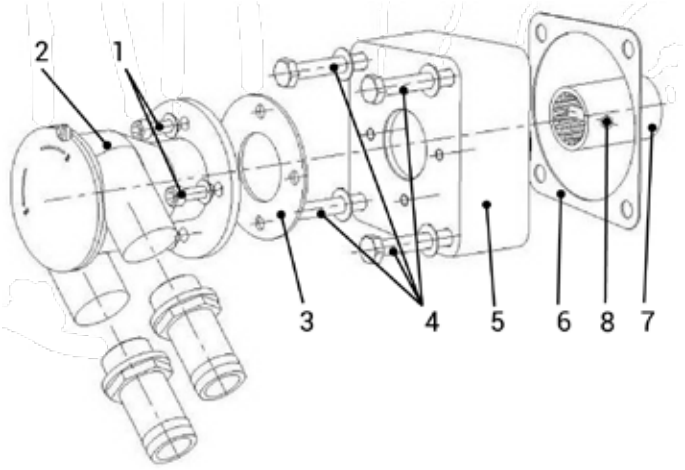
1. Unscrew clamps (**1**) and remove the hose (**2**).

2. Unscrew the bolts (**3**) and remove the pump with the spacer (**4**) with it gasket (**5**)

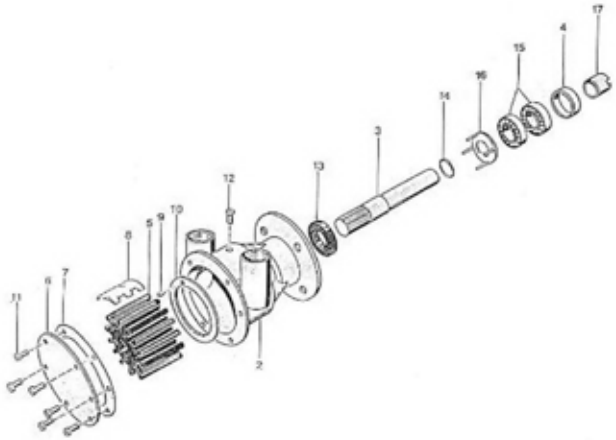
3. Unscrew and remove the 4 bolts (**6**) when remove the sea pump (**7**) with the gasket (**8**)



Sea Water Pump overview



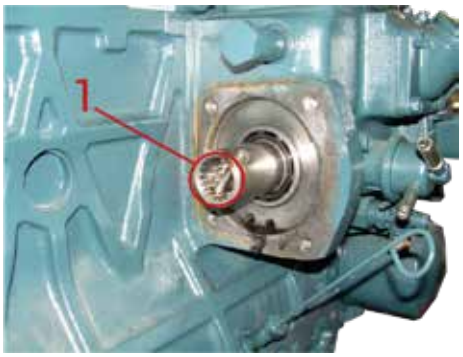
1	*Bolts*	*5*	*Pump flange*
2	*Sea water pump*	*6*	*Gasket*
3	*Gasket*	*7*	*Splined hub*
4	*Bolts*	*8*	*Pump connecting pn*



1	*Sea Water pump (1 to 17)*	*10*	*Plate*
2	*Pump Housing*	*11*	*Cover screw*
3	*Pump shaft*	*12*	*Cam screw*
4	*Guide*	*13*	*O-Ring*
5	*Impeller*	*14*	*O-Ring*
6	*Cover*	*15*	*Ball bearing*
7	*Gasket*	*16*	*Washer*
8	*Cam*	*17*	*Coupling*
9	*Pin*		

Sea Water Pump Installation

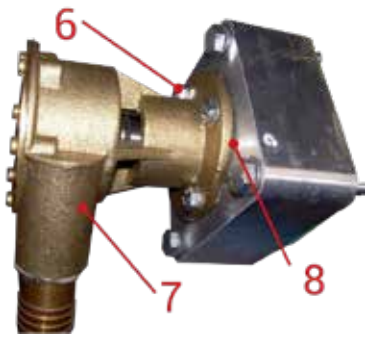
1. Install the splined hub (**1**) after inspection of the driving pin. If the pin is damage replace the splined hub.



IMPORTANT!

Position the fluted hub so that the seawater pump is turned 45° downwards.

2. Replace the gasket (**8**) and after greasing install the sea water pump (**7**) using 4 bolts (**6**) with their corrugated washers.



3. Install the pump and spacer assembly (**4**) with a new gasket (**5**) using bolts (**3**) and their corrugated washers.

4. Install the hose (**2**) using clamps (**1**).

Specifications	
Clamp bands - Torque	5 N·m (3.69 ft-lbs)

BATTERIES

CAUTION!

To avoid accidental short circuit, be sure to attach the positive cable to the positive terminal before the negative cable is attached to the negative terminal.

Never remove the battery cap while the engine is running. Keep electrolyte away from eyes, hands and clothes. If you are spattered with it, wash it away completely with water immediately.

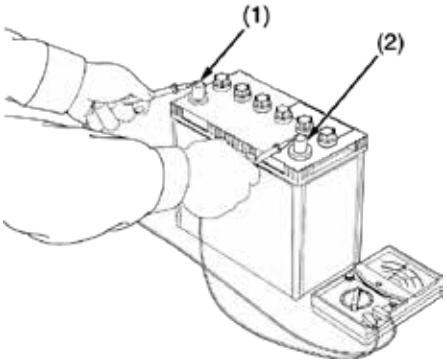
Keep open sparks and flames away from the battery at all times. Hydrogen gas mixed with oxygen becomes very explosive.

IMPORTANT!

If the machine is to be operated for a short time without battery (using a slave battery for starting), use additional current (lights) while engine is running and insulate terminal of battery. If this advice is disregarded, damage to alternator and regulator may result.

Battery Voltage

Stop the engine prior to measure the voltage with a circuit tester between the battery terminals.



(1) Positive Terminal (2) Negative Terminal

IMPORTANT!

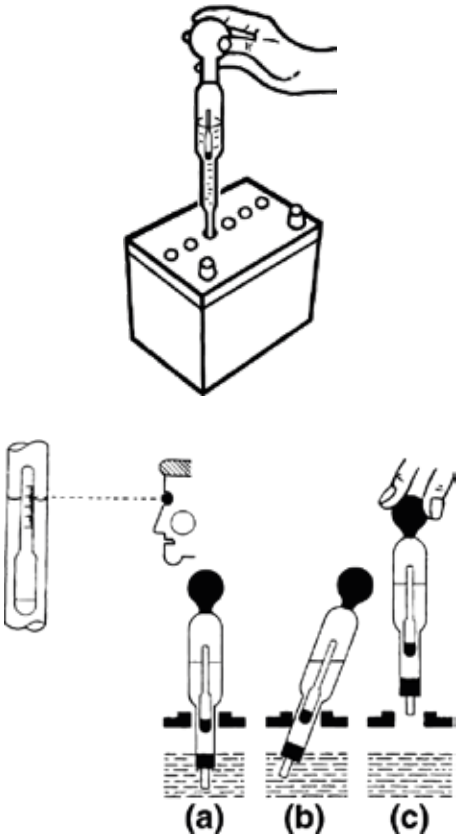
If the battery voltage is less than the factory specification, check the battery specific gravity and recharge the battery.

Specifications	
Battery voltage - Factory specification	More than 12 V

Battery Specific Gravity

Check the specific gravity of the electrolyte in each cell with a hydrometer.

When the electrolyte temperature differs from that at which the hydrometer was calibrated, correct the specific gravity reading following the formula mentioned on the right.



(a) Good - (b) Bad - (c) Bad

IMPORTANT!

If the specific gravity is less than 1.215 (after it is corrected for temperature), charge or replace the battery.

If the specific gravity differs between any two cells by more than 0.05, replace the battery.

NOTE!

Hold the hydrometer tube vertical without removing it from the electrolyte. Do not suck too much electrolyte into the tube.

Allow the float to move freely and hold the hydrometer at eye level.

The hydrometer reading must be taken at the highest electrolyte level.

Specific gravity slightly varies with temperature. To be exact, the specific gravity decreases by 0.0007 with an increase of 1 °C (0.0004 with an increase of 1 °F) in temperature, and increases by 0.0007 with a decreases of 1 °C (0.0004 with a decrease of 1 °F.

Therefore, using 20 °C (68 °F) as a reference, the specific gravity reading must be corrected by the following formula :

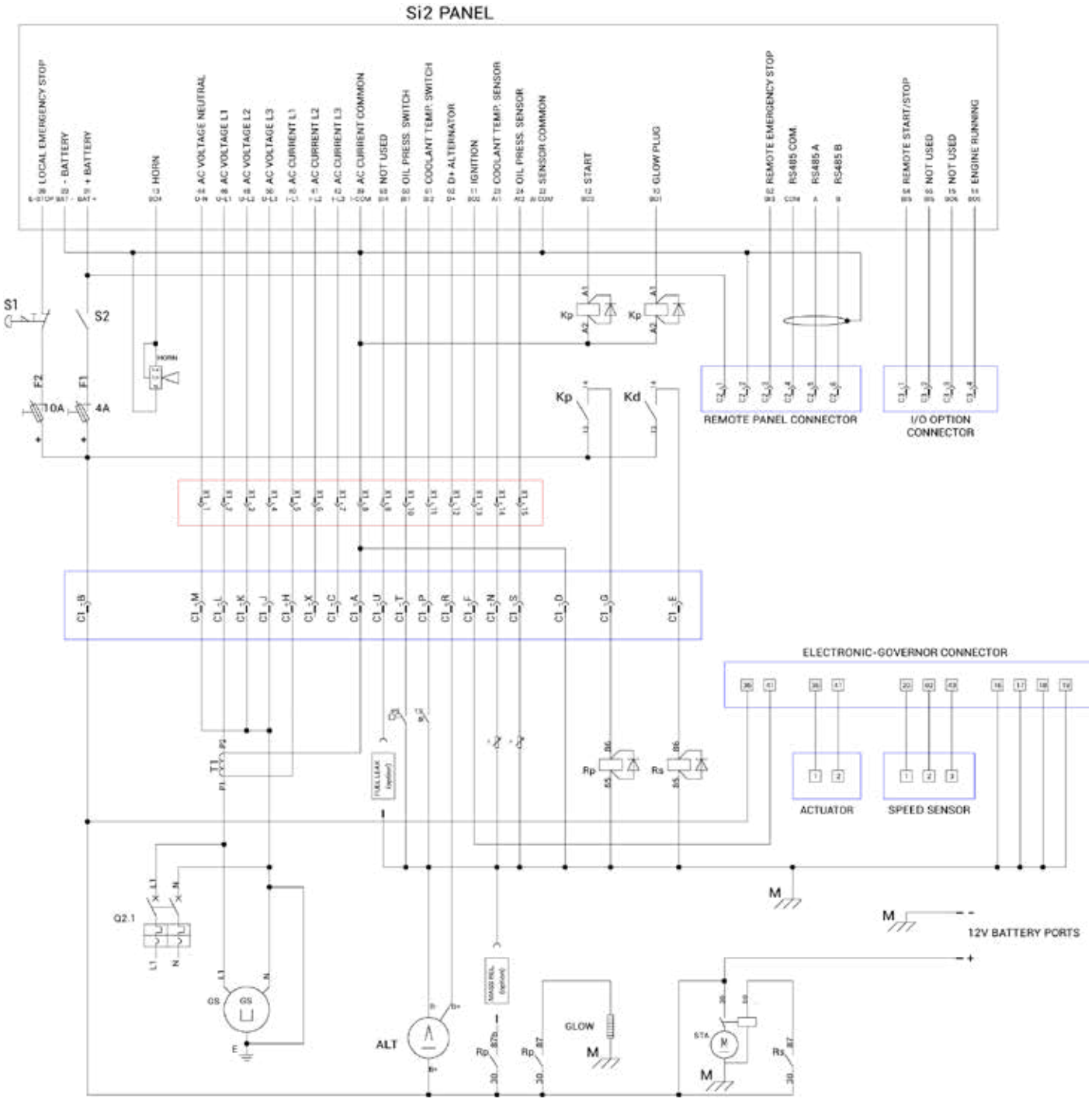
Specific gravity at 20 °C = Measured value + 0.0007 × (electrolyte temperature - 20 °C).

Specific gravity at 68 °F = Measured value + 0.0004 × (electrolyte temperature - 68 °F).

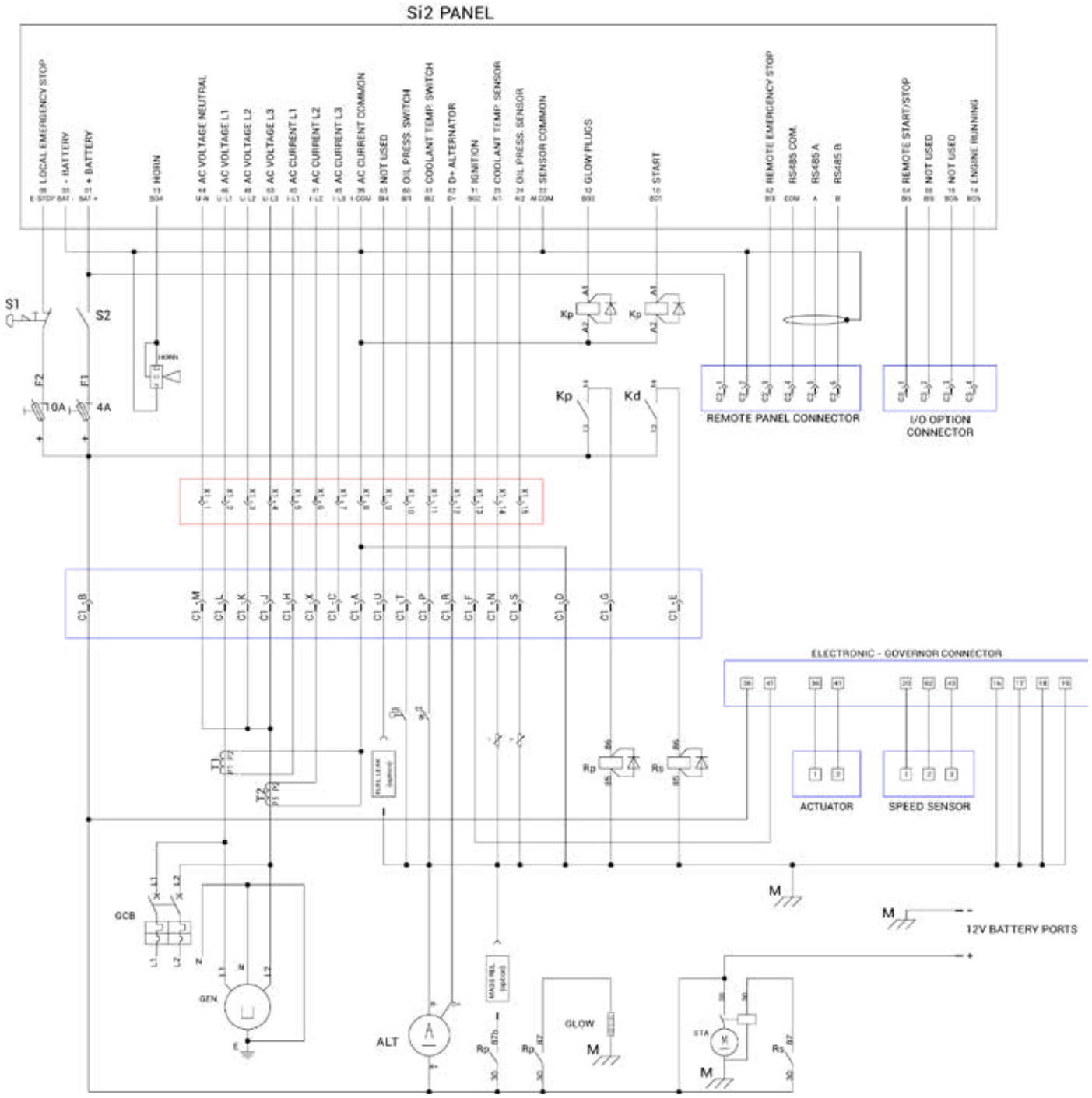
Specific Gravity	State of Charge
1.260 Sp. Gr.	100 % Charged
1.230 Sp. Gr.	75 % Charged
1.200 Sp. Gr.	50 % Charged
1.170 Sp. Gr.	25 % Charged
1.140 Sp. Gr.	Very Little Useful Capacity
1.110 Sp. Gr.	Discharged

At an electrolyte temperature of 20 °C (68 °F)

ELECTRIC DIAGRAM (50Hz - SINGLE PHASE)



ELECTRIC DIAGRAM (60Hz - SINGLE PHASE)



S 07 MAINTENANCE

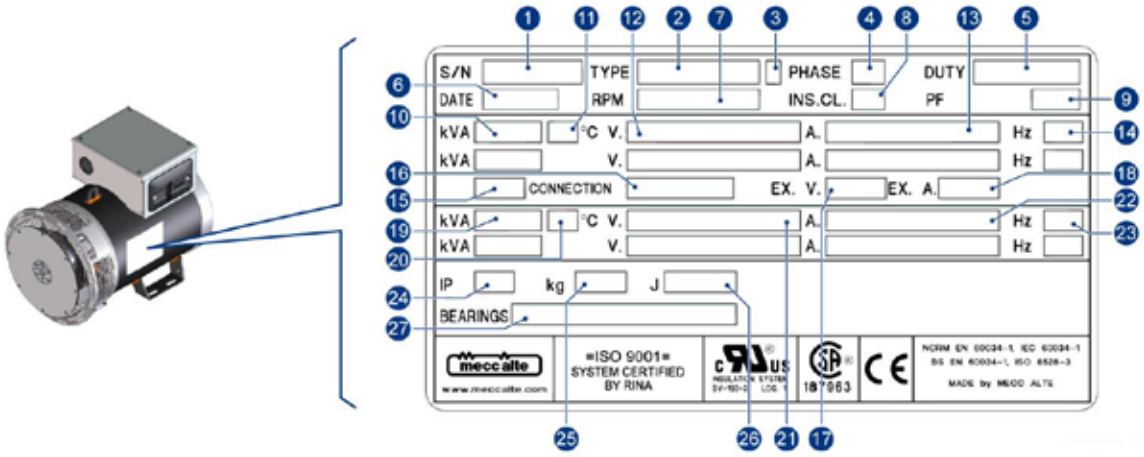
S08 ALTERNATOR

S08 ALTERNATOR

ALTERNATOR (20CM50 - 24CT50 - 23CM60 & 27CT60)

MARKING DATA

Alternator Nameplate



The ECP series alternators are self-regulating brushless alternators with 2 or 4 poles.

They are equipped with a rotating field (1) with a damping cage and a fixed armature with inclined grooves.

The winding is short-pitch to reduce harmonics.

EMC testing has been carried out to standard specifications with the neutral wire earthed.

N°	Identification
1	Serial number
2	Model
3	Update Index
4	Nomber of phases
5	Service Type
6	Mfg Date mm/yyyy
7	Rated rotating speed
8	Insulation class
9	Power factor
10	Rated power vs temperature
11	Max ambient temperature
12	Rated voltage
13	Rated current
14	Rated frequency

N°	Identification
15	Nominal characteristics class
16	Connection type
17	Excitation Voltage
18	Excitation Current
19	Power related to temperature (20)
20	Ambient temperature
21	Nominal Voltage
22	Current related to power (19)
23	Nominal Frequency
24	Protection Rating
25	Total weight
26	Moment of inertia
27	Bearing type

S08 ALTERNATOR

ALTERNATOR OVERVIEW

ECP Series alternators are self-regulated, 2 or 4-pole brushless alternators.

They are equipped with a rotating inductor (1) fitted with a damper cage and stationary armature with inclined grooves.

The winding is short pitched so as to reduce the harmonics.

The electromagnetic compatibility tests were carried out in compliance with the standard specifications, with the neutral wire connected to ground.

Testing in accordance with other specifications may be carried out on request of the customer.

The mechanical structure, always very robust, allows easy access to the connections and inspections of the various components.

The case is made of steel, the shields are made of aluminum/cast iron, the shaft is made of C45 steel with a fan splined onto the shaft.

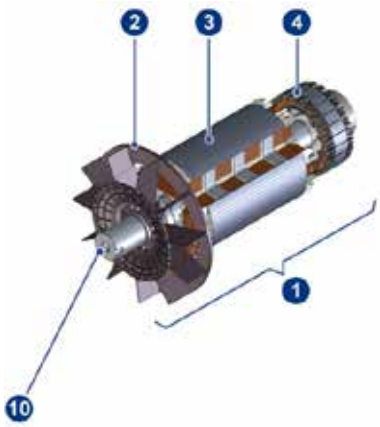
The protection rating is IP23 (higher protection ratings can be achieved on request).

Insulation is of class H standard.

The impregnations are realized with polyester resin for the rotating parts and with vacuum treatment for the parts that have higher voltage such as for instance the stators.

Special treatments may also be carried out on request

5. Terminal Box
6. Stator Frame
7. Mounting Feet
8. Protection Grid



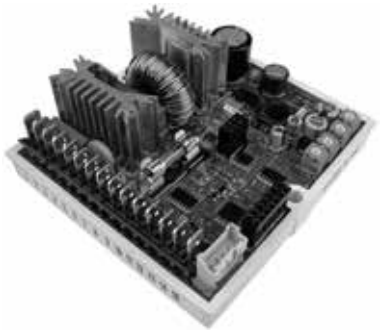
1. Rotating Inductor
2. Cooling fan
3. Main rotor
10. Shaft

Main components

9. Front Cover

DSR Digital Regulator

Standard supply comes with the DSR on the 28-32-34 series.
The regulator is normally installed in the alternator terminal box.



S08 ALTERNATOR

GENERAL DESCRIPTION AND WORKING PRINCIPLE

The drive motor is connected to the flange and disks (1) of the alternator.

The alternator rotor, started up by the drive motor, generates electricity.
The cables for the electric power supply to the user are connected on the terminal block inside the "terminal box" (2).

The DSR digital regulators are equipped with an LED Indicator. During normal operation the LED blinks with a 2-second period and a 50% duty cycle (1 second on, 1 second off), in case of faults it flashes differently.

TECHNICAL DATA

IP Protection Rating

The alternator is built with an IP23 protection rating.

Radial Loads

Maximum allowable radial loads applied to shaft projection, for double-bearing alternators.

Radial torque [N.m]
4000

Noise level [dB(A)]

50 Hz		60 Hz	
1 m	7 m	1 m	7 m
68	57	71	61

Weight

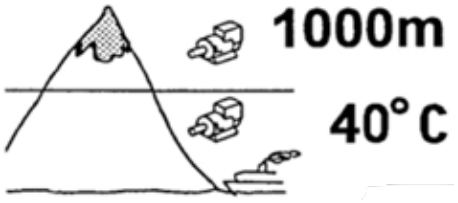
Model	Weight [Kg]
VL4 C	141,8

Materials

The table below contains the approximate percentages of the materials used in the alternators.

Material	Percentage
Steel	45 %
Steel foundry	20 %
Copper	20 %
Aluminum	10 %
Plastic	3 %
Electronic	2 %

Operating temperature



Max ambient temperature to guarantee the nominal power:	40°C
Max operating altitude to guarantee the nominal power:	Less than 1000 m

S08 ALTERNATOR

Install the alternator in a well-aired room. Insufficient ventilation may cause overheating and malfunctioning of the alternator.
For required air volumes, see installation manual DGBXXT13006A

ALTERNATOR SAFETY

IMPORTANT!

See "Safety" chapter for more information about genset safety.

Alternator Safety devices

The safety devices of the alternator are:

1. Protection screen on the front shield.
2. Cover of terminal box.
3. Rear cover.

DANGER!

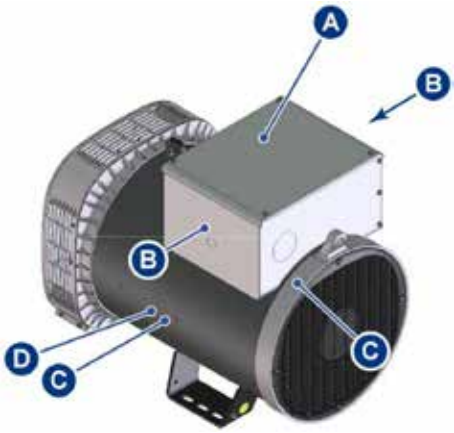
During operation, these protections must be in place

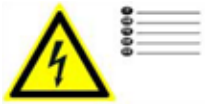
Safety tags

CAUTION!

Do not remove under any circumstances the tags attached to the alternator.

The following safety tags are attached to the machine



Position	Label	Description
A		Read manual before removing covers.
B		Danger !
C		Danger - Electricity !
D		Danger - Hot surface !

CAUTION!

The labels must be replaced if they are worn out or cannot be read anymore.

Personal Protective Equipment

CAUTION!

The staff in charge with the operation of the alternator must wear the personal protective equipment (PPE) indicated in the table below.

PPE	Operation
	Always wear
	Maintenance or lifting the alternator or its components.

CAUTION!

The operator must observe the accident prevention regulations in force in the specific country where the alternator is used.

CAUTION!

The PPE assigned may not be altered. The manufacturer disclaims all responsibility for any potential damages caused to people by failure to use the PPE.

Residual risks

The alternator presents the following residual risks:

DANGER!

Burning risk. The working alternator may release heat even to a high level.
Before touching the alternator wait for it to cool off.

CAUTION!

Risk of crushing while lifting.
Do not stand under the suspended load, do not come close to it, use adequate PPE.

Conventional symbols and symbols description

IMPORTANT!

This symbol warns the personnel concerned that the described operation may cause damages to the machine if it is not carried out according to the safety standards.

CAUTION!

This symbol warns the personnel concerned that the described operation may cause damages to the machine and/or injures to the personnel if it is not carried out according to the safety standards.

WARNING!

This symbol warns the personnel concerned that the described operation may cause serious injuries or death to the personnel if it is not carried out according to the safety standards.

DANGER!

This symbol warns the personnel concerned that the described operation may immediately cause serious injuries or death to the personnel if it is not carried out according to the safety standards.

HANDLER

This symbol identifies the type of operator in charge of the operation described.
This qualification requires a complete knowledge and

understanding of the information contained in the manufacturer's instruction manual as well as specific skills about the hoisting means, slinging methods and features and safe handling procedures.

MECHANICAL SERVICE MAN

This symbol identifies the type of operator in charge of the operation described. This qualification requires a complete knowledge and understanding of the information contained in the manufacturer's instruction manual as well as specific skills necessary to perform installation, adjustment, maintenance, cleaning and/or repair operations

ELECTRICAL SERVICE MAN

This symbol identifies the type of operator in charge of the operation described. This qualification requires a complete knowledge and understanding of the information contained in the manufacturer's instruction manual as well as specific skills necessary to perform electrical operations such as connections, adjustment, maintenance and/or repair.
The electrical service man must be able to work even in case electrical cabinets and panels are live.

In case of exceptional operations and upon written request of servicing operations please apply to NANNI authorized dealer.

Before installing the generator, arrangements must be made to earth the machine.
This is the reason why you must make sure that the grounding system is in good conditions and in compliance with the regulations of the country where the generator will be installed.

CAUTION!

The final installer is responsible for the installation of all protection (Sectioning devices, protections against direct and indirect contacts, over-current and over-voltage protections, emergency stop, etc.), necessary for the machine to comply with existing international / European safety regulations.

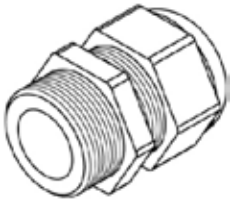
The generator must be installed in an airy room. If there is not enough air, a malfunction or an overheating may occur.

All entry doors into generator room should be clearly marked “Authorized persons only”.

ELECTRICAL CONNECTION

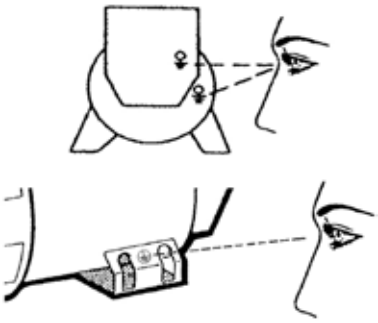
The operation must be carried out by an electrical maintenance technician.

The electrical connection shall be provided by the end user and it is carried out at his sole discretion



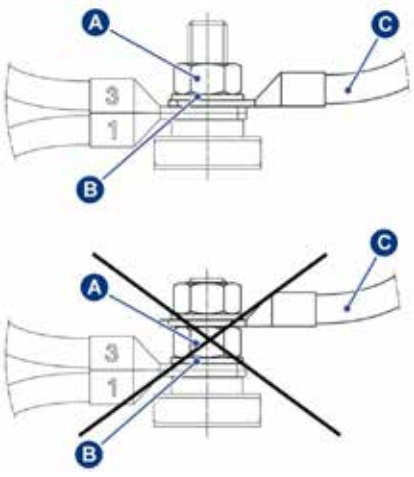
For the entry into the terminal box it is advisable to use cable glands and cable reliefs in compliance with the specifications of the user country

The alternators must always be grounded with a grounding conductor of an appropriate size. Use one of the two dedicated terminals (internal/external).



For the electrical connection use adequate cables, sized on the basis of the alternator power. Make the connections to the terminals as shown in the figure.

- A) Hexagon nut
- B) Plain washer
- C) User cable



Once the connection was made check the terminal tightening torques that must comply with the instructions given in chapter “General Tightening Torques”

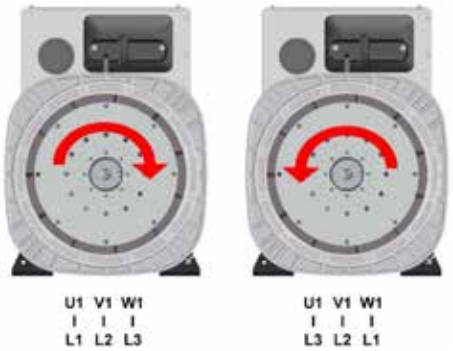
When the connection is finished reassemble the cover of the terminal box.

NOTE!

The user power cables must be wired and supported adequately so as not to cause mechanical stress on the terminal block of the alternator

Phase rotation and sequence

All the fans of the ECP alternators are designed to rotate bidirectionally.

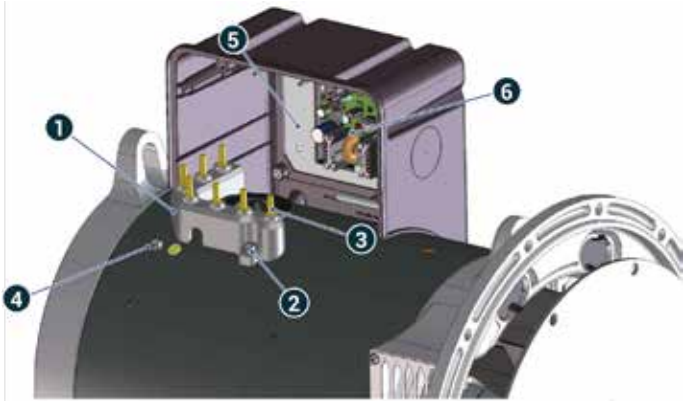


Clockwise rotation, seen from the coupling side: the order of the outgoing phases is L1, L2 , L3.
Anticlockwise rotation, seen from the coupling side: the order of the outgoing phases is L3, L2 , L1 (the order is reversed).

Winding connection modalities

The alternators are manufactured with 12 standard outgoing cables in order to allow different voltage output, for instance, at 50 Hz, 115 V (ΔΔ) / 200 V (YY) / 230 V (Δ) / 400 V (Y).

TERMINAL BOARD CONFIGURATIONS



Position	Components
1	7 x M6 terminals
2	Fixing screws and washers
3	Torque N.m
4	Self-tapping screw M6 x 25-9N.m
5	Regulator support
6	Regulator
7	Support panels

Position	Components
1	M6 7-pin terminal board
2	Self-forming TE screw M6x16 (n.2)
	Tightening torque 9Nm
3	Tightening torque Nm
4	Self-forming TE screw M6x25
	Tightening torque 9Nm
5	Regulator holding panel
	TE M6x16 screw(n.4)
	Tightening torque 9Nm
	TE M6 UNI 5587 nut (n.4)
6	Regulator
	TC M4x20 screw (n.2)
	Tightening torque 1.5Nm
	Toothed washer Ø4 (n.4)
	TE M4 UNI 5587 nut (n.2)

S08 ALTERNATOR

MAINTENANCE GENERALITIES

General Instructions

CAUTION!

Before executing any maintenance operation, read carefully the instructions in chapter 3 “Safety” of this manual

CAUTION!

The authorized operators are only allowed to carry out the works they are specifically qualified for on the alternator and wear the required PPE (personal protective equipment).

CAUTION!

Always disconnect the alternator from power supplies before carrying out any maintenance and/or replacement operation.

CAUTION!

The alternators, when working, release heat even to a high level based on the power being generated. Before touching it wait for the alternator to cool off.

DANGER!

It is forbidden to pass through or stand under the alternator during the lifting and transportation stages

NOTE!

It is advisable for the maintenance technician to keep a register of all the interventions.

The ECP series alternators are built to operate without maintenance for a long time.

The maintenance interventions on the alternator are divided into ordinary and extraordinary.

Maintenance summary table

Type	Description	Periodicity
M	Alternator exterior and interior cleaning	Every 15 days
M	General cleaning	Every 400 hours
M	Air filter cleaning (if present)	Every 400 hours of use
M	Visual Inspection	Every 2500 hours
M	Verification of winding state	Every 2500 hours
M	Verification of correct alternator operation	Every 2500 hours
M	Tightening torque check	Every 2500 hours

Acronyms of the intervention types: E = Electrical; M = Mechanical; S = Software

Summary table of extraordinary maintenance operations

Type	Description	Periodicity
M	Maintenance and potential replacement of bearings	Every 4000 hours
E	Winding state and diode bridge fastening check	Every 8000 hours / 1 year
S	Copy of the alarms of the digital regulator	Every 8000 hours / 1 year
M	Cleaning of windings	Every 20000 to 25000 hours

Acronyms of the intervention types: E = Electrical; M = Mechanical; S = Software

S08 ALTERNATOR

ORDINARY MAINTENANCE

Air filter cleaning (if present)

Type of intervention	Operator
	
PPE to wear	**Periodicity**
	Every 400 hours of use
Materials and equipments	
Cleaning tools	

DANGER!

Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies.

NOTE!

The intervention periodicity indicated refers to critical environmental conditions. Adapt the periodicity based on the actual conditions of use.

The air filters are accessories that are assembled on customer request.
Air filters must be regularly cleaned because they hold within a net that must be kept clean to guarantee the efficiency of the filter and the consequent good operation of the alternator.
The periodicity of intervention on the air filters will depend on the severity of the conditions at the installation place. However a regular inspection of these components will allow you to determine if you should intervene.

1. Remove the grid (1).

2. Remove the filter elements (2) and clean.
3. Reassemble everything according to the initial configuration.

Visual Inspection

Type of intervention	Operator
	
PPE to wear	**Periodicity**
	Every 2500 hours of use
Materials and equipments	
Workshop tools.	

1. Check for the presence of anomalies such as cracks, rust, leakages and any other anomalous event.
2. Check the tightening of the power cables and of the regulator cables.
3. Check the state of the insulations of the power cables and of the regulator cables (overtemperature, rubbing).

Verification of winding state

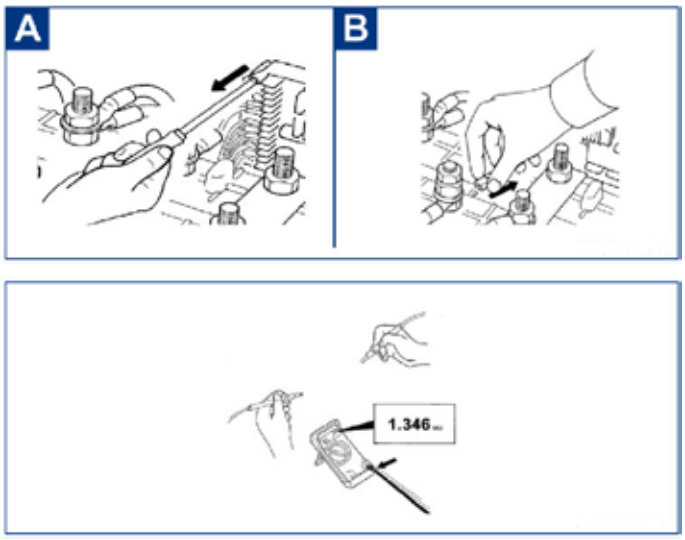
Type of intervention	Operator
	
PPE to wear	**Periodicity**
	Every 2500 hours of use
Materials and equipments	
"Megger" Tester or similar to 500V in continuous voltage.	

DANGER!

Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies

NOTE!

Before carrying out the verification disconnect the voltage regulator (fig. A), the radio interference filters (fig. B) and all the other potential devices electrically connected to the windings to check.



1. Measure insulation resistance to ground.

2. The measured value of resistance to ground of all the windings must be higher than 1MΩ.

NOTE!

If the value is lower than 1MΩ dry the windings with a jet of hot air at 50-60°C. Direct the jet of air into the air intakes and exhausts of the alternator.

Verification of correct alternator operation

Type of intervention	Operator
PPE to wear	**Periodicity**
	Every 2500 hours of use
Materials and equipments	
Workshop tools	

Check whether the alternator operates regularly without noises or anomalous vibrations.

In presence of noises and/or vibrations, check:
- The balancing of the rotor.
- The state of the alternator bearings. If necessary replace them (Call NANNI Dealer).
- The alignment of the couplings.
- The potential presence of stresses in the heat engine.
- The potential presence of stresses in the anti-vibration supports.
- The functional data (see the nameplate of the alternator).

Tightening torque check

Type of intervention	Operator
PPE to wear	**Periodicity**
	Every 2500 hours of use
Materials and equipments	
Workshop tools	

DANGER!

Disconnect the alternator from the power supplies. The drive engine must be off and unplugged from its power supplies.

1. Check the bolt tightening (see paragraph 9.6 “Tightening torques”).

2. Check the electrical connections.

Alternator exterior and interior cleaning

Type of intervention	Operator
PPE to wear	**Periodicity**
	Every 15 days
Materials and equipments	
Pressurized air.	

Clean with pressurized air.

NOTE!

It is strictly forbidden to use any kind of high-pressure water jet cleaners and detergent liquids. The standard protection rating of the alternator is IP23 and therefore by using liquids anomalies or even short circuits may occur.

NOTE!

The intervention periodicity indicated refers to critical environmental conditions. Adapt the periodicity based on the actual conditions of use.

EXTRAORDINARY MAINTENANCE

DANGER!

This type of maintenance must be done by a NANNI dealer.

CAUTION!

Carry out extraordinary maintenance with accuracy and as often as specified by the manufacturer.

WARNING!

All the maintenance intervals described below refer to a normal use of the alternator. In case it is used in more severe conditions (high humidity, temperature or dust) it is necessary to check it more often.

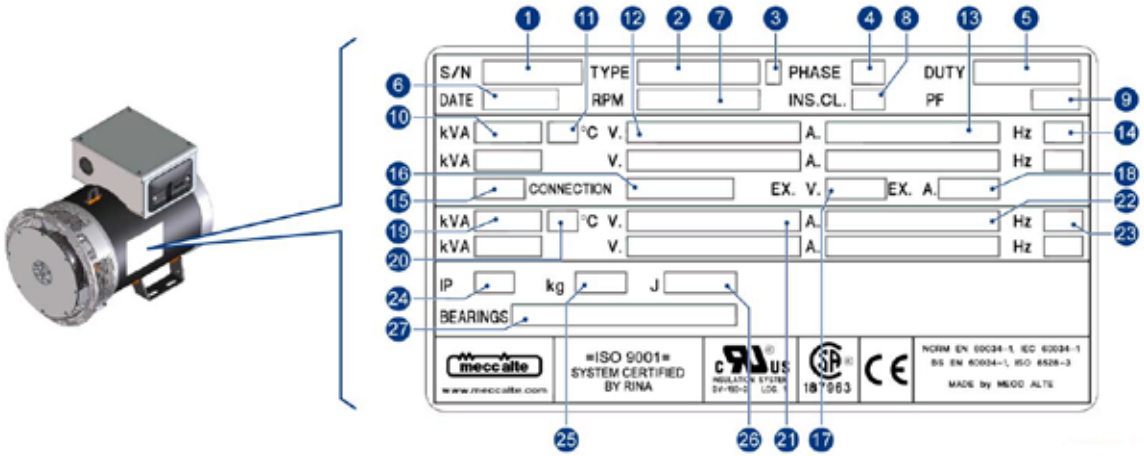
GENERAL TIGHTENING TORQUES

Application	Screw type		[Nm] ± 7% Tightening Torque
Cover tie rod	M8 X 438		21
Fastening of 35 mm exciter stator	M6 X 95	CL. 8.8	9
IP2X protection of front cover	M5 X 10	CL. 4.8	3.3
Rear Grid	M6 X 16	CL. 8.8	9
Terminal Board	M6 X 16	CL. 8.8	9
Fastening the terminal block to the frame	M6 X 16	CL. 8.8	9
Closed side panel fixing	M6 X 16	CL. 8.8	9
Regulator side panel fixing	M6 X 16	CL. 8.8	9
Regulator plug fixing	M6 X 10	CL. 8.8	9
Terminal box cover fixing	M6 X 16	CL. 8.8	9
Ground terminal on the frame	M6 X 16	CL. 8.8	9
Ground terminal on the foot	M6 X 25	CL. 8.8	9
Clamp for fan fastening	M8 X 30	CL. 8.8	12.5
Regulator	M4 X 25	CL. 4.8	1.5
Flywheel			
Flywheel 6.5	M10 X 30	CL. 8.8	48
Flywheel 7.5	M10 X 30	CL. 8.8	48
Flywheel 8	M10 X 30	CL. 8.8	48
Flywheel 8	M12 X 30	CL. 8.8	80
Flywheel 10	M10 X 30	CL. 8.8	48
Flywheel 10	M12 X 30	CL. 8.8	80
Flywheel 11.5	M10 X 40	CL. 8.8	48
Optional			
Parallel device fastening	M4 X 10	CL. 4.8	1.5
Terminal board for parallel device	M4 X 25	CL. 4.8	0.5
Terminal board for accessories	M3 X 20	CL. 4.8	0.5
Spacing insulator	M6 X 10	CL. 4.8	7

ALTERNATOR (18CM50 & 20CM60)

MARKING DATA

Alternator Nameplate



NPE 2 and 4 pole alternators are brushless, self-regulating and incorporate a rotating inductor with damper cage winding and a fixed stator with skewed slots.

The stator windings have a shortened pitch to reduce the harmonic content of the output waveform. They are equipped with a rotating field (1) with a damping cage and a fixed armature with inclined grooves.

N°	Identification
1	Serial number
2	Model
3	Update Index
4	Nomber of phases
5	Service Type
6	Mfg Date mm/yyyy
7	Rated rotating speed
8	Insulation class
9	Power factor
10	Rated power vs temperature
11	Max ambient temperature
12	Rated voltage
13	Rated current
14	Rated frequency

N°	Identification
15	Nominal characteristics class
16	Connection type
17	Excitation Voltage
18	Excitation Current
19	Power related to temperature (20)
20	Ambient temperature
21	Nominal Voltage
22	Current related to power (19)
23	Nominal Frequency
24	Protection Rating
25	Total weight
26	Moment of inertia
27	Bearing type

S08 ALTERNATOR

SAFETY REQUIREMENTS

Before any cleaning, lubrication or maintenance operation, ensure that the generator is stationary and disconnected from the power supply.

When stopping the generator, ensure the compliance with the procedures for stopping the prime mover.

The generator, in fact, has no Emergency Stop, but is controlled by the device arranged by the installer.

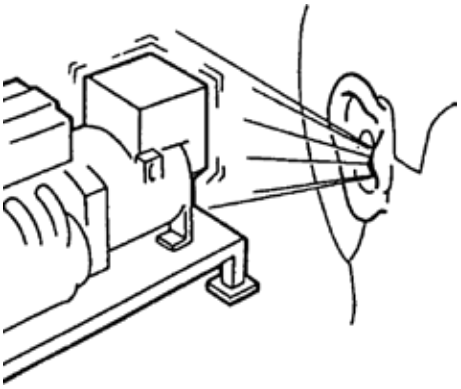
In consulting this use and maintenance manual, you will find several symbols, which have a specific meaning, as illustrated on the chapter “Alternator safety" earlier in this section.

STARTING AND STOPPING OPERATIONS

All the instrumentation for starting, running and stopping the system shall be provided by the installer.

CAUTION!

The starting, running and stopping operations must be carried out by skilled personnel who have read and understood the safety instruction at the beginning of the chapter.



IMPORTANT!

When the system is set to work for the first time, which has to be done at a reduced speed, the operator shall check that no anomalous noises can be detected.
If an anomalous noise is detected, stop the system immediately and improve the mechanical coupling.

CLEANING AND LUBRICATION

Prior to approaching or touching the alternator, ensure that it is not live and it is at room temperature; at this stage it is possible to clean it on the outside using compressed air.

CAUTION!

Never use liquids or water.
Do not clean th inside electric components with compressed air , because this may cause short-circuits or other anomalies.

For the lubrication of bearings, see table later in this section.

MAINTENANCE

The alternators series NPE are designed to give a long maintenance free working life.

CAUTION!

Before performing this operation, read the safety requirements at the beginning of this Section.

Maintenance operations on the generators can be divided into routine and extraordinary maintenance operations; in both cases, all operations must be authorized by the safety representative and they must be carried out when the machine is turned off and insulated from the electric installation or from the power mains.

High-qualified mechanical or electrical technicians must carry out maintenance operations and any fault search since all operations described hereunder could put personnel in serious danger.

It is also highly recommended to take all the necessary precautions so as to prevent an inadvertent starting of the machine during maintenance and fault search operations.

Routine maintenance operations can be summed up as follows:

1. Assessment of windings conditions after long periods of storage or inactivity
2. Assessment, on a regular basis, of correct functioning (absence of anomalous noises or vibrations)
3. Mechanical inspections on all fastening bolts and, in particular, on electric connections
4. External cleaning of generator

Extraordinary maintenance operations can be summed up as follows:

1. Maintenance and replacement (if necessary) of bearings
2. Cleaning of windings
3. Replacement of diode bridge
4. Replacement of exciter
5. Replacement of voltage regulator
6. Check of residual voltage

S08 ALTERNATOR

ROUTINE MAINTENANCE

Assessment of windings conditions after long periods of storage or inactivity.

Type of intervention	Operator
	
PPE to wear	**Periodicity**
	Every 2500 hours of use
Materials and equipments	
"Megger" Tester or similar to 500V in continuous voltage.	

DANGER!

Disconnect the alternator from the power supplies. The drive motor must be off and unplugged from its power supplies

Measuring the insulating earth resistance can assess the condition of the windings.
This measurement can be carried out with a "Megger" device, or similar, with a 500V direct-current voltage.

NOTE!

It is very important to disconnect the voltage regulator (fig. a), the rotating diode bridge (fig. b) and the radio interference filter (fig. c), as well as any other device connected to the windings to be checked, before carrying out the measurement.

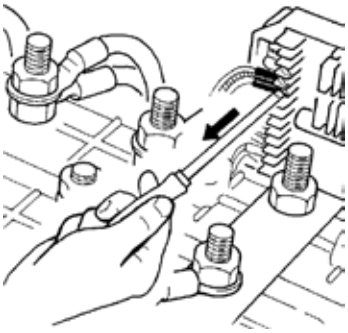


fig a

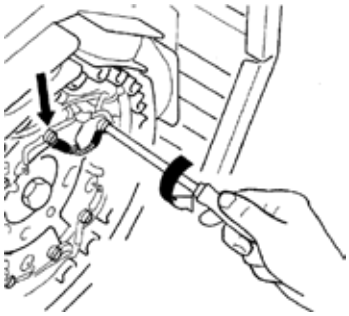


fig a

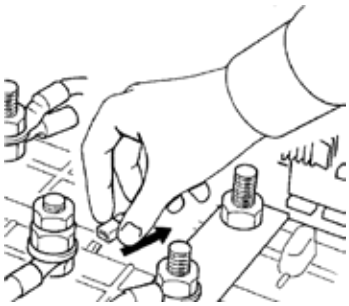
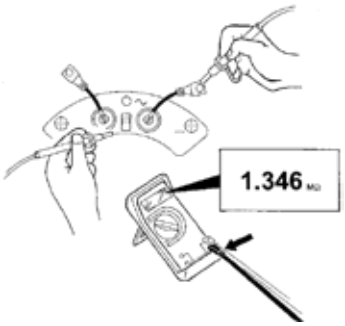


fig a

The figure resulting from the measurement of the windings' earth resistance must be over 1MΩ.



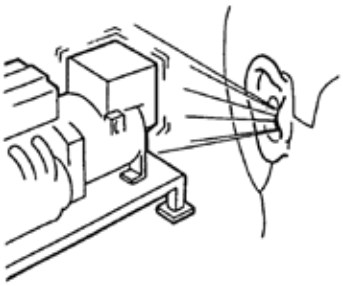
Should the figure be smaller than the above-mentioned one, the windings must be adequately dried up. This can be done by directing a jet of hot air of about 50-60°C into the generator's air inlets or outlets; alternatively, the stator's windings can be electrically connected and a voltage can be passed through them by means of a direct current power supply. The amount of current in the windings depends on the generator size, even though it must be fixed according to the nominal values stated on the plate.

S08 ALTERNATOR

Assessment of current functioning (absence of anomalous noises or vibrations).

Type of intervention	Operator
	
PPE to wear	**Periodicity**
	Every 2500 hours of use
Materials and equipments	
Workshop tools	

We recommend users to check regularly the correct functioning of the generator, and to verify that there are no anomalous noises or vibrations; their presence might indicate damage of bearings.



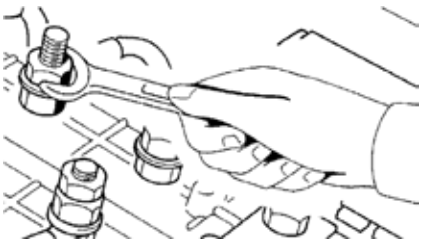
May we remind you that the alternator itself has no particular vibration since the rotating parts are perfectly balanced. Provided that the rotor balancing has not been altered and that the rotor's bearings have not been damaged, vibrations in the generator set may occur due to alignments of couplings, due to stress upon the combustion engine, or to vibration mounts.

We also recommend checking of performance data which must comply with the data on the generator's plate.

Mechanical checks of fastening bolts and, in particular, of electric connections.

Type of intervention	Operator
	
PPE to wear	**Periodicity**
	Every 2500 hours of use
Materials and equipments	
Workshop tools	

We recommend a regular check of all fastening bolts, which must be perfectly tightened up. Special attention should be paid to all electric connections; this inspection must be carried out in the complete absence of voltage.
To choose the correct tightening wrenches suitable for the different sizes of the bolts, see concerned chapter.



Internal and external cleaning of the generator.

Type of intervention	Operator
	
PPE to wear	**Periodicity**
	Every 15 days
Materials and equipments	
Pressurized air.	

For the external cleaning of the generator, you can use compressed air. The use of hydro-cleaners and detergent fluids is strictly forbidden. The standard protection degree of the generator is IP23; therefore, use of fluids could cause anomalies or even short-circuits.

S08 ALTERNATOR

EXTRAORDINARY MAINTENANCE

DANGER!

This type of maintenance must be done by a NANNI dealer.

CAUTION!

Carry out extraordinary maintenance with accuracy and as often as specified by the manufacturer.

WARNING!

All the maintenance intervals described below refer to a normal use of the alternator. In case it is used in more severe conditions (high humidity, temperature or dust) it is necessary to check it more often.

TIGHTENING TORQUE TABLE

Specifications	
Terminal board nut - Torque	6 Nm ± 7%
M8 screws - Torque	21 Nm
M10 screws - Torque	35 Nm

TROUBLE SHOOTING

Defects	REMEDIES
Alternator does not excite	• Substitute fuse. • Increase speed by 15%. • For an instant apply on “+” and “-” of the electronic regulator a 12 V battery voltage with a 30Ω resistor in series, respecting the polarities
After being excited alternator does not excite	• Check connection cables as per attached drawings
Low voltage at no load	• Reset voltage potentiometer. • Check speed. • Check windings
High voltage at no load	• Reset voltage potentiometer. • Substitute regulator
At load conditions, voltage lower than rated value	• Reset voltage potentiometer. • Current too high, power factor lower than 0.8, speed lower than 4% of rated speed. • Substitute regulator. • Check diodes, disconnect cables.
At load conditions, voltage higher than rated value	• Reset voltage potentiometer. • Substitute regulator
Unstable voltage	• Check uniformity of rotation. • Regulate stability of regulator by acting on “STAB." potentiometer
For any other defect, please contact a NANNI dealer.	

S08 ALTERNATOR

S10 STORAGE

S10 STORAGE

STORAGE PROCEDURE

LONG-TERM STORAGE

A series of operations must be performed to prepare and protect the engine for long-term storage.

See section 07 Maintenance - Raw water system - Risk of freezing / Protection against freezing, to perform certain long-term storage operations. We recommend that you have all these operations performed by an authorized Nanni workshop.

NOTE!

It may be necessary to adapt these operations depending on the weather conditions. Contact an authorized Nanni workshop for more information.

It may be necessary to adapt these operations depending on the weather conditions. Contact an authorized Nanni workshop for more information.

CAUTION!

If the motor is in danger of freezing, drain all water from the seawater system.

LONG-TERM STORAGE PROCEDURE

Perform the nearest periodic checks and maintenance before performing the long-term storage procedure.

Shutdown of the generator set

1. Drain and change the engine oil.
2. Replace the engine oil filter.
3. Replace fuel filter and pre-filter.
4. Bring the engine to operating temperature.
5. Stop the engine and remove the boat from the water.
6. Drain and clean raw water system components.
7. Protect the components from corrosion.
8. Remove the seawater pump rotor (if installed).
9. Store it in a cool, dry place. Visibly indicate that the impeller has been removed.
10. Check the level and condition of the engine coolant.
11. Drain water and contaminants from the fuel tank.
12. Fill the fuel tank completely.
13. Remove the air filter. Plug air intakes with clean, non-woven cloths.
14. Clean the engine. Touch up paint chips with paint

CAUTION!

Do not direct a high-pressure jet at sensitive areas.

15. Clean the entire boat.
16. Check the control cables. Grease the cables and apply an anti-moisture product.
17. Remove the battery cables. Adjust the electrolyte level. Charge the battery. Place the battery in a dry place.
18. Release the tension on the belts.
19. Spray motor with anti-moisture product.

S10 STORAGE

CAUTION!

Packaged or not, the alternator must be stored in a cool, dry place, protected from vibrations and never exposed to the elements.

CAUTION!

Bearings require special maintenance, but it is advisable to rotate the shaft once or twice a month to prevent fretting corrosion and grease hardening.

Engine restart

CAUTION!

Before starting the generator set, where regular lubrication of the bearings is required, you should also lubricate it.

WARNING!

After prolonged storage or if there are obvious signs of moisture/condensation, check the condition of the insulation. The insulation test must be performed by a qualified technician. Before performing the test, you must disconnect the voltage regulator. If the test result is too low (less than 1 MΩ) (EN60204-1), you will need to dry the alternator by blowing pressurized air at 50-60 C° into the alternator air inlets and outlets.

1. Clean the engine and check its condition.
2. Drain and replace engine oil.
3. Replace the oil filter.
4. Drain and replace the coolant.
5. Check the condition of the water pump rotor which has been stored separately. Replace it if in doubt. Reassemble the rotor
6. Remove the air intake covers. Check, dry and clean the air box if necessary. Install the air filter if equipped.
7. Check the hose clamps.
8. Check the coolant level. Adjust if necessary.
9. Put in place charged batteries.
10. Check the condition of the control cables and their operation.
11. Check the condition of the belts. Adjust belt tension.
12. Drain the fuel tank.
13. Open the fuel system valves. Bleed the system
14. When the boat is in the water :
    Open the through-hull and prime the raw water system (if installed).
15. Start the engine. Check for leaks.

S10 STORAGE

BATTERIES

When storing the unit, adjust the electrolyte level of the battery and store it in a dry place at room temperature. Recharge the battery as often as possible to extend its life.

WARNING!

Do not leave the battery unattended for a long time: it will be deeply discharged (about 7 to 8 volts). In such a situation, the battery will not recover.

CAUTION!

Store the lithium battery in a dark place, e.g. in a box. Temperature conditions: for storage, we recommend a cool place, protected from frost and humidity.

TROUBLE SHOOTING

CAUTION!

If the engine does not work properly, use the following table to identify the cause. If the cause cannot be found, contact an authorised Nanni workshop.

THE ENGINE IS DIFFICULT TO START

Defect	Solutions
The fuel is thick and does not flow well.	• See tank and fuel filter. • Remove water and dirt. • All fuel will be filtered through the filter, if there is water or other foreign matter on the filter, clean it with paraffin.
Air or water in the system.	• The fuel pump does not work if there is air in the fuel lines. • Check all pipe connections. • Bleed the fuel system.
Incorrect valve clearances.	• Adjust the valve clearance of the cold engine.
Valve leaks.	• Rode the valves.
Injection pump timing.	• Check the timing of the pump.
Thick oil in winter and engine starting poorly	• Change the type of oil according to weather conditions.
Compression too low.	• Valve, piston, cylinder and ring wear.
Flat battery.	• Charge the battery. • In winter, store the battery in a frost-free place. Recharge it periodically.

LOW POWER OUTPUT

Defect	Solutions
Compression too low.	• Wear of valves, pistons, cylinders and rings. • Attempt to break in the valves.
Lack of fuel.	• Fill up with fuel. • Check fuel supply and possible air intakes.
Overheating of parts.	• Check lubrication. • Check oil filter. • Dirt in the oil filter. • Check bearing clearance. • Check injection pump timing. • Adjust the distribution.
Incorrect valve clearances.	• Adjust the valve clearance of the cold engine.
Injection pump timing.	• Check the timing of the pump.
Dirty air filter.	• Change or clean the air filter every 100 hours.
Fuel pressure too low.	• Check the injection.
Injection pump wear.	• Do not use poor quality fuel as it will cause wear to the pump. (See “FUEL” in the “Fluids” section). • Check the fuel injection pump element and the delivery valve assembly and replace them if necessary.

S11 TROUBLE SHOOTING

SUDDEN ENGINE STOP

Defect	Solutions
Lack of fuel.	• Fill up with fuel. • Check fuel supply and possible air intakes.
Injection failure	Check and replace if necessary the injector
Moving parts are overheated due to a lack of oil.	• Check the oil level. • Check the lubrication. • Replace the oil filter every second oil change. • Check bearing clearance.

EXHAUST SMOKE TOO BLACK

Defect	Solutions
Fuel control defective.	• Contact NANNI dealer
Wrong fuel.	• The fuel must comply with EN 590. See fluids section.
Injection failure	Check and replace if necessary the injector
Combustion incomplete.	• Poor atomisation. • Injection pump stalling. • Injection failure • Valve clearance • Compression ratio, etc. Checks to be carried out by NANNI Dealer

S11 TROUBLE SHOOTING

EMERGENCY ENGINE STOP

Defect	Solutions
Engine speed variations.	• Check timing and injection.
Unusual noise.	• Check all rotating parts.
Smoke suddenly turns black.	• Check the injection, especially the injection nozzles.
Overheating of the bearings.	• Check the lubricating system.
Oil indicator ON.	• Check the lubrication. • Check bearing clearance. • Check the lubrication lift pump. • Check the pressure sensor. • Check the filter seal.

ENGINE OVERHEATING

Defect	Solutions
Oil level too low.	• Check the oil circuit, add oil.
Extended or broken alternator belt	• Replace the belt or adjust the tension.
Coolant level too low.	• Check the system and top up with recommended fluid identical to that in the engine.
Too much antifreeze	• Add water and check the antifreeze concentration or replace the coolant as recommended.
Defective thermostat	• Check the thermostat and replace if necessary.
Faulty temperature sensor	• Check the engine temperature with an electronic thermometer • Check the sensor and replace the sensor if necessary.
Overload	Reduce electrical overload.
Head gasket leakage.	Replace the defective seal.
Clogged seawater circuit	• Check and clean the seawater filter. • Check that the valves in the seawater circuit are open. • Check and clean if necessary the heat exchanger tube core.
Wrong fuel.	• The fuel must comply with EN 590. See fluids section.

S11 TROUBLE SHOOTING

nanni

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