

GENSETS NANNI

USER MANUAL

Ref. DGBXXT09047

MODEL

QLS 65T



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.*

S00 SUMMARY

Q00 TRACKED CHANGES	3	MICROORGANISMS IN FUEL	18
TRACKED CHANGES	3	INERT IMPURITIES IN FUEL	19
S00 SUMMARY	5	DIESEL LUBRICANTS	19
S01 INTRODUCTION	7	PRECAUTIONS TO UNDERTAKE	19
INTRODUCTION	7	OILS RECOMMENDED OR AUTHORIZED	19
ABOUT THIS MANUAL	8	GENERALITIES	19
CONTENT & UPDATES	8	OILS VISCOSITY	20
S02 SAFETY	9	CORRESPONDENCE BETWEEN API AND ACEA OILS	20
SUMMARY	9	DIESEL SULPHUR CONTENT	20
SAFETY SIGNALS	10	TO AVOID ENGINE DAMAGE:	20
SAFETY INFORMATION	10	REDUCE OIL AND FILTER SERVICE INTERVALS BY 50%	20
REPLACEMENT OF MISSING OR DAMAGED SAFETY		WHEN USING BIODIESEL BLENDS GREATER THAN	
SIGNS	10	B20. OIL ANALYSIS MAY ALLOW LONGER SERVICE	
READ SAFETY INSTRUCTIONS	10	INTERVALS.	20
ENGINE-GENSET SAFETY ICONS	11	USE ONLY APPROVED OIL TYPES.	20
SAFETY PRECAUTIONS	12	COOLANTS	21
HOT EXHAUST PRECAUTIONS	12	COOLANT DRAIN INTERVALS	21
WORK IN VENTILATED AREA	12	WATER PROPERTIES	21
WASTE DISPOSAL	12	WATER PROPERTIES TO MIX WITH COOLANT CON-	
UNWANTED ENGINE START	12	CENTRATE	21
SAFE MAINTENANCE PRACTICE	12	OTHER COOLANTS	22
WORK IN CLEAN AREA	12	FREEZE PROTECTION	22
PROTECTIVE CLOTHING	12	REQUIRED QUANTITY OF COOLANT VS COOLING	
SERVICE ENGINES SAFELY	13	SYSTEM CAPACITY	22
PROPER USE OF TOOLS	13	OPERATING ENGINE IN WARM TEMPERATURE CLI-	
SUPPORT ENGINES PROPERLY	13	MATES	22
SAFE ILLUMINATED WORK AREA	13	DISPOSING OF WASTE FLUIDS	23
PROPER LIFTING EQUIPMENT	13	ANNEX	24
NOISE PROTECTION	13	ANNEX 1. VOLUME OF GLYCOL	24
GENSET OUTPUT GENERATED POWER	13	S04 WARRANTY	25
GUARDS REQUIREMENTS	13	ENGINE IDENTIFICATION	25
STAYING CLEAR OF ROTATING DRIVELINES	14	ENGINE HOMOLOGATION	25
PAINT REMOVAL BEFORE HEATING	14	ENGINE RESPONSABILITY	26
HIGH-PRESSURE FUEL SYSTEM OPENING RISK	14	WARRANTY	26
AVOID HIGH-PRESSURE FLUIDS	14	PROPOSITION 65 STATE OF CALIFORNIA	26
SAFE COOLING SYSTEM SERVICE	14	EPA WARRANTY	27
AVOID HEAT NEAR PRESSURIZED FLUID LINES	14	GENERATOR IDENTIFICATION	27
WELDING NEAR ELECTRONIC CONTROL UNIT (ECU)		S05 ENGINE INSTRUMENTS PANEL	28
STATIC ELECTRICITY RISK	15	SUMMARY	28
HANDLE FUEL SAFELY - AVOID FIRES	15	GENERALITIES	29
BE PREPARED FOR EMERGENCIES	15	LUXE GE FRONT PANEL	29
HANDLE STARTING FLUID SAFELY (ETHER)	15	INSTRUMENTS	30
HANDLING BATTERIES SAFELY	15	STARTING BUTTONS	30
PREVENT BATTERY EXPLOSIONS	16	ENGINE OIL PRESSURE	30
FROST PROTECTION-WINTERIZATION	16	ENGINE COOLANT TEMPERATURE	30
LIVE WITH SAFETY	16	ALARMS	30
PREVENT ACCIDENTS	16	DISPLAYS	30
S03 FLUIDS	17	S06 COMPONENTS	32
SUMMARY	17	SUMMARY	32
FUELS	18	GENSET MAIN COMPONENTS	33
DIESEL FUEL	18	ENGINE VIEWS QLS65T	34
SULPHUR CONTENT	18	ENGINE VIEWS QLS65T	35
WINTER DIESEL	18	S07 STARTING & RUNNING	36
WATER IN FUEL	18		

S00 SUMMARY

SUMMARY	36	CONNECT THE CABLES	64
BEFORE STARTING	37	BATTERY ELECTROLYTE LEVEL	64
GENSET INSTALLATION	37	ELECTROLYTE LEVEL CHECK	65
FUEL SYSTEM	37	ALTERNATOR BELT	65
RAW WATER SYSTEM	38	MISCELLANEOUS	66
ENGINE ELECTRICAL SYSTEM	38	CAMSHAFT TIMING	66
START THE ENGINE	39	S09 ALTERNATOR	67
COLD WEATHER OPERATION	39	SUMMARY	67
GENSET ENGINE START	39	GENERALITIES	68
ENGINE STARTED	39	SAFETY WARNINGS	68
STARTING WITH BOOSTER BATTERIES	40	INTERNATIONAL STANDARDS	68
ENGINE RELUCTANT TO START	40	ELECTRICAL PERFORMANCES	68
NORMAL ENGINE OPERATION	40	REINFORCED MECHANICAL STRUCTURE	68
AFTER STOPPING THE GENSET	41	TERMINAL BOX	68
COLD WEATHER PRECAUTIONS	41	CLASS OF PROTECTION	68
S08 MAINTENANCE	42	LSAM 44.3 S2 DESCRIPTION	68
SUMMARY	42	CHARACTERISTICS	69
ABOUT	43	LSAM 44.3 S2 CHARACTERISTICS & RATINGS	69
MAINTENANCE	44	OUTPUT CONNECTIONS	69
GENERALITIES	45	ALTERNATOR SAFETY RULES	70
TURBOCHARGER	46	HANDLING	70
TURBO SERVICE	46	CONNECTIONS CHECKS	70
AIR INTAKE	48	HOW TO SECURE CABLES	70
CHECK THE AIR FILTER	48	CONNECTIONS TO TERMINAL POSTS	71
CLEANING THE AIR FILTER	48	ROUTINE MAINTENANCE	71
FUEL SYSTEM	49	REPAIRS	73
DRAIN WATER IN FUEL PREFILTER	49	ALTERNATOR STORAGE	73
REPLACING THE FUEL FILTER	50	DISPOSAL AND RECYCLING INSTRUCTIONS	73
AIR BLEEDING	50	S09 STORAGE	74
LUBRICATION SYSTEM	51	SUMMARY	74
OIL LEVEL - ADDING ENGINE OIL	51	LONG TERM STORAGE	75
DRAINING THE ENGINE OIL	52	LONG TERM STORAGE PROCEDURE	75
CHANGING THE OIL FILTER	52	RESTARTING THE ENGINE	76
COOLING SYSTEM	53	BATTERY	76
OVERVIEW	53	ALTERNATOR	76
COOLANT	54	S11 TROUBLESHOOTING	77
COOLANT LEVEL	54		
DRAINING THE COOLANT CIRCUIT	55		
COOLANT - FILLING	55		
HEAT EXCHANGER SERVICE	56		
RAW WATER SYSTEM	57		
CHECKING SACRIFICIAL ANODES	57		
SIPHON BREAKER	57		
EXTRACT THE RAW WATER PUMP IMPELLER	58		
CLEANING THE RAW WATER FILTER	59		
RAW WATER SYSTEM - DRAINING	59		
RAW WATER SYSTEM	60		
RISK OF ICING - PROTECTION AGAINST FROST	60		
ELECTRICAL SYSTEM	61		
WIRES AND CONNECTORS	61		
ENGINE ELECTRICAL WIRING	62		
BATTERY	64		
KEEP CLEAN THE BATTERY	64		
DISCONNECT THE STARTER CABLES	64		

INTRODUCTION

Before operating the genset, make sure that this Manual is applicable to the engine type. Refer to the identification plate if you are not sure about the engine model designation. If you don't have the correct manual, please contact your Nanni authorized dealer.

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

Illustrations are intended as a general guide and may vary from the equipment fitted in the engine in some details.

If there are any equipment details that are not shown or described in this Manual, or if you have any question regarding the operation of any equipment, your authorized Nanni dealer will be glad to inform you of correct care and operating procedures. Contact a NANNI INDUSTRIES S.A.S. authorized dealer for the servicing of your engine. A list of dealers is available on our website :

www.nannienergy.com

Read this Manual carefully to learn how to operate and service your engine correctly. Failure to do so could result in personal injury or equipment damage. This Manual should be considered as a permanent part of the genset and should remain with it, even when sold.

Right-hand and left-hand sides are determined by standing at the drive or flywheel end (rear) of the engine and facing toward the front of the engine.

Write engine and generator serial numbers and option codes. Accurately record all numbers. Your Nanni Agent also needs these numbers when you order parts. File the identification numbers in a secure place. Some engine accessories such as air cleaner, and instruments are optional. These accessories may be provided by a third party. This Manual applies only to the engine and those options available through the Nanni distribution network.

ABOUT THIS MANUAL

This Manual contains important information, tips, suggestions and warnings. We urge you to read it carefully and familiarize yourself with the engine before starting.

For your own safety and longer service life of the genset, follow the instructions and warnings contained in this manual and in all documentation provided with the boat. Ignoring them could result in damage to the engine or personal injury to you or others.

Please ensure that this Manual is always kept at hand. It should always be available to anyone else using the genset, i.e. anyone renting, borrowing or buying the genset from you.

CONTENT & UPDATES

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

Illustrations are intended as a general guide, and may vary from the equipment fitted in the engine in some details. Some sections of the Manual do not apply to all engines. If this is the case, a text indicates which engines it applies to.

If there are any equipment details that are not shown or described in this Operator's Manual, or if you have any questions about the operation of any equipment, your authorized Nanni Dealer will be glad to inform you of correct care and operating procedures.

SUMMARY

S02 SAFETY	9
SUMMARY	9
SAFETY SIGNALS	10
SAFETY INFORMATION	10
REPLACEMENT OF MISSING OR DAMAGED SAFETY SIGNS	10
READ SAFETY INSTRUCTIONS	10
ENGINE-GENSET SAFETY ICONS	11
SAFETY PRECAUTIONS	12
HOT EXHAUST PRECAUTIONS	12
WORK IN VENTILATED AREA	12
WASTE DISPOSAL	12
UNWANTED ENGINE START	12
SAFE MAINTENANCE PRACTICE	12
WORK IN CLEAN AREA	12
PROTECTIVE CLOTHING	12
SERVICE ENGINES SAFELY	13
PROPER USE OF TOOLS	13
SUPPORT ENGINES PROPERLY	13
SAFE ILLUMINATED WORK AREA	13
PROPER LIFTING EQUIPMENT	13
NOISE PROTECTION	13
GENSET OUTPUT GENERATED POWER	13
GUARDS REQUIREMENTS	13
STAYING CLEAR OF ROTATING DRIVELINES	14
PAINT REMOVAL BEFORE HEATING	14
HIGH-PRESSURE FUEL SYSTEM OPENING RISK	14
AVOID HIGH-PRESSURE FLUIDS	14
SAFE COOLING SYSTEM SERVICE	14
AVOID HEAT NEAR PRESSURIZED FLUID LINES	14
WELDING NEAR ELECTRONIC CONTROL UNIT (ECU)	15
STATIC ELECTRICITY RISK	15
HANDLE FUEL SAFELY - AVOID FIRES	15
BE PREPARED FOR EMERGENCIES	15
HANDLE STARTING FLUID SAFELY (ETHER)	15
HANDLING BATTERIES SAFELY	15
PREVENT BATTERY EXPLOSIONS	16
FROST PROTECTION-WINTERIZATION	16
LIVE WITH SAFETY	16
PREVENT ACCIDENTS	16

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 INSTRUCTIONS

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 !



NOTE !



IMPORTANT !

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.



Indicates the oil drain orifice.



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.

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 leakproof 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.

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 shortcuts.

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.

S02 SAFETY

SERVICE ENGINES SAFELY



Tie long hair behind your head. Do not wear a necktie, 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 jewelry 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.

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 be 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 DRIVELINES



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 drivelines 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.

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 sulfur and other compounds in Ultra-Low Sulfur 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 vapors 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 fueling 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 refueling. 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.

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. 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.



WARNING !

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.



WARNING !

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.

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



IMPORTANT !

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

SUMMARY

S03 FLUIDS	17
SUMMARY	17
FUELS	18
DIESEL FUEL	18
SULPHUR CONTENT	18
WINTER DIESEL	18
WATER IN FUEL	18
MICROORGANISMS IN FUEL	18
INERT IMPURITIES IN FUEL	19
DIESEL LUBRICANTS	19
PRECAUTIONS TO UNDERTAKE	19
OILS RECOMMENDED OR AUTHORIZED	19
GENERALITIES	19
OILS VISCOSITY	20
CORRESPONDENCE BETWEEN API AND ACEA OILS	20
COOLANTS	21
COOLANT DRAIN INTERVALS	21
WATER PROPERTIES	21
WATER PROPERTIES TO MIX WITH COOLANT CONCENTRATE	21
OTHER COOLANTS	22
FREEZE PROTECTION	22
REQUIRED QUANTITY OF COOLANT VS COOLING SYSTEM CAPACITY	22
OPERATING ENGINE IN WARM TEMPERATURE CLIMATES	22
DISPOSING OF WASTE FLUIDS	23
ANNEX	24
ANNEX 1. VOLUME OF GLYCOL	24

FUELS



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.

DIESEL 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.

SULPHUR CONTENT

European Union :

Low-sulphur diesel (<50 mg/kg sulphur) [EN590], or sulphur-free (<50 mg/kg sulphur [DIN EN590], [ULSD].

Non-European Union :

Sulphur contained in diesel fuel not in accordance with EN 590 regulation significantly reduces the performance of the engine lubricant. More frequent oil changes are mandatory and also induce much shorter fuel filter replacement intervals. Request a certificate of specifications from the fuel distributor and forward it to the nearest Nanni local representative for advice and action.

Fuels not intended for the operation of marine engines or with very high sulphur content can cause irreparable damage to the engine and are not covered by any warranty from Nanni Industries.

WINTER DIESEL

Without specific mention, these distributed fuels satisfy the climates in which they are geographically available. Generally speaking, summer diesel fuel complying with EN 590 is usable down to a temperature of 0°C [32°F], and the winter formulated fuel, down to a temperature of -20 °C [-4°F] (type No. 01-D in U.S.A). In any case, consult your local distributor to ensure compatibility of the fuel.



NOTE !

Additions of petroleum distillates, petrol, solvents, unapproved additives to improve the fluidity of diesel fuel at very low temperatures can cause irreparable engine damage and will void all contractual warranties and responsibilities from Nanni Industries.

WATER IN FUEL

Water is a non-flammable and incompressible liquid. For this reason, its presence is particularly harmful to the operation of the engine and to the entire fuel injection system. Water easily enters the tank by simple condensation and especially when it is left or partially empty. Fill up the fuel tank before storage/winter storage. Check the water-diesel separator regularly and clean it as required. Anticipate the replacement of the fuel filter. If a large quantity of water is present in the tank, drain it and flush the entire fuel and injection system with clean diesel fuel. Water in the diesel fuel can cause irreparable damages to the engine and are not covered by any warranty from Nanni Industries.

MICROORGANISMS IN FUEL

The presence of water in the tank automatically leads microorganisms and bacteria to grow and will mix with the fuel. These microorganisms grow rapidly with a favorable temperature. Depending on their size, they can pass through filters and penetrate in the fuel injection system and cause a total engine failure which is not covered by Nanni Industries warranty. In the event of fuel contamination, contact the nearest Nanni agent who may, if necessary, use an approved disinfectant.

INERT IMPURITIES IN FUEL

Others impurities than microorganisms and bacteria do exist : they are rust debris falling out from the internal walls of the metal tanks. Some types of fiberglass tanks are also subject to osmosis over time and tiny particles may come off internal walls and circulate in the diesel fuel. These impurities can pass through the filters and creep into the injection system and cause a total failure of the engine which is not covered by Nanni Industries warranty.

DIESEL LUBRICANTS

PRECAUTIONS TO UNDERTAKE

Engine oils must be handled with care, both for reasons of safety and the risk of pollution for the environment.

Due to their inertia, hot oils retain a higher temperature than expected. A hot oil can cause severe burns on the skin and leave after effects. This phenomenon is emphasized when draining used oil. Wear protective gloves and eye protective glasses. Avoid synthetic clothing.

To avoid introduction of impurities into the engine during filling or topping up, be sure to thoroughly clean the filler inlet hole first and use a container free of any contamination.

OILS RECOMMENDED OR AUTHORIZED

It is necessary to differentiate the breaking-in oils from the lubricating oils after running-in. All engine manufacturers do not have the same recommendations. User manuals provide information about proper oils to use for running-in (if recommended) and at which running hours and of time lapse of run.

GENERALITIES

The oil used in the engine must have a viscosity in accordance with the ambient temperatures at which the engine is operated, according to API (American Petroleum Institute) and SAE (Society of Automotive Engineers) classifications.

Following the entry into force of strict antipollution regulations, engine oils have been developed for use with low sulphur fuels (LSD or ULSD). The oils classified "CF" being now obsolete, use oils "CJ-4, CI-4, CH-4".

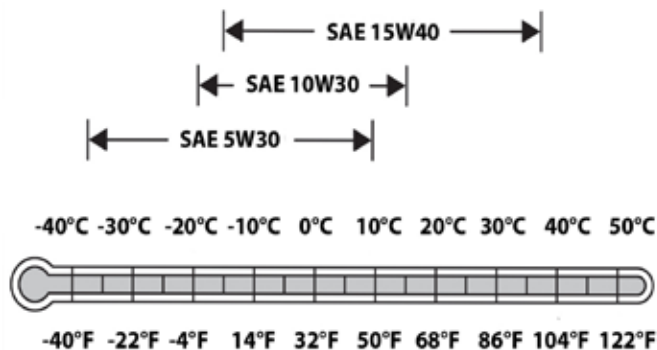
The oils "CH-4" do come in replacement of the "CD, CJ, CF-4 and CG- 4". In all cases, the use of high sulphur fuel significantly reduces the span between oil changes whichever oil is used.

OILS VISCOSITY

Viscosity is a characteristic of oil flow or fluidity, defined by two numbers: cold and hot. Example :

15W-40: cold viscosity index followed by the letter W signifying winter. A low value indicates good fluidity at low temperatures.

15W-40: hot viscosity index (100 °C - summer). A high value indicates a better lubrication at hot temperatures.



Normative instances :

- Society of Automotive Engineers (SAE),
- American Petroleum Institute (API),
- Association des Constructeurs Européens d'Automobiles (ACEA),
- Japanese Automobile Manufacturer Association (JAMA).



IMPORTANT !

On manufacturers side, oils are subject to constant improvements, particularly concerning the additives allowing a better resistance towards oxydation and fuel economy. Refer to the expertise of the local Nanni Industries representative regarding the oil that best suits your engine.

CORRESPONDENCE BETWEEN API AND ACEA OILS

API	ACEA - JAMA
CG-4	ACEA E1
CF-4	ACEA E2 ; ACEA E3
CH-4	ACEA E5 ; JAMA DH 5
CI-4	ACEA E7
CJ-4	ACEA E9 ; JAMA DH 2

DIESEL SULPHUR CONTENT



NOTE

Diesel sulfur content affects engine oil and filter service intervals.

Use of diesel fuel with sulfur content less than 2000 mg/kg (2000 ppm) is **RECOMMENDED**.

Use of diesel fuel with sulfur content of 2000-5000 mg/kg (2000-5000 ppm) **REDUCES** by 50% the oil and filter change interval.

Do not use diesel fuel with sulfur content greater than 5000 mg/kg (5000 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.**

COOLANTS



WARNING !

Products not fulfilling the demands in this section may lead to faults and damage occurring in the cooling system. This can lead to the invalidation of Nanni's warranty for faults and damage caused by the use of inappropriate coolant.

COOLANT DRAIN INTERVALS

Drain and flush the cooling system of the engine and refill with fresh coolant at the indicated intervals, which depends of the coolant used and of the maintenance schedule service of the engine.

WATER PROPERTIES

Water properties are important to the efficiency of the cooling system. Distilled, deionized, or demineralized water is recommended for mixing with ethylene glycol or propylene glycol base engine coolant concentrate.



IMPORTANT !

- Do not use cooling system sealing additives, neither antifreeze containing sealing additives.
- Do not mix ethylene glycol and propylene glycol base coolants together.
- Do not mix coolants of various brands and makes together.
- Do not use coolants containing nitrites.

WATER PROPERTIES TO MIX WITH COOLANT CONCENTRATE

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

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

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

Chlorides	< 40 mg / L
Sulfates	< 100 mg / L
Total dissolved solids	< 340 mg / L
Total hardness	< 170 mg / L
pH	5,5-9,0

When mixing coolant concentrate with water, do not use less than 40 % or greater than 60 % concentration of coolant. Less than 40 % is inadequate for corrosion protection. Greater than 60 % can result in coolant gelation (solidification by cooling) and cooling system problems. As a general rule, a mixing of 50/50% is preferred whenever possible.

OTHER 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.
- Coolant concentrate meeting ASTM D6210 requirements in a 40-60 % mixture of concentrate with appropriate 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 to a proven and recorded method or a fleet study run at or above 60 % load capacity.
- 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.

FREEZE PROTECTION

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



IMPORTANT !

DO NOT use a coolant-water mixture greater than 60% ethylene glycol or 60% propylene glycol. Refer to the table below :

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%	-24°C (-12°F)
50%	-37°C (-34°F)
60%	-52°C (-62°F)

REQUIRED QUANTITY OF COOLANT VS COOLING SYSTEM CAPACITY

See ANNEX 1: VOLUME OF GLYCOL

OPERATING ENGINE IN WARM TEMPERATURE CLIMATES

Nanni engines are designed to operate with recommended engine coolants quoted in this chapter.

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



IMPORTANT !

Tap clean water may be used as coolant substitute in emergency situations only. Contact a Nanni representative as soon as it is possible for assistance. Get this water flushed as soon as possible.

Running the engine with water only will make this substitute coolant to foam, aluminum and iron parts of the engine will be subject to fast internal corrosion, along with scaling, and cavitation occurrences, even with coolant conditioners.

When cooling system has been drained from the engine, refill with recommended coolant as soon as possible.

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 leakproof 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.

ANNEX

ANNEX 1. VOLUME OF GLYCOL

% by volume of Glycol	30	35	40	45	50	Cooling system capacity in dm ³
Ice slush starts to form at °C	-16	-21	-24	-30	-37	
Ice slush starts to form at °F	3.2	-5.8	-11.2	-22	-34.6	
Ethylene glycol dm ³ (litre)	9	11	12	14	15	30
	12	14	16	18	20	40
	15	18	20	23	25	50
	18	21	24	27	30	60
	21	25	28	32	35	70
	24	28	32	36	40	80
	27	32	36	41	45	90
	30	35	40	45	50	100
	33	39	44	50	55	110
	36	42	48	54	60	120
	39	46	52	59	65	130
	42	49	56	63	70	140
	45	53	60	68	75	150
	48	56	64	72	80	160
	51	60	68	77	85	170
	54	63	72	81	90	180
	57	67	76	86	95	190
	60	70	80	90	100	200

Volume of glycol below 30% to be avoided.

ENGINE IDENTIFICATION



NOTE !

Minor details may not be exactly as shown. Some components may not be part of the equipment ordered. Not binding pictures.

Both the engine and the alternator have an identification plate that contain several informations.

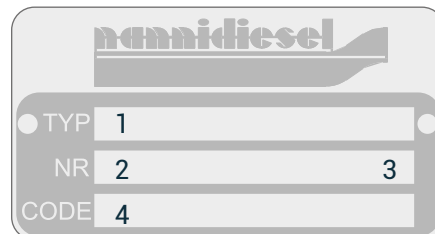
Keep these plates accessible and in good condition. Record and keep the engine and alternator serial number and designation. These numbers should always be quoted when ordering service and replacement parts. The engine identification plate is as follow :



TYP indicates the commercial designation of the engine.

- NR indicates the engine serial number.
- CODE lists various specifications of the engine.

Example :



- 1 : Type of engine
- 2 : Engine number
- 3 : Engine code
- 4 : Nanni number

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.

However, 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.
- Engine & alternator 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 invalidate if one or several of this conditions are not followed.

S04 WARRANTY

ENGINE RESPONSABILITY

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.

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 known 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 the State of California to cause cancer, birth defects or other reproductive harm. Thoroughly wash your hands after handling any of the above components.

S04 WARRANTY

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.

GENERATOR IDENTIFICATION

Global generator characteristics are identified on the nameplate below. Never attempt to remove it nor to spray paint over it. The generator has been fitted and wired onto the engine following initial order from the customer.

Should the nameplate be missing at some stage, it would become very difficult to find out quickly what are the corresponding characteristics of the generator.

Leroy-Somer																																							
<table border="1"><thead><tr><th colspan="2">LSA</th></tr></thead><tbody><tr><td>N°</td><td>Date</td></tr><tr><td>r.p.m.</td><td>Hz</td></tr><tr><td>P.F.</td><td>Th.class.</td></tr><tr><td>A.V.R.</td><td>Exoit.</td></tr><tr><td>Exoit. values</td><td>full load : V / A</td></tr><tr><td></td><td>at no load : A</td></tr><tr><td>D.E. bearing</td><td></td></tr><tr><td>N.D.E. bearing</td><td></td></tr></tbody></table>	LSA		N°	Date	r.p.m.	Hz	P.F.	Th.class.	A.V.R.	Exoit.	Exoit. values	full load : V / A		at no load : A	D.E. bearing		N.D.E. bearing		<table border="1"><thead><tr><th colspan="2">RATINGS</th></tr></thead><tbody><tr><td>Voltage</td><td>V</td></tr><tr><td>Phase</td><td></td></tr><tr><td>Conn.</td><td></td></tr><tr><td>Contin.</td><td>kVA</td></tr><tr><td>B.R.</td><td>kW</td></tr><tr><td>40°C.</td><td>A</td></tr><tr><td>Std by</td><td>kVA</td></tr><tr><td>P.R.</td><td>kW</td></tr><tr><td>27°C.</td><td>A</td></tr></tbody></table>	RATINGS		Voltage	V	Phase		Conn.		Contin.	kVA	B.R.	kW	40°C.	A	Std by	kVA	P.R.	kW	27°C.	A
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IEC 60034-1 & 5 / ISO 8528-3 / NEMA MG1-32 & 33.

Moteurs Leroy-Somer - Boulevard Marcellin Leroy, CS 10015 - 16915 Angoulême Cedex 9 - France



NOTE !

Gensets generators are designed for long time trouble free service. There are no serviceable parts in the unit for the end user. In case of suspected fault, consult the nearest Nanni representative.

In itself, the ID plate of the alternator is providing to the marine electrician in charge of installation, all data informations which will be the base to define downstream protections, safety devices, proper wire gauges to use.



NOTE !

Any modification on the alternator, will void warranty. This will also be an evidence of breach of safety regulations.

S05 ENGINE INSTRUMENTS PANEL

SUMMARY

S05 ENGINE INSTRUMENTS PANEL	28
SUMMARY	28
GENERALITIES	29
LUXE GE FRONT PANEL	29
INSTRUMENTS	30
STARTING BUTTONS	30
ENGINE OIL PRESSURE	30
ENGINE COOLANT TEMPERATURE	30
ALARMS	30
DISPLAYS	30

S05 ENGINE INSTRUMENTS PANEL

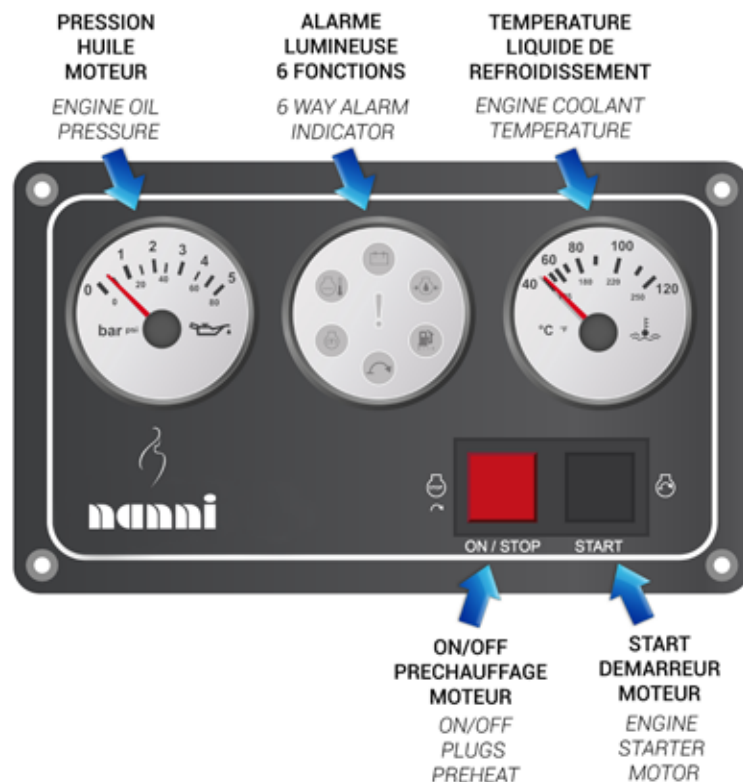
GENERALITIES

The instruments panel provides important informations about the genset engine operation. This chapter describes the function of all the instruments related to the running of the engine. In case of doubt about their function, please contact your Nanni representative.

LUXE GE FRONT PANEL

The Luxe GE front panel incorporates key required instruments to run and to monitor the engine at any moment. These instruments are :

- Dual function general Start/Stop -Plugs preheat switch (red)
- Engine start motor
- Engine oil pressure indicator
- 6 functions alarm indicator
- Engine cooling temperature indicator



S05 ENGINE INSTRUMENTS PANEL

INSTRUMENTS

STARTING BUTTONS

The red push square knob on the left allows to start and to stop the genset engine and to preheat the glow plugs.



The instantaneous black square knob on the right allows to energize the starter motor.

ENGINE OIL PRESSURE

Oil pressure is a measure of the force pushing the lubricant through the oil pump, showing that the lubrication process is occurring correctly. If indicator is above the maximum or below the minimum level, an engine checking must be performed.



ENGINE COOLANT TEMPERATURE

The instrument provides an indication of the engine coolant temperature. Any abnormal value must be investigated promptly.



ALARMS

The genset operating condition is monitored through a set of sensors which relevant alarms or status are located in one indicator located at the center of the panel. Alarms are lighting up when activated by an event.



DISPLAYS

Plugs preheat :

When plugs preheat is activated through the ON button, the preheat signal is illuminated.



Coolant temperature :

The signal is turning on when engine coolant temperature is reaching maximum safe temperature. The coolant temperature dial must be watched closely and relevant fault must be found quickly i.e. compartment abnormal temperature, coolant leak, engine fault, severe genset overload etc.

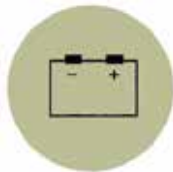


S05 ENGINE INSTRUMENTS PANEL

Battery :

Battery signal is lighting up during first instants of genset energizing and will turn off.

When abnormal charge is detected, signal is turning on. Fault must be investigated first with the help of a voltmeter against battery terminals posts and with a clamp ammeter inserted in the positive battery cable. Check also battery electrolyte with all relevant precautions (gloves & eye protection glasses). If fault cannot be resolved, contact a service technician.



Oil pressure :

This alarm is turning on when oil engine pressure is too low. Fault could be related to outside temperature (arctic temperature) during engine warming up, engine lubrication fault, etc. If fault is not erasing, contact nearest Nanni representative.



Water in fuel :

When water in fuel indicator is coming up, drain the water in fuel separator without delay. Having water sent into the combustion chambers could lead to an engine failure.



Engine in motion :

When engine is turning, the following signal is on :



CAUTION !

While this signal is illuminated, do not touch any moving part on the engine or alternator. Severe injuries could occur.

Exclamation point :

Your attention is required when this signal is illuminated.



S06 COMPONENTS

SUMMARY

S06 COMPONENTS	32
SUMMARY	32
GENSET MAIN COMPONENTS	33
ENGINE VIEWS QLS65T	34
ENGINE VIEWS QLS65T	35

GENSET MAIN COMPONENTS



NOTE !

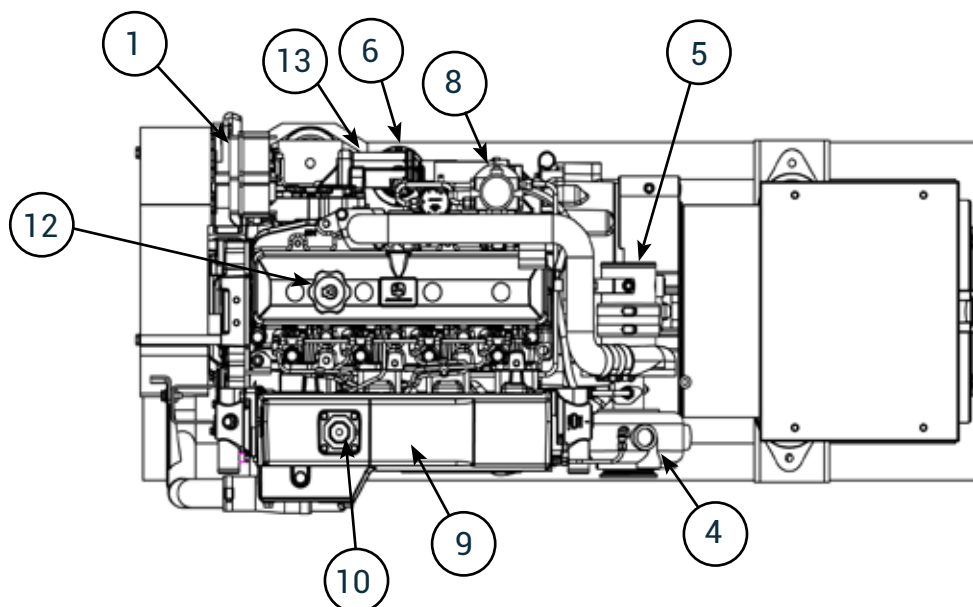
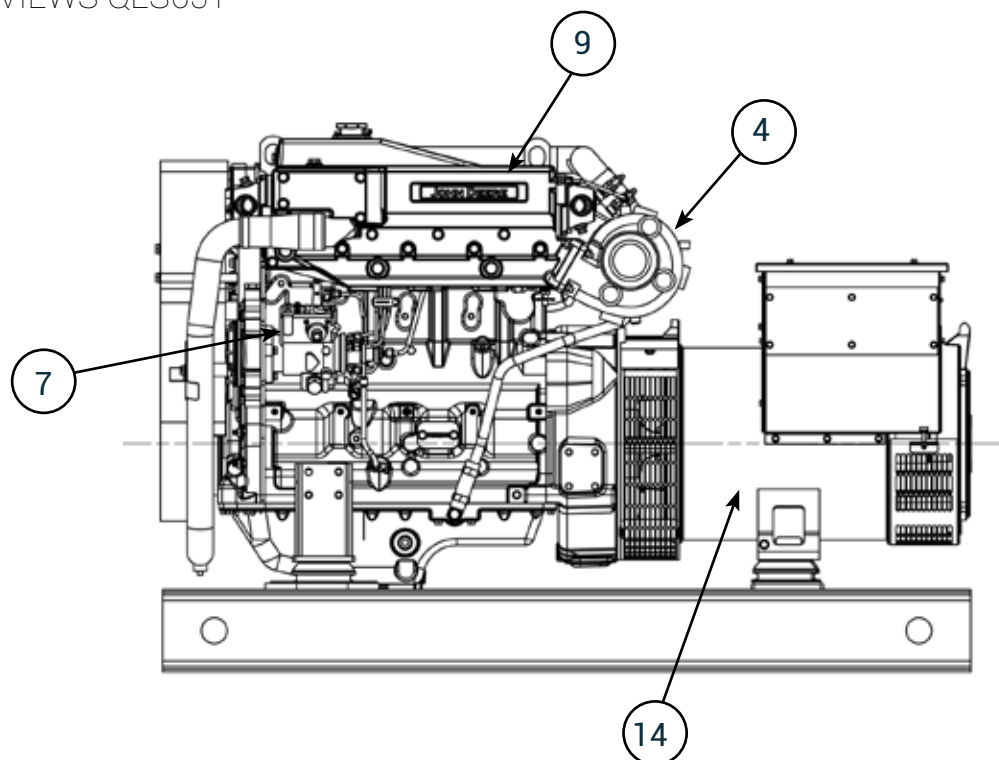
Minor engine details may not be exactly as shown. Some components may not be part of the engine ordered. Not binding pictures.

P/N COMPONENTS

1	Engine alternator
2	Engine alternator Belt
3	Starter
4	Turbocharger
5	Air intake
6	Oil filter
7	Fuel injection pump
8	Fuel filter
9	Heat exchanger
10	Coolant filler plug
11	Coolant pump
12	Oil filler port
13	Oil gauge
14	Generator x 3 phase

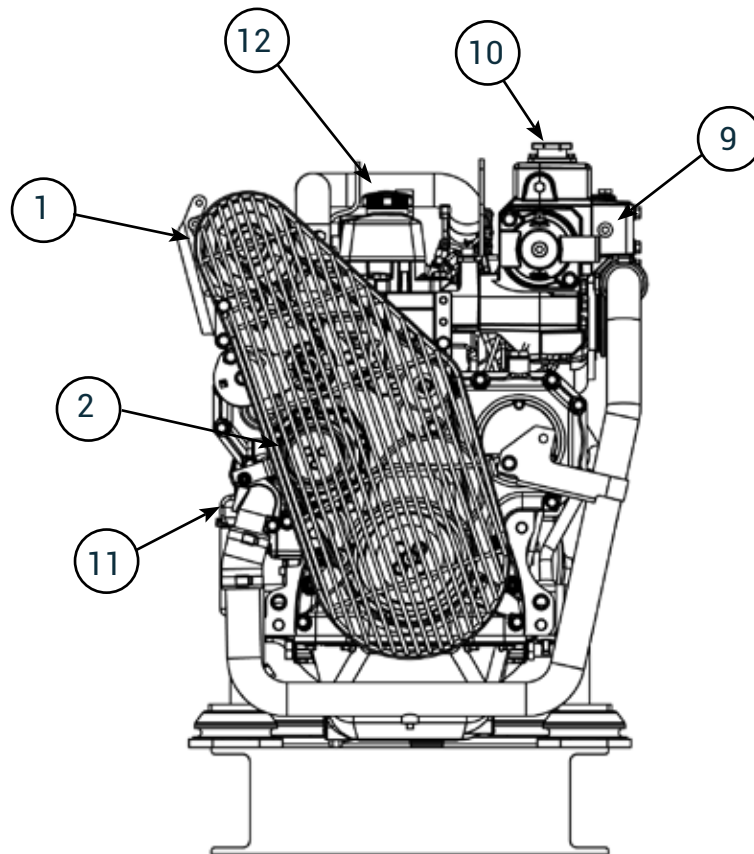
S06 COMPONENTS

ENGINE VIEWS QLS65T



S06 COMPONENTS

ENGINE VIEWS QLS65T



S07 STARTING & RUNNING

SUMMARY

S07 STARTING & RUNNING	36
SUMMARY	36
BEFORE STARTING	37
GENSET INSTALLATION	37
FUEL SYSTEM	37
RAW WATER SYSTEM	38
ENGINE ELECTRICAL SYSTEM	38
START THE ENGINE	39
COLD WEATHER OPERATION	39
GENSET ENGINE START	39
ENGINE STARTED	39
STARTING WITH BOOSTER BATTERIES	40
ENGINE RELUCTANT TO START	40
NORMAL ENGINE OPERATION	40
AFTER STOPPING THE GENSET	41
COLD WEATHER PRECAUTIONS	41

BEFORE STARTING

GENSET INSTALLATION

Genset installation is very similar to most of the propulsion engines on the market. There are only two major differences which are :

1. The genset engine is linked to a sizeable alternator (Single phase, or Star/Delta), instead of being linked to a propulsion system.
2. Engine rev (rpm) is not adjustable. The speed is of 1500 rpm (50 Hz), or 1800 rpm (60 Hz).

The situation differs for small portable gasoline gensets, not in the scope of this manual.

FUEL SYSTEM

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

The injection pump delivers a larger amount of fuel than required for combustion. The fuel that is not burned is re-injected into the tank through an over-flow pipe.



CAUTION !

The injection pump is an extremely precise unit. Water entry in the fuel system will cause major failure to the injection pump and to the whole fuel system.

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

If the fuel tank is located below the engine injection pump, an additional electric fuel feed pump should be installed between the prefilter and the feed pump of the engine.

S07 STARTING & RUNNING

RAW WATER SYSTEM

The raw water system allows to cool the engine coolant and the exhaust gas.

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

The siphon breaker prevents raw water entry into the cylinders via the raw water/exhaust system.



NOTE !

The use of a siphon breaker is mandatory if the exhaust elbow is under the waterline at full load or at less than 200 mm above it. A siphon breaker is mandatory in all Sail Boat and when there's a risk of water entry in the engine.

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

ENGINE ELECTRICAL SYSTEM

The engine extension harness should be away from any water projection and must be correctly attached as high as possible in the hold.

Engines in metallic hulls are generally fitted with a two-pole electrical system. This system allows to electrically isolate the engine from the electrical ground of the boat.

The alternator belt drives both the coolant pump and the alternator. Additional belt can also be fitted.

CHECK BEFORE STARTING



WARNING !

Put all the protective covers back before starting the engine.

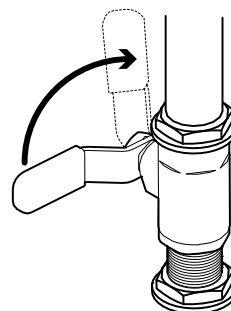


CAUTION !

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

Perform all of the following operations before starting the engine :

1. Open sea cock. Prime the raw water system if necessary.



2. Start the compartment fan (if fitted) for at least five minutes. Otherwise, open the hold.
3. Check that there is sufficient fuel.
4. Move the control lever to the neutral position.
5. Open fuel cock, prime the system if necessary.
6. Check the engine and transmission oil level and fill with the recommended oil if necessary.
7. Check the coolant level, top up if necessary.
8. Check the mechanical control cables, lubricate as required.
9. Check there are no fuel, oil, coolant or water leaks.
10. Check the alternator belt.
11. Turn ON the main battery switch.

S07 STARTING & RUNNING

START THE ENGINE



DANGER !

The propeller can cause serious injury when rotating. Check that nobody is in the water near the propeller before starting. Never use a start spray or any other equivalent product. These products are highly flammable.



CAUTION !

Always preheat the engine. Never race the engine while it is cold. Do not crank the engine continuously for more than 10 seconds at a time. Let it cool down for 2 minutes between cranking attempts. Failure to follow these guidelines may result in starter motor burnout.



NOTE !

If the engine does not start after 3 attempts, remove the key and drain the water in the waterlock. Failure to do so may lead to water ingress in the cylinders. When starting the engine for the first time, let it run at idle for several minutes and check for leaks or malfunction.

COLD WEATHER OPERATION



NOTE !

Engines may be equipped with coolant heaters as cold weather starting aids. Engine coolant heaters should be used when temperatures are at or below 0 °C (32 °F).

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

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

GENSET ENGINE START

With two C4 front panels :

1. Make sure that the two red emergency knobs are depressed on the two panels (Master & Slave). Otherwise, the genset will not start. Beware : in a hurry, this detail may be hard to find.
2. Insert the two keys in the two panels (Master & Slave). **Turn both keys to the "ON" Position.**



3. The voltage indicators will indicate 24 Volts or so.
4. From the panel chosen, turn the key to "START", until the engine is cranking. This takes a very few seconds. Release the key, which returns automatically to the "ON" position.
5. Engine has started.
6. Electricity is available at output of alternator.

ENGINE STARTED

1. Tachometer will stabilize swiftly to 1500 rpm (50 Hz), or to 1800 rpm (60 Hz).
2. Voltage indicator will reach 25-26 Volts. Oil pressure will increase too, as well as temperature.

S07 STARTING & RUNNING

DURING OPERATION



NOTE !

Never activate the panel key to the START position when the engine is running on any panel.

The solenoid of the starter motor would push up the cog and make the starter motor to start, against the turning flywheel of the engine already in motion. This action would destroy the starter motor.

Check the instruments and warning lamps after starting, and regularly when cruising.

STARTING WITH BOOSTER BATTERIES



CAUTION !

Make sure to use batteries with the same rated voltage as the engine's system voltage. On an engine with a two pole electrical system, connect the other end of the jumper cable to the negative pole (-) of the booster battery.

1. Connect the jumper cable to the positive pole (+) of the flat 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 of the engine block.

Start the engine following the starting procedure.

3. Let the engine run at idle for few minutes to charge the battery.
4. Stop the engine and remove the cables in the exact reverse order from installation.

ENGINE RELUCTANT TO START

If a water lift (water lock) muffler is installed on the exhaust line, excessive cranking could cause seawater to enter the cylinders and damage the engine. To start engine, reduce starting attempts to three and if not OK, undertake to do this :

1. Close the seacock to avoid filling the muffler with water.
2. Try to start the engine by following the regular starting procedure.
3. When the engine does start, stop the engine immediately and turn off the switch.
4. Re-open the seacock and restart the engine.

NORMAL ENGINE OPERATION

Check engine coolant temperature and oil pressure. Temperatures and pressures will vary between engines and with changing operating conditions, temperatures, and If coolant temperature rises above the maximum coolant temperature, reduce electrical load on engine.

In this case, see what kind of amenities can be stopped with no influence on navigation.

See if temperature drops quickly.



NOTE !

The genset being the power supply plant of the vessel, it may not be possible to stop it in case of failure. Symptoms that may be early signs of engine problems are :

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

S07 STARTING & RUNNING

STOPPING THE GENSET



CAUTION !

Never stop the genset in using the emergency switch. use the key switch. Besides not being the proper way to stop an engine, knocking down the emergency switch could lead to a "false fault" at the next restart.

1. Start the fan in the engine compartment (if fitted) or open the hold.
2. Turn the key of the starter switch counter-clockwise, the engine stops and all indicators turn off. The engine stops, all lamps go out.

AFTER STOPPING THE GENSET

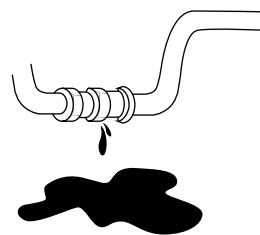
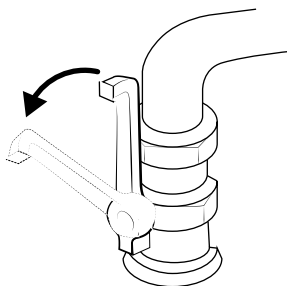


CAUTION !

Even after the engine has stopped, some components and fluids will remain hot and under pressure for several minutes. As far as possible, limit works on the engine immediately after stopping it. Allow it to cool down first.

After the engine has stopped :

1. Turn off the main switch.
2. Close the sea cock.



3. Inspect the engine compartment and check for leaks.

COLD WEATHER PRECAUTIONS

See [Maintenance](#) Section for complete details.



CAUTION !

A poorly charged battery may burst as a result of freezing.

SUMMARY

S08 MAINTENANCE	42
SUMMARY	42
ABOUT	43
MAINTENANCE	44
GENERALITIES	45
TURBOCHARGER	46
TURBO SERVICE	46
AIR INTAKE	48
CHECK THE AIR FILTER	48
CLEANING THE AIR FILTER	48
FUEL SYSTEM	49
DRAIN WATER IN FUEL PREFILTER	49
REPLACING THE FUEL FILTER	50
AIR BLEEDING	50
LUBRICATION SYSTEM	51
OIL LEVEL - ADDING ENGINE OIL	51
DRAINING THE ENGINE OIL	52
CHANGING THE OIL FILTER	52
COOLING SYSTEM	53
OVERVIEW	53
COOLANT	54
COOLANT LEVEL	54
DRAINING THE COOLANT CIRCUIT	55
COOLANT - FILLING	55
HEAT EXCHANGER SERVICE	56
RAW WATER SYSTEM	57
CHECKING SACRIFICIAL ANODES	57
SIPHON BREAKER	57
EXTRACT THE RAW WATER PUMP IMPELLER	58
CLEANING THE RAW WATER FILTER	59
RAW WATER SYSTEM - DRAINING	59
RAW WATER SYSTEM	60
RISK OF ICING - PROTECTION AGAINST FROST	60
ELECTRICAL SYSTEM	61
WIRES AND CONNECTORS	61
ENGINE ELECTRICAL WIRING	62
BATTERY	64
KEEP CLEAN THE BATTERY	64
DISCONNECT THE STARTER CABLES	64
CONNECT THE CABLES	64
BATTERY ELECTROLYTE LEVEL	64
ELECTROLYTE LEVEL CHECK	65
ALTERNATOR BELT	65
MISCELLANEOUS	66
CAMSHAFT TIMING	66

ABOUT



This section is describing preventive maintenance operations to be carried out by the owner/operator of the engine. This is not a part of a workshop repair manual.

Carrying a set of preventive maintenance operations in accordance with the service intervals will ensure engine optimal reliability and service life.

During the warranty period, it is essential to get any work carried out by a Nanni authorized workshop. Furthermore, any service should be registered in the Nanni after-sale system.

However, some regular checks, particularly those made every time the engine is used, are of the duty of the user. Some operations are explained further on for you to work on the engine in case of an emergency or if there is no repair workshop nearby.

We recommend to have all your works checked by a Nanni authorized workshop.

Repairs and/or adjustment works on the engine by unseasoned marine trained technicians is forbidden for obvious safety reasons. Improper works endangers life, even not at open sea. Operations on valve timing and injection system belong to the exclusive domain of Nanni trained representatives. These may be against EPA or other worldwide environmental regulations.



NOTE !

The service intervals and relevant informations about the preventive maintenance of the transmission are indicated in the user manual provided by the manufacturer of the transmission. Contact your Nanni representative for further information regarding the maintenance of the transmission.

The hourmeter has no reset capability and displays the total operating hours of the engine since factory acceptance tests.

S08 MAINTENANCE

MAINTENANCE INTERVALS

COMPONENTS	PERIODICITY					
	Daily	1 st Maintenance 100 hours	Every 250 hours	Every 500 hours	Every 1000 hours	Every 2000 hours
FUEL CIRCUIT						
Water in fuel - Pre-filter / Filter Draining	○	●		●		
Fuel filter (¹)		●		●		
Fuel injectors - Check Cut out and misfiring with Diagnostic Tool (³)				○		
Mechanical Fuel injectors (⁴)						○
LUBRICATION CIRCUIT						
Engine oil level (¹)	○					
Oil replacement (¹)		●	●			
Oil filter replacement (¹)		●	●			
Crankcase ventilation filter replacement (¹)				●		
COOLING CIRCUIT						
Coolant level (¹)	○					
Coolant concentration control (¹)				○		
Coolant Liquid (¹)		6000 hours or 4 years (¹)				
Thermostat Inspection (¹)					●	
Calibrated Heat-Exchanger Cap (¹)					●	
Heat-exchanger - O-rings					●	
Inter-cooler - O-rings					●	
RAW WATER CIRCUIT						
Raw Water Filter (¹)	●					
Raw Water Pump Impeller (¹)		●	●		○	
Raw water pump Overhaul						○
Zinc Anodes (¹)				○		
AIR INTAKE & EXHAUST CIRCUIT						
Turbo-charger Inspection				●		
Air Intake Filter - Cleaning - Replacement (¹)			●			
Exhaust Mixer Inspection - Replacement (¹)				●		
ELECTRICITY / ELECTRONIC						
Battery electrolyte level	○					
Electrical Harness Connectors Inspection		○	○			
Automatic belt tensioner and Alternator belt (¹)	○					●
Panel Command : Indicators & Warning Lamps		○	○			
Read out the Defect Trouble Codes (³)				○		
WHOLE ENGINE						
Engine Mounts Inspection.		○	○	● 4 years		
Hoses / Clamps tightness / Bolts / Nuts Tightening		○	○			
Visual Inspection (Coolant, fuel, oil, exhaust & raw water leaks)	○					
Valve Clearance						○
Check Crankshaft Vibration Damper (⁵)						○
GENERATOR						
Check all fixing screw (²)		○	○			
Cleanliness of the cooling circuit (²)	○					
Ventilation guards statement (²)	○					
General Cleanliness (²)				○		

(¹) Operations to be performed in accordance with user and maintenance manual for your engine. For all technical information specific to your engine, refer to the user and maintenance manual.

(²) Operation to be performed in accordance with the manufacturer user and maintenance manual.

(³) Mechanical injection Genset are not concerned.

(⁴) Only Mechanical injection Genset are concerned.

(⁵) For 4.5 and 6.8 litres Genset check if there are equipped. The crankshaft vibration damper must be replaced after 4500 hours or 5 years whichever come first (at the first occurrence)

○ CHECK/ADJUST/CLEAN/SERVICE / REPLACE IF NECESSARY

● REPLACE

GENERALITIES



WARNING !

Perform maintenance operations having the engine stopped and cold. Get the the starting key out from the panel, put it in your pocket and turn off the power supply.

Read this whole chapter and take all safety precautions before contemplating any maintenance or repair work. Make sure you understand how to perform every operation.



CAUTION !

Clean the engine before any maintenance. Watch for any oil or fluid drop as it is an evidence of a leak somewhere.



CAUTION !

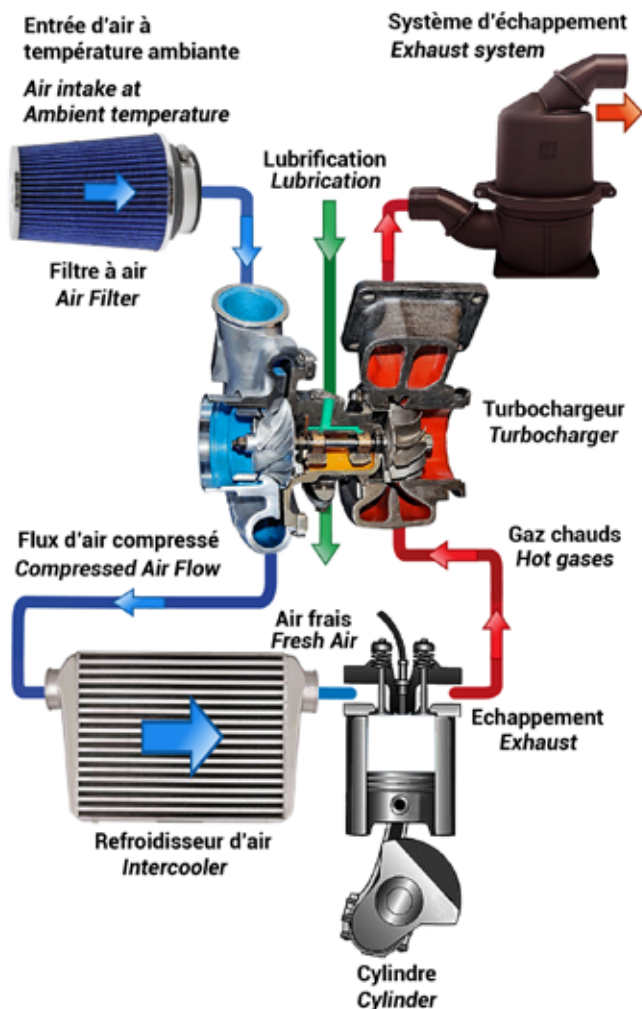
Do not let oil, fuel or grease deposits build up around the engine as they may increase the risk of fire in the engine compartment. Furthermore, these deposits may hide potential heavy unseen failures.

TURBOCHARGER



CAUTION !

A turbocharger is an exhaust-driven mechanical device that boost engine power by pumping more air into the engine. A turbocharger uses a pair of fan-like castings mounted on a common shaft. One (called the turbine) is piped to the exhaust, while the other (the compressor) is piped to the engine intake. The flow of exhaust spins the turbine, which causes the compressor to turn. The compressor serves to blow air into the engine at a greater rate than it can pull it in on its own. The greater volume of air can be mixed with a greater volume of fuel, which increases the power output.



Principle of operation of a turbocharger.

TURBO SERVICE

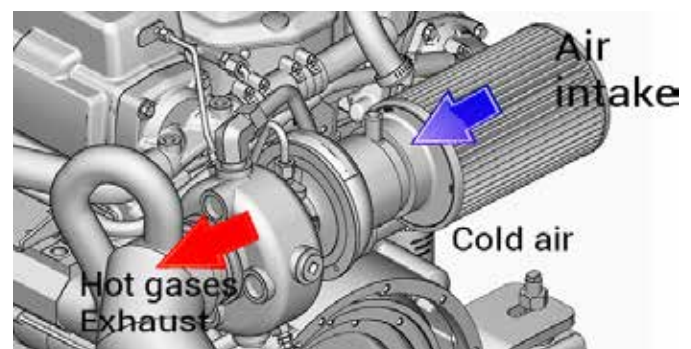
Engine turbochargers are designed to provide long years of trouble free service, which if required, can only be performed by a specialized workshop. In view to maintain turbochargers performances for as long as possible, some basic rules must be followed.

Changing or cleaning the air filters on a regular basis is a good way to keep debris from causing problems with the intake side of turbochargers.

A turbocharged engine will definitely need more oil changes than an ordinary atmospheric one, as the turbines axle requires excellent lubrication. For this reason, oil characteristics must be followed closely. Never use low grade bargain lubrication oil.

Turbochargers get very hot when engine is running and a protective metal shield or thermal sleeve is always affixed onto the exhaust side to prevent burns. Never remove these shields.

Do not get confused : a turbocharger is driven by exhaust gases. On a supercharger, the air intake turbine is driven by a belt. In addition to a rotation speed far lower compared to a turbocharger, an amount of output power is subtracted from the engine because of the drive system.



Above picture: N5 turbo & Air intake



There is no serviceable part for the end user inside turbochargers. Any attempt to disassembling would lead to a total failure.

EXHAUST SYSTEM

Inspect the exhaust system at whole (hoses, clamps, mixing elbow, manifold, etc.) Check for cracks, leaks and rust. Tight or change them if necessary.

Check for carbon or soot deposits on exhaust components as it is a conclusive sign of an exhaust leak.

Should any defect appear on any item of the exhaust system, replace it as there is a risk of exhaust leakage or water penetration in the engine.

During any dismantling of the exhaust system, replace the exhaust seal gasket(s).

ENGINE MOUNTS CHECK

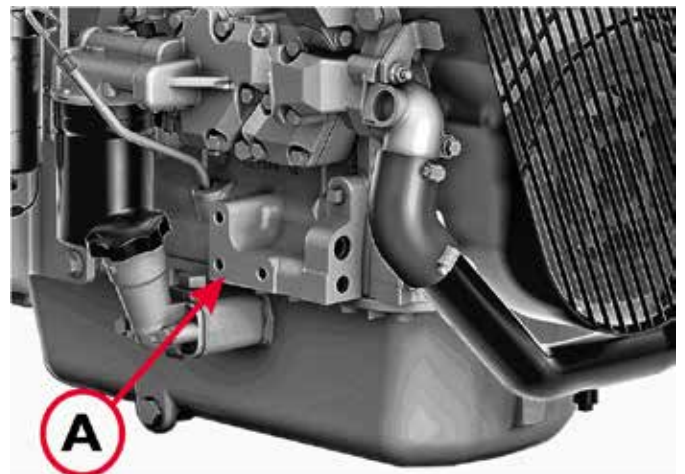
Engine mounting is the responsibility of the vessel or generator manufacturer. Follow manufacturer's guidelines for mounting to specifications. Front engine mounts (A) only are available from Nanni Diesel.



IMPORTANT !

Use only SAE Grade 8 or higher grade of hardware for engine mounting.

1. Check the engine mounting bolts on support frame and engine block for tightness. Tighten as necessary.
2. Inspect overall condition of vibration isolators, if equipped. Replace isolators, as necessary, if rubber has deteriorated or mounts have collapsed.



AIR INTAKE



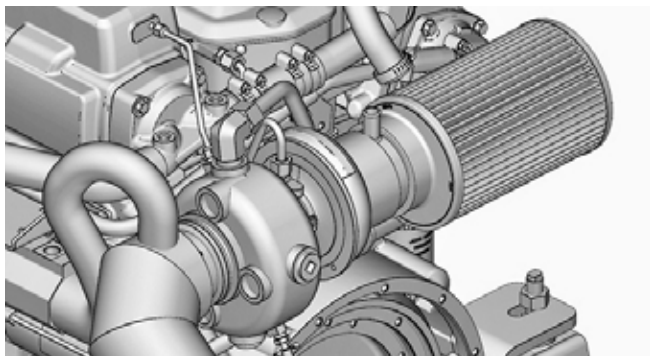
WARNING !

Carry out these operations when the engine is stopped and cold. Make sure that no dust or dirt enter the intake manifold.

The reliability and the performances of the engine depend among other things on the quantity and the temperature of the global air intake design.

CHECK THE AIR FILTER

1. Remove the holding clamps and remove the filters.
2. Replace or clean the elements.
3. If the air filters are crushed, flattened or punched, replace them.
4. Install the new filters with new clamps. Do not overtight, and do not damage the inlet mouth.



Long life NANNI air filter

CLEANING THE AIR FILTER

Specific tool

For best results, order the NANNI filter cleaning kit:

Number	Description	Illustration
970317077	Kit air filter cleaner EN, ESP, SUOMI	
970317078	Kit Air filter cleaner FR, IT, DEU	

Long life NANNI air filters require periodic cleaning. Maintenance of these air filters is very simple. Please follow the 4 steps below :



Cleaning: Spray liberally the NANNI cleaner onto both sides of the filter and let it soak for 10 minutes to loosen dirt. Do not allow cleaner to dry up on the air filter.



Rinsing: Wash the filter with cold water at low pressure on the outside to flush dirt out of the filter. Continue rinsing until removing all traces of cleaner. You may need to repeat steps 1 and 2 several times.



Drying: After rinsing, shake off any excess of water and let it dry naturally. Do not oil the filter before it is completely dry.



Oiling: Spray oil (Aerosol) evenly on the crown of each pleat while maintaining the nozzle at approximately 8 cm from the filter. Allow oil to penetrate into fabric for around 20 minutes. Respray oil wherever some white spots are still visible on

sides of the filter until there is a uniform blue color throughout.

FUEL SYSTEM



DANGER !

Stop the engine and let it cool down before refuelling or carrying out any operation on the fuel system.



CAUTION !

Fuel is flammable and can be dangerous. Fuel spilled on hot surfaces or near sparks can ignite. Do not step onto the injection pipings. Take care to always keep them in good condition.



WARNING !

Total cleanliness must be guaranteed when working on the fuel system. No impurities should enter the injection system. Make sure not to spill fuel on nearby hoses.



NOTE !

Any work on the fuel injection system must be carried out by a authorized Nanni technician.

Check regularly the condition of the components of the fuel system (hoses, filter, clamps, etc). When a clamp is removed, replace it by a new one, always in stainless steel.



WARNING !

The fuel feed pump is an extremely precise unit. Water entry in the fuel system will cause major failure to the injection pump and to the whole fuel system.

DRAIN WATER IN FUEL PREFILTER

The fuel prefilter is an optional extra not in the scope of supply of the engine. The model of prefilter may vary according to the boat.



NOTE !

Drain the water out of the prefilter several hours after the engine has been stopped (when completely cold).



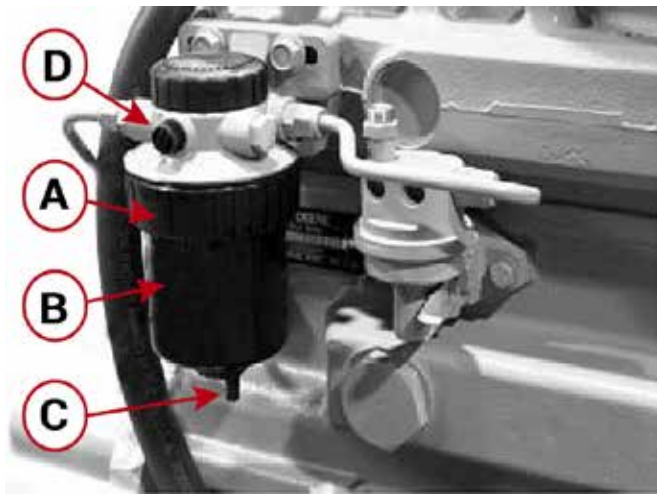
1. Close the fuel butterfly (control) valve on the fuel tank.
2. Place a suitable container under the fuel prefilter. Get floorcloths at hand to mop up any fuel which may spill. Drain water and remove impurities in opening the bottom plug.
3. Tighten the plug once the water has been drained.
4. Check the fuel filter element, change it if necessary.
5. Open the fuel butterfly (control) valve.
6. Bleed the fuel system (see in the following paragraphs).
7. Start the engine and check for leaks.

REPLACING THE FUEL FILTER



NOTE !

To ease up the air bleeding during fuel filter replacement, the filter assembly may be filled with some fuel, only if you are sure not to spill any.



Above picture : fuel filter assembly.

1. Close the fuel butterfly (control) valve. Wipe up the holding filter bracket with a clean non flint cloth.
2. Loosen drain plug (C) and drain fuel in a suitable container.
3. Rotate ring (A) counter clock wise (CCW) of 1/4 of turn. Remove ring along with filter (B).
4. Inspect filter mounting for cleanliness. Clean as required.
5. Install new filter element onto mounting base. Be sure that element is properly indexed and firmly seated on base. It may be necessary to rotate filter for correct alignment.
6. Install retaining ring onto mounting base making certain dust seal is in place on filter base. hand tighten ring (about 1/3 turn) until it "snaps" into the detent. DO NOT overtighten the retaining ring.
7. Bleed the fuel system.

AIR BLEEDING

Bleeding the air in the fuel system might be required:

- After a maintenance operation on the fuel system.
- If the fuel tank has been emptied.
- The engine has not been started for a long time.

HOW TO BLEED THE FUEL SYSTEM:

1. Fill up completely the fuel tank. Open the fuel valve.
2. To avoid spills, Dispatch a non flint cloth around the venting screw (D) of the fuel filter holder and loose it up (see picture on left side of this same page).
3. Pump the fuel using the push button (E) back and forth until fuel free of air bubbles flows out of the venting screw.



4. At this stage, you can tighten the venting screw.
5. Pump a few more times to make sure to prime completely the system.



CAUTION !

Avoid draining all fuel from the filter during this process.

LUBRICATION SYSTEM



CAUTION !

Never over-fill the engine oil crankcase.



NOTE !

With a new or reconditioned engine, oil and oil filters must be replaced after 20 hours of operation. Use oil grades as indicated in the section **TECHNICAL DATA**.

Warranty claims may be rejected if unsuitable oil grade has been used.

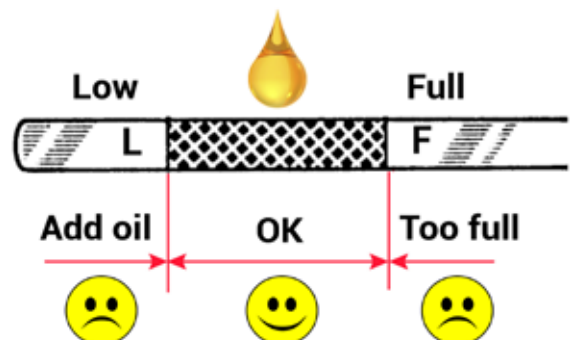
The viscosity may be adapted depending the climatic conditions.

OIL LEVEL - ADDING ENGINE OIL

Check the engine and transmission oil level before starting the engine. The oil level should be within the range indicated on the dipstick, between the Mini and Maxi level.

HOW TO CHECK THE OIL LEVEL:

1. Pull off and wipe the dipstick (in red in the picture below).
2. Re-insert and remove the dipstick.
3. Check that the oil level is between the Mini and Maxi marks.
4. If the level is too low, remove the oil filler cap and add some oil slowly at a time. Wait a few minutes before checking the oil level to allow the oil to get down to the oil pan.



NOTE !

To top up oil level, use the same oil which is in the engine. Do not mix different types of oil.

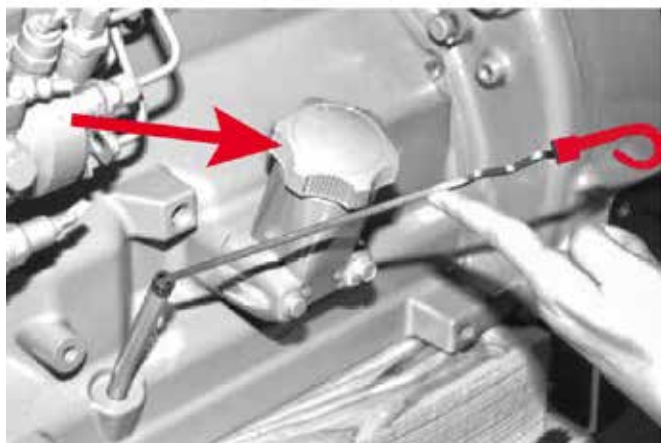
DRAINING THE ENGINE OIL

OIL DRAINING:

1. Start the engine and let it warm few minutes to render oil more fluid to ease suction.
2. Stop the engine and remove the key from the panel.
3. Open the side oil filler to ease up draining.
4. Drain all used oil out from the pan.
5. Disconnect the oil drain pump and replace the cap on the drain pipe.



Above picture: pan draining oil - close up.



Above picture: open the side oil filler.

Draining with external oil pump:

Regarding the amount of oil to drain, oil draining is better performed through an external pump connected to the oil check dipstick duct.

CHANGING THE OIL FILTER

Replace the oil filter every time the engine oil is drained.



1. Remove the oil filter with a filter wrench tool. Turn the filter counter-clockwise (CCW). Remove the gasket.
2. Clean the mating surface in order to prevent impurities from entering the engine.
3. Apply a film of oil on the new gasket. Screw the new filter by hand with the new gasket. When the gasket contacts the mating surface, turn the filter a half turn.
4. Fill with proper amount of new oil. Check for leaks and check the oil level.
5. Start the engine and let it operate few minutes at idle. Check if the oil pressure warning lamp turns off.
6. Stop the engine, wait for the engine to cool down and check the oil level. Top up if necessary.

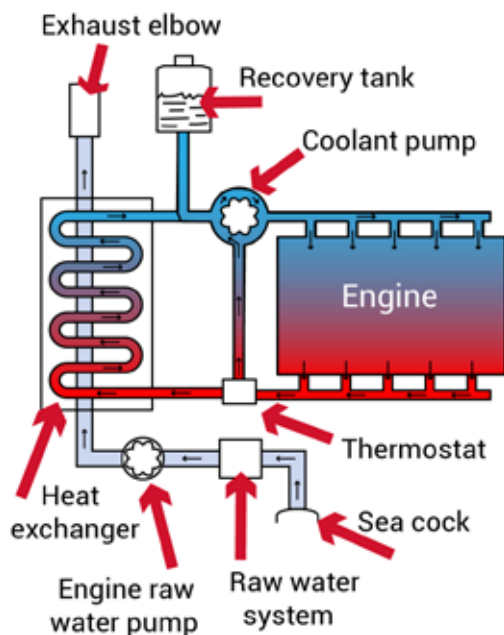
COOLING SYSTEM

OVERVIEW

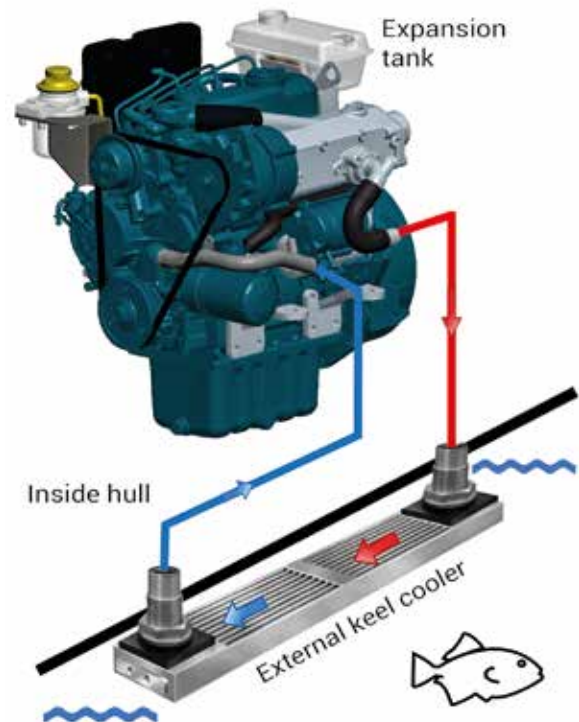
The cooling system cools the engine in order to maintain a proper operating temperature and to prevent overheating. On some engines, the cooling system also cools the fuel, the oil or the air intake. The cooling system is built around two circuits:

- The **COOLANT CIRCUIT** which is the engine internal cooling system. It is a closed-circuit in which coolant flows and cools the engine.
- The **RAW WATER CIRCUIT** which cools the coolant via an heat exchange with raw water. Nanni engines are delivered as standard with an heat exchanger, in which the coolant is cooled by heat exchange with raw water taken from a sea cock. A Keel Cooling system can also be used to cool the coolant instead.

A thermostat maintains the coolant at a proper and constant operating temperature. With thermostat control, the coolant only enter the heat exchanger when the engine reach the appropriate temperature of the engine.



Principle of operation of water cooling with heat exchanger on an engine.



External keel cooling principle



CAUTION !

Engines designed with an heat exchanger are not suitable for a Keel Cooling system. Operating the engine without coolant or raw water supply, even for few seconds, will lead to a complete engine breakdown.

Instead of proper mix coolant, raw clean water can only be used in case of emergency and for the shortest time possible. As soon as back to shore, get in touch with the nearest Nanni representative or seasoned marine shipyard or workshop. Please refer to the Fluids section for complete information.

- Always use coolant made of 50% antifreeze with anticorrosion additive and 50% of clean water. The antifreeze protects the engine against internal corrosion.
- This mix must be used all year around, even if there is no risk of frost.
- Never use water alone to completely fill the coolant system. Please refer to the Fluids section for complete information.

COOLANT

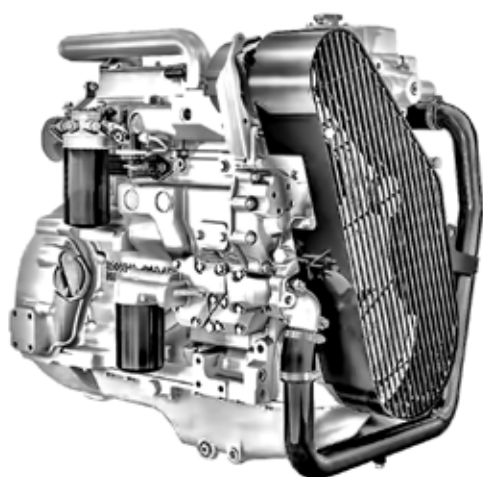
WATER & ANTI-FREEZE:

Please refer to the Fluids section for complete information.

COOLANT EXPANSION:

When the engine is running, the internal temperature is high ; as a result, the coolant liquid expands its volume. The heat exchanger is designed to accomodate this normal and physical expansion.

Make sure not to overfill the heat exchanger when filling with coolant.



COOLANT LEVEL



DANGER !

Never open the coolant filling cap or any plug of the cooling system when the engine is operating or still warm. Steam or hot fluid can spray out. Prevent potential injuries !

Check the coolant level before starting the engine.

1. Stop the engine and remove the key from the panel.
2. Unscrew the filler cap (A) on the exchanger tank on picture below.
3. You may top-up with clean water only, if amount to fill is very remote. Use glycol mix if tank is almost empty.
4. Stop filling when level is at bottom lip of the cap filler.

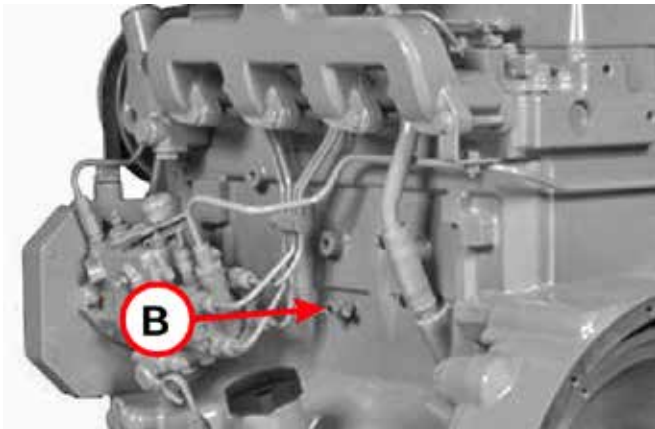


NOTE !

This Max level in the tank is representing the effective level of coolant only when the engine is cold.

DRAINING THE COOLANT CIRCUIT

1. Stop the engine and remove the key from the panel.
2. Put a container under the drain plug (B) of the engine to collect coolant. Unscrew the plug and remove the filler cap (A) on top.



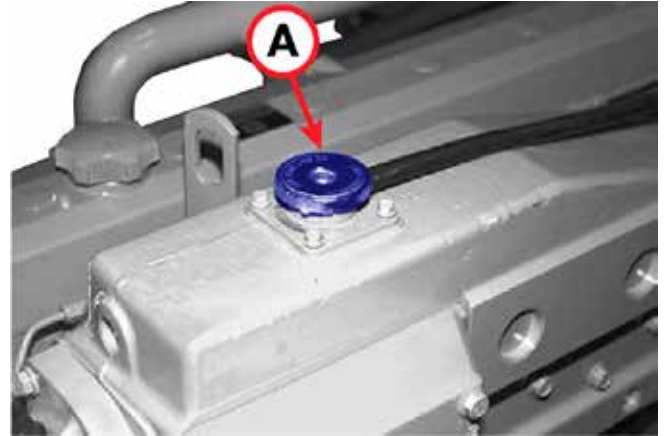
3. Drain off all coolant. Empty the recovery container as well as the hoses.
4. Insert a hose into the heat exchanger filler port. Rinse with fresh water until water which flows from the drain port is clean.
5. Reinstall the drain plug, secure it and fill with new coolant as explained on next paragraph..

COOLANT - FILLING

Mix the anti-freeze with water in a clean container before filling the heat exchanger. The coolant must be totally free from dust. Fill the exchanger slowly not to introduce air into the coolant system.

Refer to the chapter **TECHNICAL DATA** to know the coolant capacity of the heat exchanger. For Keel Cooling system or when using a water boiler, the coolant capacity must be adapted according to the pipes length and the tank capacity.

HOW TO FILL THE COOLANT SYSTEM:



1. Check that the drain plug (B) on the side of the engine is properly tightened.
2. Add coolant through the heat exchanger filler port on top (A). Stop filling when coolant is reaching the bottom of the filler cap lip.
3. Close and secure cap.
4. Start the engine and let it operate few minutes at idle. Stop the engine, wait few minutes and check the coolant level in the heat exchanger and in the expansion tank. Top up if necessary.



CAUTION !

If a boiler is connected to the engine, follow the filling procedure given by the manufacturer of the boiler. If the boiler is above the engine in the boat, first fill the heat exchanger, the boiler, and top up with coolant the recovery tank located above the boiler.

Make sure not to overfill the heat exchanger when filling with coolant. If too much coolant has been added, drain part of the coolant.

HEAT EXCHANGER SERVICE

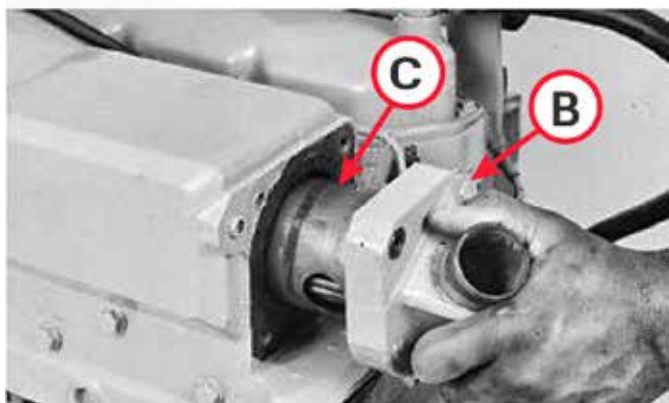
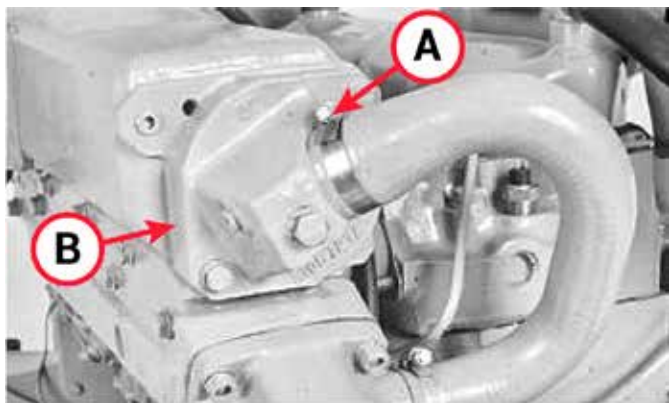


IMPORTANT !

Have the engine heat exchanger inspected at intervals. Get on hand spare new seals before servicing this unit. It is highly recommended to have this service performed by a seasoned marine service technician.

HEAT EXCHANGER INSPECTION:

1. Close sea cocks and drain the sea water system.
2. Open drain cock on cylinder block and drain approximately two gallons of engine coolant into a clean container. Close drain cock.
3. Loosen clamp (A) and remove duct from rear end cap (B).
4. Remove the two end mounting cap screws and remove end cap (B) with heat exchanger core (C) from rear of engine.



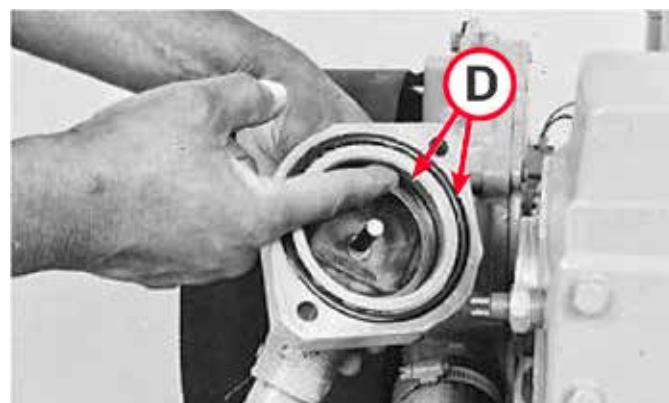
NOTE !

It is recommended that both end caps be removed when cleaning the heat exchanger core.



Use a brass rod to clean out any buildup in each heat exchanger tube. Run the rod the entire length of each tube to push debris out. Flush the heat exchanger tubes with clean water, making sure all tubes are cleared of debris.

If you suspect that your heat exchanger core is defective, have your authorized Nanni representative to handle this task. Replace the heat exchanger core as required. Remove and thoroughly clean with water the manifold/heat exchanger housing if needed.



Inspect end cap O-rings (D). O-rings may be reused if not worn nor flattened. Lubricate front and rear end cap O-rings with clean multi-purpose grease. Tighten cap screws to 24 Nm (18 lb-ft).

Fill up heat exchanger with coolant mix. Check for leaks. Start the engine for a few minutes. Check again for leaks.

RAW WATER SYSTEM



DANGER !

When the boat is on the water, water can flow into the boat via components located below the waterline. Close the raw water cock (if fitted) or prevent water discharge before working on the raw water system.

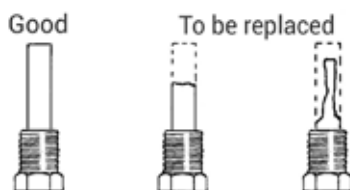
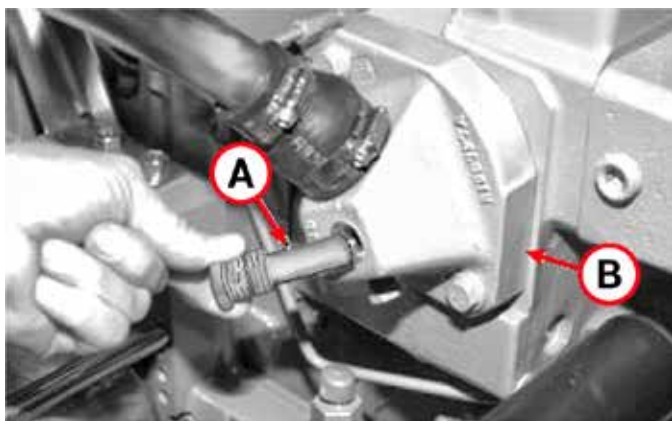


NOTE !

If there's any risk of frost, raw water system should be drained.

CHECKING SACRIFICIAL ANODES

Two protective zinc plugs (A) installed on the sea water cooling system **MUST BE** removed from end cap (B) and inspected at regular intervals.



Zinc plugs new part dimensions are 31.8 mm (1.25 in.) long and 9.5 mm (0.38 in.) diameter.

SIPHON BREAKER



DANGER !

Close the sea cock before any operation on the siphon breaker.



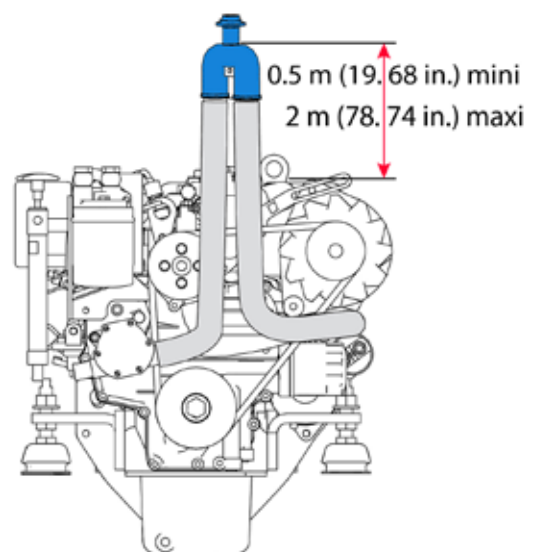
NOTE !

Siphon-breaker itself is not part of maintenance sheddule, but check regularly that the ducts are in good condition during the walk around. Please keep in mind that a siphon-breaker is compulsory if top of exhaust elbow is below the waterline.



CAUTION !

A faulty operation of the siphon breaker will lead to water entry in the engine. Inspect it regularly and clean it following the instructions given by the manufacturer.



On above picture: siphon breaker in blue.

EXTRACT THE RAW WATER PUMP IMPELLER



CAUTION !

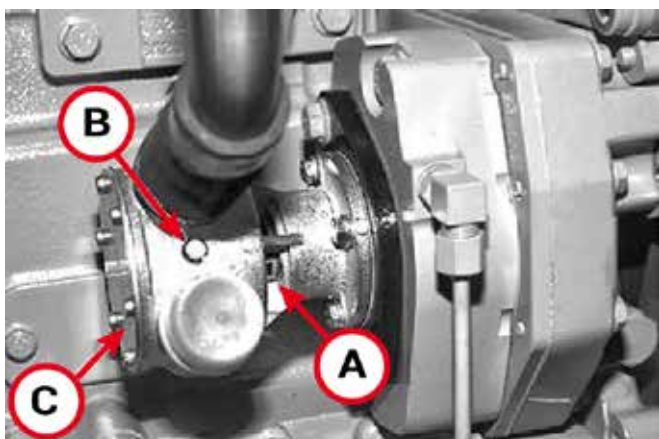
If the engine has been run without supply of raw water, check the raw water pump impeller. Change it if needed.



NOTE !

The service life of the raw water pump impeller vary depending the operating conditions. Inspect the sea water pump housing weep hole (A) for evidence of water or oil indicating seal leakage.

The raw water pump impeller is an essential component of the engine. It should be changed regularly along with the seal. A worn impeller could crack and damage the cooling system. Always have a spare raw water pump impeller on board.



Legend:

- A: Weep hole
- B: Cam screw
- C: Cover plate

TO EXTRACT THE IMPELLER:

Stop the engine, remove the key from the panel and close the sea cock. Remove the top cover flange of the raw water pump (6 screws). Remove the gasket (D).

With a permanent pen, mark the position of the neoprene impeller (E) inside the pump in order to install it in the correct position in case of reinstallation. Gently pull off the impeller in using an extractor.

Closely inspect the impeller. Check for damaged, cracked, broken missing or flattened vanes. Change the impeller if it is damaged. Thoroughly clean and drain the raw water system if parts of the impeller are missing.

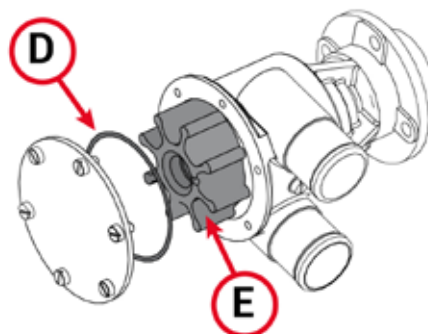
Inspect the cover and the gasket for corrosion or damage. Change it if they are damaged. Lubricate the inside of the pump and the cover with waterproof grease for rubber.

Apply LOCTITE® 242 (or equivalent threadlock compound) to curved side of cam plate near threaded hole and install cam plate into impeller housing bore, be sure holes in cam plate and housing are aligned. Apply LOCTITE® 242 to cam screw (B), install, and tighten.

Install the impeller. If reinstalling the old one, place it at the same location using the mark done previously. Rotate the impeller in the same direction as the engine rotation. Lubricate the impeller with waterproof grease for rubber.

Install the gasket and the cover on the pump housing. Open the sea cock, check for leaks. Prime the raw water system by adding water through the raw water filter if necessary.

Start the engine and check for leaks.



CLEANING THE RAW WATER FILTER

The model of prefilter can vary according to the boat as the raw water filter is an optional extra not in the scope of supply of the engine. These instructions are given as an example only.

Check the raw water filter more regularly than indicated in the service schedule if the boat is used in water with a lot of dirt and/or mud.

TO CLEAN THE FILTER:

1. Stop the engine, remove the key from the panel and close the sea cock.
2. Check the condition of the raw water filter. If deposits have formed, unscrew the cover and remove the seal plate.
3. Remove all the contaminants. Rinse the filter and the housing with fresh water and check the condition of the seal.
4. Reinstall all the components and open the sea cock. Start the engine and check for leaks.
5. Notice: When the boat is out of water, check that the through-hull is not clogged by mud or algae.



RAW WATER SYSTEM - DRAINING



WARNING !

It is highly recommended to carry out these operations when the boat is laid up on bare ground. If the boat cannot be removed from the water, close the sea cock and prevent water entry by any means.

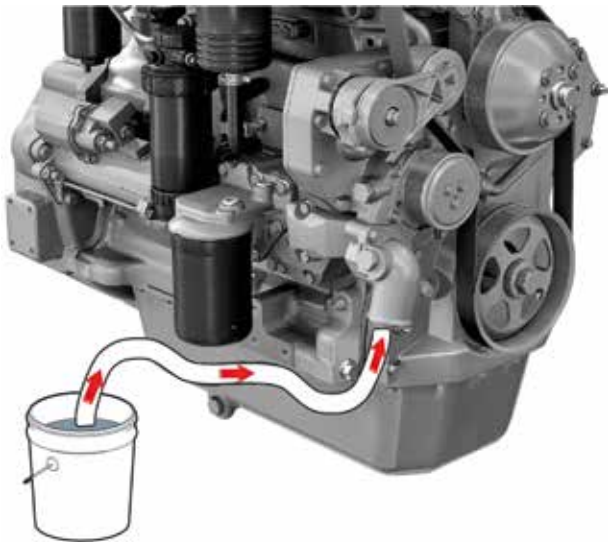
1. Stop the engine, remove the key from the panel and close the sea cock.
2. Remove the cover of the raw water pump.
3. Remove the cover and the seal from the raw water filter.
4. If a siphon breaker is fitted, drain it in following the manufacturer recommendations.
5. Drain the cooling system of the transmission lubrication circuit (if fitted).
6. Drain the waterlock and any other equipment connected to the raw water and exhaust system.
7. Reinstall correctly all components. Open the sea cock and check for leaks. Prime the raw water system by adding water through the raw water filter if necessary.

RAW WATER SYSTEM

RAW WATER SYSTEM CLEANING:

The raw water system must be cleaned to remove the building up of deposits and salt crystals as soon as detected or suspected.

1. Stop the engine and close the sea cock valve.
2. Disconnect the hose on the outlet side of the raw water filter.
3. Place the freed hose end in a container filled with fresh water. Ensure that the tank is large enough as the raw water pump must never run without water. Keep enough water on hand to add up constantly.



4. Check that no one is in the vicinity of the engine, the propeller and the exhaust outlet. Put the lever in neutral and start the engine.
5. Let the engine to run for a few minutes at idle. Add up fresh water in the container before container is being emptied.
6. Stop the engine.
7. At this stage, the raw circuit is alleged to be cleaned up. If deposits and salt crystals are still present, consult your Nanni representative. Do not add up cleaners additives like caustic soda, as aluminium parts are prone to fast corrosion if harshly cleaned.
8. Clearly identify all closed valves with labels: on wheelhouse dashboard, on valves.

RISK OF ICING - PROTECTION AGAINST FROST

1. Start process after point 8 of previous paragraph is done. Empty the remaining fresh water left in the container.
2. Fill the container with engine coolant mix (50% clean water, 50% anti-freeze).
3. Start the engine and let it run at idle. Add enough coolant to fill the raw water system with coolant.
4. Stop the engine before the container is empty.
5. Reconnect the hose.
6. Clearly identify all closed valves with labels: on wheelhouse dashboard, on valves.
7. Drain the coolant mix and refill the raw water circuit when safe weather conditions are resuming.



WARNING !

Check for leaks before the next engine start.



CAUTION !

When preparing the engine for long term storage, if the engine is likely to be subject to frost, drain and flush away all water remaining in the raw filter circuit.

ELECTRICAL SYSTEM



DANGER !

Stop the engine and switch off the main breaker before working on the electrical system. Isolate shore current to any accessories supplying the engine.



CAUTION !

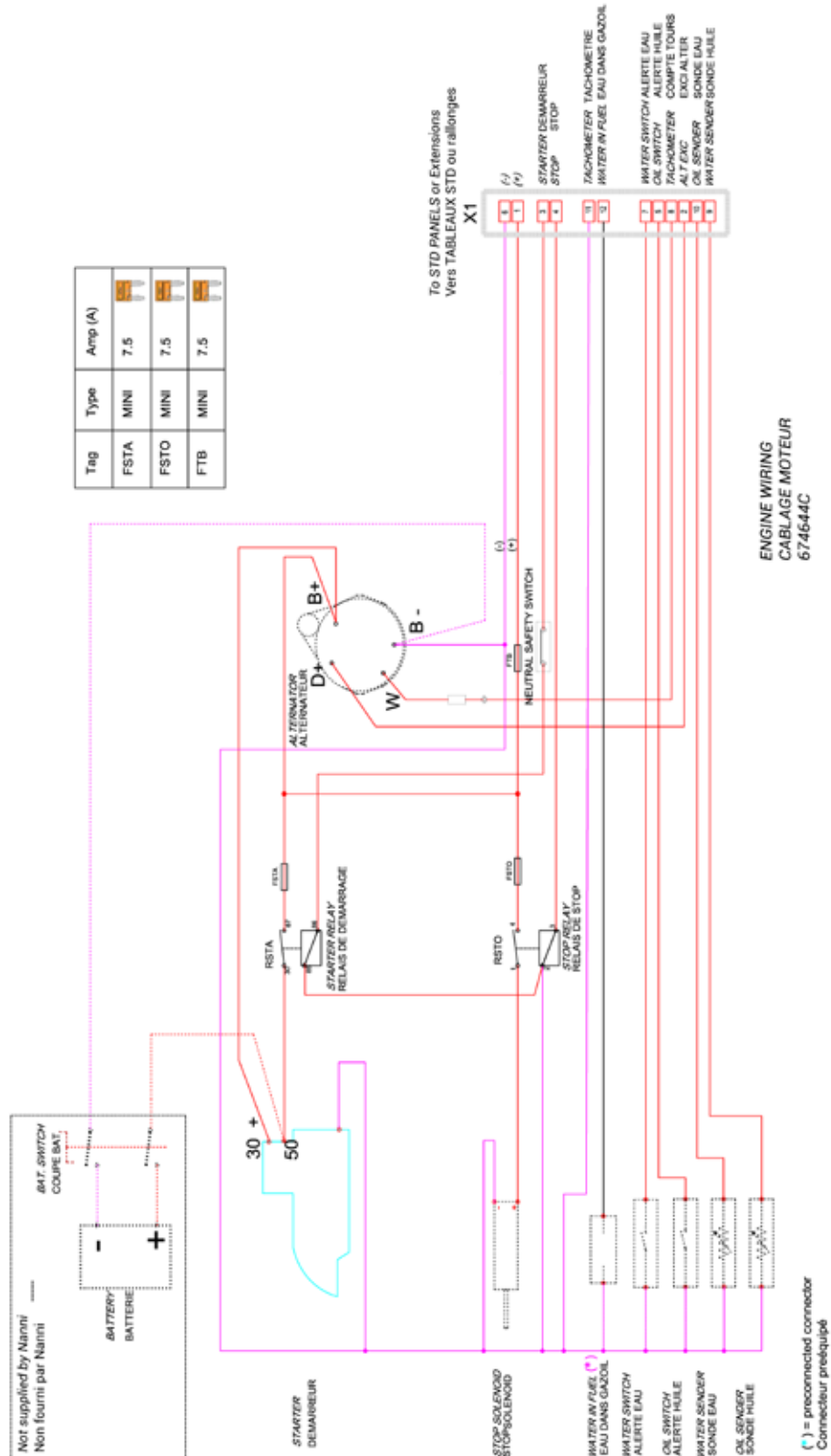
The main breaker switch must remain ON when the engine is operating. Never disconnect the cable between the alternator and the battery when the engine is running.

WIRES AND CONNECTORS

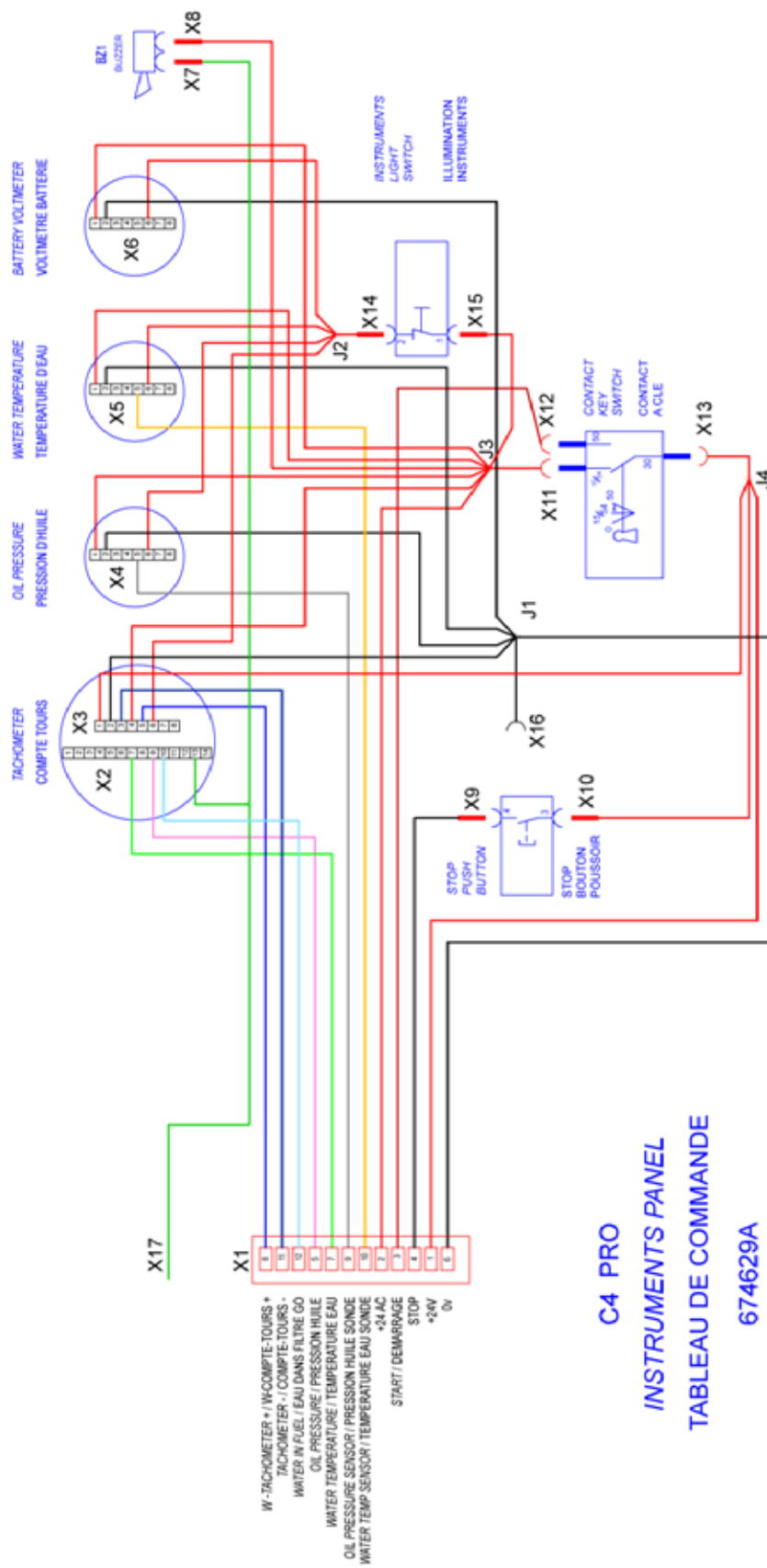
Check that electrical wires and connectors are dry and in good condition. Replace any defective part. Do not scrape green deposits on lugs in using grit : nickel plating would be removed and bare copper would corrode even faster. Tighten time to time all terminals secured by screws. Do not forget breakers in the electrical cabinet.

S08 MAINTENANCE

ENGINE ELECTRICAL WIRING



S08 MAINTENANCE



BATTERY



DANGER !

Disconnect the battery cables before contemplating any kind of soldering work. Arc welding is a carrier of heavy transients currents and may affect (or destroy) many sensitive electronic components such as the E.C.U.



Read below recommendations before operating or servicing the battery.

To charge two independent batteries with a single alternator, an isolator is available as an option on most engines. Contact an authorized Nanni representative.

KEEP CLEAN THE BATTERY

the Battery(ies) should be kept clean and dry. Oxidization deposits on the battery and on terminals posts may lead to a wide variety of disturbances like: dead shorts, voltage drops, premature discharging, notably in wet or cold weather. In some occurrences, these disturbances may be hard to locate. Use a brass brush to clean battery terminals posts.

DISCONNECT THE STARTER CABLES

1. Disconnect the negative (-) first.
2. Then remove the positive (+) cable.

If the battery is replaced, make sure that the previous one was the correct model. Check against the table below:

Engine	CCA at 0°F (-18°C)	SAE
4045AFM85	Amps	Type
12 V	640	4D
24 V	570	2 x 4D

CONNECT THE CABLES

1. Always connect first the positive lead (+) to the positive terminal (+) of the battery
2. And then the negative (-).

BATTERY ELECTROLYTE LEVEL



DANGER !

Never touch the battery electrolyte with bare fingers. The diluted sulphuric acid solution burns skin and will pierce clothing. Should this occur, immediately wash garments with spring water. Obtain medical advice and assistance without delay for burns.

ELECTROLYTE LEVEL CHECK

In general, detailed informations for service provided by battery manufacturers are very scarce. As a conservative rule, electrolyte level must always be above the top of the lead plates (+/-1 cm - slightly less than half of an inch). Electrolyte is a mix of sulfuric acid and water. If level is decreasing, acid concentration is not supposed to deplete with evaporation. Water alone must be added, but it is a good practice to check also the specific gravity with a hydrometer. Follow these indications :

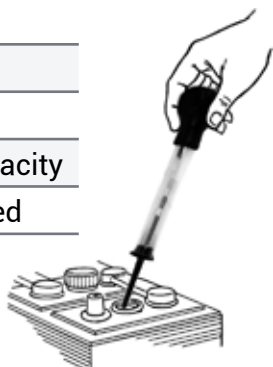
Unscrew completely the vent plugs and check level with a flashlight in each and every orifice.

Use a syringe filled with distilled water to top up the compartment where electrolyte level is too low.

Check gravity in each cell. A reading below 1.215 requires either charging the battery or to replace it.

If the lead plates are not sulfated and still in good condition, charging will improve specific gravity.

Specific Gravity	Charge
1.260	100%
1.230	75%
1.200	50%
1.170	25%
1.140	Very low capacity
1.110	Discharged



NOTE !

Never shake the battery during the process of adding electrolyte !

If the battery electrolyte level cannot be adjusted (maintenance free battery type), do not use or charge the battery if the fluid level is below the lower limit level.

If the battery has been left unattended for an extended period of time, it is likely that the battery has entered in a deep discharge process. In such a case, voltage read would be around 7 Volts or so. In such a case, it would be very unlikely for the battery to recover and it is to fear that any charge attempt will fail.

ALTERNATOR BELT

The engine alternator is driven by a belt through pulleys. These components must be in good order at all times in view for the alternator to provide electricity, among others, to the engine, to the battery, to the engine control panel.



DANGER !

Stop the engine and remove the key before checking or servicing the alternator belt.



NOTE !

Always keep a spare replacement belt on-board.



IMPORTANT !

A loosen or damaged belt can result in overheats or lack of alternator charge. A too tighten belt can damage the bearings of the water pump and of the alternator.

VISUAL CHECK OF THE ALTERNATOR BELT:

If belt internal wires become visible and frayed, replace it. Check that belt fits properly in the pulleys. Belt is constantly put under tensioning device.



TO REPLACE THE BELT:

1. Stop the engine and remove the key from the panel.
2. Carefully remove beltguard cover from engine.
3. Release tension on belt on tension arm and remove poly-vee belt from pulleys.
4. Install the new belt. Check that the belt seats nicely between the flanges of all the pulleys.
5. Apply tension to belt with tensioner. Remove socket.

CHECK THE BELT TENSION:

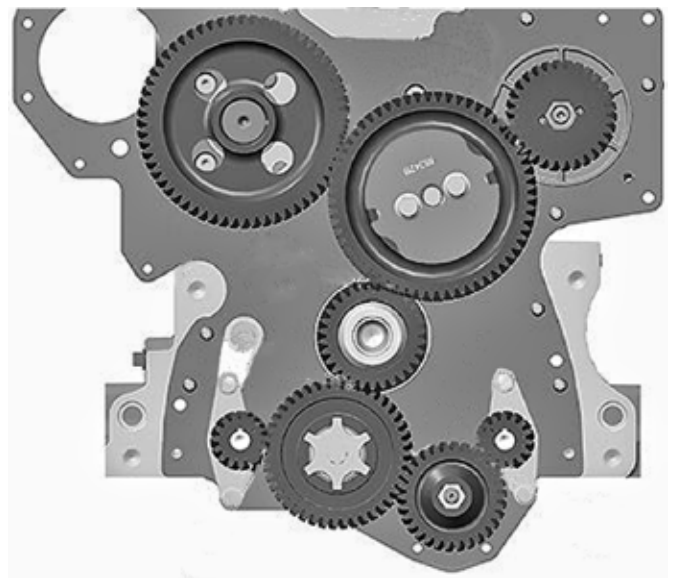
On picture shown at bottom of previous page, depress the belt at point indicated by the red arrow and check for a deflection between 7 and 9 mm. If required, loose the head screw as indicated below and adjust belt tension.



MISCELLANEOUS

CAMSHAFT TIMING

From the two camshafts down to the crankshaft, N5.150 engine timing is ordered through a gear system. The complete assembly is service free. Inspection is occurring only during a major service on the engine



SUMMARY

S09 ALTERNATOR	67
SUMMARY	67
GENERALITIES	68
SAFETY WARNINGS	68
INTERNATIONAL STANDARDS	68
ELECTRICAL PERFORMANCES	68
REINFORCED MECHANICAL STRUCTURE	68
TERMINAL BOX	68
CLASS OF PROTECTION	68
LSAM 44.3 S2 DESCRIPTION	68
CHARACTERISTICS	69
LSAM 44.3 S2 CHARACTERISTICS & RATINGS	69
OUTPUT CONNECTIONS	69
ALTERNATOR SAFETY RULES	70
HANDLING	70
CONNECTIONS CHECKS	70
HOW TO SECURE CABLES	70
CONNECTIONS TO TERMINAL POSTS	71
ROUTINE MAINTENANCE	71
REPAIRS	73
STORAGE	73
DISPOSAL AND RECYCLING INSTRUCTIONS	73

GENERALITIES

The genset QLS65T is equipped with a LSAM 44.3 S2 alternator specially designed for coupling with combustion engines.

SAFETY WARNINGS



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

INTERNATIONAL STANDARDS

The LSAM 44.3 S2 alternator is conform to the main international standards and regulations : IEC 60034, NEMA MG 1.32-33, ISO 8528-3, CSA C22.2 n°100-14, UL 1446 (UL 1004 on request), marine regulations, etc.

Alternator can be integrated into a CE marketed genset. The LSA M 44.3 S2 is designed, manufactured and marketed in an ISO 9001 environment and ISO 14001.

ELECTRICAL PERFORMANCES

- Class H insulation.
- Standard 12 wire re-connectable winding, 2/3 pitch, type no. 6.
- Available voltage range (on order only-cannot be changed afterwards by the user) :

50 Hz : 220 V - 240 V and 380 V - 415 V (440 V)
60 Hz : 208 V - 240 V and 380 V - 480 V

- High efficiency and motor starting capacity.
- R 791 interference suppression conform to EN 55011 group 1 class B standard for European zone (CE marking).

REINFORCED MECHANICAL STRUCTURE

- Compact rigid assembly to better withstand generator vibrations.
- Steel frame and terminal box.
- Aluminium flanges and shields.
- Two-bearing and single-bearing versions designed for commercially-available heat engines.
- Permanently greased bearings (20 000h).
- Direction of rotation : clockwise and anti-clockwise (without derating).

TERMINAL BOX

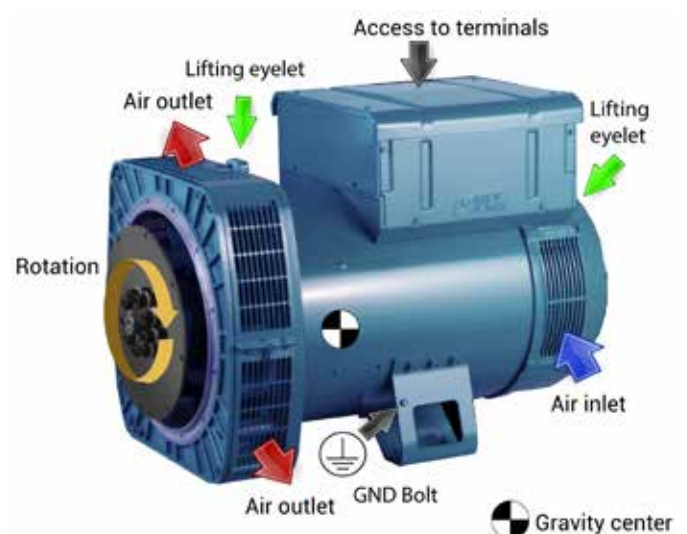
- Easy access to the AVR (lid) and connections.
- Terminal block for reconnecting voltage.

CLASS OF PROTECTION

- The LSAM 44.3 S2 Class is IP 23.

Standard winding protection for clean environments with relative humidity $\leq 95\%$, including indoor marine environments.

LSAM 44.3 S2 DESCRIPTION



CHARACTERISTICS

LSAM 44.3 S2 CHARACTERISTICS & RATINGS

General characteristics

Insulation class	H	Excitation system	SHUNT	AREP / PMG
Winding pitch	2/3 (wdg 6)	AVR type	R250	D350
Number of wires	12	Voltage regulation (*)	± 0.5%	± 0.25%
Protection	IP 23	Short-circuit current	-	300% (3 IN): 10 s
Altitude	≤ 1000 m	Total Harmonic Distortion THD (**) in no-load	< 2%	
Overspeed	2250 min ⁻¹	Total Harmonic Distortion THD (**) on linear load ...	< 5%	
Air flow	0.25m ³ /s, 50 Hz - 0.30m ³ /s, 60 Hz	Waveform: NEMA = TIF (**)	< 50	

(*) Steady state. (**) Total harmonic distortion between phases, no-load or on-load (non-distorting).

Ratings 50 Hz - 1500 R.P.M.

kVA / kW * - P.F. = 0.8																					
Duty/T°C		Continuous duty/40°C					Continuous duty/40°C					Stand-by/40°C					Stand-by/27°C				
Class/T°K		H/125°K					F/105°K					H/150°K					H/163°K				
Phase		3 ph.			1 ph.		3 ph.			1 ph.		3 ph.			1 ph.		3 ph.			1 ph.	
Y		380V	400V	415V	440V	ΔΔ	380V	400V	415V	440V	ΔΔ	380V	400V	415V	440V	ΔΔ	380V	400V	415V	440V	ΔΔ
Δ		220V	230V	240V		230V	220V	230V	240V		230V	220V	230V	240V		230V	220V	230V	240V		230V
YY		220V					220V					220V					220V				
44.3 S2	kVA	70	70	70	63	42	64	64	64	57	38	74	74	74	67	45	77	77	77	69	46
	kW	56	56	56	50	33.5	51	51	51	46	30.5	59	59	59	54	36	62	62	62	55	37
44.3 S3	kVA	80	80	80	72	48	73	73	73	66	44	85	85	85	76	51	88	88	88	79	53
	kW	64	64	64	58	38.5	58	58	58	53	35	68	68	68	61	41	70	70	70	63	42
44.3 S4	kVA	90	90	90	81	54	82	82	82	74	49	95	95	95	86	57	100	100	100	89	59
	kW	72	72	72	65	43	66	66	66	59	39	76	76	76	69	46	80	80	80	71	47
44.3 S5	kVA	100	100	100	90	60	91	91	91	82	55	106	106	106	95	64	110	110	110	99	66
	kW	80	80	80	72	48	73	73	73	66	44	85	85	85	76	51	88	88	88	79	53

OUTPUT CONNECTIONS

In itself, the ID plate of the alternator is providing to the marine electrician in charge of installation, all data informations as how to connect output(s) and to define downstream protections, safety devices, proper wire gauges to use.

ALTERNATOR SAFETY RULES



DANGER !

During operation, do not stand in front of the air outlet guards, in case anything is ejected from them. Do not allow bystanders or children to stay near the air inlet & outlet guards.

HANDLING



CAUTION !

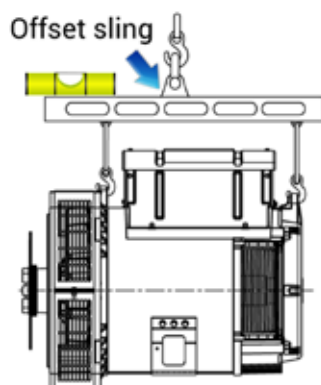
The alternator is coming already fitted onto the engine. The following applies only when alternator has to be removed for major service.

Fat-sized lifting eyes are for handling the alternator only. They must not be used to lift the genset. The choice of lifting hooks or handles should be determined by the shape of the lifting eyes. Choose a lifting system in accordance with the integrity and the environment of the machine.



CAUTION !

Because of the alternator offset center of gravity, keep the sling horizontal. Do not allow anyone to stand under the load during operation.



CONNECTIONS CHECKS



CAUTION !

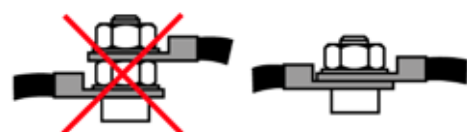
Electrical installations must comply with the current legislation in force in the country of use. Check that :

- The residual circuit-breaker conforms to legislation on protection of personnel, in force in the country of use, and has been correctly installed on the alternator power output as close as possible to the alternator. (In this case, disconnect the wire of the interference suppression module linking the neutral).
- Protection devices in place are on trip position.
- If there is an external AVR, the connections between the alternator and the cabinet are made in accordance with the connection picture.
- There is no short-circuit phase-phase or phase-neutral between the alternator output terminals and the generator set control cabinet (part of the circuit not protected by circuitbreakers or relays in the cabinet).
- The machine should be connected with the busbar separating the terminals as shown in the terminal connection picture.



- The alternator earth terminal inside the terminal box is connected to the electrical earth circuit.
- The earth terminal is connected to the frame. The connections inside the terminal box must never be subjected to stress due to cables connected by the user.

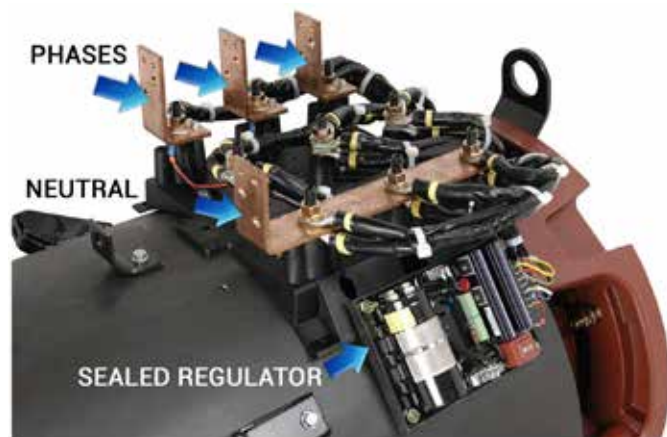
HOW TO SECURE CABLES



Tightening torque for M10 bolts is : 20 Nm +/-3.

S09 ALTERNATOR

CONNECTIONS TO TERMINAL POSTS



ROUTINE MAINTENANCE

Checks after start-up

After approximately 20 hours of operation, check that all fixing bolts on the machine are still tight, plus the general state of the machine and the various electrical connections in the installation.

Electrical service



WARNING !

Commercially-available volatile degreasing agents can be used, but do not use harsh solvents such as : trichlorethylene, perchlorethylene, trichloroethane or any alkaline type of products.

These operations must be performed in a cleaning station, using a vacuum system collecting and flushing out the products used with waste disposal recycling.

Although the insulating components and the impregnation system are not at risk of damage from solvents, avoid letting the cleaning product to run into the slots.

Apply the product with a brush, sponging frequently to avoid accumulation in the housing. Dry the windings with a dry cloth. Let any traces evaporate before reassembling the machine.

Mechanical service



WARNING !

Cleaning the alternator with water or a high pressure washer is strictly prohibited. Any problems arising from such treatment are not covered by warranty. For degreasing: use a brush and detergent (suitable for paintwork). For dusting: use an air gun.

Bearings

Bearings are permanently greased. Average greasing is depending of use = 20 000 hours of run or 3 years.

Mechanical defects

FAULT		ACTION
Bearing	Excessive overheating of one or both bearings (bearing temperature 80°C above the ambient temperature)	-If the bearing has turned blue or if the grease has turned black, change the bearing. - Bearing not fully locked (abnormal play in the bearing cage) - End shields incorrectly aligned
Abnormal temperature	Excessive overheating of alternator frame (more than 40° C above the ambient temperature)	Air flow (inlet-outlet) partially clogged or hot air is being recycled from the alternator or engine -Alternator operating at too high a voltage (>105% of Un on load) -Alternator overloaded
Vibrations	Too much vibration	-Misalignment (coupling) -Defective mounting or play in coupling -Rotor balancing fault (Engine - Alternator)
Abnormal noise	Alternator damaged by a significant impact, followed by humming and vibration	-System short-circuit -Misparalleling Possible consequences -Broken or damaged coupling -Broken or bent shaft end -Shifting and short-circuit of main field -Fan fractured or coming loose on shaft -irreparable damage to rotating diodes/AVR, surge suppressor

Electrical faults

Fault	Action	Effect	Check/Cause
No voltage at no load on start-up	Connect a new battery of 4 to 12 volts to terminals E- and E+, respecting the polarity, for 2 to 3 seconds	The alternator builds up and its voltage is still correct when the battery is removed	- Lack of residual magnetism
		The alternator builds up but its voltage does not reach the rated value when the battery is removed	- Check the connection of the voltage reference to the AVR - Faulty diodes - Armature short-circuit
		The alternator builds up but its voltage disappears when the battery is removed	- Faulty AVR - Field windings open circuit (check winding) - Revolving field coil open circuit (check the resistance)
Voltage too low	Check the drive speed	Correct speed	Check the AVR connections (AVR may be faulty) - Field windings short-circuited - Rotating diodes burnt out - Revolving field coil short-circuited - Check the resistance
		Speed too low	Increase the drive speed (do not touch the AVR voltage pot. (P2) before running at the correct speed)
Voltage too high	Adjust AVR voltage potentiometer	Adjustment ineffective	Faulty AVR
Voltage oscillations	Adjust the AVR stability potentiometer	If no effect: try normal or fast stability modes (ST2)	- Check the speed: possibility of cyclic irregularity - Loose connections - Faulty AVR - Speed too low when on load (or AVR LAM set too high)
Voltage correct at no load and too low when on load	Run at no load and check the voltage between E+ and E- on the AVR	Voltage between E+ and E- (DC) SHUNT < 20V - AREP / PMG < 10V	- Check the speed (or AVR LAM set too high)
		Voltage between E+ and E- SHUNT > 30V - AREP / PMG > 15V	- Faulty rotating diodes - Short-circuit in the revolving field coil. Check the resistance. - Faulty exciter armature. Check the resistance
Voltage disappears during operation	Check the AVR, the surge suppressor, the rotating diodes, and replace any defective components	The voltage does not return to the rated value	- Exciter winding open circuit - Faulty exciter armature - Faulty AVR - Revolving field coil open circuit or short-circuited

REPAIRS

An alternator is a very sophisticated piece of equipment. In case of fault, there is no serviceable part inside the unit for the end user. Should any defect be found in the above tables, consult a seasoned certified marine electrician who will contact the nearest Nanni representative for action to undertake.

ALTERNATOR STORAGE

As the alternator is fitted onto the engine, follow storage genset recommendations.

DISPOSAL AND RECYCLING INSTRUCTIONS

These instructions are for information purposes only. It is the user's responsibility to comply with local regulations regarding product disposal and recycling.

Recyclable materials

Alternators are mainly constructed from iron, steel and copper materials, which can be reclaimed for recycling purposes.

Waste & hazardous materials

The following components and materials require special treatment and must be separated from the alternator before the recycling process:

- Electronic materials found in the terminal box, including the automatic voltage regulator (198), current transformers (176), interference suppression module (199) and other semi-conductors.
- Diode bridge (343) and surge suppressor (347), found on the alternator rotor.
- Major plastic components, such as the terminal box structure on some products.

These components are usually marked with information concerning the type of plastic. All materials listed above need special treatment to separate waste from reclaimable materials and should be entrusted to specialist recycling companies.

The oil and grease from the lubrication system is labelled as a hazardous waste and must be treated in accordance with local regulations.

SUMMARY

S09 STORAGE	74
SUMMARY	74
LONG TERM STORAGE	75
LONG TERM STORAGE PROCEDURE	75
RESTARTING THE ENGINE	76
BATTERY	76
ALTERNATOR	76

LONG TERM STORAGE

A set of operations must be performed to prepare and protect the genset for a long-term storage.

See the Maintenance Section - Risk of icing conditions / Protection against frost, to perform some of the Long Term Storage operations onto the engine. We recommend that you have all these operations carried out by a Nanni authorized workshop.

If not fitted inside the vessel, the genset should be left in the original crate and stored at room temperature, away from moist.

Should the need be required, some specialized companies may either store the genset in appropriate conditions for very long storage, or wrap it in applying a specific protective film on it.



NOTE !

It might be necessary to adapt these operations depending the climatic conditions. Contact a Nanni authorized workshop for further informations.

For a prolonged storage (over 12 months), a specific set of measures must be performed. All these operations should be carried out by a Nanni authorized workshop.



CAUTION !

If the engine is likely to be subject to frost, drain all water in the seawater circuit.

LONG TERM STORAGE PROCEDURE

Complete the nearest periodic maintenance inspections and operations before performing the long term storage procedure.

1. Drain and change the engine and transmission oil.
2. Change the engine oil filter.
3. Change the fuel filter and prefilter.
4. Run the engine to normal operating temperature.
5. Stop the engine and take the boat out of water.
6. Drain and clean all components of the seawater system. Protect the components against corrosion.
7. Remove the impeller from the seawater pump (if fitted). Store it in a cool and dry place. Indicate by any means that the impeller has been removed.
8. Check the engine coolant level and condition. Top up if necessary.
9. Drain any water and contaminants from the fuel tank.
10. Fill totally the fuel tank.
11. Remove the air filter. Secure all air intake with clean clothes.
12. Clean the engine. Repair any damaged areas of paintwork with Nanni original paint.



CAUTION !

Do not point a high pressure water jet toward seals, hoses, grommets, etc.

13. Clean the hull, the hold and the drive (if fitted).
14. Check all control cables. Use grease and rust inhibitor to protect the cables.
15. Disconnect battery leads. Adjust electrolyte level if necessary. Charge the battery. Store the battery in a dry place.
16. Release tension. on belts.
17. Spray the engine with water-repellent product.
18. Remove the propeller for storage. Check the overall condition of all components of the propulsion system.

RESTARTING THE ENGINE

1. Perform external cleaning of the engine and control its condition.
2. Drain and change the engine and transmission oil.
3. Change oil filters.
4. Check the condition of the raw water pump impeller. Change it if needed. Install the impeller.
5. Remove cloths and tapes from openings. Install the air filter.
6. Close/Tighten all plugs and drain cocks.
7. Check the condition of hoses and clamps.
8. Check the sacrificial anodes (when fitted).
9. Fill the engine with coolant and level up. Top up if necessary.
10. Connect fully charged batteries.
11. Check the connection cables and their condition.
12. Check belts. Adjust the tension.
13. Bleed the fuel system.

Once ready :

14. Open the sea cock and prime the seawater system (if fitted).
15. Start the engine. Check for leaks and correct operation.
18. Check electric power output.

BATTERY

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

Do not left the battery unattended for a long period of time: it will get into deep discharge (around 7-8 Volts). In such a situation, the battery will not recover.

ALTERNATOR

During long term storage, the alternator must not be removed from the engine. Inlet and outlet ventilation slots should be protected to avoid moist to seat inside the alternator.

S11 TROUBLESHOOTING



CAUTION !

If the engine part of the genset does not function properly, use the following chart to identify the cause. If the cause of trouble can not be found, contact to Nanni authorized workshop.

Alternator troubleshooting has been addressed in the Alternator section of this Operator Manual. Please refer to this chapter in case of alternator fault.



NOTE !

Being generic, the table below may cover more items than contained in the engine genset you have. This list is not exhaustive and is only an assistance in case of emergency.

PROBABLE CAUSES

The engine fails to start	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13
The engine starts but suddenly stops	1, 2, 3, 4, 5
The engine is difficult to start	1, 2, 3, 4, 5, 6, 8, 9
The starter motor is not turning or turn slowly	8, 9
The starter motor turns but the engine does not start	1, 2, 3, 4, 5, 6, 7
The engine does not reach its rated speed at wide open throttle	2, 3, 4, 5, 6, 7, 12, 14, 15, 16, 17, 26, 28
The engine operate unevenly	1, 2, 3, 4, 5, 6, 7, 14, 15, 16, 17, 18, 19, 20, 24, 28
The engine vibrates a lot	16, 27
Black exhaust smoke	4, 5, 14, 15, 16, 19, 20, 28, 29
White exhaust smoke	4, 5, 23, 25
High fuel consumption	4, 7, 14, 15, 16, 19, 20, 22, 28
The engine overheats / coolant temperature too high	14, 15, 16, 18, 19, 20, 21, 22, 28
The control lever is hard to operate	12, 14, 15, 16, 17, 26
No shift between ahead and astern	9, 11, 12, 16, 17, 26
Battery charge warning lamp comes on	8, 9, 11, 18

The numbers refer to the possible causes indicated on the following page.*
Contact a Nanni authorized workshop.

S11 TROUBLESHOOTING

1. Lack of fuel
2. Air in fuel system
3. Fuel filter fouled or clogged
4. Fuel do not meet specified standard
5. Water/contaminants in fuel
6. Valve clearance is wrong *
7. Low compression *
8. Insufficient battery charge / Defective battery
9. Faulty electrical cables contact
10. Faulty starter or starter switch *
11. Tripped fuse / Main switch is open
12. Transmission is damaged*
13. Control lever not in neutral / Stop control pulled out
14. Too much load on board
15. Fouling on underwater hull, drive or propeller
16. Defective/incorrect propeller *
17. Faulty operation of control lever / control cables
18. Loosen or damaged belt
19. Incorrect coolant / Low coolant level / Coolant leaks
20. Cooling system does not operate correctly *
21. Faulty thermostat *
22. Sea cock valve closed / Raw water filter clogged
23. Lube oil burns. Excessive oil consumption *
24. Engine oil level too low
25. Engine oil level too high
26. Transmission oil level too low
27. Defective engine mounting *
28. Insufficient air supply *
29. Clogged air filter or lack of air on admission



WARRANTY
CONDITIONS



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