

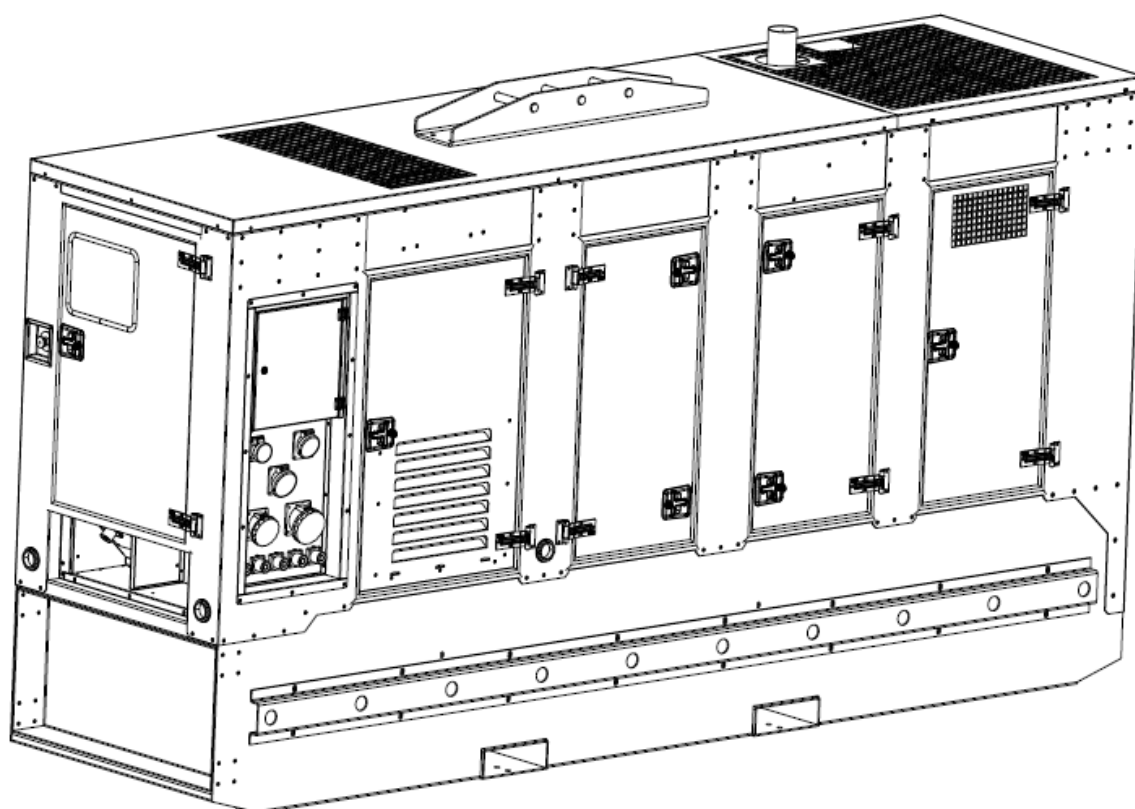
OPERATIONAL AND MAINTENANCE MANUAL



MODEL: MGTP 500 USL-S

ENGINE: VOLVO TAD881GE stage "V"

ALTERNATOR: LEROY SOMER LSA44.3VL14





OPERATING AND MAINTENANCE MANUAL MGTP 200 USL-VO

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1. INTRODUCTION

IN THE FOLLOWING PUBLICATION THE GENERATING SET WILL BE MENTIONED IN THE ABBREVIATED FORM "MACHINE", THE OPERATIONS AND MAINTENANCE MANUAL".



DANGER: THIS SYMBOL REPRESENTS A WARNING SIGNAL DESTINED TO ATTRACT ATTENTION FOR USE IN THE PRESENCE OF IMPORTANT INSTRUCTIONS FOR USE AND MAINTENANCE OF THE MACHINE.



CAREFULLY READ THE INSTRUCTIONS CONTAINED IN THE FOLLOWING MANUAL BEFORE UNDERTAKING ANY OPERATION OF THE MACHINE.
THE PRESENT MANUAL IS FOR QUALIFIED PERSONNEL, ONLY THOSE FAMILIAR WITH SAFETY REGULATIONS, OF INSTALLATION AND USE OF THE MACHINE. THE USER MUST NOT CARRY OUT ANY OPERATION INTENDED FOR QUALIFIED TECHNICIANS FOR USE AND MAINTENANCE.

GENERAL

The following manual refers to:

- TYPE OF MACHINE: **GENERATING SET.**
- SERIES: **FUSTEQ.**

No responsibility will be accepted for translations, in other languages, that may not conform to the original meaning.

THE MANUAL:

1. Is an integral part of supply and must be carefully read to ensure the correct use in conformity with the essential requisitions for safety.
2. Details the necessary technical information to ensure the correct use of procedures in conditions of safety.
3. Is to be stored carefully in a protected environment away from humidity or heat (in a clear plastic water tight protective covering to avoid deterioration) and must accompany the machine at all times during its life, including any passages to new owners.

All the replication rights of the present manual are reserved to the manufacturer even partial reproduction is not allowed. The manufacturer declines any responsibility of improper use of the machine and/or for any damage caused following any operation not mentioned in this manual. The manual reflects the state of the machine at the moment of supply and can not be held inadequate if later updated on the basis of new studies and/or experiences. The descriptions and illustrations are not binding, and as a consequence the manufacturer reserves the right to update the production and manuals without the obligation to do so with previous manuals and without obligation to inform the users of previously supplied machines.

The customer help service is available to supply, on request, information on the updates made to machines. In the case of loss or damage it is possible to receive a copy by making a request to the customer service by supplying the data information detailed on the machines identification plate.



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USER MANUAL

OPERATOR OR USER

Un-qualified personnel able only to undertake simple duties, like the running the machine through the commands placed on the buttons pad on the control panel, with the protection installed and active.

MAINTENANCE MECHANIC

A qualified technician able to run the machine in normal conditions, to work in AUTOMATIC MODE with the protection disabled, to intervene on mechanical sections to undertake all the calibrations, maintenance, interventions and repairs. The technician is not authorised to intervene on electrical wiring in the presence of live voltage.

ELECTRICAL MAINTENANCE

A qualified technician able to run the machine in normal conditions, to work in AUTOMATIC MODE with the protection disabled, to intervene on electrical wirings, to undertake all the calibrations, interventions of maintenance and repairs.

QUALIFIED TECHNICIANS

Manufacturers authorised and trained personnel trained to perform in extraordinary maintenance, repairs and operations of a complex nature or from the Technical help centre (T.H.C.)

GENERAL INFORMATION ON THE USE OF THE MACHINE

The present manual has been realised for the purpose of supplying to the user a general knowledge of the machine and instructions for maintenance deemed necessary for its good functioning. In particular the following have been taken into consideration:

- Instructions for the use of the machine and the environment where it is intended to be used.
- Regulations and applicable laws.
- Instructions for the operations not allowed on the machine.
- Instructions to avoid risks connected to the machine.
- Instructions for maintenance deemed necessary for the good functioning of the machine.
- Disposal instructions.

Before proceeding to the installation operation, maintenance and repairs, carefully read the manual, it contains all the necessary information for the correct use of the machine and therefore ensures avoidance of any accidents.

The frequency of control and maintenance prescribed by the manual are intended as the minimum necessary to guarantee efficiency, security and the wear and duration of the machine in normal working conditions, surveillance must however be constant and intervention in the case of malfunctioning must be prompt. All ordinary maintenance, controls and general lubrications must be undertaken with the machine switched off and disconnected from its power source (electrical etc)

GENERAL PRECAUTIONS ON USE OF MACHINE

For a correct use of the machine the working area must be adequate according to current regulations with respect to hygiene and safety. The present instructions are considered normal behaviour that workers must keep with regards the machine. It is the job of the user (delivering this manual) to inform and train the operators (managers, maintenance officers) to ensure that these instructions are known and understood by all the personnel that will use the machine.

- Where a safety selector or security lock with key is expected, the manufacturer and the operator are required to remove the key and to keep either on their person or in an area with limited access only to them or authorised personnel.
- During the lubrication change, always wear oil resistant gloves and always wash hands afterwards with abundant soap and water.

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- Clean immediately any oil spills on pavement to avoid injury through falls
- Do not allow unauthorised personnel to intervene on the machine.
- Do not start if the machine is damaged.
- Before using of machine it is necessary to check that any dangerous conditions for health and safety have been properly removed.
- Ensure that all covers and other protections are in their place and that all security devices are present and in efficient working order.
- Ensure that in the operator's defined area there are no unrelated objects present.
- The following individual protective devices must be used:
- When in contact with hot material gloves must be worn or other individual protective items, to avoid burns in the case of manual intervention.
- When effecting connection work, starting, maintenance, measurement and regulating of electrical equipment and/or of its components use gloves or other individual protection.

SYMBOLOLOGY

The symbols contained within the manual have the purpose of attracting the user's attention on the presence of dangers that could verify when in contact with the machine and all its components.

SYMBOLOLOGY AND LEVEL OF ATTENTION			
	GENERAL DANGER		DANGER SCORCHING PARTS
	DANGER HIGH VOLTAGE		DANGER BATTERY ACID FUMES
	DANGER MOVING PARTS		DANGER CORROSIVE
	DANGER SHARP EDGES		DANGER INTOXICATION
	DANGER INFLAMMABLE		DANGER EXPLOSIVE
	NO SMOKING OR USE OF NAKED FLAMES		NO REMOVAL OF PROTECTIVE DEVICES
	NO REPAIRS AND/OR LUBRIFICATION OF MOVING PARTS		NO WORK ALLOWED BEFORE REMOVING HIGH TENSION
	DO NOT EXTINGUISH WITH WATER		DO NOT AIM WATER JETS ON ELECTRICAL PARTS
	COMPULSORY USE OF PROTECTIVE GLASSES		COMPULSORY USE OF PROTECTIVE GLOVES
	COMPULSORY USE OF SAFETY BOOTS		COMPULSORY USE OF INDUSTRIAL EARMUFFS
	COMPULSORY USE OF PROTECTIVE CLOTHING		COMPULSORY EARTHING



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2. PRESENTATION

EXPECTED USE

The machine is destined exclusively for the production of electric energy. The conditions of use must be in conformity with that specified in paragraph "TECHNICAL DATA" and in respect with "PRINCIPLES OF USE" (hereafter described).

The use of the machine is consented on the basis of the following conditions:

- The machine must be used with respect to normal environmental parameters (shown on plate).
- The machine must be operated exclusively where there is no danger of explosions or fire.
- The working area must have sufficient natural light and must be equipped with sufficient artificial light and ventilation to safeguard the health and safety of the operator.
- Ensure that the installation's tension is in conformity with that specified on the machines identification plate.
- Read all the supplied information before using machine.
- Every intervention on the machine must be carried out exclusively by authorised and qualified personnel only.
- Entrust to authorised and specialised personnel only the keys to open the control panel.
- For maintenance and installation use always components authorised by manufacturer.



ANY OTHER USE OF MACHINE IS CONSIDERED IMPROPER USE, NOT ALLOWED, THEREFORE DANGEROUS, AND CONSEQUENTLY THE MANUFACTURER IS EXONERATED FROM ANY RESPONSIBILITY DERIVED FROM THE NON OBSERVANCE OF THESE DIRECTIVES.



ANY MODIFICATION OR TAMPERING UNAUTHORISED BY THE MANUFACTURERS OF THE MACHINE OR TO THE SAFETY SYSTEMS THE MANUFACTURERS DECLINE ANY RESPONSIBILITY WITH REGARDS TO CE CONFORMITY.

IDENTIFICATION PLATE

The machine conforms to all the National and International regulations therefore the machine should be used respecting the limits of such regulations and within their parameters shown on the machines identification plate fixed to the machine. The identification plate shows all the machines electrical, mechanical and environmental parameters of reference. The exact model, serial number and year of manufacture to facilitate the machines identification and quick and precise responses to eventual requisitions. Always quote this information when contacting the Customer Assistance Services or when requesting spare parts.



PRINCIPLE OF FUNCTION



DESCRIPTION OF COMMANDS AND BUTTON PAD ARE SHOWN IN THE SPECIFIED ATTACHED MANUALS

1. Before starting the machine, make sure that there are no unauthorised personnel in proximity of the machine.
2. Fixed security protections if removed must be replaced so as not to interfere with the functioning of the machine.
Do not remove or deviate the security protection or the security system during use of the machine or with the machine connected to voltage.
3. At every start of the machine the functioning of the emergency stop button must be checked ensuring the immediate stop of the machine.

The machine constitutes a system destined to produce electric energy comprised of an internal combustible engine and of a single-phase or three-phase alternator connected by mean of a joint.

The machine may be used for two types of principle services:

4. Machine for continuous service: used for the production of electric energy where mains power does not exist or where the user has decided to directly produce electric energy necessary for his needs.
5. Machines for emergency services used to compensate the occasional blackout that may verify to mains power, when such interruption may cause serious inconvenience to persons or cause material or financial damage.



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ENGINE

It is the main source of Energy and is needed to keep the alternator in movement from which mono-phase or three-phase electrical energy is collected. The necessity of the engine to be supplied with fuel is satisfied through the adoption of an incorporated tank whose capacity may vary according to the autonomy required. The engines exhaust manifold is protected with fixed protective devices which avoid accidental contact. All the machines are equipped with engines from the most prestigious makes and guarantee the best performance.



ALL TYPES OF FUNCTIONS AND DETAILS ARE DESCRIBED IN THE ATTACHED SPECIFIC MANUAL.

ALTERNATOR

The alternator is a single-phase or three-phase rotating electrical machine capable of transforming mechanical energy into electrical energy in the form of alternate electricity. To do this it is necessary to be connected to an engine. The alternator is a synchronising machine and the voltage at the frequency generated is strictly connected with the speed of its function. All the machines are equipped with alternators of the most prestigious makes and guarantee the best performance.



ALL TYPES OF FUNCTIONS AND DETAILS ARE DESCRIBED IN THE ATTACHED SPECIFIC MANUAL.

CONTROL PANEL

The control panel installed on board the machine carries out all the functions pertaining to the functioning of the machine. It serves to supply and, in the event of breakdown or in the case of maintenance, to disconnect electrically the machine. All machines are equipped with a standard control panel or equipped with specific control panels by request (automatic for applications in emergency services).



ALL TYPES OF FUNCTIONS AND DETAILS ARE DESCRIBED IN THE ATTACHED SPECIFIC MANUAL.

BATTERY

The lead battery is formed of a models of elements from 2 volts each: 6 elements per 12 volts battery and 12 elements per 24 volts battery. Every battery carries a plate with a list of its data:

- Nominal voltage: is the tension with empty terminal connection heads.
- Nominal capacity: is the quantity of Energy that the battery is capable of storing, measured in amperehour with discharge in 10 hours.
- Maximum electric current: is the maximum electric current that the battery can supply. In practice it is the electric current in short circuit. It must be adapted to the current requested by the starting motor of the machi



TECHNICAL DATA

All the working data and parameters are indicated in the technical data sheet attached to the present manual. The data must be intended as maximum values and may therefore be realised by the machine (always in respect of the specifics indicated with reference to each parameter) exclusively for brief sessions of work. The machine cannot maintain the aforementioned maximum working parameters on the basis of continuous work for the time it is in function and therefore must be chosen and used referring to its medium working parameters. Its power value (ISO 8528-1) as shown in the technical data sheet is defined as follows:

POWER

Electric power expressed in kW, available from the terminal connections of the alternator, as shown on the identification plate of the machine.

PRIMARY POWER (PRP)

Maximum power available during a sequence at variable power, that can last for an unlimited amount of hours a year, between agreed maintenance periods and agreed environmental conditions. An overload of 10% is allowed per 1 hour in a period of 12 hours. The medium output allowed in a period of 24 hours must not exceed the agreed load factor of 80% ($\cos(\varphi)$).

POWER FOR A LIMITED PERIOD (LTP)

The maximum power that the machine can supply (at variable load) in the event of an interruption to mains power for a maximum of 500 hours per year, of which up to 300 hours of continuous function.

CONTINUOUS POWER (COP)

Power that the machine is able to supply, in continuous service, for an unlimited amount of hours at the environmental conditions referred, on the condition that, maintenance on the engine is carried out as agreed by the manufacturer. The power value (indicated on the plate affine to the machine) is the maximum power available for a variable power cycle (PRP) and it is guaranteed with a tolerance of $\pm 5\%$.



DO NOT STEER FROM THE VALUES OR THE WORKING LIMITS DESCRIBED IN THE TECHNICAL DATASHEET OF THIS MANUAL AND ITS ATTACHMENTS. EVERY OTHER UNEXPECTED USE, IN THAT NON CONFORM TO THE PROJECTUAL TECHNICAL SPECIFICS, IS TO BE CONSIDERED AS "NOT ALLOWED".

ENVIRONMENT DESTINED FOR USE

The machine is destined for industrial or civil use in normal environmental conditions. It can function in outside open spaces for those machines predisposed for such use (in canopy or container) or internally. The use of the machine must be allocated by fully trained personnel on the characteristics of the machine and they must be fully informed on the contents of this manual. The machine functions in manual or automatic; such functions are available to the user through the selection of the commands placed on the panel. Lighting of the premises where machine will be used must conform to the laws in force in the country where the machine is to be installed, it must guarantee good visibility at every point, it must not create dangerous shadows and it must consent the clear reading of the control panel as well as the emergency buttons. The leaning base of the machine must be flat, levelled and of adequate measurement.



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OPERATIONAL CONDITIONS

Normal operative conditions to which the machine has been designed are distinctly as follows:

Air temperature	25°C
Air humidity	30%
Barometric pressure	1000 mbar
Altitude	1000 m a.s.l.

Temperature and altitude influence greatly on the machines output. When environmental conditions differ from those mentioned above a de rating condition is created, that is a necessity to apply a de rating factor whose value varies in function of the type of engine and alternator.



CONSULT SPECIFIC MANUALS ATTACHED FOR USE AT TEMPERATURES DIFFERENT FROM NORMAL OPERATION.



NOISE

The relative value of noise emission of fan airplane are listed in the attached data sheet and defined as follows:

NOISE LEVEL (LWA).

Represents the quantity of noise energy emitted in time units.

It is independent from the distance of measuring point.

ACOUSTIC PRESSURE (Lp).

Measures the pressure caused by the emission of sound waves, picked up at a determined distance from the noise source. The acoustic pressure value changes when the measuring point distance changes.



exemple

The following table shows the calculations of the value of the acoustic pressure (Lp) obtained at a certain acoustic power level (LWA) in function at distance.

Example: machine with LWA = 89 dB

Lp at 1 metre = 89 dB(A) - 8 dB(A) = 81 dB(A)	Lp at 4 metres = 89 dB(A) - 20 dB(A) = 69 dB(A)
Lp at 7 metres = 89 dB(A) - 25 dB(A) = 64 dB(A)	Lp at 10 metres = 89 dB(A) - 28 dB(A) = 61 dB(A)

The values have a tolerance of $\pm 0,5$ dB(A).

A prolonged exposure to noise can provoke:

- Hearing problems or damage.
- Physiological problems or damage.
- Psychological problems or damage.
- Loss of concentration.

It is therefore necessary to use individual protective items (Industrial earmuffs).



CONSULT THE SPECIFIC ATTACHED MANUALS FOR THE VALUE OF NOISE EMISSION FOR EACH INDIVIDUAL MACHINE.



THE QUOTED VALUES FOR NOISE ARE THE EMISSION LEVELS RELATIVE TO THE MACHINE ONLY. THEY ARE NOT REPRESENTATIVE OF THE LEVELS TO WHICH THE OPERATORS ARE EXPOSED; THESE LEVELS MUST BE EVALUATED IN THE ENVIRONMENT OF USE OF THE MACHINE TO DEFINE WHETHER NECESSARY ANY FURTHER PROTECTIVE MEASURES FOR THE OPERATORS.

VIBRATIONS

In conditions of use that are in conformity with the indications given for correct use, vibrations should not be present.

ELECTROMAGNETIC ENVIRONMENT

The electromagnetic compatibility represents the eligibility of equipment to function within an electromagnetic field in a satisfactory way without producing electromagnetic atmosphere or other phenomena that may interfere with the functioning of another machine (electromagnetic atmosphere) The machine is created to correctly operate in an electromagnetic atmosphere of an industrial type and non industrial type, and it operates within the emissions limits and is protected against any interference caused.



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3. HEALTH & SAFETY

RESTRICTIONS ON USE AND CONTRAINDICATIONS

The machine must be used only for the purposes expressed in the previous paragraphs and for the use intended by the manufacturer. In particular, it is forbidden to use the machine, even partially:

- Without protection and/or with the security devices deactivated, in failure mode or missing.
- If not correctly installed.
- In explosive atmosphere or in places where the danger of fire exists.
- In conditions of danger or malfunction of the machine.
- For improper use of the machine or for use by untrained personnel.
- For use to the contrary of the specified regulations.
- In the case of defective current supply.
- In the case of serious lack of maintenance.
- After unauthorised modifications or interventions.
- With total or partial disregard for the instructions.
- With materials or utensils that differ from those authorized by the manufacturer.
- Undertaking any intervention of repair, maintenance and regulation to the machine whilst in function or attached to electric load.
- With energy values and performances different from those indicated on the identification plate.
- For use at temperatures different from normal operative temperatures.
- For different use from that expressly intended and defined in the present manual.



TO WAIVE THE ABOVE PROVISIONS A SPECIFIC WRITTEN DECLARATION IS REQUIRED FROM THE MANUFACTURERS.



THE RESPONSIBILITIES GENERATED BY EVERY MODIFICATION THAT IS UNAUTHORISED BY THE MANUFACTURER, WHICH ALTERS THE REQUIRED INTENDED FUNCTIONALITIES, INTENDED MODIFYING THE RISKS AND/OR GENERATING ADDITIONS WILL BE THE COMPLETE RESPONSABILITY OF ARE OF WHO CARRIES OUT THE MODIFICATIONS. SUCH MODIFICATIONS, IF CARRIED OUT WITHOUT AUTHORISATION BY THE MANUFACTURER, WILL INVALIDATE ANY GUARANTEE IN ALL ITS FORMS AND WILL INVALIDATE ANY DECLARATION OF CE CONFORMITY.

DEFINITIONS OF THE AREAS OF THE MACHINE:

WORKING AREA

Area that corresponds to the machines perimeters, from which it is possible to control the normal functioning of the machine and/or rapidly intervene on the button pad. In this area there are no dangers for the operators or for exposed persons.

CONTROL AREA

Control area from where it is possible to undertake command and control operations of the machine using the control panel and button pad.

DANGER AREA

Internal area of the machine and the control panel, reserved only to qualified maintenance operators or to T.A.C (Technical Assistance Centre).

In these areas it is forbidden to operate, pass, loiter or stop during the functioning of the machine.



ALL OPERATORS THAT HAVE FREE ACCESS TO THESE AREAS MUST RESPECT THE LIMITS OF THEIR DUTIES; RESPECT THE WARNINGS GIVEN IN THE MANUAL AND ON THE SECURITY PLATE; RESPECT THE REQUIRED INTERVENTION PROCEDURES.

SECURITY SYSTEMS AND PROTECTION

During the normal use of the machine the operators are not subject to risk inasmuch as any possible dangers on the machine have been eliminated with fixed and mobile protections in place to prevent contact with internal parts mobile and dangerous.



THE POSITION OF DEVICES AND PROTECTIONS FOR SECURITY OF SINGLE MACHINES ARE INDICATED IN THE SPECIFIED ATTACHED MANUALS.

DEFINITION OF REPAIRS AND SECURITY DEVICES

EMERGENCY BUTTON

Red coloured button placed in proximity of the CONTROL AREA the machine that when pressed causes the immediate stop of the machine.

REGULAR REPAIRS

Protection of mechanical moving parts: they have the function of isolating and containing the mechanical organs that can create dangerous situations for the operators. If it necessary to remove the security protection, it is mandatory to replace it before restarting the machine.

CIRCUIT BREAKER SWITCH

The machine is protected against short circuits and overloads by a circuit breaker switch placed above the installation. The intervention currents both thermic and magnetic may be fixed or regulated depending on the model of the switch. In the models with regulating currents of intervention do not modify the calibration because it may compromise the machines protections or the output characteristics of the machine. The intervention of protection against overloads is not instantaneous, but follows a characteristic of over current in which the more the over current is, the quicker is the intervention time. It is to be highlighted that the nominal current of intervention refers to an operating temperature of 30°C, to every variation of 10°C corresponds approximately to a variation of 5% on the value of the nominal current. In the case of intervention of the circuit breaker protection, please verify that the total absorption does not exceed the nominal current of the machine.

DIFFERENTIAL SWITCH (ELCB)

The differential switch guarantees the protection against indirect contact or accidental contact due to faulty earth currents. When the switch detects a faulty current superior to the nominal current or that imposed it intervenes removing the feed to the connected circuit. In the case of intervention verify that there are no isolation faults in the connections: connection cables, plugs and sockets, users connected. Before every working session check the differential switch tripping functionality by the differential switches function pressing the testing button of the machine which must be running and the differential switch must be in the ON position.

PLUGS WITH PROTECTION

Designed to function in safety, in difficult environmental conditions, to have a major mechanical robustness and to prevent accidental disconnection.

CANOPY (OR CONTAINER)

Designed to function in safety in difficult environmental conditions it acts both as protection against atmospheric agents as well as a fixed protection for the operator.



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LOCK WITH KEY TO ACCESS TO CONTROL PANEL

Does not permit access to the control panel by unauthorised personnel.

ANTIVIBRATION MOUNTS

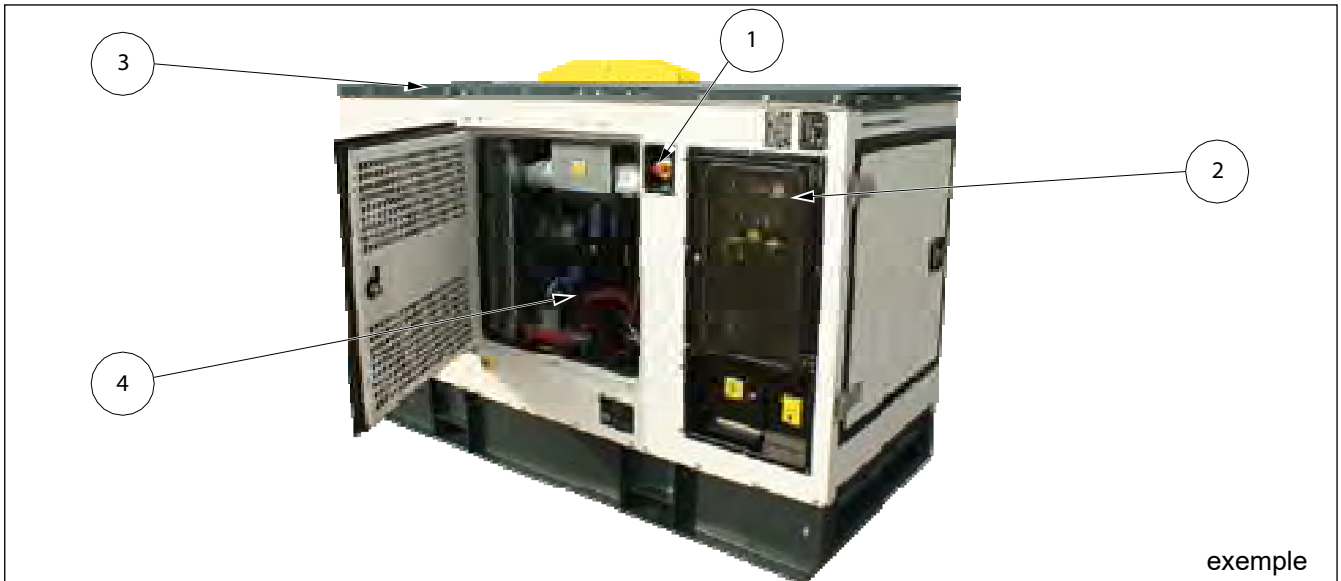
Allows the isolation and the attenuation of vibrations transmitted to the ground.

FUSES

They are capable of isolating the electrical connection in case of short circuit.



AFTER EVERY INTERVENTION IT IS OBLIGATORY TO REASSEMBLE AND FIX THE EVENTUAL PROTECTIONS THAT HAVE BEEN DISASSEMBLED.



1 Emergency stop button • 2 Control panel • 3 Soundproof canopy • 4 Engine

RESIDUAL RISKS AND PERSONAL PROTECTIVE EQUIPMENT (P.P.E.)



THE USER IS OBLIGED TO OBSERVE ALL THE SAFETY PRESCRIPTIONS IMPOSED BY THE CURRENT LAW OF THE COUNTRY WHERE THE MACHINE IS INSTALLED.



ALL THE INSTALLATION OPERATIONS, MOVEMENT, MAINTENANCE, REGULATION AND SUBSTITUTION ON THE MACHINE MUST BE UNDERTAKEN BY TECHNICAL PERSONNEL HIGHLY QUALIFIED AND EXPRESSLY AUTHORISED.



THE MACHINE IF NOT UTILISED AND MAINTAINED IN THE APPROPRIATE MANNER REPRESENTS A POTENTIAL DANGER FOR THE LIFE OF THE PERSONS THAT USE IT.



CAREFULLY READ THE PRESENT MANUAL AND THOSE SPECIFICALLY ATTACHED BEFORE USING THE MACHINE.



WEAR THE FOLLOWING I.D.P. BEFORE ACTING AND/OR INTERVENING ON THE MACHINE.



Residual risk represents a potential danger partially eliminated that can provoke damage to the user if intervening using incorrect methods. The best way to avoid accidents is that of being informed of all the possible dangers, evidenced by a symbol applied to the machine, and assume prudent behaviour. Here follows a description of residual risks of the machine with warnings, prohibitions and precautions.

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Symbol	Danger	PROHIBITIONS AND PROVISIONS	DANGEROUS ZONES
	ELECTROCUTION	- Ensure that the electrical installation, mechanical installation and earthed rod of the machine are installed in the proper manner. - Ensure that hands and feet are completely dry before any intervention on the machine. Do not undertake any maintenance or regulation during functioning and/or when machine is under electrical current. - Do not touch any electrical connections with tools or jewellery during regulation or maintenance of the machine. - Never use water to extinguish fire of any electrical nature. Section the connections and use powder extinguisher or CO2. - Switch on the machine only if equipped with all protections and coverage of electrical parts. - Do not connect the machine to any public electrical connection: the retroactive connection can provoke severe damage or death. - Disconnect the battery before carrying out any installation or maintenance operation. - When the machine is under electric current it is forbidden to introduce hands or any other part of the body inside the control panel. - Before operating inside the control panel remove electric connection from the general switch that feeds it. - To avoid accidental start before any intervention on the machine put it out of service: - Press emergency stop button. - Disconnect the battery leads (the negative (-) for).	 BUSBAR POWER TERMINAL
 	CRUSHING CUTTING ENTANGLEMENT	- Run the machine only when all the fixed protections are positioned correctly and the fixing screws are tightened and blocked. - Do not substitute original nuts and bolts with inferior grade. - Do not repair or lubricate any part of the machine when the machine is on. - Keep hands, feet, hair and clothing away from moving parts when the machine is on. - Perform maintenance and substitution operations only when the machine has been stopped and after having waited a few minutes for the cooling.	 COUPLING ZONE ENGINE/ALTERNATOR / ALTERNATOR FAN



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 	CRUSHING CUTTING ENTANGLEMENT		 ELECTRO-FAN
	BURNS	- The use of the machine provokes the over heating of certain parts of the engine, the exhaust pipe, the oil pan and other components and connected material. Therefore it is better to undertake any controls with the machine in the stop position and only when cooled down. Ensure that the machine is at the correct distance from walls to the ends of avoiding over heating of components. - Never cover the machine when operating.	 EXHAUSTS
 	INFLAMMABILITY EXPLOSION	- Protect access to the machine from children, animals or unauthorised persons. - In proximity of the machines hot parts never connect inflammable materials like fuel, solvents, oil, paper etc. - Keep away from the machine any inflammable material during its functioning. - Do not smoke and keep at a distance any source of flames or sparks. - Before refuelling check that machine is off and that there are no heated parts on which fuel could be spilled. - Clean any eventual fuel spills. - Fuel must be kept in the appropriate containers hermetically sealed and conserved in an area not accessible. - Refuel in a well ventilated area. - To avoid the dangers of fire only use fuses of the correct type, amperage and voltage.	 FUEL TANK

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  	CORROSION INTOXICATION INHALATION	• Avoid contact with fuel, electrolyte liquid from the battery and engine oil in that it is toxic and corrosive; In the eventuality that these come into contact with the skin, swallowed or inhaled seek immediate medical assistance and if accidentally spilled on clothing wash the affected with soap and water. • The batteries contain sulphuric acid that, in the case of contact with clothing, skin and/or eyes, can cause dangerous burns. • Do not remove battery protections. • Do not inhale exhaust gas in that carbon monoxide is an odourless gas, colourless, tasteless that if inhaled even only for a brief period can cause death.	
	CRUSHING ENTANGLEMENT	• The displacement of the machine must be performed by qualified personnel. • Do not allow personnel to stay in the area of the machine during operations of lifting or moving. • Lift with the ropes or chains connected in a safe manner to the lifting hooks. • Position the machine in a well protected and isolated area to avoid eventual harm to children, animals or unauthorised persons.	
	HEARING LOSS	• Noise creates damage to the hearing apparatus, a prolonged exposure to noise levels above 85 dB(A) can provoke the permanent loss of hearing. Wear protective industrial earmuffs for the ears in proximity of the machine in function. • Do not allow the machine to function without soundproofing panels. • When using the machine, respect all laws and regulations regarding the noise limits.	

SAFETY PICTOGRAM APPLIED TO THE MACHINE

The points and zones of the machine that present residual risks that may occur are marked by an adhesive safety pictogram (symbol), affixed to the machine, useful for calling the operators attention to the possible dangers and to precautions.

The following list shows those present in the access zones to the machine.

	THE PICTOGRAM POSITIONS OF THE SINGLE MACHINES ARE INDICATED IN THE SPECIFIC MANUALS ATTACHED.
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OPERATING AND MAINTENANCE MANUAL MGTP 200 USL-VO

1. The pictograms contained within a triangle indicate DANGER.
2. The pictograms contained in a circle impose a prohibition/obligation.

SYMBOL	DESCRIPTION
	GENERAL DANGER
	DANGER HIGH VOLTAGE
	DANGER SCORCHING PARTS
	DANGER SHARP EDGES
	DANGER INFLAMMABLE
	NO WORK ALLOWED BEFORE REMOVING HIGH TENSION
	NO REMOVAL OF PROTECTIVE DEVICES



THE PICTOGRAM POSITIONS OF THE SINGLE MACHINES ARE INDICATED IN THE SPECIFIC MANUALS ATTACHED.



THE PICTOGRAM POSITIONS OF THE SINGLE MACHINES ARE INDICATED IN THE SPECIFIC MANUALS ATTACHED.

Danger symbols, Prohibition and General Warnings	
Earth connection point. (inside the control panel)	
Identification plate	
Lifting hooks and forklift pockets	



4. LIFTING, TRANSPORT AND STORING

WARNINGS



THE UNLOADING AND UNPACKING OPERATIONS FROM THE TRANSPORT VESSEL MUST BE UNDERTAKEN BY QUALIFIED PERSONNEL. IN THIS CHAPTER THERE ARE ONLY THE GENERAL SAFETY WARNINGS AND THE MINIMUM OPERATIVE PROCEDURES NECESSARY. FOR FURTHER INFORMATION CONTACT THE C.A.T.



WEAR THE FOLLOWING INDIVIDUAL PROTECTIVE ITEMS TO PERFORM ALL THE FOLLOWING OPERATIONS LISTED.



- Unloading and movement operations necessitate the presence of helpers for eventual signalling during transport.
- The lifting and movement vehicles must be chosen on the basis of their dimension, to their weight, to the machines shape with its components. The capability of the vehicle to lift must be superior (with a margin of safety) to the actual weight of the components to transported.
- Lifting process must be continuative, without brisk movement.
- During movement persons are not allowed in the manoeuvre area, including all the surrounding area which is to be considered "DANGEROUS AREA". It is the duty of the personnel in charge of lifting to verify the stability of the load before lifting and moving.
- It is not allowed to stop or pass underneath suspended loads.
- The manufacturer does not assume any responsibility for damage caused by incorrect lifting operations, by unqualified personnel or using inadequate lifting machinery.

UNPACKAGING AND VERIFICATION OF CONTENTS

Packaging is agreed with customer with regards to distance and means of transport previously chosen. Normally the machine is sent without packaging or packaging of various types (e.g. carton, cellophane, multi-ball wrap). If transport takes place by lorry the machine is deposited and anchored directly to lorry floor, covered by a tarpaulin to protect from external agents (direct contact with humidity and dust). In the case that the delivery is through sea or air, the machine is deposited and anchored with wooden boxes. The weight of packaged good is documented on the transport documents.

Upon receipt of the goods supplied:

- Verify that the machine and its components have not sustained any damage during transport. In the case that damage has been sustained due to transport it will be necessary to follow the requirements in the contract to ensure coverage of the damage sustained contacting and informing the manufacturer.
- Verify that all parts written in the bill of material are present.
- Verify that the identification plate is in accordance with that of the machine ordered.
- Abide to the laws in vigour regarding collection and elimination of packaging.



THE MANUFACTURER ACCEPTS NO RESPONSIBILITY FOR ANY DAMAGE CAUSED TO THE MACHINE WHEN IT IS TRANSPORTED AND PLACED IN THE ASSIGNED AREA OF INSTALLATION BY THIRD PARTIES.



OPERATING AND MAINTENANCE MANUAL MGTP 200 USL-VO

LIFTING AND TRANSPORT

LOADING CHARACTERISTICS

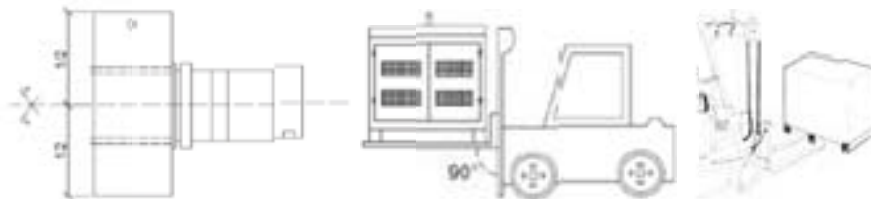
If the machine has a mass (dimensions and form) lower than 25 Kg it can be lifted and/or transported by hand using the appropriate handles that allow movement in safety.

If the machine has a mass heavier than 25 Kg use the following for lifting, cranes, fork lift truck, block and tackle etc. Such operations must be undertaken by qualified and authorised personnel ensuring that the space around the machine is free to avoid falls or flipping over and damage to persons and/or things. Do not use any lifting points on the machine that are not intended for the lifting operations.

- Ensure that the appropriate lifting devices are correctly fixed and adequate for the loading of the machine.
- During lifting of the machine it is necessary to guarantee that the centre bar is maintained as centrally as possible and as low as possible to avoid excessive inclination.
- For lifting and transport of the machine environmental conditions, wind and other must be taken in to consideration.

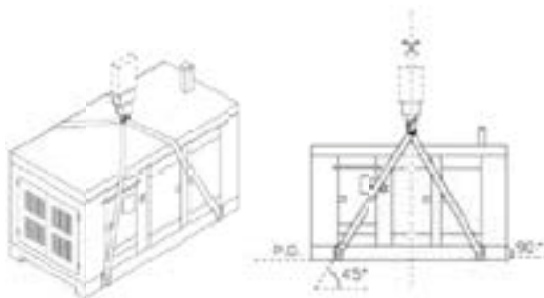
MOVEMENT USING FORK LIFT TRUCK

- For movement of the machine if a fork lift truck is used ensure that the weight is well distributed in the lifting points, inserting the forks under the base beneath the machine keeping it constantly in a horizontal position.
- The fork lift truck must be capable of the machines weight lift as evidenced on the machines identification plate.



MOVEMENT WITH ROPES OR CHAINS

- In the case of lifting with ropes or chains of equal length between them, use the 4 existing lifting points on the structure identifiable by the appropriate symbols, it may be necessary, in these cases, the use of balancing scales to avoid that the chains and ropes used for lifting can damage the machine.
- Use suitable harnesses hooked to the lifting hooks with an inclination of 45° degrees with respect the horizontal floor (H.F.).
- Do not lift machine by a singular lifting point to avoid overturning.





STORING

In the case the machine is not to be installed shortly it must be stored in an adequate environment at an ideal temperature of between (-10° a +40°C), preferably closed, dry and not in a dusty environment.

- Verify that the floor that will hold the machine is capable of sustaining the weight of the machine.
- The machine must be stored in a horizontal position.
- Do not place on the machine, boxes, cases or other heavy objects.
- Do not climb onto machine.
- Protect the non painted parts with an antioxidant product with an oil or grease base.
- Cover the machine with a tarpaulin to protect it from humidity and dust.

5. INSTALLATION

WARNINGS



INSTALLATION OPERATIONS, CONNECTIONS AND FUNCTIONING SERVICE, MUST BE UNDERTAKEN BY QUALIFIED PERSONNEL. IN THIS CHAPTER ARE LISTED ONLY THE GENERAL WARNINGS AND THE MINIMUM OPERATIVE PROCEDURES NECESSARY. FOR FURTHER INFORMATION CONTACT C.A.T.



THE INSTALLATION PROCEDURES, CONNECTIONS AND FUNCTIONING SERVICES MUST CONFORM TO LAW, REGULATIONS AND TO ALL THE LAWS IN FORCE IN THE AREA INSTALLATION OF THE MACHINE.



WEAR THE FOLLOWING INDIVIDUAL PROTECTIVE ITEMS TO UNDERTAKE ALL THE FOLLOWING LISTED OPERATIONS



- Always refer to the specifics of the laws in force in every country that discipline in different ways the single aspects with regards to type of fuel, noise, emissions, liabilities regarding the power installed etc.
- Avoid taking action on any part of the regulated machine and/or preset at testing. Every technical alteration that affects the functioning and/or security and safety of the machine must be affected only by technical personnel formally authorised. In case of the contrary any responsibility relative to alterations and/or damage that may derive thereof is denied.
- Eventual protections, such as barriers, electromechanical security, safety selectors under lock and key, installed by the user must correspond to the health and safety laws in vigour in the country of installation of the machine.



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CONDITIONS AND INSTALLATION AREA

The installation area of the machine:

- There must be sufficient natural light and/or artificial light that is conform to the regulations of the country of the machines installation. The illumination must be uniform, it must guarantee a good visibility in every point of the machine, it must not create dangerous reflections and must consent a clear reading of the control panel and clearly individualise the emergency stop button.
- It must guarantee the necessary space required for movement operations of the machine, and for use and maintenance of the same.
- It must guarantee escape routes of the operator in the case of emergency.
- It must have the correct extinguishers for use on electric equipment in the case of start of fire.
- It must have be equipped with the appropriate safety signalling to warn persons of risks and to advice on behaviour to avoid possible dangers and it must be kept dry, clean and clear of clutter.

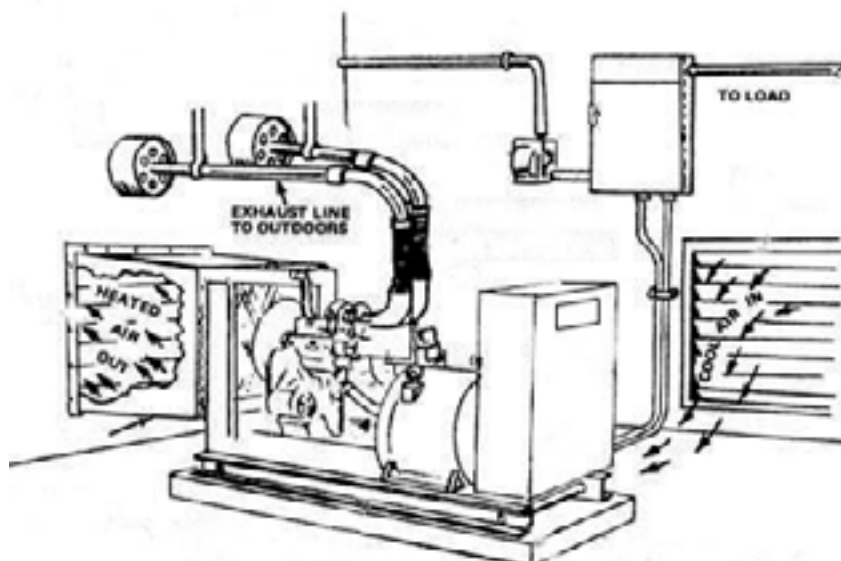
OUTDOOR INSTALLATION

External installation (excluding machines in containers or with canopies that are designed for such applications) must have a protective roof against atmospheric elements and to avoid that rain water wets the electrical apparatus of the machine, and against direct sunlight that can provoke overheating of the machine. The roof must be flame resistant and must guarantee the evacuation of the exhausts gas and the cooling of the machine. For temporary installations, it is sufficient placing the machine on a flat levelled surface, for installations intended for longer periods it is important not to place the machine directly on the floor but to build a base of cement or steel.

INDOOR INSTALLATION

WALL AND FLOOR

The machine must be installed respecting the security distances from the perimeter wall according to the current regulation in effect regarding area of installation. The area must be destined for use only for the machine and must allow adequate circulation of air necessary for the combustion of the engine and the cooling down of the same. The access opening to the area must be sufficient for the unloading, movement and insertion of the machine in to the area. The walls must be of adequate resistance against fire. The floor must be of an industrial type, smooth and perfectly even and must be adequately capable of supporting the machines weight.





BASEFRAME AND LEVELLING OF THE MACHINE

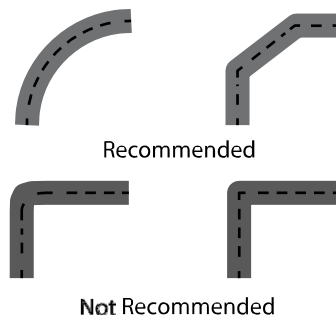
The base frame must be raised with respect to the floor of 10cm in that:

- Avoids that rising damp compromises the machines "bodywork" causing a rapid degradation for rust above all on the resting points.
- Avoids that eventual infiltrations of water due to direct contact with the machine.
- Avoids knock-backs during the engine startup phase, as the weight of the machine is distributed on the whole baseframe and there is no warranty of a uniform contact surface due to irregularities of the floor. It is advisable then to fix the machine on 4 raised points.

It is necessary furthermore to predispose liquid collectors, covered with a grill, for possible losses of combustibles from the tank. To avoid the transmission of vibrations and noise to other parts of the working area the foundation of the base frame must be unattached from major walls, external walls, divisions and slabs.

PIPING FOR COMBUSTIBLE EXHAUST GAS

- The exhaust systems of combustible gas must be externally fixed through stainless steel tubes sufficiently robust and perfectly fitting to the machine tubes. The exhaust must be done so that the exhaust tubes are placed adequately distant from windows, walls and practicable openings or sources of ventilation.
- Internal tubes of the working area must be protected with insulating material, adequately fire resistant and must be adequately protected or shielded for the protection of persons from accidental contact.
- The length and diameter of the exhaust tubing, the type and the number of curves, must be carefully evaluated because, this determines the good functioning of the installation. So it is therefore fundamental the realisation of tubing of limited length, with reduced number of curves and with distances between curves as ample as possible. To avoid the loss of excess fumes, the distance must not be less than 2,5 - 3 times the diameter of the internal part of the tube.



Example of exhaust tubing curves for combustible gas.

The first two on the top are suggested while the two on the bottom are not suggested

- The exhaust must be protected from exposure from the elements and equipped with drainage, and expansion joints in proximity to the exhaust flange of the machines engine.
- In the proximity of the machine there must be placed a collector with an escape valve for the collection of condensation, oil vapours and particles of combustion that under no circumstances must enter inside the engine.
- Do not release gas exhaust of any other machine into a single exhaust system.



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VENTILATION

- The ventilation installation must be able to realise an efficient cooling of the machine and ensure optimal environmental conditions in the working area.
- The ventilation system must provide adequate windows for the aspiration of cold air and for the expulsion of hot air. On the windows there must be mounted anti rain metal grill, with added filtered panels, in the case that the environment f where it cannot create any inconvenience to persons or disturb the correct functioning of other installation.
- The radiator is equipped with its own ventilation system and its conformation consents an easy evacuation of hot air. In this case the evacuation can be placed in front of the radiator. The hot air from the radiator on exit must not find any obstacle for at least 1 m to ensure its disposal in an easy way. Furthermore the outlet of the exhaust hot air must be positioned so to avoid inconvenience to persons or disturb the correct functioning to other of equipment.

SOUNDPROOFING

Machines that are used for emergency purposes (not equipped with canopy or container) when they are put into function may create disturb to people in the immediate vicinity. The problems of noise emissions are to be considered on a case by case basis with respect to the laws in vigour in the country of installation.

Solutions to consider are:

- Choose an area of adequate dimensions.
- The walls and roof should be padded with noise absorbing and/or noise isolation material.
- The pavement may be insulated through layers of cork or other noise absorbing material, on top of which will be applied a layer of material suitable to walk on.
- The material used as insulation must be fire resistant.

COMBUSTIBLE SYSTEM

- The machine is equipped with an incorporated tank whose capacity is variable depending on the autonomy required. For superior autonomy it is necessary to use an appropriate tank with a greater capacity mounted separately from the machine with an automatic filling kit mounted on the same tank.
- The feeding of the incorporated tank or of service must take place through forced circulation.
- In the case of use as a storage tank this must have the correct protections against corrosion and must be equipped with drainage pipe fixed firmly to the tank and the tip must be free, hermetically sealed, positioned in a manhole or in a niche in a wall of the building and in any case must be located to avoid that the combustible, in the case of leakages or spillages do not invade the working area or the areas beneath.
- The technical requisites for the construction, function and use of tanks, both on land as well as in a basement must conform to the law, regulations and any other norms in vigour in the area of installation.

ELECTRICAL SYSTEM

- If the machine is installed inside a building it is opportune to duplicate the emergency stop button externally in a position easily reached and adequately signalled.
- The electrical installation must be earthed to a load absorbed by the machine and must have an electromagnetic differential switch above the same line.
- The electrical installation must not be the cause of any fire or explosion.



ELECTRICAL CONNECTION



ALL THE CONNECTING OPERATIONS OF THE ELECTRICAL LINES MUST BE UNDERTAKEN WITH THE ALIMENTATION LINE SELECTED (WITHOUT TENSION), BY QUALIFIED PERSONNEL EXPRESSLY AUTHORISED AND ALWAYS IN RESPECT OF THE LAWS IN VIGOUR IN THE COUNTRY OF INSTALLATION.

- The machine is already predisposed for connection to utility. During the connection process all the connections in the electrical data sheet must be respected.
- The control panel must be connected to the equipotential bonding (PE) adequate enough for the protection of the operator from accidental contact with metal parts of the machine with conductors or components under tension.
- Check that the voltage and the electric frequency correspond to those indicated in the machine's identification plate.
- The cables used to supply electric energy must be sufficiently sectioned and isolation must be suitable for the tension requisites and temperature requisites relative to the equipment (see general data of machine and the max shown on the technical data sheet attached).
- Connect the machine to a distribution board equipped with protection fuses to safeguard the machine and any short circuits or isolation loss.
- To avoid the dangers of fire, only use fuses that are of the exact correct type, tension and voltage.
- Verify that the short circuit electric estimated at the switch connection clamps is compatible with its power of interruption (traceable from the electrical data sheet).
- Connect the electrical feed to the appropriate entry clamps placed inside the general control panel.



LIST OF ELECTRICAL COMPONENTS AND RESPECTIVE CONNECTION DATA SHEETS ARE LISTED IN THE ELECTRICAL DATA SHEETS ATTACHED.

EARTH CONNECTION

A CABLE OF ADEQUATE TO THE POWER ABSORBED BY THE LOAD AND OF A MINIMUM SECTION OF 6 mm² MUST BE CONNECTED TO THE PE CLAMPS WITH DISPERSERS THAT ENSURE AN EARTH RESISTANCE EQUAL OR INFERIOR TO 100 Ohm.



THE EARTH WIRE MUST ALWAYS BE PLACED NEXT TO THE SAME LINE AND MUST BE ADEQUATE TO THE POWER ABSORBED BY THE MACHINE.



Earth Connection Plug
(inner side Control Panel)



6. CONTROLS, REGULATION AND SIGNALING

Every machine is equipped with a control panel installed on board the machine. The commands of the machine are launched directly by the operator from his working /manoeuvring position, of which comprised of a rational and accessible button pad.



ALL THE FUNCTION MODES AND DETAILS ARE DESCRIBED IN THE SPECIFIC MANUAL ATTACHED.



THE DESCRIPTION OF THE CONTROL PANEL, BUTTON PAD AND THE EMERGENCY BUTTONS ARE DETAILED IN THE SPECIFIC MANUAL ATTACHED.



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COMMAND DEVICES

GENERAL SWITCH

The rotation of the command handle to the ON position supplies the control panel.

EMERGENCY STOP BUTTON

If pressed will stop immediately the machine taking power away from the actuators. For normal stop the appropriate button must be used on the control panel.

“MANUAL/AUTOMATIC” SELECTOR/BUTTONS

Allows the choice of operational mode

		
Emergency Stop button	Controller	General Switch

REGULATING DEVICES

The machine is equipped with regulating devices placed on the button pad of the control button which consents to undertake various regulations.



ALL THE FUNCTIONING MODES AND DETAILS ARE DESCRIBED IN THE SPECIFIC MANUAL ATTACHED.

SIGNALLING DEVICES

The machine is equipped with a “FAULTS DIAGNOSTICS” which indicates the various malfunctions and the possible solutions which remains always at minimum power indicating the instructions of the item in question (warning lights, acoustic signals).



ALL THE FUNCTIONING MODES AND DETAILS ARE DESCRIBED IN THE SPECIFIC MANUAL ATTACHED.

7. START AND STOP

OPERATIONS TO FOLLOW BEFORE STARTING



BEFORE STARTING THE MACHINE READ CAREFULLY THE PRESENT MANUAL AND SPECIFICS ATTACHED.



THE OPERATIONS BEFORE STARTING MUST BE UNDERTAKEN BY QUALIFIED PERSONNEL AND EXPRESSLY AUTHORISED AND ALWAYS RESPECTING ALL THE LAWS IN VIGOUR IN THE COUNTRY OF INSTALLATION.



ONCE OPERATIONS ARE CONCLUDED DO NOT DISPOSE IN THE ENVIRONMENT (OIL EXHAUST, FUEL, CLOTHS LIQUIDS ETC.) THEY MUST BE POURED INTO TO THE APPROPRIATE CONTAINERS WHERE THEY WILL BE DISPOSED OF BY THE AUTHORISED AUTHORITIES WITH RESPECT TO ALL THE LAWS AND REGULATIONS IN VIGOUR REGARDING WASTE.



WEAR THE FOLLOWING INDIVIDUAL PROTECTIVE ITEMS TO EFFECT ALL THE OPERATIONS HEREWITH LISTED



After the installation of the machine It is necessary to perform a few verification checks.

- Verify that all the electrical connections have been done properly and that no connections are in a unsatisfactory state.
- Verify that the safety pictograms are affixed to the machine and are visible.
- Individuate the emergency stop button, switch and other emergency systems that are present on the machine.
- Verify that the safety pictogram is affixed to the machine and are legible.
- Control the following:

CONTROL STARTING BATTERY

Control that the battery electrolyte is levelled otherwise restore as described:

- Dismantle the machine's battery disconnecting its poles, first the negative (-) pole and then the positive (+) pole before undertaking any operation of activation or top up of the battery.
- Shake the electrolyte containers well before use.
- Fill up the battery with sulphuric acid at the density prescribed by the manufacturer up to the indicated level.
- Clean thoroughly the superior parts of the battery.
- Wait at least 30 minutes before installing aboard.
- Connect the positive (+) clamp and the negative (-).
- In the case of batteries already with electrolyte incorporated being supplied check for eventual damage sustained during transport due to movement or overturning to avoid loss of electrolyte.
- Do not smoke or bring flames in proximity of the electrolyte to avoid explosions.

Filling method advised: charge the battery with electricity in ampere of 1/10 of the capacity of the battery, until under charge a tension of 16V is reached. After this treatment the battery at rest at an environmental temperature will have a tension of between 12,7V and 12,9V at the terminals. Both during use and at rest maintain the machine in horizontal position. The maximum inclination tolerated by the battery is of 30° on 4 sides.

Consult the specific manuals attached to undertake the controls and verify the preliminaries of use of the single machine.



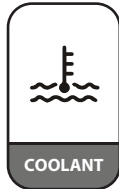
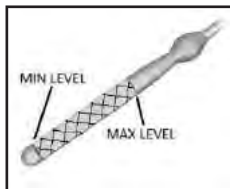
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STARTUP GUIDE

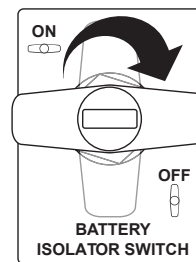
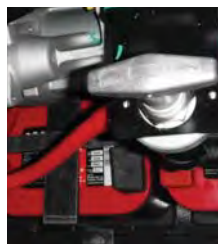
PRELIMINARY OPERATION

Before to start any operation with the Genset, be sure to follow all the Health and Safety procedures (part 4) and allready checked the residual risks and individual protection devices (i.d.p.) tables.

- Check all the engine fluids level: Check all the engine fluids leve



- Make sure that the battery is connected. ALWAYS connect the positive (+) terminal first, and only then the negative (-) terminal. Put the Battery isolator switch in the ON position.

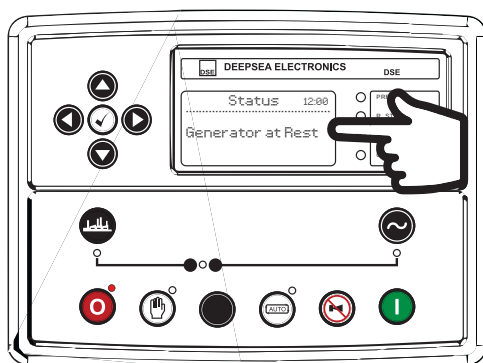


- Make sure that the Emergency Stop button is not activated.

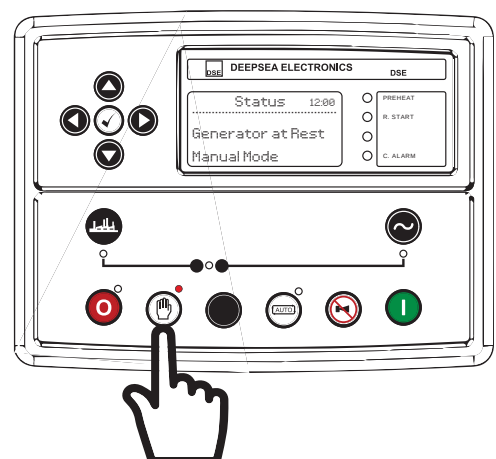


MANUAL START WITH DSE 7310

1. DSE in the rest mode.



2. Select the MANUAL Mode of operation - Check the relevant LED is On.

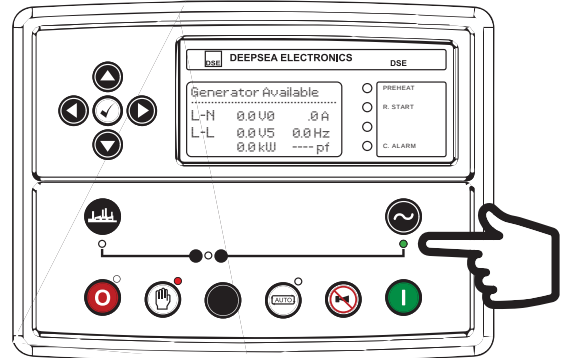
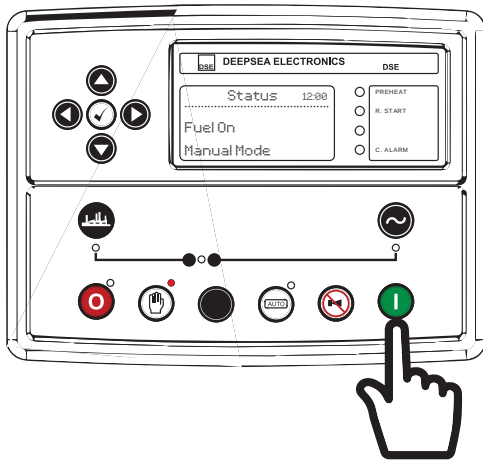


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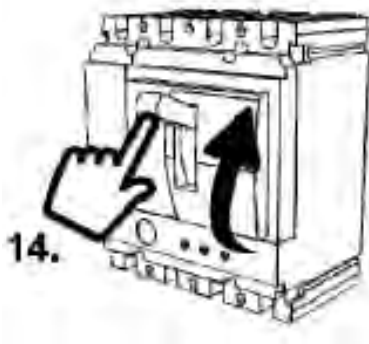


3. Press the green starting button - Generator will start within few seconds.

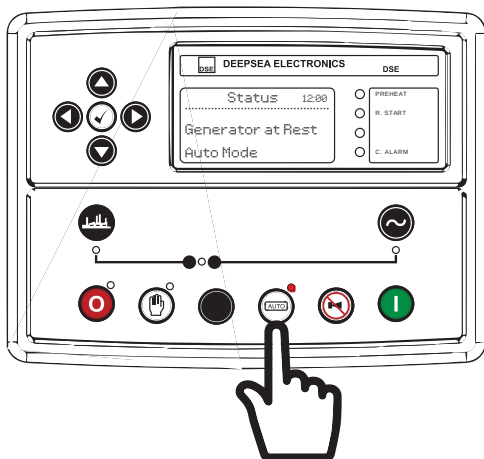
4. Generator Available - Check the relevant LED is On.



5. Set the Main Circuit Breaker in the ON position to get the electrical power.



AUTOMATIC START WITH DSE 7310



Once the cable for the external signal has been connected, according the manual instruction, select the AUTO Mode of operation.

The generating set will automatically start and stop remote start/stop signal.



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ECU ALARMS (CAN FAULT CODES / DTC)

 **NOTE:** For details on these code/graphic meanings, refer to the ECU instructions provided by the engine manufacturer, or contact the engine manufacturer for further assistance.

 **NOTE:** For further details on connection to electronic engines, refer to DSE Publication: *057-004 Electronic Engines And DSE Wiring*

When connected to a suitable CAN engine, the controller displays alarm status messages from the ECU in the *Alarms* section of the display.

1/1	Alarms
ECU Amber	
Warning	

Type of alarm that is triggered on the DSE module, e.g. Warning



Press the **Next Page** button to access the list of *Current Engine DTCs* (Diagnostic Trouble Codes) from the ECU which are DM1 messages.

1/2	ECU Current DTCs
Water Level Low	
SPN=131166 , FMI=8, OC=127	

The DM1 DTC is interpreted by the module and is shown on the module's display as a text message. In addition to this, the manufacturer's DTC is shown below.



Press the **Next Page** button to access the list of *ECU Prev. DTCs* (Diagnostic Trouble Codes) from the ECU which are DM2 messages.

1/10	ECU Prev. DTCs
Water Level Low	
SPN=131166 , FMI=8, OC=127	

The DM2 DTC is interpreted by the module and is shown on the module's display as a text message. In addition to this, the manufacturer's DTC is shown below.



8. CLEANING AND MAINTENANCE

GENERAL PRECAUTIONS



THE PROCEDURE FOR ORDINARY AND EXTRAORDINARY MAINTENANCE MUST BE UNDERTAKEN BY QUALIFIED PERSONNEL AND RESPECTING ALL THE RULES LAWS IN VIGOUR IN THE AREA OF INSTALLATION OF THE MACHINE.



ALL THE CLEANING AND MAINTENANCE OPERATIONS MUST BE UNDERTAKEN WITH MACHINE STOPPED AND DISCONNECTED FROM THE ELECTRICAL CURRENT.



IN THIS CHAPTER ARE LISTED GENERAL WARNINGS AND THE MINIMUM OPERATIVE PROCEDURES NECESSARY. THE MAINTENANCE SPECIFICS FOR EVERY SINGLE MACHINE ARE LISTED IN THE SPECIFIED MANUALS ATTACHED..



WEAR THE FOLLOWING INDIVIDUAL PROTECTIVE ITEMS TO UNDERTAKE ALL THE FOLLOWING LISTED OPERATIONS.



To obtain maximum duration and guarantee a sufficient condition of safety at work observe the following points:

- Before undertaking any maintenance or lubrication procedures, follow “PROCEDURE FOR PLACING IN MAINTENANCE MODE” described as follows.
- Do not do maintenance interventions, lubrication and repairs when the machine is running and/or under electric tension.
- After every intervention reassemble always the protections removed bringing the machine back to its initial state.
- Do not use matches, lighters, torches or flames as a means of illumination.
- Before any intervention on electrical components, check the disconnection of the electric line.
- After every intervention on the control panel, close it and block it with the security door of the general switch, before switching on the power and starting the machine.
- Always keep clean and dry the area assigned for maintenance interventions. Always remove any oil stains.
- Unauthorised persons must keep adequate distance from the machine.
- The lack of inspections and maintenance cause severe damage to the machine.

PROCEDURE FOR PLACING IN MAINTENANCE MODE

The procedure must be undertaken before every ordinary maintenance operation, cleaning or extraordinary maintenance and requires the isolation of the machine from all sources of energy and consists of:

- Push the stop button of the machine
- Push the emergency stop button placed on the control panel.
- Bring the general switch of the control panel to the OFF position.
- Disconnect the battery (removing the cables, the negative cable (–) first).
- Lock the general switch.



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TYPE OF OPERATION	CER	CLASSIFICATION
JOINT ENGINE		
Diesel or gas engine	160117	Not Dangerous
Exhausted oil filters	160107	Dangerous
Air filters	160122	Not Dangerous
Fuel filters	160107	Dangerous
Exhausted mineral oil	130203	Dangerous
Glycol treated radiator liquid	160115	Not Dangerous
JOINT ALTERNATOR		
Alternator	160214	Not Dangerous
JOINT CONTROL PANEL		
Electronic boards	200136	Not Dangerous
Electrical cables	200140	Not Dangerous
Electrical board frames	160117	Not Dangerous
JOINT CARPENTRY		
Base frame	160117	Not Dangerous
Careening	160117	Not Dangerous
Container	160117	Not Dangerous
VARIOUS MATERIAL		
Phono absorbent material	101103	Not Dangerous
Exhausted battery lead accumulators	160601	Dangerous
Drained fuel tank	170405	Dangerous
Fuel tank un drained	170409	Dangerous
Sludge due to cleaning the fuel tank	160703	Dangerous
Dirty cloths used during maintenance	150203	Not Dangerous



CLEANING

The following cleaning operations may be performed by the user on conditions that the necessary equipment is used and the correct items are worn P.P.E.

- Undertake a visual control on the state of use of the machine and its good function.
- Remove dust from the carter, control panel and the button pads.
- Clean the area around the machine with a broom and damp cloth.
- Clean the single components of the machine on condition that they are removed by qualified personnel (maintenance mechanic and/or electrician).
- Clean and maintain cleaned the adhesive safety applications and guarantee always their legibility.



ALL OTHER CLEANING OPERATIONS (MECHANICAL AND ELECTRICAL) MUST BE UNDERTAKEN BY A MAINTENANCE OPERATOR.

ORDINARY MAINTENANCE



THE ORDINARY MAINTENANCE OPERATIONS MUST BE UNDERTAKEN EXCLUSIVELY BY QUALIFIED PERSONNEL (ELECTRICAL AND MECHANICAL MAINTAINER OR MAINTAINERS).



MAINTENANCE AND LUBRIFICATION OPERATIONS MUST BE UNDERTAKEN ACCORDING TO THE INTERVAL TIMES ACCORDING TO THE SPECIFIC MANUALS ATTACHED FOR EVERY SINGLE MACHINE.

Ordinary maintenance for mechanical interventions (regulation, lubrication, cleaning) and electrical must be periodically undertaken on the machine consulting the table listed in the following pages and in the specified manuals attached.

MAINTAINANCE OF MECHANICAL COMPONENTS

- During the removal of components avoid the entry of residual dust in the working area and on the same components.
- Do not use compressed air to clean mechanical parts. Dust must be removed by a dust vacuum cleaner or by cloth.
- Do not use petrol or inflammable solvents such as detergents, but use only commercially authorised solvents that are not toxic and not flammable.

LUBRIFICATION

- Never exceed the interval limits prescribed in this or specific manuals attached.
- Use only lubrication as advised by manufacturer. Never mix different lubricants.
- The disposal of exhaust lubrication must be done in respect of the laws in vigour and local regulations.

MAINTENANCE OF ELECTRICAL COMPONENTS

- Pay attention to the general rules quoted for mechanical components.
- Do not drill holes into electrical cables or on electrical channels where electric cables are contained.
- Do not use water, sponge pieces, damp cloths and/or abrasive cloths to clean electrical components.
- Do not use compressed air to clean electrical components. Dust must be removed using only a vacuum cleaner.
- Avoid penetration of detergents on electrical parts.



OPERATING AND MAINTENANCE MANUAL MGTP 200 USL-VO



UPON THE CONCLUSION OF THESE OPERATIONS DO NOT DISPOSE IN THE ENVIRONMENT OF REFUSE (EXHAUSTED OIL, FUEL, RAGS LIQUIDS ETC) BUT POUR THEM IN THE CORRECT CONTAINERS WHERE THEY WILL BE COLLECTED AND DISPOSED OF BY AUTHORISED SOCIETIES AND OFFICES WITH RESPECT TO THE LAWS IN VIGOUR REGARDING REFUSES.

MAINTENANCE SCHEDULE

MAINTENANCE SCHEDULE					
INTERESTED PARTS	TIME INTERVAL				OPERATION
	DAILY	250 HOURS OR 3 MONTH	500 HOURS OR 6 MONTH	2000 HOURS OR 2 YEARS	
Air Intake Piping	X				Check
Engine Oil Level	X				Check
Engine Coolant Level	X				Check
Inspection of the engine	X				Check
Fuel-Water Separator	X				Drain
Air Cleaner status	X				Check
External cleaning		X			Check
Plates and pictogram		X			Check
Cables and connections fixings		X			Check
Control panel components		X			Check
Battery status		X			Check
Radiator Hoses		X			Check
Belt		X			Check
Exhaust duct		X			Check
Charge-Air Cooler		X			Check
Charge-Air Piping		X			Check
Fuel Filter		X			Replace
Engine Oil and Filters		X			Change
Primary air filter cartridge			X		Replace
Secondary air filter cartridge			X		Check
Radiator Cap			X		Check
Belt				X	Replace
Cooling System				X	Drain

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PERIODICAL CONTROLS

- Verify the continuity of the PE circuit of the machine after every intervention that involves it.
- Verify the state of the electrical meters; in the case of marked or uncertain functioning they must be substituted.
- Verify the state of the electrical equipment and evaluate its capability to function in the interval period until the next control.
- Verify the state of efficiency of the “EMERGENCY STOP” circuit.
- For verifications of single machines consult the specific manual attached.

IMPORTANT NOTICE



IN CASE OF FAULTS OF THE FOLLOWING COMPONENTS: ALTERNATOR (MECHANICAL AND ELECTRICAL), AVR, BATTERY, DSE7310 CONTROL UNIT AND ENGINE, CONTACT THE RESPECTIVE MANUFACTURERS.

MAINTENANCE REGISTER

The following table must be filled in by the person in charge of the machine or by the person who undertakes the interventions indicated.

TYPE OF OPERATION	DESCRIPTION OF INTERVENTION	HOURS OF WORK	DATE	OPERATOR



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EXTRAORDINARY MAINTENANCE



FOR EXTRAORDINARY MAINTENANCE INTERVENTIONS ALL THE PREVIOUS WARNINGS APPLY.

All extraordinary maintenance operations regard breakages of parts or components where it is necessary a specific knowledge of the fault. Such operations may be carried out by the ordinary maintainer. If no remedy is found, contact the Customer Assistance Service.

FAULT FINDER AND MEASURES

The solutions to problems are easily consultable in this and the specific manuals attached.

Only in the case of particular anomalies or working inconveniences that cannot be resolved it is necessary to seek corrective action from the Technical Assistance Centre.(T.H.C.).

Only after having executed the controls and verifications listed, if it has not been possible to find a solution contact the Customer Assistance Service.



FOR EXTRAORDINARY MAINTENANCE INTERVENTIONS ALL THE PREVIOUS WARNINGS APPLY.

PRELIMINARY CHECK BEFORE TROUBLESHOOTING

GENERIC CHECK	CORRECTIVE ACTION
Check fuel level in tank	Refuelling
Verify the emergency button is in the "ON" position	Bring to "ON" position
Verify that circuit breaker switches have not intervened	Restore
Check that circuit breaker switches for protection are open	Restore the contact pressing the button
Check the cables and clamps of connection to the battery and electrical connections	Re connect
Check the battery's integrity	Charge or substitute
Unit is inoperative Read/Write configuration does not operator	Check the battery and writing to the unit Check the DC supply.
Unit shuts down	Check DC supply voltage is not above 35 Volts or below 9 Volts Check the operating temperature is not above 70 °C

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FAULT	POSSIBLE ACTION
Unit locks out on Emergency Stop	If no Emergency Stop Switch is fitted, ensure that a DC positive signal is connected to the Emergency Stop input. Check emergency stop switch is functioning correctly. Check Wiring is not open circuit.
Intermittent Magnetic Pick-up sensor fault	Ensure that Magnetic pick-up screen only connects to earth at one end, if connected at both ends, this enables the screen to act as an aerial and will pick up random voltages. Check pick-up is correct distance from the flywheel teeth
Low oil Pressure fault	Check engine oil pressure. Check oil pressure switch/sensor and wiring. Check configured polarity (if applicable) is correct (i.e. Normally Open or Normally Closed) or that sensor is compatible with the 73x0 Module and is correctly configured.
High engine temperature	Check engine temperature. Check switch/sensor and wiring. Check configured polarity (if applicable) is correct (i.e. Normally Open or Normally Closed) or that sensor is compatible with the 7000 series module.
Shutdown fault	Check relevant switch and wiring of fault indicated on LCD display
Warning fault	Check relevant switch and wiring of fault indicated on LCD display.
Fail to Start is activated after preset number of attempts to start	Check wiring of fuel solenoid. Check fuel. Check battery supply. Check battery supply is present on the Fuel output of the module. Check the speed-sensing signal is present on the 7000 series module's inputs. Refer to engine manual.
Continuous starting of generator when in AUTO	Check that there is no signal present on the "Remote Start" input. Check configured polarity is correct.
Generator fails to start on receipt of Remote Start signal	Check Start Delay timer has timed out. Check signal is on "Remote Start" input. Confirm correct configuration of input is configured to be used as "Remote Start". Check that the oil pressure switch or sensor is indicating low oil pressure to the controller.
High fuel temperature	Inspect the radiator core for external damage and contamination. Using water pressure with special care remove all insects , dust, dirt, and debris such as leaves, bits of paper, etc. that may be on the front of the radiator core or lodged between the radiator core and the cooling fins and tubes. Depending on the type of problem might be necessary to drain and flush the radiator with proper fuel. If the pressure exerted by the pressure washer is high enough, keep the mouth of it at a minimum distance of 1 meter from the radiator, to avoid damaging the radiator. (Procedure to be carried out every 500 operating hours)



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FAULT	POSSIBLE ACTION
Pre-heat inoperative	Check wiring to engine heater plugs. Check battery supply. Check battery supply is present on the Pre-heat output of module
Starter motor inoperative	Check wiring to starter solenoid. Check battery supply. Check battery supply is present on the Starter output of module. Ensure that the Emergency Stop input is at Positive. Ensure oil pressure switch or sensor is indicating the "low oil pressure" state to the 7300 series controller.
Engine runs but generator will not take load	Check Warm up timer has timed out. Ensure generator load inhibit signal is not present on the module inputs. Check connections to the switching device. Note that the set will not take load in manual mode unless there is an active remote start on load signal.
Incorrect reading on Engine gauges Fail to stop alarm when engine is at rest	Check engine is operating correctly. Check sensor and wiring paying particular attention to the wiring to terminal 47 (refer to appendix). Check that sensor is compatible with the 7000 series module and that the module configuration is suited to the sensor.
Module appears to 'revert' to an earlier configuration	When editing a configuration using the PC software it is vital that the configuration is first 'read' from the controller before editing it. This edited configuration must then be "written" back to the controller for the changes to take effect.
Set will not take load	Ensure the generator available LED is lit. Check that the output configuration is correct to drive the load switch device and that all connections are correct. Remember that the set will not take load in manual mode unless a remote start on load input is present or the close generator button is pressed.
Inaccurate generator measurements on controller display	Check that the CT primary, CT secondary and VT ratio settings are correct for the application. Check that the CTs are wired correctly with regards to the direction of current flow and additionally ensure that CTs are connected to the correct phase (errors will occur if CT1 is connected to Ph2). Remember to consider the power factor. ($kW = kVA \times \text{power factor}$). The 7000 series controller is true RMS measuring so gives more accurate display when compared with an 'averaging' meter such as an analogue panel meter or some lower specified digital multimeters.



SPARE PARTS ORDERS

To ensure a good function of the machine, use only original spare parts. Such parts may be purchased through the authorised assistance (indicating the information as shown on the machines identification plate affixed to the machine).

SUBSTITUTION OF COMPONENTS



THE SUBSTITUTION OF COMPONENTS ON THE MACHINE MUST BE UNDERTAKEN BY QUALIFIED PERSONNEL EXPRESSLY AUTHORISED ACCORDING TO THE INSTRUCTIONS IN THE SPECIFIED MANUAL ATTACHED.

To substitute the components safely it is necessary to:

- Before any intervention on the machine check and confirm the disconnection to electrical current.
- Bring the general switch to the “OFF” position and block it using the appropriate lock.
- Remove the carter protection of the component that is to be substituted.
- Substitute the component verifying that the torque is correct.
- Re position the carter.
- Place the substituted component in a secure container to be eventually placed in the industrial refuse container.
- Bring the general switch back to the “ON” position.
- Re start the machine

9. SCRAPPING AND DISPOSAL

DISMANTLING AND DEMOLITION



DISMANTLING AND DEMOLITION OF THE MACHINE MUST BE UNDERTAKEN BY QUALIFIED PERSONNEL EQUIPPED WITH THE ELECTRICAL AND MECHANICAL KNOW HOW NECESSARY TO WORK IN CONDITIONS OF SAFETY.



THE DISMANTLING AND DEMOLITION PROCEDURE MUST BE UNDERTAKEN FOLLOWING THE INSTRUCTIONS CONTAINED IN THIS AND THE SPECIFIED MANUALS ATTACHED.



ON TERMINATION OF THESE OPERATIONS DO NOT DISPOSE OF IN THE ENVIRONMENT REFUSE (EXHAUSTED OIL, FUEL, RAGS, LIQUIDS ETC) BUT POUR THEM IN THE CORRECT CONTAINERS WHERE THEY WILL BE COLLECTED AND DISPOSED OF BY AUTHORISED SOCIETIES AND OFFICES WITH RESPECT TO THE LAWS IN VIGOUR REGARDING REFUSE.



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WEAR THE FOLLOWING INDIVIDUAL PROTECTIVE ITEMS TO UNDERTAKE ALL THE OPERATIONS LISTED AS FOLLOWS



When the working life of the machine is concluded dismantling and subsequent disposal must take place.

For legal and fiscal aspects (notifications etc.) keep to the laws in vigour in the country of installation of the machine.

During the dismantling procedure the Residual Risks must be carefully evaluated, subsequently indicated and others not foreseen from the beginning:

- CRUSHING between moving or dismantled parts.
- FALLING MATERIAL from above or not steadily placed.
- CUTS from live corners or unprotected sheet metal.
- ABRASIONS/BURNS from contact with rough parts or chemical substances. **DISMANTLING PROCEDURE**

Predispose a working area free of clutter, persons not connected to the dismantling procedure are not to be allowed in this area and proceed in the following way:

- Stop the machine by pushing the emergency button, interrupt all electric feeds by disconnecting the general switch and section the energy in the following points.
- Disconnect the power cables on board the machine from the terminal of the control panel only after having sectioned the installation.
- Disconnect the battery cables.
- Disconnect all the electrical connections.
- Empty the liquid tanks (oil, fuel, etc) in the appropriate containers,
- Dismantle the fumes exhaust systems with caution: there could be still present in the tubing a residue formed internally as a solid body produced by the emissions of the combustion.
- Dismantle all parts of the machine and sub-divide the components to be disposed and to be recycled.

DISPOSAL OF RESIDUALS

The material with which the machine is built constitutes a danger for the environment if not treated in the correct manner. After dismantling it is necessary to sub-divide the machines components in function of the material of their composition and advise the SOCIETY and the AUTHORISED OFFICES who will arrange for the disposal with respect to the laws in vigour in the country where the material is to be disposed.



AUTO DISPOSAL IS NOT ALLOWED.

The crossed wheelie bin symbol in this manual and as attached on product indicates that:

- The electric and electronic equipment (AEE) on which it is attached must be considered object for separate refuse collection.
- Where un reusable and/or considered "Refuse" RAEE the electrical and electronic equipment MUST not be put into wheelie bins for urban refuse.



CER (European Code for Refuse) herewith listed are the identification codes that are assigned to every type of refuse on the basis of its composition and the process of origin.

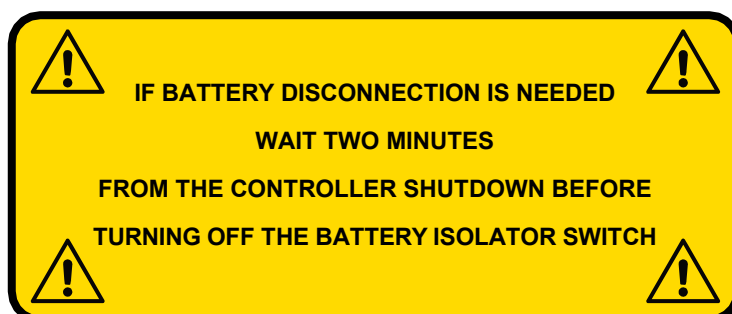


WARNING! ELECTRICITY CAN KILL.
DO NOT TAKE UNNECESSARY
CHANCES.

If you are unsure whether any electrical
equipment is unsafe or if there are signs
that could indicate the equipment is
faulty or damaged, DO NOT USE IT
AND REPORT IT IMMEDIATELY.

PROPERLY DISCONNECT THE BATTERY

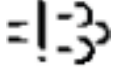
To properly disconnect the battery follow the instruction on the sticker below (placed under the controller and on the battery isolator switch)





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10. DEEPSEA ICONS

Icon	Fault	Description
	ECU Amber Alarm	The module received an Amber fault condition from the engine ECU.
	ECU Red Alarm	The module received a Red fault condition from the engine ECU.
	DPF Active	The module received a fault indication from the engine ECU informing that the Diesel Particulate Filter is active.
	DPF inhibited	The module received a fault indication from the engine ECU informing that the Diesel Particulate Filter has been inhibited.
	DPF Stop	The module received a fault indication from the engine ECU informing that the Diesel Particulate Filter has been stopped.
	DPF Warning	The module received a fault condition from the engine ECU informing that the Diesel Particulate Filter has a fault condition.
	HEST Active	The module received a fault indication from the engine ECU informing that the High Exhaust System Temperature is active.
	DEF Low Level	The module received a fault condition from the engine ECU informing that the Diesel Exhaust Fluid Low Level/ is active.
	SCR Inducement	The module received a fault indication from the engine ECU informing that the Selective Catalytic Reduction Inducement is active.

EXAMPLE:





11. EAT DESCRIPTION

AFTERTREATMENT SYSTEM (ATS) GENERAL DESCRIPTION

DIESEL OXIDATION CATALYST (DOC)

A diesel oxidation catalyst (DOC), reduces CO, HC, and the soluble organic fraction (SOF) of diesel particulates by oxidizing chemical reactions converting to carbon dioxide (CO₂) and water (H₂O) in the presence of heat and catalyst materials. A DOC is easy to implement as it consists of a flow-through substrate, adds little back pressure, and is relatively low cost. Additionally, little maintenance is required and it has demonstrated excellent durability. The downside of a DOC is minimal reductions of PM and NO_x, which are the primary reductions required to meet Stage V levels. Therefore, it is often used as a stand-alone device to meet the specified requirements or in conjunction with another aftertreatment device such as a DPF or SCR. When doing so, the DOC is typically used to increase nitrogen dioxide NO₂ production. NO₂ can enhance the performance of many selective catalytic reduction (SCR) systems as well as the performance of a passive regeneration diesel particulate filter (DPF).

DIESEL PARTICULATE FILTER (DPF)

Diesel particulate filter (DPF), filters out the solid fraction of particulate matter (PM), commonly known as soot and seen as black smoke. The exhaust gases pass through small pores in the ceramic substrate of the filter, trapping the particulate matter. The layer of trapped soot builds up and increases back pressure to the point where it needs to be burned off periodically, known as regeneration. DPFs are either a passive regeneration system or an active regeneration system. Regeneration events require a minimum exhaust temperature to occur, which may happen during operation (passive) or require the addition of fuel or other heat input (active). Therefore, a generator application may require a minimum load on the engine to reach the proper exhaust temperatures. A load bank is often required to maintain the minimum load on the unit and needs to be added to the system.

EXHAUST GAS RECIRCULATION (EGR)

Commonly referred to as EGR, exhaust gas recirculation is a NO_x reduction technology widely used in nonroad diesel engines. During operation exhaust gases are recycled back into the combustion chamber. The exhaust gases are mixed with intake air to reduce oxygen content and combustion temperature. It is considered an in-cylinder control technology since it is reducing the creation of NO_x.



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WARRANTY

TRIME S.r.l. guarantees the technical characteristics, the quality of the components and the good functioning of the machine supplied according to the parameters declared in the manual. The guarantee is applied to the machine in its whole for a period of 12 months (twelve) from the date of shipment proven by fiscal purchase documents (invoice) and does not cover the engine and alternator that are covered by guarantee by their respective manufacturers (for the conditions of guarantee see the manuals for use and maintenance attached regarding the engine and alternator). Should, in the case of the machine after 12 months not yet being put into function, the guarantee is to be considered as expired. Should the customer be a dealer the period of the guarantee will begin from the date of the installation of the machine at the final client's location, from TRIME S.r.l. of the test certificates sent by the customer (dealer). The guarantee excludes: electronic parts, all parts to which repairs or substitution are due to the natural use of the piece and the defects due to an incorrect use of the machine by the customer which, non-exhaustive example:

- Use for that other than specified by TRIME S.r.l.
- Overloading the machine above the limits indicated in the manual
- Incorrect maintenance and cleaning of the machine and its components.
- Interventions on the machine that are not conform to the indications by TRIME S.r.l.
- Non substitution of parts subject to wear and tear, etc
- Wrong installation and/or electrical connections.
- Un authorised modifications.
- Use of fuel or oil not adaptable.
- Operations undertaken by unqualified or un-trained personnel.
- Use of non-original spare parts.
- Non observance in whole or in part of the instructions.
- In all cases the following are excluded from the guarantee:
 - Eventual transport costs of the machine
 - Eventual transfer costs for technicians to the customer.
 - Eventual damage caused to persons and things in the case of malfunction of the machine.

In the case of defects encountered on the machine, the customer must notify in writing the presence of the malfunction of the machine within 15 (fifteen) days from the date of verification of the defect, TRIME S.r.l. reserves the right to accept or refuse the complaint after having verified the defect of the component.

The repair or substitution of the defective component of the machine by TRIME S.r.l. constitutes the one and only guarantee that TRIME S.r.l. concedes to the customer. TRIME S.r.l. will not reimburse any other costs of any type directly or indirectly, sustained by the customer as a consequence of the defectiveness of the machine and its components.



THE FOLLOWING GUARANTEE ANNULS AND SUBSTITUTES ANY OTHER GUARANTEE
EXPRESSED OR IMPLIED AND CANNOT BE MODIFIED.

DSE7310 MGTP 200 USL-VO

400A 400V-50HZ 24VDC

1	07/10/2022	Collaudo	
0	09/06/2022	giomacchia	
REV.	DATE	NAME	CHANGES
TRIME SPA			BR SILANO CONTROL PANNEL AMF
DSE7310MKII			REVISION 1
400V-50HZ-24V-250A			CONTRACT : 220272
FQ220VV -VO220FQV			User data 1 User data 2
			SCHEME 01

1-400A 400V-50HZ 24VDC

Drawing	Description	Function	Location	Revision	Date	Created by	Folder	Folder description
01	Cover page	=F1	+L1	0	09/06/2022	giomacchia		
02	Drawings list	=F1	+L1	0	09/06/2022	giomacchia		
03	Wiring line diagram	=F1	+L1	0	09/06/2022	giomacchia		
04	Electrical scheme	=F1	+L1	0	09/06/2022	giomacchia		
04A	Socket kit	=F1	+L1	0	09/06/2022	giomacchia		
05	dse measures	=F1	+L1	0	09/06/2022	giomacchia		
06	battery charger -auxiliaries	=F1	+L1	0	09/06/2022	giomacchia		
06A	ELCB Diagram	=F1	+L1	0	09/06/2022	giomacchia		
07	I/O control dse	=F1	+L1	0	09/06/2022	giomacchia		
07A	Dse M835	=F1	+L1	0	24/06/2022	giomacchia		
08	engine cabling	=F1	+L1	0	09/06/2022	giomacchia		
09	Color code engine	=F1	+L1	0	09/06/2022	giomacchia		
10	AVR	=F1	+L1	0	09/06/2022	giomacchia		
12	Fan power scheme	=F1	+L1	0	09/06/2022	giomacchia		
13	fan connections	=F1	+L1	0	09/06/2022	giomacchia		
14	XAUX-(1/1)	=F1	+L1	0	09/06/2022	giomacchia		
15	Bill Of Materials grouped by manufacturer	=F1	+L1	0	09/06/2022	giomacchia		
16	Bill Of Materials grouped by manufacturer	=F1	+L1	0	09/06/2022	giomacchia		

BR
SILANO
CONTROL PANNEL AMF

400A 400V-50HZ 24VDC

CONTRACT: 220272

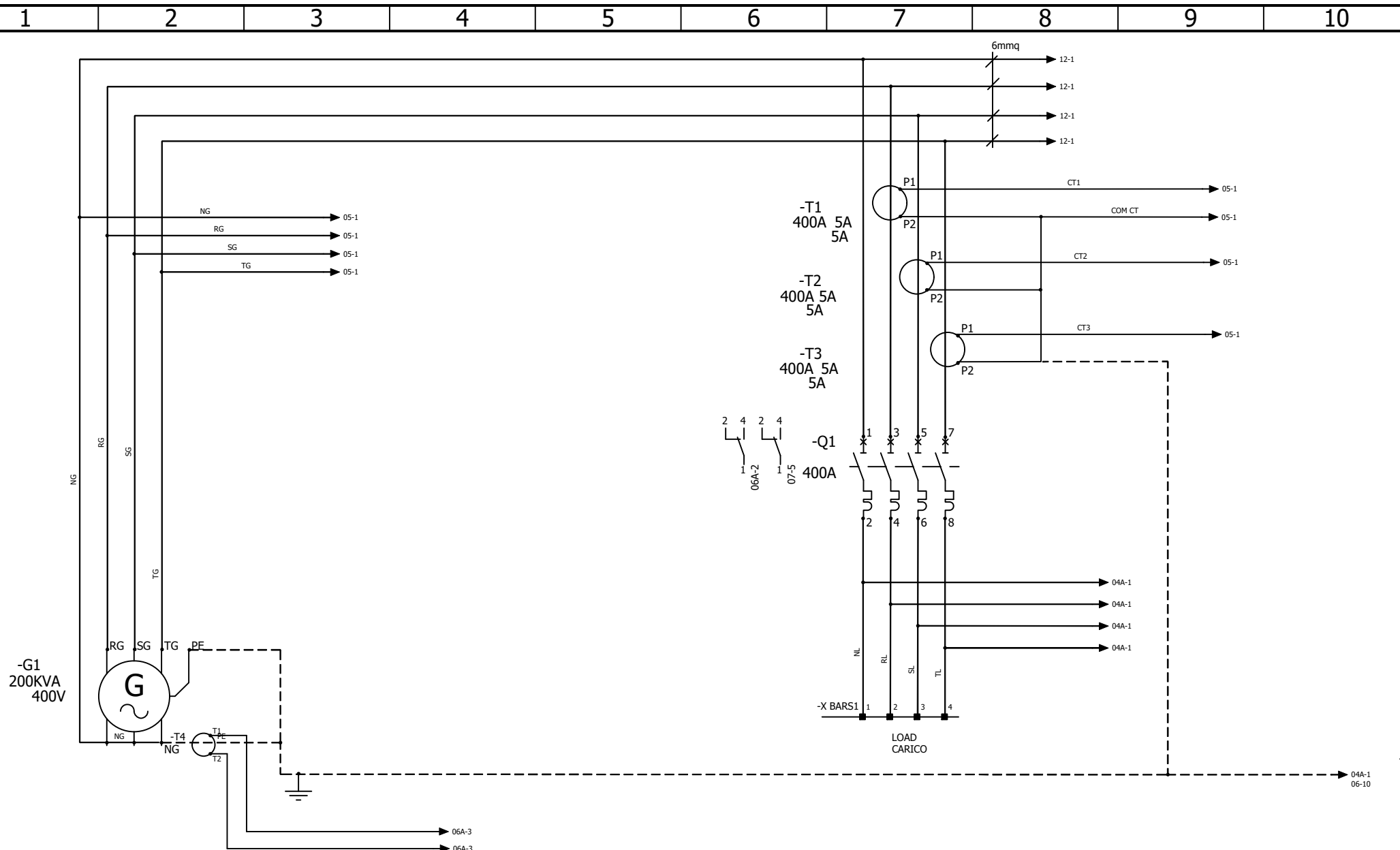
LOCATION:

+L1

Main electrical closet

				REVISION
1	07/10/2022	Collaudo		1
0	09/06/2022	giomacchia		
REV.	DATE	NAME	CHANGES	SCHEME
User data 1			User data 2	02

1	2	3	4	5	6	7	8	9	10
BR SILANO CONTROL PANNEL AMF			400A 400V-50HZ 24VDC						REVISION
						1	07/10/2022	Collaudo	1
						0	09/06/2022	giomacchia	
						REV.	DATE	NAME	CHANGES
CONTRACT: 220272			LOCATION: +L1			Main electrical closet			SCHEME
						User data 1			03
						User data 2			



BR
SILANO
CONTROL PANNEL AMF

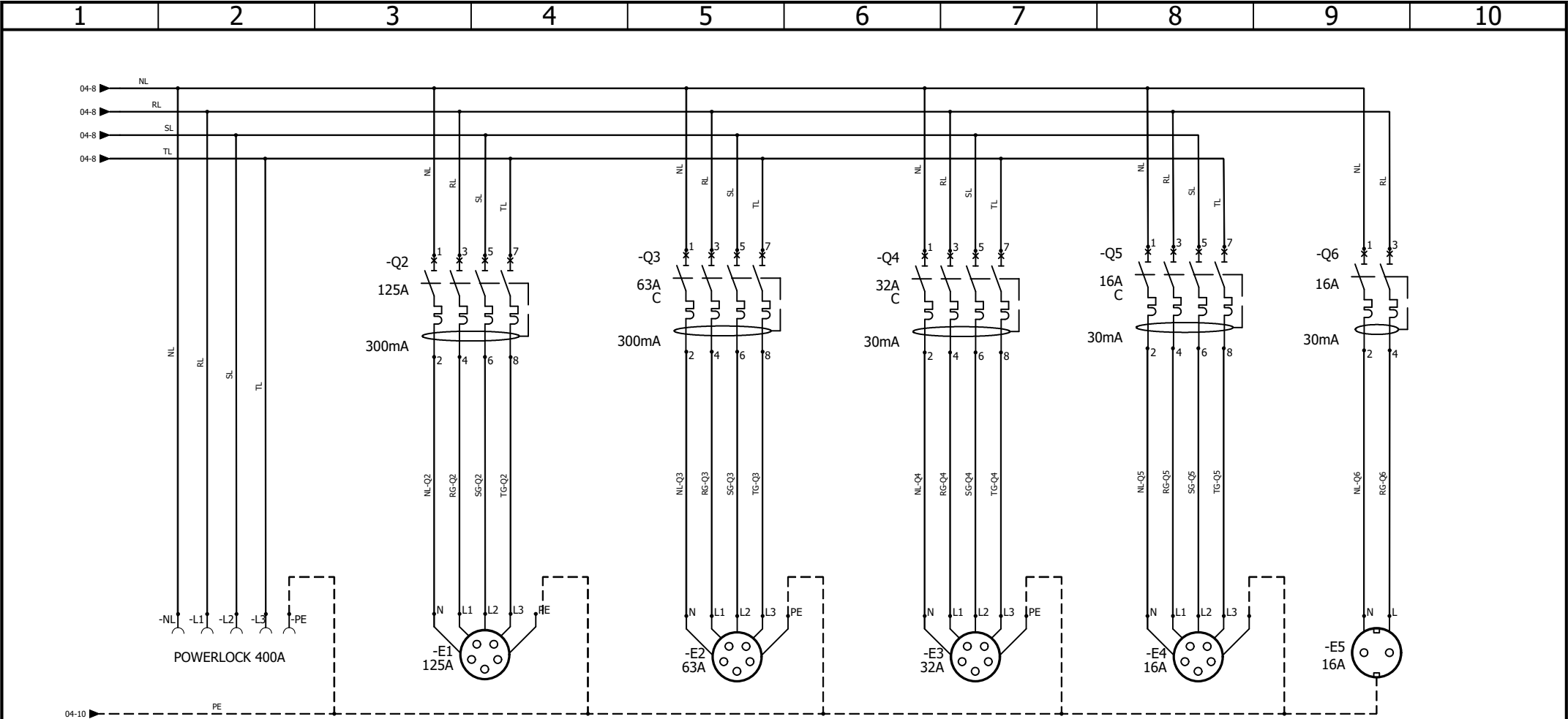
400A 400V-50HZ 24VDC

CONTRACT: 220272

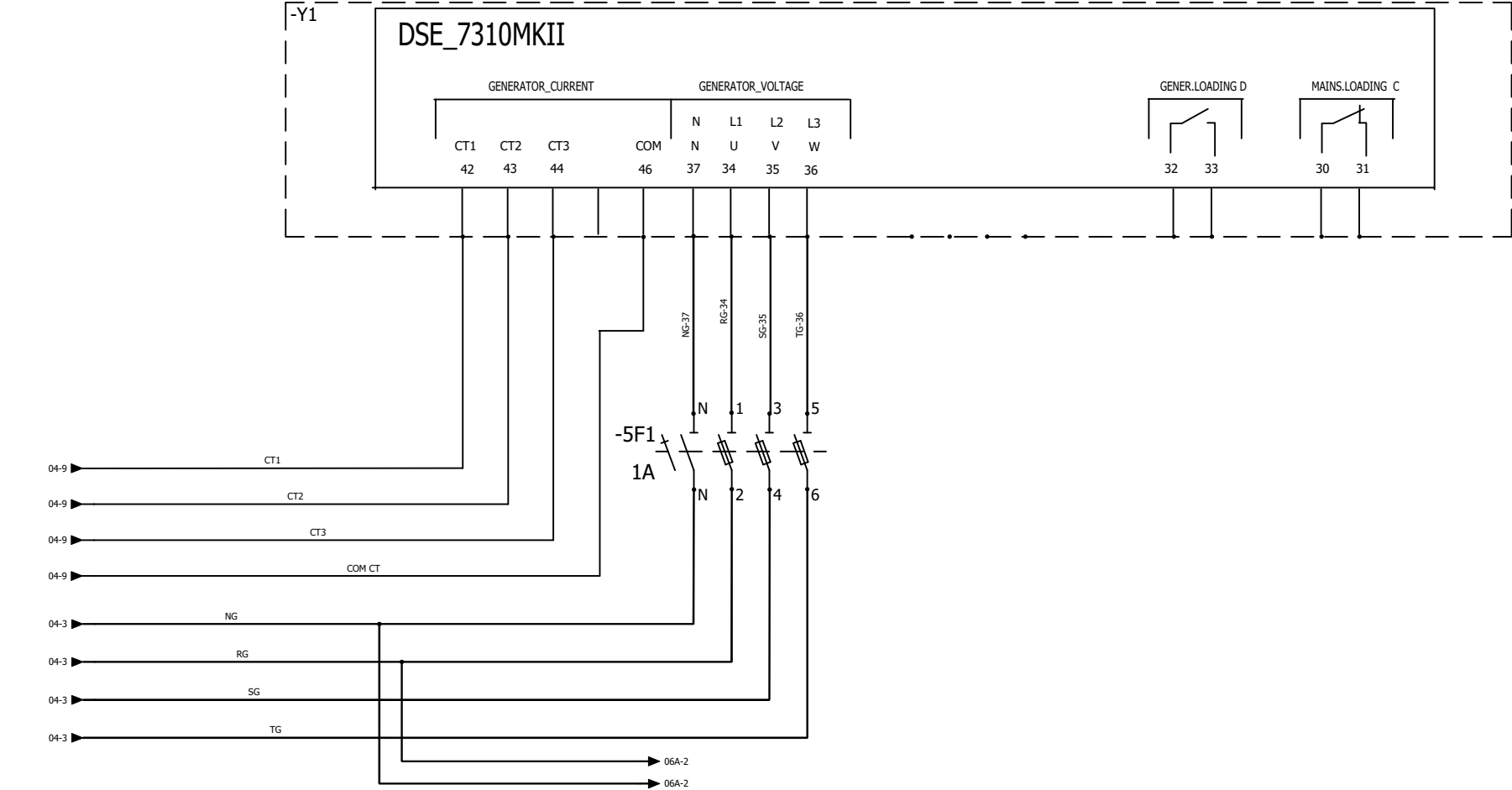
LOCATION: +L1

Main electrical closet

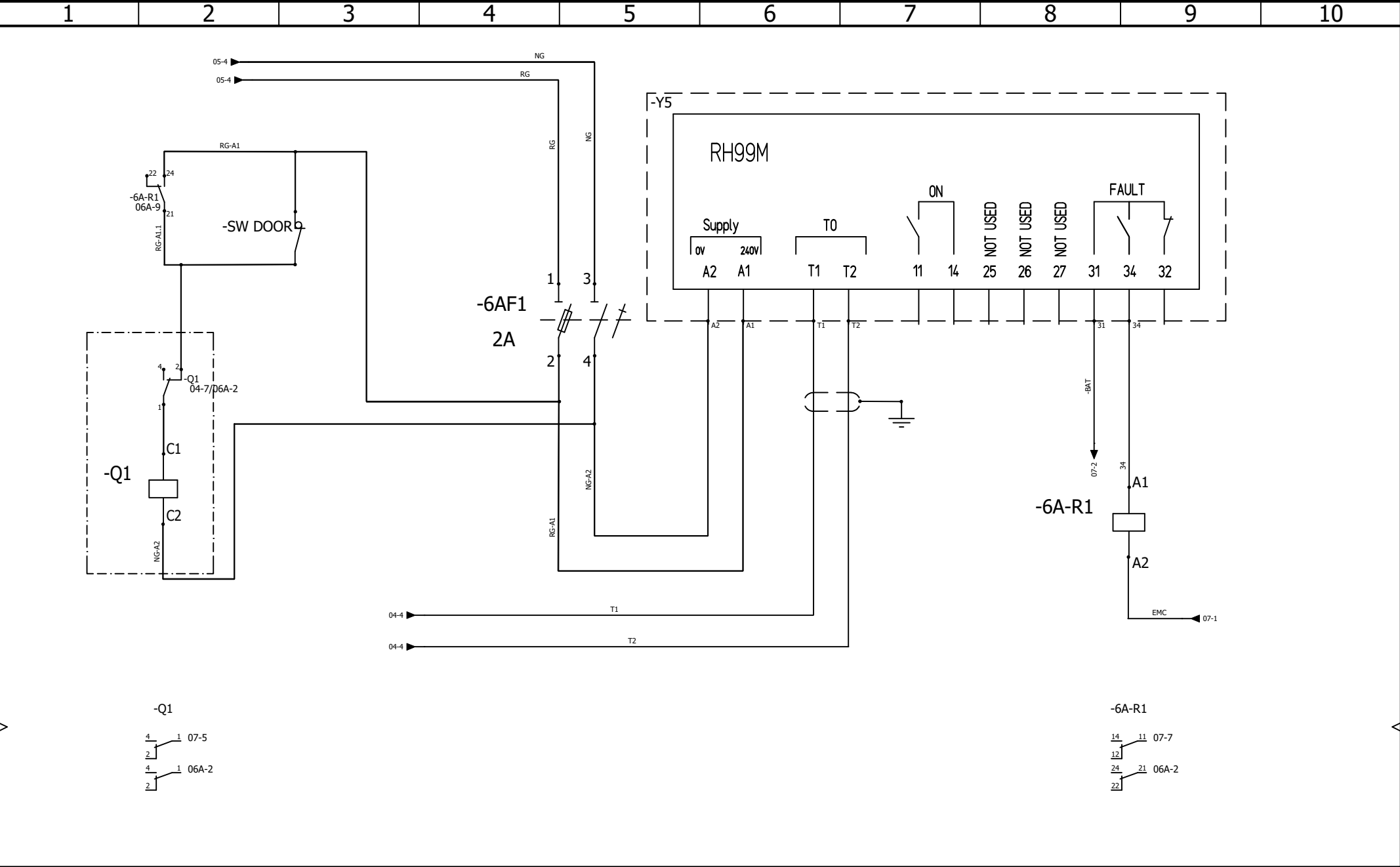
					REVISION 1 SCHEME 04
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0	09/06/2022	giomacchia			
REV.	DATE	NAME	CHANGES		
User data 1			User data 2		



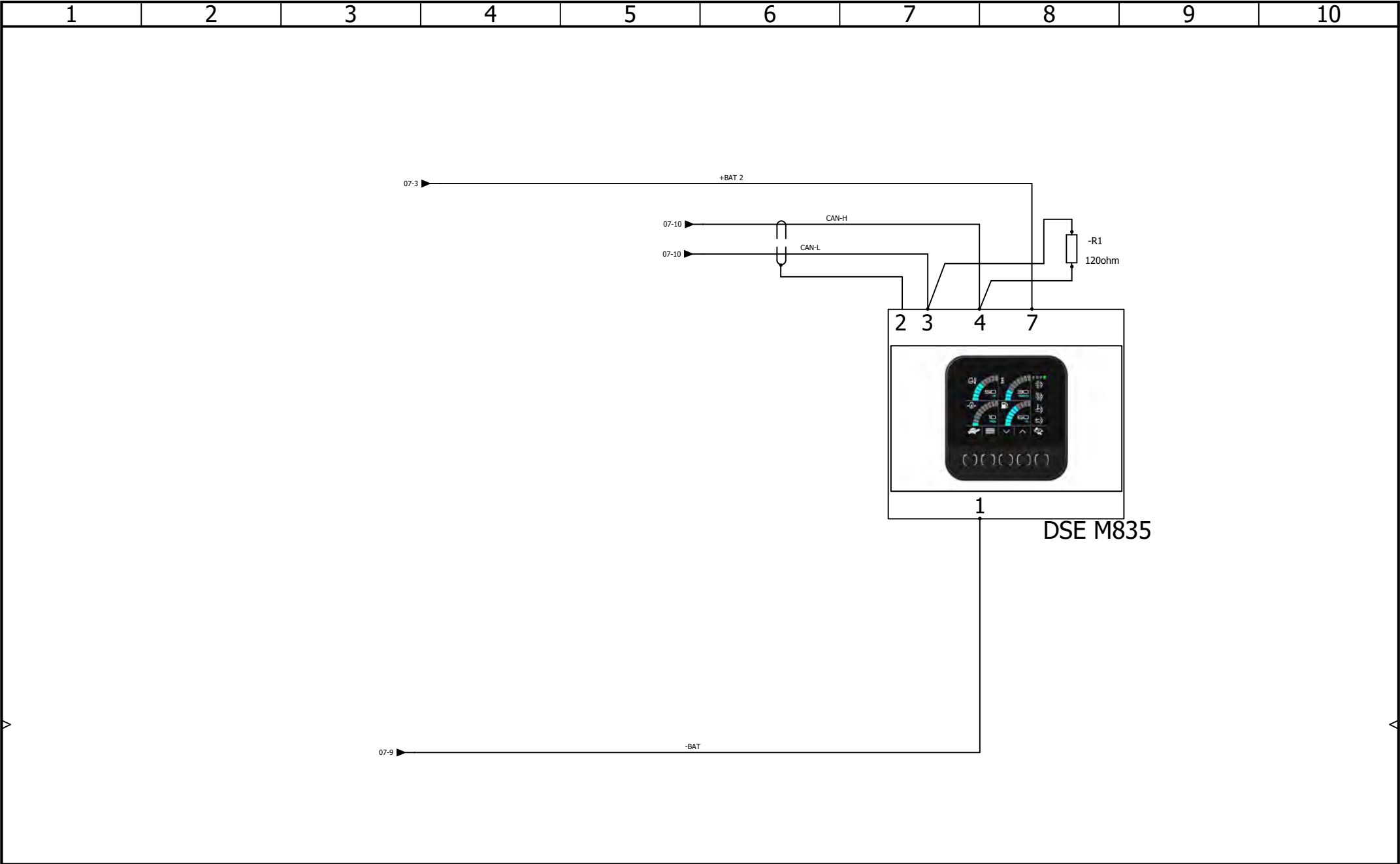
BR SILANO CONTROL PANNEL AMF	400A 400V-50HZ 24VDC				REVISION
		1	07/10/2022	Collaudo	1
		0	09/06/2022	giomacchia	
		REV.	DATE	NAME	CHANGES
CONTRACT: 220272	LOCATION: +L1	Main electrical closet			SCHEME
		User data 1			04A
		User data 2			



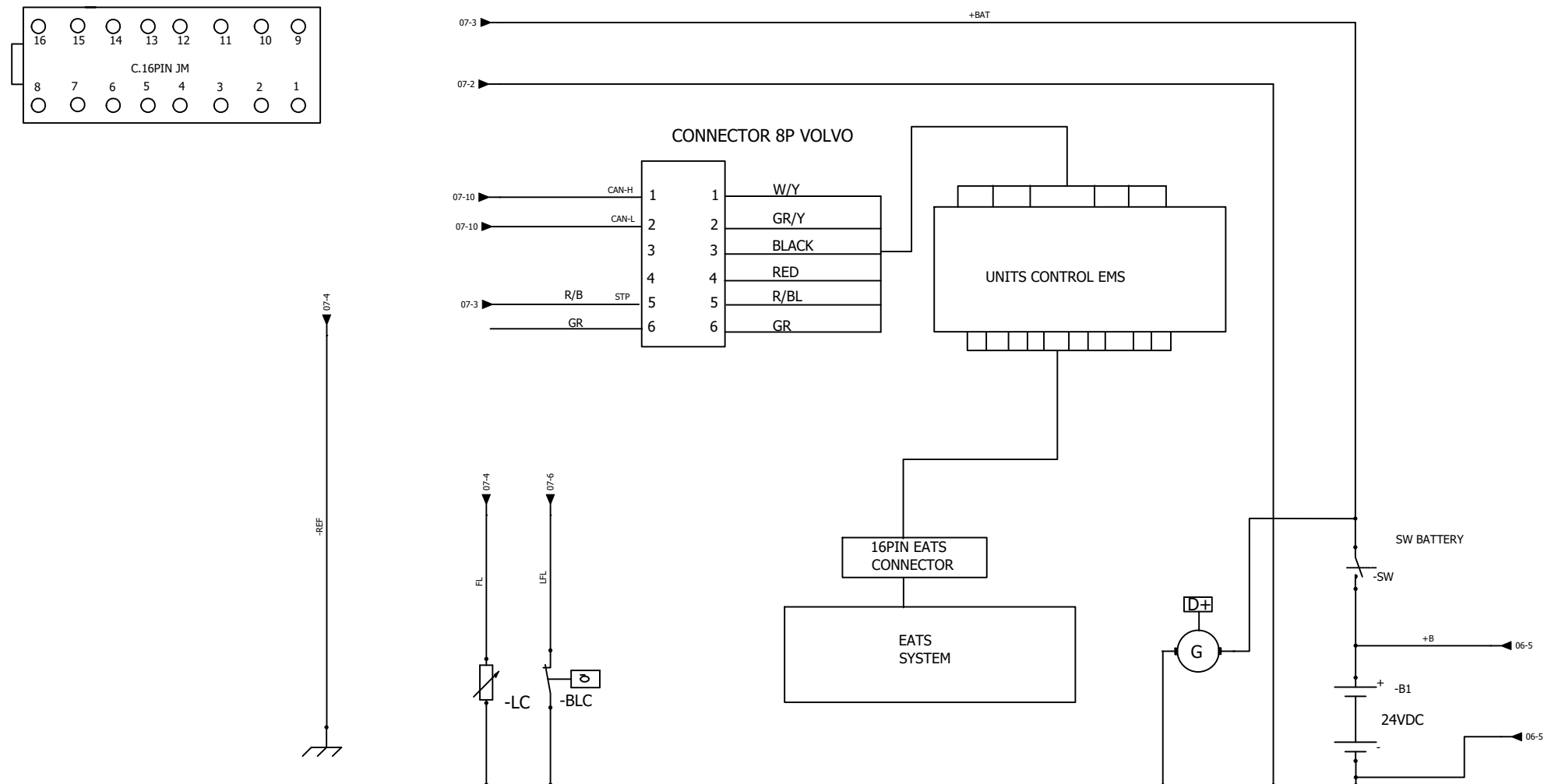
BR SILANO CONTROL PANNEL AMF	400A 400V-50HZ 24VDC				REVISION
					1
		1	07/10/2022	Collaudo	
		0	09/06/2022	giomacchia	
CONTRACT: 220272	LOCATION: +L1	Main electrical closet		CHANGES	SCHEME
		User data 1		User data 2	05



BR SILANO CONTROL PANNEL AMF	400A 400V-50HZ 24VDC					REVISION	
		1	07/10/2022	Collaudo		1	
		0	09/06/2022	giomacchia			
		REV.	DATE	NAME	CHANGES	SCHEME	
CONTRACT: 220272	LOCATION: +L1	Main electrical closet			User data 1	User data 2	06A



BR SILANO CONTROL PANNEL AMF	400A 400V-50HZ 24VDC					REVISION 1 SCHEME 07A
		1	07/10/2022	Collaudo		
		0	24/06/2022	giomacchia		
		REV.	DATE	NAME	CHANGES	
CONTRACT: 220272	LOCATION: +L1 Main electrical closet	User data 1			User data 2	



User Data

+BATT	ROSSO-RED 4MM	POSITIVO BATTERIE
		BATTERY PLUS
-BATT	GRIGIO 4MM	NEGATIVO BATTERIE
	GREY	NEGATIVE BATTERY
D+	VERDE	D+ CARICA BATTERIA
	GREEN	D+ BATTERY CHARGE
STA	NERO	AVVIAMENTO
	BLACK	STARTING
STP	GIALLO O (MARRONE)	STOP MOTORE
	YELLOW OR BROWN	ENGINE STOP
BPO-LOP	BIANCO	BASSA PRESSIONE OLIO
	WHITE	LOW OIL PRESS
ATA-HCT	BLU	ALTA TEMPER. REFRIGERANTE
	BLUE	HIGHT COOLANT TEMP
BLC-LFL	ARANCIONE	BASSO LIV.GASOLIO
	ORANGE	LOW FUEL LEVEL
LC-FL	VIOLA	LIVELLO GASOLIO
	VIOLET	FUEL LEVEL
PO-OP	BIANCO/NERO	PRESSIONE OLIO
	WHITE/BLACK	OIL PRESS

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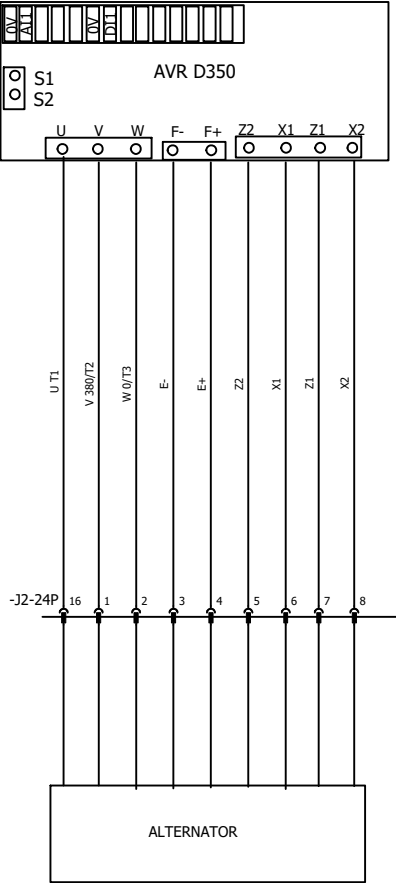
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SILANO
CONTROL PANNEL AMF

400A 400V-50HZ 24VDC

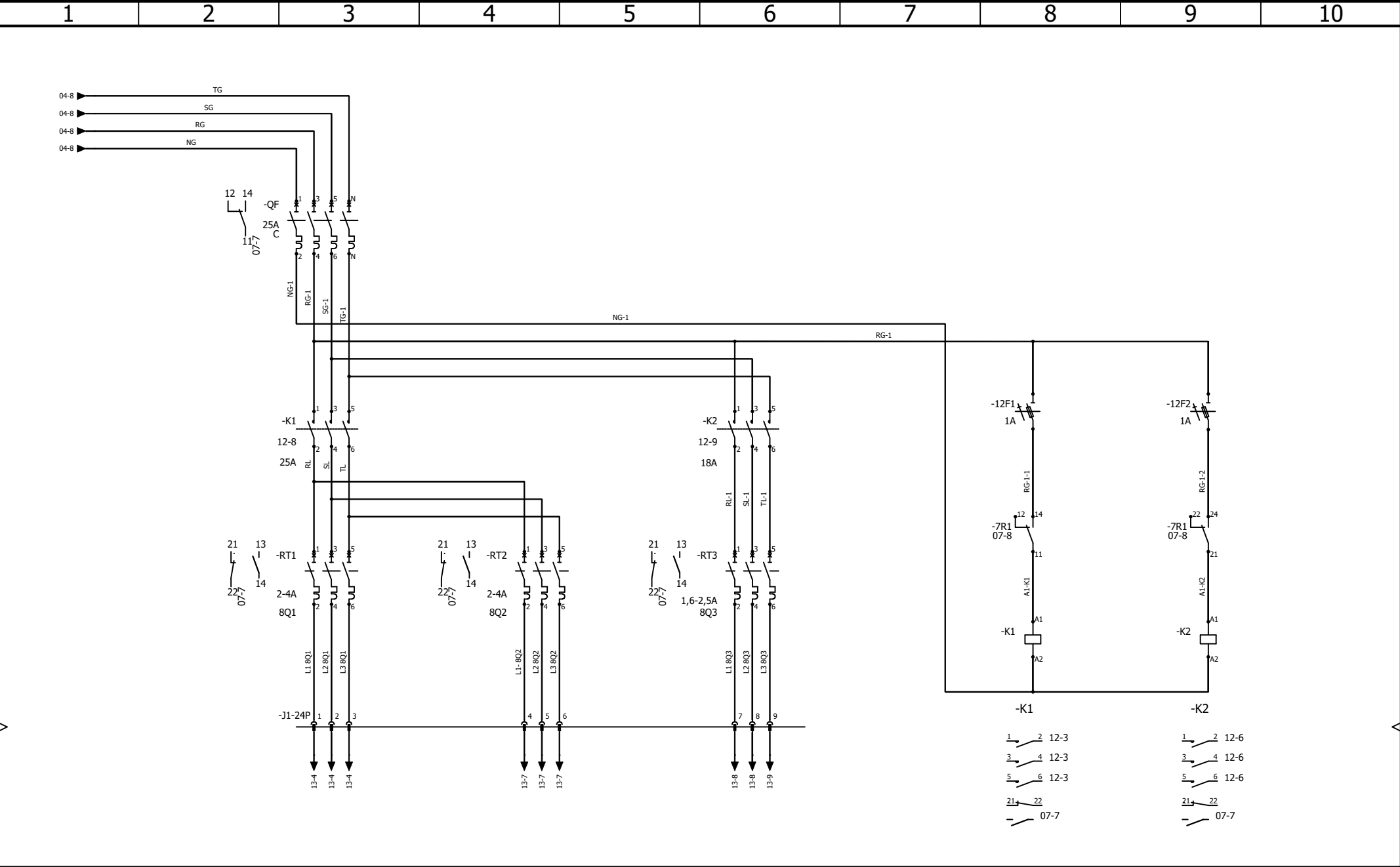
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0	09/06/2022	giomacchia		
REV.	DATE	NAME	CHANGES	SCHEME
User data 1			User data 2	09

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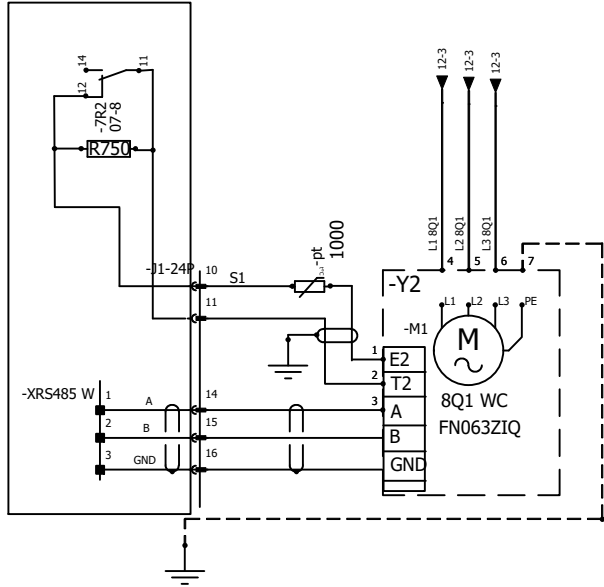
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		REV.	DATE	NAME	CHANGES
CONTRACT: 220272	LOCATION: +L1	Main electrical closet			SCHEME
		User data 1			10
		User data 2			



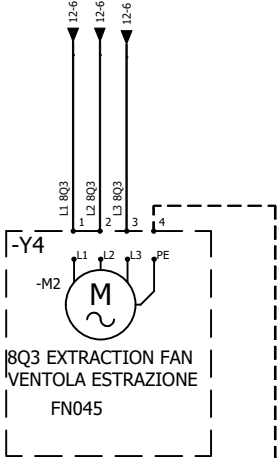
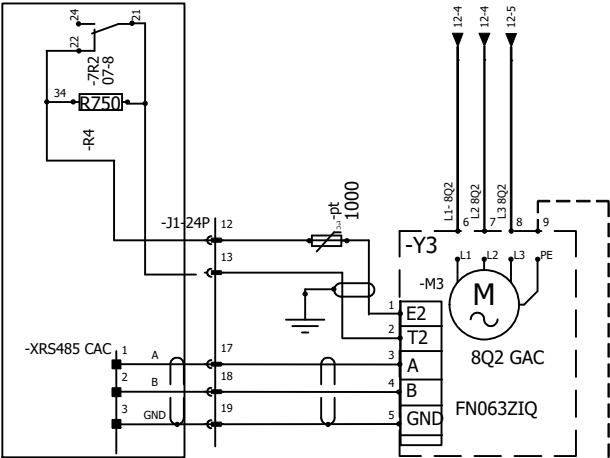
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			0	09/06/2022	giomacchia		
			REV.	DATE	NAME	CHANGES	SCHEME
CONTRACT: 220272	LOCATION: +L1	Main electrical closet	User data 1			User data 2	12

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+L1 - Main electrical closet

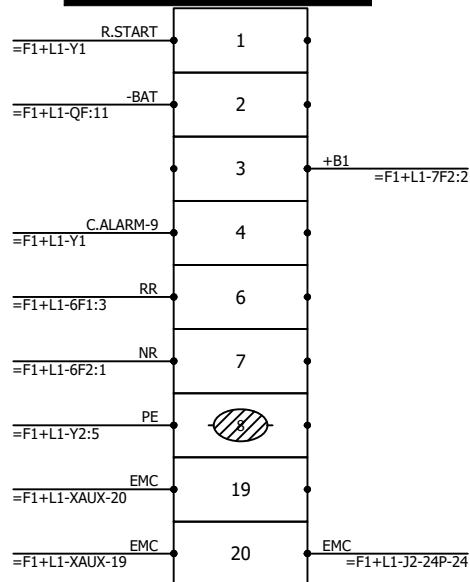


+L1 - Main electrical closet



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		REV.	DATE	NAME	CHANGES
CONTRACT: 220272	LOCATION: +L1	Main electrical closet			SCHEME
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-XAUX



BR
SILANO
CONTROL PANNEL AMF

400A 400V-50HZ 24VDC

REV.	DATE	NAME	CHANGES	REVISION
1	07/10/2022	Collaudo		1
0	09/06/2022	giomacchia		
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CONTRACT: 220272

LOCATION: +L1 Main electrical closet

AB trasmissioni-Eleberg

	Reference	Mark	Description	Quantity
1	ABE24160-A400	-T1, -T2, -T3	Miniature current transformer, Ø32mm. pass through hole, flexible collar + tie fixing	3

CABUR

	Reference	Mark	Description	Quantity
1	CBC 4	-XAUX-3, -XAUX-4, -XAUX-7, -XAUX-19, -XAUX-20	Simple terminal	5
2	TE 6/D-TE6/0	-XAUX-8	Simple terminal earth	1

DSE

	Reference	Mark	Description	Quantity
1	M835	-N1		1

Finder

	Reference	Mark	Description	Quantity
1	97.P1	-7R4	Socket Series 97, for Relay,46	1
2	97.P2	-6A-R1, -7R1, -7R2, -7R3	Socket Series 97, for Relay,46	4
3	46.52.9.024.0040	-7R1, -7R2, -7R3, -6A-R1	Miniture Industrial Relay Series 46, 24V DC; 2 NO/NC 250V/8A	4
4	46.61.9.024.0040	-7R4	Miniture Industrial Relay Series 46, 24V DC; 1 NO/NC 250V/16A	1

MECCALTE

	Reference	Mark	Description	Quantity
1	LSA44.3L10	-G1		1

Schneider Electric

	Reference	Mark	Description	Quantity
1	29450	-Q1	Standard auxiliary contact, circuit breaker status OF-SD-SDE-SDV, 1 single contact	2
2	50437	-T4	Toroidal CT TA30	1
3	81283	-E2	Inclined BT recessed socket IP67 63A 380V 3P + N + T	1
4	81295	-E1	Inclined BT recessed socket IP67 125A 380V 3P + N + T	1
5	A9D27216	-Q6	2P 16A 30mA C 10000A	1
6	A9F79463	-Q3	Circuit breaker iC60N 4P 63A C curve	1
7	A9F94416	-Q5	Circuit breaker iC60L 4P C 16A 15000A	1
8	A9F94432	-Q4	Circuit breaker iC60L 4P C 32A 15000A	1
9	A9N15636	-6FCB, -7F2, -7F3	Acti 9 - fuse-disconnector STI - 1 pole - 25 A - for fuse 10.3 x 38 mm	3
10	A9N15646	-6AF1, -6F1, -6F2, -7F1	Acti 9 - fuse-disconnector STI - 1 pole + N - 25 A - for fuse 10.3 x 38 mm, 2 pole STI	4

BR
SILANO
CONTROL PANNEL AMF

400A 400V-50HZ 24VDC

CONTRACT: 220272

LOCATION:

+L1

Main electrical closet

				REVISION 1 SCHEME 15
1	07/10/2022	Collaudo		
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REV.	DATE	NAME	CHANGES	
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-> Schneider Electric

	Reference	Mark	Description	Quantity
11	A9N15658	-5F1	Acti 9 - fuse-disconnector STI - 3 poles + N - 25 A	1
12	A9N17529	-QF		1
13	A9N18376	-Q2	Magnetic circuit breaker C120N 4P C 125A 10000A	1
14	A9N18579	-Q2	Vigi C120 - 4P 125A 300mA - Type A earth leakage block	1
15	A9N26924	-QF	Auxiliary contact OF, ACTI9	1
16	A9Q41225	-Q6	VIGI C60L, 2P, 25A, 30mA	1
17	A9Q41425	-Q5		1
18	A9Q41440	-Q4	QuickVigi iC60 earth leakage block 4P 40A 30mA AC type	1
19	A9V54463	-Q3	Vigi iC60 4P 63A 300mA A-type	1
20	A9Y72725	-Q5	Vigi iCG40 3P + N 25A 30mA residual current device	1
21	GV2ME07AE11TQ	-RT3		1
22	GV2ME14AE11TQ	-RT1		1
23	GV2ME14TQ	-RT2		1
24	GVAE11TQ	-RT1, -RT2, -RT3		3
25	LC1D38016P7	-K1, -K2	CONTACTOR LC1-D - 3P - AC-3 440V 38A - COIL 230VAC	2
26	LV429387	-Q1	MX 220-240V AC 50/60Hz, 208-277C AC 60Hz Shunt trip voltage release, NSX100-630 circuit breaker accessory	1
27	LV432085	-Q1	Trip unit - Micrologic 2.3 - 400A - 4 poles 4d	1
28	LV432415	-Q1	Circuit breaker Compact - Without trip unit NSX400F - 4P - 400A - 36kA	1
29	PKF259	-E4	Inclined BT recessed socket IP67 16A 380V 3P + N + T	1
30	PKF271	-E3	PratiKa industrial socket IP67 32A 380V 3P+N+T	1
31	PKS51B	-E5	PratiKa socket - blue - 2P + E - 10/16 A - 250 V - German - IP54 - flush - back	1
32	PRA10261	+L1		1
33	XB7ES545P	-S1		1
34	ZB5AW353	-S3	Orange flush illuminated pushbutton head Ø22 spring return for integral LED	1
35	ZBE101	-S3	single contact block for head Ø22 1NO silver alloy screw clamp terminal	1
36	ZBV85TQ	-S3	Light block for head Ø22, orange, integral LED, 24 V AC/DC	1

BR
SILANO
CONTROL PANNEL AMF

400A 400V-50HZ 24VDC

CONTRACT: 220272

LOCATION:

+L1

Main electrical closet

				REVISION
1	07/10/2022	Collaudo		1
0	09/06/2022	giomacchia		
REV.	DATE	NAME	CHANGES	SCHEME
User data 1			User data 2	16

**VOLVO
PENTA**

OPERATOR'S MANUAL

5L, 8L





WARNING! Operating, servicing and maintaining an engine can expose you chemicals including engine exhaust, carbon monoxide, phthalates, and lead which are known to the State of California to cause cancer and birth defects or other reproductive harm.

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

To minimize exposure, avoid breathing exhaust when operating, servicing and maintaining the engine.

- Always start and operate the engine in a well-ventilated area.
- If in an enclosed area, vent the exhaust to the outside.
- Wear gloves or wash your hands frequently when servicing the vessel.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to

www.P65warnings.ca.gov

www.p65warnings.ca.gov/products/diesel

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Foreword

Welcome!

Volvo Penta engines are designed to fulfill Volvo's core values; quality, safety and environmental care. After more than 100 years as an engine manufacturer, the Volvo Penta brand has also become a symbol of reliability, technical innovation, top-of-the-range performance and long service life. Volvo Penta engines are used all over the world, in different operating conditions.

Make sure to thoroughly read through the Operator's Manual regarding operating and maintenance. It contains the information you need to be able to operate and maintain the engine safely and correctly. Pay careful attention to the safety instructions included in the manual.

As the owner of a Volvo Penta engine, you become part of a worldwide network of dealers and service workshop that assist you with technical advice, service requirements and replacement parts. Contact your nearest authorized Volvo Penta dealer for assistance.

It is possible to buy additional literature about your Volvo Penta engine, e. g. the Service & Maintenance manual. More information on how to do this can be found at www.volvopenta.com.

Information about your closest Volvo Penta dealer and other useful news and information can be found at www.volvopenta.com and by following Volvo Penta on Facebook.



www.volvopenta.com



www.facebook.com/volvopenta

Safety Information

This chapter describes how safety precautions are presented in the manual and on the product. Read the chapter through very carefully before you start the engine or do any maintenance or service. It has to do with your safety; an incorrect operation can lead to personal injury and damage to products or property. It also gives you an introduction to the basic safety rules for using and looking after the engine.

If anything remains unclear or if you are unsure of something, contact your Volvo Penta dealer for assistance.

IMPORTANT:

Always follow local safety instructions and regulations.

Safety texts have the following order of priority:

DANGER!

Indicates a hazardous situation, which, if not avoided, result in death or serious injury.

WARNING!

Indicates a hazardous situation, which, if not avoided, could result in death or serious personal injury.

CAUTION!

Indicates a hazardous situation, which, if not avoided, could result in minor or moderate personal injury.

IMPORTANT:

Indicates a situation, which, if not avoided, could result in property damage.

NOTICE! Used to draw attention to important information that facilitates work or operations.



This symbol is may be used on the product to call your attention to the fact that this is safety information. Always read such information very carefully.

Make sure that warning and information symbols on the engine are clearly visible and legible. Replace symbols that have been damaged or have been painted over.



In some cases, this symbol is used on our products and refers to important information in the Operator's Manual.

Most chemicals such as engine and transmission oils, glycol, petrol and diesel oil and chemicals used in workshops such as degreasing agents, paint and solvents are harmful to health.

Carefully read the instructions on the product packaging! Always follow the safety regulations, such as the use of protective masks, goggles, gloves, etc. Make sure that other personnel are not exposed to substances that are hazardous to health. Ensure good ventilation.

Manage used and leftover chemicals in the prescribed manner.

Daily Checks

WARNING!

Do not start the engine if there is reason to suspect fuel leaks or if there is explosive material nearby.

Make it a habit to give the engine and engine compartment a visual check before the engine is started and after operations, once the engine has stopped. This helps you to quickly discover fuel, coolant or oil leakages or any other abnormality that has occurred, or is about to occur.

Personal safety equipment

CAUTION!

Always use appropriate safety equipment. Personal protective equipment does not eliminate the risk of injury but it will reduce the degree of injury if an accident does happen.

Some examples are ear protection, eye and face protection, protective footwear, personal protective equipment, head protection, protective clothing, gloves and respirators.

WARNING!

Ensure that all machine guards and safety devices are in place and are functional.

CAUTION!

Never use tools or products that show signs of damage.



P0024482

Protect your eyes

⚠ CAUTION!

Wear safety glasses.

Always wear safety glasses if there is a risk of splintering, sparks and spray from the electrolyte (so-called battery acid), or other chemicals. Your eyes are very delicate and damage can result in loss of sight!

Protect your skin

⚠ CAUTION!

Risk of skin damage.

Avoid getting oil on your skin! Prolonged or repeated exposure to oil can dry out the skin. Thereafter, irritation, dryness and eczema and other skin problems may occur.

Use protective gloves and avoid oil-soaked clothes and rags. Wash regularly, especially before eating. Wear suitable protective creams to prevent skin from drying out and to facilitate cleaning.

Fire safety

⚠ WARNING!

Fire and Explosion Risk!

Accidental spark could ignite fuel vapors.

All fuels – as well as many lubricants and chemicals – are flammable. Do not allow open flames or sparks near them. **Smoking forbidden!** Hydrogen from the batteries is also very flammable and explosive in certain mixture with air.

Ensure that the workplace is well ventilated and take the necessary precautions before welding or grinding begins. Always ensure that there is a fire extinguisher close at hand in the work area.



P0024470

Spare parts — safety

⚠ WARNING!

Always use spare parts with the same quality as genuine Volvo Penta parts to minimize the risk of an explosion or fire.

Components in fuel systems and electrical systems on Volvo Penta engines are designed and manufactured to minimize the risk of explosions and fire, in accordance with applicable legal requirements.

Used oils, filters and chemicals etc.

⚠ WARNING!

Risk of fire.

Store fuel soaked rags and other flammable material so that there is no danger of them catching fire.

Oil-soaked rags can spontaneously ignite under certain circumstances.

IMPORTANT:

Used fuel and oil filters are environmentally hazardous waste and must be taken to an approved waste management facility for correct handling, as must any used lubricating oil, contaminated fuel, paint residue, solvents, degreasers and wash residue.

Prevent start of the engine

⚠ WARNING!

Immobilize the engine by turning off the power supply with the main switch(es) and lock it (them) in the off position before starting work. Place a warning notice at the main switch.

If the engine is equipped with BMS (Battery Management System), always disconnect both battery cables from the battery terminals.

Ventilation when running the engine

⚠ WARNING!

Only start the engine in a well-ventilated area. If operating the engine in a closed area ensure that there is exhaust ventilation leading out of the work area to remove exhaust gases and crankcase ventilation emissions.

The engine must not be operated in areas where there are explosive materials or stored gas.



P0024481



P0024808

Rotating parts and hot surfaces

⚠ DANGER!

Working with or approaching a running engine is a safety risk. Watch out for rotating components and hot surfaces.

If the engine is in operation and operates another device, you must not, under any circumstances, staying close to the engine.

Work on running engines is strictly prohibited. There are however adjustments that require the engine to be run. Approaching a running engine is a safety risk. Loose clothing and long hair can get caught in the rotating parts; careless movements or a dropped tool can lead to serious personal injury.

Be careful to avoid hot surfaces (exhaust pipes, turbochargers, charge air manifolds, start elements etc.) and hot fluids in pipes and hoses on engines that are running or have just stopped. Re-install all protective covers that were removed during maintenance work before starting the engine.

Information on the engine

IMPORTANT:

Make sure that all warning and information decals on the product are always visible. Replace decals which have been damaged or painted over.



P0024483

Prohibition on use of start spray

⚠ WARNING!

Never use start spray or similar agents to start an engine. This may cause an explosion in the inlet manifold. Risk of personal injury.



P0024688

Before start of engine

⚠ WARNING!

Never start the engine if there is reason to suspect fuel and/or gas leaks, or if there is explosive material nearby.

IMPORTANT:

Only start the engine with the air filter and protective caps fitted. Foreign objects in the inlet line could cause machine damage. Also make sure that no tools or other parts have been left next to the engine.

⚠ WARNING!

Never start the engine with the valve cover removed. There is a risk of personal injury. For engines with turbochargers, the rotating compressor turbine can in addition cause serious personal injuries.

Before any work on the electrical system

⚠ WARNING!

Always stop the engine first. Then disconnect the current at the main switches and any external power supply before working on the electrical system – to minimize the risk of electrical hazards.

IMPORTANT:

Never disconnect the current using the main switches when the engine is running or by disconnecting the battery cables. The alternator and electronics could be damaged.

Avoid damage to the engine control module and other electronics

IMPORTANT:

Switch off the main switch before connecting or disconnecting a connector.

Before welding work

IMPORTANT:

Before any work with electric weld can begin, the connection to all control units must be disconnected. After finished welding, re-connect the connection to all control units before connecting any battery cable.

Before any work on the cooling system

⚠ WARNING!

Stop the engine and let it cool before starting work on the cooling system. Hot fluids and hot surfaces can cause burns.

Hot coolant under pressure

⚠ CAUTION!

Hot coolant can cause burns. Avoid opening the filler cap for the coolant when the engine is still hot. Steam or hot coolant can spray out and system pressure is lost.

Open the filler cap slowly and release the pressure in the cooling system if the filler cap or valve must be opened – or if a plug or a coolant hose must be removed from a hot engine.

Hot oil under pressure

⚠ CAUTION!

Hot oil can cause burns. Avoid getting hot oil on the skin. Ensure that the lubrication system is not pressurized before starting any work. Never start or operate the engine without the oil filler cap is on. There is a risk that hot oil can spray out.

Refueling

⚠ WARNING!

There is always a risk of fire and explosion during refueling. Smoking is forbidden and the engine must be stopped.



P0024477

Proper fuel quality

IMPORTANT:

Always use the fuel recommended by Volvo Penta. See *Technical Data* in Operator's Manual. Other fuel can damage the engine. Wrong fuel quality can also lead to higher service costs.

⚠ WARNING!

Risk of personal injury. Wrong fuel quality in a diesel engine can cause the fuel control mechanism to bind which can cause the engine to overspeed!

Legal requirements to use proper fuel

IMPORTANT:

To meet regulatory requirements for certified emission levels must always recommended fuel according to *Technical Data* in the Operator's Manual be used.

Legal requirements to not alter system

IMPORTANT:

All kind of tampering or modifications of the engine or EATS system, effecting the emission of the engine, will lead to that the type-approval for the engine becomes invalid.

At any leak detection on the fuel system

⚠ WARNING!

Wear safety goggles!
Be extremely careful when searching for leaks in the fuel system high-pressure circuits. There is very high pressure in the jet from pipes and injectors. The fuel may penetrate the tissue and cause serious risk of blood infection (septicemia).



P0024488

Handling of fuel pipes

IMPORTANT:

High pressure pipes for fuel must not be bent or straightened under any circumstances. Cracks may occur. Damaged pipes must be replaced.

Safe handling of batteries

⚠ WARNING!

Risk of fire and explosion. Never allow an open flame or electric sparks near the batteries.

A spark caused by an incorrectly connected battery can be enough for the battery to explode with serious injuries.

Do not touch the connections during start attempts. Sparking hazard! Do not lean over batteries.



P0024468

Correct polarity of the batteries

IMPORTANT:

Make sure that the positive (+) and negative (–) battery cables are correctly connected to the corresponding battery terminals. Wrong connection may cause severe damage to electrical equipment.

Risks of electrolyte in batteries

⚠ WARNING!

Always wear protective goggles when charging or handling batteries.

Battery electrolyte is highly corrosive.

Rinse immediately with copious amounts of water if the electrolyte gets in your eyes. Search directly after the rinsing help by medical staff.

If it comes electrolyte to unprotected skin, wash immediately with soap and water.

Layout of the battery compartment

IMPORTANT:

Make sure the battery compartment is designed according to current safety standards.

Cleaning the engine and components

IMPORTANT:

Never use a high pressure washer for cleaning of engine or engine components.



P0024486

Cleanliness for sensitive components

IMPORTANT:

Observe meticulous cleanliness when handling system components.

Even minimal amounts of dirt could cause a breakdown.

Adjustment of the clutch

⚠ CAUTION!

Clutch adjustments must be carried out with the engine stopped.

Introduction

Check that you have received the correct operator's manual before continuing reading. If not, please contact your Volvo Penta dealer.

For engine designations, refer to *Engine*. The designation is stated on the engine plate, refer to *Technical Data*, page 82.

The illustrations in this book may cover several product types, which means that there may be slight differences between the illustrations and the purchased product. This does, however, not affect the validity of the information and/or instructions in the manual. Volvo Penta reserves the right to make alterations to specifications, design features, and illustrations without prior notice.

To retain the dependability and exhaust emission control originally built into all Volvo Penta engines, it is essential that the engines and receive periodic maintenance according to the maintenance instructions.

At service, software that affects the functionality described in this manual can be updated.

About this manual

This Operator's Manual contains the information required for the correct, safe operation and maintenance of your Volvo Penta engine. Read the Operator's manual carefully and learn to handle the engine and other equipment in a safe manner before you start the engine.

Warranty

Your new Volvo Penta engine is covered by a limited warranty, subject to the conditions compiled in the Warranty Information. AB Volvo Penta's liability is limited to the specification in the Warranty Information and Emission Control System Warranty Statement.

Read the information carefully, as soon as possible after delivery. It includes important information about service and maintenance; the owner is responsible for being familiar with checking and implementing these. Otherwise AB Volvo Penta may deny its warranty obligations in part or in full.

Contact your Volvo Penta dealer if you have not received information on how to access the Warranty Information or received the Service Book.

Running in the engine

The engine must be run in during its first 10 operating hours, as follows:

Run the engine in normal operations. However, full load may not be applied other than for short periods.

Higher oil consumption is normal during the first 100–200 hours of operation. For this reason, check the oil level more frequently than the normal recommendation.

When a disengageable clutch is installed, it should be checked more carefully during the first days. Adjustments may be necessary to compensate bedding-in of the friction plates.

Fuel, oils and coolant

Only use the fuels and oils recommended in the Operator's Manual, other viscosity and quality may cause malfunctions, increased fuel consumption and possibly shorten the life of the engine.

Always change the oil, oil filters and fuel filters at the specified maintenance intervals.

Make sure to always use suitable and correctly mixed coolant.

If an unsuitable coolant has been used, or if the instructions for coolant mixture have not been followed, future warranty claims related to engine and accessories may be denied.

Maintenance and replacement parts

Volvo Penta engines are designed for maximum reliability and long life and built to withstand a demanding environment. The engines are also designed to have a minimal environmental impact. These qualities will be maintained through regular servicing and the use of spare parts with the same quality as genuine Volvo Penta parts. If reliable and purpose-built parts are not used, your safety, health, and the machine's function may be compromised. Volvo Penta has a world-wide network of authorized dealers.

The authorized dealers are Volvo Penta product specialists, and have the accessories, genuine parts, test equipment and special tools needed for high quality service and repair work. Always observe the maintenance intervals in the manual, the complete Service Protocol can be found at volvopenta.com. Remember to note the engine / transmission identification number when you **order service and spare parts**.

Excessive strain on a product and components

Volvo Penta products and components are not dimensioned for external loads. Never stand or step onto an engine, transmission or its components. Loads can bring about damage and the malfunction of a product or property.

Environmental care

Environmental care is a core value at Volvo Penta. Energy efficiency and low emissions are among the most important product related aspects and priority focus areas for Volvo Penta business. Several of the global challenges the world faces are directly or indirectly related to power industries and transports. We recognize that Volvo Penta is part of the environmental problems, but we are also convinced that we are a part of the solution.

Volvo Penta currently has a broad engine program in which great advances have been made in reducing exhaust emissions in the same time as the fuel consumption has been improved. Through regular maintenance, the Volvo Penta engines retain its low fuel consumption and low emissions. We hope that you will be keen to preserve these qualities.

Always follow the directions in the Operator's Manual regarding fuel grades, operation and maintenance to avoid unnecessary environmental impact. Contact your Volvo Penta dealer if you notice any changes such as increased fuel consumption or exhaust smoke.

Remember always to hand in environmental hazardous waste such as drained oil, coolant, old batteries, etc. for treatment at a recycling facility. Our united efforts can make a valuable contribution to the environment.

Certified engines

If you own an emission-certified engine used in an area where exhaust emissions are regulated by law, this places special demands on the care and maintenance you provide your engine.

NOTICE! Neglects or failure to follow the points listed here may invalidate the engine emission certificate. This means AB Volvo Penta can no longer guarantee engine conformity with the certified model. Volvo Penta is not responsible for damages or costs arising as a result of this.

- Certification means that an engine type has been checked and approved by the relevant authority. The engine manufacturer guarantees that all engines of the same type are equivalent to the certified engine.
- It is the responsibility of the operator/user to ensure that no intentional misuse of the engine takes place.
- Volvo Penta maintenance and service intervals must be complied with.
- Any case of malfunction must be rectified without delay.
- Only use genuine Volvo Penta parts or spare parts with the same quality as genuine Volvo Penta parts.
- Volvo Penta recommends that service to injection pumps, pump settings and injectors always are carried out by a qualified workshop.
- The engine must not be converted or modified in any way, except with accessories and service kits that Volvo Penta has approved for the engine.
- No installation changes to the exhaust pipe and engine air inlet ducts may be made.
- No warranty seals (where present on the product) may be broken by unauthorized persons.
- The general instructions in the Operator's Manual concerning operation, service and maintenance apply.

Emission Aftertreatment System

AdBlue®/DEF

AdBlue®/DEF ⁽¹⁾⁽²⁾ is mandatory for the equipment/ vehicle to comply with emission directive certification.

When adding AdBlue®/DEF, the solution must fulfill ISO22241 standards. If the solution used don't fulfill the ISO standard, any warranty claims will be rejected.

Using an engine that does not use AdBlue®/DEF, or the use of low quality solution, where such is required to reduce air pollution is a punishable offense. A consequence of such a failure may entail invalidation of conditions and warranties provided in the country where the engine is used.

Filling should take place between scheduled service intervals. The consumption of AdBlue/DEF is a percentage of the fuel consumption and is varying depending on the operating conditions. For filling instructions, refer to *Filling AdBlue®/DEF*, page 68.

If the exhaust gas control system does not work correctly the operator will be informed by a fault indication.

1. AdBlue® = Registered trademark of the Verband der Automobilindustrie e.V. (VDA).

2. DEF = Diesel Exhaust Fluid

Volvo Penta Dealer Network

The Volvo Penta global network of authorized dealers is at your service. We strongly recommend that you take your product to an authorized Volvo Penta dealer for service and repair. They are specialists in Volvo Penta products and have the accessories, genuine Volvo Penta parts, the special tools and the latest service information for high quality service and repair work.

Dealer Locator Services

Locate the nearest Volvo Penta dealer through our dealer locator on **www.volvopenta.com** or download the dealer locator app to your smartphone.

Volvo Penta Action Service

Our global dealer network, your first line of contact, is backed up by Volvo Penta Action Service, a phone based breakdown and support service providing assistance 24 hours a day, every day of the year.

How it works

A dedicated operator will support you all the way through your case and keep you updated on status and progress.

Whenever on-site assistance or technical support is needed, the operator will put you in contact with the closest Volvo Penta dealer that can support your product.

Phone numbers

Find your Volvo Penta Action Service phone number and more information on **www.volvopenta.com**.



Presentation

Engines

This Operator's Manual covers the following industrial diesel engines:

TAD580VE, TAD581VE, TAD582VE, TAD583VE, in-line, direct injected, 4-cylinder engines.

TAD881VE, TAD882VE, TAD883VE, TAD884VE, TAD880GE, TAD881GE, TAD882GE in-line, direct injected, 6-cylinder engines.

All of the engines are equipped with turbocharger, charge air cooler, thermostatically controlled cooling systems.

The engines are equipped with EGR (Exhaust Gas Recirculation) and the EATS system (Exhaust Aftertreatment System) consist of a DOC (Diesel Oxidation Catalyst), DPF (Diesel Particular Filter), SCR (Selective Catalytic Reduction) and ASC (Ammonia Slip Catalyst), in order to fulfill the Stage V emissions.

To retain the dependability and exhaust emission control originally built into all Volvo Penta engines, it is essential that the engines receive periodic maintenance according to the maintenance instructions.



P0029371

EMS (Engine Management System)

To control the engine and the exhaust aftertreatment system two control units are used. The EMS is used primarily for the diesel engine control and the ACM for the aftertreatment control. The control units are connected to all actuators and sensors and communicate internally on CAN.

The OEM control system communicates with the engine and exhaust aftertreatment control system on a CAN-link according to SAE J1939 standard with some additional Volvo Penta proprietary CAN messages.

System diagnostics

The control system includes diagnostic functionality to detect and locate any malfunctions in the control system, as well as to protect components from damage.

If a malfunction is detected, related fault codes will be transmitted on CAN to the OEM control system or Volvo Penta Controller Interface Module (CIM) if used. If there is a serious malfunction, the engine performance may be reduced or the engine is shut down completely (depending on the type of fault and application).

Two step inducement for VE: If the detected fault is emission related, there will be a two step Inducement (reduced performance) according to the StageV legislation. For genset the engine will be shut down after a certain time according to inducement settings. Fault codes can also be read by the Volvo Penta aftermarket tool VODIA for fault tracing.

EATS (Exhaust Aftertreatment System)

EATS (Exhaust Aftertreatment System) is used to reduce emissions and comply with statutory emission levels. The EATS system consist of a, DPF-system and a SCR-system. (Diesel particular filter system and a Selective catalytic Reduction system and Ammonia slip cat), AdBlue®/DEF is injected in the exhaust gases before they pass through the catalytic converter. Sensors measure nitrogen oxide (NOx) levels in the exhaust gases.

The engine control unit calculates the optimum amount of solution to be added in relation to engine load and engine speed, to achieve efficient reduction of nitrogen oxides.

NOTICE! All kind of tampering or modifications of the engine and it's EATS system will void the type-approval of this particular engine.

AdBlue®/DEF

The solution that is injected in the exhaust gases is a clear, transparent liquid with a faint odor of ammonia; it consists of de-ionized water mixed with 32.5% urea (the solution must meet ISO 22241 standards / API AUS 32). The urea in the exhaust is broken down into ammonia which reacts with NO_x to form harmless nitrogen and water vapor, which occur naturally in our surroundings.

The solution is not flammable or harmful to health with normal use; it is however very corrosive to metals, especially copper and aluminum.

IMPORTANT:

The use of solution that do not fulfill the ISO 22241 standard will compromise the aftertreatment system performance, increase emissions.
Any warranty claims will be rejected.

NOTICE! The urea solution has different names in different markets, e.g. DEF or AdBlue®. The solution is designated either AdBlue or AdBlue/DEF in display messages.

Monitoring

For VE: The system is monitored to ensure that all system components are working as they should, that the quality of the AdBlue®/DEF fulfills set standards and that the tank level is not too low. Should the system detect deviations, the maximum engine torque and engine speed will be reduced and related fault codes are communicated on CAN and stored in the control unit. For Genset the engine will be shut down. For further information refer to *EATS Inducements, VE-engines (EU)*, page 45.

Shut-down

Should any solution remain in the hoses in freezing weather, the entire system can be damaged. To avoid this and any solution spillage, the system is equipped with automatic drainage when the engine is switched off so that hoses, the pump and injector are emptied and the solution runs back to the tank.

NOTICE! The automatic drainage only works when the engine is stopped using the ignition switch or the stop button on the instrument panel (depending on application), not if only the engine power supply is disconnected. If the system is not drained properly, solution may squirt out if the hoses are disconnected.

CAUTION!

The EATS system needs time to for automatically drainage and depressurizing.

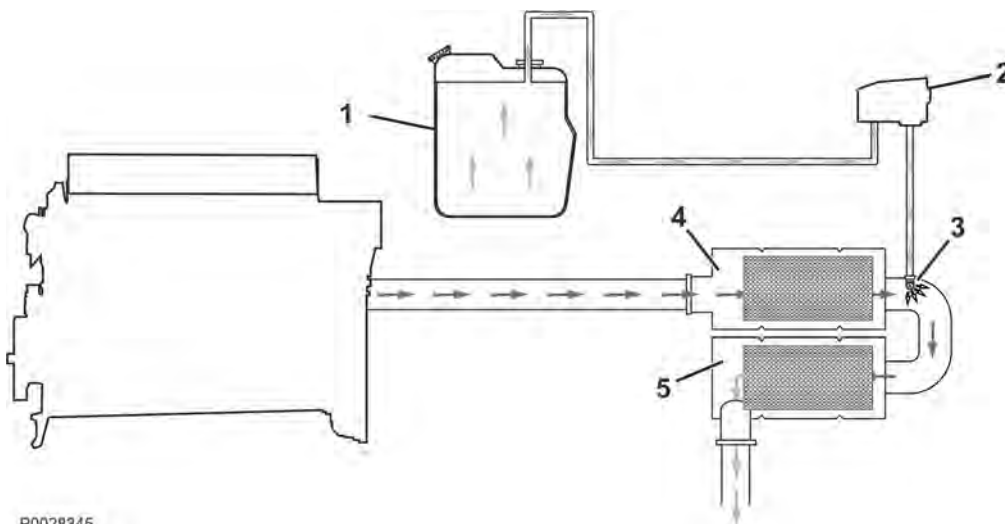
Wait at least two minutes after the engine been turned off before removing the AdBlue/DEF hoses.

Overview

The system comprises:

- 1 Tank
- 2 Pump
- 3 Injector
- 4 DPF-system
- 5 SCR-system

The atomized AdBlue®/DEF is sprayed into the exhaust gases after the DPF.



P0028345

AdBlue®/DEF Tank

IMPORTANT:

Dirt/dust, oil, greases, detergents and any chemicals and natural products must be prevented from entering the Adblue/DEF tank.

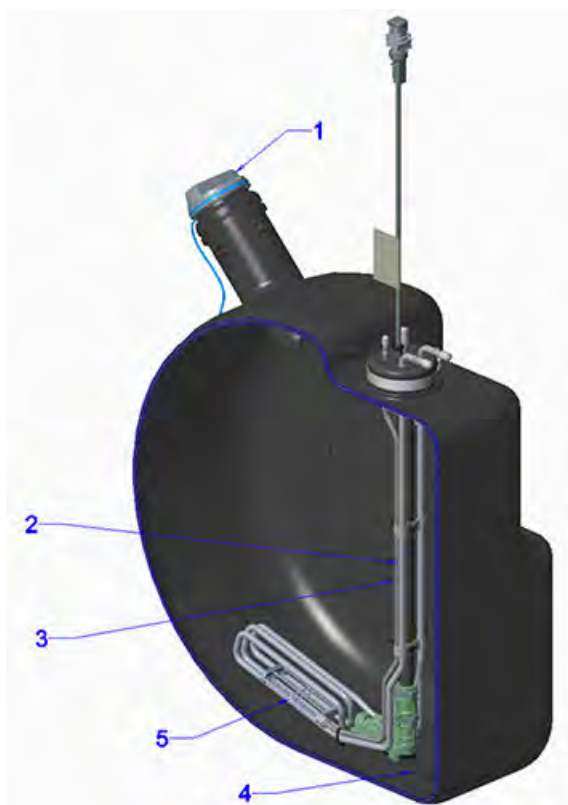
The system will be damaged if dust or dirt enters the tank clogging the filters in the dosing system. Keep the tank clean at all times.

The AdBlue®/DEF is stored in a separate, tank. The tank is available in different sizes.

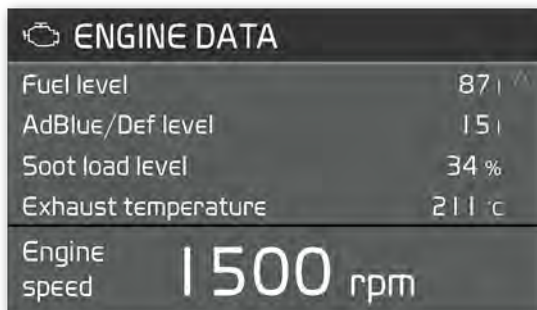
There is a fitting in the tank that comprises a heating coil (2), a float (3) and a filter (5) on the suction line to prevent any particles from circulating through the system and causing disruptions. The filter must be checked and cleaned as necessary.

There is a drain plug (4) on the bottom of the tank so that the solution can be emptied when necessary, e.g. for cleaning. The tank is fitted with a breather to equalize pressure changes.

The filler pipe (1) is equipped with a blue cap to clearly indicate that the tank contains AdBlue/DEF.



P0028517



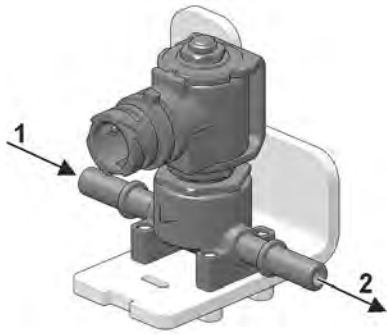
P0028067

Tank level

The solution consumption varies during operations. The level in the tank is shown on the gauge as a percentage of the total tank volume, or what the OEM choose to display.

The tank level signal is continuously read by the EMS. When the level falls below the set limit, the level sensor in the tank transmits a signal that stops AdBlue/DEF dosing. A fault code is set in the engine control unit, a warning lamp lights up and a fault message is shown on the control panel. If solution is not added, injection into the exhaust pipe will cease and engine torque and engine speed will be limited. When solution is added the fault message is canceled and the engine is able to revert to full power. For genset the engine will be shut down according to inducement settings.

Refer to *EATS Inducements, VE-engines (EU)*, page 45 for further information.



- 1. From engine
- 2. To tank

Heating

Because AdBlue®/DEF solution freezes at around – 11 °C (12.2 °F) the tank is equipped with a heating coil that uses engine coolant. A solenoid valve controls the flow of coolant. The hoses between the tank, pump and injectors are electrically heated and the hose connections are equipped with extra insulation.

There is a temperature sensor in the tank that transmits a signal to the control unit so that the pump cannot start until the AdBlue®/DEF solution is fluid. The standard system can handle thawing from –40 °C (–40 °F). The system is emptied at shut down in order to prevent expansion damage due to freezing.

IMPORTANT:

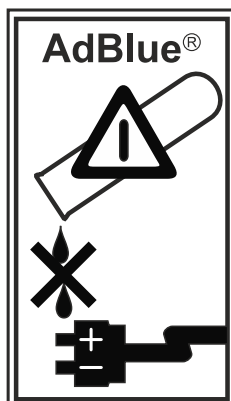
Hoses must be handled carefully and not twisted or bent excessively in order to avoid damaging the heating system.

Storage

IMPORTANT:

To prevent breakdown and evaporation during longterm storage, AdBlue®/DEF may not be stored at temperatures higher than 25 °C (77 °F) or in direct sunlight.

Remember that the solution expands upon freezing and to leave room for expansion in the tank when storing in spaces where there is a risk of freezing.



P0011697



Operation

⚠ WARNING!

In the case of any contact with eyes or skin the affected area must be thoroughly rinsed with lukewarm water. If you inhale any fumes, make sure you breathe fresh air.

⚠ CAUTION!

Risk of corrosive damage.

Contact with the fluid can cause irritation and corrosion.

Wear protective gloves!

Change gloves and clothing that have been in contact with the liquid.

⚠ CAUTION!

Risk of material damage.

AdBlue®/DEF oxidises metal and the capillary action creeps through lines at a speed of approx. 0.6 metres per hour.

If spillage occurs, electrical connectors must be replaced immediately. Do not try to clean with water or compressed air.

AdBlue®/DEF is not a combustible product. When exposed to high temperatures it will convert to ammonia and carbon dioxide. However, do not allow the solution to come into contact with other chemicals or be mixed with other chemicals.

When handling AdBlue®/DEF it is important that electrical connectors are connected or well-encapsulated. The solution is corrosive toward certain metals such as copper and aluminum. Should oxidation occur, it cannot be removed.

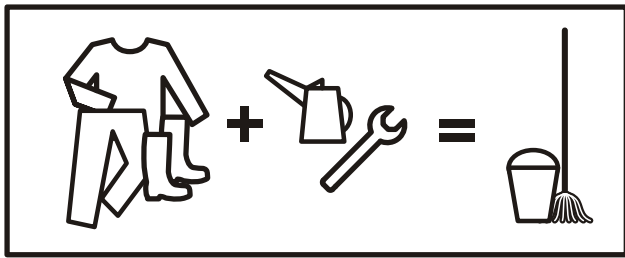
If connectors come into contact with the solution they must be replaced immediately to prevent the solution from seeping further along the copper wiring.

If the solution is spilled onto the engine, wipe it away and flush with water. White crystals of concentrated AdBlue®/DEF may form in the event of a spill; wash the crystals away using water.

IMPORTANT:

AdBlue®/DEF spillages may not be washed into drains.

If a spill should occur, the solution must be absorbed using dry sand or other non-flammable material and handled according to local and national regulations.



p0013225

Cleaning tools and clothes

⚠ CAUTION!

Gloves must be changed. Take off contaminated clothes.

⚠ CAUTION!

Tools that come into contact with the fluid must be cleaned.

It is important that tools and clothes are thoroughly cleaned from AdBlue®/DEF so that the liquid or crystals are not transferred to other parts and cause them damaged.

Contact with AdBlue®/DEF

- **skin contact** — flush with copious amounts of water and remove contaminated clothing.
- **eye contact** — flush thoroughly for several minutes; contact physician as necessary.
- **inhalation** — breathe fresh air and contact physician as necessary.

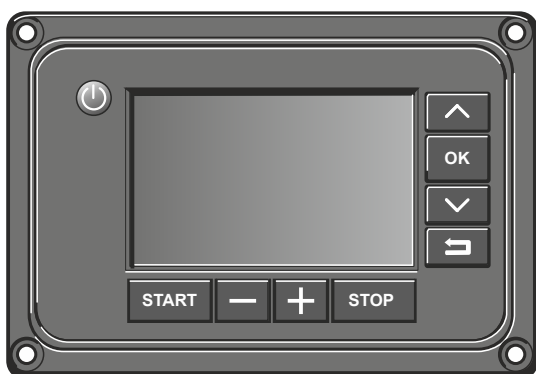
Instruments and Controls

Control Interface Module

The Volvo Penta Control Interface Module (CIM) instrument panel communicates with the engine control unit and has a number of functions as control, monitoring and diagnostics.

NOTICE! Settings and the type of engine data presented on the display may vary depending on the installation and engine model.

NOTICE! The menus and illustrations shown here are the English version. Refer to the section *Settings* to change the display language.



P0018811



Turn On/Off the ignition

START

Start the engine



Reduce engine rpm



Increase engine rpm

STOP

Stop the engine



Scroll upwards in menus

OK

Select and confirm in menus



Scroll downwards in menus



Return to previous menu selection



P0028070

Display

The basic view shows three main menus.

- **ENGINE DATA** (ENGINE DATA), shows current engine data.
- **DIAGNOSTICS** (DIAGNOSTICS), shows fault codes.
- **SETTINGS** (SETTINGS), shows display and engine settings.

Press **OK** to proceed in the submenus and scroll using the panel arrow buttons.

Press **Back** to return to previous menu.

Status bar

The status bar with symbols for active malfunctions is shown in the top right of the display.

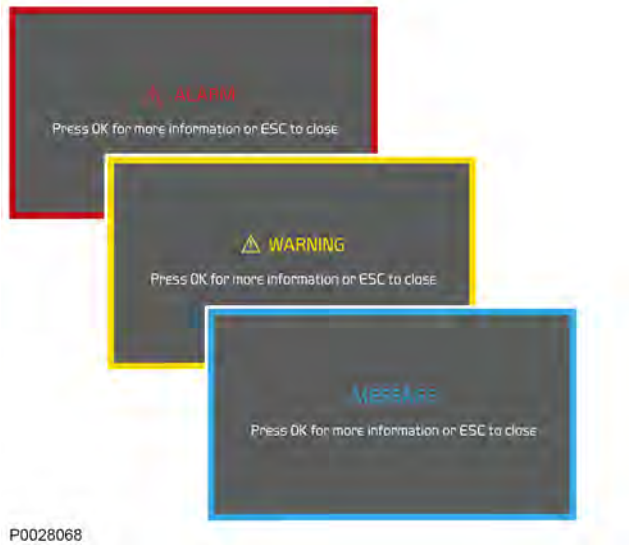
	Emission related malfunction
	EMS system malfunction

Alarms and messages

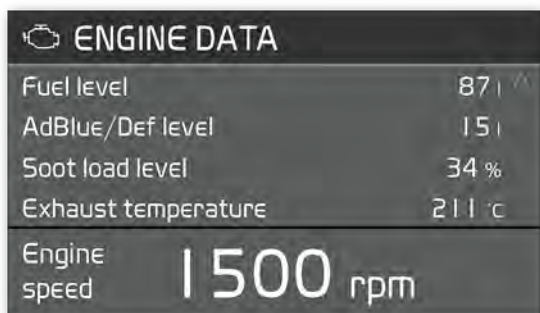
Messages to the operator are of three types, color coded according to degree of severity.

When a message is shown on the display, press **OK** to reach the diagnostic menu to get more information regarding registered faults and instructions for remedial actions.

- **ALARM** (ALARM), red text, the system has detected a serious fault — Volvo Penta recommends to immediately contact a qualified workshop .
- **WARNING** (WARNING), yellow text, the system has detected a fault — Volvo Penta recommends to contact a qualified workshop as soon as possible.
- **MESSAGE** (MESSAGE), blue text, non-critical engine message for the operator.



P0028068



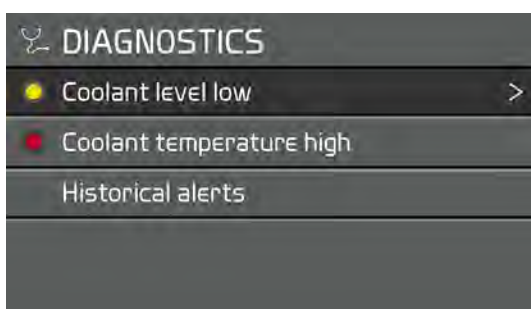
P0028067

Menus

ENGINE DATA (ENGINE DATA)

Engine data shown may vary depending on the engine installation.

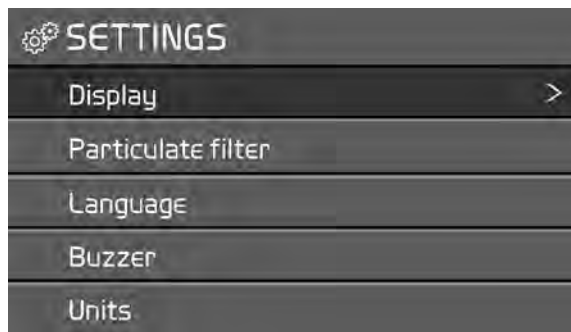
- **Engine Hours** (Engine Hour)
- **Engine Speed** (Engine Speed) (rpm)
- **Coolant Temperature** (Coolant Temperature) (°C/°F)
- **Oil Pressure** (Oil Pressure) (kPa)
- **Fuel Rate** (Fuel Rate) (l/h/gph)
Current fuel consumption.
- **Boost Temperature** (Boost Temperature) (°C/°F)
- **Boost Pressure** (Boost Pressure) (kPa)
- **Oil Temperature** (Oil Temperature) (°C/°F)
- **Battery voltage** (V)
- **Engine load** (%)
- **Fuel delivery pressure** (bar/psi)
- **Throttle/pedal percent** (%)
- **Fuel level** (l/g)
- **Def/Aus level** (l/g)
- **Soot load level** (%)
- **Exhaust temperature** (°C/°F)



P0028065

DIAGNOSTICS (DIAGNOSTICS)

If the system detects a malfunction, the operator is informed via a pop-up message on the display. The fault codes are listed in the diagnostics menu; active fault codes. For more information regarding cause and remedies, use the arrow button to scroll to the fault concerned and press **OK**. This will also provide information about number of engine hours when the fault became active and the SPN and FMI codes.



P0028270

SETTINGS (SETTINGS)

Display (Display)

- **Set backlight time** (Set backlight time). On/OFF, sets backlight to run in standby mode. *On* is the default setting.
- **Set backlight brightness** (Set backlight brightness). Adjust display backlight brightness using the panel arrow buttons.
- **Set Instrument Brightness** (Set Instrument Brightness). Sets backlighting in the display instrument.
- **Change background color** (Change background color). Select background color, gray or white.

Particulate filter, only applicable for VE

- Start regeneration, here you can manually start the regeneration when all requirements for regeneration are met.

Language (Language)

Sets the display language; chooses between English, French, German, Spanish, Italian, Brazilian-Portuguese, Russian and Chinese.

Buzzer

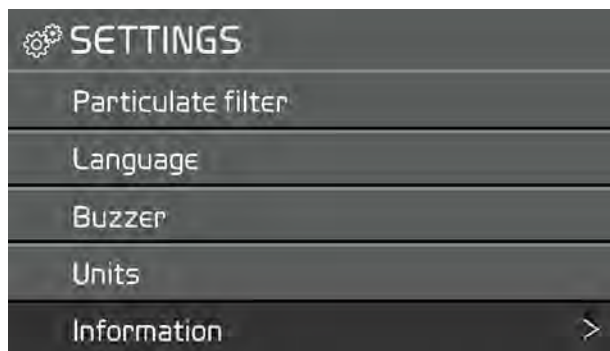
Enable/Disable (Enable/Disable)

Option to disable the built-in buzzer in the CIM.

Unit

- Metric
- imperial

NOTICE! Here you choose which devices you want to use, metric or imperial.



P0028160

Information

Reading CIM information

- **Engine Hardware ID** (Engine Hardware ID)
- **CIM hardware ID** (CIM hardware ID)
- **Engine Software ID** (Engine Software ID)
- **CIM Software ID** (CIM Software ID)
- **Chassis ID** (Chassis ID)

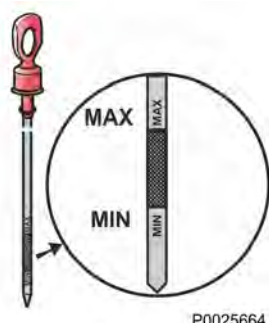
Starting

Make it a habit of giving the engine and engine room a visual check before starting. This will help you to discover quickly if anything abnormal has happened, or is about to happen.

Also check that instruments and warning displays show normal values after you have started the engine.

⚠ WARNING!

Never use start spray or similar agents to start an engine. This may cause an explosion in the inlet manifold. Risk of personal injury.



Before Starting

- Check that the oil level is between the MIN and MAX marks. Refer to *Oil level, checking and topping up*.
- Check the fuel pre-filter; refer to *Draining condensate, fuel system, page 58*.
- Check that no leakage of oil, fuel or coolant is present.
- Check the coolant level and that the radiator is not blocked externally. Refer to *Coolant Level, Checking and Topping Up, page 63* and *Charge Air Cooler, External Cleaning, page 65*.

⚠ WARNING!

Do not open the coolant filler cap when the engine is hot, except in emergencies, as this could cause serious personal injury. Steam or hot fluid could spray out.

- Turn the main switch on.

IMPORTANT:

Never break the circuit with the main switch while the engine is running.
Alternator and electronics could be damaged.

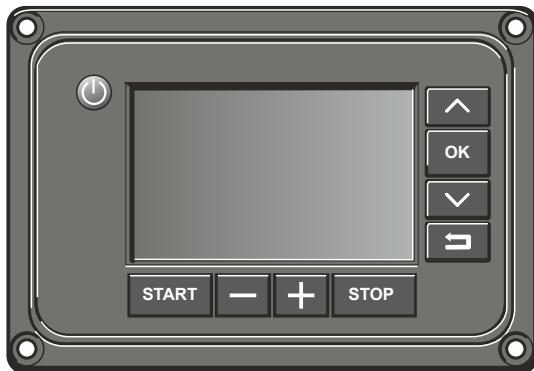
- Move the engine speed control to idle, and open the disengageable clutch/gearbox if installed.

Starting the Engine

The pre-heating time is adjusted to suit the engine temperature, and can last for up to 50 seconds both before and after starting.

The starter motor cranking time is maximized to 20 seconds. After that, the starter motor circuit is temporarily cut to protect the starter motor from overheating.

CIM (Control Interface Module)



P0018811

- 1 Press the  button to switch on the ignition. The display switches on at the same time.
- 2 If preheat is activated, wait until heating icon has disappeared until START is requested.
- 3 Press the START button to start the engine.

Starting Using Auxiliary Batteries

WARNING!

Explosion hazard. Batteries contain and give off an explosive gas which is highly flammable and explosive. A short circuit, open flame or spark could cause a violent explosion. Ventilate well.

- 1 Check that the auxiliary batteries are connected (series or parallel) so that the rated voltage corresponds to the engine system voltage.
- 2 First connect the red (+) jumper cable to the auxiliary battery, then to the flat battery. Then connect the black (-) jumper cable to the auxiliary battery and to a location that is **somewhere away from the discharged battery**, e.g. the main switch negative terminal or the negative terminal on the starter motor.
- 3 Start the engine.

WARNING!

Do not touch the connections during the start attempt: Risk of arcing.
Do not bend over any of the batteries either.

- 4 Remove the cables in the reverse order.

IMPORTANT:

The ordinary cables to the standard batteries must not under any circumstances be loosened.

Operation

Correct operating technique is very important for both fuel economy, environmental protection and engine life. Always let the engine warm up to normal operating temperature before operating at full power.

Reading the Instruments

Check all instruments directly after starting, and then regularly during operation.

NOTICE! On engines in continuous operation, it is recommended that the lubrication oil level is checked at least every 24 hours. Refer to *Oil level, checking and topping up*.

Alarms

If the EMS receives abnormal signals from the engine, the control unit generates fault codes and alarms, in the form of lamps and audible warnings. This is done by means of CAN signals to the instrument.

More information about fault codes and fault tracing can be found in the chapter *Fault handling, page 39*.

Maneuvering

Operation at low load

Avoid long-term operation at idle or at low load. It takes a long time for the engine to reach working temperature, resulting in high viscosity of the oil and large clearances in the engine mechanics. In cold climate, it takes even longer.

The combustion temperature and cylinder pressure can become so low that an effective combustion cannot be ensured. At these conditions unburned fuel could dilute the lubricant oil. Because of the low cylinder pressure, the piston ring performance could be affected causing oil from the crankcase to pass the rings and go further out with the exhaust gases. This mixture of unburned fuel and oil in exhaust gases is referred to as "slobber". A new engine produces more "slobber" at low load compared to an engine with more hours of operation.

At low load, the pressure in the turbocharger is low and oil could seep past the turbocharger seals and mix with the air into the engine. The consequences can be carbon build-up on valves, piston crowns and the exhaust turbine, which could affect engine performance.

Both conditions can lead to increased oil consumption and eventually external oil leakage from joints in the

exhaust system. For example, leakage could be seen at the exhaust manifold, before and after the turbo, around the muffler and in worse case even in the exhaust end pipe. Consequences could lead to clogged exhaust gas recirculation systems and exhaust aftertreatment systems.

Signs of oil leaking caused by "slobber" do not indicate an engine problem but indicates low load operation. To minimize the risk of malfunctions caused by operation at low load, follow these points as a complement to normal maintenance:

- Run in the engine as soon as possible.
- Load the engine so it reaches working temperature as soon as possible.
- For VE: Turn off the engine instead of running on idle for longer periods.
- For genset turn off the engine instead of running unloaded for longer periods.
- Avoid load levels below 20% as constant operation.
- If the engine is regularly tested without load, limit the duration of the operation to 5 minutes. Run the engine at full load for about 4 hours once a year, for the carbon deposits in the engine and exhaust system to burn off.
- If visible slobber has occurred, it can be burned off by running the engine on at least 30% load for about 40-60 minutes.

Engine Shutdown

During longer breaks in operation, the engine must be warmed up at least once every two weeks. This prevents corrosion in the engine. If you expect the engine to remain unused for two months or more, it must be preserved: Refer to the chapter *Storage*, page 73.

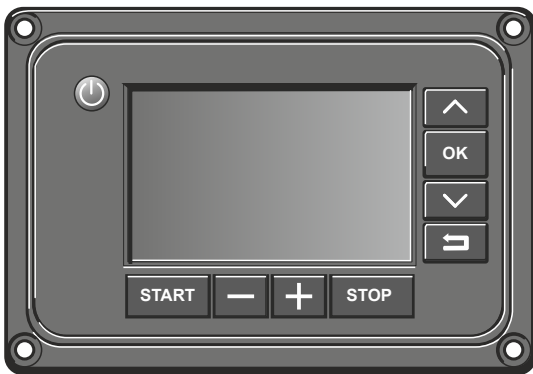
Before Engine Shutdown

Let the engine run at high idle (1500 or 1800rpm) for a minimum of 5 minutes before the shutdown after normal use. Normal use is defined as minimum 50% load. After use with less than 50% load, high idle for approximately 3 minutes is sufficient. This allows engine temperature equalization and prevents boiling once stopped and also allows the turbochargers to cool down. This contributes to long, fault-free service life.

NOTICE! Do not turn off the main switch within 2 minutes after turning off the ignition. This is in order to save engine data to the engine control unit.

Stop the Engine

- 1 Disengage the clutch, if possible.
- 2 Press the STOP button to turn off the engine.
- 3 Press the  button to turn off the ignition.



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P0025697

Auxiliary Stop

For location of the extra stop, refer to *Maintenance*, page 50.

WARNING!

Working with or approaching a running engine is a safety risk. Watch out for rotating components and hot surfaces.

After Engine Shutdown

- 1 Check the engine and engine compartment for leaks.
- 2 Turn off the main switches before any long stoppage.
- 3 Carry out maintenance in accordance with the schedule.

For longer breaks in operation

During longer breaks in operation, it is recommended that the engine is warmed up at least once every two weeks. This prevents corrosion in the engine.

If you expect the engine to be unused for two months or more, it should be conserved. Refer to *Storage, page 73*.

IMPORTANT:

If there is a risk of freezing, the coolant in the cooling system must have adequate antifreeze protection.

Refer to *Maintenance, page 62*.

IMPORTANT:

A poorly charged battery can freeze and burst.

Refer to *Battery, page 71*.

Fault handling

Despite regular service in accordance with the planned maintenance schedule and perfect operating conditions, faults may occur that must be remedied before operations continue. This chapter describes the diagnostics function.

Diagnostic Function

The purpose of the diagnostic function is to monitor, control and protect the engine and its surrounding system and components from damage, as well as to ensure a minimal environmental impact.

If a malfunction is detected the diagnostic function informs of the occurred fault in the form of a fault code. The fault code provides guidance when fault tracing. All fault codes and fault messages can be found in the *Fault Code Register*.

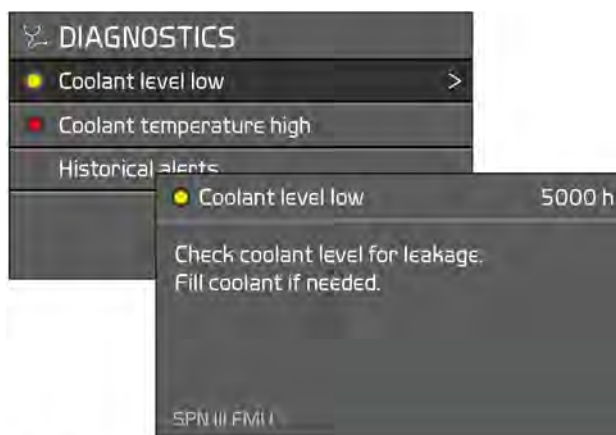
The operator is warned that there is a malfunction via the instruments. Depending on the instrumentation in use, the fault message is shown in various ways.

Depending on the severity of the fault, the diagnostic function will take various actions to protect the engine and limit emissions (e.g. torque derate, idle speed only, engine shut down etc.)

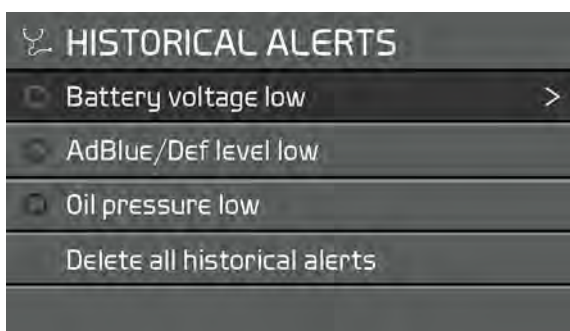
CIM (Control Interface Module)

DIAGNOSTICS

If the system detects a malfunction the driver/operator is informed via a pop-up message on the display. The fault codes are listed in the diagnostics menu; active fault codes. For more detailed information regarding the cause and remedies, use the arrow buttons to scroll to the fault concerned and press **OK**. This will also provide information about the number of engine hours when the fault became active and the SPN and FMI codes.



P0028529



P0028162

Historical Alerts

When fault codes are no longer active, they end up under "Historical Alerts". There you can delete an error code at a time or delete all at once.

Erasing fault codes

The memory of the diagnostic function is reset when the power to the engine is disconnected. When the power is switched on again, the diagnostic function will check if there are any malfunctions in the system. If so a new fault codes is registered.

If a malfunction has not been corrected it will be registered once again and has to be acknowledged again.

EATS Warnings and Inducements

EATS system monitoring checks the quality of the AdBlue®/DEF, the level in the tank and the correct function of the system components. If a fault is detected, the operator is warned via the instrument panel and the engine speed and torque is limited. To enable fault tracing and the remedy of any faults, the engine can be re-started according to a start schedule; refer to *EATS Inducements, VE-engines (EU)*, page 45.

NOTICE! Warning messages and symbols may vary depending on the installation; shown here are those seen on panels sold by Volvo Penta.

Important! Take prompt action in case of error code indication



NCD symbol

Warning Symbols

NCD - NOx Control Diagnostics

The NCD symbol will be shown if the reagent level is below 15%, the quality of the reagent is bad or if the dosing activity is un-normal. If no action has been taken to resolve the EATS malfunctions or refill the tank within certain time, the engine will be derated (applicable for VE engines). For genset the engine will be shut down according to inducement settings.

VE engines: The operator has the possibility to override the derate if the power reduction makes the application stuck in an unsuitable situation. An urgent repair or maintenance of the EATS system has to be performed when the combination of NCD symbol and yellow/red warning indicator are lit/flashing.

Light inducement



- The warning symbol shines with a solid **yellow light**.
- The NCD symbol shines with a solid light.

Severe inducement



- The warning symbol shines with a solid **red light**.
- The NCD symbol flashes.



PCD symbol

PCD - Particle Control Diagnostics

The control system detects the need of regeneration due to high EATS load level (high soot level in filter, high sulfur load or HC-formation). Beside this the system also notices if the DPF system has been removed from the engine or if there is a malfunction on the sensors.

VE engines: A parked regeneration is needed to reduce the EATS load level the PCD symbol starts to flash in yellow. If no action is taken the engine will go into derate and finally a filter replacement is required to get back to normal operation.

Genset engines: If the PCD symbol is flashing, contact a qualified workshop.

Light inducement	
 	- The warning symbol shines with a solid yellow light. - The PCD symbol shines with a solid light.
Severe induement	
 	- The warning symbol shines with a solid red light. - The PCD symbol flashes.



P0031752

Regeneration

Only applicable for VE engines

If the control system detects high EATS loads (high soot level in filter, high sulfur load or HC-formation) the engine is in need of regeneration. When requested, a parked regeneration should be performed as soon as possible. The regeneration will last for approximately 60 minutes and it should not be aborted.

Regeneration needed	
 	- The warning symbol shines with a solid yellow light. - The PCD symbol flashes.

CAUTION!

During regeneration the exhaust gases gets hot. Make sure the vehicle is parked in a safe environment before regeneration is started.

NOTICE! Repeated regeneration interruptions will force the system in derate and Volvo Penta diagnostic tool is required to perform a service regeneration.

Engine derate information

If the soot load reaches >80%, full derate will be applied. Full derate keeps engine speed below 1500 rpm and torque reduction.

If exhaust temperature gets above 440 °C for more than 300 seconds, EATS fully loaded with sulfur combined with continues high-power outtake can lead to maximum 28% derate. Such an event will be followed by a fault code and request parked sulfur regeneration.

Regeneration calibration settings

- Target temp (VE), for soot/deposit regen is 470–490 °C and takes 40–60 min.
For genset: Soot 60 min temperature elevated.
- Target temp for HC regen is 350–400 °C and takes about 17 min.
- Target temp (VE), sulfur parked regeneration is ~530 °C inside EATS and takes 90 min.

NOTICE! The Emission control using SCR-catalyst may sometime cause some deposits inside the Exhaust After Treatment System. A thin layer of deposits (few mm's) is acceptable and should be expected - this requires no action. Occurrence of deposits may vary over time. Continuous operation at low load and low temperature increases the risk of accumulating deposits of crystallized AdBlue/DEF. If the engine is running very cold at low power for a long period, the crystals will not burn off naturally.

To avoid crystallization, operate the engine on higher load and temperature during extended periods of the driving cycles. If the driving cycles are alternated between cold and hot temperature, the crystals will be burnt off and removed due to the high exhaust temperatures.

To manage the EATS at sufficient temperature, avoid long periods of idling; it may also be necessary to use engine stop/start functionality, viscous clutch fan and do a careful insulation of pipes and muffler.

If deposits are present even though the engine is run at varying load and are larger in volume than a chicken's egg, it is suggested to monitor the deposit size over time to ensure that there is not growth of the deposit. It is suggested taking photos including a reference object like a pen or a matchbox to be able to relate size when comparing photos over time.

Presence of deposits **outside** the exhaust lines is a sign of a bad sealing in exhaust line joints. Deposits can be removed by cleaning with water and a soft brush. Joint alignments should be checked and gaskets replaced before reassembly.

For cases with deposits larger in size – contact your local Volvo Penta representative to discuss the issue.

Quality shortcomings and component defects

If the system signals a quality shortcoming or component defect, check the following:

- that the QLT (Quality-Level-Temperaturesensor) in the AdBlue®/DEF tank is connected.
- that system hoses and the injection valve are not clogged or disconnected.
- that the injection valve is connected.
- that the AdBlue®/DEF pump is connected.
- that the SCR system electrical cables are connected.
- that the NO_x sensors are connected.
- that the exhaust temperature sensor is connected.
- that the temperature sensors for the AdBlue®/DEF is connected.
- that there are no leaks in the exhaust system where substantial amount of solution can escape.
- that the EGR valve is not stuck.

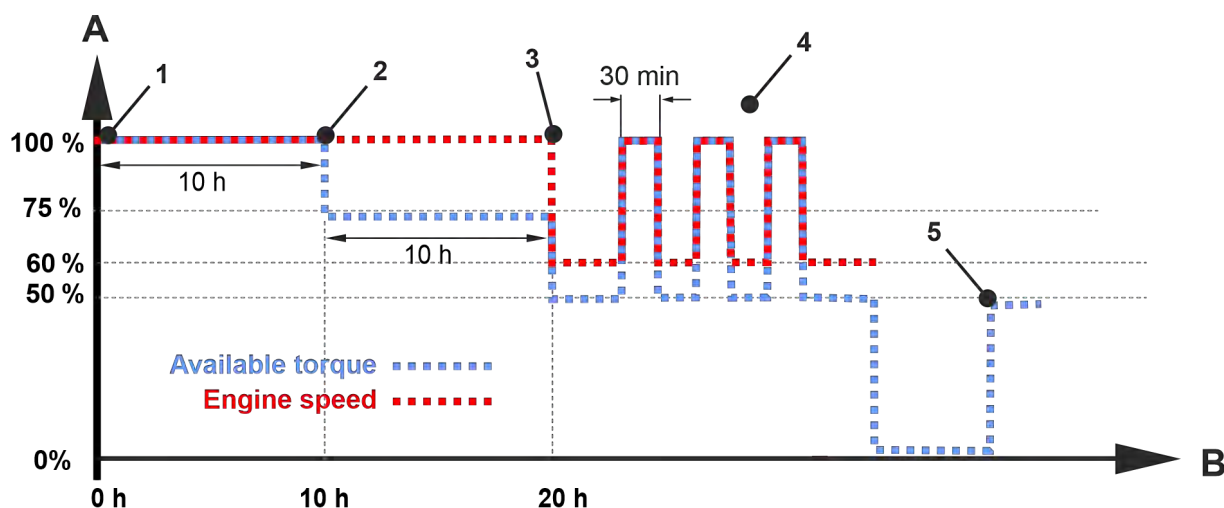
If the fault can not be remedied with any of the above, refer to *EATS Inducements, VE-engines (EU)*, page 45.

EATS Inducements, VE-engines (EU)

AdBlue/DEF tank level

- 1 When the level in the tank falls to 15%, a yellow warning indicator is lit in combination with a solid NCD symbol.
- 2 When the tank level reaches 6%, the warning indicator turns red and the NCD symbol starts to flash. The engine goes into light inducement, 75% of available torque.
- 3 If the tank is not filled up, the engine goes into severe inducement 7 minutes after the tank level has reached 6%. At severe inducement the engine drops to 50% of available torque level and is restricted to 60% engine speed.
- 4 If the engine is restarted when the tank level is below 6%, the engine will run for 30 minutes and then again go into severe inducement. It is possible to restart the engine three times, thereafter the engine will remain in idle speed.
- 5 To revert the engine to full power, the tank level must be above 12%. To exit the inducement, the tank level must be above 21%.

AdBlue/DEF, dosing and quality

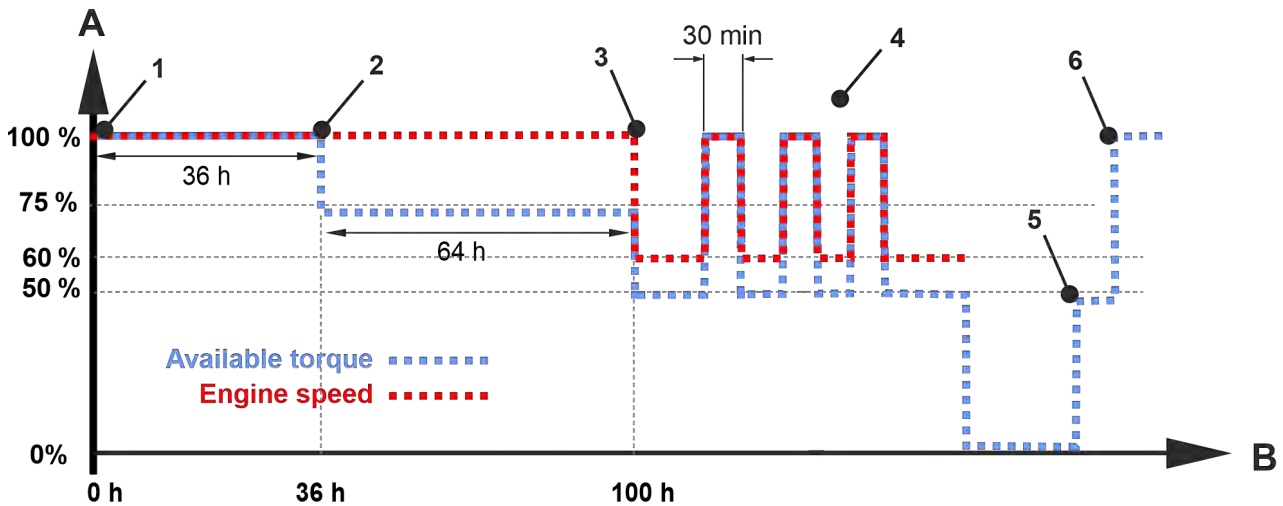


P0029877

- A Engine rpm and torque
B Time axis

- 1 When a fault is detected a yellow warning indicator is lit in combination with a solid NCD symbol.
- 2 If the fault is not resolved within 10 hours the engine goes into light inducement, 75% of available torque. 7 minutes before going into inducement the warning indicator turns red and the NCD symbol starts to flash.
- 3 If the fault is still not resolved within the next 10 hours the engine goes into severe inducement. At severe inducement the engine drops to 50% of available torque level and is restricted to 60% engine speed. Service tools is required to reset the system.
- 4 During severe inducement it is possible to manually override the system actions and run the engine at full power for 3 x 30 minutes. After 30 minutes the engine again goes into severe inducement. Each 30-minute period requires a manual activation.
- 5 If an additional fault recurs within 40 hours after the first fault was remedied, severe inducement is activated after 2 hours.
- 6 If a fault recurs within 40 hours, default timers applies.

Component fault



P0029876

A Engine rpm and torque

B Time axis

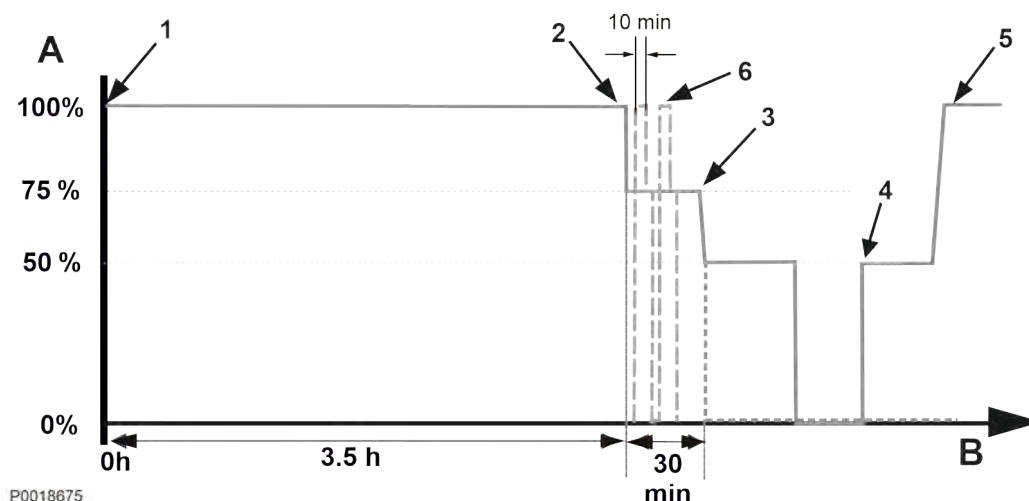
- 1 When a fault is detected a yellow warning indicator is lit in combination with a solid NCD symbol.
- 2 If the fault is not remedied within 36 hours the warning indicator turns red and the NCD symbol starts to flash. The engine goes into light inducement, 75% of available torque.
- 3 After a further 64 hours the engine goes into severe inducement. At severe inducement the engine drops to 50% of available torque level and is restricted to 60% engine speed.
- 4 During severe inducement it is possible to manually override the system actions and run the engine at full power for 3 x 30 minutes. After 30 minutes the engine again goes into severe inducement. Each 30-minute period requires a manual activation.
- 5 Upon re-start the engine will run in severe inducement mode.
- 6 When the fault is remedied the engine will revert to full power.
- 7 If a fault recurs within 40 hours, available running time will be reduced to 300 minutes from the moment the fault is detected.

EATS Inducements, VE-engines (combined EU/US)

AdBlue/DEF tank level

- 1 When the level in the tank falls to 15%, a yellow warning indicator is lit in combination with a solid NCD symbol.
- 2 When the tank level reaches 6%, the warning indicator turns red and the NCD symbol starts to flash. The engine goes into light inducement, 75% of available torque.
- 3 If the tank is not filled up, the engine goes into severe inducement 7 minutes after the tank level has reached 6%. At severe inducement the engine drops to 50% of available torque level and is restricted to idle.
- 4 If the engine is started when the tank level falls below 6%, the engine will only run at idle.
- 5 To revert the engine to full power, the tank level must be above 12%. To exit the inducement, the tank level must be above 21%.

AdBlue/DEF high temperature, quality and component faults



A Engine rpm and torque

B Time axis

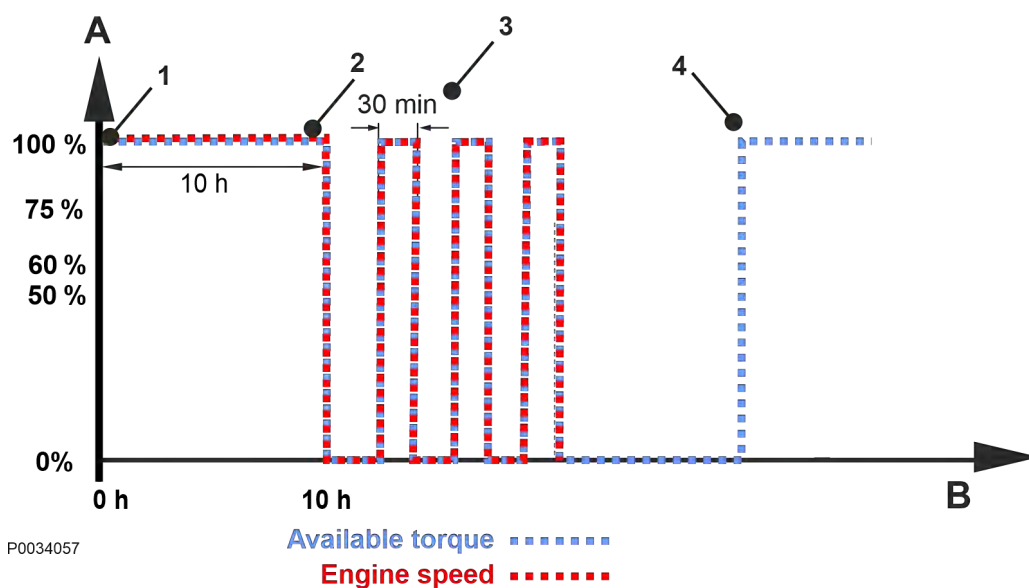
- 1 When a fault is detected, a yellow warning indicator is lit in combination with a solid NCD symbol.
- 2 If the fault is not resolved within 3.5 hours the engine goes into light inducement, 75% of available torque. The warning indicator turns red and the NCD symbol starts to flash.
- 3 After 30 minutes, the engine will drop to idle with a 50% torque reduction. The warning indicator turns red and the NCD symbol is flashing.
- 4 Following restart, the engine will run at idle with a 50% torque reduction.
- 5 When component faults are remedied, the engine will revert to full power.
- 6 During severe inducement, it is possible to manually override the system actions and run the engine at full power for 2 x 10 minutes. After 10 minutes the engine drops to 75% power. Each 10-minute period requires a manual activation.
- 7 If an additional fault recurs within 40 hours after the first fault was remedied, severe inducement will be activated 30 minutes from the moment the fault is detected.

EATS Inducements, GE-engines

AdBlue/DEF tank level

- 1 When the level in the tank falls to 15%, a yellow warning indicator is lit in combination with a solid NCD symbol.
- 2 When the tank level reaches 6%, the warning indicator turns red and the NCD symbol starts to flash. After 7 minutes the engine is stopped.
- 3 If the engine is started when the tank level falls below 6%, the engine will only run at idle speed.
- 4 To revert the engine to full power, the tank level must be above 12%. To exit the inducement, the tank level must be above 21%.

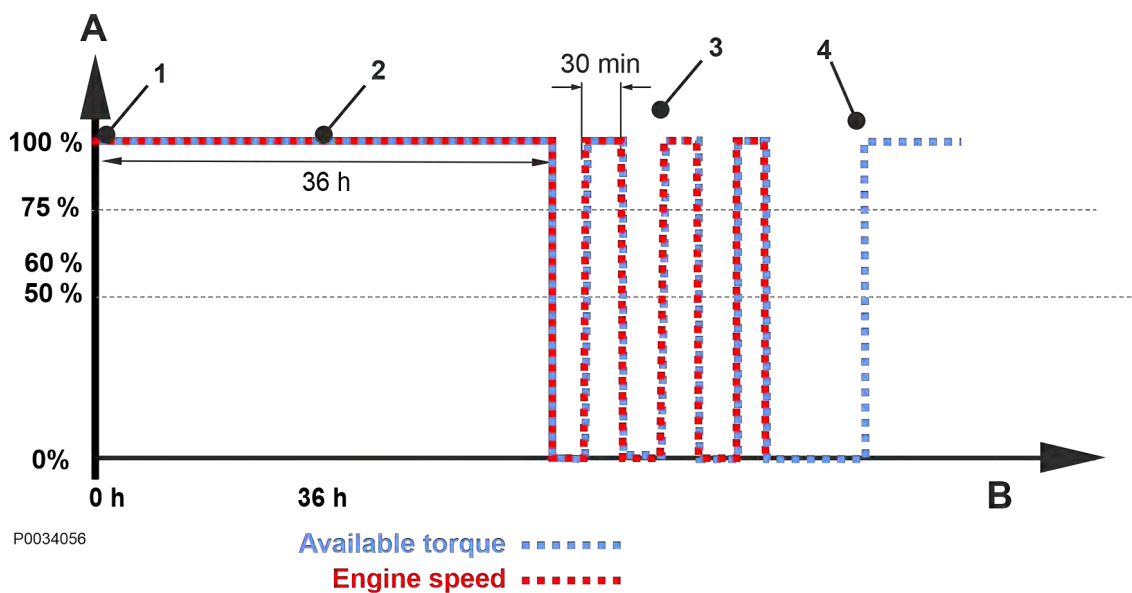
AdBlue/DEF, dosing and quality



- A Engine rpm and torque
B Time axis

- 1 When a fault is detected, a yellow warning indicator is lit in combination with a solid NCD symbol.
- 2 If the fault is not resolved within 10 hours the warning indicator turns red and the NCD symbol starts to flash. After 7 minutes the engine will be stopped.
- 3 If the engine has stopped it is possible to manually override the system actions and run the engine at full power for 3 x 30 minutes. After 30 minutes the engine shuts down again. Each 30-minute period requires a manual activation.
- 4 When the faults are remedied the engine will revert to full power.

Component fault



P0034056

- A Engine rpm and torque
B Time axis

- 1 When a fault is detected, a yellow warning indicator is lit in combination with a solid NCD symbol.
- 2 If the fault is not resolved within 36 hours the warning indicator turns red and the NCD symbol starts to flash. After 7 minutes the engine will be stopped.
- 3 If the engine has stopped it is possible to manually override the system actions and run the engine at full power for 3 x 30 minutes. After 30 minutes the engine shuts down again. Each 30-minute period requires a manual activation.
- 4 When the faults are remedied the engine will revert to full power.

Maintenance

This chapter describes the most common maintenance items. Refer to *Maintenance Schedule* for service intervals. When ordering service or spare parts, always specify the engine and transmission identification number. Refer to *Technical Data*, page 82.

NOTICE! More information on how to perform service and maintenance can be found in the Service and Maintenance handbook. Information on how to purchase the Service and Maintenance handbook can be found at www.volvopenta.com.

⚠ CAUTION!

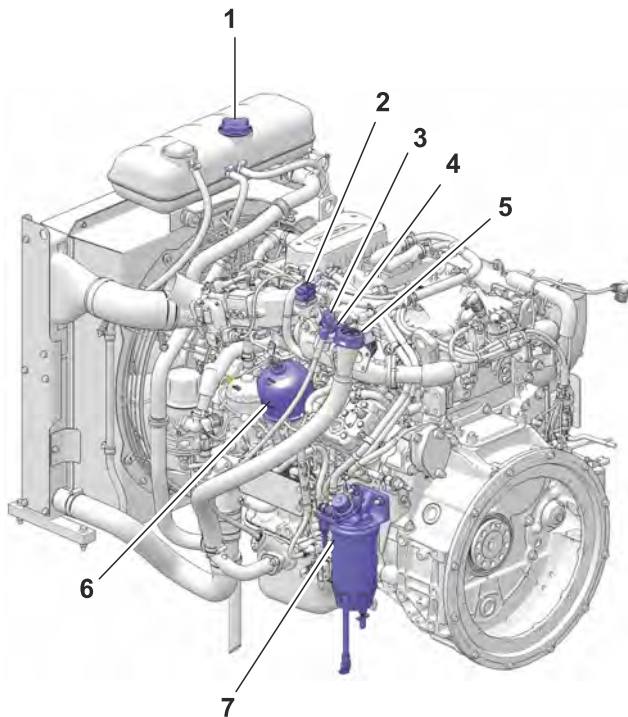
Read through the safety advice before starting any work.

⚠ WARNING!

Care and maintenance work should be done with the engine stopped unless otherwise specified. Stop the engine before opening or removing the engine hatch/hood. Make it impossible to start the engine by removing the start key and cutting the system voltage with the main switches.

Orientation

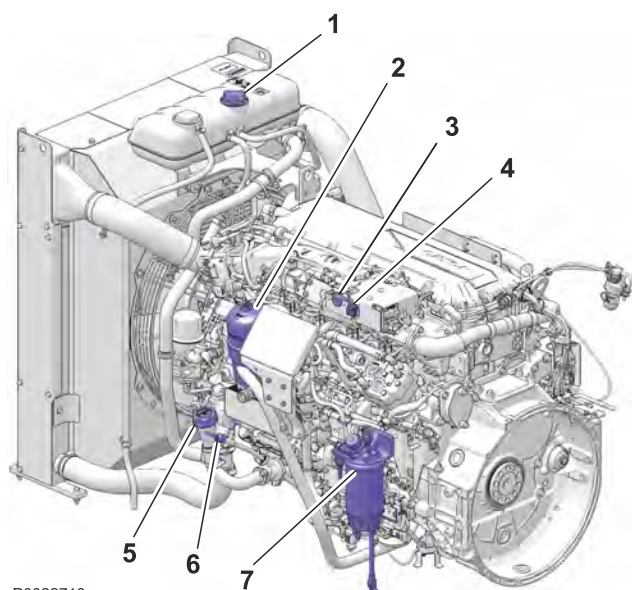
TAD580VE, TAD581VE, TAD582VE, TAD583VE



P0022704

- 1 Coolant filler cap
- 2 Fuse
- 3 Oil dipstick
- 4 Auxiliary stop
- 5 Oil filler cap
- 6 Oil filter
- 7 Fuel pre-filter

TAD880GE, TAD881GE, TAD881VE, TAD882GE,
TAD882VE, TAD883VE, TAD884VE



P0022713

- 1 Coolant filler cap
- 2 Oil filter
- 3 Auxiliary stop
- 4 Fuses
- 5 Oil filler cap, engine
- 6 Oil dipstick
- 7 Fuel pre-filter

Engine, General

General inspection

Make it a habit to give the engine and engine compartment a visual inspection before starting the engine and after operation once the engine has stopped. This will help you to discover quickly if anything abnormal has happened, or is about to happen.

Look especially carefully at oil, fuel and coolant leakage, loose bolts, worn or poorly tensioned drive belts, loose connections, damaged hoses and electrical cables. This inspection only takes a few minutes and can prevent serious malfunctions and expensive repairs.

⚠ WARNING!

Risk of fire.

Remove all accumulations of fuel, oil and grease when detected on the engine or in the engine room.

⚠ WARNING!

If an oil, fuel or coolant leak is detected, the cause must be investigated and the fault rectified before the engine is started.

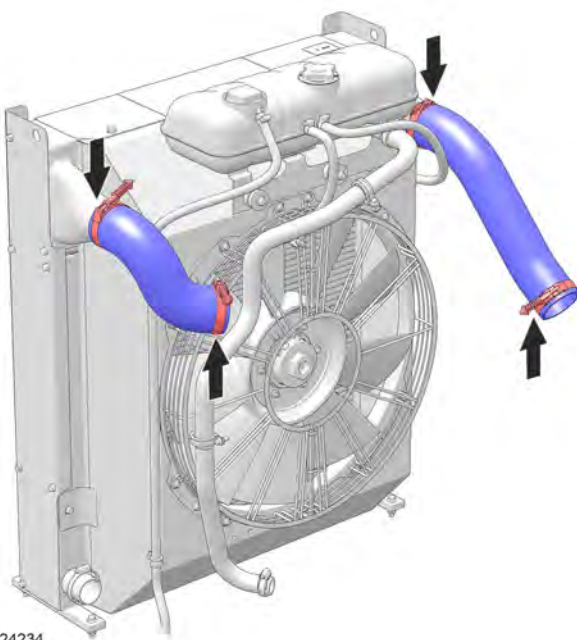
IMPORTANT:

Washing with a power washer: Never aim the water jet at radiators, charge air cooler, seals, rubber hoses or electrical components.

Charge Air Pipe, Leakage Check

Inspect the condition of the charge air hoses, hose unions and clamps for cracks and other damage. Change as necessary.

Check for leaks in the exhaust system. Leaks between the turbo and the muffler represent a risk for leakage of AdBlue/DEF.



P0024234

Drive Belt, Check and Replace

CAUTION!

Pinch hazard. Keep fingers clear.

IMPORTANT:

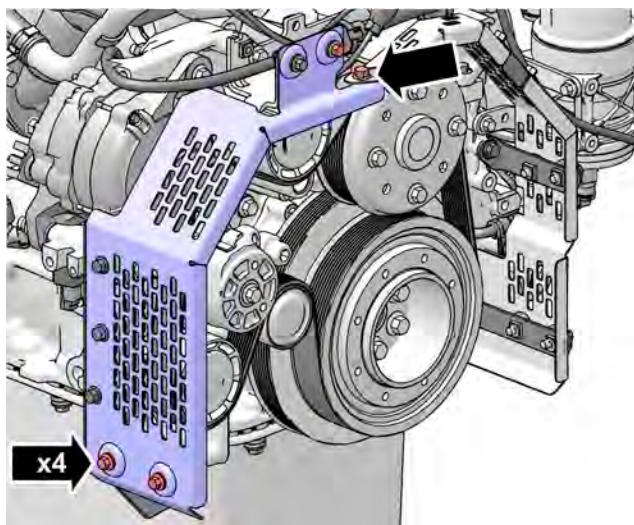
Always change a belt that is oily, worn or damaged.

Check

Check the drive belt after operation, when the belt is hot. It should be possible to depress the drive belt about 3-4 mm (0.12–0.16") between the pulleys. The drive belt has an automatic belt tensioner and therefore does **not** need to be adjusted.

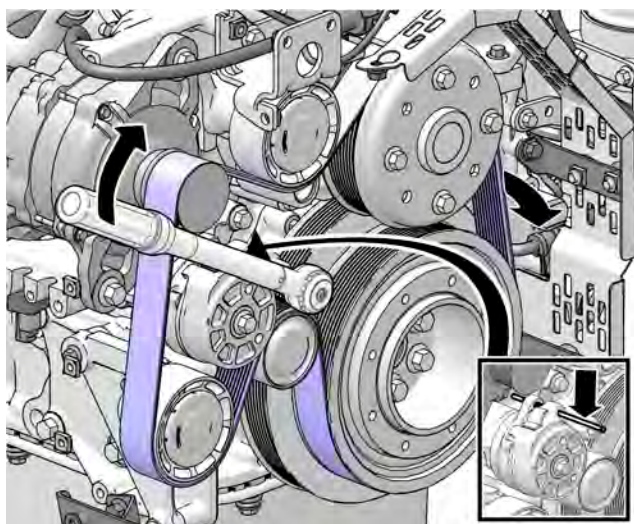
Replacement

- 1 Remove the right belt guard.

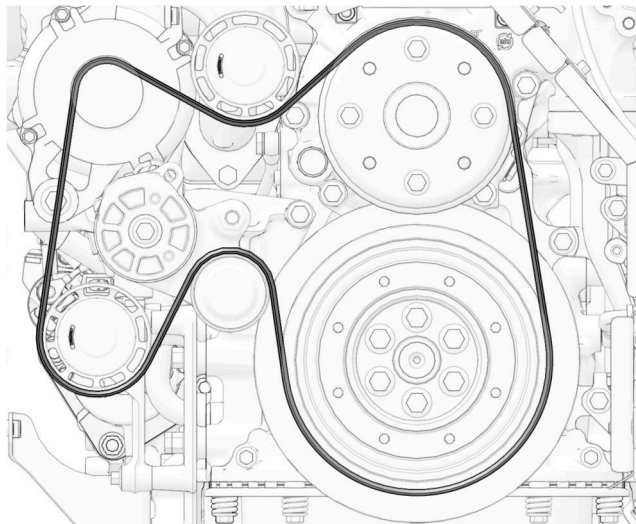


P0019257

- 2 Undo the belt tensioner and restrain it with a mandrel.
Remove the old drive belt.



P0019255



P0019256

- 3 Fit the new drive belt.
- 4 Remove the mandrel restraining the belt tensioner.
- 5 Re-install the belt guards.
- 6 Check that the belts are correctly aligned in their grooves and are correctly tensioned. It should be possible to depress the drive belt about 3-4 mm (0.12–0.16") between the pulleys.



P0002089

Lubrication System

Refer to *Oil recommendations*, page 77.

NOTICE! Oil change intervals must never exceed a period of 12 months.

Volvo Penta only recommends the use of genuine Volvo Penta oils with the correct VDS (Volvo Drain Specification) standards.

Genuine Volvo Penta oils are extensively tested and quality assured by Volvo Penta to optimize performance, reduce fuel consumption and maximize the life of the engine.

Oil level, checking and topping up

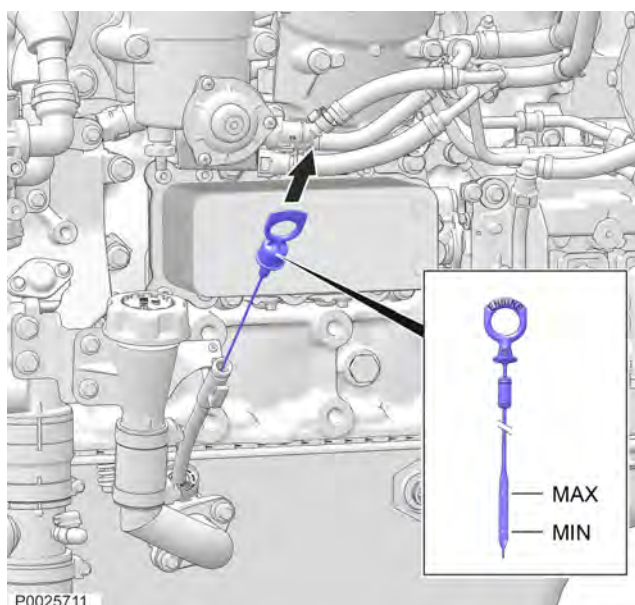
⚠ WARNING!

Working with or approaching a running engine is a safety risk. Watch out for rotating components and hot surfaces.

- When checking the oil level the vehicle should stand on level ground.
- The oil level is to be checked when the engine is stopped. Wait a few minutes before reading off the level, so that the oil has time to run down into the oil sump.
- Only use a recommended quality and viscosity of oil; refer to *Oil recommendations*, page 77.
- Make sure that the oil level is between the MIN and MAX marks. Do **not** fill above the maximum oil level.

Digital Oil Level Display (Optional)

Depending on installation and application, some variants are equipped with digital oil level display, this function never replaces the engine oil dipstick.



P0025711

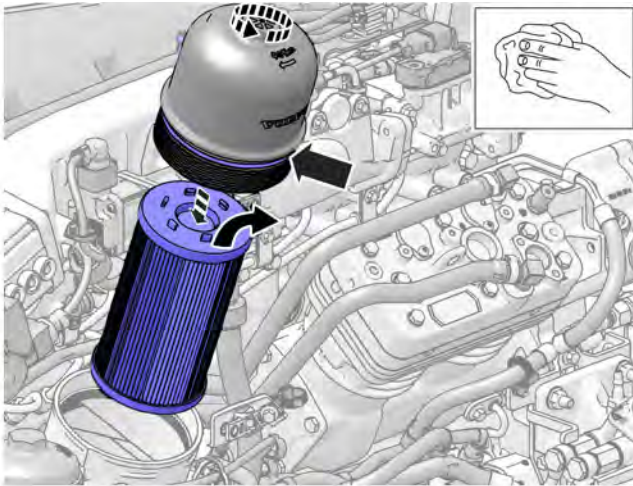
Oil Filter, Replace

⚠ WARNING!

Hot oil and hot surfaces can cause burns.

NOTICE!

Always follow the recommended oil change intervals.
Always replace the oil filter at the same time as the oil change.



Removal

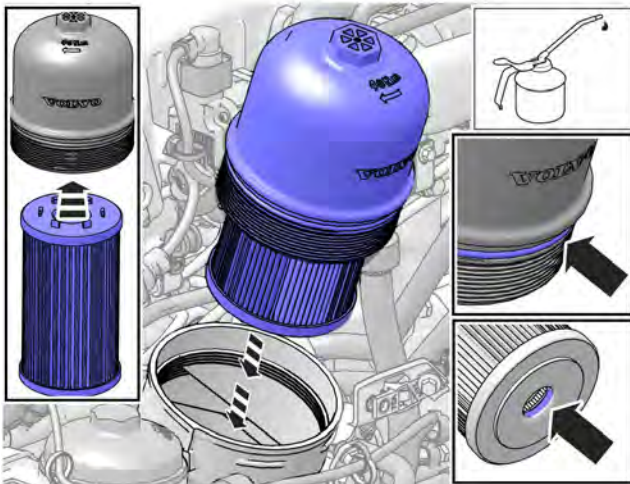
- 1 Drain the oil according to the instructions in *Engine Oil, Replace*, page 57.

NOTICE! Place a collection vessel underneath the filter to avoid oil spillage.

- 2 Clean around the oil filter.
- 3 Carefully remove the filter cover together with the filter
- 4 Remove the O-ring and filter from the cover.
- 5 Let the oil drip off into a collection vessel.

Installation

- 1 Lubricate the new O-ring and the gasket of the new filter before installation.
- 2 Install the new filter and new O-ring in the filter cover. Make sure the filter is correct installed in the cover.
- 3 Install the filter cover and filter in the bracket. Tighten the cover to: 40 Nm (29.5 lbf.ft.)
- 4 Fill with required volume of oil; refer to *Engine Oil, Replace*, page 57.
- 5 Start the engine and check that there is no oil leakage from the oil filter or drain nipple.
- 6 Switch the engine off and check the oil level after a few minutes. Top up with oil as necessary.



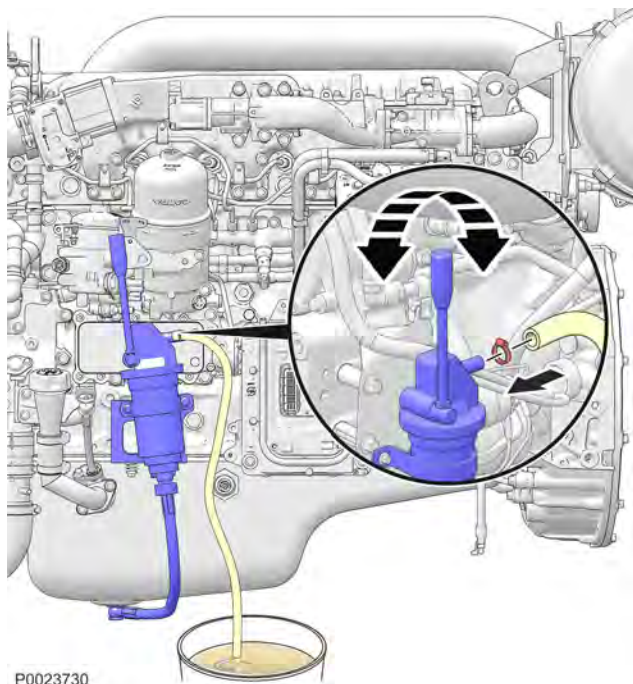
P0025714

Engine Oil, Replace

⚠ WARNING!

Hot oil and hot surfaces can cause burns.

NOTICE! Always follow the recommended oil change interval and always change the oil filter in connection with oil changes.



- 1 Run the engine until warm.
- 2 Remove the drain plug. Drain the oil.

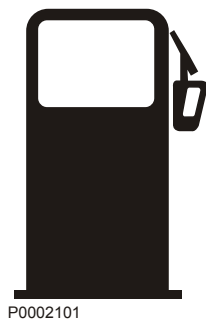
NOTICE! Collect the old oil and old filters and hand them to a re-cycling station.

- 3 Install the drain plug with a new gasket.
- 4 Change the oil filter, refer to *Oil Filter, Replace, page 56*.
- 5 Fill oil to the correct level, refer to *Oil level, checking and topping up, page 55*.

IMPORTANT:

Do not fill above the MAX level.

- 6 Start the engine and let it idle. Check that the oil pressure is normal.
- 7 Stop the engine. Check that there is no oil leakage around the filters. Check the oil level and top up with oil as necessary. Refer to *Oil level, checking and topping up, page 55*.



P0002101

Fuel System

⚠ WARNING!

Fire hazard. When carrying out work on the fuel system make sure the engine is cold. A fuel spill onto a hot surface or an electrical component can cause a fire. Store fuel soaked rags so that they cannot cause fire.

IMPORTANT:

Always observe the greatest cleanliness during refueling and work on the fuel system.

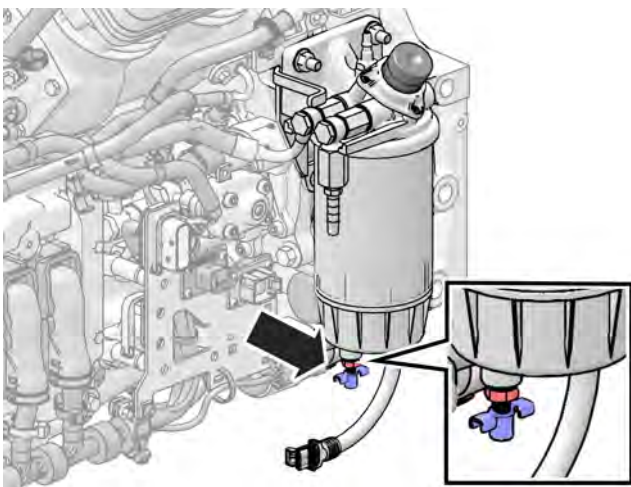
Only use the grades of fuel recommended in the fuel specification.

Draining condensate, fuel system

- 1 Stop the engine and close the fuel tap.
- 2 Put a collection vessel under the fuel pre-filter to collect the condensate and fuel.
- 3 Open the drain nipple at the bottom of the water separator.
- 4 Drain the water contained in the water separator into the collection vessel.

NOTICE! Do not drain the water separator completely.

- 5 Tighten the drain nipple and open the fuel tap.
- 6 Start the engine and check there is no fuel leakage from water separator.



Fuel Filter, Replace

IMPORTANT:

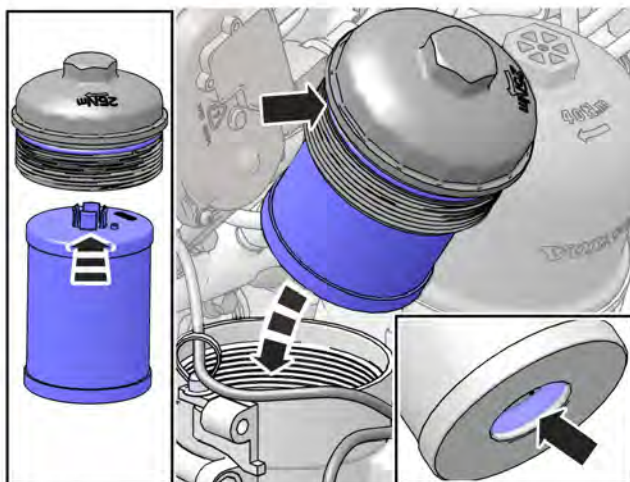
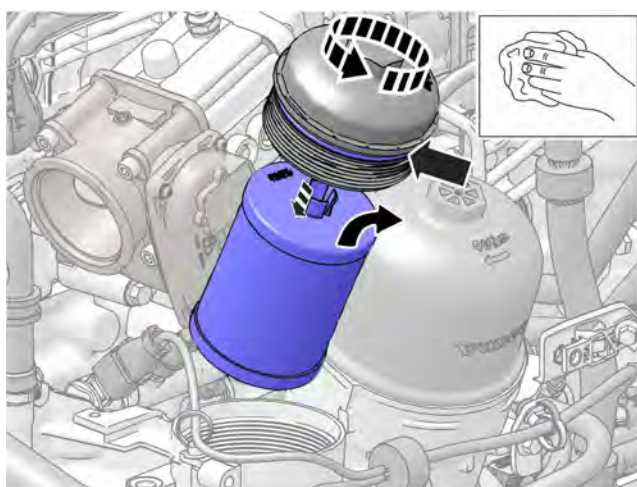
Risk of material damage.

The wrong type of fuel filter may damage the fuel injection circuit.

Use only a fuel filter approved by the manufacturer.

IMPORTANT:

Take great care to keep fuel system unions clean. Even minimal amounts of dirt can cause engine breakdown.



P0025715

Removal

- 1 Clean around the filter cover and housing.
- 2 Carefully remove the fuel filter cover and filter.

NOTICE! Be prepared to gather up fluid. The filter is still full of fuel and there is a risk of spillage when the cover is removed.

- 3 Remove the O-ring and filter.
Let the fuel drip off into a collection vessel.

Installation

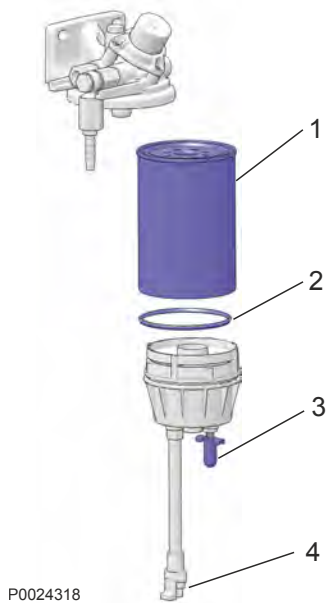
- 1 If the new filter housing is completely empty, lubricate with diesel around the inner section of the filter sealing surface.
- 2 Lubricate the O-ring with diesel before installing the filter cover.
- 3 Install the filter in the filter cover. Make sure the filter seats properly in the cover.
- 4 Install the filter cover and filter in the bracket. Carefully screw in the cover and check that the O-ring does not get twisted. Re-lubricate the seal as necessary.
Tighten the cover to: 25 Nm (18.4 lbf. ft.)
- 5 Bleed the fuel system according to *Fuel Pre-filter, Bleeding*, page 61.
- 6 Start and warm up the engine. Check that no leakage occurs.

Fuel Pre-filter, Replace

⚠ CAUTION!

Always use protective gloves for work including contact with oil, fuel etc.

NOTICE! Put a collection vessel under the fuel filter to collect the condensate and fuel. Store the used filter in a suitable container.



Removal

- 1 Loosen the connector (4) to the water trap sensor.
- 2 Clean thoroughly around the pre-fuel filter and water separator.
- 3 Open the drain nipple (3) in the base of the fuel prefilter and drain the filter.
- 4 Tighten the drain nipple again.
- 5 Remove the fuel pre-filter (1) and seal together with the lower section of the water separator.
- 6 Remove the water separator and O-ring.

NOTICE! Put the used filter in a suitable container.

- 7 Clean the lower section of the water separator and the contact surfaces.

Installing

- 1 Clean the seal surfaces thoroughly and lubricate the gasket with diesel.
- 2 Lubricate a new O-ring (2) with diesel and install the lower part of the water separator to the new filter.
- 3 Screw the filter onto the filter bracket by hand until the rubber seal bottoms on the mating surface. Then tighten a further 1/2–2/3 turns.
- 4 Connect the cable from the water trap sensor.
- 5 Open fuel taps and purge the system, refer to *Fuel system, bleeding*.
- 6 Start the engine and check that no leakage occurs.

Fuel Pre-filter, Bleeding

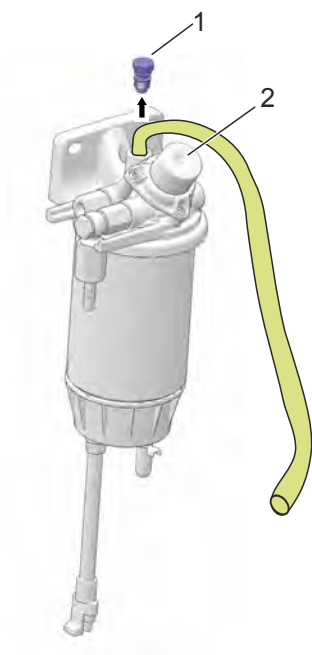
It is only necessary to purge the fuel system following maintenance on the system or if a fault has caused it to run dry.

NOTICE! Be prepared to gather up fluid.

- 1 Position a collection vessel.
- 2 Remove the plug (1) and place a nipple.

NOTICE! There is a special nipple for the filter housing, order through your Volvo Penta dealer.

- 3 Connect a transparent hose to the nipple.
- 4 Operate the hand pump (2) by pumping it until fuel flows without air bubbles.
- 5 Remove the hose and nipple.
- 6 Install and tighten the plug.



P0024319



P0013077

Cooling System

The cooling system ensures that the engine operates at the correct temperature. It is a closed system that should always be filled with a coolant mixture.

IMPORTANT:

Coolant of a suitable chemical composition must be used all year round to protect the engine against internal corrosion, cavitation and freeze bursting. This even applies when there is no risk for freeze damage, to make sure the engine always has a complete corrosion protection.

Therefore, the use of anti-corrosion agents alone, or water alone as a coolant, is not permitted in Volvo Penta engines.

The coolant must be based on Organic Acid Technology (OAT). Using an improper coolant or mixing with another coolant will rapidly reduce the performance and lifetime of the engine. Material incompatibility can lead to leakages, which - in the worst case - can cause engine breakdown.

Volvo Penta strongly recommend the use of our own coolants, "Volvo Penta Coolant VCS Ready Mixed" or the concentrate "Volvo Penta Coolant VCS", which ensure the protection of the cooling system components from corrosion, ageing, swelling and cracking, thereby ensuring optimal engine lifetime.

Over time the corrosion protection additives become less effective, and consequently the coolant must be changed at regular intervals to maintain sufficient protection of the engine. The latest Service Protocol that specifies service intervals can be found at volvopenta.com.

Coolant, Mixing

It is extremely important that the system is filled with the correct coolant concentration; refer to *Coolant, Mixing, page 79*.

The coolant should be mixed with distilled, deionized water. For Volvo Penta specified water requirements; refer to *Coolant, Mixing, page 79*.

NOTICE! If water quality can not be guaranteed, use ready mixed coolant.

Coolant Level, Checking and Topping Up

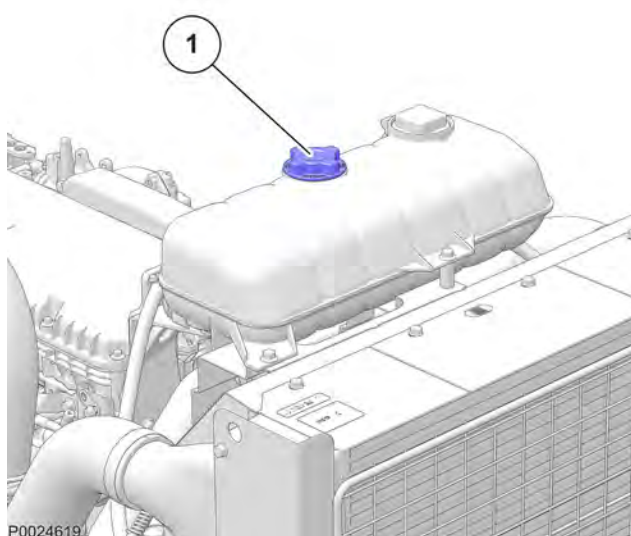
WARNING!

Do not open the coolant filler cap when the engine is hot, except in emergencies, as this could cause serious personal injury. Steam or hot fluid could spray out.

Coolant filling must be preformed with the engine stopped. Check the coolant level daily before starting.

IMPORTANT:

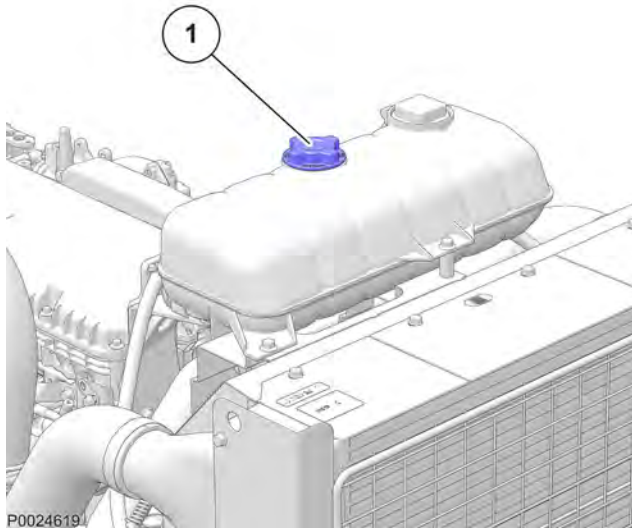
Only use coolant recommended by Volvo Penta.
Top up with the same type of coolant as already used in the system.
Different types of coolant must not be mixed.



- 1 Only open the filler cap (1). Do not open the pressure cap.
- 2 Check that the coolant level is above the MIN mark on the expansion tank.
- 3 Top up with coolant as required, so that the level is between the MIN and MAX marks. Fill slowly, to allow air to flow out.

Refill of empty system

NOTICE! Mix the correct amount of coolant in advance to ensure that the cooling system is completely filled. Refer to *Technical Data*, page 79 for the correct coolant volume.



- 1 Check that all drain points are closed.
- 2 Only open the filler cap (1). Do not open the pressure cap.
- 3 Fill with coolant, so that the level is between the MIN and MAX marks. Fill slowly, to allow air to flow out.
- 4 Start the engine when the cooling system has been completely filled and bled. Open any bleeding nipples a short while after starting, to allow trapped air to escape.
If a heating unit is connected to the engine cooling system, the heat control valve should be opened and the installation vented during filling.
- 5 Run the engine at idle a while. Increase engine speed to 1600-1700 rpm (VE) over three minutes. For genset engines run at 1500 or 1800 rpm. Check the coolant level.
- 6 Start the engine and run it until it reaches operating temperature (thermostat open). Check the coolant level again, top up as necessary.
- 7 Carry out a follow-up check of the coolant level after approx 1 hour's operation.

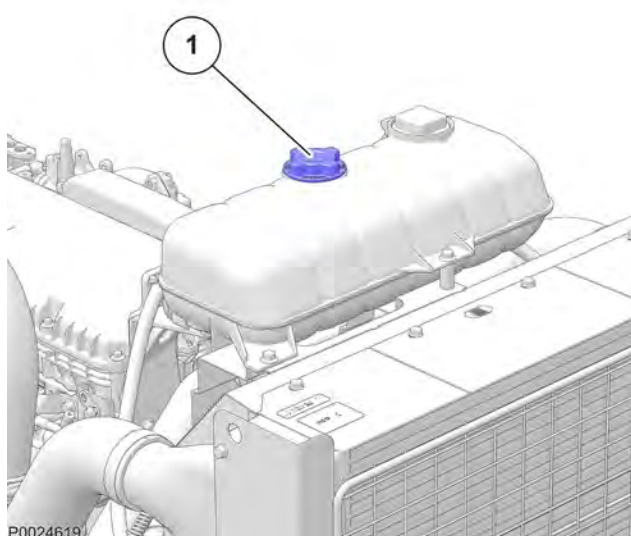
Coolant, Draining

⚠ WARNING!

Do not open the coolant filler cap when the engine is hot, except in emergencies, as this could cause serious personal injury. Steam or hot fluid could spray out.

IMPORTANT:

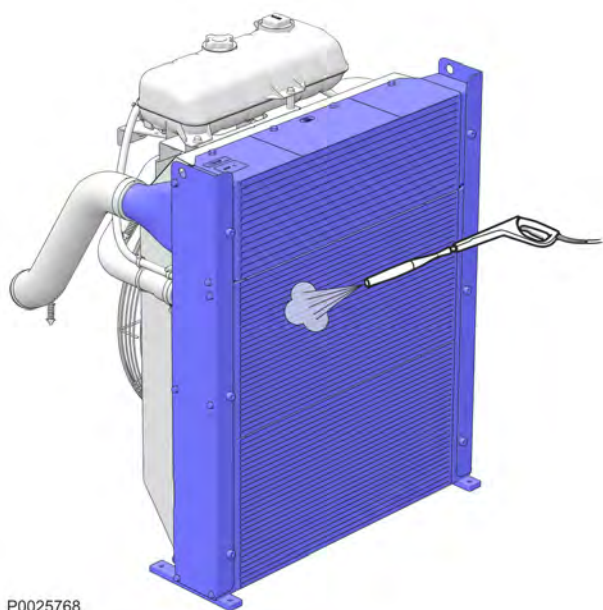
The coolant contains corrosion-inhibiting additives. Never drain the engine cooling system on engines, which are to be put in storage.



- 1 Stop the engine.
- 2 Remove the filler cap (1). Do not open the pressure cap.
- 3 Open all drain points. Drain the coolant from the radiator and engine block, using the drain hose. The drain nipples are situated under the radiator on the right side of the engine block.
- 4 Check that all coolant drains out. Deposits may be found inside the drain plug/tap, and need to be cleared away. There is otherwise a risk that coolant could remain and cause damage due to freezing. Check whether the installation has any further taps or plugs at the lowest points of the cooling water pipes.
- 5 Shut any taps and check that the spring-loaded covers on the nipples close completely. Install the rubber plugs.

Charge Air Cooler, External Cleaning

NOTICE! Regular inspect the charge air cooler visually.



- 1 Cover the engine before cleaning. The charged air cooler must be cold.
- 2 Clean with high pressure wash or compressed air. Be careful not to damage the radiator fins. If detergent is used, make sure that it is not corrosive to aluminum.

Cooling System, Cleaning

WARNING!

All coolant is hazardous and harmful to the environment. Do not consume. Coolant is flammable.

IMPORTANT:

Never clean the cooling system if there is any risk of freezing, since the cleaning solution does not have any antifreeze properties.

IMPORTANT:

It is extremely important that the correct concentration and volume of coolant is added to the system. Mix in a separate clean vessel before filling the cooling system. Make sure that the liquids mix.

IMPORTANT:

Always follow local safety instructions and regulations.

Cooling performance is reduced by deposits in the radiator and cooling galleries. The cooling system should be cleaned out when the coolant is changed.

- 1 Empty the cooling system. Refer to *Coolant, Draining, page 65*.
- 2 Put a hose into the expansion tank filling hole and flush with clean water, as specified by Volvo Penta—refer to section Water quality in *Technical Data, page 79* until the water draining out is completely clear.
- 3 If there should still be some contamination left after flushing for a long time, cleaning can be done with coolant. Otherwise, continue as in item 8 below.
- 4 Fill the cooling system with 15-20 % mixture of concentrated coolant. Use only Volvo Penta recommended concentrated coolant mixed with clean water.
- 5 Drain the coolant after 1-2 days of operation. Remove the filler cap and possibly the lower radiator hose to increase the speed of emptying. To prevent suspended material from settling back in the system emptying should be done rapidly, within the space of 10 minutes, when the engine has not been standing still for a long time.
- 6 Flush the system immediately and thoroughly with clean hot water to prevent dirt from settling in the inner areas. Flush until the water that runs out is completely clean. Make sure that any heater controls are set to full heating during emptying.
- 7 If contamination should still be left after a long period of flushing, cleanout using Volvo Penta radiator cleaner, followed by finishing-off with Volvo Penta neutralizer. Carefully follow the instructions on the package. Otherwise, continue as in item 8 below.
- 8 When the cooling system is completely free from contamination, close the drain taps and plugs.

- 9 Fill up with Volvo Penta recommended coolant, following the instructions in the chapters entitled *Maintenance, page 62* and *Coolant Level, Checking and Topping Up, page 63*.

Inlet and Exhaust System

Filling AdBlue®/DEF

⚠ CAUTION!

AdBlue®/DEF spilt onto hot components will quickly vaporize. Turn your face away!



P0011697

⚠ CAUTION!

Risk of corrosive damage.

Contact with the fluid can cause irritation and corrosion.

Wear protective gloves!

Change gloves and clothing that have been in contact with the liquid.

⚠ CAUTION!

Risk of material damage.

AdBlue®/DEF oxidises metal and the capillary action creeps through lines at a speed of approx. 0.6 metres per hour.

If spillage occurs, electrical connectors must be replaced immediately. Do not try to clean with water or compressed air.

IMPORTANT:

Dirt/dust, oil, greases, detergents and any chemicals and natural products must be prevented from entering the Adblue/DEF tank.

The system will be damaged if dust or dirt enters the tank clogging the filters in the dosing system. Keep the tank clean at all times.

IMPORTANT:

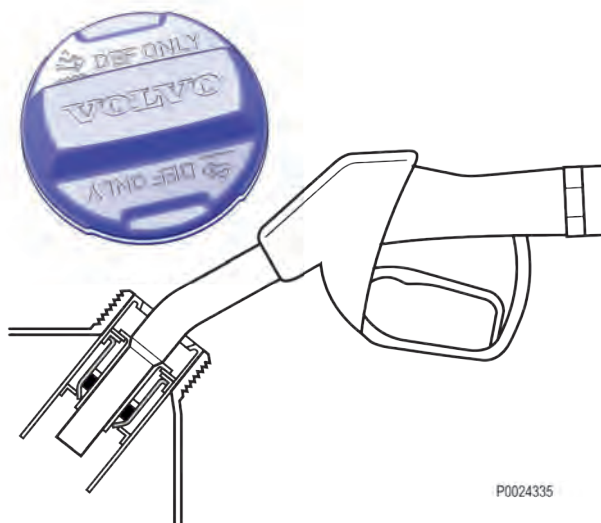
Never start the engine if anything other than clean AdBlue®/DEF has been added to the tank.

IMPORTANT:

The use of solution that do not fulfill the ISO 22241 standard will compromise the aftertreatment system performance, increase emissions. Any warranty claims will be rejected.



P0024301



When topping off AdBlue®/DEF a nozzle with a built-in shut-off function should be used in accordance with ISO standard 22241. These nozzles are designed not to fit any other filling equipment.

The tank cover is blue and marked with the text 'AdBlue/DEF only' to avoid confusion when filling. The ratio between the consumption of Adblue®/DEF and diesel is dimensioned as at least 1:1 to avoid the solution's running out before the diesel.

Never fill with AdBlue®/DEF other than ISO 22241 as specified by Volvo.

If this instruction is not followed the aftertreatment system may be permanently damaged. Engine power may also be affected negatively and engine components risk damage. Damage and costs arising from a failure to meet these requirements are not covered by Volvo Penta warranty obligations.

If AdBlue®/DEF is filled from a can or pump that lacks a stop function, it is important to make sure the tank is not overfilled as the solution may leak out of the breather tube. If the tank is overfilled and the solution in it freezes at temperatures below -11 °C (12.2 °F), the tank and the hoses may be permanently damaged.

Take great care not to spill the solution as it is extremely corrosive toward many materials. If a spill should occur the solution must be absorbed using dry sand or other non-flammable material and handled according to local and national regulations. Avoid spills onto soil and into waterways.

Erroneous filling of diesel or AdBlue®/DEF

IMPORTANT:

The filling of diesel or AdBlue®/DEF in the wrong tank can result in damage to the engine.

In order to avoid confusion, the AdBlue®/DEF tank has a blue filler cap and a decal affixed to the tank.

Mistaken filling of AdBlue®/DEF in the diesel tank

- The engine will not run at full power or will not run at all
- Injectors may be damaged
- Corrosion in the exhaust system between the turbocharger and aftertreatment system
- Expensive repairs

Mistaken filling of diesel in the AdBlue®/DEF tank

- The aftertreatment system may be seriously damaged
- The engine will no longer fulfill emission level requirements
- Expensive repairs

Electrical System

The engine is equipped with a single-pole electrical system and an alternator. System voltage is 24V.

WARNING!

Always stop the engine and break the current using the main switches before working on the engine.

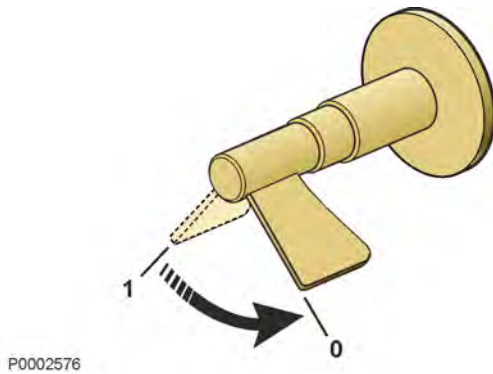
Main switch

IMPORTANT:

Never disconnect the current using the main switches when the engine is running or by disconnecting the battery cables.

The alternator and electronics could be damaged.

The main switches must never be switched off before the engine has stopped. If the circuit between the alternator and the battery is disconnected when the engine is running, the alternator and electronics may be damaged. For the same reason, the charging circuits must never be re-connected with the engine running.



P0002576

Fuses

The engine is equipped with two fuses which cuts the current if overloaded. There is one for the engine (15 A) and one for the ETAS system (25 A).

The engine stops if the fuse trips. If the fuse trips frequently, Volvo Penta recommends that a qualified workshop should be contacted to investigate the cause of the overload.

Refer to *Maintenance*, page 50 for location of the fuses.

Electrical Connections

Check that electrical connections are dry, free from oxide, and that they are securely tightened.



P0002107

Battery

⚠ WARNING!

Risk of fire and explosion. Never allow an open flame or electric sparks near the batteries.

⚠ WARNING!

Battery electrolyte is a corrosive acid and should be handled with care. If you spill or splash electrolyte on any part of the body, immediately flush the exposed area with liberal amounts of water and seek medical attention as soon as possible.

⚠ WARNING!

Ventilate the engine compartment before working on batteries or battery connections.

IMPORTANT:

Batteries can be damaged if they are left discharged, and can also freeze and burst easier in cold weather. If the engine is not going to be used for a longer period of time, the batteries should be fully charged, trickle charged if possible.

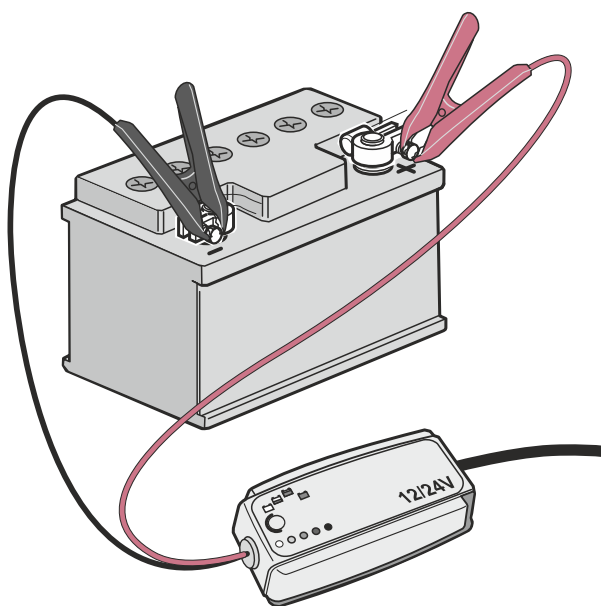
Maintenance

It is important to always follow the battery manufacture's recommendation and instruction when replacing and charging batteries. Depending on battery type, the instructions for maintenance and charging may vary.

Modern batteries are normally maintenance free, but there are some actions that are recommended to increase the battery service life and avoid accidents:

- Keep the batteries clean and dry. Contamination and oxide on the batteries and battery poles can result in stray currents, voltage drop and discharge, especially in wet weather.
- Remove oxidation from the battery poles and terminals, using a brass brush.
- Tighten the terminals securely and grease them with terminal grease or petroleum jelly. Loose battery connections may cause damage to the engine's electrical system.
- Charge the battery regularly. A battery that is kept fully loaded has a maximum service life. The easiest way to check if a battery needs charging is to use a voltmeter.

NOTICE! If low starter battery alarm occur, the battery may get drained which might result in loss of functions and engine stopping.



P0022892

Replacing Battery

IMPORTANT:

Make sure that the new battery fulfills the specifications in *Technical Data*. Read the information supplied with the battery before you begin the installation.

IMPORTANT:

Do not disconnect the batteries with the engine running.

Sensitive electrical components can be immediately damaged.

⚠ WARNING!

Never confuse the positive and negative poles on the batteries. Risk of arcing and explosion.

Disconnecting (A)

- 1 Untighten the nut and remove the – cable (black).
- 2 Untighten the nut and remove the + cable (red).

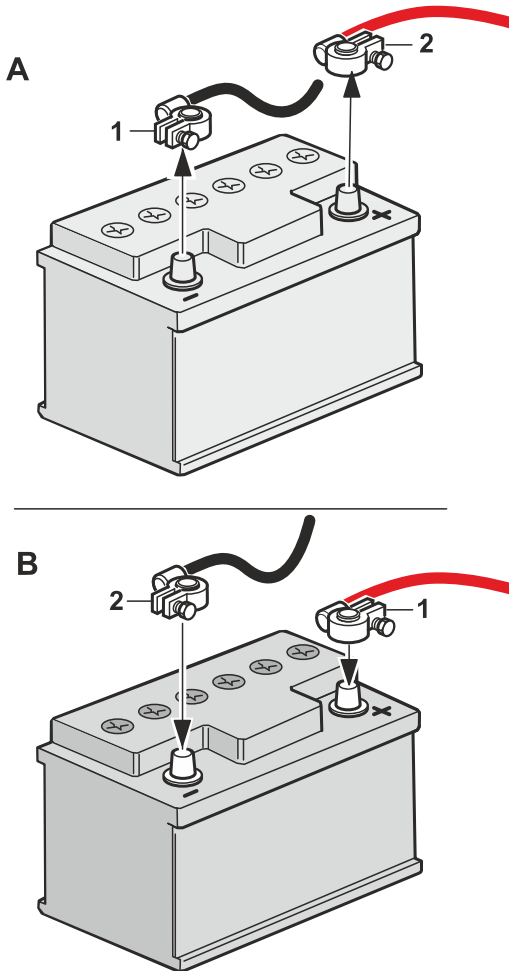
Remove the battery.

Connecting (B)

Place the new battery.

- 1 Connect the + cable (red) to the + pole on the battery and tighten the nut.
- 2 Connect the – cable (black) to the – pole on the battery and tighten the nut.

NOTICE! Hand in the old battery to a re-cycling station.



P0022893

Storage

To prevent the engine and other equipment from being harmed during long (2 months or more) periods out of service, it must be conserved. Conservation protects the engine from freezing and corrosion damages.

It is of utmost importance that the conservation is performed correctly, therefore we have compiled a checklist covering the most important points. Before taking the engine out of service for long periods, Volvo Penta recommends that the engine is checked by a qualified workshop for possible need for overhaul or repair.

⚠ CAUTION!

Read the chapter on Maintenance in the Operator's Manual before starting work. It contains instructions on how to carry out maintenance and service operations in a safe and technical correct manner.

⚠ WARNING!

Conservation oils can be flammable and dangerous to inhale. Ensure good ventilation. Use a protective face mask when spraying.

IMPORTANT:

Washing with a power washer: Never aim the water jet at radiators, charge air cooler, seals, rubber hoses or electrical components.



P0002089

- **For up to 8 month's stoppage:**
Change the oil and oil filter on the engine, then run the engine until warm.
- **More than 8 month's stoppage:**
Conserve the lubrication and fuel systems with conservation oil. Refer to the section *Conservation of the lubrication and fuel systems for more than 8 months' stoppage*.
- Make sure the coolant has adequate antifreeze properties. Top up as necessary.
Alternatively, you can drain the coolant (also drain the coolant filter).
- Drain any water and contamination from the fuel filters and fuel tank. Fill the fuel tank completely, to avoid condensation.
- Disconnect the battery cables, clean and charge the batteries. Trickle charge the batteries while the equipment is in storage. **A poorly charged battery can freeze and burst.**
- Clean the outside of the engine. Do not use a high pressure washer for engine cleaning. Touch up paint damage with Volvo Penta original paint.
- Put a note on the engine with the date, type of conservation and the conservation oil used.
- Cover the air filter, exhaust pipe and engine if necessary.
- Empty the AdBlue/DEF tank and rinse it with distilled water.

Bringing Out of Storage

- Remove any covers from the engine, air filter and exhaust pipe.
- Fill the engine with the correct quality and viscosity oil into the engine, as necessary, refer to *Technical Data, Lubrication System*. Install a new oil filter if the filter was not changed during conservation.
- Install new fuel filters and bleed the fuel system.
- Check the drive belt(s).
- Check the condition of all rubber hoses, and retighten the hose clamps.
- Close the drain taps and install any drain plugs.
- Check the coolant level. Top up as necessary.
- Connect the fully charged batteries.
- Start the engine and warm it up at fast idle with no load.
- Check that no oil, fuel or coolant leakage occurs.
- Fill the AdBlue/DEF tank. The solution must fulfill ISO 22241 standards.

Conservation of the lubrication and fuel systems for more than 8 months' stoppage:

- Drain the engine oil and fill up with **conservation oil*** to just over the MIN marking on the dipstick.
- Connect the fuel suction and return hoses to a 1/3 full jerrican containing **conservation oil*** and 2/3 diesel fuel.
- Bleed the fuel system.
- Start the engine and run at a fast idle until about 2 liters (0.6 US gal) of the fluid in the jerrican have been used. Stop the engine and re-connect the fuel suction and return lines.
- Drain the conservation oil from the engine.
- Follow the other instructions on the previous page.

* Conservation oils are sold by oil companies.

Technical Data

Engines

TAD580VE, TAD581VE, TAD582VE, TAD583VE

Type designation	TAD580VE, TAD581VE, TAD582VE, TAD583VE
Power, prime/stand-by	Refer to the sales literature
Torque, prime/stand-by	Refer to the sales literature
No. of cylinders	4
Bore	110 mm (4.33 inch)
Stroke	135 mm (5.31 inch)
Displacement	5,13 dm ³ (313 in ³)
Weight, wet (engine only)	562 kg (1239 lb)
Firing order	1-3-4-2
Compression ratio	17.2:1
Idling speed	700-900

TAD881VE, TAD882VE, TAD883VE, TAD884VE

Type designation	TAD880/81/82/83/84VE
Power, prime/stand-by	Refer to the sales literature
Torque, prime/stand-by	Refer to the sales literature
No. of cylinders	6
Bore	110 mm (4.33 inch)
Stroke	135 mm (5.31 inch)
Displacement	7.7 dm ³ (470 in ³)
Weight, wet (Engine)	723 kg (1594 lb)
Firing order	1-4-2-6-3-5
Compression ratio	17.2:1
Idling speed	600-900

TAD880GE, TAD881GE, TAD882GE

Type designation	TAD880GE, TAD881GE, TAD882GE
Power, prime/stand-by	Refer to the sales literature
Torque, prime/stand-by	Refer to the sales literature
No. of cylinders	6
Bore	110 mm (4.33 inch)
Stroke	135 mm (5.31 inch)
Displacement	7.7 dm ³ (470 in ³)
Weight, wet (Engine)	723 kg (1594 lb)
Firing order	1-4-2-6-3-5
Compression ratio	17.2:1
Idling speed	900

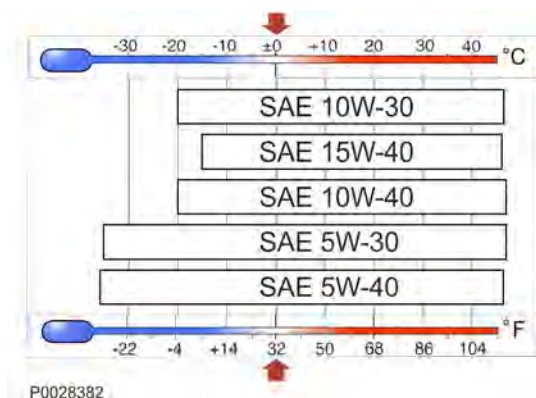
Lubrication System

Oil capacity including oil filters, approx.:	
TAD580–83VE	16 liters (4.23 US gal)
TAD880–84VE	27 liters (7.13 US gal)
TAD880–82GE	27 liters (7.13 US gal)
Oil Sump	
TAD580–83VE	
Min	10 liters (2.51 US gal)
Max	14 liters (3.57 US gal)
TAD880–82GE, TAD880–84VE	
Min	19 liters (5.02 US gal)
Max	24 liters (6.36 US gal)
Oil pressure	
At rated engine rpm	
TAD580–83VE	
Min	275 kPa (40 psi)
Max	475 kPa (69 psi)
TAD880–84VE	
Min	275 kPa (40 psi)
Max	475 kPa (69 psi)
TAD880–82GE	385 kPa (56 psi)
Oil filter	
Full flow filter	1
Lube oil pump	
Type	Gear driven

Oil recommendations

Oil quality	Service interval, reached first in operation
VDS-4.5	1000 hours or 12 months

VDS = Volvo Drain Specification



Select the viscosity according to the table.

The temperature values refer to stable ambient temperatures.

NOTICE! Volvo Penta recommendation for lowest possible fuel consumption and optimal durability is to use SAE 10W-30 oil when the viscosity table allows.

Fuel System

TAD580VE, TAD581VE, TAD582VE, TAD583VE

CO ₂ emission ⁽¹⁾	
B7 Fuel, according to EN590	689,2 g/kWh
HVO Fuel, according to EN 15940	660,8 g/kWh
US 1065 (ASTM D975-2D)	722,5 g/kWh

1) This CO₂ measurement results from testing over a fixed test cycle under laboratory conditions a(n) (parent) engine representative of the engine type (engine family) and shall not imply or express any guarantee of the performance of a particular engine once installed in a type of non-road mobile machinery or category T vehicle (agricultural and forestry tractors and their trailers).

TAD881VE, TAD882VE, TAD883VE, TAD884VE

CO ₂ emission ⁽¹⁾	
B7 Fuel, according to EN590	669,4 g/kWh
HVO (EN15940)	644,4 g/kWh
US 1065 (ASTM D975-2D)	678,1 g/kWh

1) This CO₂ measurement results from testing over a fixed test cycle under laboratory conditions a(n) (parent) engine representative of the engine type (engine family) and shall not imply or express any guarantee of the performance of a particular engine once installed in a type of non-road mobile machinery or category T vehicle (agricultural and forestry tractors and their trailers).

TAD880GE, TAD881GE, TAD882GE

CO ₂ emission ⁽¹⁾	
B7 Fuel, according to EN590	638 g/kWh
HVO Fuel, according to EN15940	611 g/kWh

1) This CO₂ measurement results from testing over a fixed test cycle under laboratory conditions a(n) (parent) engine representative of the engine type (engine family) and shall not imply or express any guarantee of the performance of a particular engine once installed in a type of non-road mobile machinery or category T vehicle (agricultural and forestry tractors and their trailers).

Fuel quality requirements for emission legislation stage 5, diesel engines with exhaust aftertreatment system

General requirements

Volvo Penta diesel engines are certified for compliance with emission legislations with the diesel test fuels specified by law. These fuels correspond with diesel fuel standards EN 590, ASTM D975-2D and EN15940. Volvo Penta engines will be compliance with emission legislation, if the engine is maintained according to service instructions and used according to intended purpose.

It is the responsibility of the fuel suppliers to always ensure that their fuels meet relevant requirements and are fit for their intended purpose. Their responsibility includes any use of additives for proper engine performance and function.

Special requirements are placed on cold-flow properties, that is, temperature limit values of fuel filterability during operation in winter conditions.

Restrictions for specified diesel fuels

98/70/EC is not fully specified in the fuel standard from an engine warranty perspective. Below mentioned fuel parameters must be fulfilled.

- **Max density for ASTM D975 No 2-D: 860 kg/m³**

Insufficient density reduces the power and increases the fuel consumption. Excessive density endangers the durability and function of the fuel injection equipment.

Paraffinic fuels - HVO and GTL

Paraffinic diesel fuels ("Synthetic Diesel") have higher cetane numbers and lower densities than diesel fuels. HVO (Hydrotreated Vegetable Oils) is renewable paraffinic fuels. GTL (Gas-To-Liquid) is fossil paraffinic fuels. Volvo Penta approves the use of paraffinic diesel fuels that fulfill the standard EN15940.

Volvo Penta also approves the use of fuel blends between these paraffinic fuels and diesel fuels that comply with the quality requirements.

In general, the maximum torque and power output, depends on the density and heat value of the fuel. HVO and GTL fuel may have a power/torque loss of a couple of % compared to EN590 fuel.

Cooling System

Type	Pressurized, sealed
Pressure cap, max opening pressure	75 kPa (10.9 psi)
Coolant	
Volume (engine)	
TAD580–83VE	13 liters (3.4 US gal)
TAD880–84VE	17 liters (4.5 US gal)
TAD880–82GE	17 liters (4.5 US gal)
Thermostat	
Qty	1 pc
Opening temperature	85 °C (185 °F)
Fully open at	95 °C (203 °F)



P0013077

Coolant, Mixing

⚠ WARNING!

All coolant is hazardous and harmful to the environment. Do not consume. Coolant is flammable.

IMPORTANT:

Always use the same type of coolant that is already in the engine.

Different types of coolant must not be mixed with each other.

Risk of reduced cooling function and performance by clogging and isolation.

Coolant shall be based on Organic Acid Technology (OAT).



P0002463

Follow the mixing recommendation on the product.

The coolant should be mixed with distilled, deionized water. For Volvo Penta specified water requirements; refer to *Water Quality*, page 80.

NOTICE! Always use “Ready Mixed” coolant if water quality cannot be determined or if it does not fulfill ASTM D4985.

NOTICE! Never mix more than 60% concentrated coolant with water. A greater concentration provides reduced cooling effect with the risk for overheating and reduced freeze protection.

Water Quality

ASTM D4985:

Total solid particles	<340 ppm
Total hardness	<9,5° dH
Chloride	<40 ppm
Sulfate	<100 ppm
pH value	5.5–9
Silica (acc. ASTM D859)	<20 mg SiO ₂ /l
Iron (acc. ASTM D1068)	<0.10 ppm
Manganese (acc. ASTM D858)	<0.05 ppm
Conductivity (acc. ASTM D1125)	<500 µS/cm
Organic content, COD _{Mn} (acc. ISO8467)	<15 mg KMnO ₄ /l



P0002094

Inlet and Exhaust System

Tank	Small	Medium	Large	X Large
Usable volume (AdBlue®/DEF)	17.4 liters (4.54 US gal)	38.6 liters (10.2 US gal)	68 liters (17.96 US gal)	164.2 liters (43.38 US gal)

Consumption of Urea

The consumption of Urea varies depending on how the engine is used. For engines that meet Euro-4 and Euro-5, standard consumption of Urea is 4–6 percent of fuel consumption.

NOTICE! Urea is always filled in a separate tank in the vehicle and must never be mixed with the diesel fuel.

Electrical System

System voltage	24 V			
Batteries	2 pcs. series connected			
Battery voltage	12 V			
Max. Battery capacity	2 x 225 Ah			
Alternator				
ambient temperature 20 °C				
Engine speed	600 rpm	700 rpm	950 rpm	1250 rpm
Alternator, 110 A	80 A	95 A	110 A	115 A
Alternator, 130 A	78 A	95 A	113 A	130 A
ambient temperature 100 °C				
Engine speed	600 rpm	700 rpm	950 rpm	1250 rpm
Alternator, 110 A	65 A	78 A	88 A	93 A
Alternator, 130 A	65 A	80 A	92 A	102 A
Starter motor, output	5.0 kW (6.7 hp)			
	5.5 kW (7.4 hp)	(Start/Stop)		
Battery electrolyte specific gravity at +25 °C:				
Fully charged battery	1.28 g/cm ³ (1.24 g/cm ³)*			
Battery recharged at	1.20 g/cm ³ (1.20 g/cm ³)*			

Note! * Applies to batteries with tropical acid.

Identification Numbers

NOTICE! The engine labels are placed on the valve cover.

Example of general label

VOLVO PENTA
PRODUCT INFORMATION

PRODUCT DESIGNATION: B
 SPECIFICATION No.: C
 CHASSI ID: D
 SERIAL No.: E
 POWER (kW): F
 SPEED (rpm): G
 MADE IN: H

Part No. A

P0024526

- A Label part number
- B Product designation
- C Specification number
- D Chassis ID
- E Serial number
- F Power (kW)
- G Engine speed (rpm)
- H Country of manufacturing

VOLVO PENTA
 AB VOLVO PENTA

EMISSION CONTROL INFORMATION

ENGINE MODEL: B
 DATE OF MANUFACTURE (mm-yy): G
 ULTRA LOW SULPHUR FUEL ONLY,
 MAX 15 PPM SULPHUR
 USE VOLVO SOFTWARE SERVICE TOOL
 TO VERIFY ACTUAL ENGINE SETTINGS.
 Part No. A

EU
 ENGINE FAMILY DESIGNATION: C
 EU TYPE-APPROVAL NUMBER: D

USA
 THIS ENGINE COMPLIES WITH U.S. EPA /
 CALIFORNIA REGULATIONS FOR H
 NONROAD / OFF-ROAD DIESEL ENGINES
 ENGINE FAMILY: E
 POWER CATEGORY: F
 EXHAUST EMISSION CONTROL SYSTEM
 J

P0034041

Example of EU/EPA/CARB combined cert label

- A. Label part number
- B. Engine mode
- C. Engine family designation
- D. EU Type Approval number
- E. EPA Engine family
- F. Power Category
- G. Date of Manufact ure (mm-yy)
- H. Model year
- J. Exhaust Emission Control System

Example of EU certificate label

VOLVO PENTA
 AB VOLVO PENTA
 SE- 405 08 GOTHENBURG

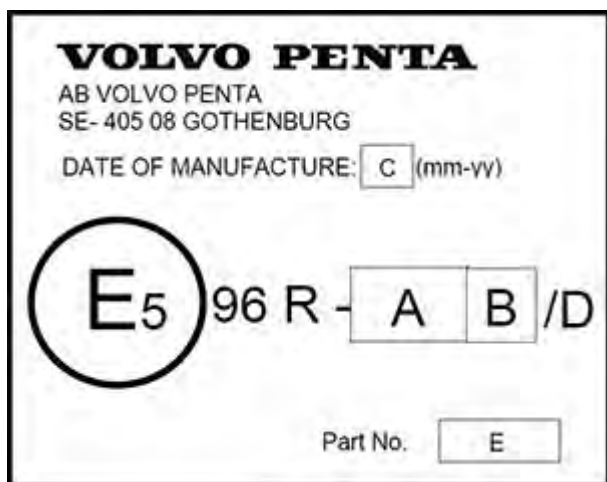
EMISSION CONTROL INFORMATION

ENGINE FAMILY DESIGNATION: A
 DATE OF MANUFACTURE (mm-yy): B
 EU TYPE-APPROVAL NUMBER: C

Part No. D

P0028278

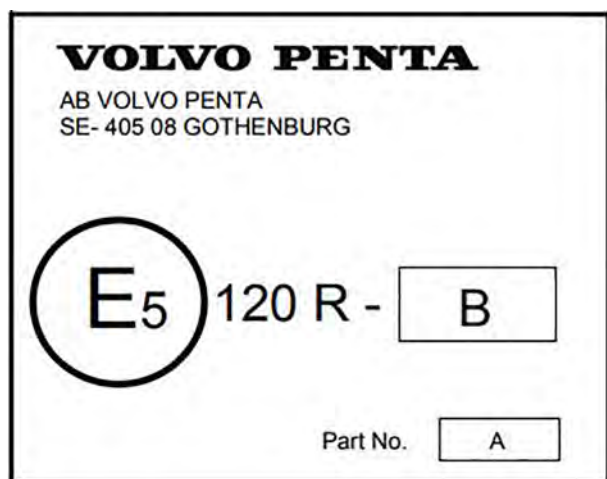
- A Product designation
- B Date of Manufacture (mm-yy)
- C Type Approval
- D Label part number



P0031659

Example of REG 96 certificate label

- A Type Approval
- B Engine Category
- C Date of Manufacture (mm-yy)
- D –
- E Label part number



P0034051

Example of REG120 certificate label

- A Label part number
- B Approval number

VOLVO PENTA		AB VOLVO PENTA	
<u>IMPORTANT ENGINE INFORMATION</u>			
ENGINE MODEL:	A	MAXIMUM ALTITUDE BEFORE DERATION:	J
POWER: kW	C	VENTILATION RATE MSHA:	O
SPEED: rpm	D	APPROVAL No. CANMET:	L
HIGH IDLE:	I		
*EC: Electronically Controlled			
VP: E			

P0028325

Example of MSHA, CANMET certificate label

- A. Engine Model Designation
- C. Power (kW)
- D. Speed (rpm)
- E. Label part number
- I. High idle
- J. Maximum altitude
- L. Ventilation rate MSHA
- O. Approval No. CANMET

VOLVO PENTA		AB VOLVO PENTA SE-405 08 GOTHENBURG
<u>EMISSION CONTROL INFORMATION</u>		
ENGINE FAMILY DESIGNATION: X EU TYPE- APPROVAL NUMBER: Y DATE OF MANUFACTURE (mm-yy): Z		
<u>IMPORTANT ENGINE UNFORMATION</u>		
ENGINE MODEL: B	CANMET APPROVAL No: E VENTILATION RATE: F	
MAXIMUM ALTITUDE BEFORE DERATION: C	MSHA APPROVAL No: G VENTILATION RATE: H	
HIGH IDLE: D		
*EC: Electronically Controlled		
		Part No: A

P0034044



P0020083

Example of EU, CANMET, MSHA certificate label

- A. Label part No
- B. Engine model
- C. Maximum altitude before deration
- D. High Idle (rpm)
- E. Approval No. CANMET
- F. Ventilation Rate: CANMET (cfm)
- G. Approval No. MSHA
- H. Ventilation Rate: MSHA (cfm)
- X. Engine Family Designation
- Y. EU Type-approval number
- Z. Date of manufacture (mm-yy)

Country of manufacture.

VOLVO PENTA		AB VOLVO PENTA
<u>EMISSION CONTROL INFORMATION</u>		ULTRA LOW SULPHUR FUEL ONLY MAX 15 PPM SULPHUR
ENGINE FAMILY: B	POWER CATEGORY: C	USE VOLVO SOFTWARE SERVICE TOOL TO VERIFY ACTUAL ENGINE SETTINGS.
DATE OF MANUFACTURE: D (mm-yy)	EXHAUST EMISSION CONTROL SYSTEM: H	
F	G	
THIS ENGINE COMPLIES WITH U.S. EPA AND CALIFORNIA REGULATIONS FOR E NON ROAD DIESEL ENGINES.		Part No. A

P0028149

Example of EPA/CARB certificate label

- A Label part number
- B Engine family
- C Power category
- D Date of manufacture
- E Model year
- F –
- G –
- H Exhaust emissssion control system

VOLVO PENTA

Declaration for the installation of partially-completed machinery in accordance with Machinery Directive 2006/42/EC, Annex II, 1B and Supply of machinery (Safety) Regulations 2008

Engine Manufacturer:

AB Volvo Penta
Gropegårdsgatan, SE 405 08 Gothenburg, Sweden

Description of engine 4-cycle diesel engine. Engine types covered by this declaration:

TAD540VE	TAD580VE	TAD840VE	TAD882VE
TAD541VE	TAD581VE	TAD841VE	TAD883VE
TAD542VE	TAD582VE	TAD842VE	TAD884VE
TAD550VE	TAD583VE	TAD843VE	TAD84xGE
TAD551VE		TAD850VE	TAD85xGE
TAD552VE		TAD851VE	TAD880GE
TAD570VE		TAD852VE	TAD881GE
TAD571VE		TAD853VE	TAD882GE
TAD572VE		TAD870VE	
TAD570VE-B		TAD871VE	
TAD571VE-B		TAD872VE	
		TAD873VE	
		TAD881VE	

Fundamental health and safety requirements applied to, and fulfilled by, the above-mentioned engines are described in the following items in Annex I:

1.1.3, 1.1.5, 1.5.1, 1.5.2, 1.5.3, 1.5.4, 1.5.6, 1.5.13, 1.6.1, 1.6.2, 1.6.4, 1.7.1, 1.7.1.1, 1.7.1.2, 1.7.4, 1.7.4.1 and 1.7.4.3.

The relevant technical documentation is compiled as described in part B of Annex VII.

Relevant information concerning the partially completed machinery will be provided in suitable form upon justified requests from competent national authorities. The individual authorized to compile the relevant technical documentation is the signer of this declaration.

The harmonized standards applied are:

EN ISO 12100:2010: Safety of machinery – General principles for design – Risk assessment and risk reduction.
EN 1679–1+A1:2011: Reciprocating internal combustion engines – Safety – Part 1: Compression ignition engines.

The partially completed machinery also complies with the following relevant Directive:

2014/30/EU – Electromagnetic Compatibility (EMC) Directive.

Applied standards: EN 61000–6–1:2007, EN 61000–6–2:2005, EN 61000–6–3:2007, EN 61000–6–4:2007, EN 12895:2015 + A1:2019, EN-ISO 14982:2009 and EN 13766-1:2018.

For engines equipped with the Volvo Penta Start/Stop System the responsibility for the functional safety of the system lies with the machine manufacturer performing the integration.

The engines covered by this declaration may not be put into operation before the completed machinery into which they are to be installed has been declared to conform with the provision of Machinery Directive 2006/42/EC and Supply of machinery (Safety) Regulations 2008.

Name and function:

Fredrik Berggren, Safety Compliance
(The identity of the individual authorized to sign on behalf of the engine manufacturer or the latter's authorized representative.)

Signature and title:



Date and place of issue: (yyyy-mm-dd) 2021–05–31
Gothenburg

Phoenix no. 50334799



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ENG

This Operator's Manual may be ordered in a different language free of charge up to 12 months after delivery, via internet.

<http://manual.volvopenta.com/coupon/>

If internet access isn't possible, please contact your Volvo Penta dealer.

GER

Diese Betriebsanleitung kann bis zu 12 Monate nach der Lieferung über Internet kostenlos in einer anderen Sprache bestellt werden.

<http://manual.volvopenta.com/coupon/>

Wenn Sie keinen Internet-Zugriff haben, kontaktieren Sie bitte Ihren Volvo Penta-Händler.

FRE

Ce manuel d'utilisation peut être commandé gratuitement sur Internet en différentes langues, jusqu'à 12 mois après la date de livraison.

<http://manual.volvopenta.com/coupon/>

Veuillez contacter votre Distributeur Volvo Penta si vous avez un problème d'accès à l'Internet.

SPA

El presente libro de instrucciones puede solicitarse en otro idioma diferente, libre de cargo, hasta 12 meses después de la entrega, mediante internet.

<http://manual.volvopenta.com/coupon/>

Si no se tiene acceso a internet, contacten al su concesionario Volvo Penta.

ITA

Il manuale per l'operatore può essere ordinato tramite Internet, in varie lingue e per consegna gratuita, entro 12 mesi dalla consegna del prodotto.

<http://manual.volvopenta.com/coupon/>

Se l'accesso a Internet risulta impossibile, contattare la concessionaria Volvo Penta.

SWE

Denna instruktionsbok kan beställas via internet på ett annat språk gratis i upp till 12 månader efter leverans.

<http://manual.volvopenta.com/coupon/>

Kontakta din Volvo Penta-återförsäljare om du inte har tillgång till internet.

DUT

Dit instructieboek kan gratis via internet in een andere taal worden besteld tot 12 maanden na aflevering.

<http://manual.volvopenta.com/coupon/>

Als toegang tot het internet niet mogelijk is, neem dan contact op met uw Volvo Penta dealer.

DAN

Denne instruktionsbog kan bestilles gratis på et andet sprog via Internettet i op til 12 måneder efter levering.

<http://manual.volvopenta.com/coupon/>

Hvis det ikke er muligt at bestille via Internettet, bedes du kontakte din Volvo Penta forhandler.

FIN

Tämä käyttöohjekirja on tilattavissa Internetin kautta veloituksesta eri kielillä 12 kuukauden ajan toimituksen jälkeen.

<http://manual.volvopenta.com/coupon/>

Jos sinulla ei ole Internet-yhteyttä, ota yhteys lähimpään Volvo Penta jälleenmyyjään.

POR

Este Manual do Operador pode ser encomendado em idiomas diferentes isento de custos até 12 meses após entrega, via internet.

<http://manual.volvopenta.com/coupon/>

Se não for possível aceder à internet, contacte o seu concessionário Volvo Penta.

GRC

Το παρόν Βιβλίο Χρήσης μπορεί να παραγγελθεί δωρεάν σε άλλη γλώσσα μέχρι 12 μήνες μετά την παράδοση, μέσω διαδικτύου.

<http://manual.volvopenta.com/coupon/>

Εάν δεν είναι δυνατή η πρόσβαση στο ιαδίκτυο, παρακαλούμε επικοινωνήστε με το δικό σας αντιπρόσωπο της Volvo Penta.

RUS

Данное руководство по эксплуатации можно бесплатно заказать на другом языке по Интернету в течение 12 месяцев после доставки.

<http://manual.volvopenta.com/coupon/>

Если доступ к Интернету отсутствует, обратитесь к своему дилеру компании Volvo Penta.

TUR

Bu Kullanım Kılavuzu, teslimden 12 ay sonrasına kadar Internet yoluyla ücretsiz olarak farklı bir dille sipariş edilebilir.

<http://manual.volvopenta.com/coupon/>

Internet mümkün değilse, lütfen Volvo Penta yetkili satıcınızla temas geçin.

CHI

本操作手册可通过互联网以不同的语言进行订购，交付后可免费使用达12个月。

<http://manual.volvopenta.com/coupon/>

如果无法访问互联网，请与沃尔沃通达经销商联系。

BZS

Este Manual de operador pode ser encomendado em um idioma diferente, gratuitamente, até 12 meses após a entrega, via internet.

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Caso o acesso à internet não for possível, contatar seu distribuidor Volvo Penta.

JPN

このオペレーターズ マニュアルの他言語版が、発行後最高12か月間、インターネットより無料で発注可能です。

<http://manual.volvopenta.com/coupon/>

インターネットにアクセスできない場合は、担当のボルボペンタディーラーまでご連絡ください。

ARA

من الممكن طلب دليل المشغل بلغة أخرى مجاناً عبر الإنترنت لفترة تصل إلى ١٢ شهراً من بعد التسليم.

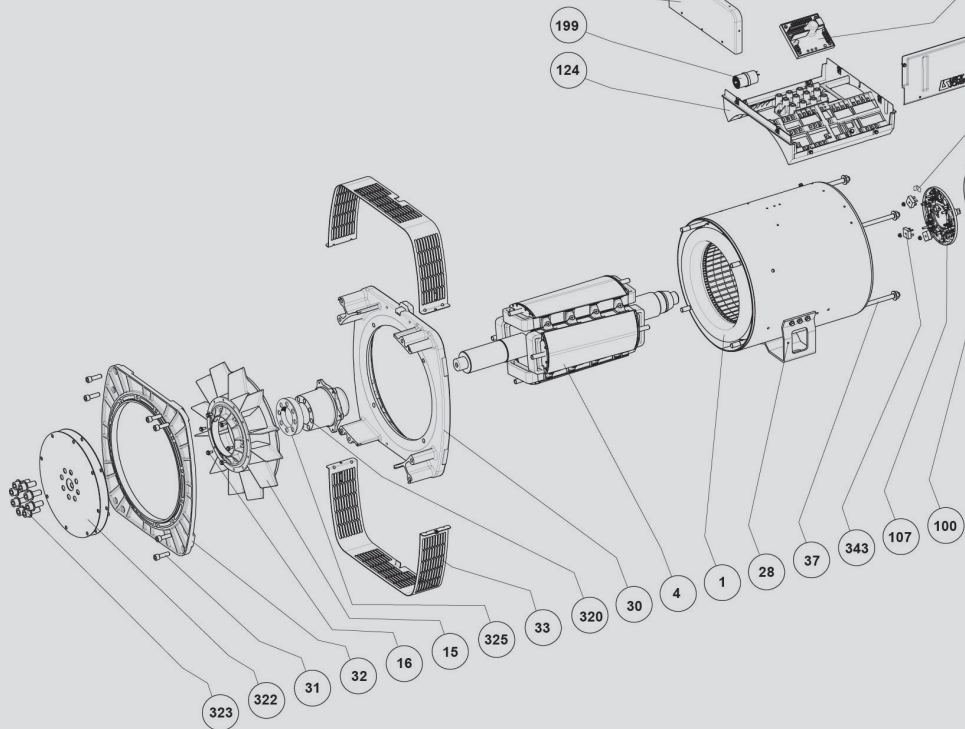
[http:// manual.volvopenta.com/coupon](http://manual.volvopenta.com/coupon/)

إذا كان الوصول إلى الإنترنت غير متاح، فالرجاء الاتصال بوكيل Volvo Penta.



AB Volvo Penta
SE-405 08 Göteborg, Sweden
www.volvopenta.com





Low Voltage Alternators - 4 pole

LSA 44.3

Installation and maintenance

Leroy-Somer™


EMERSON™
Industrial Automation

LSA 44.3

Low Voltage Alternators - 4 pole

**This manual concerns the alternator which you have just purchased.
We wish to draw your attention to the contents of this maintenance manual.**

⚠ : This manual is be given to the end user.

SAFETY MEASURES

Before using your machine for the first time, it is important to read the whole of this installation and maintenance manual.

All necessary operations and interventions on this machine must be performed by a qualified technician.

Our technical support service will be pleased to provide any additional information you may require.

The various operations described in this manual are accompanied by recommendations or symbols to alert the user to the potential risk of accidents. It is vital that you understand and take notice of the different warning symbols used.

WARNING

Warning symbol for an operation capable of damaging or destroying the machine or surrounding equipment.



Warning symbol for general danger to personnel.



Warning symbol for electrical danger to personnel.

WARNING SYMBOLS

We wish to draw your attention to the following 2 safety measures which must be complied with:

a) During operation, do not allow anyone to stand in front of the air outlet guards, in case anything is ejected from them.

b) Do not allow children younger than 14 to go near the air outlet guards.

A set of self-adhesive stickers depicting the various warning symbols is included with this maintenance manual. They should be positioned as shown in the drawing below once the machine has been fully installed.

WARNING

The alternators must not be put into service until the machines in which they are to be incorporated have been declared compliant with Directives EC and plus any other directives that may be applicable.

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LSA 44.3

Low Voltage Alternators - 4 pole

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EC declaration of incorporation

LSA 44.3

Low Voltage Alternators - 4 pole

1 - RECEIPT

1.1 - Standards and safety measures

Our alternators comply with most international standards.

See the EC Declaration of Incorporation on the last page.

1.2 - Inspection

On receipt of your alternator, check that it has not suffered any damage in transit. If there are obvious signs of knocks, contact the transporter (you may be able to claim on their insurance) and after a visual check, turn the machine by hand to detect any malfunction.

1.3 - Identification

The alternator is identified by means of a nameplate fixed on the machine (see drawing).

Make sure that the nameplate on the machine conforms to your order.

So that you can identify your alternator quickly and accurately, we suggest you fill in its specifications on the nameplate below.

1.4 - Storage

Prior to commissioning, machines should be stored :

- away from humidity (< 90%); after a long period of storage, check the machine insulation. To prevent the bearings from becoming marked, do not store in an environment with significant vibration.

1.5 - Application

These alternators are mainly designed to produce electricity in the context of applications involving the use of generators.

1.6 - Contraindications to use

Use of the machine is restricted to operating conditions (environment, speed, voltage, power, etc) compatible with the characteristics indicated on the nameplate.

**LEROY
SOMER**
PARTNER
ALTERNATORS

LSA		IP	
N°:		Date :	
r.p.m.		Hz	Weight : kg
P.F. :	Th.class.	Altitude : m	
A.V.R.		Excit.	
Excit. values	full load : V / A		
	at no load : A		
D.E. bearing			
N.D.E. bearing			
			

RATINGS			
Voltage			V
Phase			
Conn.			
Contin.			kVA
B.R.			kW
40°C.			A
Std by			kVA
P.R.			kW
27°C.			A
ISO 8528-3		Made in	

IEC 60034-1 & 5

NEMA MG1-32 & 33

www.leroy-somer.com

1.025.002 a

LSA 44.3

Low Voltage Alternators - 4 pole

2 - TECHNICAL CHARACTERISTICS

2.1 - Electrical characteristics

This alternator is a machine without sliprings or revolving armature brushes, wound as "2/3 pitch", 12-wire, with class H insulation and a field excitation system available in either SHUNT, AREP or «PMG» version (see diagrams and AVR manuals).

• Electrical options

- Stator temperature detection sensors
- Space heater

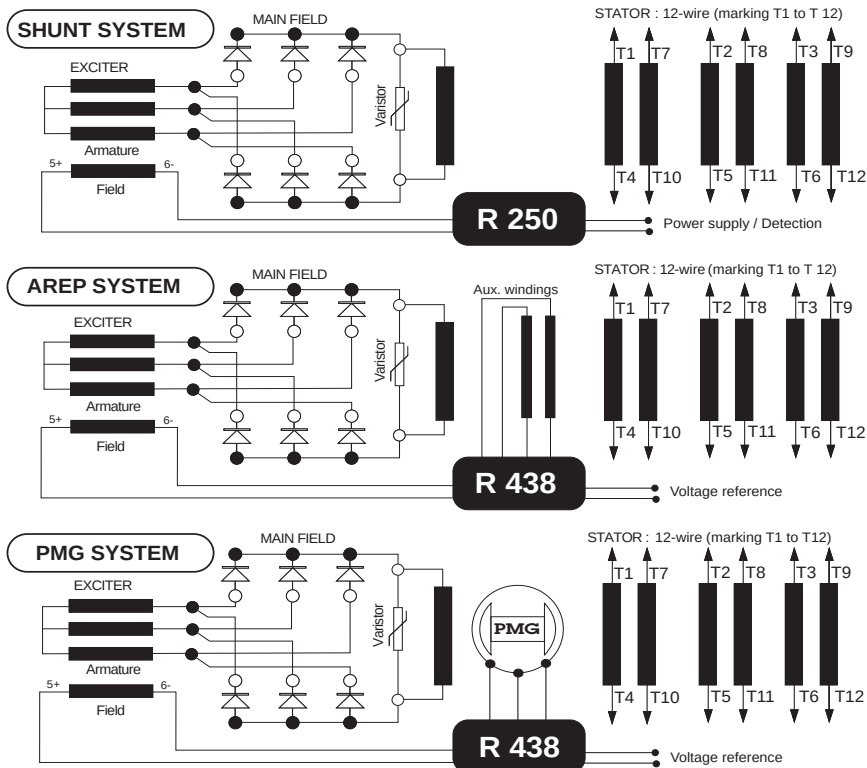
Interference suppression conforms to standard EN 55011, group 1, class B (Europe).

2.2 - Mechanical characteristics

- Steel frame
- Cast iron end shields
- Protected ball bearings, greased for life
- Mounting arrangements:
IM 1201 (MD 35) foot and flange mounted, single-bearing with SAE coupling disc.
IM 1001 (B 34) double-bearing with SAE flange and standard cylindrical shaft extension.
- Drip-proof machine, self-cooled
- Degree of protection: IP 23

• Mechanical options

- Air inlet filter
- IP 44 protection



LSA 44.3

Low Voltage Alternators - 4 pole

3 - INSTALLATION

Personnel undertaking the various operations indicated in this section must wear personal protective equipment appropriate for mechanical and electrical hazards.

3.1 - Assembly



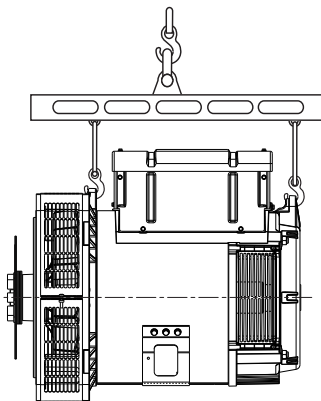
All mechanical handling operations must be undertaken using suitable equipment and the machine must be horizontal. Check how much the machine weighs (see 4.8) before choosing the lifting tool.

During this operation, do not allow anyone to stand under the load.

• Handling

The generously-sized lifting rings are for handling the alternator alone. They must not be used to lift the genset. The choice of lifting hooks or handles should be determined by the shape of these rings. Choose a lifting system which respects the integrity and the environment of the machine.

During this operation, do not allow anyone to stand under the load.



• Single-bearing coupling

Before coupling the machines, check that they are compatible by:

- undertaking a torsional analysis of the transmission,
- checking the dimensions of the flywheel and its housing, the flange, coupling discs and offset.

WARNING

When coupling the alternator to the prime mover, do not use the fan to turn the alternator or rotor.

The holes of the coupling discs should be aligned with the flywheel holes by cranking the engine.

Make sure the machine is securely bedded in position during coupling.

Check that there is lateral play on the crankshaft.

• Double-bearing coupling

- Semi-flexible coupling

Careful alignment of the machines is recommended, checking that the lack of concentricity and parallelism of both parts of the coupling do not exceed 0.1 mm.

This alternator has been balanced with a 1/2 key.

• Location

The room where the alternator is placed must be ventilated to ensure that the ambient temperature cannot exceed the data on the nameplate.

3.2 - Checks prior to first use

• Electrical checks



Under no circumstances should an alternator, new or otherwise, be operated if the insulation is less than 1 megohm for the stator and 100,000 ohms for the other windings.

LSA 44.3

Low Voltage Alternators - 4 pole

There are 2 possible methods for restoring the above minimum values.

a) Dry out the machine for 24 hours in a drying oven at a temperature of 110 °C (without the regulator).

b) Blow hot air into the air intake, having made sure that the machine is rotating with the exciter field disconnected.

Note : Prolonged standstill

In order to avoid these problems, we recommend the use of space heaters, as well as turning over the machine from time to time. Space heaters are only really effective if they are working continuously while the machine is stopped.

WARNING

Ensure that the alternator has the degree of protection matching the defined environmental conditions.

• Mechanical checks

Before starting the machine for the first time, check that:

- all fixing bolts and screws are tight,
- the cooling air is drawn in freely,

- the protective grilles and housing are correctly in place,

- the standard direction of rotation is clockwise as seen from the shaft end (phase rotation in order 1 - 2 - 3).

For anti-clockwise rotation, swap 2 and 3.

- the winding connection corresponds to the site operating voltage (see section 3.3).

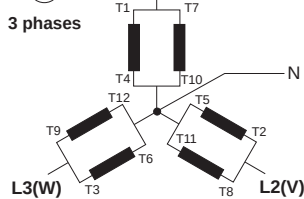
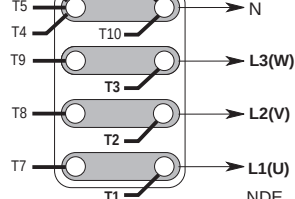
3.3 - Terminal connection diagrams

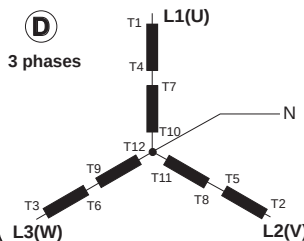
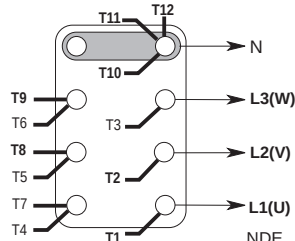
To modify the connection, change the position of the stator cables on the terminals. The winding code is specified on the nameplate.



Any intervention on the alternator terminals during reconnection or checks should be performed with the machine stopped.

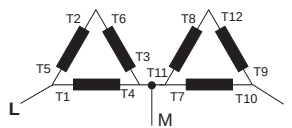
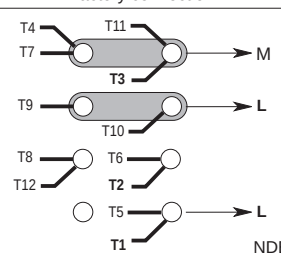
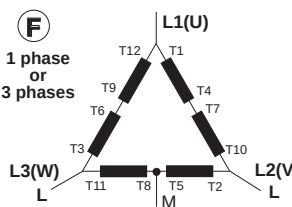
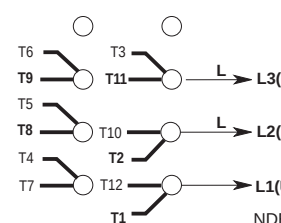
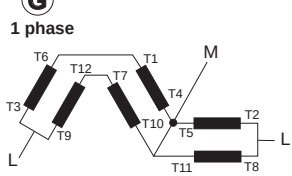
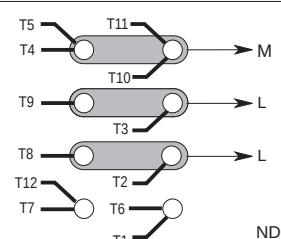
In no case should the internal connections in the terminal box be subjected to stresses due to cables connected by the user.

Connection codes		L.L. voltage		Factory connection
A 3 phases 	Winding	50 Hz	60 Hz	
	6	190 - 208	190 - 240	
	7	220 - 230	-	
	8	-	190 - 208	
R 250 voltage sensing: 0 => (T8) / 110 V => (T11) R 438 voltage sensing: 0 => (T3) / 110 V => (T2)				

D 3 phases 	Winding	50 Hz	60 Hz	
	6	380 - 415	380 - 480	
	7	440 - 460	-	
	8	-	380 - 416	
R 250 voltage sensing: 0 => (T8) / 110 V => (T11) R 438 voltage sensing: 0 => (T3) / 380 V => (T2)				

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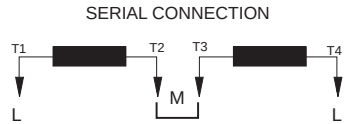
Connection codes	L.L. voltage			Factory connection
FF 1 phase  LM voltage = 1/2 LL voltage	Winding	50 Hz	60 Hz	 NDE
	6	220 - 240	220 - 240	
	7	250 - 260	-	
	8	200	220 - 240	
R 250 voltage sensing: 0 => (T1) / 110 V => (T4) R 438 voltage sensing: 0 => (T10) / 220 V => (T1)				
F 1 phase or 3 phases  LM voltage = 1/2 LL voltage	Winding	50 Hz	60 Hz	 NDE
	6	220 - 240	220 - 240	
	7	250 - 260	-	
	8	200	220 - 240	
R 250 voltage sensing: 0 => (T8) / 110 V => (T11) R 438 voltage sensing: 0 => (T3) / 220 V => (T2)				
G 1 phase  LM voltage = 1/2 LL voltage	Winding	50 Hz	60 Hz	 NDE
	6	220 - 240	220 - 240	
	7	250 - 260	-	
	8	200	220 - 240	
R 250 voltage sensing: 0 => (T8) / 110 V => (T11) R 438 voltage sensing: 0 => (T3) / 220 V => (T2)				



When coupling alternators in parallel with connected neutral, it may be necessary to use a reactance (please contact us).

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Low Voltage Alternators - 4 pole

SINGLE-PHASE 4-WIRE - type M or M1 DEDICATED WINDING



Voltage 50/60Hz		Link	Output		
L - L	L - M		L	L	M
220	110	T2 - T3	T1	T4	T2 - T3
230	115				
240	120				

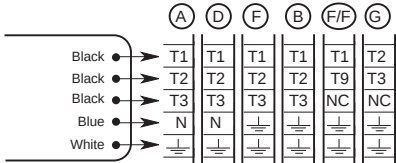
R 250 voltage sensing: 0 => (T1) / 110 V => (T2)



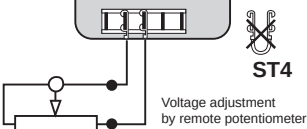
Warning: parallel connection not possible.

• Option connection diagram

R 791 T interference suppression kit (standard for CE marking)

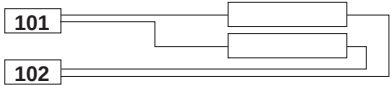


Voltage potentiometer

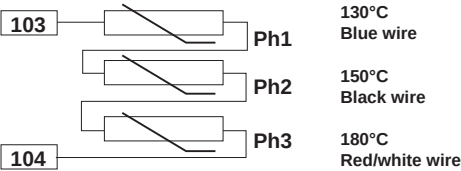


ST4

Anti condensation heater



Thermistor (PTC) temperature



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Low Voltage Alternators - 4 pole

• Connection checks



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

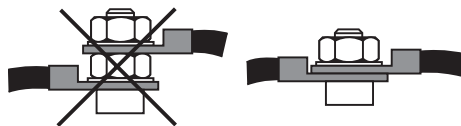
Check that:

- 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).
- Any protection devices in place have not been tripped.
- If there is an external AVR, the connections between the alternator and the cabinet are made in accordance with the connection diagram.
- 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 diagram.



- The alternator earth terminal inside the terminal box is connected to the electrical earth circuit
- The earth terminal (ref 28) is connected to the frame.

The connections inside the terminal box must never be subjected to stress due to cables connected by the user.



3.4 - Commissioning



The machine can only be started up and used if the installation is in accordance with the regulations and instructions defined in this manual.

The machine is tested and set up at the factory. When first used with no load, make sure that the drive speed is correct and stable (see the nameplate). With the regreasable bearing option, we recommend greasing the bearings at the time of commissioning (see section 4.3).

On application of the load, the machine should achieve its rated speed and voltage; however, in the event of abnormal operation, the machine setting can be altered (follow the adjustment procedure in section 3.5). If the machine still operates incorrectly, the cause of the malfunction must be located (see section 4.5).

3.5 - Setting up



The various adjustments during tests must be made by a qualified engineer. Ensure that the drive speed specified on the nameplate is reached before commencing adjustment.

After operational testing, replace all access panels or covers.

The AVR is used to make any adjustments to the machine.

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Low Voltage Alternators - 4 pole

4 - SERVICING - MAINTENANCE

4.1 - Safety measures

Servicing or troubleshooting must be carried out strictly in accordance with instructions so as to avoid the risk of accidents and to maintain the machine in its original state.



All such operations performed on the alternator should be undertaken by personnel trained in the commissioning, servicing and maintenance of electrical and mechanical components, who must wear personal protective equipment appropriate for mechanical and electrical hazards.

Before any intervention on the machine, ensure that it cannot be started by a manual or automatic system and that you have understood the operating principles of the system.



Warning : During and after running, the alternator will reach temperatures hot enough to cause injury, such as burns.

4.2 - Routine maintenance

• Checks after start-up

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

• Electrical servicing

Commercially-available volatile degreasing agents can be used.

WARNING

Do not use: trichlorethylene, perchlorethylene, trichloroethane or any alkaline products.



These operations must be performed at a cleaning station, equipped with a vacuum system that collects and flushes out the products used.

The insulating components and the impregnation system are not at risk of damage from solvents. Avoid letting the cleaning product run into the slots.

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

• Mechanical servicing

WARNING

Cleaning the machine using water or a highpressure washer is strictly prohibited. Any problems arising from such treatment are not covered by our warranty.

Degreasing: Use a brush and detergent (suitable for paintwork).

Dusting: Use an air gun.

If the machine is fitted with air inlet and outlet filters, the maintenance personnel should clean them routinely at regular intervals. In the case of dry dust, the filter can be cleaned using compressed air and/or replaced if it is clogged.

After cleaning the alternator, it is essential to check the winding insulation (see sections 3.2 and 4.7).

Electric Power Generation	Installation and maintenance	5056 en - 2015.03 / d
LSA 44.3 Low Voltage Alternators - 4 pole		

4.3 - Bearings

The bearings are permanently greased	Approximate life of the grease (depending on use) = 20,000 hours or 3 years.
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4.4 - Mechanical defects

Fault		Action
Bearing	Excessive overheating of one or both bearings (bearing temperature 80°C above the ambient temperature) (With or without abnormal bearing noise)	- 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)
	Excessive vibration and humming noise coming from the machine	- Phase imbalance - Stator short-circuit
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

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Low Voltage Alternators - 4 pole

4.5 - 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

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Low Voltage Alternators - 4 pole

• Checking the winding

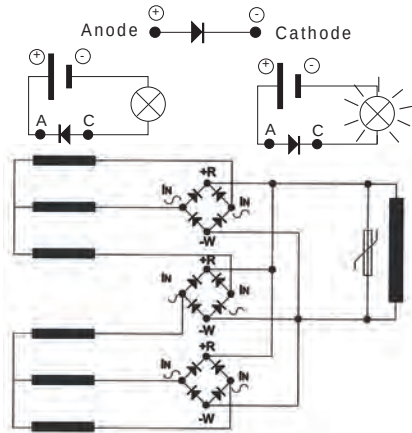
You can check the winding insulation by performing a high voltage test. In this case, you must disconnect all AVR wires.

WARNING

Damage caused to the AVR in such conditions is not covered by our warranty.

4.5.2 - Checking the diode bridge

A diode in good working order should allow the current to flow only in the anode-to-cathode direction.



• Checking the windings and rotating diodes using separate excitation



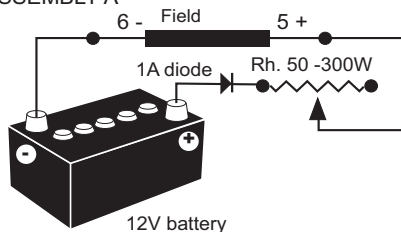
During this procedure, make sure that the alternator is disconnected from any external load and inspect the terminal box to check that the connections are fully tightened.

1) Stop the unit, disconnect and isolate the AVR wires.

2) There are two ways of creating an assembly with separate excitation.

Assembly A: Connect a 12 V battery in series with a rheostat of approximately 50 ohms - 300 W and a diode on both exciter field wires (5+) and (6-).

ASSEMBLY A



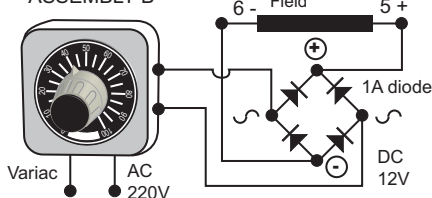
Assembly B: Connect a "Variac" variable power supply and a diode bridge on both exciter field wires (5+) and (6-).

Both these systems should have characteristics which are compatible with the field excitation power of the machine (see the nameplate).

3) Run the unit at its rated speed.

4) Gradually increase the exciter field current by adjusting the rheostat or the variac and measure the output voltages on L1 - L2 - L3, checking the excitation voltage and current at no load (see the machine nameplate or ask for the factory test report). When the output voltage is at its rated value and balanced within 1% for the rated excitation level, the machine is in good working order. The fault therefore comes from the AVR or its associated wiring (ie. sensing, auxiliary windings).

ASSEMBLY B



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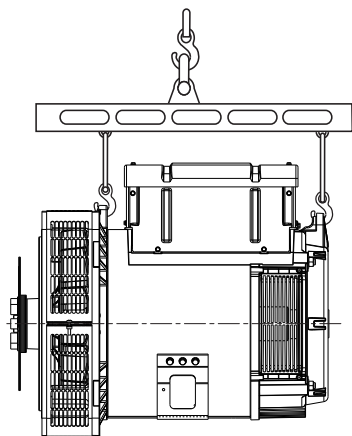
Low Voltage Alternators - 4 pole

4.6 - Dismantling, reassembly

WARNING

During the warranty period, this operation should only be carried out in an approved workshop or in our factory, otherwise the warranty may be invalidated.

Whilst being handled, the machine should remain horizontal (rotor not locked when moved). Check how much the machine weighs before choosing the lifting method.



• Tools required

To fully dismantle the machine, we recommend using the tools listed below:

- 1 ratchet spanner + extension
- 1 torque wrench
- 1 set of flat spanners: 7, 8, 10, 12 mm
- 1 socket set: 8, 10, 13, 16, 18, 21, 22, 24 mm
- 1 Allen key: size 5 (eg. Facom: ET5), size 6 (ET6), size 10 (ET10, size 14 (ET14)
- 1 T20 and T30 TORX bit
- 1 puller (U35)/(U32/350)

• Screw tightening torque

See section 5.4.

• Access to diodes

- Remove the air intake grille [51].
- Check all 3 modules using an ohmmeter or a battery lamp.

- Refit the modules.
- Refit the air intake grille [51].

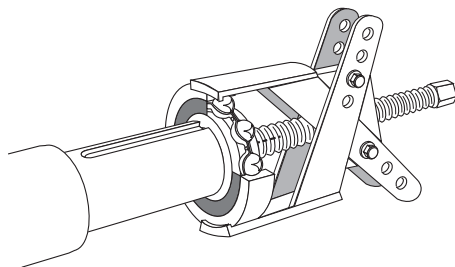
• Access to connections and the regulation system

The terminals are accessed directly by removing the terminal box lid [48]. To access the AVR adjustment potentiometers, the side plate [59] should be removed.

• Replacing the NDE bearing on single-bearing machines

- Dismantling

- Remove the terminal box lid [48].
- Unscrew the fixing clamps on the power output cables, remove the connector from the exciter and the R 791 module.
- Remove the 4 nuts on the tie rods.
- Remove the NDE shield [36] using a puller: eg. U.32 - 350 (FACOM).
- Remove the antifriction bearing [70] using a screw puller.

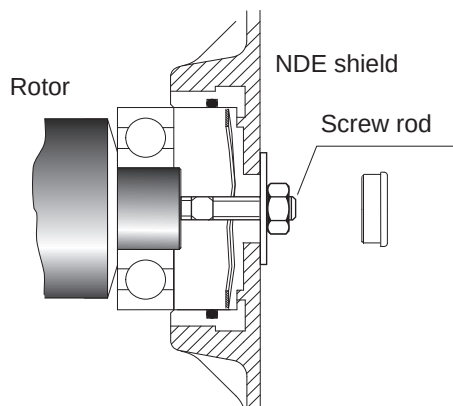


- Reassembly

- Heat the inner slipring of a new bearing by induction or in a drying oven at 80°C (do not use an oil-bath) and fit it to the machine.
- Place the preloading wavy washer [79] in the shield and fit a new O ring seal [349]. Refit the NDE shield and pass the bundle of wires between the top bars of the shield.
- Refit the fixing clamps on the cables, the R 791 module and the exciter connector.
- Replace the terminal box lid [48] and also the earth continuity screw [29].

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WARNING

When dismantling the shields, you will need to change the antifriction bearings, the “O” ring seal, the preloading (wavy) washer and adhesive paste.

• Replacing the DE bearing

- Dismantling

- Uncouple the alternator from the prime mover.
- Remove the 8 assembly screws.
- Remove the DE shield [32].
- Remove the NDE shield.
- Remove both antifriction bearings [60] and [70] using a puller with a central screw.

- Reassembly

- Heat the new bearings by induction or in a drying oven at 80°C (do not use an oil-bath) and fit them to the machine.
- Check that both the preloading wavy washer [79] and the new O ring seal [349] have been fitted on the NDE shield [36].
- Refit the NDE shield and pass the bundle of wires between the top bars of the shield.
- Refit the DE shield [32] and tighten the 8 fixing screws.
- Check that the alternator assembly is correctly mounted and that all screws are tightened.

• Accessing the main field and stator

- Dismantling

Follow the procedure for dismantling the bearings (see section 4.6).

- Remove the coupling disc (single-bearing alternator) or the DE shield (twin-bearing alternator) and insert a tube of the corresponding diameter on the shaft end.
- Rest the rotor on one of its poles, then slide it out. Use the tube as a lever arm to assist dismantling.
- After extraction of the rotor, be careful not to damage the fan or dismantle it.
- Remove the revolving field coil (rotor) and place on special V-shaped supports.

NOTE: If intervention is required on the revolving field coil (rewinding, replacement of components), the rotor assembly must be rebalanced.

- Reassembling the revolving field coil

- Follow the dismantling procedure in reverse order.

Take care not to knock the windings when refitting the rotor in the stator.

- Refit the fan with its fixing screws on the hub.

Follow the procedure for refitting the bearings (see section 4.6).

4.7 - Installation and maintenance of the PMG

The PMG reference is PMG 7. See the PMG maintenance manual, ref: 4211.



After operational testing, it is essential to replace all access panels or covers. Don't forget the screw [29] earth continuity.

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Low Voltage Alternators - 4 pole

4.8 - Table of characteristics

Table of average values:

Alternator - 2 and 4 poles - 50 Hz/60 Hz - Winding n° 6 and M or M1 connected in dedicated single-phase. (400 V for the excitation values).

The voltage and current values are given for no-load operation and operation at rated load with separate field excitation. All values are given at $\pm 10\%$ (for exact values, consult the test report) and are subject to change without prior warning. For 60 Hz machines, the resistance values are the same and the excitation current «i exc» is approximately 5 to 10% weaker.

• SHUNT resistances at 20°C (Ω)

Type	L/N stator	Rotor	Exciter field	Armature
S2	0.0503	2.354	11.647	0.422
S3	0.0503	2.354	11.647	0.422
S4	0.039	2.578	12.941	0.459
S5	0.039	2.578	12.941	0.459
M6	0.0335	2.805	12.941	0.459
M8	0.0287	3.032	12.941	0.459
L10	0.0236	3.291	12.941	0.459

• excitation current SHUNT - 400 V - 50 Hz

“i exc”: excitation current of the exciter field

Type	At no load	On load
S2	0.74	2.03
S3	0.74	2.27
S4	0.71	2.06
S5	0.71	2.24
M6	0.65	2.39
M8	0.62	2.30
L10	0.66	2.36

• AREP resistances at 20°C (Ω)

Type	L/N stator	Rotor	Exciter field	Armature
S2	0.0503	2.354	7.262	0.422
S3	0.0503	2.354	7.262	0.422
S4	0.039	2.578	8.068	0.459
S5	0.039	2.578	8.068	0.459
M6	0.0335	2.805	8.068	0.459
M8	0.0287	3.032	8.068	0.459
L10	0.0236	3.291	8.068	0.459

• AREP resistances at 20°C (Ω) on the auxiliary windings

Type	Winding X1, X2	Winding Z1, Z2
S2	0.341	0.627
S3	0.341	0.627
S4	0.304	0.571
S5	0.304	0.571
M6	0.288	0.575
M8	0.271	0.559
L10	0.247	0.524

• AREP excitation current - 400 V - 50 Hz

“i exc”: excitation current of the exciter field.

Type	At no load	On load
S2	0.96	2.61
S3	0.96	2.92
S4	0.92	2.65
S5	0.92	2.89
M6	0.83	3.08
M8	0.8	2.97
L10	0.85	3.05

• Voltage on the auxiliary windings

Type	Winding X1, X2	Winding Z1, Z2
50 Hz	55 ... 59	11 ... 16
60 Hz	66 ... 71	14 ... 19

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• 4P dedicated single-phase LSA 44.3

- Winding M SHUNT excitation (50 Hz)

Resistances at 20°C (Ω)

Type	L/N stator	Rotor	Exciter field	Armature
S2	0.012	2.354	11.647	0.422
S3	0.012	2.354	11.647	0.422
S4	0.0093	2.578	12.941	0.459
S5	0.0093	2.578	12.941	0.459
M8	0.0068	3.032	12.941	0.459

i_{exc} excitation current (A) - 240 V - 60 Hz

"i_{exc}": excitation current of the exciter field.

Type	At no load	On load
S2	0.7	1.3
S3	0.7	1.5
S4	0.7	1.3
S5	0.7	1.5
M8	0.6	1.3

• 4P dedicated single-phase LSA 44.3 -

Winding M1 SHUNT excitation (60 Hz)

Resistances at 20°C (Ω)

Type	L/N stator	Rotor	Exciter field	Armature
S2	0.0084	2.354	11.647	0.422
S3	0.0084	2.354	11.647	0.422
S4	0.0059	2.578	12.941	0.459
S5	0.0059	2.578	12.941	0.459
M6	0.0053	2.805	12.941	0.459
L10	0.0042	3.291	12.941	0.459

i_{exc} excitation current (A) - 240 V - 60 Hz

"i_{exc}": excitation current of the exciter field.

Type	At no load	On load
S2	0.8	1.7
S3	0.9	1.8
S4	1	1.9
S5	1	2
M6	0.6	1.7
L10	0.7	1.5

• Table of weights

(values given for information only)

Type	Total weight (kg)	Rotor (kg)
S2	301	120
S3	301	120
S4	338	136
S5	338	136
M6	374	150
M8	404	162
L10	439	178



After operational testing, it is essential to replace all access panels or covers.

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Low Voltage Alternators - 4 pole

5 - SPARE PARTS

5.1 - First maintenance parts

Emergency repair kits are available as an option.

They contain the following items:

SHUNT repair kit	ALT 44.3 KS 001
R 250 voltage regulator	-
Diode set assembly	-
	-

AREP repair kit	ALT 44.3 KS 002
R 450 voltage regulator	-
Diode set assembly	-
	-

Single-bearing kit	ALT 44.3 KB 001
NDE bearing	-
'O' ring seal	-
Preloading wavy washer	-

Twin bearing kit	ALT 44.3 KB 002
NDE bearing	-
DE bearing	-
'O' ring seal	-
Preloading wavy washer	-

5.2 - Technical support service

Our technical support service will be pleased to provide any additional information you may require.

When ordering spare parts, you should indicate the complete machine type, its serial number and the information given on the nameplate.

Address your enquiry to your usual contact.

Part numbers should be identified from the exploded views and their description from the parts list.

Our extensive network of service centres can dispatch the necessary parts without delay.

To ensure correct operation and the safety of our machines, we recommend the use of original manufacturer spare parts.

In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.



After operational testing, it is essential to replace all access panels or covers.

5.3 - Accessories

• Space heater for use when stopped

The space heater must run as soon as the alternator stops. It is installed at the rear of the machine. Its standard power is 250W with 220V or 250W with 110V on request.



Warning: the power supply is present when the machine has stopped.

• Temperature sensors with thermistors (PTC)

These are thermistor triplets with a positive temperature coefficient installed in the stator winding (1 per phase). There can be a maximum of 2 triplets in the winding (at 2 levels: warning and trip) and 1 or 2 thermistors in the shields.

These sensors must be linked to adapted sensing relays (supplied optionally).

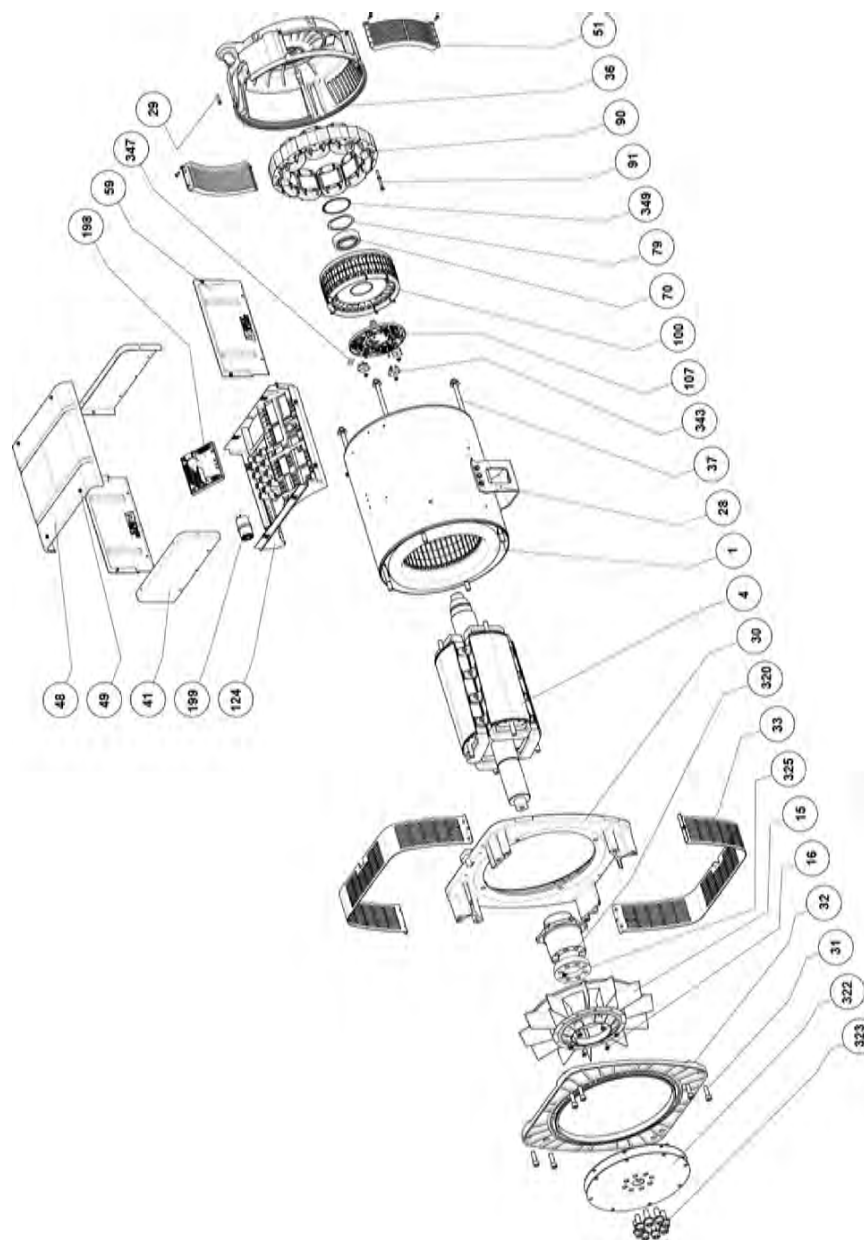
Cold resistance of cold thermistor sensors: 100 to 250 Ω per sensor.

LSA 44.3

Low Voltage Alternators - 4 pole

5.4 - Exploded view, parts list and tightening torque

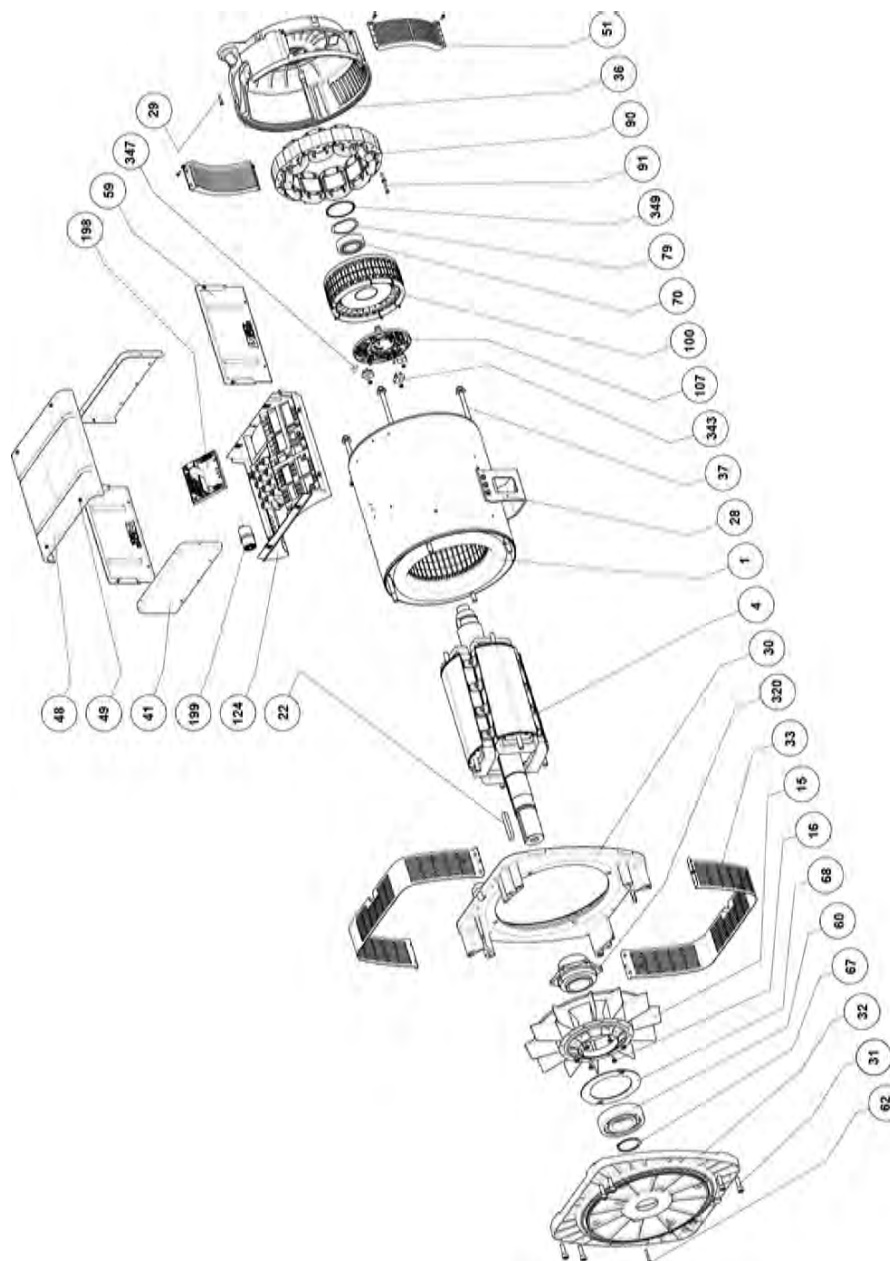
• Single-bearing



LSA 44.3

Low Voltage Alternators - 4 pole

• Double-bearing



LSA 44.3

Low Voltage Alternators - 4 pole

Ref.	Qty	Description	Screw Ø	Torque N.m	Ref.	Qty	Description	Screw Ø	Torque N.m
1	1	Stator assembly	-	-	62	2	Fixing screw	M6	8.3
4	1	Rotor assembly	-	-	67	1	Circlip	-	-
15	1	Fan	-	-	68	1	Inner bearing retainer	-	-
16	6	Fixing screw	M6	5	70	1	NDE bearing	-	-
22	1	Key	-	-	79	1	Washer preloading	-	-
28	1	Earth terminal	M6	10	90	1	Exciter field	-	-
29	1	Earth continuity screw	M6	10	91	4	Fixing screws exciter	M6	10
30	1	DE shield	-	-	100	1	Exciter armature	-	-
31	8	Fixing screw	M12	69	107	1	Diode module support	M5	6
32	1	S.A.E. washer	-	-	124	1	Terminal plate	M6	5
33	2	Air outlet grille	M6	5	198	1	Voltage regulator (AVR)	M5	3.6
36	1	NDE shield	-	-	199	1	Interference suppression module	-	-
37	4	Tie rod	M14	90	320	1	Sleeve	-	-
41	2	NDE or DE cover	-	-	322	2	Coupling disc	-	-
48	1	Top cover	-	-	323	8	Fixing screw	M16	320
49	-	Fixing screw	M5	5	325	-	Spacer shim	-	-
51	2	Air intake grille	M5	3.6	343	3	Diode module assembly	M5	3
59	2	Side cover	-	-	347	1	Surge suppressor	M6	4
60	1	DE bearing	-	-	349	1	'O' ring seal	-	-

LSA 44.3

Low Voltage Alternators - 4 pole

Leroy-Somer

Electric Power Generation Division

Declaration of CE compliance and incorporation

This Declaration applies to the generators designed to be incorporated into machines complying with the Machinery Directive Nr 2006/42/CE dated 17 May 2006.

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Declares hereby that the electric generators of the types LSA 40 - 42.3 - 44.3 - 46.2 - 47.2 - 49.1 - 50.2 - 51.2 - 52.3 - 53.2 - 54, as well as their derivatives, manufactured by Leroy-Somer or on Leroy Somer's behalf, comply with the following International Standards and Directive :

- EN and IEC 60034 -1, 60034 -5 and 60034 - 22
- ISO 8528 – 3 " Reciprocating internal combustion engine driven alternating current generating sets. Part 3. Alternating current generators for generating sets "
- Low Voltage Directive Nr 2006/95/CE dated 12 December 2006.

Furthermore, these generators, designed in compliance with the Machine Directive Nr 2006/42, are therefore able to be incorporated into Electrical Gen-Sets complying with the following International Directives :

- Machinery Directive Nr 2006/42/CE dated 17 May 2006
- EMC Directive Nr 2004/108/CE dated 15 December 2004, as intrinsic levels of emissions and immunity are concerned

WARNING :

The here above mentioned generators should not be commissioned until the corresponding Gen-Sets have been declared in compliance with the Directives Nr 2006/42/CE et 2004/108/CE, as well as with the other relevant Directives.

Leroy Somer undertakes to transmit, in response to a reasoned request by the national authorities, relevant information on the generator.

Technical Managers

A. DUTAU - Y. MESSIN



4152 en – 2015.02 / g

The contractual EC Declaration of Conformity and Incorporation can be obtained from your contact on request.

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Leroy-Somer™


EMERSON™
Industrial Automation

OPERATIONAL AND MAINTENANCE MANUAL

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