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Marine generator sets

Parallel Operation

Operator's manual

29 GS/GSC

35 GT/GTC

45 GT/GTC

50 GT/GTC

68 GT/GTC

32 GSA/GSAC

40 GTA/GTAC

54 GTA/GTAC

60 GTA/GTAC

84 GTA/GTAC

Introduction

Presentation

Dear Customer,

First, we would like to thank you for choosing a Solé Diesel product. We recommend that you read this manual carefully before carrying out any of the operations and keep it close at hand, near the genset, as it can be of great use in the future.

Our goal as a manufacturing company is that you enjoy our product, regardless of the use you make of it. The equipment manufactured in Solé Diesel facilities is designed to offer the highest performance in the most demanding operating conditions.

NOTICE

The images, text and information contained in this manual are based on the product's features at the time of publication. Solé Diesel reserves the right to modify this document without prior notice.

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Safety precautions and instructions

Solé Diesel is concerned for your safety and your machine's condition. Safety Precautions and Instructions are one of the primary ways to call your attention to the potential hazards associated with our engine operation. Follow the precautions listed throughout the manual before and during operation and maintenance procedures for your safety, the safety of others and the performance of your engine.

Types of Safety Precautions:

WARNING

Indicates the presence of a hazard that can **cause severe personal injuries, death or substantial property damages.**

CAUTION

Indicates the presence of a hazard that **will or can cause minor personal injury or property damages.**

NOTICE

Communicates installation, operation and maintenance information that is safety related but not hazard related.

WARNING

Servicing the fuel system and combustible materials. A flash fire can cause severe injury or death.



Do not smoke or permit flames or sparks near the fuel injection system, fuel line, fuel filter, fuel pump, or other potential sources of spilled fuels or fuel vapors. Never add fuel to the tank while the engine is running because spilled fuel may ignite on contact with hot parts or from sparks.

Catch fuels in an approved container when removing the fuel line or fuel system. Keep the fuel lines and connections tight and in good condition. Do not replace flexible fuel lines with rigid lines and use flexible sections to avoid fuel line breakage caused by vibrations.

Keep the compartment and the engine clean and free of debris to minimize the risk of fire.



WARNING

Servicing the air cleaner. A sudden backfire can cause severe injury or death.

Do not operate the engine with the air cleaner/silencer removed.

Combustible materials. A fire can cause severe injury or death.

Engine fuels, fuel vapours and combustible materials are flammable and explosive. Handle these materials carefully to minimize the risk of fire or explosion. Equip the compartment or nearby area with a fully charged fire extinguisher.



In case of fire do not open sound shield compartment and follow these instructions:

- Shut down engine(s)
- Continuously discharge entire contents of a halon or CO2 portable fire extinguisher (or other provision) immediately.

Safety precautions and instructions

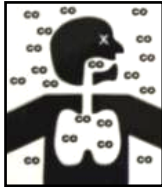


⚠ WARNING

Carbon monoxide (CO) can cause severe nausea, fainting or death.

Engine exhaust gases contains carbon monoxide gas. Carbon monoxide is an odourless, colourless, tasteless, no irritating gas that can cause death if inhaled for even a short time.

Get fresh air and do not sit, lie down or fall asleep if anyone shows signs of carbon monoxide poisoning:



- Light-headedness, dizziness
- Physical fatigue, weakness in joints and muscles. Sleepiness, mental fatigue, inability to concentrate or speak clearly, blurred vision. Stomachache, vomiting, nausea.

⚠ WARNING



Keep the area around the battery well ventilated. While the engine is running or the battery is charging, hydrogen gas is produced which can be easily ignited.

Never allow battery fluid (battery contains sulfuric acid) to come in contact with clothing, skin or eyes. Always wear safety gloves and protective clothing when servicing the battery. If battery fluid contacts the eyes and/or skin, immediately flush the affected area with a large amount of clean water and obtain prompt medical treatment.

⚠ CAUTION



Before working on the engine or connected equipment, disable the engine as follows: Set the genset controller to OFF Mode.

- (1) Disconnect the power input from battery.
- (2) Disconnect the battery cables. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Follow these precautions to prevent the starting of the engine by engine controller, remote start/stop switch, or engine start command from a remote computer.

⚠ CAUTION



Never remove the cooler cap if the engine is hot. Steam and hot engine coolant will spurt out and seriously burn you. Allow the engine to cool down before you attempt to remove the cooler cap.

⚠ NOTICE

Read the engine operator's manual and understand it before operation and maintenance of the engine, to ensure that it continues operating practices and maintenance procedures.

Hearing protection. Use to avoid hearing loss when handling the motor.

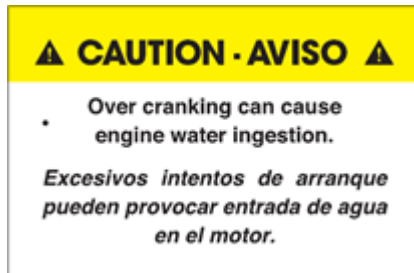
⚠ NOTICE

1. The installer / operator of the engine has to wear suitable CLOTHING for the workplace and the situation; in particular, avoid loose clothes, chains, bracelets, rings and all accessories that could become entangled with moving parts.
2. The installer / operator of the engine has to wear personal protective equipment such as gloves, work shoes, eye and hearing protection as required by the task.
3. The area in which the operator is working has to be kept tidy and free of oil and other liquid spillages and solid waste (metal chips, etc.).

Safety precautions and instructions



Engine labels



If the engine does not start after several attempts to crank may cause water entering the engine. In this situation it is recommended:

- 1) Close the seacock.
- 2) Drain the water from the exhaust system in the water trap.
- 3) Do not try to restart the engine until the cause of the start fail is identified.



El motor y/o el inversor se suministran sin ningún fluido en su interior. Consulte el manual para seguir el procedimiento de instalación y puesta en marcha.



The engine and the gearbox are supplied without any fluid inside. Consult the manual to follow the installation procedure and commissioning as well as the fluid capacity - coolant, oil and oil of gearbox

Moving parts. Keep hands, feet, hair, clothing and test leads away from the belts and pulleys when the engine is running. Replace guards, screens and covers before operating the engine.



Read the engine operator's manual and understand it before any operation and maintenance of the engine, to ensure that it continues operating practices and maintenance procedures insurance.

Dangerous voltage. Operate the engine only when all guards and electrical panels are ready.

Hot parts, coolant and steam. Stop the engine and let it cool down before touching or removing any engine part.

Moving parts. Keep hands, feet, hair, clothing and test leads away from the belts and pulleys when the engine is running. Replace guards, screens and covers before operating the engine.

Heavy material. Engine is a heavy element, use the right tools for transportation and handling.

Do not use the motor as a step. Use it as a step can cause engine damage plus cause undesired operation.



Connection point of the battery cables to the engine. Red cable (positive) and black cable (negative).

NOTICE

Engine exhaust line installation label, above and below the waterline. See 5.7. *Intake and exhaust system.*



Solé Diesel warranty

Read the manual and documents delivered with each engine before carrying out any of the operations or presenting any queries. The engine is supplied without any liquids. Ensure that the liquids used match the specifications contained in Solé Diesel manuals.

The application of the conditions described in this document shall only be effective for engines or generator sets that have been invoiced after November 4, 2011.

Solé Diesel limited warranty

Solé Diesel guarantees that at the time of shipment all its engines and generator sets comply with the provided specifications and do not have any manufacturing defects.

The limited warranty provided by Solé Diesel enters into force from the time of sale to the first end-purchaser or user of the engine or generator set. In the event that the product is not immediately delivered to the end-customer, the warranty shall enter into force 6 months after the date of sale. Any limited warranty period that has not elapsed can be transferred to the following purchaser (s).

Unless authorised otherwise by Solé Diesel, the warranty periods are applied according to the time elapsed in months from the date of purchase or the limit of hours of operation (whichever occurs first) listed in the following table:

Limited Warranty Coverage Periods				
Product	Pleasure		Comercial	
	Months	Hours	Months	Hours
Propulsion Engines	36	1000	12	2000
Generator Sets	36	1000	12	2000

Solé Diesel extended warranty

Solé Diesel an extended period of coverage for the following components: engine block, cylinder head, crankshaft, camshaft, flywheel housing, timing gear housing, timing gear, conrod.

Extended Coverage Periods				
Product	Pleasure		Comercial	
	Months	Hours	Months	Hours
Propulsion Engines	24	1500		
Generator Sets	24	1500		

Restrictions

Coverage:

- a) To validate the warranty is necessary fill and send the inspection prior to the delivery of propulsion engines or genset to Solé Diesel through an official installer. See SECTION 12.
- b) The warranty covers any failure of the product under normal operating conditions caused by a defect in manufacturing.
- c) The warranty covers the labour costs necessary to replace and/or repair the defective original components, according to Solé Diesel standards of excellence. The time period covered for these operations is limited to 4 hours.
- d) The warranty covers reasonable costs of travel required to carry out the necessary operations. The travel distance is limited to 300 kilometres in conjunction to a travel time of 3 hours.

Excluded from coverage:

- a) If Solé Diesel products are installed and used alongside other products not designed or manufactured by Solé Diesel that affect their operation, the warranty shall apply exclusively to the Solé Diesel products and shall not apply if the products from another manufacturer are inappropriate for use alongside Solé Diesel products or are the cause of the failure or poor operation of our products.
- b) The warranty doesn't will be effective if don't filled correctly and send the inspection prior to the delivery of propulsion engines and genset to Solé through an official installer. SECTION 12.
- c) The warranty shall not apply if the revisions and maintenance services indicated in the User and Maintenance Manuals have not been adhered to properly. In case of implemented warranty, supporting document of the revisions and maintenance service should be exhibited, proving the requirements outlined in the manuals have been followed.
- d) Deterioration resulting from time of storage exceeding 6 months and/or storage conditions that do not comply with the procedures described in the User and Maintenance Manuals.
- e) Deterioration resulting from not complying with the procedure for winter storage while the engine is not in service, as described in the User and Maintenance Manuals.
- f) Faults due to negligence, lack of service, accidents, abnormal use and inadequate service or installation.
- g) Faults due to the use of components not manufactured or sold by Solé Diesel.
- h) Faults due to electrical installations that do not comply with Solé Diesel design specifications or are not expressly approved by Solé Diesel.
- i) Faults due to the use of and operation with fuels, oils or lubricants that are not authorised by Solé Diesel.
- j) Faults due to water entering the cylinder(s) through the exhaust system.
- k) Faults in propulsion engines due to the use of a propeller that is inadequate for the load or application. We recommend contacting Solé Diesel to consult the choice of the correct propeller(s).
- l) Failure for general omission of the procedures described in the User and Maintenance Manuals.
- m) Components subjected to normal operating wear and tear.
- n) n) Costs due to phone communications, loss of time or money, discomfort, launching, grounding, removal or replacement of vessel parts or materials because the design of the vessel makes it necessary to do so to access the engine, and damage and/or accidents caused as a result of a failure.

Responsibilities

Responsibilities of the manufacturer:

The obligations of Solé Diesel are restricted to repairing the defective parts or, IF DEEMED APPROPRIATE BY Solé Diesel, returning the amount of the purchase or replacing the parts to prevent poor operation resulting from defective materials or faults in the manufacture covered by the warranty.

Solé Diesel reserves the right to modify the design of any of its products without taking on any obligation to modify a product that has been manufactured previously.

This manual, as well as technical documentation, manuals or pamphlets may undergo modifications without prior notice.

Responsibilities of the purchaser:

The purchaser shall be responsible for the care, operation and maintenance of the product in compliance with the contents of the User and Maintenance Manuals. The purchaser shall provide proof of all the maintenance services performed on the product. The costs of said services and that of the components and liquids replaced during said services shall be at the expense of the purchaser.

The maintenance operations described in this manual shall be performed during the Warranty Contract Periods (Limited and Extended Coverage) by an AUTHORISED Solé Diesel DEALER. Non-compliance with this condition shall void the warranty in all its terms. In such an event, the materials (oil, filters, etc.) and labour involved shall be at the expense of the purchaser. The purchaser should keep the invoice of the work performed as proof.

If the service is not covered by the warranty, the purchaser must pay for all labour performed, the associated materials and any other expense related to the service.

All shipments of products or components sent by the purchaser for inspection and repair shall be paid in advance by the purchaser.

After-sales service contact

Claims shall be presented during the warranty period to the nearest authorised Solé Diesel dealer (see chart of Solé Diesel Dealers), who shall take care the service covered by the warranty.

The purchaser must provide a proof of purchase and date of purchase by presenting the invoice to the authorized dealer for the purchase of the product served or a copy of it. Claims under warranty shall not be dealt with by the dealer until the date of purchase has been verified.

The following information must also be provided by the purchaser:

- a) Owner's name, address and contact telephone number.
- b) Product model and serial number.
- c) Number of service hours of the product.
- d) Detailed description of the problem.
- e) Information regarding any repair or installation performed by a service not included in the Solé Diesel distribution network, as well as the services performed.

For an updated list of our distribution network, visit Dealers section in our web page www.soleDiesel.com.

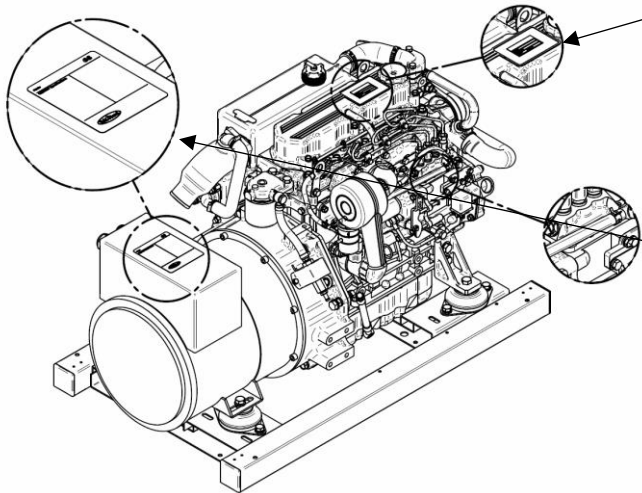
Or request this information by contacting Solé Diesel at: **e-mail:** info@soleDiesel.com
Phone: +34 93 775 14 00

Section 1 – Genset Information

1.1. Genset Identification

Identification label

The nameplate is located above the rocker cover. The characteristics plate of genset it's located above the alternator case.



Solé Diesel <small>MADE IN SPAIN</small>	
TIPO	
TYPE	
MOTOR Nº	
ENG No.	
KW	R.P.M.

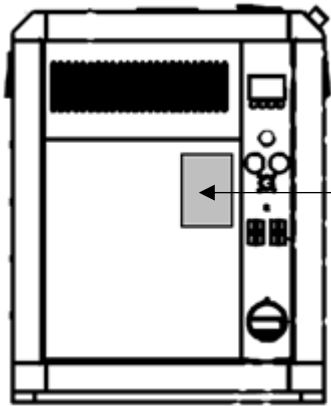


Model: 25 GT S/N: 116027

AC Voltage:	400/230 V	Firing Order:	1-3-4-2
Amp:	35.1 A	Oil capacity:	6.5 L
Freq:	50 Hz	Cool. capacity:	9.5 L
Phase:	3 PH + N	Oil:	SAE 15W40
Max Power Output:	19.4 kW	Coolant:	Orgine: 50% 38°C
Prime Power Output:	17.7 kW	Hose diameter:	60
RPM:	1500		
DC Voltage:			
Fuel:	DIESEL		
Insulation:	H		
Degree of Protection:	IP 23		
No of cylinders:	4		
Bore x Stroke:	88 X 103		
Year:	2020		
Weight:	413 Kg		

REFER TO OPERATOR'S
MANUAL FOR MAINTENANCE
SPECIFICATIONS AND
ADJUSTMENTS

The characteristics plate of canopy genset it's located outside, as shown in the following picture:



Model: 25 GT S/N: 116027

AC Voltage:	400/230 V	Firing Order:	1-3-4-2
Amp:	35.1 A	Oil capacity:	6.5 L
Freq:	50 Hz	Cool. capacity:	9.5 L
Phase:	3 PH + N	Oil:	SAE 15W40
Max Power Output:	19.4 kW	Coolant:	Orgine: 50% 38°C
Prime Power Output:	17.7 kW	Hose diameter:	60
RPM:	1500		
DC Voltage:			
Fuel:	DIESEL		
Insulation:	H		
Degree of Protection:	IP 23		
No of cylinders:	4		
Bore x Stroke:	88 X 103		
Year:	2020		
Weight:	413 Kg		

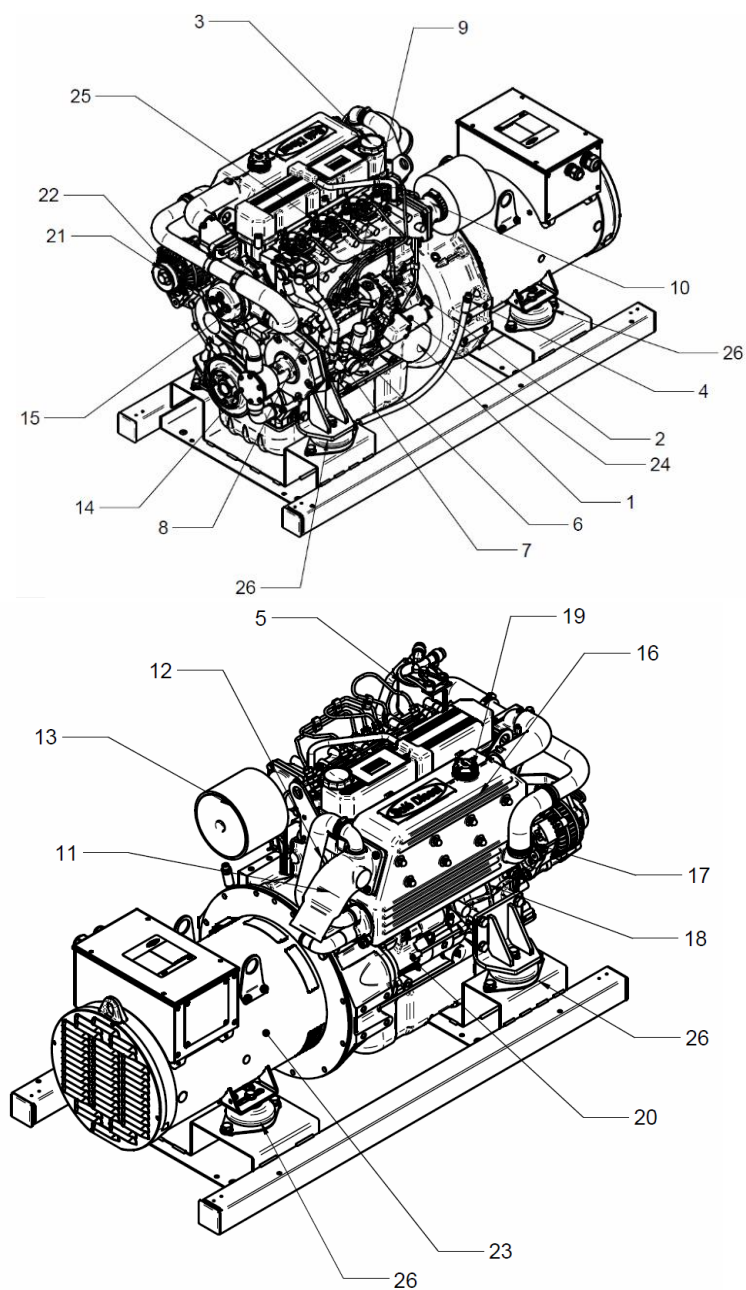
REFER TO OPERATOR'S
MANUAL FOR MAINTENANCE
SPECIFICATIONS AND
ADJUSTMENTS

GENSET SERIAL NUMBER:

In addition, all gensets are marked with the serial number on the block, on the fuel injection pump.

1.2. Genset parts identification

Gensets 29 GSC / 35 GTC / 32 GSAC / 40 GTAC:

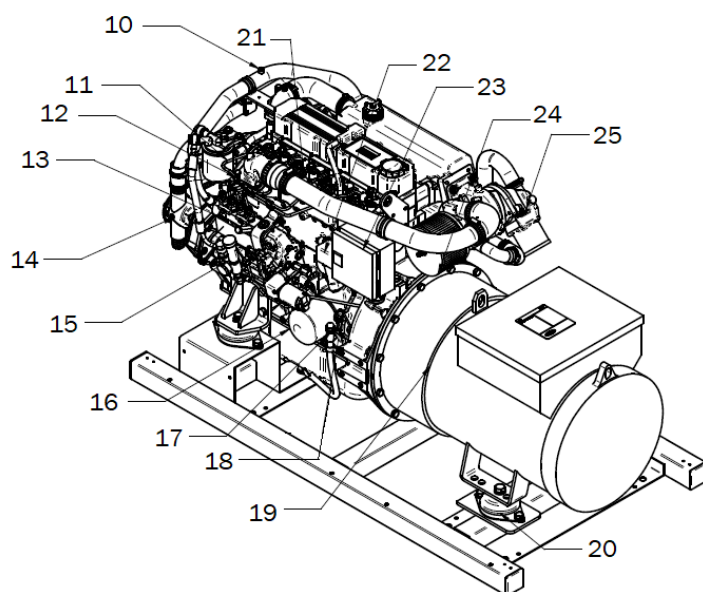
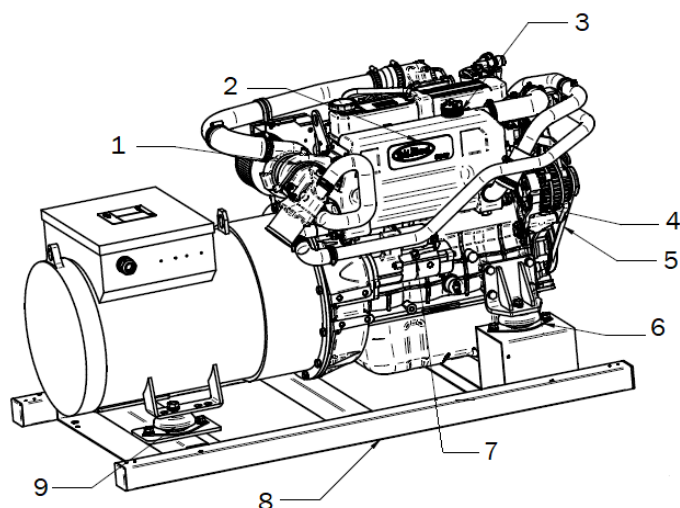


PIECE	ELEMENT
1	Oil filter
2	Oil dipstick
3	Oil filler plug
4	Oil drain pipe
5	Fuel filter
6	Manual priming pump
7	Injection pump
8	Fuel pump
9	Injectors
10	Air inlet elbow
11	Wet exhaust elbow
12	Relay set
13	Air filter
14	Seawater pump
15	Cooler pump
16	Cooler body
17	Anode
18	Coolant drain plug
19	Coolant filler plug
20	Starter assy
21	DC alternator
22	Alternator pulley
23	AC alternator
24	Stop solenoid
25	Glow plugs
26	Silentblock

Genset information

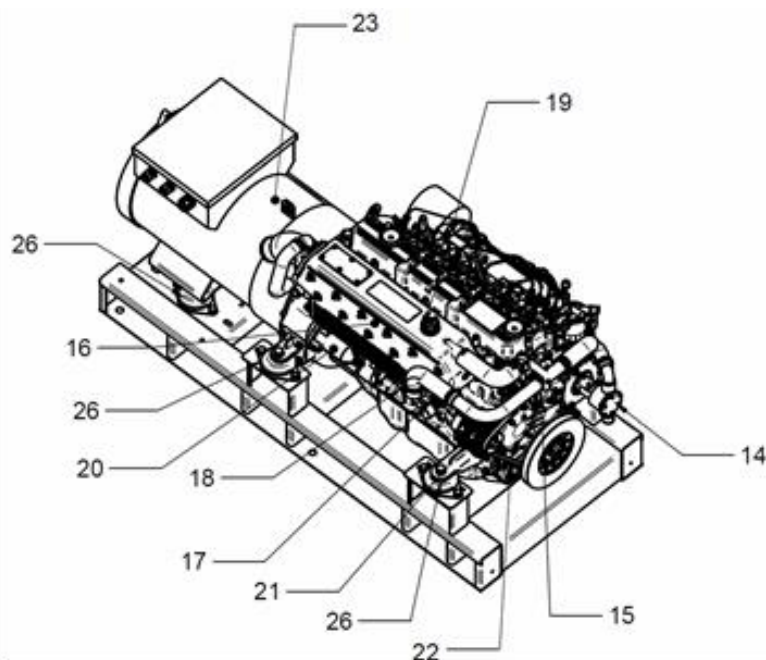
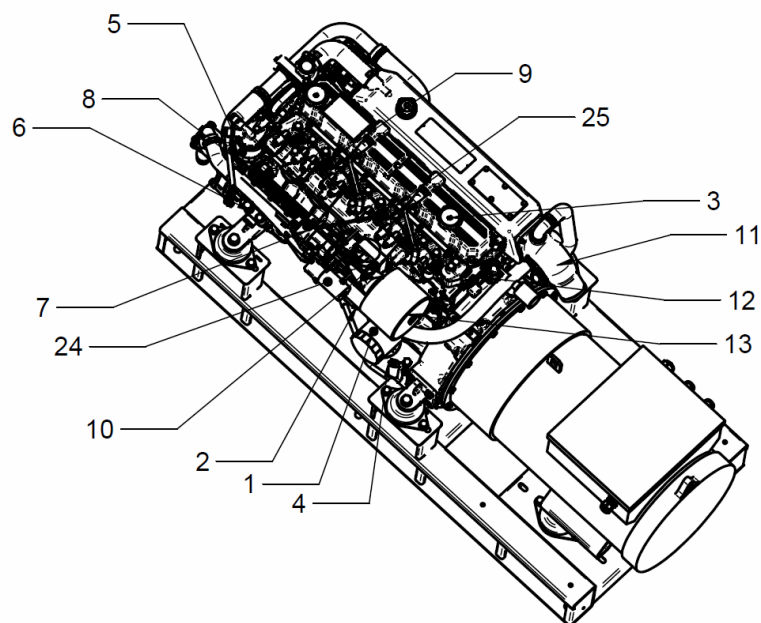


Gensets 45 GTC / 54 GTAC:



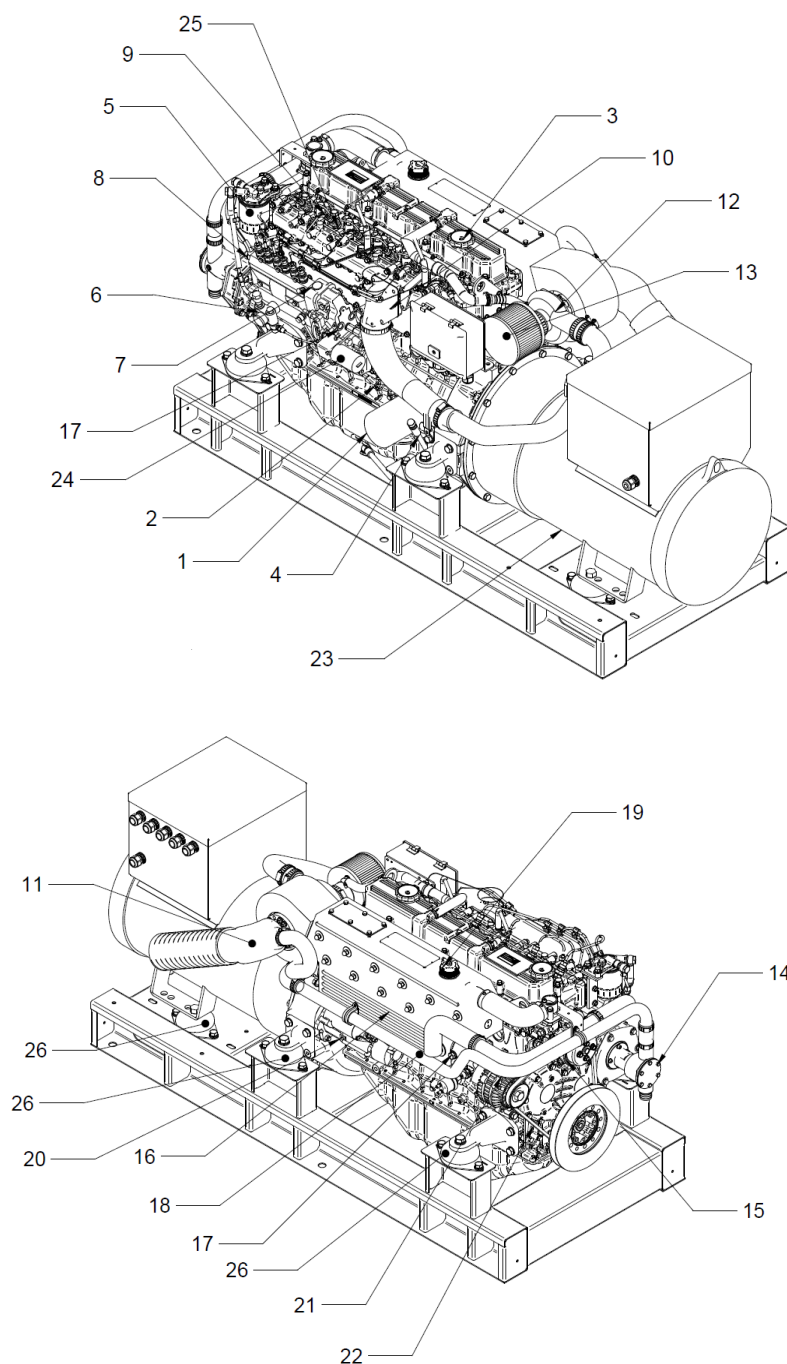
PIECE	ELEMENT
1	Turbocharger
2	Cooler body
3	Coolant drain plug
4	DC alternator
5	V-Belt
6	Silentblocks
7	Starter assy
8	Genset chassis
9	Silentblocks
10	Coolant drain plug
11	Fuel filter
12	Injection pipe
13	Injection pump
14	Seawater pump
15	Manual priming pump
16	Oil filter
17	Oil drain tube
18	Oil dipstick
19	AC alternator
20	Silentblocks
21	Injectors
22	Earth isolated relay
23	Relay box
24	Air filter
25	Wet exhaust elbow

Gensets 50 GTC / 60 GTAC:



PIECE	ELEMENT
1	Oil filter
2	Oil dipstick
3	Oil filler plug
4	Oil drain pipe
5	Fuel filter
6	Priming pump
7	Oil drain plug
8	Fuel pump
9	Injectors
10	Air inlet elbow
11	Wet exhaust elbow
12	Relay set
13	Air filter
14	Seawater pump
15	Raw water pump
16	Cooler body
17	Anode
18	Coolant drain plug
19	Coolant filler plug
20	Starter assy
21	DC alternator
22	V-belt
23	AC alternator
24	Stop solenoid
25	Glow plugs
26	Silentblocks

Gensets 68 GTC / 84 GTAC:



PIECE	ELEMENT
1	Oil filter
2	Oil dipstick
3	Oil filler plug
4	Oil drain pipe
5	Fuel filter
6	Priming pump
7	Fuel pump
8	Fuel feed pump
9	Injectors
10	Air inlet elbow
11	Wet exhaust elbow
12	Turbocharger
13	Air filter
14	Seawater pump
15	Raw water pump
16	Cooler body
17	Anode
18	Coolant drain plug
19	Coolant filler plug
20	Starter assy
21	DC alternator
22	V-belt
23	AC alternator
24	Stop solenoid
25	Glow plugs
26	Silentblocks

Section 2 – Transport, Handling and Storage

2.1. Reception

When the genset is delivered make sure that the packing has not been damaged during transport and that it has not been tampered with or that components inside the packing have been removed (see information marked on covers, bases and cartons).

Place the packed genset as close as possible to the place of installation and remove the packing material, checking that the goods supplied correspond to the order specifications.

⚠ NOTICE

If you notice damage or missing parts, inform Solé Diesel after-sales departments and the carrier immediately and forward photographic evidence of the damage.

After inspecting the goods if you notice damage, write a reservation on the delivery note. Have the carrier countersign the note and advise Solé Diesel, preferably by mail (info@solediesel.com).

2.2. Transporting and Handling the Packed Genset

When lifting and transporting the genset use EXCLUSIVELY a forklift or bridge crane of appropriate load capacity, with chains equipped with safety hooks suitable for lifting the load.

The use of any other system automatically invalidates the insurance guarantee against possible damage to the genset.

To unpack the genset, you must follow these steps:

1. Remove the cardboard crate.
2. Lift the genset using a forklift and suitable chains, which hook to the genset eyebolts.
3. Transfer the genset to the intended position of installation.
4. Remove the wooden base.
5. Begin installation operations.

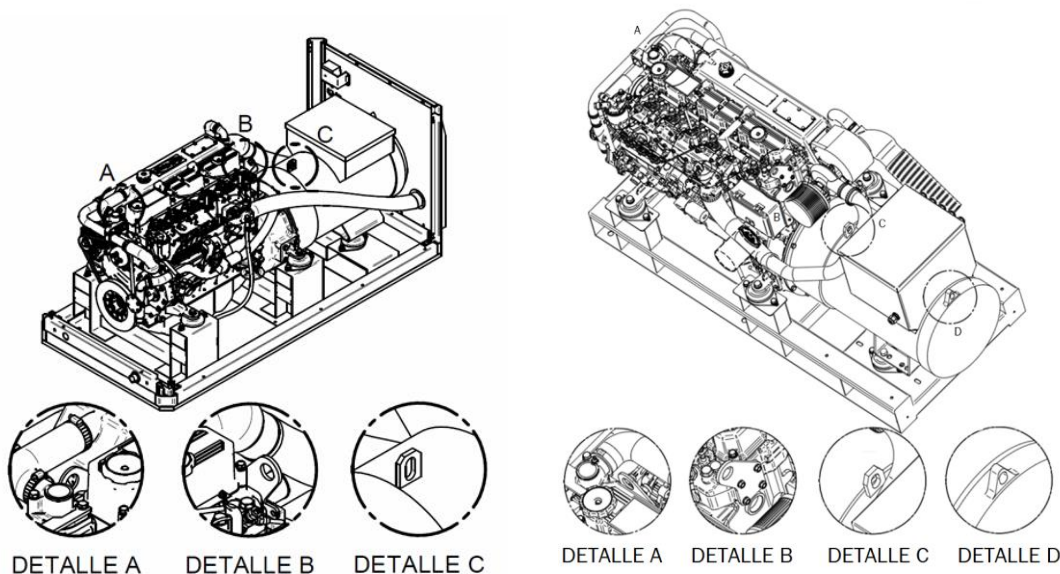


2.3. Transporting and Handling the Unpacked Genset

When the genset is unpacked and ready for transport, use EXCLUSIVELY the appropriate lifting eyebolts.

For gensets 29 GSC / 32 GSAC / 35 GTC / 40 GTAC / 45 GTC / 54 GTC / 50 GTC / 60 GTAC:

For gensets 68 GTC / 84 GTAC:



2.4. Storage of Packed and Unpacked Genset

If the genset is left idle for prolonged periods, the client must check the possible conditions of conservation in relation to the place of storage.

If the genset is unused for prolonged periods and stored, observe all the relative technical specifications.

The treatment of the genset for storage is guaranteed for 6 months after the time of delivery.

⚠ NOTICE

If the user decides to start the genset after a long-time period, this must be done in the presence of an authorized technic

Section 3 – Installation

3.1. Angle of Installation

Make sure the genset is installed on a level surface. Otherwise, the following angular operation maximum is permitted:

	Continuously	Temporary
29 GSC / 32 GSAC / 35 GTC / 40 GTAC / 45 GTC / 54 GTAC / 50 GTC / 60 GTAC / 68 GTC / 84 GTAC	15°	25° (Max. 30 min.)

If the genset operates in these conditions, check *Section 5.4. Lubrication System*.

3.2. Genset installation

Follow these steps to install the genset:

1. Fix genset. See *10.4 Genset Dimensions* (mounting holes) and *Section 9 Tightening Torques*.
2. Connect exhaust outlet. See *10.4 Genset Dimensions*.
 1. Wet exhaust outlet
 2. Dry exhaust outlet + Seawater outlet
3. Connect siphon breaker. (If installed) See *10.4 Genset Dimensions* and *5.7 Inlet and exhaust system*.
4. Connect sweater inlet. See *10.4 Genset Dimensions*.
5. Connect fuel inlet. See *10.4 Genset Dimensions*.
6. Connect leak coolant outlet. See *10.4 Genset Dimensions*.
7. Fill the lubrication circuit with an adequate oil. See *5.4 Lubrication System*.
8. Fill the cooling circuit with an adequate coolant. See *5.6 Cooling System*.
9. Check each pipe connection for oil or coolant leaks.
10. Connect to earth. See *5.5 Fuel System*.
11. Prime the fuel system. See *5.5 Fuel System*.
12. Connect to control panel. See *Section 10.4 Genset Dimensions*.
13. Connect to the battery. Follow label battery connection into the genset.

NOTICE

It is necessary to install a waterlock (supplied as accessory) in the exhaust system to avoid water ingestion (See *5.7 Inlet and exhaust system*).

Section 4 – Operation

4.1. Prestart checklist

Follow these checks and inspections to ensure the correct genset operation. In addition, some checks require verification after unit starts.

AIR CLEANER: Check for a clean and installed air cleaner element to prevent unfiltered air from entering the genset.

AIR INLETS: Check for clean and unobstructed air inlets.

BATTERY: Check for tight battery connections.

COOLANT LEVEL: Check the coolant level according to coolant circuit capacity.

DRIVE BELTS: Check the belt condition and tension of the coolant pump and battery charging alternator belt.

EXHAUST SYSTEM: Check for exhaust leaks and blockages. Check the silencer and piping condition and check for tight exhaust system connections.

Check that the exhaust outlet is unobstructed.

FUEL LEVEL: Check the fuel level and keep the tank(s) full to ensure adequate fuel supply.

OIL LEVEL: Maintain the oil level below dipstick high mark and above dipstick low mark.

OPERATING AREA: Check for obstructions that could block the flow of admission air.

SEAWATER PUMP PRIMING: Prime the seawater pump before initial startup. To prime the pump:

- Close the seacock.
- Remove the hose from the seawater-filter outlet.
- Fill the hose and seawater pump with clean water.
- Reconnect the hose to the water filter outlet.
- Open the seacock.

Confirm seawater pump operation on startup as indicated by water discharge from the exhaust outlet.

4.2. Genset Operation at Low Temperatures

Whenever the atmospheric temperature drops below zero, the following series of circumstances occur:

- The cooling liquids may freeze.
- The oil becomes thicker.
- There is a drop in the voltage at the battery terminals.
- The inlet air temperature is low and the genset has difficulty in starting.
- The fuel loses fluidity.

To prevent the damage caused by low temperature operation, the genset should be prepared:

1. Use special low temperature coolant or suitable anti-freezing agent concentration.
2. Close the seawater cock, when the genset is stopped. Open the seawater filter cover and start the genset adding a mixture of freshwater and suitable anti-freezing agent concentration (see package labels) until the seawater circuit is filled completely. Stop the genset and replace the seawater filter cover. Before starting the genset again, open the seawater cock. Repeat this operation whenever the genset is used at temperatures below 0°C.
3. Use oil with suitable quality and viscosity. SAE 15W40 is recommended. Under extreme conditions contact with technical support.

4. Cover battery with an adequate material to protect it against the cold. Check that the battery is fully charged.
It is also advisable to use a dielectric spray on the electrical connections.
5. When starting the genset, make sure that the glow plugs become hot enough.
6. If necessary, replace the Diesel oil by a specified Diesel oil type for low temperatures. The accumulation of impurities in the fuel tank could cause faulty firing.

⚠ NOTICE

All gensets not in use are subject to rusting and corrosion of machined surfaces that are not protected with a paint coating. The degree of corrosion depends on meteorological changes and climatic conditions. The following recommendations are therefore of a general nature but they will help prevent or reduce the risk of damage due to rusting.

4.3. Winterization and Preservation

If the boat is not going to be used for a long period of time or during the winter, certain tasks must be carried out to keep it in perfect operating condition. If there is no care, the inside parts can oxidize and cause damage on the genset. When the genset is stored, steps indicated below have to be followed:

1. Clean the outer surface of the genset.
2. Bleed the seawater circuit by filling it with fresh water. Fill the seawater circuit again with a mixture of fresh water and anti-freezing agent.
3. Remove the impeller from the seawater pump, clean it with fresh water and store it in place protected from moisture and sunlight.
4. Renew and refill the heat exchanger to the maximum level with a mixture of fresh water and anti-freezing agent.
5. Renew the oil and oil filter in the genset.
6. Cover the air intake.
7. If the fuel tank is small, empty it completely and clean it; fill it up again with a mixture of Diesel and anti-corrosion additive. Solé S.A. recommends DIECYL PLUS. Add one measure of this additive for every 25 litres of Diesel. On the other hand, if the fuel tank is large, add 1 litre of this additive for every 500 litres of Diesel.
8. Clean and dry the area where the genset is installed.
9. Loosen the belts.
10. Apply dielectric spray on the electrical connection, disassemble the battery and charge it several times during the time it is not being used.
11. Apply moisture repellent spray on the motor.

4.4. Maintenance during the storage

During the long genset storage, it has to be stored inside a ventilated area and free of humidity.

When the genset stay stopped for 3 months or more, inside parts can be oxidize and lost the oil film. As a result, the genset could to size up after the storage. To avoid this, the genset must work periodically during the storage.

Realize the following steps at least once per month:

1. In case that has a battery next to the genset, check the electrolyte level and fill it.
2. Start the genset during approximately 10 seconds.
3. Stop the genset during 1 minute. Repeat this action two or three times.
4. Be sure that oil pressure of the genset increase.
5. Get the genset work during 5 or 10 minutes without load, as maintenance operation.

4.5. Restoration of Operational Conditions

When starting up the genset again after winter lay-up, certain operations must be performed. Follow these steps:

1. Fill the fuel tank with clean Diesel. The mixture of Diesel oil and anti-corrosion additive in tank for winter lay-up can be used to operate the genset.
2. Get the genset work during 5 or 10 minutes without load, as maintenance operation.
3. Check the fuel filter. If the filter is clogged, replace the filter.
4. Renew the oil in the genset.
5. Check the condition of coolant circuit's rubber hoses.
6. Reconnect the battery and apply a layer of neutral Vaseline to the battery terminals.
7. Remove the nozzle supports and clean them. If possible, verify the setting of the nozzles at a workshop. Then install the clean nozzles.
8. Connect the cooling and exhaust system. Open the seawater cock.
9. 9. Verify whether there are any leaks in the fuel, coolant and oil systems.

Section 5 – Systems and scheduled maintenance

5.1. Operating Description

Information of special tools required and basic safety precautions.

Disassembly:

- ✓ Use the correct tools and instruments. Serious injury or damage to the genset can result from using the wrong tools and instruments.
- ✓ Use an overhaul stand or work bench if necessary. Also, use assembly bins to keep the genset parts in order of removal.
- ✓ Lay down disassembled or cleaned parts in the order in which they were removed. This will save you time at reassembly.
- ✓ Pay attention to the marks on assemblies, components and parts for positions or directions. Put on your own marks, if necessary, to aid reassembly.
- ✓ Carefully check each part for faults during removal or cleaning. Signs of abnormal wear will tell if parts or assemblies are functioning improperly.
- ✓ When lifting or carrying heavy parts, get someone to help you if the part is too awkward for one person to handle. Use jacks and chain blocks when necessary.

Reassembly:

- ✓ Wash all genset parts, except oil seals, O-rings, rubber seals, etc. in cleaning solvent and dry them.
- ✓ Use only the correct tools and instruments.
- ✓ Use only good quality lubricating oils and greases. Be sure to apply a coat of oil, grease, or sealant to parts as specified.
- ✓ Use a torque wrench to tighten parts when specified tightening torques is required.
- ✓ Replace all gaskets and packing. Apply appropriate amount of adhesive or liquid gasket when required.

NOTICE

- ✓ Increase the frequency of maintenance in harsh duty conditions (frequent stops and starts, dusty surrounding, prolonged winter season, no-load running).
- ✓ Risk of burns during maintenance operations carried out when the genset is hot. Wear suitable safety clothing.
- ✓ It is strictly forbidden to clean the genset with compressed air.
- ✓ It is strictly forbidden to perform maintenance/cleaning operations in the presence of moving parts.
- ✓ Use gloves, overalls, etc. to protect the body from burns.

5.2. Periodic Maintenance Schedule

The maintenance and fault diagnostic procedures involve risks that may cause severe injury or even death. These procedures should therefore be carried out solely by qualified electrical and mechanical specialists. Before any maintenance and cleaning work, make sure that there are no moving parts, that the generator housing has cooled to ambient temperature, that the electricity generating set cannot be accidentally started up and that all procedures are strictly observed.

Systems and scheduled maintenance



		Intervals							
	Inspection Item	Daily	1st 20h-50h	Every 200h	Every 400h	Every 800h	Every year	Every 2 years	Winter storage and Preservation
General	Screw tightening, fastening.		I		I				CL
	Engine block.								
	Valve clearance.				I				
	Exhaust gas, noise and vibrations.	I							
	Compression pressure.					I			
Lubrication system*	Genset oil.	I	C	C			C		C
	Oil filter.		C	C					
Fuel System	Fuel level.	I						CL	E/CL/I
	Fuel tank.								
	Fuel filter.				C				
	Water separator filter (if applicable).		E		C				
	Injection pump.					I			
	Injector.					I			
Cooling system	Purge the feed system.							I	C I/CL I/CL
	Coolant.	I						C	
	Sea water circuit								
	Water filter	I	CL	CL					
	Sea water cock	I							
	Sea water pump impeller.			I/C	I				
Intake system	Anode			I/C					I
	Air filter.		I		C			C	
Electrical system	Instruments.	I							I
	Starter and alternator.				I				
	Belt.		I		I	C			
	Battery level		I	I		C			
	Main alternator - electrical insulation.					I			

* Use oil with 15W40 viscosity and no less than ACEA E5 or API CH-4/SJ quality.

I: Inspect, adjust or fill. E: Empty. C: Change. CL: Clean.

5.3. General

Solé Diesel offers several maintenance packs for its gensets, you can find more information about on the website:

- Welcome pack.
- On board pack.
- 50 hours Maintenance pack
- 1600 hours Maintenance pack
- 3000 hours Maintenance pack



Maintenance task. Screw tightening, fastening

For details of tightening torques see *Section 9 Torques*.

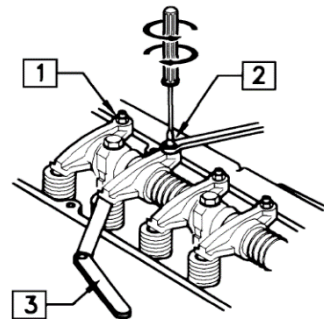
Maintenance task. Valve clearance inspection

The rocker cover must be dismantled to check the valve clearance. This operation must be carried out when the genset is cold.

Item		Assembly standard
Valve clearance (cold setting)	Inlet	0,25 mm
	Exhaust	

Inspection

1. Insert the appropriate thickness gauge between the rocker arm and valve cap to check the clearance.
2. Loosen the rocker nut (1).
3. Tighten or loosen adjusting screw (2) to adjust valve clearance by checking thickness with thickness gauge (3).
4. When you have adjusted the thickness, tighten the rocker nut and recheck the thickness.



With piston nº1 in the top dead centre of the compression cycle, adjust the play of the intake and exhaust valves of cylinder nº 1. Proceed similarly as with the other cylinders. The position of the BTDC can be confirmed with the alining signs of the distribution or timing cover and the crankshaft pulley.

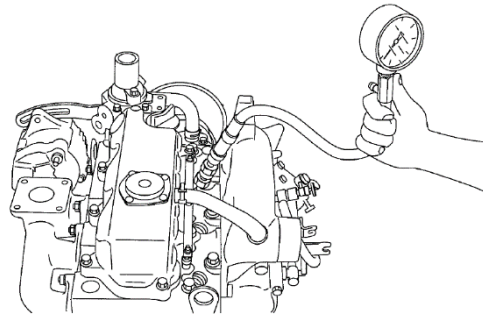
NOTICE

The adjustment of the valve play must be made after the cylinder head screws are again tightened. (Strictly comply with the operation sequence indicated in the section 9).

Maintenance task. Compression pressure inspection

Start by:

1. Make sure the genset oil level, air cleaner, starting motor and battery are well-conditioned.
2. Start the genset and allow it to warm up thoroughly, until 50°C or more coolant temperature.



Measure the compression pressure on all cylinders:

1. Remove the injection nozzle from the cylinder head where the compression pressure is to be measured.
2. Attach the compression pressure gauge.
3. Disconnect the stop solenoid connector (the fuel supply shut off) and crank the genset by means of the starter and read the compression pressure gauge indication when the genset is running at specified speed.
4. If the compression pressure is lower than repair limit, check the genset parts affected.

Model	Genset speed	Compression pressure	Repair limit
29 GSC / 32 GSAC / 35 GTC / 40 GTAC / 45 GTC / 54 GTAC / 50 GTC / 60 GTAC / 68 GTC / 84 GTAC	300 rpm	2,94 MPa (30 kgf/cm ²)	2,64 MPa (27 kgf/cm ²)

▲ NOTICE

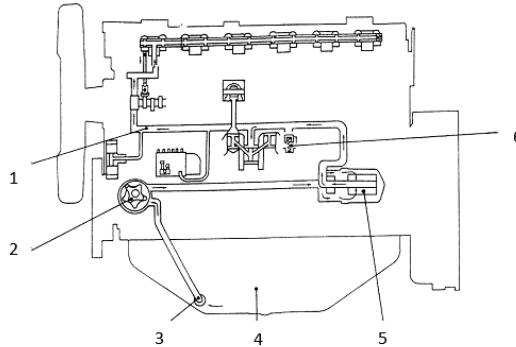
- It is not a good practice to measure the compression pressure on only few cylinders and presume the compression on the remaining cylinders.
- Compression pressure varies with genset speed. Check genset speed when measuring the compression pressure.
- The compression pressure will be slightly higher in a new or overhauled genset due to new piston rings, valve seats, etc.

5.4. Lubrication System

Circuit description

The lubrication circuit is forced by the trochoid gear pump, and it is composed of the following elements.

PIECE	ELEMENT
1	Main gallery
2	Oil pump
3	Oil strainer
4	Oil pan
5	Oil filter
6	Pressure relief valve



	*Oil circuit capacity (L)
29 GSC / 32 GSAC / 35 GTC / 40 GTAC / 45 GTC / 54 GTAC	10,0
50 GTC / 60 GTAC	9,0
68 GTC / 84 GTAC	12,0

*Including filter change (0,5l)
The minimum oil pressure in all lubrication system is **0,1 kg/cm²**.

Oil specifications

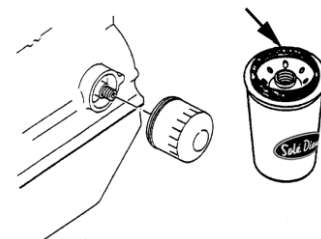
Use oil with 15W40 viscosity (this is an all-season oil for temperatures ranging between -15°C and +40°C) or select the most suitable oil viscosity for the atmospheric temperatures on which the genset is going to be operated. On the other hand, use oil quality no less than ACEA E5/E3 or API CH-4/SJ. Other genset oils may affect warranty coverage, cause internal genset components to seize and/or shorten genset life.



Never mix different types of genset oil. This may adversely affect the lubricating properties of the genset oil.

Maintenance task. Oil filter change

The oil filter is located under inlet manifold of the engine. When fitting a fresh oil filter, smear a small quantity of oil into the annular seal and firmly tighten it with the hand. When this operation is finished, start the genset and check oil is not leaking.



Maintenance task. Oil level check

Check the oil level in the crankcase daily or before each start-up to ensure that the level is between the upper (Max mark) and lower (Min mark) lines on the dipstick. To check the oil level:

1. Remove the dipstick
2. Wipe the dipstick end
3. Reinsert inside the guide
4. Remove it again to see the oil level

If the genset is fitted inclined, the oil dipstick must be modified to avoid problems of aspiration by the oil pump. Follow next steps to perform the modification:

1. With the engine in horizontal position, fill the oil circuit until the dipstick minimum mark and take note of the quantity of oil used.
2. With the engine in horizontal position, fill the oil circuit until the dipstick mark maximum and take note of the quantity of oil used.
3. With the engine inclined, fill the oil circuit with the maximum oil quantity, according to the previous amount

Then, extract the difference between the maximum and minimum quantity, and mark the new minimum.

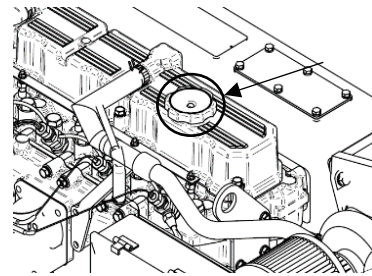
▲ NOTICE

Do not operate the genset if the oil level is below the Min mark or above the Max mark.

Maintenance task. Oil fill / change

Oil must be changed with hot genset so as to be sure the oil is fully drained. The procedure is the following:

1. Drain the oil (follow steps below)
 - a. Stop the genset.
 - b. Disconnect the battery negative (-) terminal.
 - c. Remove the oil drain plug.
 - d. Connect the external oil pump to the end of the oil drain hose. Place the outlet of the pump into an oil collection container.
 - e. Allow time for the genset oil to drain completely.
2. Replace the oil filter.
3. **Remove dipstick**
4. Fill with oil according to oil capacity circuit.
5. Check for leaks.
6. Check oil level according to the oil level check procedure.



▲ NOTICE

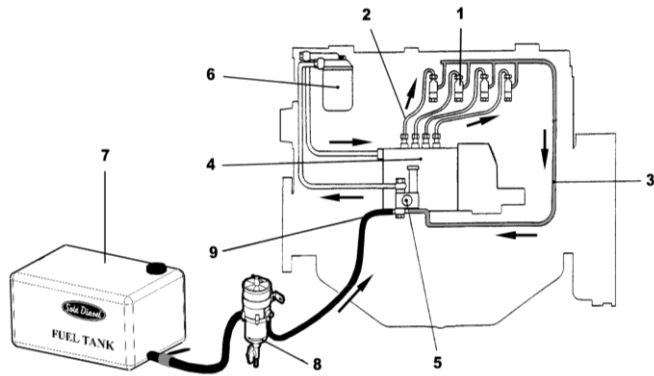
Never overfill. Overfilling may result in white exhaust smoke, genset overspeed or internal damage.

5.5. Fuel System

Circuit description

The fuel system is based on a fuel feed pump and an in-line mechanical injection pump.

PIECE	ELEMENT
1	Fuel injection nozzle
2	Fuel injection pipe
3	Fuel leak-off pipe
4	Injection pump
5	Feed fuel pump
6	Fuel filter
7	Tank (not supplied)
8	Fuel decanting filter (supplied as accessory)
9	Fuel intake pipe (supplied as accessory)



Fuel specifications

Use ASTM Diesel fuel No.2-D for the best genset performance, to prevent genset damage. Never use kerosene, heavy Diesel fuel or bioDiesel. It is essential to use clean and filtered Diesel oil.

The use of Diesel oil that not complies with the technical specifications may affect warranty coverage and cause serious damage in the injection system and internal genset components.

Maintenance task. Fuel level inspection

Periodically, it is necessary to check the fuel level to assure the operation of the genset. On top of that, if fuel pump sucks air when the fuel level is lower than pump suction, it could break.

Whenever possible, keep the fuel tank full. The temperature changes may cause condensation of the damp air present in the tank and this water accumulates at the bottom. It can cause an increase of corrosion or an impossibility of starting the genset if this water is aspirated by the fuel pump.

Maintenance task. Fuel tank clean

The fuel impurities could obstruct the suction pump. For this reason, drain out the content of the fuel tank to remove condensate and any foreign material. Then, wash the tank with fuel and refill it.

Maintenance task. Water separator filter purge

The fuel system has to have a water separator filter (supplied as accessory) to avoid the inlet of water in the fuel circuit. According to the maintenance plan it is necessary to purge the filter to eliminate water periodically. This is the procedure:

1. Loosen the bottom nut to eliminate water.
2. Shut it off again.



3. Check for any leakage.

Maintenance task. Fuel filter change

Procedure to change the fuel filter:

1. Close the fuel supply valve.
2. Disconnect fuel pipes from the fuel filter.
3. Remove fuel filter with a bell key.
4. Place a new fuel filter.
5. Reconnect fuel pipes from the fuel filter.
6. Open the fuel supply valve.
7. Once finished with this operation, start the genset and check for oil leaks.



CAUTION

Wash hands after any contact with Diesel fuel.

Maintenance task. Injection pump inspection

The injection pump is adjusted at factory and should never be adjusted carelessly. Such adjustment, whenever is required, shall be made by a Solé Diesel licensed service shop, since a precision pump monitor and skill knowledge are required.

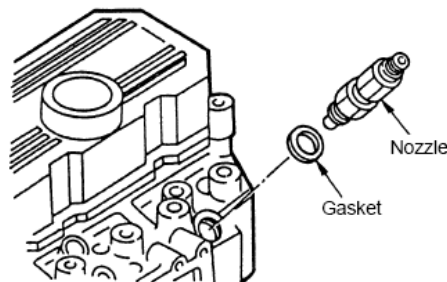
You must check:

- The presence of exhaust smoke colour.
- Procedure: quickly accelerate genset.
- Criteria: no remarkably black smoke exhaust, and correct function of fuel cut-off solenoid
- Any leaks at the body injection pump or fuel lines

Maintenance task. Injector inspection

To check the injection pressure of injectors (opening pressure) you have to follow these steps:

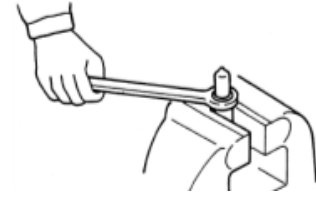
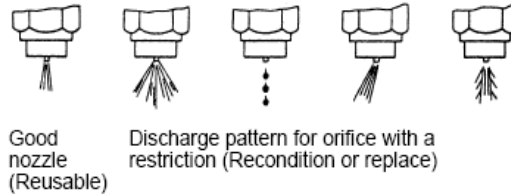
1. Remove nozzle and washer.
2. Install the injection nozzle on the tester. Slowly operate the tester handle full strokes to bleed (remove) air from the pipe and nozzle.
3. Make a slow increase in pressure by operating the tester handle at a speed of more than one stroke per second while observing the pressure gauge.
4. The pressure gauge reading will slowly increase and, when the nozzle starts discharging fuel, it will go down fast. Take the gauge reading right then as the injection pressure.



Injection pressure	13,73 MPa (140 kgf/cm²)
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5. To adjust the injection pressure, increase or decrease the amount of shims fitted to the nozzle holder.

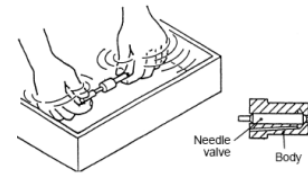
6. Look at the orifice discharge pattern (shape of discharge) when fluid begins to flow through the injection nozzle. The discharge must be finely and uniformly atomized. Any change is an indication of a bad nozzle.



7. If the nozzle is bad, remove the tip from the nozzle and wash needle valve and body in clean washing solution.

And if the nozzle is still bad after the tip has been washed, replace the tip.

8. When installing the new tip, remove synthetic resin film from the tip and slide the needle valve in the body in clean Diesel fuel to wash off inhibitor completely
9. The washer shown on figure must be replaced.



⚠ WARNING

When testing the injection nozzle, keep its tip pointed away from the operator. Fuel from the orifices in the tip of the nozzle is under high pressure and can cause injury to the operator.

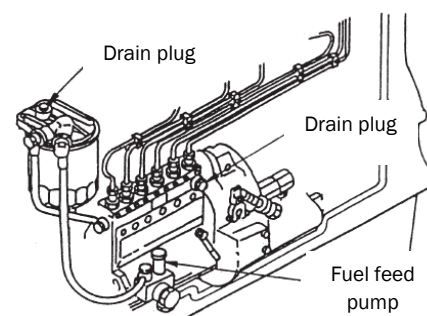
Maintenance task. Bleeding air from the fuel system

Prime the fuel system to bleed the air from the circuit. Trapped air in the fuel system can cause difficult starting and erratic engine operation. It is necessary to prime the system:

- ✓ Before starting the engine for the first time.
- ✓ After running out of fuel and adding fuel to the tank.
- ✓ After fuel system maintenance such as changing the fuel filter, draining the fuel/water separator, or replacing a fuel system component.

Fuel filter:

1. Loose the air drain plug on the fuel filter, turning it approximately 1,5 laps.
2. Unlock the fuel pump plunger turning it in anticlockwise and actuate the pump.
3. Taut the air drain plug when fuel flows without fizzing.



Fuel injection pump:

1. Loose the air drain plug on the fuel filter, turning it approximately 1,5 laps.
2. Unlock the fuel pump plunger turning it in anticlockwise and actuate the pump.
3. Taut the air drain plug when fuel flows without fizzing.

⚠ CAUTION

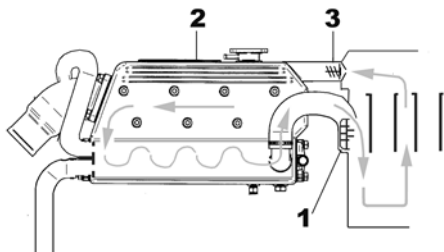
When fuel overflows from the injection pipes, wipe thoroughly with a cloth. Spilled fuel is a fire hazard.

5.6. Cooling system

The genset cooling system is based on coolant circulation controlled by centrifugal pump with thermostatic control and heat exchanger, where the coolant is refrigerated by sea water. Moreover, the exhaust manifold is cooled also by sea water.

Coolant circuit description

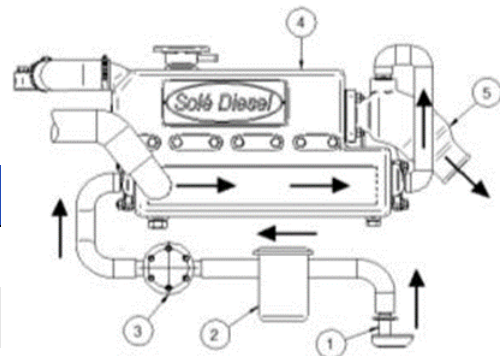
PIECE	ELEMENT
1	Fresh water pump
2	Heat exchanger
3	Thermostat



Model	Coolant circuit capacity (L)
29 GSC / 32 GSAC / 35 GTC / 40 GTAC / 45 GTC / 54 GTAC	13
50 GTC / 60 GTAC / 68 GTC / 84 GTAC	21

Seawater circuit description

PIECE	ELEMENT
1	Seacock (accessory)
2	Sea water filter (accessory)
3	Sea water pump
4	Heat exchanger
5	Wet exhaust elbow



Thermostatic valve

Initial opening	76,5°C
Final opening	90°C

Coolant specifications

It is recommended use Solé Diesel 50% coolant or another coolant with similar specifications. On the other hand, distilled water with an anti-freezing agent is also suitable. The anti-freezing agent concentration according to operating conditions is specified in anti-freezing agent package labels. It is advisable select the anti-freezing agent concentration based on a temperature approx. 5°C under the actual atmospheric temperature.

Other genset coolants may affect warranty coverage, cause an internal build-up of rust and scale and/or shorten genset life.

⚠ NOTICE

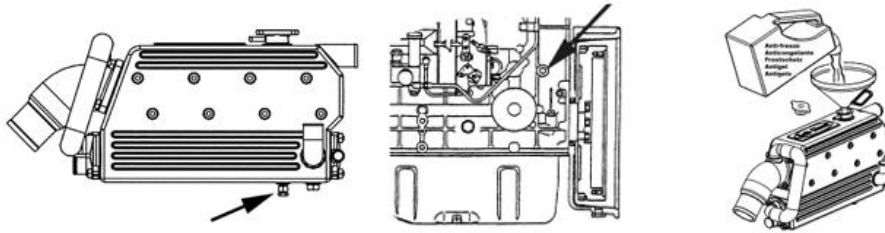
Never mix different types of coolants. This may adversely affect the properties of the genset coolant.

Maintenance task. Coolant check

Allow the genset to cool. Release pressure from the cooling system before removing the pressure cap. To release pressure, cover the pressure cap with a thick cloth and then slowly turn the cap counterclockwise. Remove the cap after pressure has been completely released and the genset has cooled. Check the coolant level at the tank, the level must be approximately 3/4 full.

Maintenance task. Coolant fill / change

1. Drain off all the coolant by opening the two drain plugs, one in the heat exchanger and the other in the cylinder block.
2. Close the drain plugs.
3. Remove bleeding bolt of thermostat holder.
4. Refill to the hole in the tank cap with coolant.



Maintenance task. Seawater filter inspection

It is important to install a seawater filter (supplied as accessory) between seawater cock and the seawater pump to avoid that any impurity might clog the seawater circuit or seawater pump.

To clean this filter:

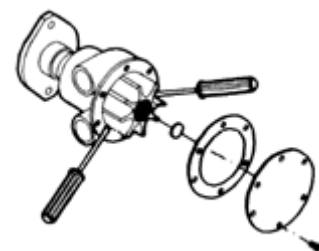
1. Loose the cover top, turning it.
2. Remove the filtering component and clean it.
3. Fit it again taking care that the cover is well seated on the o-ring.
4. Start the genset to check seawater leakages.



Maintenance task. Seawater pump impeller inspection

Seawater pump impeller is neoprene and cannot rotate dried. If operated without water, the impeller can be broken. It is important therefore that a spare impeller is always available. Impeller inspection and replacement procedure:

1. Close the seawater cock.
2. Remove the seawater pump cover plate.
3. Remove the impeller from the shaft.
4. Clean the housing.
5. Inspect the impeller for damaged, cranked, broken, missing or flattened vanes. The impeller vanes should be straight and flexible.
6. If it is damaged replace with a new one.
7. Lubricate the impeller with soapy water before installation.
8. Install the impeller. During installation push and rotate the impeller in the same direction as the genset rotation until it is thoroughly seated in the impeller housing.
9. Inspect the cover plate and gasket for corrosion and/or damage. Replace components as necessary.
10. Lubricate the gasket with silicon grease and attach the gasket and cover plate to the seawater pump housing.
11. Open the seacock.
12. Start the genset and check for leaks.



Maintenance task. Zinc anode inspection

In order to avoid the corrosion produced by galvanic currents, the genset is fitted with a zinc anode located on the front lid of the coolant-seawater heat exchanger. Anticorrosion zinc anode inspection and replacement:

1. With the genset cooled, close the seacock, open the coolant drain plug and drain the coolant into a suitable container.
2. Remove the anticorrosion zinc anode (plug) from the heat exchanger.
3. Use a wire brush to remove the loose corrosion on the anticorrosion zinc anode.
4. Clean the threaded hole of the heat exchanger and coat the threads of anticorrosion zinc anode. Install the anticorrosion zinc anode into the heat exchanger.
5. Close the coolant drain plug and open the seacock. Refill the coolant circuit.
6. Start the genset and check for leaks at the anticorrosion zinc anode location. The pump is operating if the seawater flows from the exhaust outlet.

5.7. Inlet and Exhaust System

Exhaust circuit description

There are two possible installations of the exhaust system. You need to check the distance between water injection point and waterline to decide which type of installation you need. This information is specified in the following drawings.

The elements included in the drawing are essential for the correct genset operation:

- Waterlock (supplied as accessory) to prevent seawater from entering inside the engine when it stops.

To calculate the required collector capacity, we must follow the following formula:

$$C = \frac{\left(\frac{\pi}{4} D^2 * L\right)}{1000000} * 0.5$$

C = collector capacity (L)
D = Inside diameter of the tube (mm)
L = Tube length (mm)

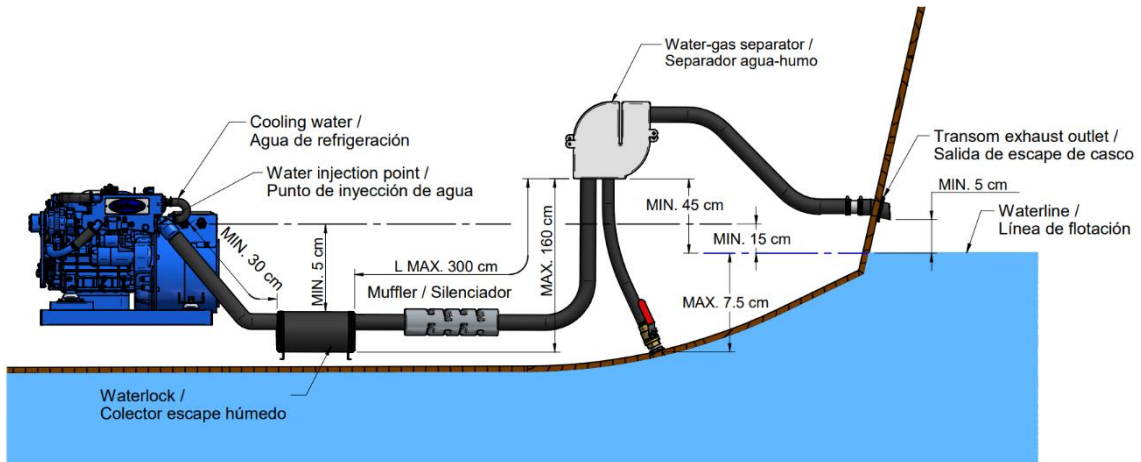
- Goose neck (supplied as accessory)
- Siphon breaker (supplied as accessory) – needed in case there is less than 150 mm between the water injection point of wet exhaust and the waterline, or if the point of injection is below waterline.

Contrapresión de gases de escape (kPa)	Max - 6,57
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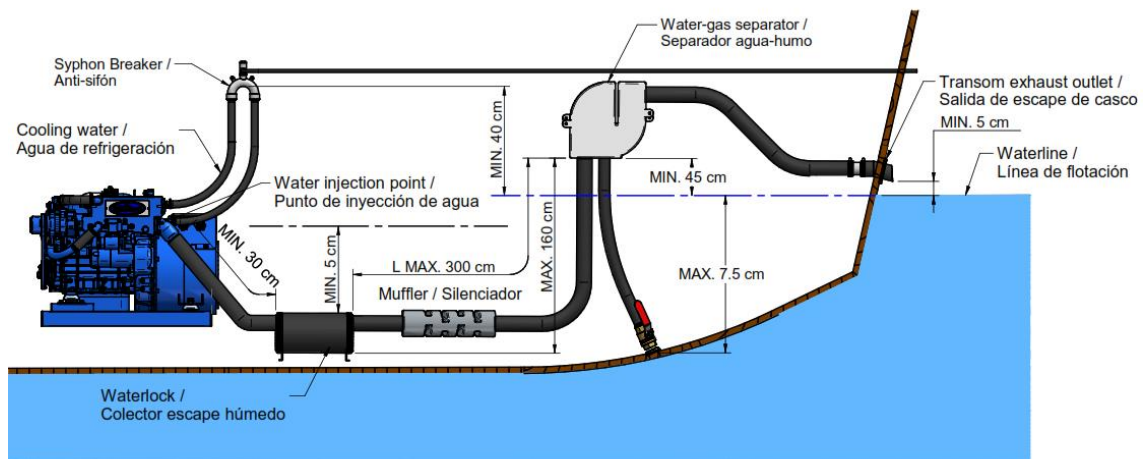
Systems and scheduled maintenance



Type 1 installation. When between water injection point of wet exhaust and waterline is minimum 150 mm.



Type 2 installation. When between water injection point of wet exhaust and waterline there is less than 150 mm or the point of injection is below waterline.

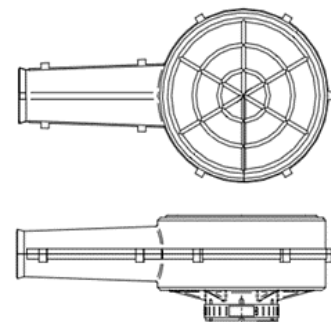


⚠ NOTICE

The wet exhaust is the genset's standard equipment. If you want dry exhaust, which is an optional equipment, contact with our dealers.

Maintenance task. Air filter inspection

Genset is provided with an intake air filter. Examine the element and housing for damage. Replace the complete air filter if necessary.



⚠ NOTICE

It is important to ensure that the combustion air is freely supplied and freely expelled from the area.

Maintenance task. Exhaust gas, noise and vibrations inspection

Inspect the exhaust system components for cracks, leaks and corrosion.

Exhaust system inspection points

1. Check the hoses for softness, cracks or dents. Replace the hoses as needed.
2. Check for corroded or broken metal parts and replace them as needed.
3. Check for loose, corroded or missing clamps. Tighten or replace the hose clamps and/or hangers as needed.
4. Check that the exhaust outlet is unobstructed.
5. Visually inspect the exhaust system for exhaust leaks. Check for carbon or soot residue on exhaust components. Carbon and soot residue indicate an exhaust leak. Seal leaks as needed.

5.8. Electrical System

Panel

You can find all information in the control panel operator's manual.

Sensors and switches

Coolant temperature sensor:

- Operating voltage: 6-24V
- Operating current: <85mA, Pmax<0.25W
- Operating temperature: -40°C to +120°C
- Measuring range: -40°C to +120°C
- Absolute max. value: 130°C, max. 1 min.
- Protection: BODY IP 67
- Tightening torque: Max. 20Nm

Function table		
Temperature (°C)	Resistance (ohm)	Tolerance (ohm)
40	287.4	±32.8
60*	134	±13.5
80	69.1	±6.5
90*	51.2	±4.3
100*	38.5	±3.0
120	22.7	±2.2

*Test point

Oil pressure sensor:

- Operating voltage: 6-24V
- Operating current: >20mA, <85mA, Pmax<0.25W
- Operating temperature: -20°C to +100°C
- Measuring range: 0 – 10 BAR
- Absolute max. value: 30 BAR, max. 2 seconds.
- Protection: BODY IP 67
- Tightening torque: Max. 20Nm

Function table		
Pressure (BAR)	Resistance (ohm)	Tolerance (ohm)
0	10	+3/-5
2	52	±4
4	88	±4
6	124	±5
8	155	±5
10	184	+20/-10

Coolant temperature sensor specifications (two pole)

- Operating voltage: 6-24V
- Operating current: <85mA, Pmax<0.25W
- Operating temperature: -40°C to +120°C
- Measuring range: -40°C to +120°C
- Absolute max. value: 130°C, max. 1 min.
- Protection: BODY IP 67
- Tightening torque: Max. 20Nm

Function table		
Temperature (°C)	Resistance (ohm)	Tolerance (ohm)
40	287.4	±32.8
60*	134	±13.5
80	69.1	±6.5
90*	51.2	±4.3
100*	38.5	±3.0
120	22.7	±2.2

*Test point

Oil pressure sensor (two pole):

- Operating voltage: 6-24V
- Operating current: >20mA, <85mA, Pmax<0.25W
- Operating temperature: -20°C to +100°C
- Measuring range: 0 - 10 BAR
- Absolute max. value: 30 BAR, max. 2 seconds.
- Protection: BODY IP 67
- Tightening torque: Max. 20Nm

Function table		
Pressure (BAR)	Resistance (ohm)	Tolerance (ohm)
0	10	+3/-5
2	52	±4
4	88	±4
6	124	±5
8	155	±5
10	184	+20/-10

TEMPERATURE SWITCH:

- Operating voltage: 12-24V
- Operating power: 5W
- Operating temperature: ≤100°C ±4°C (OPEN CIRCUIT), ≥100°C ±2°C (CLOSE CIRCUIT)

OIL PRESSURE SWITCH:

- Operating voltage: 12V
- Operating power: 5W
- Operating pressure: 0.98bar (CLOSE CIRCUIT)

TEMPERATURE SWITCH (TWO POLE)

- Operating voltage: 6-24V
- Operating power: Max 100W
- Operating temperature: 96°C ±3°C (CLOSE CIRCUIT)

OIL PRESSURE SWITCH (TWO POLE):

- Operating voltage: 6-24V
- Operating current: <0.5A

Operating pressure: 0.4bar±0.15bar (CLOSE CIRCUIT)

Battery

The minimum recommended capacity is from 55-120 Ah. However, this value serves as a general reference since it relates to the maximum intensity it can offer for starting the generator set.

The connection of the battery for a standard engine:

- Positive battery is connected to the starter.
- Negative battery is connected to the relay support.

The connection of the battery for an earth isolated engine.

- Positive battery is connected to the starter.
- Negative battery is connected to the bipolar relay.

Genset model	Battery capacity (Ah)	
	12V	24V
29 GSC / 32 GSAC / 35 GTC / 40 GTAC / 45 GTC / 54 GTAC / 50 GTC / 60 GTAC /	92	-
68 GTC / 84 GTAC	120	-

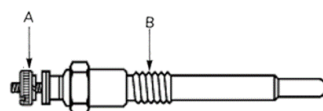
Circuit protection

AC Breaker interrupts the genset output in the event of an overload or short circuit. The nominal current is indicated in the following table:

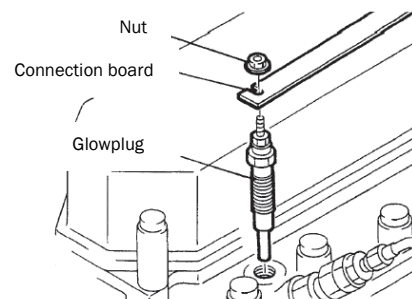
Model	Current (A)
29 GSC / 32 GSAC	125
35 GTC / 40 GTAC	80 (Delta) / 50 (Star)
45 GTC / 54 GTAC	125 (Delta) / 63 (Star)
50 GTC / 60 GTAC	125 (Delta) / 63 (Star)
68 GTC / 84 GTAC	160 (Delta) / 100 (Star)

Maintenance task. Incandescent glow plug inspection

1. Loosen nuts, and then remove connection plate and glow plug.
2. If the glow plug glows red when the positive (+) wire is connected to the portion A with the portion B grounded, the plug can be used.

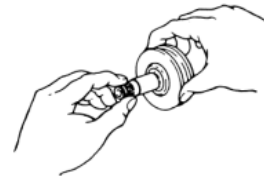


Rated voltage - Current	12 V	9,7-10,5 A
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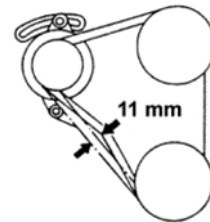
Maintenance task. Starter motor inspection

1. Check if there is any impurity in pinion teeth.
2. Make sure that the pinion shaft turns freely when turned in the direction of driving (clockwise) and it is locked when turned in the opposite direction. If not, replace the overrunning clutch.



Maintenance task. Alternator belt tension inspection

Push the belt inward with thumb pressure exerted midway between the pulleys, as shown, to check the belt tension (deflection). If the tension is incorrect, loosen the adjusting bracket bolt and mounting bolt, and move the alternator in or out.



Item	Assembly Standard
V-belt deflection	10 - 12 mm

NOTICE

An excessive tension may cause a quick wear of the belt and alternator bearings. Otherwise, if the belt is excessively loose or has oil and insufficient load, it can cause the belt to skid.

CAUTION

Never adjust the belt tension with genset running or battery connected.

Maintenance task. Battery level

Battery requires a very careful handling and frequent checking. Proceed as shown below:

1. Keep battery dry and cleaned.
2. Check terminal cleanliness regularly. If dust is settled, terminals should be loosened, cleaned and smeared with a neutral grease layer.
3. Metal objects must not be placed over the battery.
4. Add distilled water if the level is out of range.

5.9. Alternator

The maintenance and fault diagnostic procedures involve risks that may cause severe injury or even death. These procedures should therefore be carried out solely by qualified electrical and mechanical specialists. Before any maintenance and cleaning work make sure that there are no live parts that the generator housing has cooled to ambient temperature, that the genset cannot be accidentally started up and that all procedures are strictly observed.

Maintenance task. Control of windings and electrical insulation

The condition of the windings can be checked by measuring their electrical resistance to earth. While running this test, disconnect the voltage regulator. It is usually sufficient to control the main winding.

The readings should give a measurement of the least 1MOhms. If the insulation resistance is below this threshold, the alternator alone should be oven dried at 60 – 80°C for 3 hours. Before carrying out this operation remove the voltage regulator. As an alternative to oven drying hot air at 60 – 80°C can be blown through the alternator for at least 1 hour.

Maintenance task. Control of bearings

During maintenance control the condition of the bearing and check that no grease has leaked: the lifespan of the bearings depends on the vibrations and axial strains they undergo (vibrations can increase considerably with a bad alignment) and on the working conditions. So check for any unusual signs: vibrations, unusual noises.

If undue vibrations or noises appear after long-term usage, these could be due to a worn bearing that, if damaged, has to be replaced. No maintenance is required for the total operating time:

Operating time
20.000 horas



A bearing lifespan is closely linked to the working conditions and environment.

Long periods of sustained vibrations can damage the bearing balls and their seat. Too high humidity can emulsify the grease and encourage corrosion.

Intense vibrations caused by the motor or bad alignment of the components in the genset put the bearing under stresses that will reduce its lifespan.

Maintenance task. Cleaning and lubrication

Any kind of cleaning work must be carried out with the genset shutdown and the mains power shut off for the risk of severe hazard for persons and objects. Moreover, prior to approaching or touching the alternator, ensure that it is at room temperature.

Make sure that the genset is shutdown and the mains power is shut off before cleaning the outside of the genset with compressed air.

Never and for no reason whatsoever use fluids or water. Do not use compressed air to clean internal electrical parts since this could cause short circuits or related problems.

Section 6 – Troubleshooting

If a fault occurs in the genset, proceed as follows:

- Within the period of warranty:

Contact to Sole Diesel Official Service. See Solé Diesel WARRANTY.

- Outside the period of warranty:

Contact to Sole Diesel Official Service. See Solé Diesel WARRANTY.

Stop the genset, determine the cause and repair it before continuing driving the motor.

GENSET FAILURE	SYSTEM	PROBABLE CAUSES	RECOMMENDED ACTIONS
MANUAL START FAILURE	ELECTRICAL SYSTEM (CC)	Power cable fuse (red).	Replace the fuse in the installation. If fuse blows again, check electrical system for overloads or short circuits.
		Discharged or empty battery.	Charge the battery or replace it with a new one.
		Loose or corroded battery connections.	Check the battery connections are correct, clean and tight.
		Faulty start/preheating relay.	Check and replace the preheating/start relay if necessary.
		Faulty starter motor	Check starter motor and replace it if necessary.
		Control panel start signal	Check the start signal from the controller (pink wire).
		Faulty stop solenoid (ETR).	Check stop solenoid and replace it if necessary.
	GENERAL	Low compression pressure.	Check the compression of each cylinder.
	LUBRICATION SYSTEM	Oil viscosity too high.	Check oil viscosity (according to Technical Specifications).
	FUEL SYSTEM	Faulty or clogged fuel pump.	Check the pump by verifying the fuel inlet and outlet of the pump. Replace it with a new one if necessary.
		Clogged fuel pipes	Check fuel pipes.
		Clogged fuel filter	Replace fuel filter.
		Faulty injection pump	Contact an Official Solé Diesel Service.
		Air in fuel system	Bleed fuel system.
		Dirty or faulty fuel injectors	Clean, test and/or replace fuel injector which is not operating properly.
		Fuel injection timing malfunction	Adjust fuel injection timing
	INLET AND EXHAUST SYSTEM	Empty fuel tank or closed fuel valve.	Add fuel and place fuel valve in open position.
		Dirty or clogged fuel tank.	Clean tank with proper products.
		Dirty or clogged air filter.	Replace the air filter element.

Troubleshooting



GENSET FAILURE	SYSTEM	PROBABLE CAUSES	RECOMMENDED ACTIONS
STARTS AND THEN STOPS	GENERAL	The fuel regulator is not operational.	Contact an Official Solé Diesel Service.
	FUEL SYSTEM	Faulty or clogged fuel pump	Check fuel pump inlet.
		Clogged fuel filter	Replace fuel filter.
		Air in fuel system	Bleed fuel system.
		Incorrect injection pump setting	Contact an Official Solé Diesel Service.
		Closed fuel outlet tap	Open the fuel outlet tap.
BLACK SMOKE	COOLING SYSTEM	Low cooling liquid level.	Check cooling liquid level and fill tank if necessary.
	ELECTRICAL SYSTEM (CC)	Faulty stop solenoid (ETR).	Check stop solenoid and replace it if necessary.
		Pressed emergency stop button.	Reset the emergency stop button position.
		Control panel start signal.	Check the start signal from the controller (yellow wire).
	INLET AND EXHAUST SYSTEM	Dirty or clogged air filter.	Replace the air filter element.
BLUE SMOKE	FUEL SYSTEM	Clogged fuel filter.	Replace fuel filter.
		Dirty or faulty fuel injectors.	Clean, test and/or replace fuel injector which is not operating properly.
		Incorrect injection pump setting.	Contact an Official Solé Diesel Service.
LOW OIL PRESSURE	INLET AND EXHAUST SYSTEM	Clogged air filter.	Replace the air filter element.
	GENERAL	Incorrect valve clearance.	Perform valve adjustment.
LOW OIL PRESSURE	LUBRICATION SYSTEM	Oil level too high.	Check the lubrication oil level and reset it.
		Faulty oil pump.	Contact our dealer
		Strangled oil pressure-relief valve.	Clean the valve and check its operation.
		Oil pressure too low.	Check oil level.
		Oil level too low.	Reset oil level. Inspect the marine generator set for leaks.
LOW OIL PRESSURE	LUBRICATION SYSTEM	Faulty oil pressure valve.	Contact an Official Solé Diesel Service.
		Faulty pressure gauge, pressure sensor and/or pressure switch.	Check and/or replace elements.
		Engine tilt above allowable values.	Check the engine installation inclination. Reinstall the engine if necessary.

GENSET FAILURE	SYSTEM	PROBABLE CAUSES	RECOMMENDED ACTIONS
OIL PRESSURE TOO HIGH.	LUBRICATION SYSTEM	Strangled oil pressure-relief valve	Clean the valve and check its operation.
		Faulty oil pressure valve	Contact an Official Solé Diesel Service.
		Oil level too high.	Reset oil level.
		Obstruction of oil lines.	Contact an Official Solé Diesel Service.
HIGH FUEL CONSUMPTION	GENERAL	Low compression pressure.	Check compression.
		Electrical overload.	Reduce electrical load.
		The regulator is not working properly.	Contact an Official Solé Diesel Service.
	FUEL SYSTEM	Fuel injection timing malfunction.	Adjust fuel injection timing
LOW POWER	INLET AND EXHAUST SYSTEM	Clogged air filter	Replace the air filter element.
	GENERAL	Incorrect valve clearance.	Perform valve adjustment.
		Clogged fuel filter.	Replace fuel filter.
		Dirty or faulty fuel injectors.	Clean, test and/or replace fuel injector which is not operating properly.
		Water in fuel system.	Clean fuel system with proper products. Inspect the source of the water inlet.
		Fuel injection timing malfunction.	Adjust fuel injection timing
	FUEL SYSTEM	Clogged air filter	Replace the air filter element.
		Exhaust detonations	Inspect exhaust system. Replace exhaust system components that are not operational.
ENGINE OVERHEATING	GENERAL	Low compression pressure.	Check compression.
		Electrical overload.	Reduce electrical load.
	LUBRICATION SYSTEM	Faulty oil pump.	Contact an Official Solé Diesel Service.
		Oil viscosity too high.	Check oil specifications according to Technical Specifications.
		Oil level too low.	Reset oil level. Inspect the marine generator set for leaks.

GENSET FAILURE	SYSTEM	PROBABLE CAUSES	RECOMMENDED ACTIONS
ENGINE OVERHEATING	COOLING SYSTEM	Faulty coolant water pump.	Check coolant pump (impeller, pump sealing).
		Plugged or restricted-pitch salt water tap.	Clean the tap, check if the salt water pump impeller is damaged.
		Faulty salt water pump.	Check sea water pump (impeller, pump sealing).
		Clogged water cooler.	Clean the water cooler.
		Low coolant level.	Restore normal coolant level for operation.
		Thermostat is not operational.	Replace the thermostat.
	INLET AND EXHAUST SYSTEM	Clogged air filter	Replace the air filter element.
GENERATOR SET WITH NOISE	GENERAL	Low compression pressure.	Check compression.
		Electrical overload.	Reduce electrical load.
		Exhaust system leakage.	Inspect exhaust system. Replace exhaust system components that are not operational.
		Excessive vibration.	Check engine brackets. Inspect engine and retighten loose parts.
		Incorrect valve clearance.	Perform valve adjustment.
	ALTERNATOR (AC)	AC worn alternator bearing. Faulty AVR regulator plate.	Replace the CA alternator bearing. Replace AVR regulator plate.
FAULTY BATTERY CHARGE	ELECTRICAL SYSTEM (DC)	Discharged or empty battery.	Charge the battery or replace it with a new one.
		Loose or corroded battery connections.	Check the battery connections are correct, clean and tight.
		Faulty DC alternator regulator.	Replace alternator.
		DC alternator belt tension.	Check belt tension and change if necessary.
LOW OR ZERO OUTPUT VOLTAGE	GENERAL	Electrical overload.	Reduce electrical load.
		The regulator is not working properly.	Contact an Official Solé Diesel Service.

GENSET FAILURE	SYSTEM	PROBABLE CAUSES	RECOMMENDED ACTIONS
LOW OR ZERO OUTPUT VOLTAGE	ALTERNATOR (AC)	CA open output breaker. Open wiring, terminals or exciter field pin. The main field (rotor) is not operational (open or earthed). Stator is not operational (open or earthed). Generator set without excitation. After generator set excitation, it is deactivated Faulty AVR regulator plate. Blown AVR regulator plate fuse.	Close the CA output breaker. Check continuity. Test and/or replace alternator assembly. Test and/or replace alternator assembly. Contact an Official Solé Diesel Service. Check if the wiring matches the diagrams in the annex. Replace AVR regulator plate. Replace AVR regulator plate fuse.
VOLTAGE TOO LOW	ALTERNATOR (AC)	Voltage is too low without load.	Calibrate voltage. Check revolutions. Check windings.
VOLTAGE TOO HIGH	ALTERNATOR (AC)	Voltage is too high without load.	Calibrate voltage. Replace AVR regulator plate.
LOW LOAD VOLTAGE BELOW THE NOMINAL VALUE	ALTERNATOR (AC)	Low load voltage below the nominal value.	Calibrate voltage. Too high current, too low $\cos \phi$, speed 4 % below nominal value. Replace AVR regulator plate. Check diodes and release wires.
LOW LOAD VOLTAGE ABOVE NOMINAL VALUE	ALTERNATOR (AC)	Low load voltage above the nominal value.	Calibrate voltage. Replace AVR regulator plate.
UNSTABLE VOLTAGE	ALTERNATOR (AC)	Unstable voltage.	Check the engine rotational speed is uniform. Check the stability of the regulator by adjusting the potentiometer.

Section 7 – Parallel operation elements

7.1. Controller Connections

Operation

The genset is delivered with all necessary elements to operate in parallel. However, the controller that regulates the genset is not included in the Scope of Supply.

If the controller has not been installed from the factory, the design the control part of the genset must be carry out. For this reason, it is necessary consider the requirements of the electrical wiring, according to the ECU connector, where the controller must be connected. The following table specifies the function of each wire:

Wire	Colour	Description
1	Red	Battery positive (+)
2	Black	Battery negative (-)
3	Red-White	DC alternator excitation
4	Brown	Oil pressure signal
5	Blue	Oil pressure alarm
6	Grey	Coolant temperature signal
7	White	Coolant temperature alarm
8	Pink	Cranking signal
9	Yellow	Fuel solenoid
10	Green	Electric fuel pump
11	Green-White	Preheating signal
12	Purple	Emergency stop signal (not used)
13	Brown	External controller RPM regulation AUX (ECU PIN N)
14	Blue	External controller RPM regulation AUX (ECU PIN G)
15	-	Shield (ECU PIN Ground)
16	Brown	Voltaje control signal (Controller or potentiometer 5 kΩ) AVR Pot.
17	Blue	Voltaje control signal (Controller or potentiometer 5 kΩ) AVR Ext.
18	-	Shield

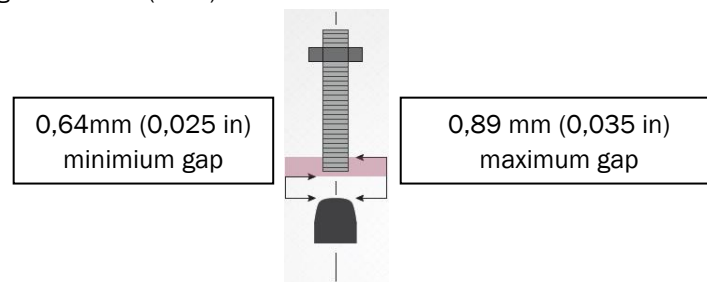
Sole Diesel dispose the complete elements to control the gensets in parallel operation (optional kit).

7.2. Magnetic speed sensor (Pickup)

The magnetic speed sensor is used for detecting the engine speed. This element sends a signal to the controller with the engine speed information. Requires no energizing from the ECU.

Installation

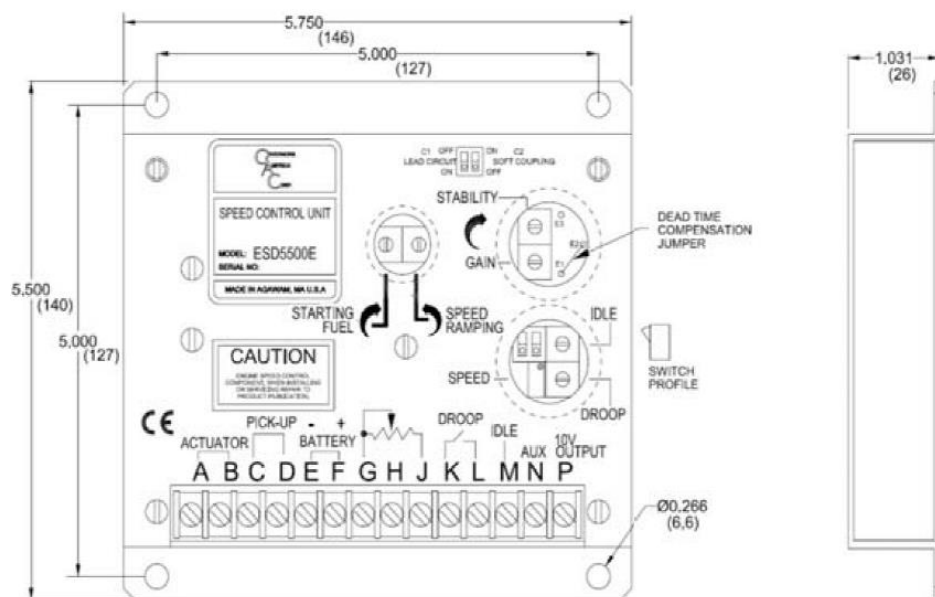
- Insert the magnetic speed pickup into the hole and turn it until the magnetic speed pickup makes contact with the face of the gear.
- Back out the magnetic pickup by turning it counterclockwise (about a 3/4 turn). The gap between the pickup and gear should be no smaller than 0,64 mm (0.025 in) and 0,89 mm (0.035 in).
- Wire leads should be twisted for their entire length from the magnetic speed sensor to the control unit. Shielding is required if external interference is present or the leads are longer than 3 m (10 ft).



7.3. Electronic control unit (ECU)

The controller (ECU) is all-electronic device designed to control the engine speed quickly and precisely in response to transient load changes. This is connected to an electric actuator and magnetic speed sensor (pickup)

Connections



TERMINAL	DEFINITION
A & B	Actuator power (+/-)
C & D	Magnetic speed Pickup signal (D is ground)
E & F	Battery power (-/+)
G	Ground signal
N	Accessory input. Load sharing/synchronizing

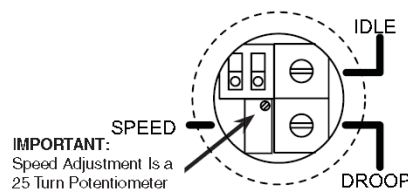
Adjustments before engine startup:

COMPONENT	POSITION
GAIN	Middle position
STABILITY	Middle position
SPEED TRIM CONTROL	Middle position
STARTING FUEL	Full CW (Maximum fuel)
SPEED RAMPING	Full CCW (Fastest)

Start the engine

The speed ECU setting is factory set at approximately engine nominal speed. If the engine does not start, adjustment of the Speed potentiometer may be required.

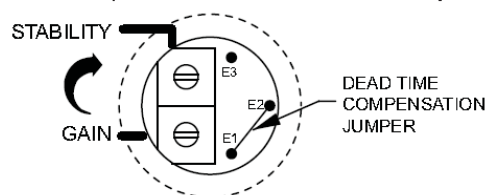
Crank the engine with DC power applied to the governor system. The actuator will energize to the maximum fuel position until the engine starts. The governor system should control the engine at a low idle speed. If the engine is unstable after starting, refer to Section 8 ADJUSTING FOR STABILITY.



Governor speed setting: The governed speed set point is increased by clockwise rotation of the SPEED adjustment control. Remote speed adjustment can be obtained with an optional 5K Speed Trim Control.

To do the **stability adjustment**, do the follow steps with the engine running:

- Turn the GAIN potentiometer clockwise until the engine becomes unstable. Then, turn it slowly counterclockwise until it stabilizes. Turn it about 1/8 more turn counterclockwise to ensure stability.
- Turn the STABILITY knob clockwise until the engine becomes unstable. Then, turn it slowly counterclockwise until it stabilizes again. Turn it about 1/8 more turn counterclockwise to ensure stability.
- Apply load to the engine and if any instability is observed, try to correct it by turning the GAIN and STABILITY potentiometers slightly counterclockwise.



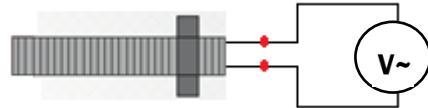
7.2. Electrical actuator

Engines managed electronically are controlled by the ECU through the electric actuator. This regulates the fuel flow by acting on the fuel injection pump according to the orders sent by the ECU.

7.3. Parallel operation troubleshooting

To do the following checks, it is necessary to have the engine running.

Magnetic speed sensor



To verify the pickup operation, it is necessary to check the output voltage with the genset running (the engine doesn't crank but the flywheel rotates).

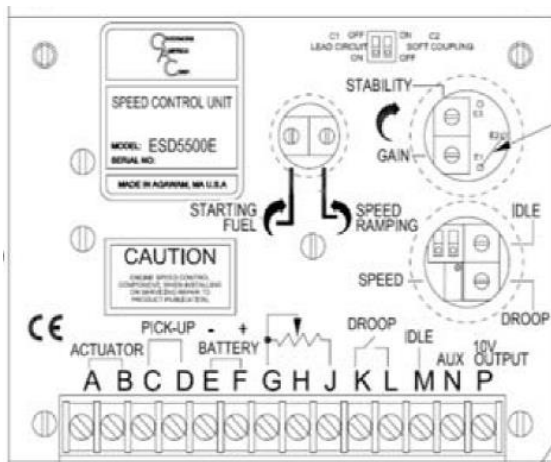
Disconnect the wires and measure the voltage (AC) between wires. The voltage value should be **1V**. If the voltage value is around 1 V – 3 V, it is correct, and the pickup works correctly. If the value is less than 1 V:

- Check the distance between sensor and flywheel teeth.
- Wrong wires. Check the impedance between terminals C and D of the ECU. This should be 30 to 1200 ohms.
- Replace the sensor.

Electronic control unit and governor (ECU)

To verify the ECU operation, it is necessary to check the output voltage with the genset running.

1. Check the voltage between following PINS:



Terminals	Value
V [A (-) to B (+)]	10 V – 14 V
V [C to D]	1 V < 3 V
V [E (-) to F (+)]	12 V o 24 V
V [P (+) to G (-)]	10 V
V [F (+) to A (-)]	1 V < 2 V (cranking)

2. Check the current on the wire of PIN A to actuator at 1500 RPM. Increase the load and measure the current, it should increase. If don't increases the ECU don't operates correctly.

Terminals	Value
Nominal current	4,0 A (12 V DC) 2,0 A (24 V DC)
Max. Continuous current	5,8 A (12 V DC) 3,1 A (12 V DC)
Nominal coil resistance	7,2 Ω 2,0 Ω

3. Check the resistance between PIN C and PIN D.

Terminals	Value
C & D	30 Ω to 1200 Ω

Section 8 – Technical specification

Single-Phase

General data

Maximum power*:	28,4 kW (28,4 kVA)	Voltage:	230 V
Prime Power**:	25,8 kW	Amperage:	123,5 A
Frequency:	50 Hz	Phases:	1

Dimensions and weights

Total length without canopy:	1437 mm	Total length with canopy:	1600 mm
Total width without canopy:	740 mm	Total width with canopy:	740 mm
Total height without canopy:	783 mm	Total height with canopy:	837 mm
Dry weight without canopy:	680 Kg	Dry weight with canopy:	714 Kg

Engine

Base engine manufacturer:	Mitsubishi	Diameter:	94 mm (3,7 in)
Model Solé Diesel:	MINI-74	Stroke:	120 mm (4,72 in)
Type:	4 No. of Strokes	Compression ratio:	22:1
Engine RPM:	1500	Injection system:	Mechanical and indirect
Number of cylinders:	4	Intake system:	Naturally aspirated
Total displacement:	3331 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	13 L (3,43 gal)
Oil capacity:	10 L (2,64 gal)	Flywheel:	SAE 11 1/2
Power:	30,8 kW (41,89 CV)	Coolant flow rate:	105 l/min (27,74 gal/m)
Salt water flow rate:	37,5 l/min (9,91 gal/m)	Intake air flow rate:	2,25 m3/m
Starting aid:	Glow plugs		

Fuel system details

Consumption:	2,9 L/H (0,77 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	4,3 L/H (1,14 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	6,1 L/H (1,61 Gal/H)	Injection pump type:	In line
Consumption at 100 %:	8,2 L/H (2,17 Gal/H)	Governor type:	Electronic

Electrical system

Battery voltage:	12 V	Stop solenoid type:	ETR
Starter motor:	2,2 kW	Alternator:	50 A
Battery cable section:	70 mm2	Battery cable length:	1,5 m

Installation details

Exhaust hose inner diameter:	75 mm (2,95 in)	Maximum fuel lift height:	0,6 m (1,97 ft)
Sea water hose inner diameter:	32 mm (1,26 in)	Maximum raw water lift height:	2,5 m (98,43 in)
Fuel feeding hose inner diameter:	8 mm (0,31 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	6 mm (0,23 in)	Maximum installation angle***:	15 °
Minimum battery capacity:	12 V 95 Ah		

Alternator details

Brand:	Meccalte	Cos φ:	1
Model:	ECP32-1M/4B	Tropicalized:	S
Regulator type:	DSR	Excitation system:	BRUSHLESS
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN60034-1, IEC 60034-1
IP protection*:	23	Alternator type:	Synchronous

Single-Phase**General data**

Maximum power*:	31,6 kW (31,6 kVA)	Voltage:	240 V
Prime Power**:	28,7 kW	Amperage:	131,7 A
Frequency:	60 Hz	Phases:	1

Dimensions and weights

Total lenght without canopy:	1437 mm	Total lenght with canopy:	1600 mm
Total width without canopy:	740 mm	Total width with canopy:	740 mm
Total height without canopy:	783 mm	Total height with canopy:	837 mm
Dry weight without canopy:	680 Kg	Dry weight with canopy:	714 Kg

Engine

Base engine manufacturer:	Mitsubishi	Diameter:	94 mm (3,7 in)
Model Solé Diesel:	MINI-74	Stroke:	120 mm (4,72 in)
Type:	4 No. of Strokes	Compression ratio:	22:1
Engine RPM:	1800	Injection system:	Mechanical and indirect
Number of cylinders:	4	Intake system:	Naturally aspirated
Total displacement:	3331 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	13 L (3,43 gal)
Oil capacity:	10 L (2,64 gal)	Flywheel:	SAE 11 1/2
Power:	35,7 kW (48,55 CV)	Coolant flow rate:	140 l/min (36,98 gal/m)
Salt water flow rate:	44 l/min (11,62 gal/m)	Intake air flow rate:	2,7 m3/m
Starting aid:	Glow plugs		

Fuel system details

Consumption:	3,1 L/H (0,82 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	4,8 L/H (1,27 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	6,8 L/H (1,8 Gal/H)	Injection pump type:	In line
Consumption at 100 %:	9,6 L/H (2,54 Gal/H)	Governor type:	Electronic

Electrical system

Battery voltage:	12 V	Stop solenoid type:	ETR
Starter motor:	2,2 kW	Alternator:	50 A
Battery cable section:	70 mm2	Battery cable length:	1,5 m

Installation details

Exhaust hose inner diameter:	75 mm (2,95 in)	Maximum fuel lift height:	0,6 m (1,97 ft)
Sea water hose inner diameter:	32 mm (1,26 in)	Maximum raw water lift height:	3 m (118,11 in)
Fuel feeding hose inner diameter:	8 mm (0,31 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	6 mm (0,23 in)	Maximum installation angle***:	15 °
Minimum battery capacity:	12 V 95 Ah		

Alternator details

Brand:	Meccalte	Cos φ:	1
Model:	ECP32-1M/4B	Tropicalized:	S
Regulator type:	DSR	Excitation system:	Brushless
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN60034-1, IEC 60034-1
IP protection*:	23	Alternator type:	Synchronous

General data

Maximum power*:	28 kW (35 kVA)	Voltage:	400/230 V
Prime Power**:	25,5 kW	Amperage:	50,5 A
Frequency:	50 Hz	Phases:	3

Dimensions and weights

Total lenght without canopy:	1308 mm	Total lenght with canopy:	1445 mm
Total width without canopy:	630 mm	Total width with canopy:	630 mm
Total height without canopy:	732 mm	Total height with canopy:	788 mm
Dry weight without canopy:	494 Kg	Dry weight with canopy:	545 Kg

Engine

Base engine manufacturer:	Mitsubishi	Diameter:	94 mm (3,7 in)
Model Solé Diesel:	MINI-74	Stroke:	120 mm (4,72 in)
Type:	4 No. of Strokes	Compression ratio:	22:1
Engine RPM:	1500	Injection system:	Mechanical and indirect
Number of cylinders:	4	Intake system:	Naturally aspirated
Total displacement:	3331 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	13 L (3,43 gal)
Oil capacity:	10 L (2,64 gal)	Flywheel:	SAE 11 1/2
Power:	30,8 kW (41,89 CV)	Coolant flow rate:	105 l/min (27,74 gal/m)
Salt water flow rate:	37,5 l/min (9,91 gal/m)	Intake air flow rate:	2,25 m3/m
Starting aid:	Glow plugs		

Fuel system details

Consumption:	2,4 L/H (0,63 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	4,1 L/H (1,08 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	6 L/H (1,59 Gal/H)	Injection pump type:	In line
Consumption at 100 %:	8,3 L/H (2,19 Gal/H)	Governor type:	Electronic

Electrical system

Battery voltage:	12 V	Stop solenoid type:	ETR
Starter motor:	2,2 kW	Alternator:	50 A
Battery cable section:	70 mm2	Battery cable length:	1,5 m

Installation details

Exhaust hose inner diameter:	75 mm (2,95 in)	Maximum fuel lift height:	0,6 m (1,97 ft)
Sea water hose inner diameter:	32 mm (1,26 in)	Maximum raw water lift height:	2,5 m (98,43 in)
Fuel feeding hose inner diameter:	8 mm (0,31 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	6 mm (0,23 in)	Maximum installation angle***:	15 °
Minimum battery capacity:	12 V 95 Ah		

Alternator details

Brand:	SINCRO	Cos φ:	0,8
Model:	SK160WA	Tropicalized:	S
Regulator type:	BL4	Excitation system:	BRUSHLESS
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN 60034-1, IEC 60034-1, ISO 8528-3
IP protection*:	23	Alternator type:	Synchronous

Three-Phase**General data**

Maximum power*:	31,2 kW (39 kVA)	Voltage:	480/277 V
Prime Power**:	28,4 kW	Amperage:	46,9 A
Frequency:	60 Hz	Phases:	3

Dimensions and weights

Total lenght without canopy:	1308 mm	Total lenght with canopy:	1445 mm
Total width without canopy:	630 mm	Total width with canopy:	630 mm
Total height without canopy:	732 mm	Total height with canopy:	788 mm
Dry weight without canopy:	494 Kg	Dry weight with canopy:	545 Kg

Engine

Base engine manufacturer:	Mitsubishi	Diameter:	94 mm (3,7 in)
Model Solé Diesel:	MINI-74	Stroke:	120 mm (4,72 in)
Type:	4 No. of Strokes	Compression ratio:	22:1
Engine RPM:	1800	Injection system:	Mechanical and indirect
Number of cylinders:	4	Intake system:	Naturally aspirated
Total displacement:	3331 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	13 L (3,43 gal)
Oil capacity:	10 L (2,64 gal)	Flywheel:	SAE 11 1/2
Power:	35,7 kW (48,55 CV)	Coolant flow rate:	140 l/min (36,98 gal/m)
Salt water flow rate:	44 l/min (11,62 gal/m)	Intake air flow rate:	2,7 m3/m
Starting aid:	Glow plugs		

Fuel system details

Consumption:	3,1 L/H (0,82 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	4,8 L/H (1,27 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	6,8 L/H (1,8 Gal/H)	Injection pump type:	In line
Consumption at 100 %:	9,6 L/H (2,54 Gal/H)	Governor type:	Electronic

Electrical system

Battery voltage:	12 V	Stop solenoid type:	ETR
Starter motor:	2,2 kW	Alternator:	50 A
Battery cable section:	70 mm2	Battery cable length:	1,5 m

Installation details

Exhaust hose inner diameter:	75 mm (2,95 in)	Maximum fuel lift height:	0,6 m (1,97 ft)
Sea water hose inner diameter:	32 mm (1,26 in)	Maximum raw water lift height:	3 m (118,11 in)
Fuel feeding hose inner diameter:	8 mm (0,31 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	6 mm (0,23 in)	Maximum installation angle***:	15 °
Minimum battery capacity:	12 V 95 Ah		

Alternator details

Brand:	SINCRO	Cos φ:	0,8
Model:	SK160WA	Tropicalized:	S
Regulator type:	BL4	Excitation system:	BRUSHLESS
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN 60034-1, IEC 60034-1, ISO 8528-3
IP protection*:	23	Alternator type:	Synchronous

General data

Maximum power*:	36 kW (45 kVA)	Voltage:	400/230 V
Prime Power**:	32,7 kW	Amperage:	65 A
Frequency:	50 Hz	Phases:	3

Dimensions and weights

Total lenght without canopy:	1428 mm	Total lenght with canopy:	1605 mm
Total width without canopy:	740 mm	Total width with canopy:	740 mm
Total height without canopy:	785 mm	Total height with canopy:	841 mm
Dry weight without canopy:	560 Kg	Dry weight with canopy:	598 Kg

Engine

Base engine manufacturer:	Mitsubishi	Diameter:	94 mm (3,7 in)
Model Solé Diesel:	SM-56	Stroke:	120 mm (4,72 in)
Type:	4 No. of Strokes	Compression ratio:	17:1
Engine RPM:	1500	Injection system:	Mechanical and direct
Number of cylinders:	4	Intake system:	Turbocharged
Total displacement:	3331 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	13 L (3,43 gal)
Oil capacity:	10 L (2,64 gal)	Flywheel:	SAE 11 1/2
Power:	40,5 kW (55,08 CV)	Coolant flow rate:	105 l/min (27,74 gal/m)
Salt water flow rate:	38 l/min (10,04 gal/m)	Intake air flow rate:	2,9 m3/m
Starting aid:	Glow plugs		

Fuel system details

Consumption:	3,2 L/H (0,85 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	5,2 L/H (1,37 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	7,4 L/H (1,95 Gal/H)	Injection pump type:	In line
Consumption at 100 %:	9,7 L/H (2,56 Gal/H)	Governor type:	Electronic

Electrical system

Battery voltage:	12 V	Stop solenoid type:	ETR
Starter motor:	2,2 kW	Alternator:	50 A
Battery cable section:	70 mm2	Battery cable length:	1,5 m

Installation details

Exhaust hose inner diameter:	75 mm (2,95 in)	Maximum fuel lift height:	0,3 m (0,98 ft)
Sea water hose inner diameter:	32 mm (1,26 in)	Maximum raw water lift height:	2,5 m (98,43 in)
Fuel feeding hose inner diameter:	8 mm (0,31 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	8 mm (0,31 in)	Maximum installation angle***:	15 °
Minimum battery capacity:	12 V 95 Ah		

Alternator details

Brand:	Meccalte	Cos φ:	0,8
Model:	ECP32-1M/4B	Tropicalized:	S
Regulator type:	DSR	Excitation system:	Brushless
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN60034-1, IEC 60034-1
IP protection*:	23	Alternator type:	Synchronous

Three-Phase**General data**

Maximum power*:	42,8 kW (53,5 kVA)	Voltage:	480/277 V
Prime Power**:	38,9 kW	Amperage:	64,4 A
Frequency:	60 Hz	Phases:	3

Dimensions and weights

Total lenght without canopy:	1428 mm	Total lenght with canopy:	1605 mm
Total width without canopy:	740 mm	Total width with canopy:	740 mm
Total height without canopy:	785 mm	Total height with canopy:	841 mm
Dry weight without canopy:	560 Kg	Dry weight with canopy:	598 Kg

Engine

Base engine manufacturer:	Mitsubishi	Diameter:	94 mm (3,7 in)
Model Solé Diesel:	SM-56	Stroke:	120 mm (4,72 in)
Type:	4 No. of Strokes	Compression ratio:	17:1
Engine RPM:	1800	Injection system:	Mechanical and direct
Number of cylinders:	4	Intake system:	Turbocharged with intercooler
Total displacement:	3331 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	13 L (3,43 gal)
Oil capacity:	10 L (2,64 gal)	Flywheel:	SAE 11 1/2
Power:	48,6 kW (66,1 CV)	Coolant flow rate:	140 l/min (36,98 gal/m)
Salt water flow rate:	45 l/min (11,89 gal/m)	Intake air flow rate:	3,5 m3/m
Starting aid:	Glow plugs		

Fuel system details

Consumption:	4,1 L/H (1,08 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	6,2 L/H (1,64 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	8,9 L/H (2,35 Gal/H)	Injection pump type:	In line
Consumption at 100 %:	12,1 L/H (3,2 Gal/H)	Governor type:	Electronic

Electrical system

Battery voltage:	12 V	Stop solenoid type:	ETR
Starter motor:	2,2 kW	Alternator:	50 A
Battery cable section:	70 mm2	Battery cable length:	1,5 m

Installation details

Exhaust hose inner diameter:	75 mm (2,95 in)	Maximum fuel lift height:	0,3 m (0,98 ft)
Sea water hose inner diameter:	32 mm (1,26 in)	Maximum raw water lift height:	3 m (118,11 in)
Fuel feeding hose inner diameter:	8 mm (0,31 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	8 mm (0,31 in)	Maximum installation angle***:	15 °
Minimum battery capacity:	12 V 95 Ah		

Alternator details

Brand:	Meccalte	Cos φ:	0,8
Model:	ECP32-1M/4B	Tropicalized:	S
Regulator type:	DSR	Excitation system:	Brushless
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN60034-1, IEC 60034-1
IP protection*:	23	Alternator type:	Synchronous

General data

Maximum power*:	39,1 kW (48,9 kVA)	Voltage:	400/230 V
Prime Power**:	35,6 kW	Amperage:	70,6 A
Frequency:	50 Hz	Phases:	3

Dimensions and weights

Total lenght without canopy:	1680 mm	Total lenght with canopy:	1875 mm
Total width without canopy:	841 mm	Total width with canopy:	840 mm
Total height without canopy:	797 mm	Total height with canopy:	848 mm
Dry weight without canopy:	690 Kg	Dry weight with canopy:	795 Kg

Engine

Base engine manufacturer:	Mitsubishi	Diameter:	94 mm (3,7 in)
Model Solé Diesel:	SM-105	Stroke:	120 mm (4,72 in)
Type:	4 No. of Strokes	Compression ratio:	22:1
Engine RPM:	1500	Injection system:	Mechanical and indirect
Number of cylinders:	6	Intake system:	Naturally aspirated
Total displacement:	4996 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	21 L (5,55 gal)
Oil capacity:	12 L (3,17 gal)	Flywheel:	SAE 11 1/2
Power:	43,4 kW (59,02 CV)	Coolant flow rate:	80 l/min (21,13 gal/m)
Salt water flow rate:	38 l/min (10,04 gal/m)	Intake air flow rate:	3,3 m3/m
Starting aid:	Glow plugs		

Fuel system details

Consumption:	4 L/H (1,06 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	6,2 L/H (1,64 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	9 L/H (2,38 Gal/H)	Injection pump type:	In line
Consumption at 100 %:	12,2 L/H (3,22 Gal/H)	Governor type:	Electronic

Electrical system

Battery voltage:	12 V	Stop solenoid type:	ETR
Starter motor:	3 kW	Alternator:	50 A
Battery cable section:	70 mm2	Battery cable length:	1,5 m

Installation details

Exhaust hose inner diameter:	75 mm (2,95 in)	Maximum fuel lift height:	0,6 m (1,97 ft)
Sea water hose inner diameter:	32 mm (1,26 in)	Maximum raw water lift height:	2,5 m (98,43 in)
Fuel feeding hose inner diameter:	8 mm (0,31 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	6 mm (0,23 in)	Maximum installation angle***:	15 °
Minimum battery capacity:	12 V 95 Ah		

Alternator details

Brand:	Meccalte	Cos φ:	0,8
Model:	ECP32-1M/4B	Tropicalized:	S
Regulator type:	DSR	Excitation system:	Brushless
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN60034-1, IEC 60034-1
IP protection*:	23	Alternator type:	Synchronous

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Three-Phase

General data			
Maximum power*:	46,6 kW (58,3 kVA)	Voltage:	240 V
Prime Power**:	42,3 kW	Amperage:	140 A
Frequency:	60 Hz	Phases:	3

Dimensions and weights			
Total lenght without canopy:	1675 mm	Total lenght with canopy:	1875 mm
Total width without canopy:	840 mm	Total width with canopy:	840 mm
Total height without canopy:	800 mm	Total height with canopy:	848 mm
Dry weight without canopy:	690 Kg	Dry weight with canopy:	795 Kg

Engine			
Base engine manufacturer:	Mitsubishi	Diameter:	94 mm (3,7 in)
Model Solé Diesel:	SM-105	Stroke:	120 mm (4,72 in)
Type:	4 No. of Strokes	Compression ratio:	22:1
Engine RPM:	1800	Injection system:	Mechanical and indirect
Number of cylinders:	6	Intake system:	#N/D
Total displacement:	4996 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	21 L (5,55 gal)
Oil capacity:	12 L (3,17 gal)	Flywheel:	SAE 11 1/2
Power:	51,4 kW (69,9 CV)	Coolant flow rate:	96 l/min (25,36 gal/m)
Salt water flow rate:	45 l/min (11,89 gal/m)	Intake air flow rate:	4 m3/m
Starting aid:	Glow plugs		

Fuel system details			
Consumption:	4,8 L/H (1,27 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	7,4 L/H (1,95 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	10,8 L/H (2,85 Gal/H)	Injection pump type:	In line
Consumption at 100 %:	14,6 L/H (3,86 Gal/H)	Governor type:	Electronic

Electrical system			
Battery voltage:	12 V	Stop solenoid type:	ETR
Starter motor:	3 kW	Alternator:	50 A
Battery cable section:	70 mm2	Battery cable length:	1,5 m

Installation details			
Exhaust hose inner diameter:	75 mm (2,95 in)	Maximum fuel lift height:	0,6 m (1,97 ft)
Sea water hose inner diameter:	32 mm (1,26 in)	Maximum raw water lift height:	3 m (118,11 in)
Fuel feeding hose inner diameter:	8 mm (0,31 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	6 mm (0,23 in)	Maximum installation angle***:	15 °
Minimum battery capacity:	12 V 95 Ah		

Alternator details			
Brand:	Meccalte	Cos φ:	0,8
Model:	ECP32-1M/4B	Tropicalized:	S
Regulator type:	DSR	Excitation system:	BRUSHLESS
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN60034-1, IEC 60034-1
IP protection*:	23	Alternator type:	Synchronous

Three-Phase

General data

Maximum power*:	54,7 kW (68,4 kVA)	Voltage:	400/230 V
Prime Power**:	49,7 kW	Amperage:	98,7 A
Frequency:	50 Hz	Phases:	3

Dimensions and weights

Total lenght without canopy:	1723 mm	Total lenght with canopy:	1903 mm
Total width without canopy:	700 mm	Total width with canopy:	840 mm
Total height without canopy:	800 mm	Total height with canopy:	848 mm
Dry weight without canopy:	759 Kg	Dry weight with canopy:	869 Kg

Engine

Base engine manufacturer:	Mitsubishi	Diameter:	94 mm (3,7 in)
Model Solé Diesel:	SM-81	Stroke:	120 mm (4,72 in)
Type:	4 No. of Strokes	Compression ratio:	17:1
Engine RPM:	1500	Injection system:	Mechanical and indirect
Number of cylinders:	6	Intake system:	Turbocharged
Total displacement:	4996 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	21 L (5,55 gal)
Oil capacity:	12 L (3,17 gal)	Flywheel:	SAE 11 1/2
Power:	59,6 kW (81,06 CV)	Coolant flow rate:	70 l/min (18,49 gal/m)
Salt water flow rate:	38 l/min (10,04 gal/m)	Intake air flow rate:	4,2 m3/m
Starting aid:	Glow plugs		

Fuel system details

Consumption:	4,8 L/H (1,27 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	7,8 L/H (2,06 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	11 L/H (2,91 Gal/H)	Injection pump type:	In line
Consumption at 100 %:	14,5 L/H (3,83 Gal/H)	Governor type:	Electronic

Electrical system

Battery voltage:	12 V	Stop solenoid type:	ETR
Starter motor:	3 kW	Alternator:	50 A
Battery cable section:	70 mm2	Battery cable length:	1,5 m

Installation details

Exhaust hose inner diameter:	90 mm (3,54 in)	Maximum fuel lift height:	0,6 m (1,97 ft)
Sea water hose inner diameter:	32 mm (1,26 in)	Maximum raw water lift height:	2,5 m (98,43 in)
Fuel feeding hose inner diameter:	10 mm (0,39 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	10 mm (0,39 in)	Maximum installation angle***:	15 °
Minimum battery capacity:	12 V 120 Ah		

Alternator details

Brand:	Meccalte	Cos φ:	0,8
Model:	ECP32-3L/4B	Tropicalized:	S
Regulator type:	DSR	Excitation system:	Brushless
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN60034-1, IEC 60034-1
IP protection*:	23	Alternator type:	Synchronous

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Three-Phase

General data			
Maximum power*:	66,9 kW (83,6 kVA)	Voltage:	480/277 V
Prime Power**:	60,8 kW	Amperage:	100,6 A
Frequency:	60 Hz	Phases:	3

Dimensions and weights			
Total lenght without canopy:	1723 mm	Total lenght with canopy:	1903 mm
Total width without canopy:	700 mm	Total width with canopy:	840 mm
Total height without canopy:	800 mm	Total height with canopy:	848 mm
Dry weight without canopy:	759 Kg	Dry weight with canopy:	869 Kg

Engine			
Base engine manufacturer:	Mitsubishi	Diameter:	94 mm (3,7 in)
Model Solé Diesel:	SM-81	Stroke:	120 mm (4,72 in)
Type:	4 No. of Strokes	Compression ratio:	17:1
Engine RPM:	1800	Injection system:	Mechanical and indirect
Number of cylinders:	6	Intake system:	Turbocharged
Total displacement:	4996 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	21 L (5,55 gal)
Oil capacity:	12 L (3,17 gal)	Flywheel:	SAE 11 1/2
Power:	70 kW (95,2 CV)	Coolant flow rate:	96 l/min (25,36 gal/m)
Salt water flow rate:	45 l/min (11,89 gal/m)	Intake air flow rate:	5,8 m3/m
Starting aid:	Glow plugs		

Fuel system details			
Consumption:	6,2 L/H (1,64 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	9,7 L/H (2,56 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	13,2 L/H (3,49 Gal/H)	Injection pump type:	In line
Consumption at 100 %:	17,4 L/H (4,6 Gal/H)	Governor type:	Electronic

Electrical system			
Battery voltage:	12 V	Stop solenoid type:	ETR
Starter motor:	3 kW	Alternator:	50 A
Battery cable section:	70 mm2	Battery cable length:	1,5 m

Installation details			
Exhaust hose inner diameter:	90 mm (3,54 in)	Maximum fuel lift height:	0,6 m (1,97 ft)
Sea water hose inner diameter:	32 mm (1,26 in)	Maximum raw water lift height:	3 m (118,11 in)
Fuel feeding hose inner diameter:	10 mm (0,39 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	10 mm (0,39 in)	Maximum installation angle***:	15 °
Minimum battery capacity:	12 V 120 Ah		

Alternator details			
Brand:	Meccalte	Cos φ:	0,8
Model:	ECP32-3L/4B	Tropicalized:	S
Regulator type:	DSR	Excitation system:	Brushless
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN60034-1, IEC 60034-1
IP protection*:	23	Alternator type:	Synchronous

Section 9 – Tightening torques

Important nuts and bolts:

TIGHTENING VALUES	THREAD	29 GSC / 32 GSAC / 35 GTC / 40 GTAC / 45 GTC/ 54 GTAC/ 50 GTC/ 60 GTAC/ 68 GTC/ 84 GTAC	
		N · m (kgf · m)	
Cylinder head	M12 x 1.75	113 to 123 (11.5 to 12.5)	
Rocker cover	M8 x 1.25	10.0 to 13.0 (1.0 to 1.3)	
Crankshaft pulley	M30 x 1.5	480 to 500 (49 to 51)	
Bearing cap	M14 x 2.0	98 to 108 (10.0 to 11.0)	
Flywheel	M12 x 1.25	78.5 to 88.5 (8.0 to 9.0)	
Oil pan drain plug	M14 x 1.5	34.0 to 44.0 (3.5 to 4.5)	
	M20 x 1.5	73.0 to 83.0 (7.5 to 8.5)	
Oil filter	-	44.1 to 53.9 (4.5 to 5.5)	
Oil relief valve	M22 x 1.5	44.1 to 53.9 (4.5 to 5.5)	
Injector (adjustment at	M20 x 1.5	53.0 to 64.7 (5.4 to 6.6)	
Glow plug	M10 x 0.7	15.0 to 30.0 (1.5 to 3.0)	
General tightening torque		4T	7T
	M6 x 1.0	2.94 to 4.90 (0.3 to 0.5)	7.85 to 9.8 (0.8 to 1.0)
	M8 x 1.25	9.8 to 12.7 (1.0 to 1.3)	14.7 to 21.6 (1.5 to 2.2)
	M10 x 1.25	17.7 to 24.5 (1.8 to 2.5)	29.4 to 41.2 (3.0 to 4.2)
	M12 x 1.25	29.4 to 41.2 (3.0 to 4.2)	53.9 to 73.5 (5.5 to 7.5)

Section 10 – Technical Appendices

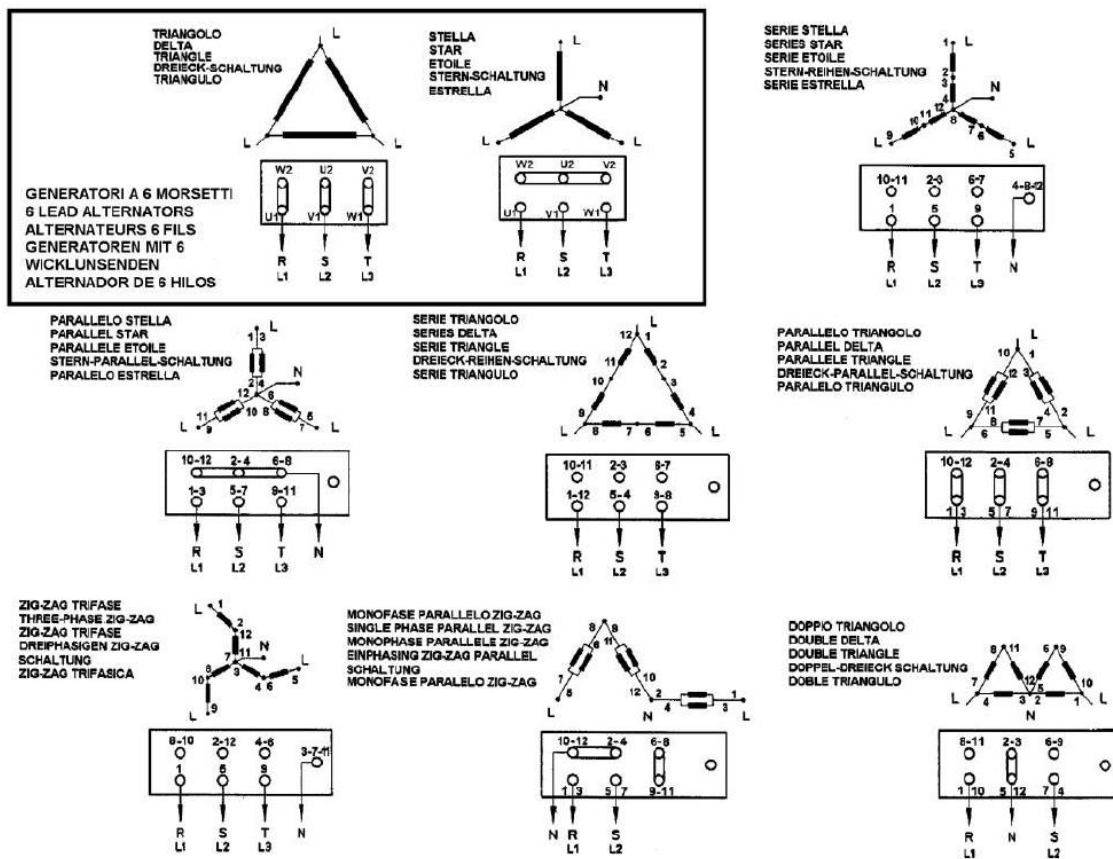
10.1. Wiring diagrams

10.2. Alternator connections

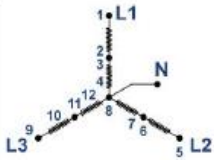
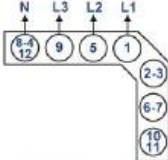
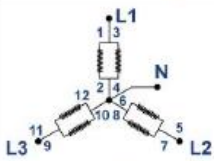
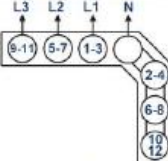
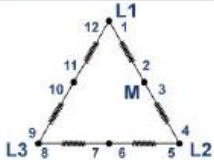
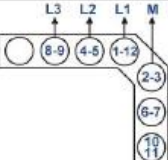
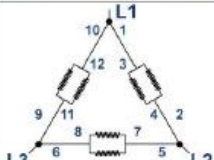
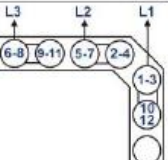
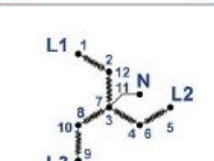
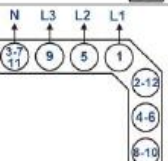
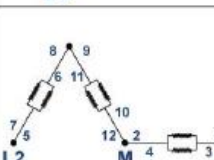
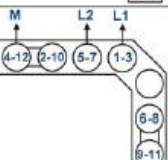
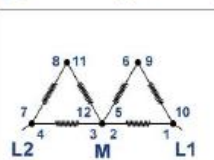
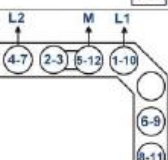
According to genset model, consult the alternator's connection:

- Connection type 1: Meccalte alternator 1
- Connection type 2: Meccalte alternator 3
- Connection type 3: Sincro alternator

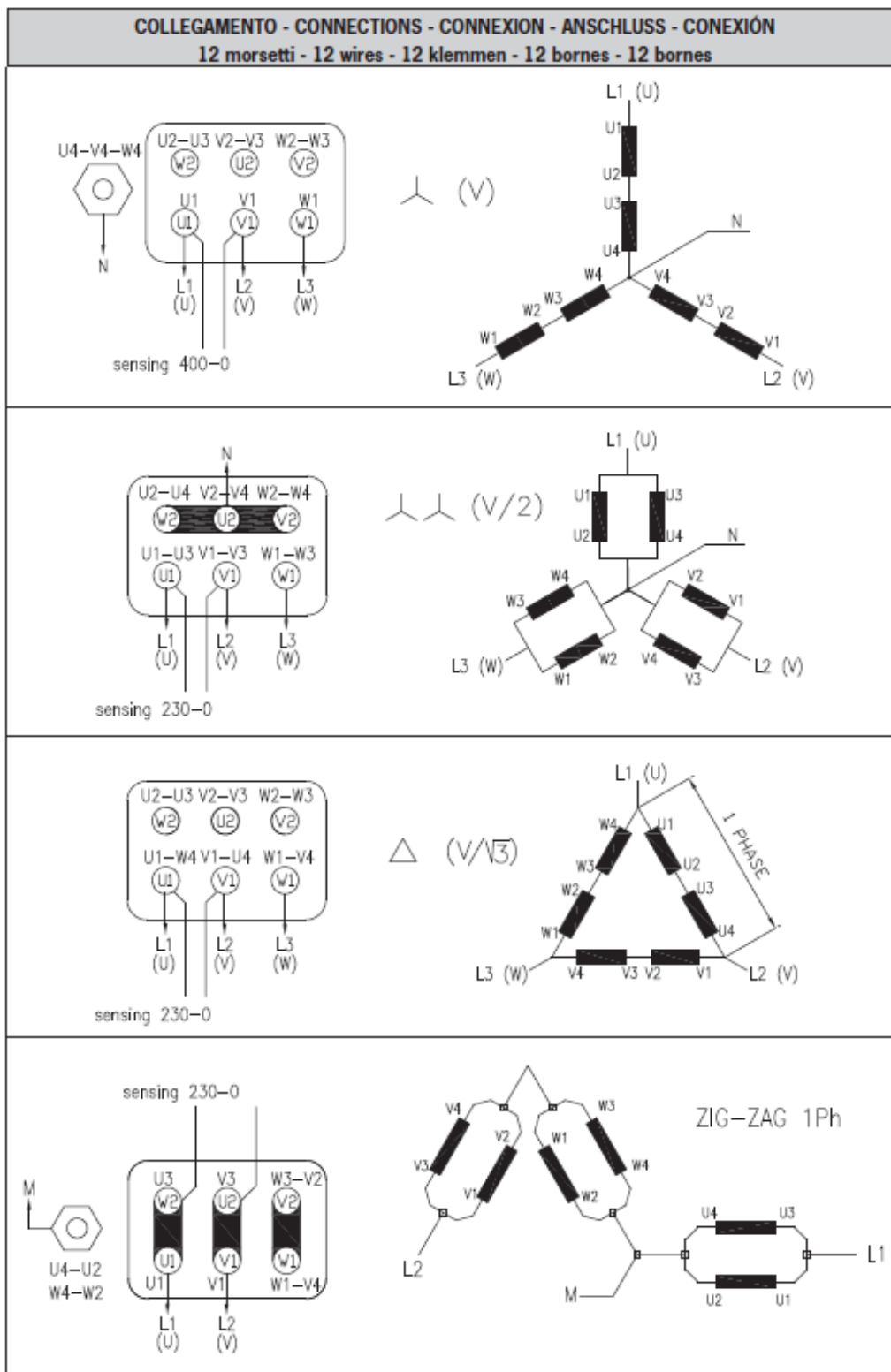
Connection's type 1



Connection Type 2

12 wires connection									
Connection					Winding T0405S3 (***)				
Series star			50Hz	L - L	380	400	415	440	
			50Hz	L - N	220	230	240	254	
			60Hz	L - L	460	480	500	530	
			60Hz	L - N	265	277	290	305	
Parallel star			50Hz	L - L	190	200	208	220	
			50Hz	L - N	110	115	120	127	
			60Hz	L - L	230	240	250	265	
			60Hz	L - N	133	138	145	152	
Series delta (*)			50Hz	L - L	220	230	240	254	
			50Hz	L - M	110	115	120	127	
			60Hz	L - L	265	277	290	305	
			60Hz	L - M	133	138	145	152	
Parallel delta (*)			50Hz	L - L	110	115	120	127	
			60Hz	L - L	133	138	145	152	
Three phase Zig-Zag (**)			50Hz	L - L	330	346	360	380	
			50Hz	L - N	190	200	208	220	
			60Hz	L - L	400	415	430	460	
			60Hz	L - N	230	240	250	265	
Single phase parallel zig-zag (*)			50Hz	L - L	220	230	240	254	
			50Hz	L - M	110	115	120	127	
			60Hz	L - L	265	277	290	305	
			60Hz	L - M	133	138	145	152	
Single phase double delta (*)			50Hz	L - L	220	230	240	254	
			50Hz	L - M	110	115	120	127	
			60Hz	L - L	265	277	290	305	
			60Hz	L - M	133	138	145	152	

Connection Type 3

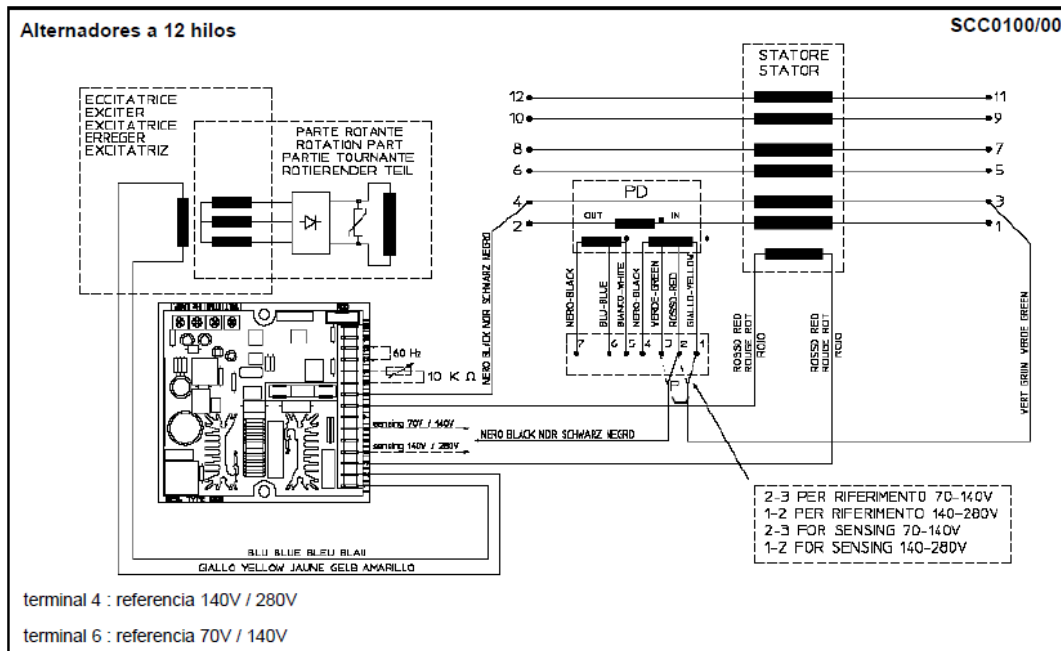


10.3. Regulator connections

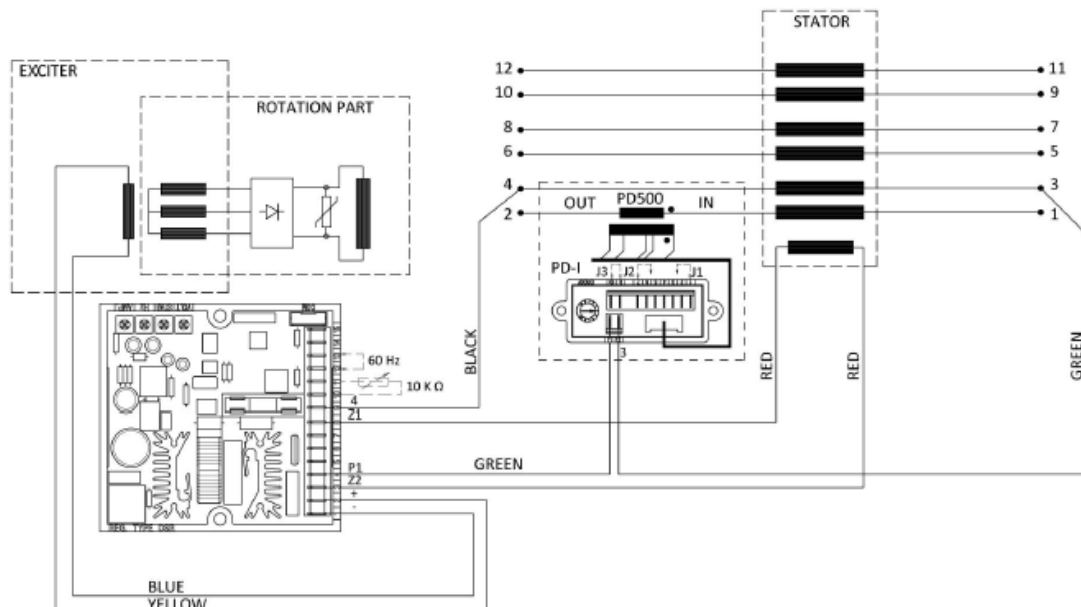
According to genset model, consult the regulator's connection:

- Connection type 1: Meccalte alternator 1
- Connection type 2: Meccalte alternator 3
- Connection type 3: Sincro alternator

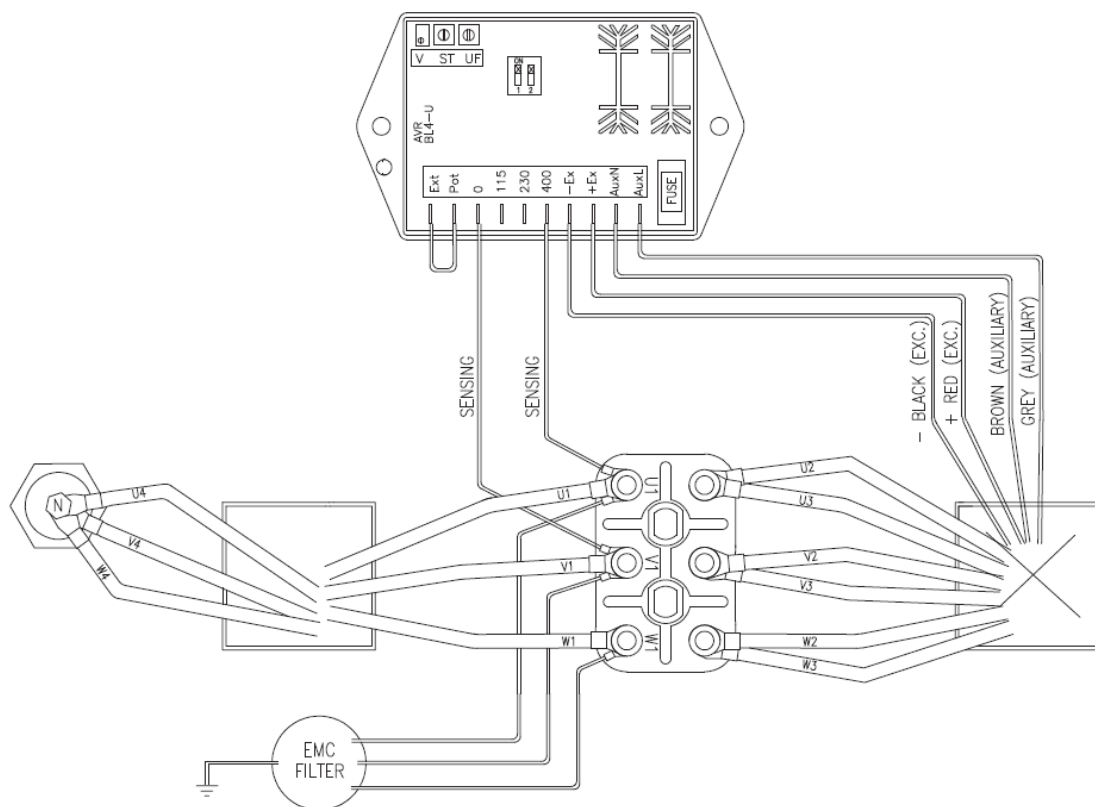
Connection Type 1



Connection Type 2

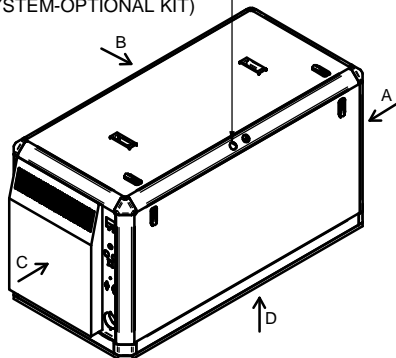


Connection type 3



10.4. Overall dimensions

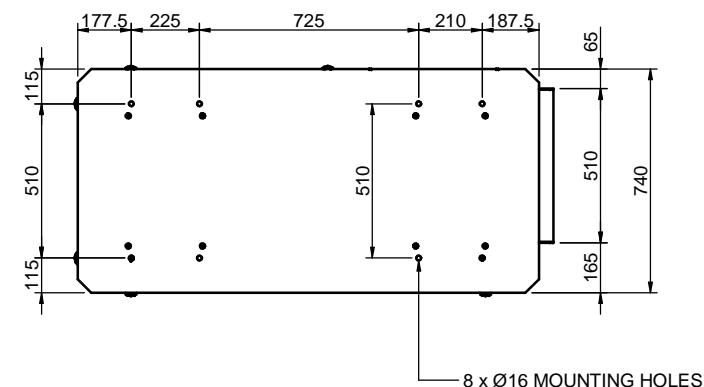
SIPHON BREAK CONNECTIONS
(AIR VENT SYSTEM-OPTIONAL KIT)



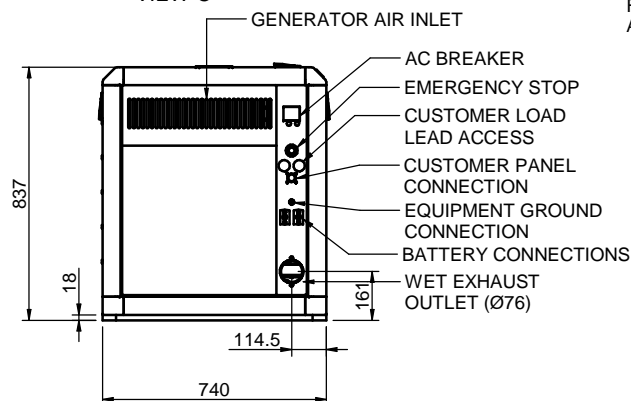
ALTERNATOR:
MECCALTE ECP32_M4B

ENGINE:
MITSUBISHI MINI-74

VIEW D

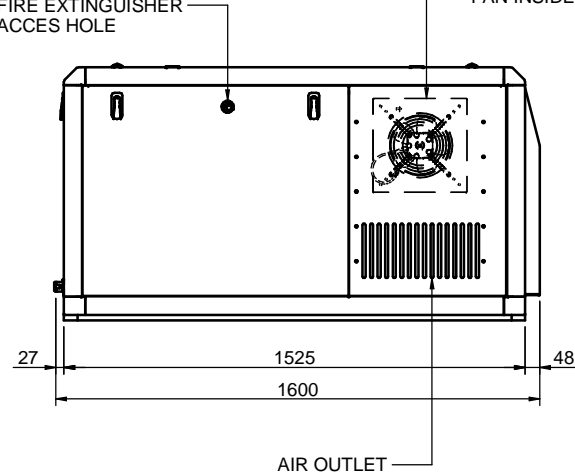


VIEW C

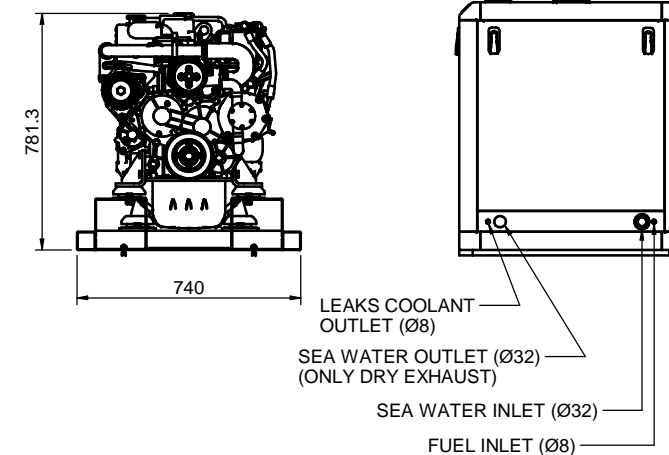


FIRE EXTINGUISHER
ACCES HOLE

VIEW B



VIEW A

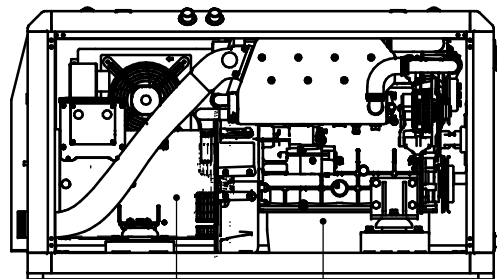
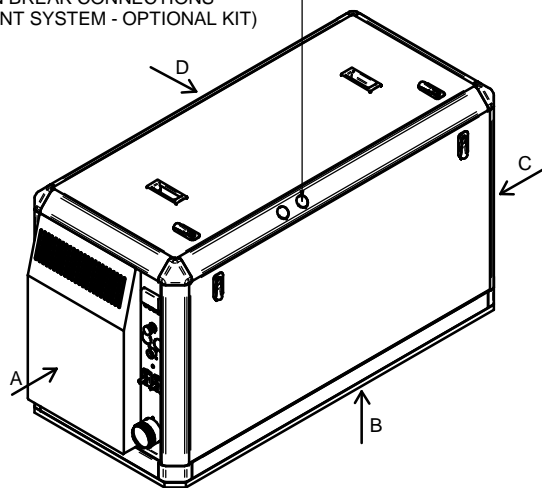


Note: The control panel (main controller) is supplied without fixing at genset in order to permit their installation on engine room according to installer requirements

Note 2: Dimensions in millimeters

GRUPO 29 GSC 12V 230V				
GENSET 29 GSC 12V 230V				
MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
				-/-
DIBUJADO J.RODRÍGUEZ	VERIFICADO	GRADO PRECISIÓN MEDIO	FECHA CREACIÓN 20/02/2017	ÚLTIMA REVISIÓN ---
		SOLÉ, S.A.		G7401M0291C00

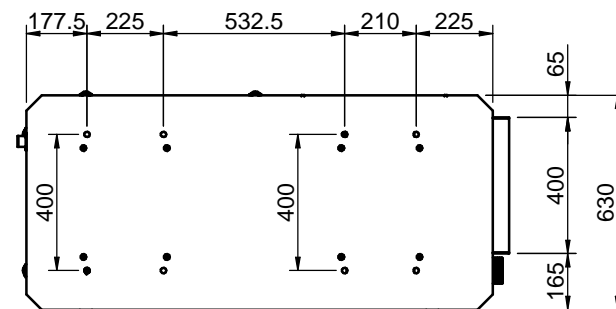
SIPHON BREAK CONNECTIONS
(AIR VENT SYSTEM - OPTIONAL KIT)



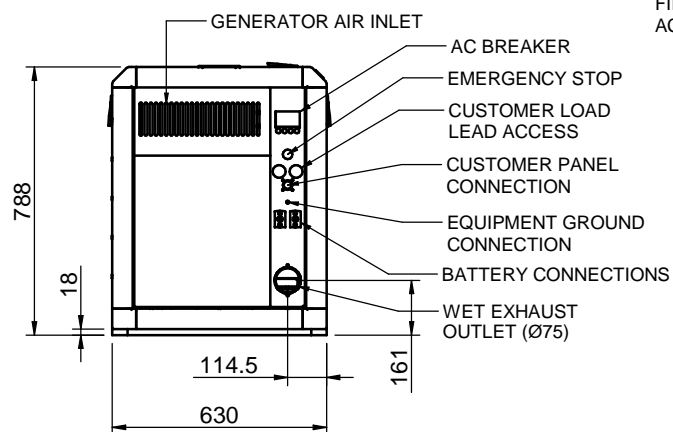
ALTERNATOR:
SINCRO SK 160WA

ENGINE:
MITSUBISHI MINI 74

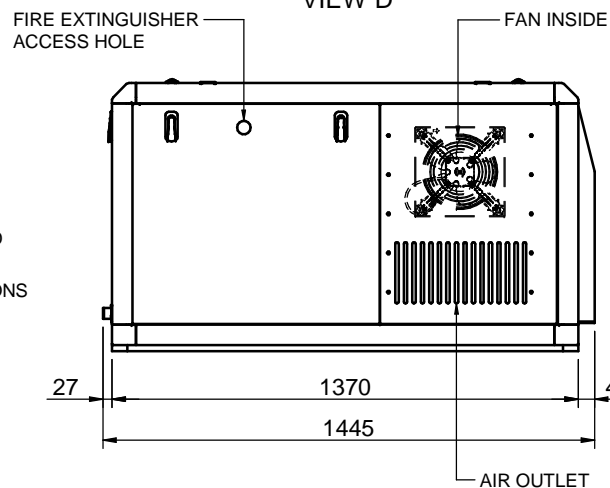
VIEW B



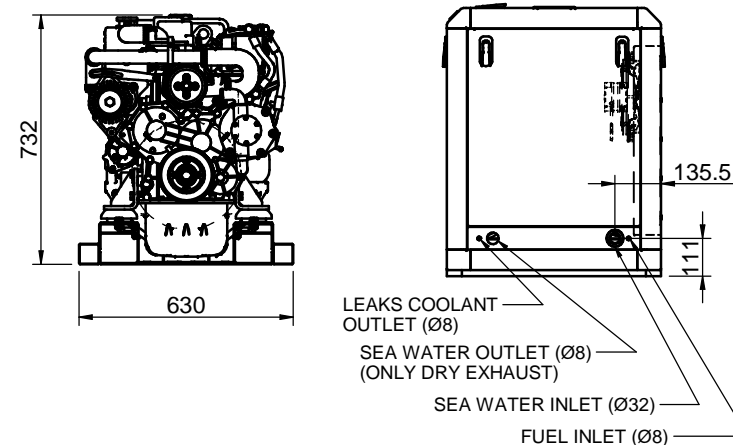
VIEW A



VIEW D



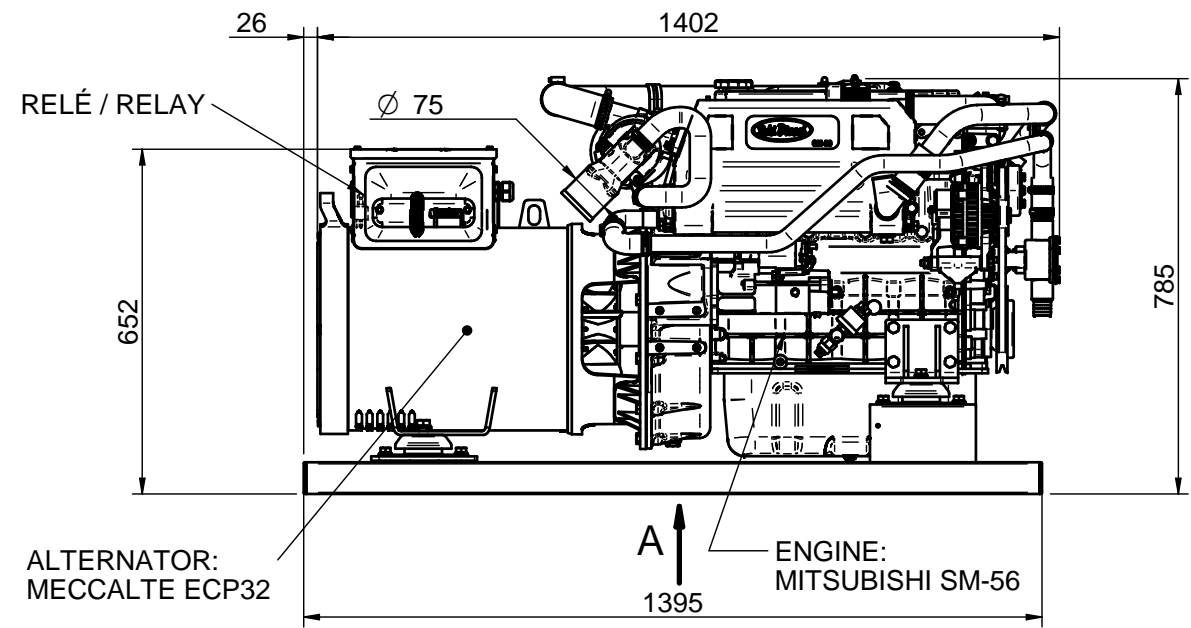
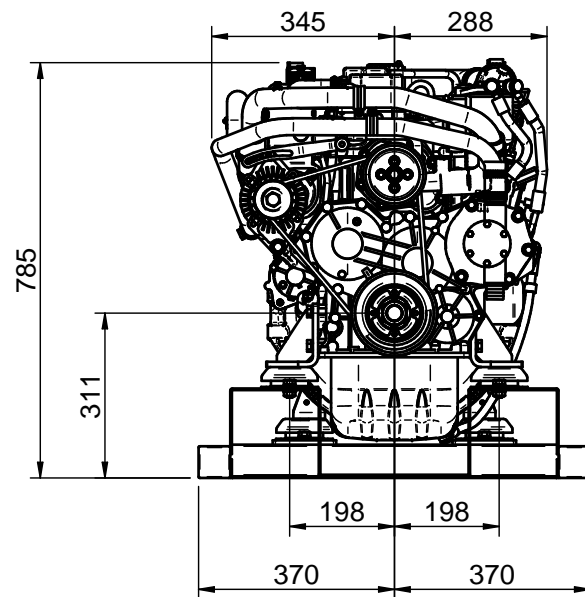
VIEW C



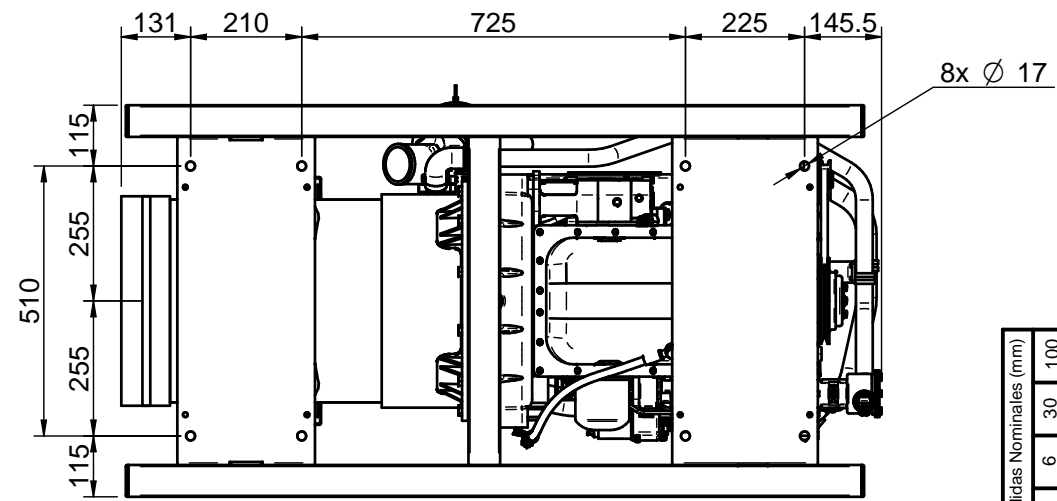
Note: The control panel (main controller) is supplied without fixing at genset in order to permit their installation on engine room according to installer requirements

Note 2: Dimensions in millimeters

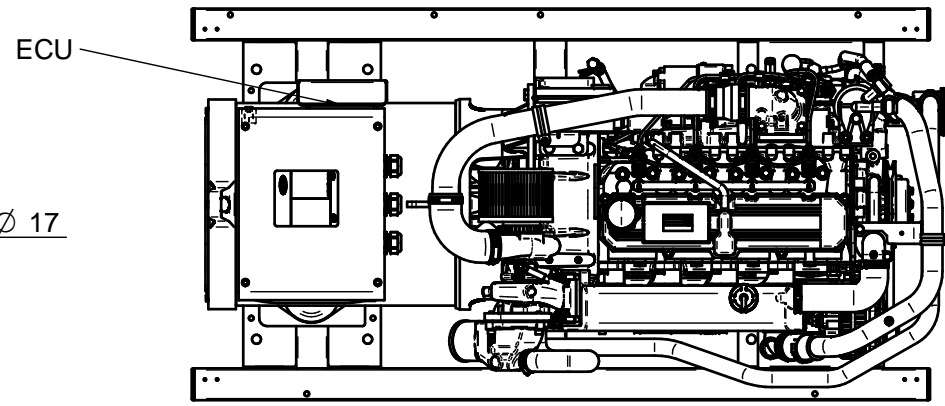
Medidas Nominales (mm)					GRUPO 35 GTC 12V 400/230V				
					GENSET 35 GTC 12V 400/230V				
					MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
									-/-
					DIBUJADO	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN
					XAVIER	S. UBACH	MEDIO	10/06/2014	---
								SOLÉ, S.A.	
								60574335SI	



Entrada de agua / Water Inlet	Ø32
Entrada de Gas-Oil / Fuel Inlet	Ø9
Retorno de Gas-Oil / Fuel Return	Ø8

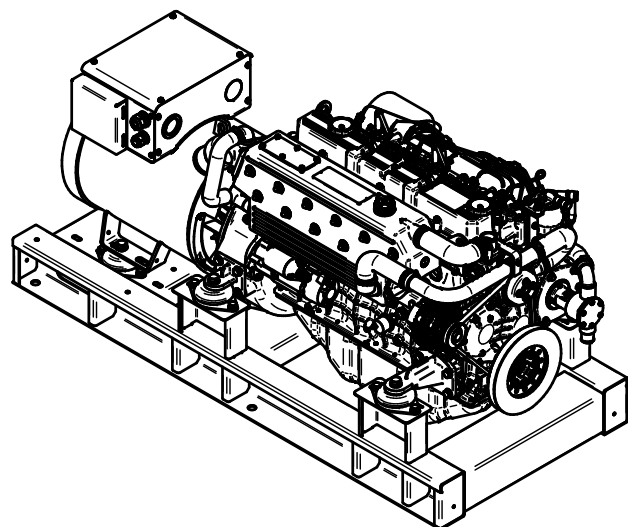
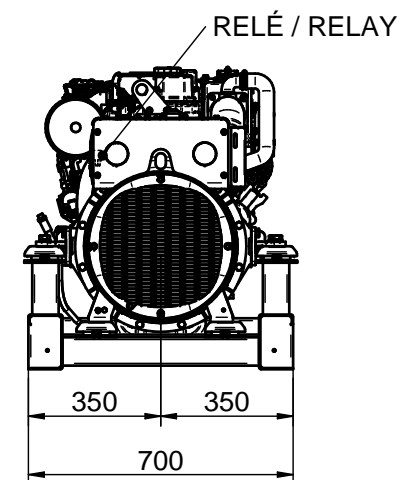
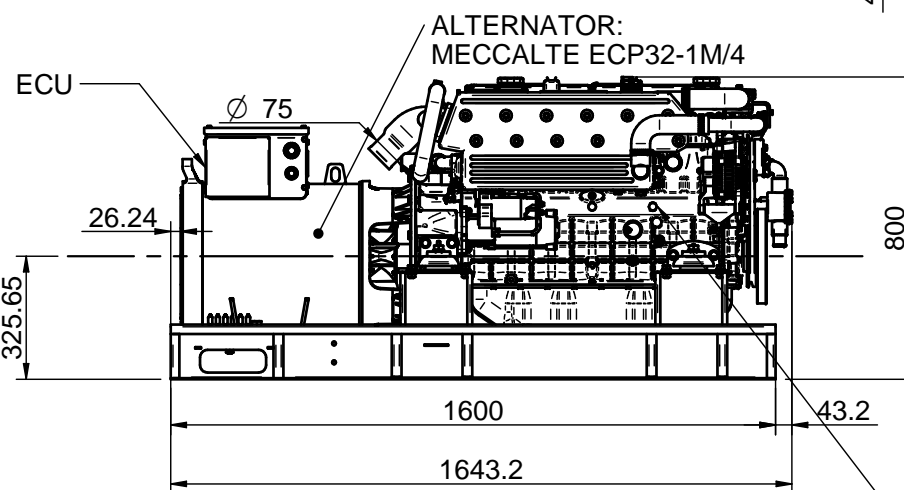
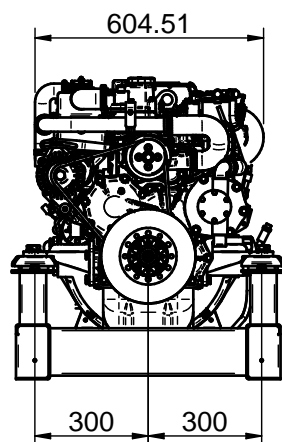
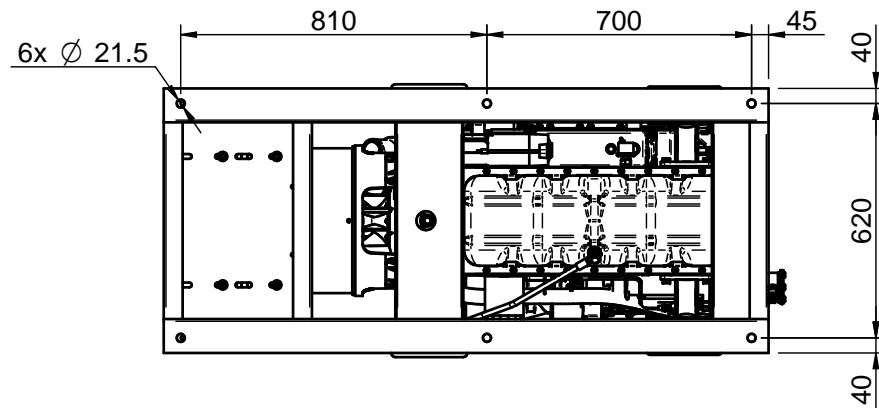


VISTA A




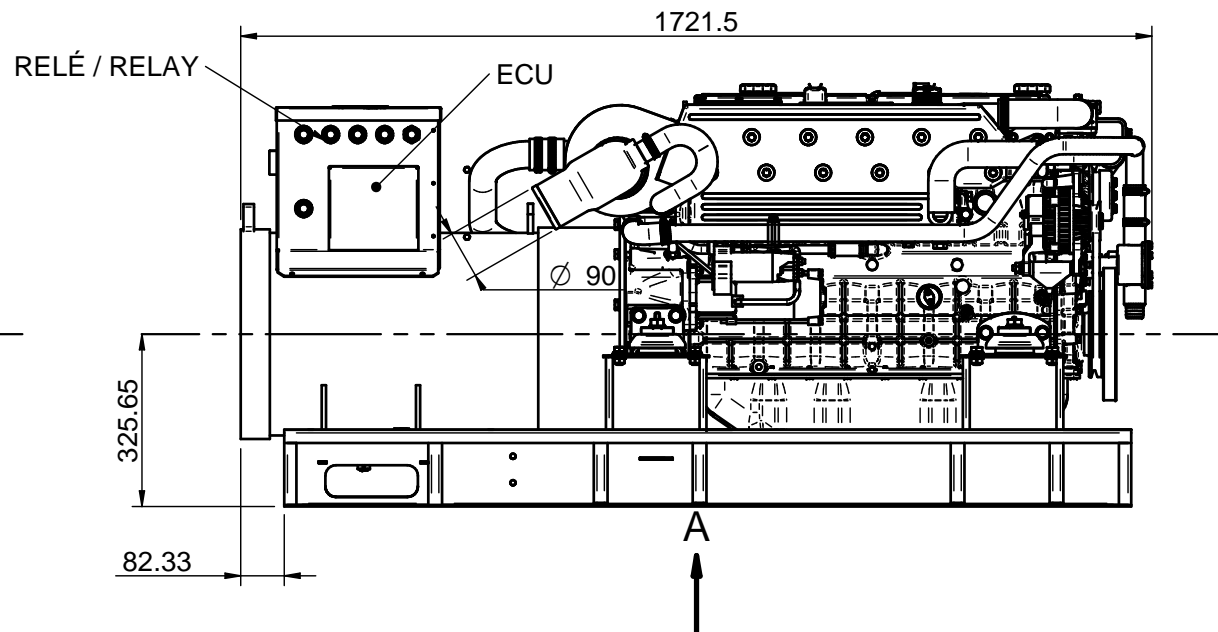
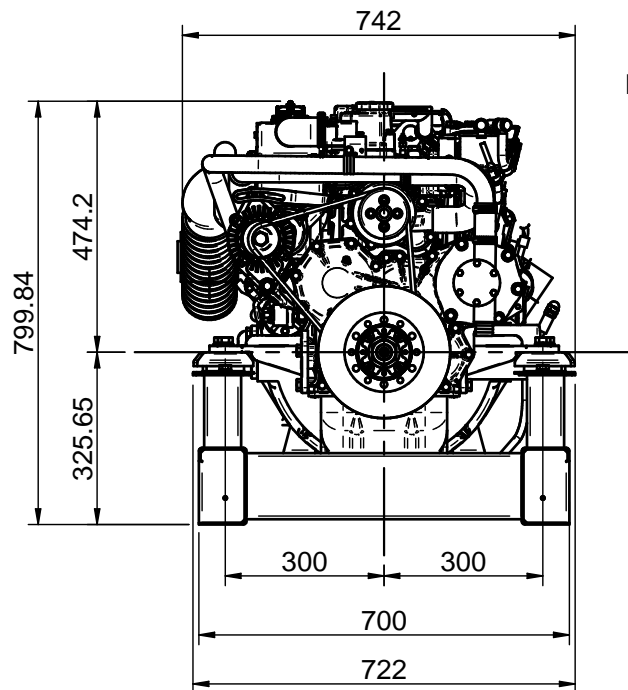
GRUPO 45 GT 12V 400/230 V PREP.PARA				
GENSET 45 GT 12V 400/230 V PARALLEL				
MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
			Suavizar Arsitás	/.
DIBUJADO	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN
P.IGLESIAS	V.MIRAVET		08/04/2019	--
		SOLÉ, S.A.		G7B03M0451SPP

Medidas Nominales (mm)	100	±0.2
	30	±0.15
	6	±0.1
	0	±0.05
	Grado de Precisión DIN-7168	
	Fino	±0.1
	Medio	±0.2
	Bastio	±0.5

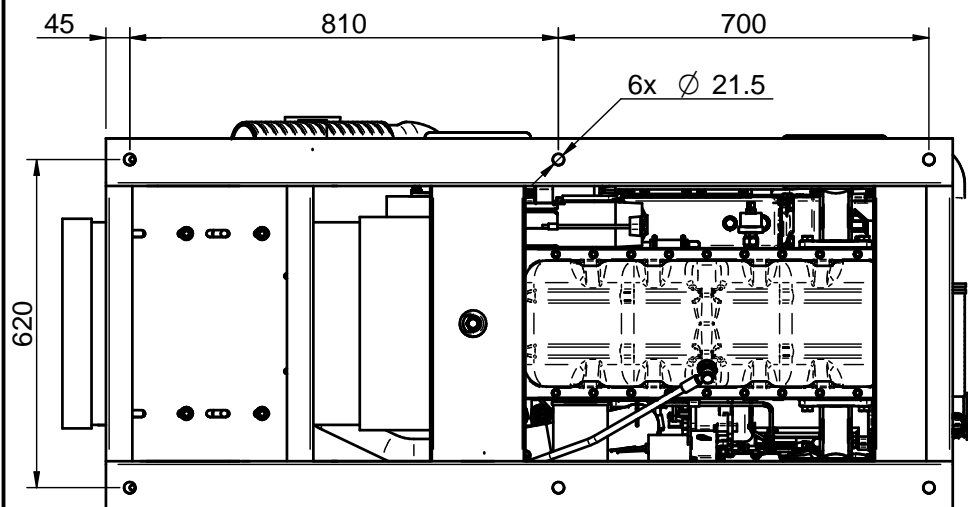


Entrada de agua / Water Inlet	Ø32
Entrada de Gas-Oil / Fuel Inlet	Ø8

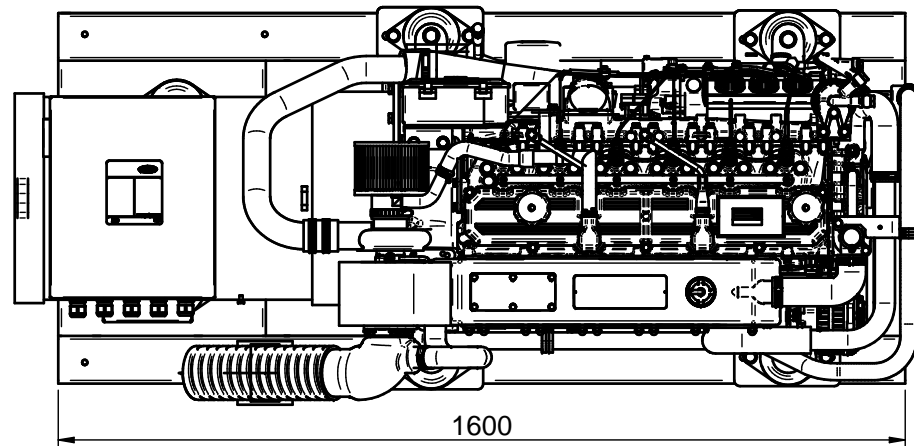
Medidas Nominales (mm)					GRUPO 50 GT 24V 400/230V Prep.Para				
100	30	6	0		PREP. PARALLEL GENSET 50 GT 24V 400/230V				
a	a	a	a		MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
100	100	30	6					Suavizar Aristas	/.
±0.2	±0.15	±0.1	±0.05		DIBUJADO	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN
±0.2	±0.1	±0.1	±0.05		P. IGLESIAS		MEDIO	07/06/2017	30/03/2020
±0.2	±0.1	±0.1	±0.05					SOLÉ, S.A.	
±0.2	±0.1	±0.1	±0.05					G7503M0502SPP	




Entrada de agua / Water Inlet	Ø32
Entrada de Gas-Oil / Fuel Inlet	Ø10
Retorno de Gas-Oil / Fuel Return	Ø10



VISTA A / VIEW A



Medidas Nominales (mm)	100	GRUPO 68 GT 12V 230 V										Prep. Para	
	30	PREP. PARALLEL GENSET 68 GT 12V 230 V											
	6	MATERIAL			ACABADO			TRATAMIENTO	PRESENTACIÓN	ESCALA			
	0	DIBUJADO			VERIFICADO			GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN			
		P.IGLESIAS			V.MIRAVET				13/06/2019	--			
Grado de Precisión DIN-7168	Fino	Medio	Basto					SOLÉ, S.A.		G7A04M0681SPP			

Section 11 – Instructions to replace and remove

When you decide to replace the genset, please contact Solé Diesel S.A.; will provide relevant instructions regarding the laws in force at the time. When disposing of the whole or parts of this genset, meets LAWS IN FORCE IN THE COUNTRY OF INSTALLATION.

For more information about the materials they are made of the individual components of the generator, contact Solé Diesel S.A.

Inspection prior to the delivery of generator sets



Section 12 – Inspection prior to the delivery of generator sets

INSPECTION PRIOR TO THE DELIVERY OF GENERATOR SETS

Installer / Marina information			
Installer Company:		Installation Date:	
Contact Tel. No.:		E-mail:	
Owner's Information			
Name and surnames:			
Contact Tel. No.:		Email:	
Generator Set Information			
Generator set model:			
Generator set serial number:		Alternator serial No. (if applicable):	
Installation Information			
Type of electrical installation:		Total power consumption: kw	
Machine chamber operating temperature:			°C
Angle of the generator set (boat moored):			°
Maximum angle of the generator set (navigation conditions)			°
Is the wet exhaust elbow above or below the floating line?		above	below
Exhaust, Cooling and Fuel Line Information			
Int. Diameter of exhaust hose (if applicable):	mm	Int. Diameter of sea water intake to the pump	mm
Int. Diameter of diesel intake:	mm		
Int. Diameter of diesel return intake	mm		
Has an exhaust collector been installed?	YES	Has an air trap been installed?	YES
	NO		NO
Verifications Prior to Start-Up		V/x	Notes
Correct engine alignment.			
Electrical installation connections.			
Engine oil level			
Coolant level and concentration.			
Control panel operation.			
Transmission belts and belt tension.			
Airtight water cock			
Verification of Generator Set No. - Load Operation		V/x	Notes
Oil pressure			
Bledd the fresh water cooling system.			
Verify the control panel: normal indications and alarm operation.			
Water, oil and fuel leaks in the engine.			

Inspection prior to the delivery of generator sets



INSPECTION PRIOR TO THE DELIVERY OF GENERATOR SETS		
Verification of Generator Set Operations with Load	V/x	Notes
Verify the electrical power and voltage of the generator set at full load.		
Engine output and alternator operation at variable load		
Engine temperature and oil pressure.		
Information for the Owner	V/x	Notes
Delivery of the instructions manual and generator set-related documents.		
Review of the generator set operator's manual.		
Study the generator set control panel functions.		
Report the first revision date.		
Report the maintenance schedule indicated in the manuals.		

Section 13 - Maintenance log

DATE	HOURS	DESCRIPTION	SERVICE NAME

Maintenance log



DATE	HOURS	DESCRIPTION	SERVICE NAME



MARINE DIESEL ENGINES · GENSSETS · PROPELLERS · ACCESSORIES

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www.solediesel.com · info@solediesel.com

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U_CTGR7481E_EN
Revision 1
07/2022