



www.solediesel.com

Marine generator sets

Electronic operation

Operator's manual

85 GT/GTC
100 GTA/GTAC
115 GT/GTC
120 GTA/ GTAC
165 GT/GTC
180 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



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.

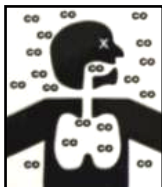
Safety precautions and instructions

⚠ 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 engine 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.

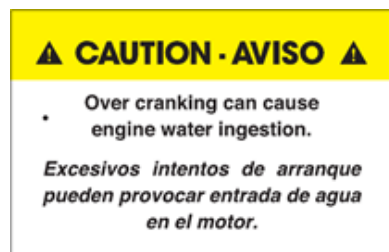
⚠ NOTICE

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.

Safety precautions and instructions

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.).

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.



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	1000

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	1000		

Restrictions

Coverage:

- 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 13.

Sole Diesel Warranty



- 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 13.
- 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:

Sole Diesel Warranty



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

Genset information

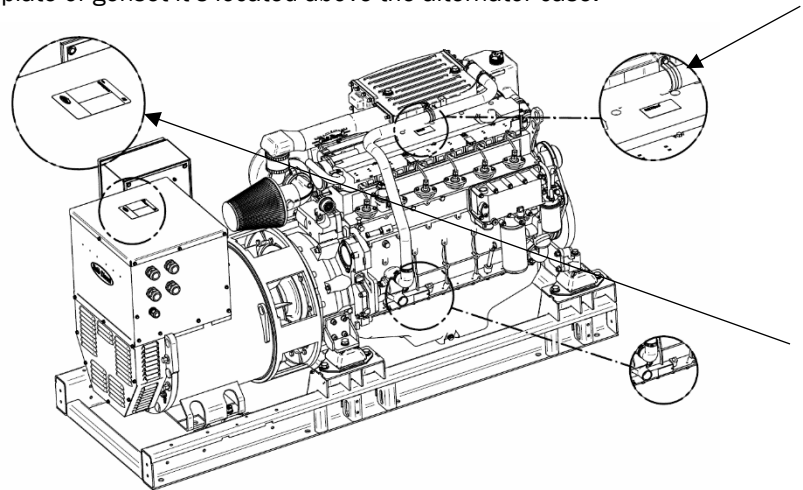


Section 1 – Genset Information

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		MADE IN SPAIN
TIPO TYPE		
MOTOR N° ENG No.		
kW	R.P.M.	



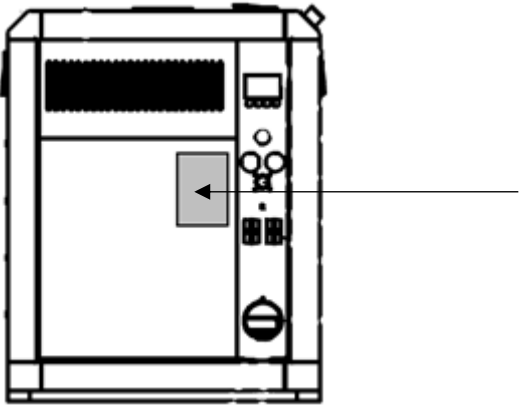
Model: 25 GT

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:	Orgen: 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:



Genset serial number:

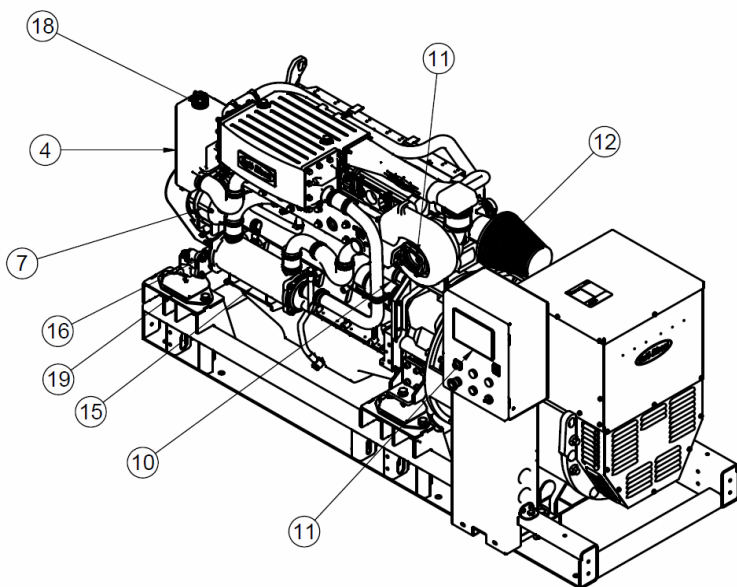
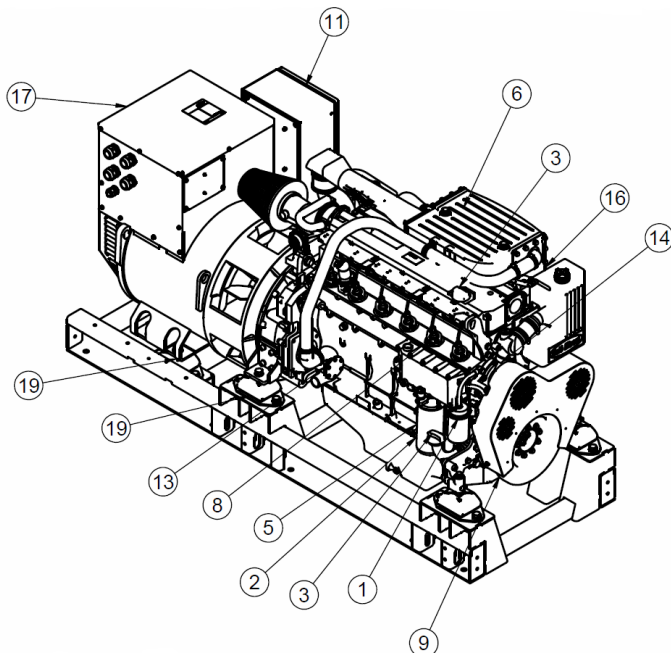
In addition, all gensets are marked with the serial number on the block, on the fuel injection pump.

Genset information

1.2. Genset parts identification

Gensets: 85 GTC / 100 GTAC / 115 GTC / 120 GTAC / 165 GTC / 180 GTAC

PART	ELEMENT
1	Fuel filter
2	Oil filter
3	Oil fill cap
4	Expansion tank
5	Dipstick
6	Intercooler assy ¹
7	DC alternator
8	Injectors
9	Belt protection case
10	Starter assy
11	Control panel ²
12	Air filter
13	Seawater pump
14	Cooler pump
15	Exchanger assy
16	Anode
17	AC alternator
18	Coolant fill cap
19	Silentblocks
20	Turbochager



¹ Only for 115 GTC / 120 GTAC / 165 GTC / 180 GTAC models.

² Only for 165 GTC / 180 GTAC models or 85 GTC / 100 GTAC / 115 GTC / 120 GTAC models supplied with the control and power kit for parallel operation.

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 S.A. 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 S.A., 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:

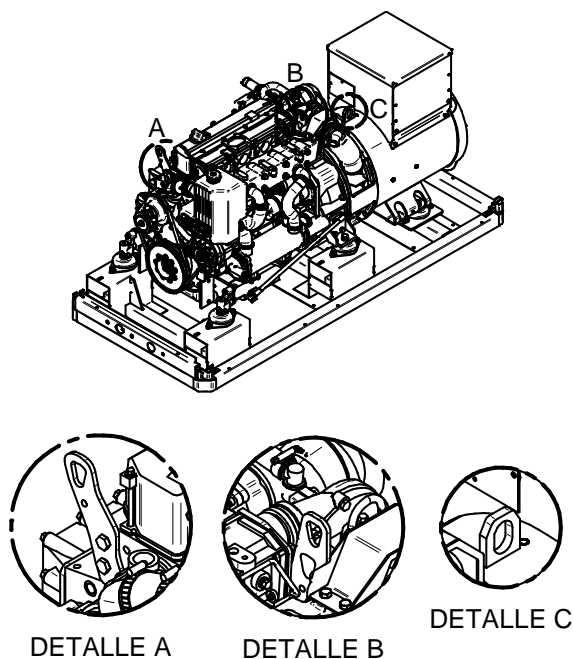
1. Remove the cardboard crate.
2. Lift the genset using a forklift and suitable chains, which hook to the genset eyebolts.
3. Transfer the genset to the intended position of installation.
4. Remove the wooden base.
5. Begin installation operations.



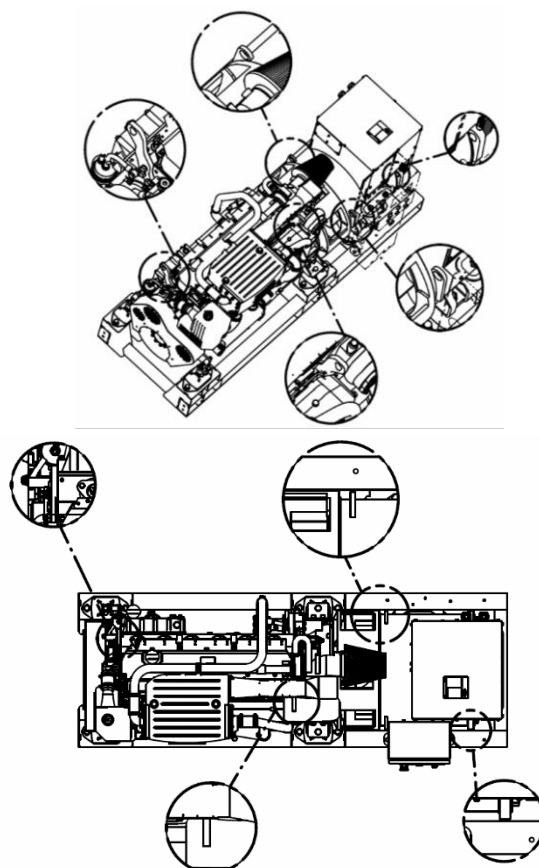
2.3. Transporting and Handling the Unpacked Genset

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

For 85 GTC / 100 GTAC / 115 GTC / 120 GTAC models:



For 165 GTC / 180 GTAC models:



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
85 GTC / 100 GTAC	10°	30° (Max. 30 min.)
115 GTC / 120 GTAC	10°	30° (Max. 30 min.)
165 GTC / 180 GTAC	10°	30° (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 *11.4 Genset Dimensions and section 10 Tightening Torques*.
2. Connect exhaust outlet. See *11.4 Genset Dimensions*.
 1. Wet exhaust outlet
 2. Dry exhaust outlet + Seawater outlet
3. Connect siphon breaker (if installed). See *11.4 Genset Dimensions and section 5.7 Inlet and exhaust system*.
4. Connect seawater inlet. See *11.4 Genset Dimensions*.
5. Connect fuel inlet. See *11.4 Genset Dimensions*.
6. Connect leak coolant outlet. See *11.4 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 11.4 Genset Dimensions*.
13. Connect to 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 section *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. Winterzation 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 been follow:

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 must 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 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 for 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.				I				
	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.

Systems and scheduled maintenance



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 10 Torques*.

Maintenance task. Valve clearance inspection

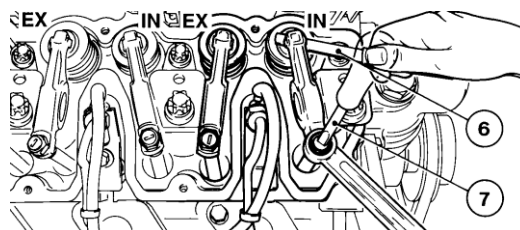
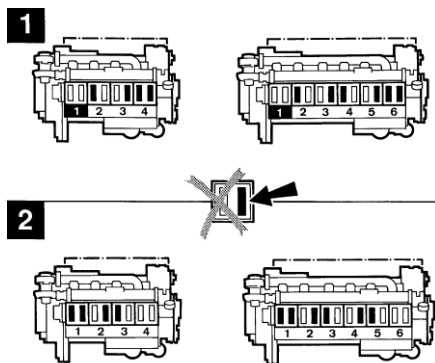
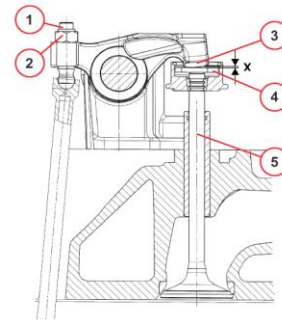
The rocker cover must be removed to check the valve clearance. This operation must be carried out when the generator set is cold. The oil temperature should be below 80°C.

Item	Assembly standard	
Valve clearance (cold setting)	Inlet	0,3 mm
	Exhaust	0,5 mm

Inspection (without pressure washer)

Do these operations in an authorised Sole Diesel Service. Before adjusting valve clearance, allow the engine to cool for at least 30 minutes. The oil temperature should be below 80°C.

1. Loosen ventilation valve and swing it to the side.
2. Remove the cylinder head cover.
3. Position the crankshaft as shown in the following image. Check the valve clearance of the cylinders marked in black.



4. Check valve clearance (X) between rocker arm and tappet contact face (2) and valve stem (3) with a feeler gauge (6). There should only be slight resistance when feeler blade is inserted.

Systems and scheduled maintenance



Adjust valve clearance

1. Release locknut (2).
2. Regulate the adjustment screw (1) by using a screwdriver (7) so that after tightening the locknut (4), correct valve clearance (X) is achieved.
3. Check and adjust the valve clearance on all remaining cylinders.
4. Reinstall cylinder head with a new gasket if necessary.
5. Swing ventilation valve into position and fasten.

Crankshaft – Position 1

Turn crankshaft until both valves in cylinder n°. 1 overlap (exhaust valve about to close, inlet valve about to open). Adjust clearance of valves marked in black on photo. Mark respective rocker arm with chalk to show that adjustment has been carried out.

Crankshaft - Position 2

Turn crankshaft one full revolution (360°). Adjust clearance of valve marked in black on photo. After the adjustment, the locking nut should be well tightened while the adjusting screw is locked so that it does not rotate. NOTE: The adjustment of the valve play must be made after the cylinder head screws are again tightened.

Inspection (with pressure washer)

1. Loosen ventilation valve and swing it to the side.
2. Remove the cylinder head cover.
3. Do these operations in an authorised Sole Diesel Service. Before adjusting valve clearance, allow the engine to cool for at least 30 minutes. The oil temperature should be below 80°C.
4. Turn crankshaft until both valves in cylinder n°. 1 overlap (exhaust valve about to open).
5. Locate the crankshaft as shown in the photo of the last page.
6. If necessary to adjust the clearance, do as the following:

Adjust valve clearance

1. Release locknut (2).
2. Fix the tool (6) on the adjustment screw (1) and adjust the clearance as the following steps:
 - a. Fix the magnet.
 - b. Turn the feeler gauge of the tool (1). After, turn 90°/150° at the back. IN = 90° / EX = 150°.
 - c. Tightening the locknut (2), using a torque tool (torque 20 Nm).
3. Repeat the check and adjust the clearance in every cylinder.
4. Reinstall cylinder head with a new gasket if necessary.
5. Swing ventilation valve into position and fasten.

NOTICE

Valve clearance should be inspected and adjusted when the engine is cold.

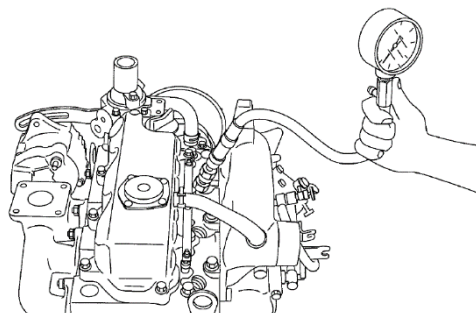
Systems and scheduled maintenance



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	Pressure
85 GTC / 100 GTAC	3,0 to 3,8 MPa (30,6 to 38,7 kgf/cm ²)
115 GTC / 120 GTAC	3,0 to 3,8 MPa (30,6 to 38,7 kgf/cm ²)
165 GTC / 180 GTAC	3,0 to 3,8 MPa (30,6 to 38,7 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.
- The compression measurement is advised only as a comparison measure between all cylinders of the same engine. If differences greater than 15% are verified, it is advisable to look for the cause, disassembling the affected cylinder unit.

Systems and scheduled maintenance

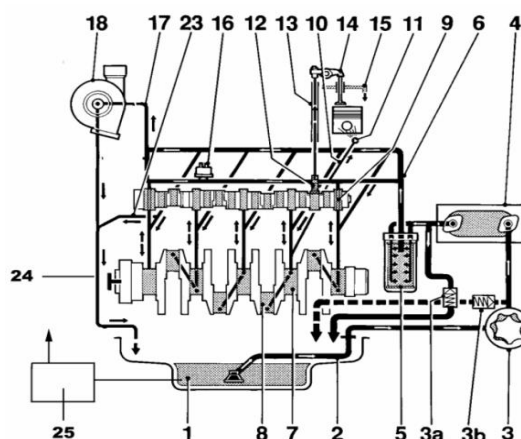


5.4. Lubrication System

Circuit description

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

PIECE	ELEMENT
1	Oil pan
2	Scroop
3	Oil pump
3a	Valve, flow control
3b	Valve, máximo pressure
4	Engine oil cooler
5	Oil filter
6	Oil pipe
7	Crankshaft bearing
8	Conecting rod bearing
9	Camshaft bearing
10	Cooling cylinder pipe
11	Cooling cylinder pipe
12	Tappet
13	Rod cooling rocker
14	Rocker
15	Pipe to oil pan
16	Oil pressure sender
17	Pipe to turbo charger
18	Turbocharger
23	Pipe to oil pan
24	Pipe from turbocharger to oil pan
25	Oil suction pump



MODEL	CAPACITY(L)
85 GTC / 100 GTAC	14
115 GTC / 120 GTAC	14
165 GTC / 180 GTAC	23

*Including filter change (0,5l)

- The minimum oil pressure in all lubrication system is **0,1 kg/cm²**.
- Oil pressure at idling speed: **0,8 kg/cm²**.
- Oil pressure at operating speed (max. RPM): **4,5 kg/cm²**.

Oil specifications

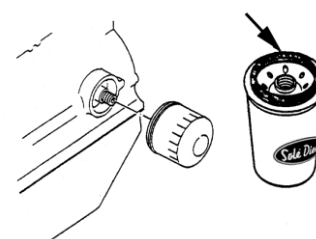
Use oil with 15W40 viscosity (this is an all-season oil for temperatures ranging between -15°C and +40°C) or select the most suitable oil viscosity for the atmospheric temperatures on which the genset is going to be operated. On the other hand, use oil quality no less than ACEA E5/E3 or API CH-4/SJ.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

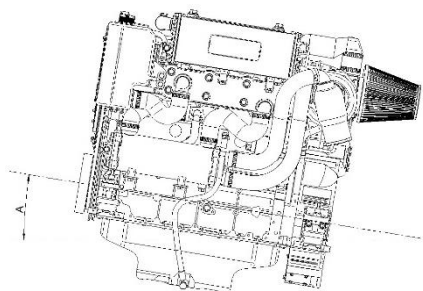


Systems and scheduled maintenance

Maintenance task. Oil level check

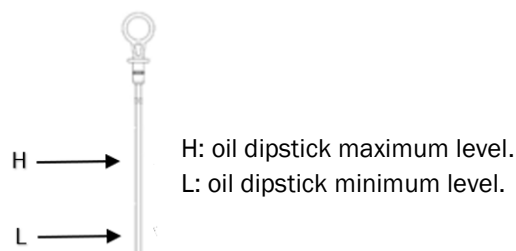
Check the oil level in the crankcase daily or before each start-up to ensure that the level is between the upper (Max mark) and lower (Min mark) lines on the dipstick. To check the oil level:

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. See the attached table to check the position of the maximum level (H) and minimum level (L). The check should be done by taking the measurement from the lower end of the dipstick.

Inclination (A)	85 GTC / 100 C / 115 GTC / 120 GTAC / 165 GT / 180 GTAC	
	Min. (L)	Max. (H)
4°	10,5	24,5
6°	5	21
8°	2	15
10°	-	12



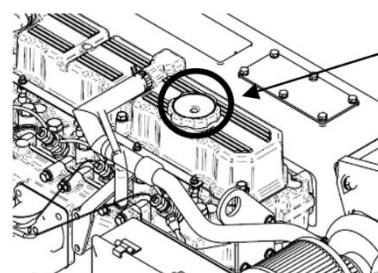
NOTICE

Do not operate the genset if the oil level is below the Min mark or above the Max mark. Know that the markings on the dipstick refer to the engine in a horizontal position. Therefore, check the tilt of the engine when the oil level has been checked.

Maintenance task. Oil fill / change

Oil must be changed with hot genset 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. It is important to remove the dipstick to let the air out of the engine while it is being filled with oil, otherwise, bubbles may be created that make oil overflow to the outside.

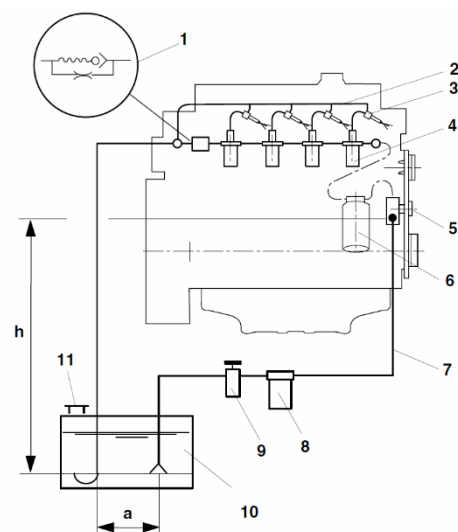
Systems and scheduled maintenance

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	Circuit compensation valve
2	Return fuel tube
3	Nozzle
4	Injection pump
5	Fuel pump
6	Fuel filter
7	Fuel hose
8	Fuel filter (water separator)
9	Valve
10	Fuel tank
11	Breather tank



MODEL	INJECTOR NUMBER
85 GTC / 100 GTAC	4
115 GTC / 120 GTAC	4
165 GTC / 180 GTAC	6

⚠ NOTICE

The dimension "a" will be the maximum possible. Mount the inlet and return as far apart as possible. Distance "a" > 300 mm. Do not exceed height "h". "H" ≤ 1500 mm.

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 does not comply 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.

Systems and scheduled maintenance



Maintenance task. Water separator filter purge

The fuel system must 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. Close the water tap.
2. Unscrew the bleed screw to remove water.
3. Unscrew the filter housing together with the O-ring and remove them.
4. Clean all the elements, specifically the sedimentation chamber. Change the filter if necessary.
5. Assemble the elements again. Check that it does not leak.



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 workshop authorized by SOLÉ DIESEL, since a precision pump monitor and skill knowledge are required.

You must check:

- The presence of exhaust smoke colour. Quickly accelerate the genset. If the engine does not produce black or dark-hued exhaust smoke, the pump is working properly.
- Any leak in the injection pump body or in the fuel lines.

Maintenance task. Injector inspection

This operation requires special tools and must be performed made by workshop authorized by SOLÉ DIESEL.

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.

Systems and scheduled maintenance

For this operation you must follow these steps:

1. Loosen all injection pipes.
2. Start the engine to blow air into the injection lines and injectors automatically.
3. When the fuel overflows from one injection pipe, tighten it and wait for the fuel to come out of another. Repeat until all injection lines are tight.
4. After draining, clean up fuel spill.

CAUTION

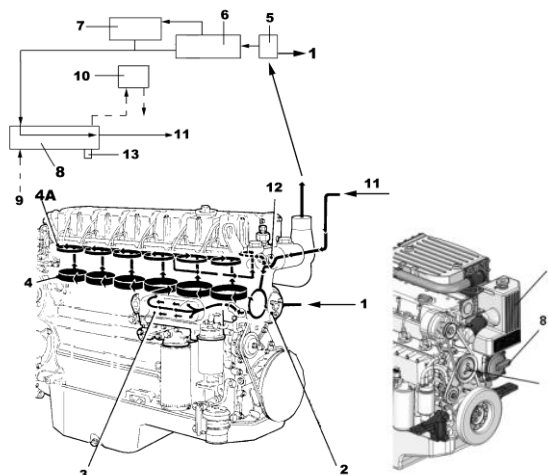
When fuel overflows from the injection pipes, wipe thoroughly with a cloth. Spilled fuel is a fire hazard.

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	
2	Freshwater pump
3	Oil cooler
4	Cooling circuit, cylinders
4A	Cooling circuit, cylinder head
5	Expansion tank
6	Exhaust manifold cooled
7	Turbo charger
8	Heat exchange, anti-freeze
9	Pipe, seawater
10	Elbow, wet exhaust
11	Pipe, inlet freshwater pump
12	Thermostat
13	Boiler kit (optional)



Model	Capacity (L)
85 GTC / 100 GTAC	17,5
115 GTC / 120 GTAC	17,5
165 GTC / 180 GTAC	23

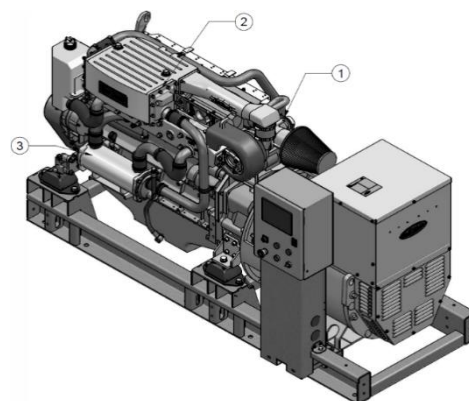
Thermostatic valve

Initial opening	83°C
Final opening	98°C

COOLANT CIRCUIT DESCRIPTION

PIECE	ELEMENT
1	Seawater pump
2	Intercooler ¹
3	Heat exchanger

¹ Only for 115 GTC / 120 GTAC / 165 GTC / 180 GTAC models.



Systems and scheduled maintenance



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

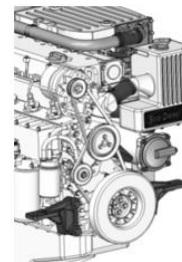
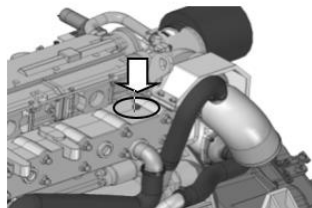
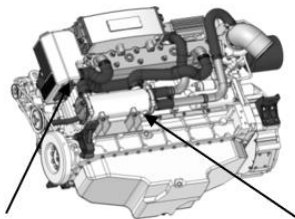
Never mix different types of coolants. This may adversely affect the properties of the genset coolant.

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.



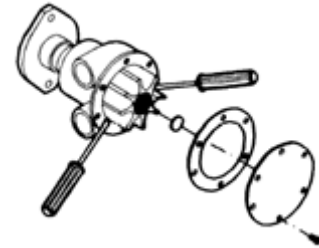
Systems and scheduled maintenance



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:

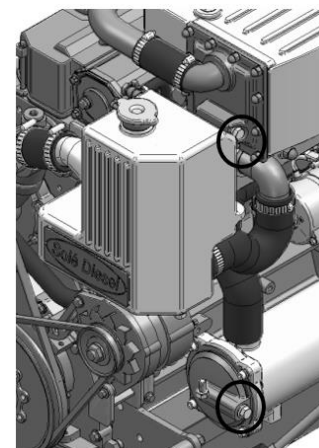
1. Close the seawater cock.
2. Remove the seawater pump cover plate.
3. Remove the impeller from the shaft.
4. Clean the housing.
5. Inspect the impeller for damaged, cranked, broken, missing or flattened vanes. The impeller vanes should be straight and flexible.
6. If it is damaged replace with a new 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.



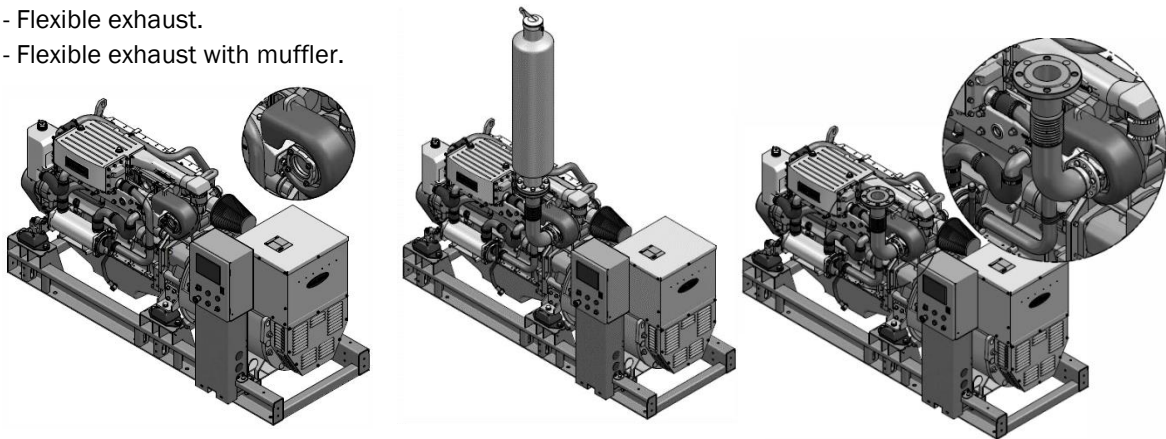
5.7. Inlet and Exhaust System

Exhaust circuit description

To 165 GTC / 180 GTAC models:

These standard models are equipped with dry exhaust. There are 3 variants depending on the installation on your boat:

- Dry exhaust adapter to join the pipe in the exhaust system of the boat.
- Flexible exhaust.
- Flexible exhaust with muffler.



To 85 GTC / 100 GTAC / 115 GTC / 120 GTAC models:

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 = Waterlock capacity (L)

D = Inside diameter of the tube (mm)

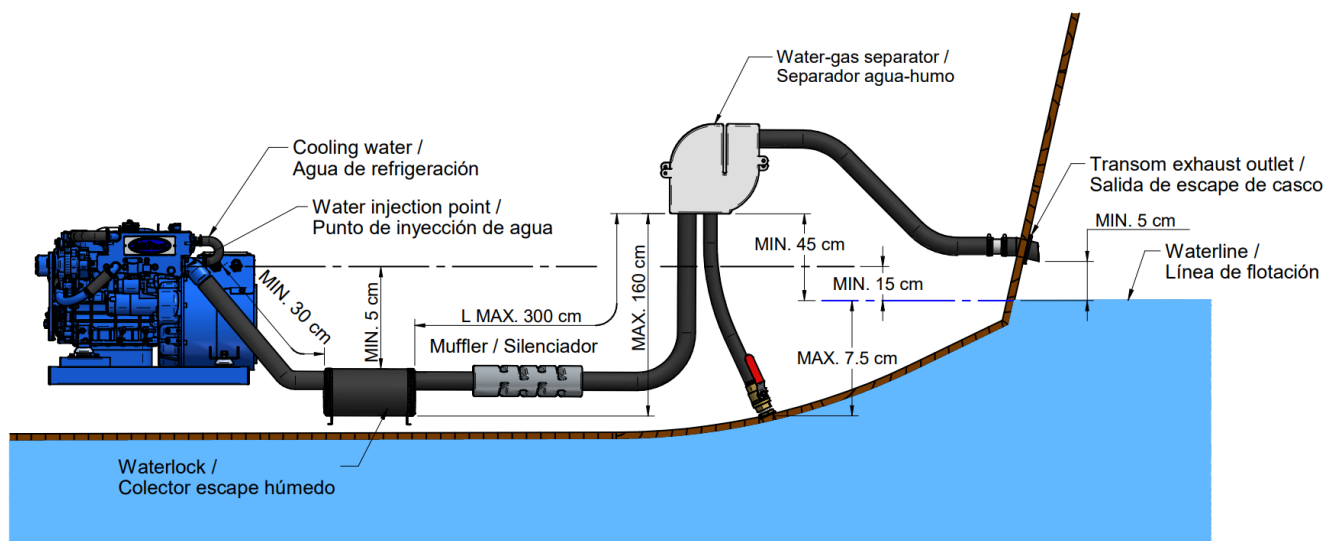
L = Tube length (mm)

- 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.

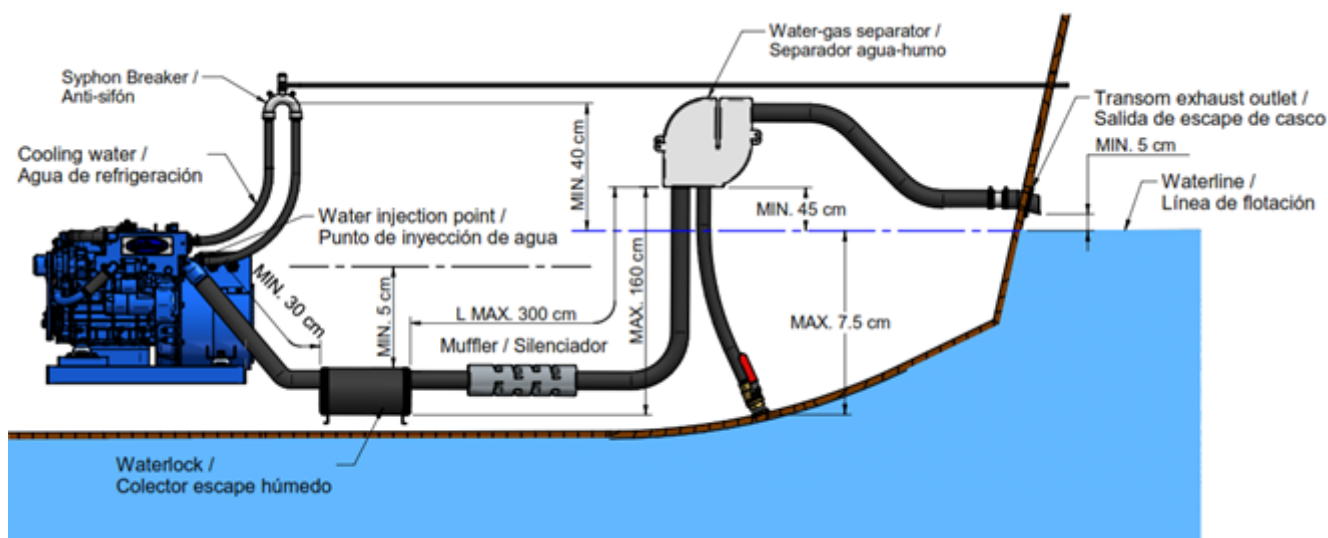
Exhaust backpressure (kPa)	Max – 3,0
----------------------------	-----------

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.

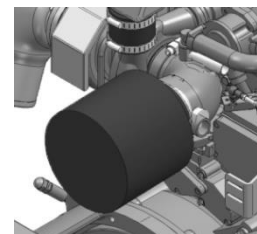


⚠ NOTICE

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.

Systems and scheduled maintenance



Maintenance task. Turbocharger cleaning and inspection

Turbocharger maintenance

To extend turbocharger life and efficiency, some basically important are given below:

- Inspect for possible oil leaks in the inlet and outlet ducts, as well as inside the turbo. A lack of lubrication or the appearance of oily residue could lead to shaft seizure and premature seal wear.
- Maintain the correct condition of the air filter to prevent particles from entering the turbocharger and damaging the turbine blades.

⚠ NOTICE

In the event of oil leaks, vibrations or abnormal noise, it is advisable to stop the engine immediately. Preventive maintenance can avoid costly and unexpected repairs.

⚠ CAUTION

The turbocharger is an element that works at very high temperatures. Any inspection or repair work carried out on it must be done with the engine stopped and cold.

Turbocharger cleaning

1. Loosen the ventilation pipe from the air intake and remove the air filter together with the air intake.
2. Loosen the screws on the compressor housing and remove it carefully.
3. Immerse complete assy in petrol (gasoline) untill all dirt is dissolved.
4. Clean the housing and compressor Wheel from soot, by using a plastic brush or scraper.
5. Wipe and dry in air making sure that the oil ducts are perfectly clean (it is better not to use steam wich might damage the bearings and the shaft).
6. Make sure that the intake air filter is perfectly clean.

⚠ CAUTION

After the turbocharger disassembly, before the crank, be sure to prime the engine with oil to prevent turbo damage from dry running.

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.

Systems and scheduled maintenance

5.8. Electrical System

Control panel

85 GTC / 100 GTAC / 115 GTC / 120 GTAC models:

These models are supplied without control panel. It is necessary to purchase the appropriate power and control kit for each model.

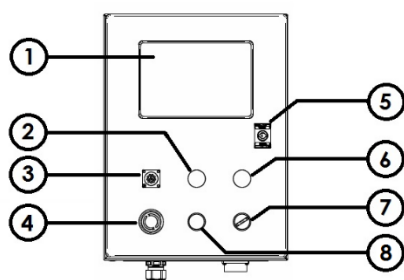
165 GTC / 180 GTAC model:

These genset models are supplied with the control panel. You can find in your operator's manual all the needed information which is supplied with the generator set.

In addition, these models are manufactured with a box which adds two additional features to the control panel. On the one hand, a manual emergency stop has been added for critical situations. On the other hand, a panel power switch has been added to turn it on and off as desired.

At the same time, an audible alarm has also been added to show any warning in the panel.

The other three items are for engine diagnostics. Diagnosis must be carried out by a repair workshop authorized by SOLÉ DIESEL when required.



PART	COMPONENT
1	Control panel
2	Diagnostic bulb
3	Diagnostic connector
4	Emergency stop button
5	Box key
6	Alarm
7	Switch
8	Test button

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

Systems and scheduled maintenance

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)

Systems and scheduled maintenance

Battery

The minimum recommended capacity is 100 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)
	24 V
85 GTC / 100 GTAC	90
115 GTC / 120 GTAC	90
165 GTC / 180 GTAC	100

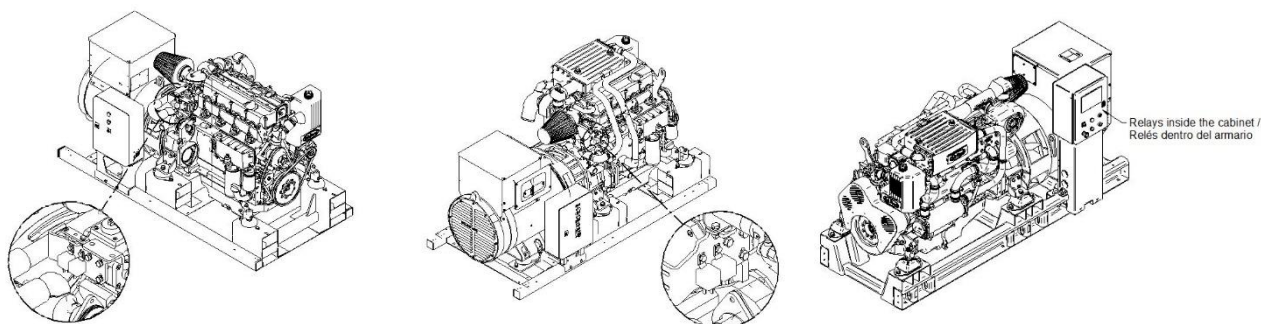
Circuit protection

It is recommended to install an AC circuit breaker in order to protect the electrical installation and the generator set itself from an overload or short circuit condition. The nominal current is indicated on the technical specifications sheet for each model.

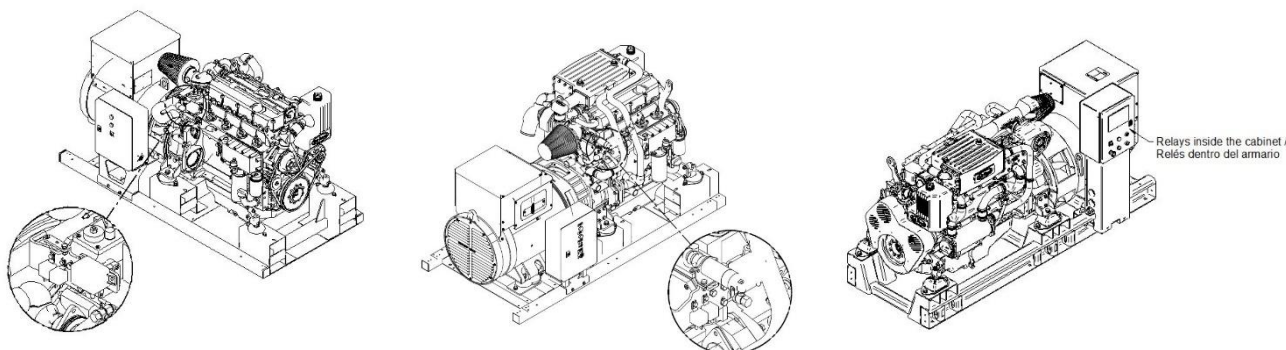
The 85 GTC / 100 GTAC / 115 GTC / 120 GTAC models always include this component

Relays

The relays of the electrical installation are in the location shown in the images.



On earth isolated gensets, the relays isolated from ground are in the location shown in the images.

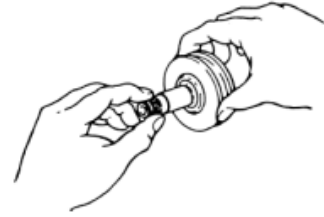


Systems and scheduled maintenance



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.

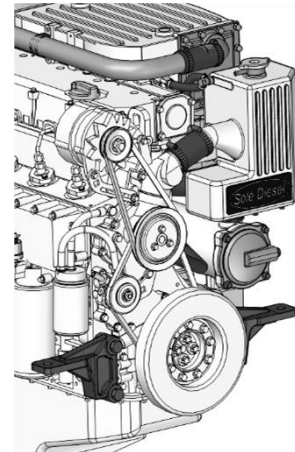


Maintenance task. Alternator belt tension inspection

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

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.



⚠ NOTICE

Excessive tension could cause rapid wear of the belt bearing and alternator. IF the belt is too loose or has oil and not enough charge, it may slip.

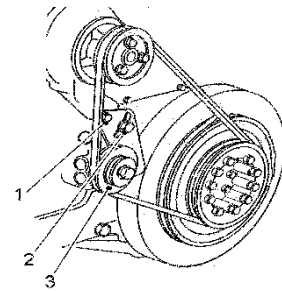
⚠ CAUTION

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

Maintenance task. V-belt replacement

In the event that replacement of the belt (s) is required, carry out the following procedure:

Fully destension old belt so that is removal can be made easier.



Fuel pump

1. To adjust the belts, loosen the screws (1) and (2). Push the fuel pump (3) to the left until the belt is correctly tensioned. Tighten the screws.
2. To change the belts. Loosen the screws (1) and (2). Push the fuel pump (3) to the right. Remove the belt and replace it with a new one. Push the fuel pump (3) to the left until the belt is correctly tensioned. Tighten the screws.

Alternator

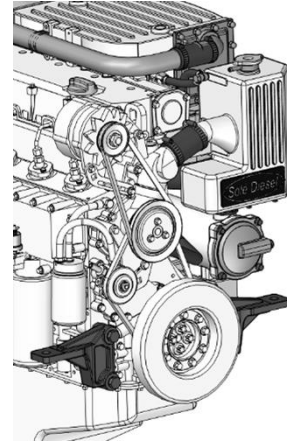
1. To adjust, loosen the screw (2). Push the alternator belt pulley (1) to the right until the belt is correctly tensioned. Tighten the screws.
2. To change the belt. Remove the belt for the fuel pump. Loosen the screw (2). Push the alternator belt pulley (1) to the left and remove the belt. Replace it with a new one. Push

Systems and scheduled maintenance



the alternator belt pulley (1) to the right until the correct belt tensión. Tighten the screw (2).

2. When the belt is unfitted, check the condition of the pulley recesses, they shall be dry and clean. Its cleanliness is performed with soap water (never use petrol, gas oil or similar products).
3. Fit the belt taking care the belt insertion is made with the hand but without damaging it and if required pace it with a tool at least without any cutting edges since otherwise the belt could be damaged and its life shortened.
4. The belt shall be tensioned such as is previously explained.



Always change a belt that appears worn or is cracked. Belts working in pairs be replaced together.

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 $1M\Omega$. If the insulation resistance is below this threshold, the alternator alone should be oven dried at $60 - 80^{\circ}C$ for 3 hours. Before carrying out this operation remove the voltage regulator. As an alternative to oven drying hot air at $60 - 80^{\circ}C$ can be blown through the alternator for at least 1 hour.

Systems and scheduled maintenance

Maintenance task. Control 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, must be replaced. No maintenance is required for the total operating time:

Operation time
20.000 hours

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.

⚠ NOTICE

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 shut down 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 operating the genset.

Troubleshooting

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
		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.
	INLET AND EXHAUST SYSTEM	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.
STARTS AND THEN STOPS	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.
BLACK 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.
BLACK SMOKE	INLET AND EXHAUST SYSTEM	Clogged air filter.	Replace the air filter element.
	GENERAL	Incorrect valve clearance.	Perform valve adjustment.
BLUE SMOKE	LUBRICATION SYSTEM	Oil level too high.	Check the lubrication oil level and reset it.
LOW OIL PRESSURE	LUBRICATION SYSTEM	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.
		Faulty oil pressure valve.	Contact an Official Solé Diesel Service.
LOW OIL PRESSURE	LUBRICATION SYSTEM	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.

Troubleshooting

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.
	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.
		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
	INLET AND EXHAUST 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.

Troubleshooting

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.

Troubleshooting

GENSET FAILURE	SYSTEM	PROBABLE CAUSES	RECOMMENDED ACTIONS
LOW OR ZERO OUTPUT VOLTAGE	ALTERNATOR (AC)	CA open output breaker.	Close the CA output breaker.
		Open wiring, terminals or exciter field pin.	Check continuity.
		The main field (rotor) is not operational (open or earthed).	Test and/or replace alternator assembly.
		Stator is not operational (open or earthed).	Test and/or replace alternator assembly.
		Generator set without excitation.	Contact an Official Solé Diesel Service.
		After generator set excitation, it is deactivated	Check if the wiring matches the diagrams in the annex.
		Faulty AVR regulator plate.	Replace AVR regulator plate.
		Blown AVR regulator plate fuse.	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 – Alarms list (ECU)

There are four ways to diagnose any failure or malfunction in the generator set:

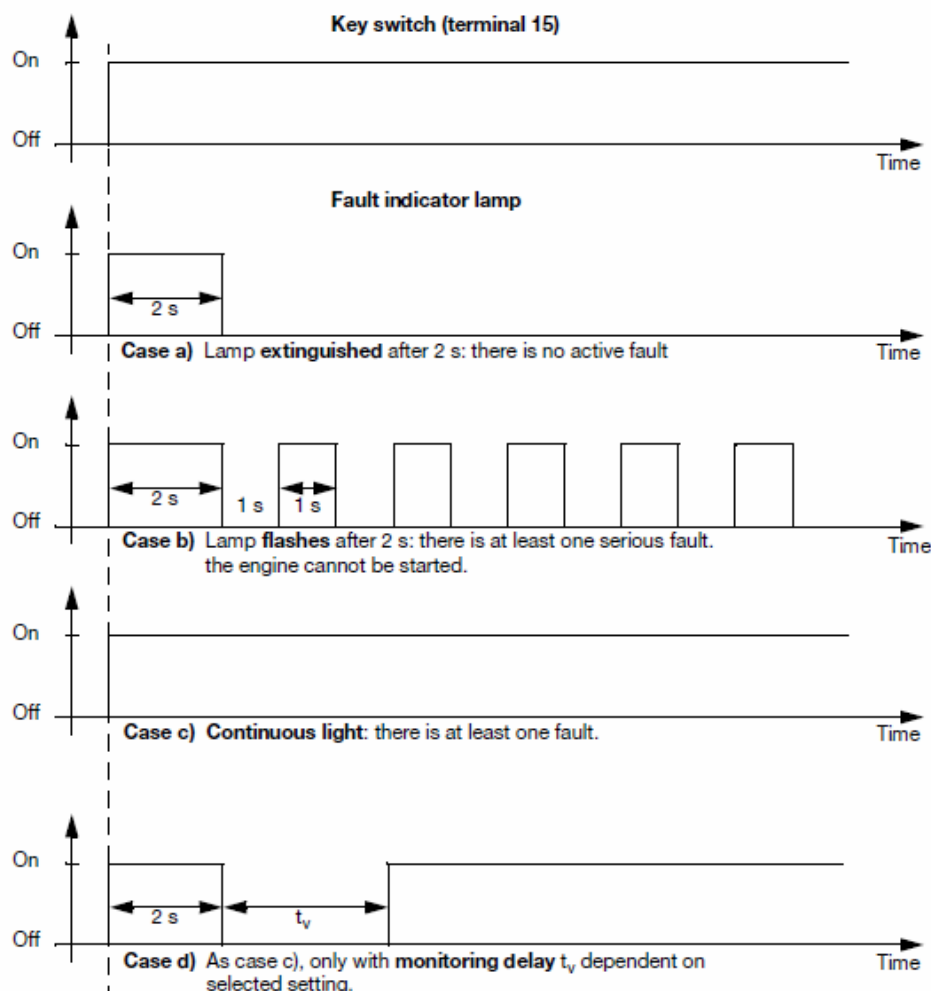
- Malfunction indicator lamp.
- Diagnostic button and malfunction indicator lamp.
- List of ECU alarms on the control panel.
- Diagnostic tool (Solé Diesel Official Service).

7.1. Malfunction indicator lamp

Depending on the available measurement points or sensors the engine governor has numerous engine protection functions. Engine may run on in reduced mode (the fault indicator lamp will light up on steady beam) or it will shut off (the fault indicator lamp will flash) depending on the severity of the recognized error.

If the indicator light is on it means there is a wiring error (short circuit, cable break) or an error in the corresponding sensor screens.

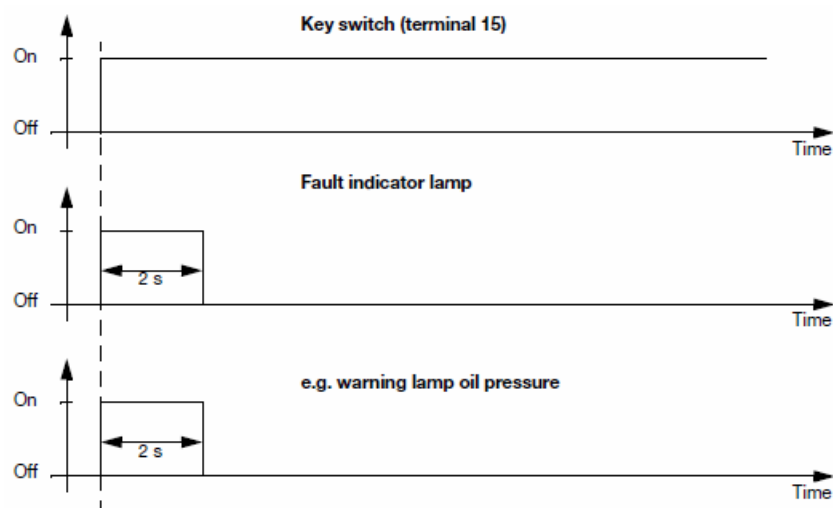
Electronic failures are recorded or stored in the control unit and are displayed by the malfunction indicator light. The malfunction indicator light turns off as soon as the failure has been removed.



Alarm List (ECU)

Control function for configured warning lamps

Warning lamp also switches on during the self-diagnosis (2 s) when ECU is activated (key switch (pin 15)).

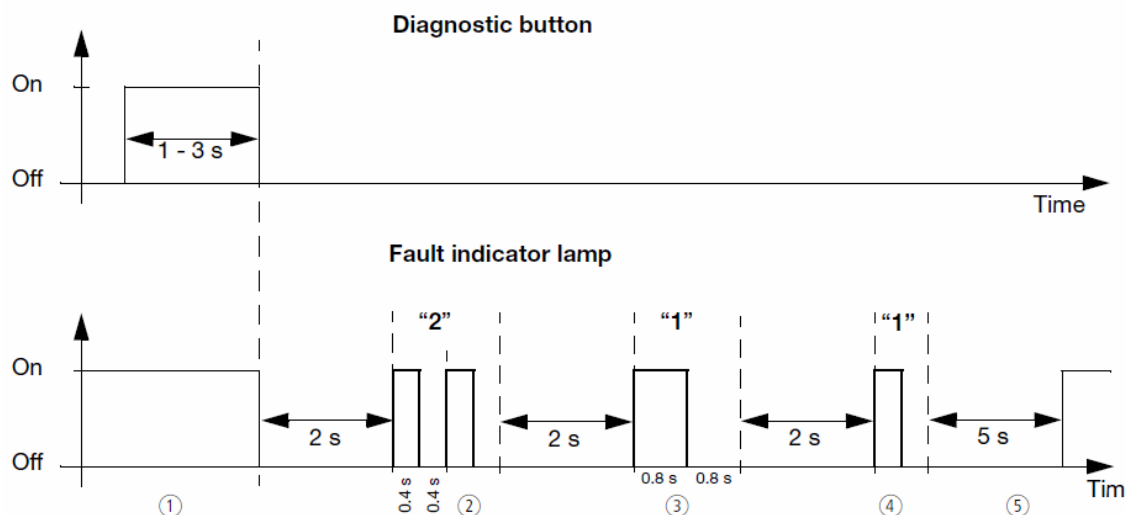


7.2. Diagnostic button and malfunction indicator lamp

It is possible to read existing failures using the indicator light and delete them from the failure memory using the diagnostic button. Both the button and the lamp are located in the ECU cabinet.

The diagnostic button must be pressed for 1 to 3 seconds to carry out the diagnosis process. After these seconds, the unit recognizes the request of reading and the lamp displays any active failures while it switches on continuously or intermittently.

The read-out of the blink code is only possible after the malfunction indicator lamp has been switched off or after the initialization phase of the operating program. This means the malfunction indicator lamp can also show continuous lightning after it is turned on. The ECU only shows active failures through flashes emitted by the lamp.



Alarm List (ECU)

Hereunder you will find the steps to carry out the reading of the failure code issued by the lamp:

- a) The indicator lamp shows a failure.

Example: Continuous flashing light.

Press diagnostic button 1 to 3 seconds. Flashing or continuous indicator lamp light will switch off.

- b) After 2 seconds: ECU recognition. Lamp will show 2 short blinks.
First flash sequence output of the first stored failure.

Example: Fault #01, "Speed Sensor 1":

- After 2 seconds: 1 x long
- After 2 seconds: 1 x short

After fault code, wait 5 seconds, then lamp on display will continue.

Steps for reading out the following fault code:

- a) Malfunction indicator light shows a failure.

Example: continuous blinking lights.

Press diagnostic button 1 to 3 seconds. The flashing or continuous indicator lamp light will switch off.

- b) After 2 seconds: ECU recognition. The lamp will show 2 short blinks.

The following failure code (c, d) is displayed. After failure code, wait 5 seconds, then lamp on display will continue.

The above steps can be repeated until the last stored failure code is displayed. After that, the first fault code will be displayed again.

Alarm List (ECU)

FAULT GROUP	FAULT NO.	DESCRIPTION	CODE			FMI	SPN	CAUSE	REMARKS	HELP
			Short 0.4 s	Long 0.8 s	Short 0.4 s					
Zero error display	-	No faults	2	-	-	31	524287			
RPM	01	Speed sensor 1	2	1	1	8	190	Sensor failure Gear distance too far. Cable joint interrupted.	ECU in emergency operation (if sensor 2 is available). Emergency switch-off (if sensor 2 is not available or failed).	Check distance. Check wiring. Check sensor and replace if required.
	02	Speed sensor 2	2	1	2	8	190		ECU in emergency operation (if sensor 1 is available). Emergency switch-off (if sensor 2 is not available or failed).	
	03	Speed sensor	2	1	3	8	84	Cable connection interrupted.	ECU in emergency operation.	Check cable connection. Replace if required.
	04	Excess speed switch-off	2	1	4	0	190	Speed is/was in excess of limit.	Engine stop.	Check parameter (21). Check speed settings.
Sensors	05	Set point sensor 1	2	2	1	2	91	Fault at corresponding sensor	With sensor failure, the associated monitoring function is de-activated.	Check sensor wiring. Check sensor and replace if required. Check sensor limits.
	06	Set point sensor 2	2	2	2	2	201			
	07	Air pressure	2	2	3	2	102			
	08	Oil pressure	2	2	4	2	100			
	09	Coolant temperature	2	2	5	2	110			
	10	Air temperature	2	2	6	2	105			
	11	Fuel temperature	2	2	7	2	174			
Functional fault warning	30	Oil pressure warning	2	3	1	1	100	Value below the limit.	Fault disappears when value has exceeded the limit.	Inspect engine. Check level and pump. Check sensor and wiring.
	31	Cooling temperature warning	2	3	2	0	110	Value has exceeded the limit.	Fault disappears when value is below the limit.	Check coolant level. Check sensor temperature and wiring.
	32	Air temperature warning	2	3	3	0	105	Value has exceeded the limit.	Fault disappears when value is below the limit.	Check sensor and wiring.
	34	Coolant level warning	2	3	5	1	111	Input switch is active.	-	Check coolant level. Check sensor and wiring.
	35	Speed warning	2	3	6	14	SID 190	Value has exceeded the limit.	-	Check actuator and replace if required.
	36	Fuel temperature warning	2	3	7	0	174	Value has exceeded the limit.	Fault disappears when value is below the limit.	Check fuel. Check sensor and wiring.
Sensor functional fault	40	Oil pressure switch-off	2	3	1	1	100	Value below switch-off limit.	Emergency stop button.	Inspect engine. Check level and pump. Check sensor and wiring.

Alarm List (ECU)

	41	Coolant temperature sensor switch-off	2	3	2	0	110	Value has exceeded switch-off limit.		Check coolant level. Check sensor temperature and wiring.
	42	Air temperature sensor switch-off	2	3	3	0	105	Value below switch-off limit.		Check sensor and wiring.
	44	Coolant level sensor switch-off	2	3	5	1	111	Low coolant level switch is active.	Emergency stop button. Start lock.	Check coolant level. Check sensor and wiring.
Actuator	50	Feedback	2	5	1	12	SID 24	Actuator not connected. Fault in actuator confirmation.	Emergency switch-off. Actuator cannot be operated.	Check actuator and replace if required. Check cable and limits for "Confirmation".
	52	Feedback reference	2	5	1	13	SID 24			Check actuator and replace if required. Check cable and limits for "Rifeness Confirmation".
	53	Control travel difference	2	5	1	7	SID 23	Injection pump/actuator stuck or not connected. The difference between the nominal / actual control travel is >10 % of the overall control path.	Fault message disappears when the difference is <10 %.	Check actuator/ actuator rods /injection pump replace if required. Check actuator cable.
	59	Bosch EDC pumps self-calibration faulty operation	2	5	2	13	SID 23	No automatic actuator equalization possible. Incorrect input of actuator reference values.	Emergency stop / start lock. Governor cannot be taken into use. EDC actuator calibration required.	Check actuator and replace if required. Check feedback cable. Check voltage supply / cables. Check failure limits and feedback reference values.
Hardware input/output	60	Digital output 3 (PIN M2 shut off solenoid).	2	6	1	2	SID 51	Fault (short circuit / cable break) at digital output.	Driver level is switched off.	Check digital output cable.
	62	Digital output 6 (PIN M7)	2	6	2	2	SID 60		Fault message.	
	63	Shut off solenoid excess voltage	2	6	1	6	SID 51	-	-	-
	67	Error Hand Setp 1	2	6	2	11	91	-	-	-
	68	Error CAN Setp 1	2	6	2	2	898	-	-	-
Communication	70	CAN-BUS controller	2	7	1	12	SID 231	CAN controller for CAN-BUS is faulty. Faults removal despite continuous initialization is not possible.	Application-dependent	Check CAN connection, actuator and resistor.
	71	CAN interface SAE J 1939	2	7	1	9	SID 231	Overflow in input buffer or transmission cannot be placed on the BUS.		

Alarm List (ECU)

	74	Broken wire, short circuit or BUS error.	2	7	1	14	SID 231	-	-	Check CAN connection and connecting cable. Check sensor and replace if required.
Memory	76	Parameter Programming (EPROM Writing)	2	8	1	12	SID 253	Parameter programming fault in governor fixed memory.	Emergency stop button. Engine cannot be started.	Turn the ignition off and on again. Check again. If defective, inform Official Service.
	77	Cyclic program test	2	8	1	12	SID 240	Constant monitoring of the program memory shows an error (Flash test).		
	78	Cyclic RAM test	2	8	1	2	SID 254	Constant monitoring of the memory shows an error.		
Hardware control unit	80	Power supply (actuator)	2	9	1	1	SID 254	Power supply for actuator out of range.	Error message. It will disappear when the value is in the nominal range.	Turn ignition off and on again. Check again. If defective, inform Official Service.
	83	Voltage reference 1	2	8	2	2	SID 254	Actuator voltage reference out of range.	Error message. It will disappear when the value is in the nominal range.	Check supply voltage. Turn ignition off and on again. Check again. If defective, inform Official Service.
	84	Voltage reference 2	2	8	2	2	SID 254			
	85	Voltage reference 4	2	8	2	2	SID 254	.		
	86	Internal temperature	2	9	2	12	171	Control unit internal temperature out of range	Error message. It will disappear when the value is in the nominal range.	Turn ignition off and on again. Check again. If defective, inform Official Service.
	87	Atmospheric pressure	2	9	2	12	108	Pressure out of range.	Error message. It will disappear when the value is in the nominal range.	
Logical program	90	Parameter fault (EEPROM recall or checksum failure).	2	10	1	2	SID 253	No data found or checksum of the data is faulty (NOTE: the error only occurs during parameter configuration / save or reset).	Engine cannot be started.	Check data for correct settings. Turn ignition off and on again. Check again. If defective, inform Official Service.
	93	Stack overflow	2	10	1	2	SID 240	Internal calculation failure.	Emergency switch-off. Engine cannot be started.	Note parameter values (3897 and 3898). Turn ignition off and on again. Check again. If defective, inform Official Service.
	94	Internal failure	2	10	1	2	SID 254	-	-	-

Section 8 – Parallel operation

This generator set can be operated with or without the Parallel Kit supplied by Solé Diesel. Refer to the Parallel Kit Manual to operate the generator set if this kit has been installed.

On the other hand, if it has not been installed, it is necessary to design the power and control part in order to operate the genset. For this reason, it is necessary to consider the requirements of the electrical wiring, according to the connector in the ECU cabinet, where it must be connected.

NOTICE

For 165 GTC / 180 GTAC models supplied with the standard panel, the controller must be replaced in order to operate the standard panel in parallel.

Input: controller signal to ECU. Output: ECU signal to controller.

SPECIFICATIONS					
PIN	IDENTIFICATION	DESCRIPTION	I/O SIGNAL	SIGNAL	COLOUR
4	CAN Low	CAN-interface SAE J 1939 ECU-Controller communication while is activated.	In / Out	CAN L	Blue
5	CAN High		In / Out	CAN H	Brown
6	Screen		In / Out	Earth point	White
7	Start signal	Starter relay excitation: This signal closes the start relay to activate the starter assy. The start sequence must end when the generator set exceeds the rated speed of 25 %.	In	24 VDC	Pink
8	ECU power signal	Power signal. It is always enabled.	In	24 VDC	Yellow
9	+5V Speed governor	Engine speed control: Regulation used to correct the genset speed to maintain 1500 RPM (50 Hz) or 1800 RPM (60 Hz).	In	5 VDC	Blue
10	Speed governor voltage signal		In	0.5 – 4.5 VDC	Brown
11	GND Speed governor	U IN = 0,5-4,5 VDC, fg = 7 Hz, RI=220 kΩ, U ref = 5 VDC ± 25 mV, I max = 25 mA	In	GND	Yellow - Green
12	Screen		In	Cut on its end	White
13	D+	DC alternator excitation: Excitation used to generate power from the beginning.	In	200 mA/ 24 VDC	Red - White
14	+ Battery	Controller power supply.	Out	24 VDC	Red
15	- Battery	Output power available for controller.		24 VDC	Black
16	AVR voltage signal	Output voltage control of AC alternator. U IN=0 – 2,5 VDC or 10K potentiometer	In	0 – 2.5 VDC	Blue
17	AVR Common		In	GND	Brown
18	Screen		In	Earth point	White
19	Emergency stop signal	This signal supplies the ECU and start relay to stop the engine.	In	24 VDC	Purple

If the parallel kit is not installed, the genset can be started and stopped manually or by CAN-BUS. The following instructions must be followed to operate manually. On the other hand, if CAN-BUS is used, follow the instructions of the installed controller.

START THE GENSET

1. Connect batteries: It is necessary to connect the battery positive (+) and negative (-) at the same time for proper operation of the generator set.
2. Energize starter relay (NO – Normally Open) to power starter assy. Apply voltage of 24 VDC to ECU cabinet connector PIN 7 (start signal). This signal must be maintained until generator set reaches 25 % of rated speed. In addition, it should not exceed 8 seconds of relay activation.

* If the generator set does not start after 3 start-up attempts, be aware that excessive start-up may cause entry of water. Therefore, do not attempt to start the generator set and identify the cause of the start failure.

STOP THE GENSET

1. Energize ECU power relay (NC – Normally closed) to stop powering the ECU. As a result, the generator set will stop. Apply voltage of 24 VDC to ECU cabinet connector PIN 8 (ECU power signal). This signal must be maintained until generator set stops. In addition, it should not exceed 10 seconds of relay activation.

Section 9 – Technical specifications

85 GT/GTC PARALLEL



Three-Phase

General data			
Maximum power*:	68 kW (85 kVA)	Voltage:	400/230 V
Prime Power**:	61,8 kW	Amperage:	122,7 A
Frequency:	50 Hz	Phases:	3

Dimensions and weights			
Total lenght without canopy:	1779 mm	Total lenght with canopy:	2007 mm
Total width without canopy:	866 mm	Total width with canopy:	865 mm
Total height without canopy:	969 mm	Total height with canopy:	1048 mm
Dry weight without canopy:	988 Kg	Dry weight with canopy:	1100 Kg

Engine			
Base engine manufacturer:	Deutz	Diameter:	108 mm (4,25 in)
Model Solé Diesel:	SDZ-109	Stroke:	130 mm (5,12 in)
Type:	4 No. of Strokes	Compression ratio:	19:1
Engine RPM:	1500	Injection system:	Mechanical and direct
Number of cylinders:	4	Intake system:	Turbocharged
Total displacement:	4764 cc	SAE Flywheel housing:	SAE 2
Oil type:	SAE 15W40	Coolant capacity:	17,5 L (4,62 gal)
Oil capacity:	11 L (2,91 gal)	Flywheel:	SAE 11 1/2
Power:	81 kW (110,16 CV)	Coolant flow rate:	141,5 l/min (37,38 gal/m)
Salt water flow rate:	107,4 l/min (28,37 gal/m)	Intake air flow rate:	5,5 m3/m
Starting aid:	Fuel supercharged		

Fuel system details			
Consumption:	5,5 L/H (1,45 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	10,2 L/H (2,69 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	15 L/H (3,96 Gal/H)	Injection pump type:	Individual
Consumption at 100 %:	19,9 L/H (5,26 Gal/H)	Governor type:	Mechanical

Electrical system			
Battery voltage:	24 V	Stop solenoid type:	ETS
Starter motor:	4 kW	Alternator:	35 A
Battery cable section:	50 mm2	Battery cable length:	5 m

Installation details			
Exhaust hose inner diameter:	90 mm (3,54 in)	Maximum fuel lift height:	1,3 m (4,27 ft)
Sea water hose inner diameter:	42 mm (1,65 in)	Maximum raw water lift height:	4 m (157,48 in)
Fuel feeding hose inner diameter:	12 mm (0,47 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	12 mm (0,47 in)	Maximum installation angle***:	10 °
Minimum battery capacity:	24 V 90 Ah		

Alternator details			
Brand:	Meccalte	Cos φ:	0,8
Model:	ECP34-1S/4	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

100 GTA/GTAC PARALLEL



Three-Phase

General data			
Maximum power*:	77,8 kW (97,3 kVA)	Voltage:	480/277 V
Prime Power**:	70,8 kW	Amperage:	117 A
Frequency:	60 Hz	Phases:	3

Dimensions and weights			
Total lenght without canopy:	1779 mm	Total lenght with canopy:	2007 mm
Total width without canopy:	866 mm	Total width with canopy:	865 mm
Total height without canopy:	969 mm	Total height with canopy:	1048 mm
Dry weight without canopy:	988 Kg	Dry weight with canopy:	1100 Kg

Engine			
Base engine manufacturer:	Deutz	Diameter:	108 mm (4,25 in)
Model Solé Diesel:	SDZ-109	Stroke:	130 mm (5,12 in)
Type:	4 No. of Strokes	Compression ratio:	19:1
Engine RPM:	1800	Injection system:	Mechanical and direct
Number of cylinders:	4	Intake system:	Turbocharged
Total displacement:	4764 cc	SAE Flywheel housing:	SAE 2
Oil type:	SAE 15W40	Coolant capacity:	17,5 L (4,62 gal)
Oil capacity:	11 L (2,91 gal)	Flywheel:	SAE 11 1/2
Power:	85 kW (115,6 CV)	Coolant flow rate:	162,1 l/min (42,82 gal/m)
Salt water flow rate:	130,4 l/min (34,45 gal/m)	Intake air flow rate:	6,6 m3/m
Starting aid:	Fuel supercharged		

Fuel system details			
Consumption:	5,8 L/H (1,53 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	11,2 L/H (2,96 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	16,1 L/H (4,25 Gal/H)	Injection pump type:	Individual
Consumption at 100 %:	20,9 L/H (5,52 Gal/H)	Governor type:	Mechanical

Electrical system			
Battery voltage:	24 V	Stop solenoid type:	ETS
Starter motor:	4 kW	Alternator:	35 A
Battery cable section:	50 mm2	Battery cable length:	5 m

Installation details			
Exhaust hose inner diameter:	90 mm (3,54 in)	Maximum fuel lift height:	1,3 m (4,27 ft)
Sea water hose inner diameter:	42 mm (1,65 in)	Maximum raw water lift height:	4 m (157,48 in)
Fuel feeding hose inner diameter:	12 mm (0,47 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	12 mm (0,47 in)	Maximum installation angle***:	10 °
Minimum battery capacity:	24 V 90 Ah		

Alternator details			
Brand:	Meccalte	Cos φ:	0,8
Model:	ECP34-1S/4	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

115 GT/GTC PARALLEL



Three-Phase

General data			
Maximum power*:	90 kW (112,4 kVA)	Voltage:	400/230 V
Prime Power**:	82 kW	Amperage:	162,2 A
Frequency:	50 Hz	Phases:	3

Dimensions and weights			
Total lenght without canopy:	1770 mm	Total lenght with canopy:	2007 mm
Total width without canopy:	865 mm	Total width with canopy:	865 mm
Total height without canopy:	996 mm	Total height with canopy:	1048 mm
Dry weight without canopy:	1010 Kg	Dry weight with canopy:	1117 Kg

Engine			
Base engine manufacturer:	Deutz	Diameter:	108 mm (4,25 in)
Model Solé Diesel:	SDZ-165E	Stroke:	130 mm (5,12 in)
Type:	4 No. of Strokes	Compression ratio:	19:1
Engine RPM:	1500	Injection system:	Mechanical and direct
Number of cylinders:	4	Intake system:	Turbocharged with intercooler
Total displacement:	4764 cc	SAE Flywheel housing:	SAE 2
Oil type:	SAE 15W40	Coolant capacity:	17,5 L (4,62 gal)
Oil capacity:	11 L (2,91 gal)	Flywheel:	SAE 11 1/2
Power:	102 kW (138,72 CV)	Coolant flow rate:	141,45 l/min (37,37 gal/m)
Salt water flow rate:	107,43 l/min (28,38 gal/m)	Intake air flow rate:	6,1 m3/m
Starting aid:	Fuel supercharged		

Fuel system details			
Consumption:	6,3 L/H (1,66 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	11,1 L/H (2,93 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	16,2 L/H (4,28 Gal/H)	Injection pump type:	Individual
Consumption at 100 %:	21,5 L/H (5,68 Gal/H)	Governor type:	Electronical

Electrical system			
Battery voltage:	24 V	Stop solenoid type:	ETS
Starter motor:	4 kW	Alternator:	35 A
Battery cable section:	50 mm2	Battery cable length:	5 m

Installation details			
Exhaust hose inner diameter:	90 mm (3,54 in)	Maximum fuel lift height:	1,3 m (4,27 ft)
Sea water hose inner diameter:	42 mm (1,65 in)	Maximum raw water lift height:	4 m (157,48 in)
Fuel feeding hose inner diameter:	12 mm (0,47 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	12 mm (0,47 in)	Maximum installation angle***:	10 °
Minimum battery capacity:	24 V 143 Ah		

Alternator details			
Brand:	Meccalte	Cos φ:	0,8
Model:	ECP34-1L/4A	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

120 GTA/GTAC PARALLEL



Three-Phase

General data			
Maximum power*:	96 kW (120 kVA)	Voltage:	480/277 V
Prime Power**:	87,3 kW	Amperage:	144,3 A
Frequency:	60 Hz	Phases:	3

Dimensions and weights			
Total lenght without canopy:	1769 mm	Total lenght with canopy:	2007 mm
Total width without canopy:	865 mm	Total width with canopy:	865 mm
Total height without canopy:	996 mm	Total height with canopy:	1048 mm
Dry weight without canopy:	1010 Kg	Dry weight with canopy:	1117 Kg

Engine			
Base engine manufacturer:	Deutz	Diameter:	108 mm (4,25 in)
Model Solé Diesel:	SDZ-165E	Stroke:	130 mm (5,12 in)
Type:	4 No. of Strokes	Compression ratio:	19:1
Engine RPM:	1800	Injection system:	Electronic unit injector and direct
Number of cylinders:	4	Intake system:	Turbocharged with intercooler
Total displacement:	4764 cc	SAE Flywheel housing:	SAE 2
Oil type:	SAE 15W40	Coolant capacity:	17,5 L (4,62 gal)
Oil capacity:	11 L (2,91 gal)	Flywheel:	SAE 11 1/2
Power:	111 kW (150,96 CV)	Coolant flow rate:	162,1 l/min (42,82 gal/m)
Salt water flow rate:	130,4 l/min (34,45 gal/m)	Intake air flow rate:	7,8 m3/m
Starting aid:	Fuel supercharged		

Fuel system details			
Consumption:	8,3 L/H (2,19 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	14,5 L/H (3,83 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	21,1 L/H (5,57 Gal/H)	Injection pump type:	Individual
Consumption at 100 %:	28 L/H (7,4 Gal/H)	Governor type:	Electronical

Electrical system			
Battery voltage:	24 V	Stop solenoid type:	ETS
Starter motor:	4 kW	Alternator:	35 A
Battery cable section:	50 mm2	Battery cable length:	5 m

Installation details			
Exhaust hose inner diameter:	90 mm (3,54 in)	Maximum fuel lift height:	1,3 m (4,27 ft)
Sea water hose inner diameter:	42 mm (1,65 in)	Maximum raw water lift height:	4 m (157,48 in)
Fuel feeding hose inner diameter:	12 mm (0,47 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	12 mm (0,47 in)	Maximum installation angle***:	10 °
Minimum battery capacity:	24 V 143 Ah		

Alternator details			
Brand:	Meccalte	Cos φ:	0,8
Model:	ECP34-1L/4A	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

MARINE GENERATORS

165 GT/GTC



Three-Phase

General data			
Maximum power*:	125,6 kW (157 kVA)	Voltage:	400/230 V
Prime Power**:	114,2 kW	Amperage:	226,8 A
Frequency:	50 Hz	Phases:	3

Dimensions and weights			
Total length without canopy:	2079 mm	Total length with canopy:	2350 mm
Total width without canopy:	804 mm	Total width with canopy:	865 mm
Total height without canopy:	1070 mm	Total height with canopy:	1146 mm
Dry weight without canopy:	1410 Kg	Dry weight with canopy:	1630 Kg

Engine			
Base engine manufacturer:	Deutz	Diameter:	108 mm (4,25 in)
Model Solé Diesel:	SDZ-175E	Stroke:	130 mm (5,12 in)
Type:	4 stroke	Compression ratio:	17.5:1
Engine RPM:	1500	Injection system:	Mechanical and direct
Number of cylinders:	6	Intake system:	Turbocharged with intercooler
Total displacement:	7146 cc	SAE Flywheel housing:	SAE 3
Oil:	SAE 15W40	Coolant capacity:	23 L (6,08 gal)
Oil capacity:	23 L (6,08 gal)	Flywheel:	SAE 11 1/2
Power:	128,5 kW (174,76 CV)	Coolant flow rate:	141,5 l/min (37,38 gal/m)
Salt water flow rate:	107,4 l/min (28,37 gal/m)	Intake air flow rate:	10,2 m3/m
Starting aid:	Supercharger		

Fuel system details			
Consumption:	10,4 L/H (2,75 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	20 L/H (5,28 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	28,5 L/H (7,53 Gal/H)	Injection pump type:	Individual
Consumption at 100 %:	36,7 L/H (9,7 Gal/H)	Governor type:	Electronical

Electrical system			
Battery voltage:	24 V	Stop solenoid type:	ETS
Starter motor:	4 kW	Alternator:	35 A
Battery cable section:	70 mm2	Battery cable length:	5 m

Installation details			
Exhaust hose inner diameter:	115 mm (4,53 in)	Maximum fuel lift height:	1,3 m (4,27 ft)
Sea water hose inner diameter:	42 mm (1,65 in)	Maximum raw water lift height:	2,5 m (98,43 in)
Fuel feeding hose inner diameter:	12 mm (0,47 in)	Maximum sea water temperature:	32 ° (32 S/N)
Fuel return hose inner diameter:	12 mm (0,47 in)	Maximum installation angle***:	10 °
Minimum battery capacity:	24 V 143 Ah		

Alternator details			
Brand:	Meccalte	Cos φ:	0,8
Model:	EC038-1S/4A	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

165 GT/GTC PARALLEL



Three-Phase

General data			
Maximum power*:	125,6 kW (157 kVA)	Voltage:	400/230 V
Prime Power**:	114,2 kW	Amperage:	226,8 A
Frequency:	50 Hz	Phases:	3

Dimensions and weights			
Total length without canopy:	2079 mm	Total length with canopy:	2350 mm
Total width without canopy:	804 mm	Total width with canopy:	865 mm
Total height without canopy:	1070 mm	Total height with canopy:	1146 mm
Dry weight without canopy:	1410 Kg	Dry weight with canopy:	1630 Kg

Engine			
Base engine manufacturer:	Deutz	Diameter:	108 mm (4,25 in)
Model Solé Diesel:	SDZ-175E	Stroke:	130 mm (5,12 in)
Type:	4 stroke	Compression ratio:	17.5:1
Engine RPM:	1500	Injection system:	Mechanical and direct
Number of cylinders:	6	Intake system:	Turbocharged with intercooler
Total displacement:	7146 cc	SAE Flywheel housing:	SAE 3
Oil:	SAE 15W40	Coolant capacity:	23 L (6,08 gal)
Oil capacity:	23 L (6,08 gal)	Flywheel:	SAE 11 1/2
Power:	128,5 kW (174,76 CV)	Coolant flow rate:	141,5 l/min (37,38 gal/m)
Salt water flow rate:	107,4 l/min (28,37 gal/m)	Intake air flow rate:	10,2 m3/m
Starting aid:	Supercharger		

Fuel system details			
Consumption:	10,4 L/H (2,75 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	20 L/H (5,28 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	28,5 L/H (7,53 Gal/H)	Injection pump type:	Individual
Consumption at 100 %:	36,7 L/H (9,7 Gal/H)	Governor type:	Electronical

Electrical system			
Battery voltage:	24 V	Stop solenoid type:	ETS
Starter motor:	4 kW	Alternator:	35 A
Battery cable section:	70 mm2	Battery cable length:	5 m

Installation details			
Exhaust hose inner diameter:	115 mm (4,53 in)	Maximum fuel lift height:	1,3 m (4,27 ft)
Sea water hose inner diameter:	42 mm (1,65 in)	Maximum raw water lift height:	2,5 m (98,43 in)
Fuel feeding hose inner diameter:	12 mm (0,47 in)	Maximum sea water temperature:	32 ° (32 S/N)
Fuel return hose inner diameter:	12 mm (0,47 in)	Maximum installation angle***:	10 °
Minimum battery capacity:	24 V 143 Ah		

Alternator details			
Brand:	Meccalte	Cos φ:	0,8
Model:	EC038-1S/4A	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

180 GTA/GTAC



Three-Phase

General data			
Maximum power*:	144 kW (180 kVA)	Voltage:	480/277 V
Prime Power**:	131 kW	Amperage:	216 A
Frequency:	60 Hz	Phases:	3

Dimensions and weights			
Total lenght without canopy:	2079 mm	Total lenght with canopy:	2350 mm
Total width without canopy:	804 mm	Total width with canopy:	865 mm
Total height without canopy:	1070 mm	Total height with canopy:	1146 mm
Dry weight without canopy:	1410 Kg	Dry weight with canopy:	1630 Kg

Engine			
Base engine manufacturer:	Deutz	Diameter:	108 mm (4,25 in)
Model Solé Diesel:	SDZ-190E	Stroke:	130 mm (5,12 in)
Type:	4 No. of Strokes	Compression ratio:	17.5:1
Engine RPM:	1800	Injection system:	Mechanical and direct
Number of cylinders:	6	Intake system:	Turbocharged with intercooler
Total displacement:	7146 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	23 L (6,08 gal)
Oil capacity:	23 L (6,08 gal)	Flywheel:	SAE 11 1/2
Power:	148 kW (201,28 CV)	Coolant flow rate:	162,1 l/min (42,82 gal/m)
Salt water flow rate:	130,4 l/min (34,45 gal/m)	Intake air flow rate:	12,2 m3/m
Starting aid:	Fuel supercharged		

Fuel system details			
Consumption:	14 L/H (3,7 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	27 L/H (7,13 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	38,4 L/H (10,14 Gal/H)	Injection pump type:	Individual
Consumption at 100 %:	49,5 L/H (13,08 Gal/H)	Governor type:	Electronical

Electrical system			
Battery voltage:	24 V	Stop solenoid type:	ETS
Starter motor:	4 kW	Alternator:	35 A
Battery cable section:	70 mm2	Battery cable length:	5 m

Installation details			
Exhaust hose inner diameter:	115 mm (4,53 in)	Maximum fuel lift height:	1,3 m (4,27 ft)
Sea water hose inner diameter:	42 mm (1,65 in)	Maximum raw water lift height:	3 m (118,11 in)
Fuel feeding hose inner diameter:	12 mm (0,47 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	12 mm (0,47 in)	Maximum installation angle***:	10 °
Minimum battery capacity:	24 V 143 Ah		

Alternator details			
Brand:	Meccalte	Cos φ:	0,8
Model:	EC038-1S/4A	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

180 GTA/GTAC PARALLEL



Three-Phase

General data			
Maximum power*:	144 kW (180 kVA)	Voltage:	480/277 V
Prime Power**:	131 kW	Amperage:	216 A
Frequency:	60 Hz	Phases:	3

Dimensions and weights			
Total lenght without canopy:	2079 mm	Total lenght with canopy:	2350 mm
Total width without canopy:	804 mm	Total width with canopy:	865 mm
Total height without canopy:	1070 mm	Total height with canopy:	1146 mm
Dry weight without canopy:	1410 Kg	Dry weight with canopy:	1630 Kg

Engine			
Base engine manufacturer:	Deutz	Diameter:	108 mm (4,25 in)
Model Solé Diesel:	SDZ-190E	Stroke:	130 mm (5,12 in)
Type:	4 No. of Strokes	Compression ratio:	17.5:1
Engine RPM:	1800	Injection system:	Mechanical and direct
Number of cylinders:	6	Intake system:	Turbocharged with intercooler
Total displacement:	7146 cc	SAE Flywheel housing:	SAE 3
Oil type:	SAE 15W40	Coolant capacity:	23 L (6,08 gal)
Oil capacity:	23 L (6,08 gal)	Flywheel:	SAE 11 1/2
Power:	148 kW (201,28 CV)	Coolant flow rate:	162,1 l/min (42,82 gal/m)
Salt water flow rate:	130,4 l/min (34,45 gal/m)	Intake air flow rate:	12,2 m3/m
Starting aid:	Fuel supercharged		

Fuel system details			
Consumption:	14 L/H (3,7 Gal/H)	Fuel type:	Diesel
Consumption at 50 %:	27 L/H (7,13 Gal/H)	Fuel standards:	Fueloil diesel ASTM
Consumption at 75 %:	38,4 L/H (10,14 Gal/H)	Injection pump type:	Individual
Consumption at 100 %:	49,5 L/H (13,08 Gal/H)	Governor type:	Electronical

Electrical system			
Battery voltage:	24 V	Stop solenoid type:	ETS
Starter motor:	4 kW	Alternator:	35 A
Battery cable section:	70 mm2	Battery cable length:	5 m

Installation details			
Exhaust hose inner diameter:	115 mm (4,53 in)	Maximum fuel lift height:	1,3 m (4,27 ft)
Sea water hose inner diameter:	42 mm (1,65 in)	Maximum raw water lift height:	3 m (118,11 in)
Fuel feeding hose inner diameter:	12 mm (0,47 in)	Maximum sea water temperature:	32 °C (32 °F)
Fuel return hose inner diameter:	12 mm (0,47 in)	Maximum installation angle***:	10 °
Minimum battery capacity:	24 V 143 Ah		

Alternator details			
Brand:	Meccalte	Cos φ:	0,8
Model:	EC038-1S/4A	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

Tightening torques

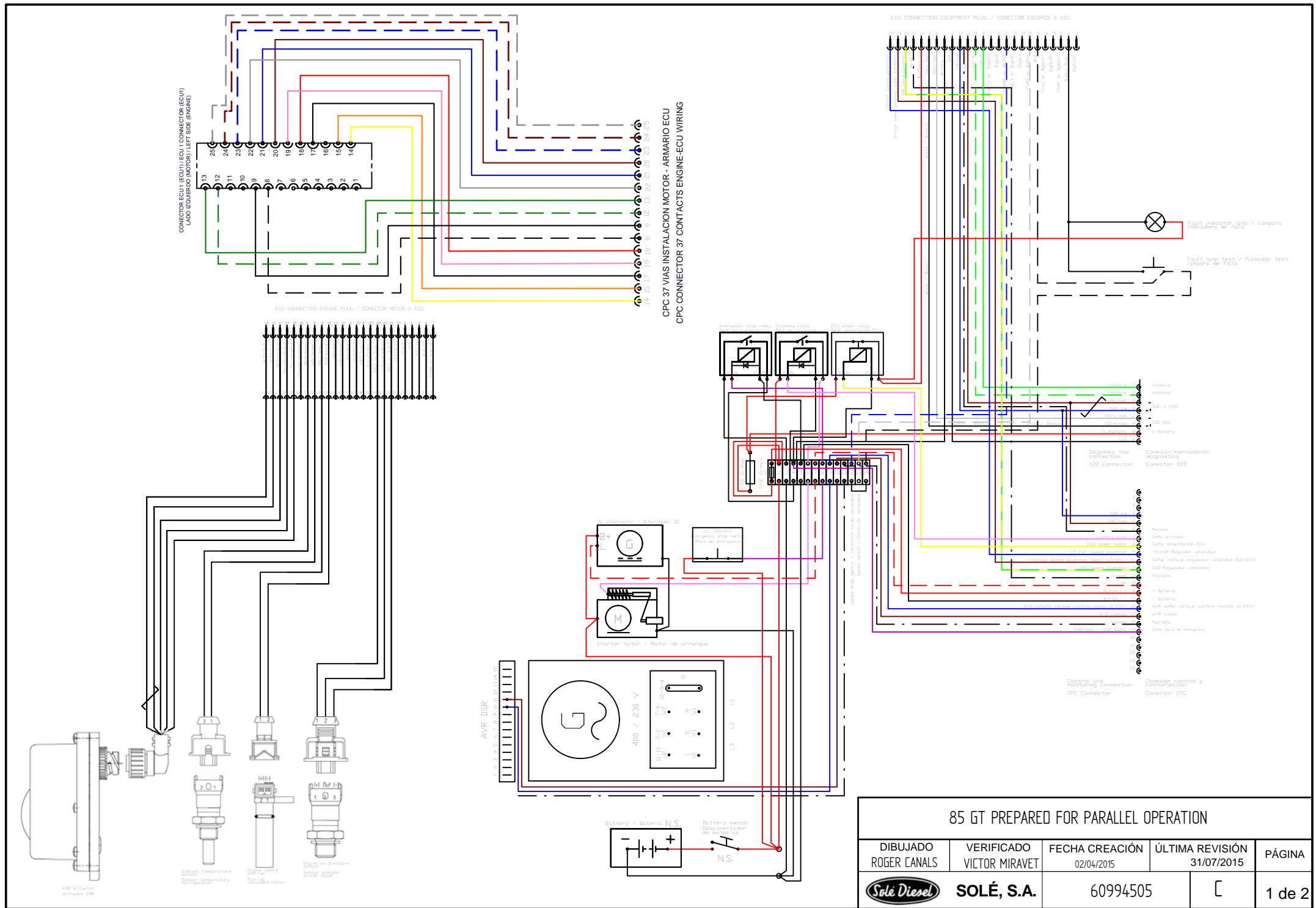


Section 10 – Tightening torques

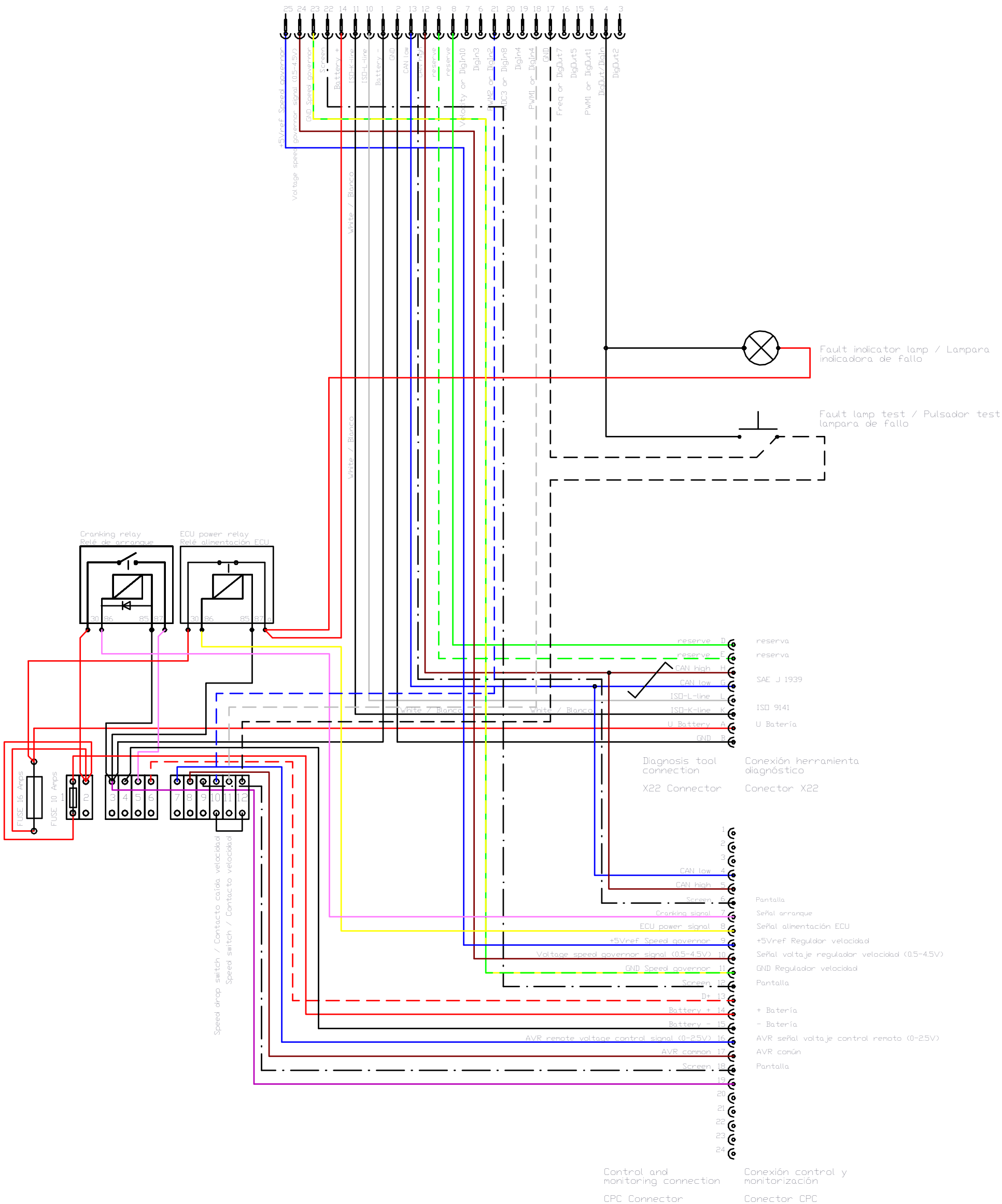
TORQUE VALUES	SDZ-165 / 205 / 280	
	N·m	kgf·m
Cylinder head	1st Tightening 50 2nd Tightening 130 Tightening 90°	1st Tightening 5 2nd Tightening 13 Tightening 90°
V-Belt pulley	40 a 50 Tightening 60°	4 a 5 Tightening 60°
Main bearing bolts	50	5
Bearing cap bolts	30	3
Flywheel (30-45 mm)	20 to 30	2 to 3
Flywheel (50-85 mm)	30 to 40	3 to 4
Tapón de drenaje del cárter	50	5
Sheet metal oil pan	21 to 23	2,1 to 2,3
Cast oil pan	29 to 31	2,9 to 3,1
Oil pressure control valve	40 to 44	4 to 4,4
Valve locknut	22	2,2
Nuts of injection lines on injection pumps	1st Tightening 5 2nd Tightening	1st Tightening 0,5 2nd Tightening 2,85
Sensors and switches	18 to 20	1,8 to 2
Starter Terminal B	28 to 30	2,8 to 3
Rocker cover	9 to 10	0,9 to 1
Lubrication oil pump	8 to 9	0,8 to 0,9
Oil cooler	20	2

Section 11 – Technical appendices

11.1. Wiring diagrams

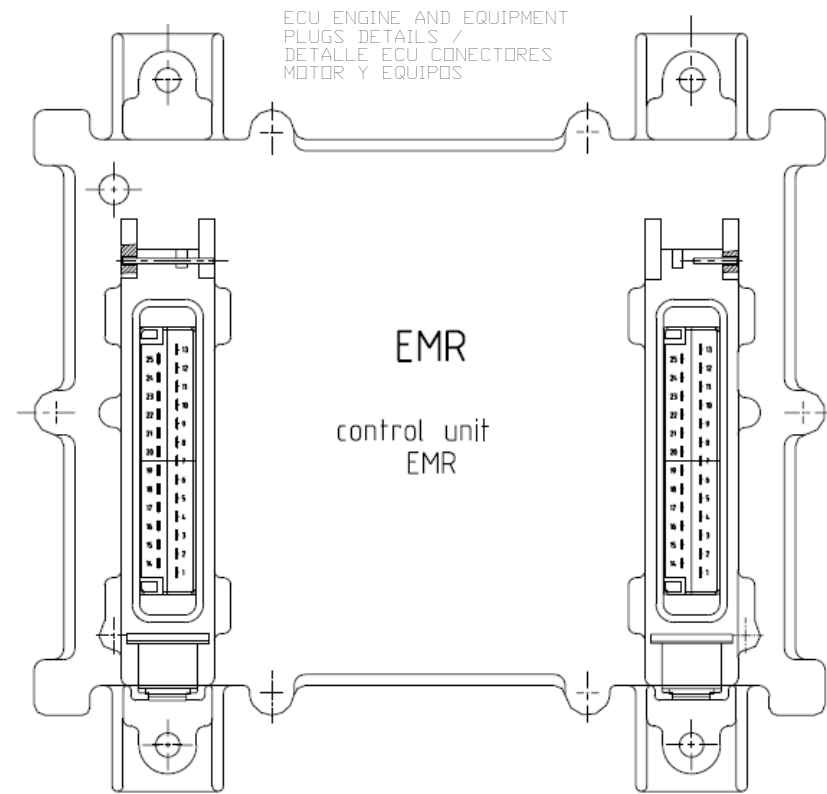


ECU CONNECTION EQUIPMENT PLUG / CONECTOR EQUIPOS A ECU



GENSET MODEL / MODELO GRUPO		95 GT/GTC - 100 GTA/GTAC - 115 GT/GTC - 120 GTA/GTAC	
---		ECU and engine control wiring closet detail / Detalle armario ECU e instalación control de motor	
ENGINE VOLTAGE / VOLTAGE MOTOR		24 V	

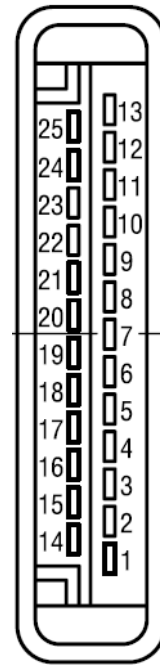
DRAFTSMAN / DIBUJANTE ROGER CANALS	REVISED / REVISADO VICTOR MIRAVET	CREATION DATE / FECHA DE CREACIÓN (DD/MM/YY) 02-04-2014	REVISION DATE / FECHA DE REVISIÓN 05-05-2014
SOLE, S.A.		PANEL REF.: --- ELEC. WIRING REF.: 60994206P	



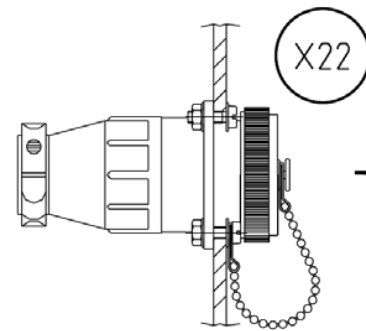
ECU CONNECTION ENGINE PLUG /
CONECTOR MOTOR A ECU

ECU CONNECTION EQUIPMENT PLUG /
CONECTOR EQUIPOS A ECU

ECU CONNECTION EQUIPMENT
PLUG DETAIL /
DETALLE CONECTOR EQUIPOS
A ECU

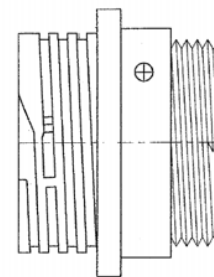


Num.	COLOR	DESCRIPTION / DESCRIPCIÓN
1	Black / Negro	Battery - / - Batería
2	Black / Negro	GND
3	-	Spare / Libre
4	Black / Negro	DigOut/DigIN
5	-	Spare / Libre
6	-	Spare / Libre
7	-	Spare / Libre
8	Green / Verde	reserve / reserva
9	Green-White / Verde-Blanco	reserve / reserva
10	Grey / Gris	ISO-L-line
11	White / Blanco	ISO-K-line
12	Brown / Marrón	CAN high
13	Blue / Azul	CAN low
14	Red / Rojo	Battery + / + Batería
15	-	Spare / Libre
16	-	Spare / Libre
17	Black-White / Negro-White	GND
18	Grey-White / Gris-Blanco	Speed switch / Contacto velocidad
19	-	Spare / Libre
20	-	Spare / Libre
21	Blue-White / Azul-Blanco	Speed drop switch / Contacto caída velocidad
22	-	Screen / Pantalla
23	Yellow-Green / Amarillo-Verde	GND Speed governor / GND Regulador velocidad
24	Brown / Marrón	Voltage speed governor signal (0.5-4.5V) / Señal voltaje regulador velocidad (0.5-4.5V)
25	Blue / Azul	+5Vref Speed governor / +5Vref Regulador velocidad



X22 CONNECTOR DETAIL /
DETALLE CONECTOR
X22

Num.	COLOR	DESCRIPTION / DESCRIPCIÓN
D	Green / Verde	reserve / reserva
E	Green-White	reserve / reserva
H	Brown / Marrón	CAN high
G	Blue / Azul	CAN low
L	Grey / Gris	ISO-L-line
K	White / Blanco	ISO-K-line
A	Red / Rojo	U Battery / U Batería
B	Black / Negro	GND



CPC CONNECTOR DETAIL /
DETALLE CONECTOR
CPC

Num.	COLOR	DESCRIPTION / DESCRIPCIÓN
1	-	Spare / Libre
2	-	Spare / Libre
3	-	Spare / Libre
4	Blue / Azul	CAN low
5	Brown / Marrón	CAN high
6	-	Screen / Pantalla
7	Pink / Rosa	Cranking signal / Señal arranque
8	Yellow / Amarillo	ECU power signal / Señal alimentación ECU
9	Blue / Azul	+5Vref Speed governor / +5Vref Regulador velocidad
10	Brown / Marrón	Voltage speed governor signal (0.5-4.5V) / Señal voltaje regulador velocidad (0.5-4.5V)
11	Yellow-Green / Amarillo-Verde	GND Speed governor / GND Regulador velocidad
12	-	Screen / Pantalla
13	Red-White / Rojo-Blanco	D+
14	Red / Rojo	Battery + / + Batería
15	Black / Negro	Battery - / - Batería
16	Blue / Azul	AVR remote voltage control signal (0-2.5V) / AVR señal voltaje control remoto (0-2.5V)
17	Brown / Marrón	AVR common / AVR común
18	-	Screen / Pantalla
19	Purple / Morado	---
20	-	Spare / Libre
21	-	Spare / Libre
22	-	Spare / Libre
23	-	Spare / Libre
24	-	Spare / Libre

GENSET MODEL / MODELO GRUPO		85 GT/GTC - 100 GTA/GTAC - 115 GT/GTC -120 GTA/GTAC PREPARED FOR PARALLEL OPERATION / PREPARADO PARA PARALELO	
---		ECU and engine control wiring closet connectors detail / Detalle conectores armario ECU e instalación control de motor	
ENGINE VOLTAGE / VOLTAGE MOTOR		24 V	

DRAFTSMAN / DIBUJANTE ROGER CANALS	REVISED / REVISADO VICTOR MIRAVET	CREATION DATE / FECHA DE CREACIÓN (DD/MM/YY) 02-04-2014	REVISION DATE / FECHA DE REVISIÓN 05-05-2014
SOLE, S.A.		PANEL REF.: --- ELEC. WIRING REF.:60994206P	

BOOST PRESSURE SENSOR

ENGINE OIL PRESSURE SENSOR

ENGINE SPEED PICK-UP

COOLANT TEMPERATURE SENSOR

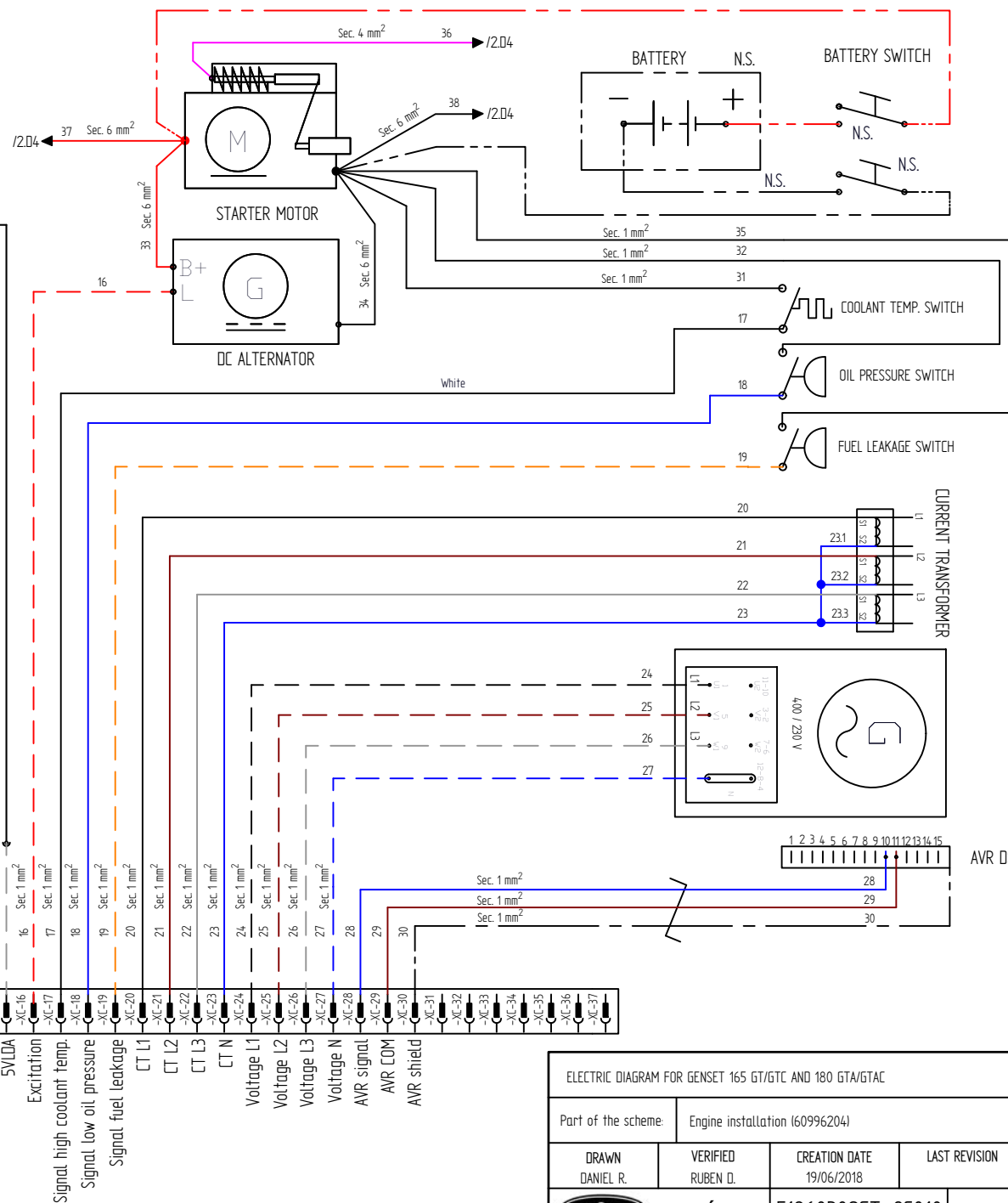
EMR ACTUATOR

DEUTZ ORIGINAL CONNECTOR

CONNECTOR
ENGINE-ECU WIRING
CPC 37 PIN
PIN FEMALE

NS

NOT SUPPLIED



ELECTRIC DIAGRAM FOR GENSET 165 GT/GTC AND 180 GTA/GTAC

Part of the scheme: Engine installation (60996204)

DRAWN
DANIEL R.VERIFIED
RUBEN D.CREATION DATE
19/06/2018

LAST REVISION

PAGE

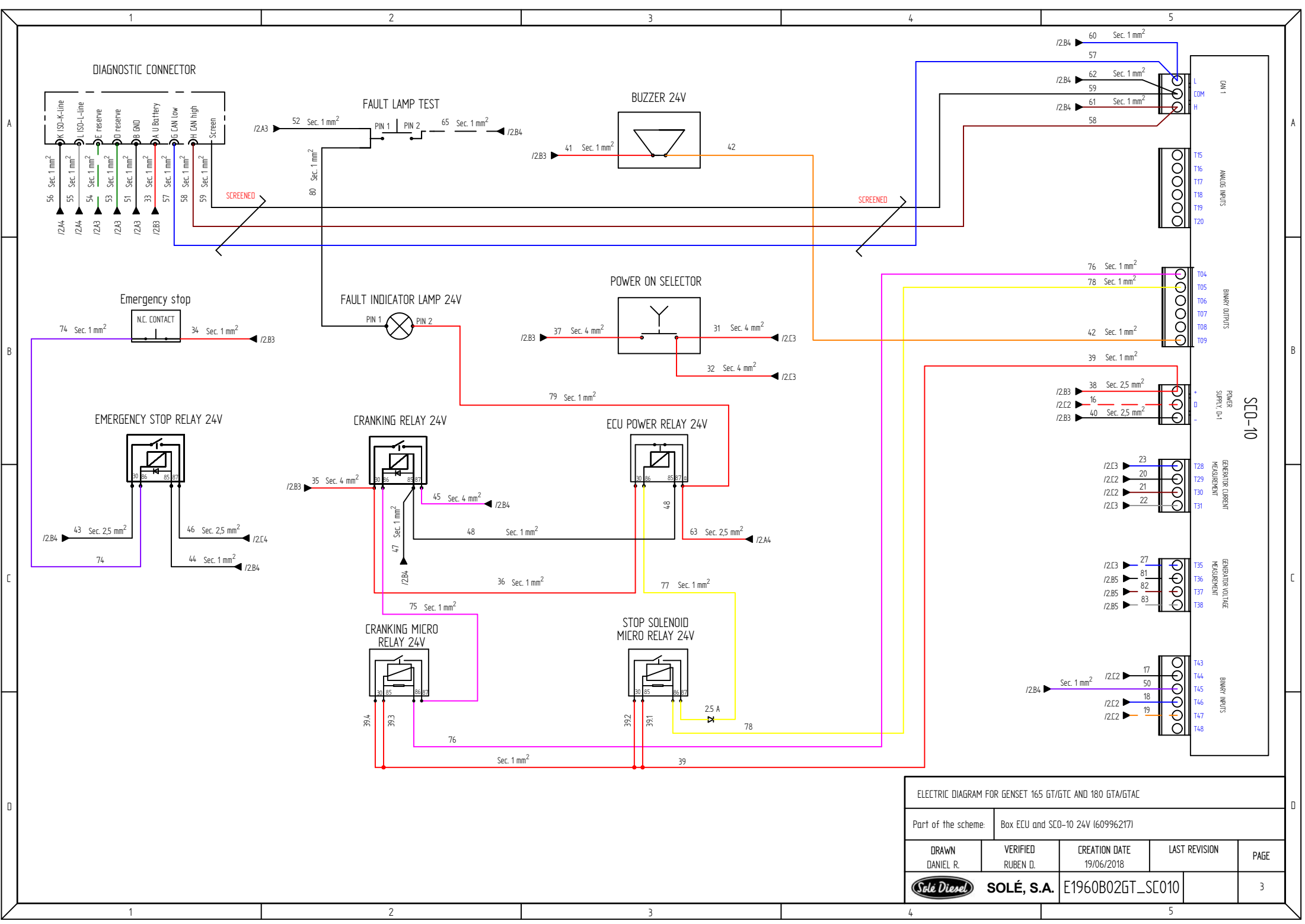
Sole Diesel


SOLÉ, S.A.

E1960B02GT_SC010

1





ELECTRIC DIAGRAM FOR GENSET 165 GT/GTC AND 180 GTA/GTAC				
Part of the scheme:		Box ECU and SCO-10 24V (60996217)		
DRAWN DANIEL R.	VERIFIED RUBEN D.	CREATION DATE 19/06/2018	LAST REVISION	PAGE
 SOLÉ, S.A.		E1960B02GT_SCO10		3

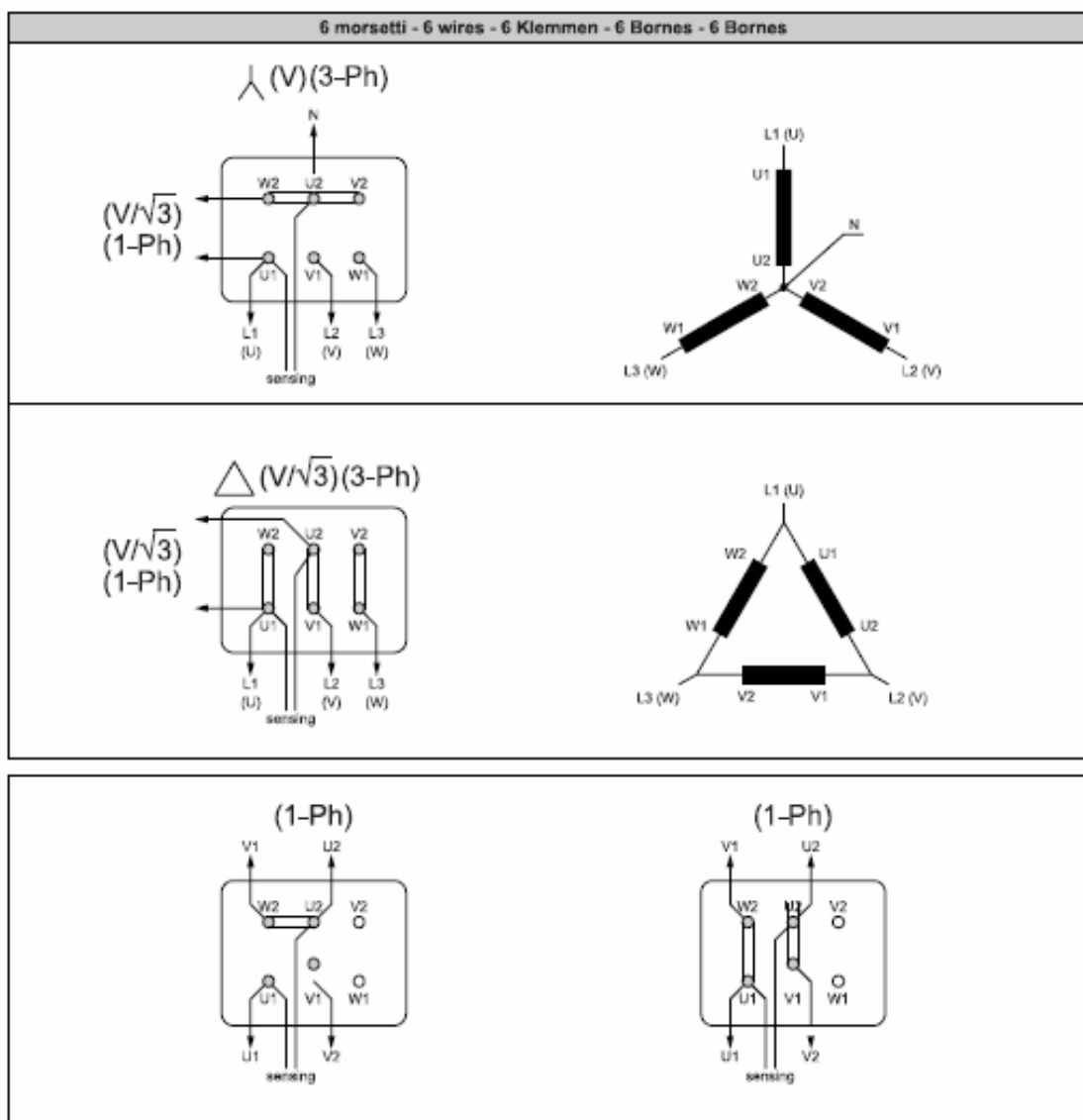
11.2. Alternator connections

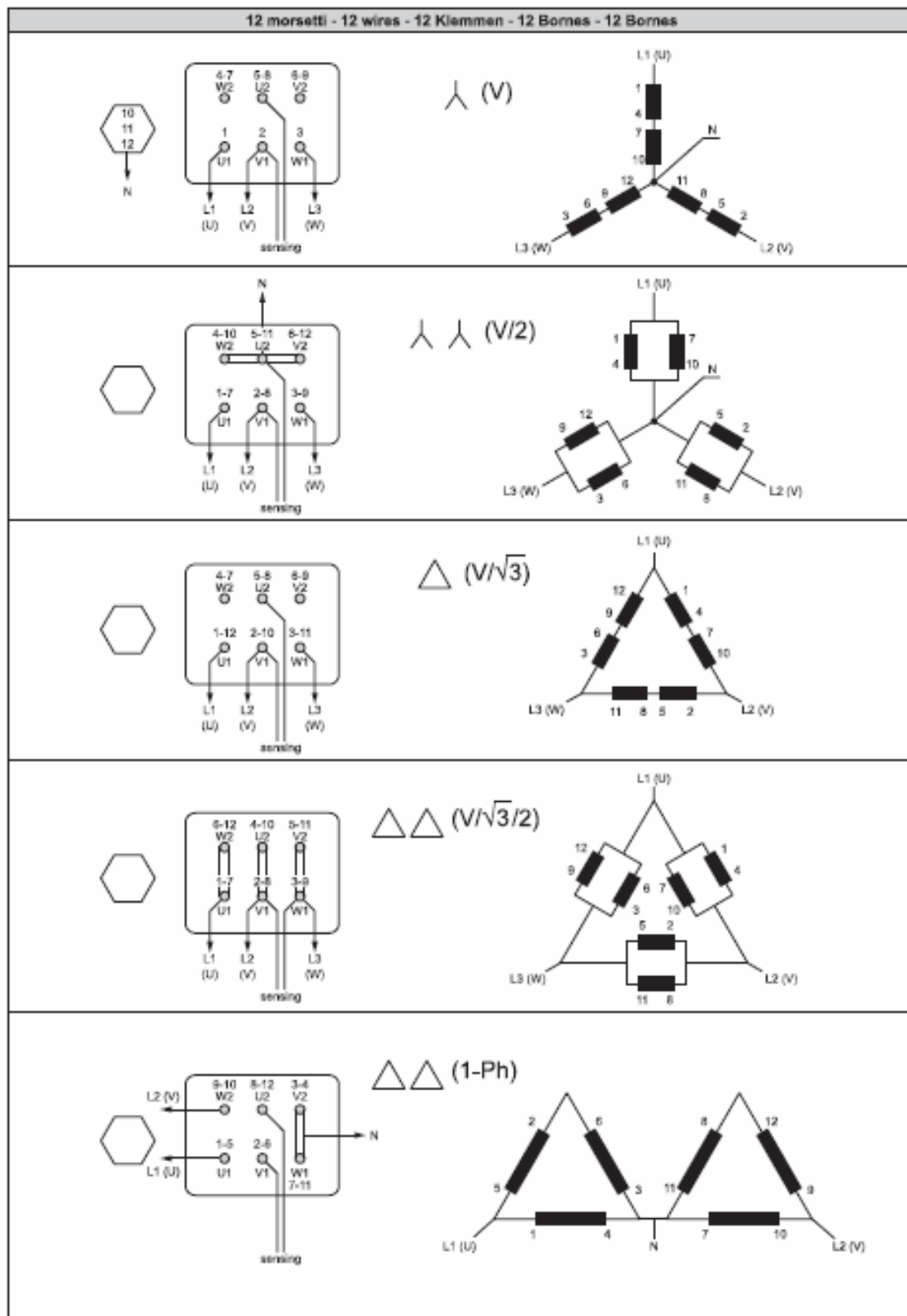
According to genset model, consult the alternator's connection:

CONNECTION'S TYPE 1 19 GSC / 23 GSAC / 20 GTC / 25 GTAC / 20 GSC / 25 GSAC / 25 GTC / 30 GTAC / 35 GTC / 40 GT

CONNECTION'S TYPE 2 29 GSC / 32 GSAC / 50 GTC / 60 GTAC

Connection's type 1





[illegible]

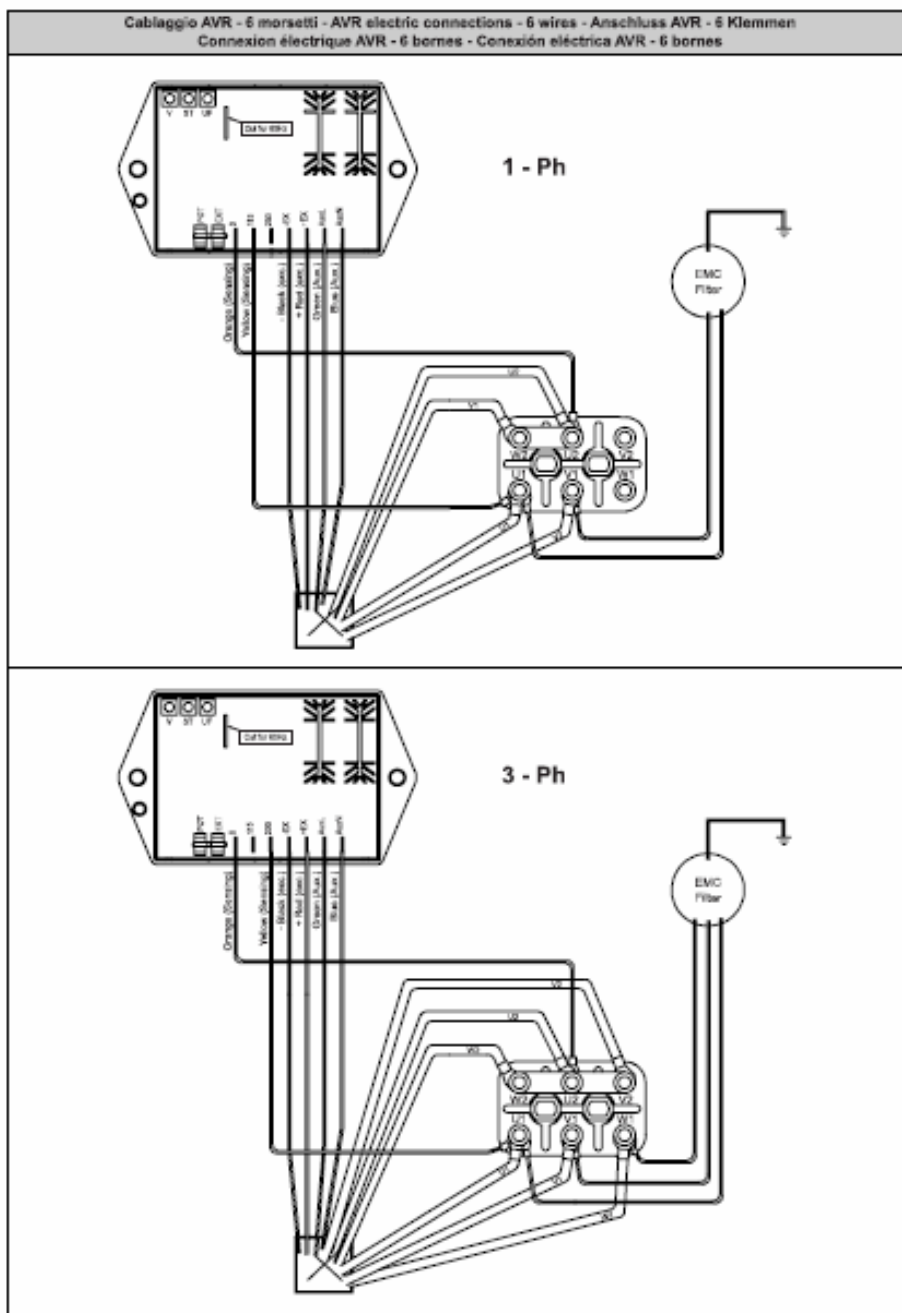
11.3. Regulator connections

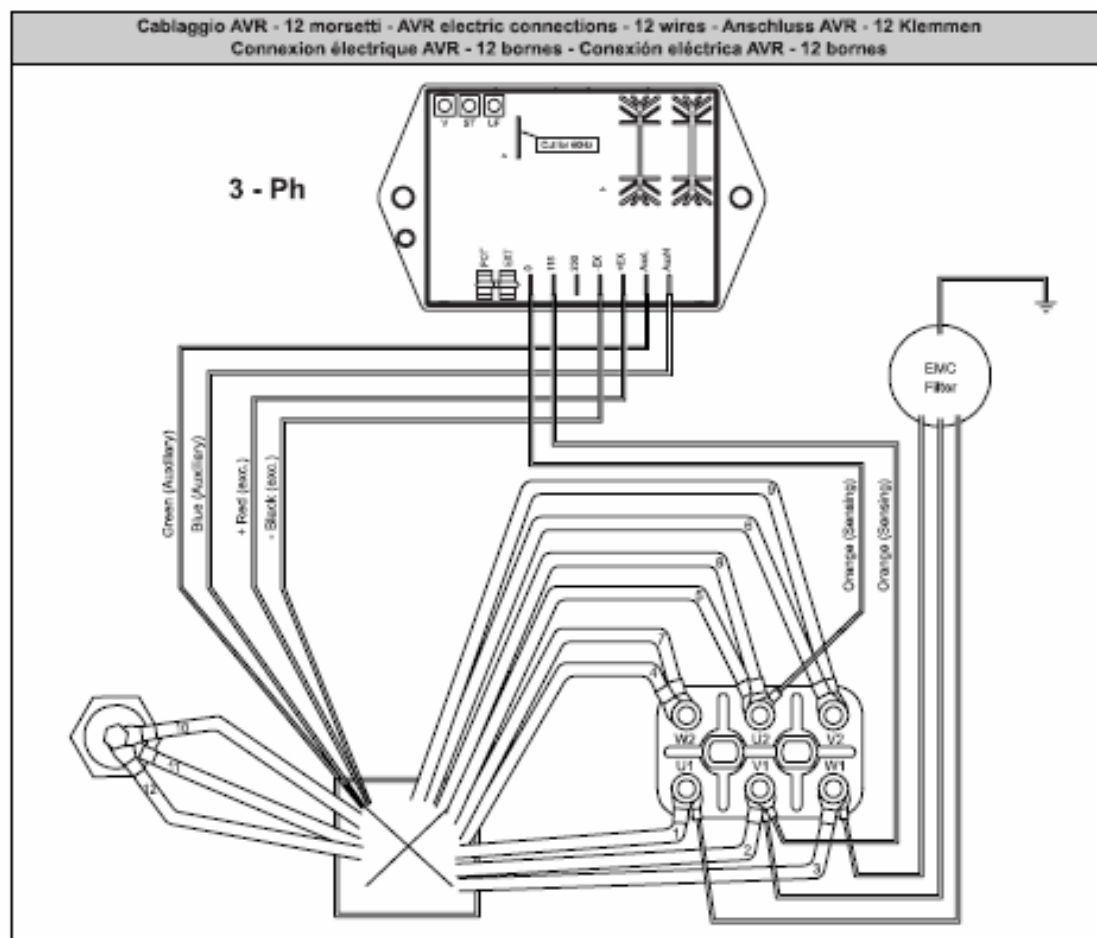
According to genset model, consult the regulator's connection:

CONNECTION'S TYPE 1 19 GSC / 23 GSAC / 20 GTC / 25 GTAC / 20 GSC / 25 GSAC / 25 GTC / 30 GTAC / 35 GTC / 40 GT

CONNECTION'S TYPE 2 29 GSC / 32 GSAC / 50 GTC / 60 GTAC

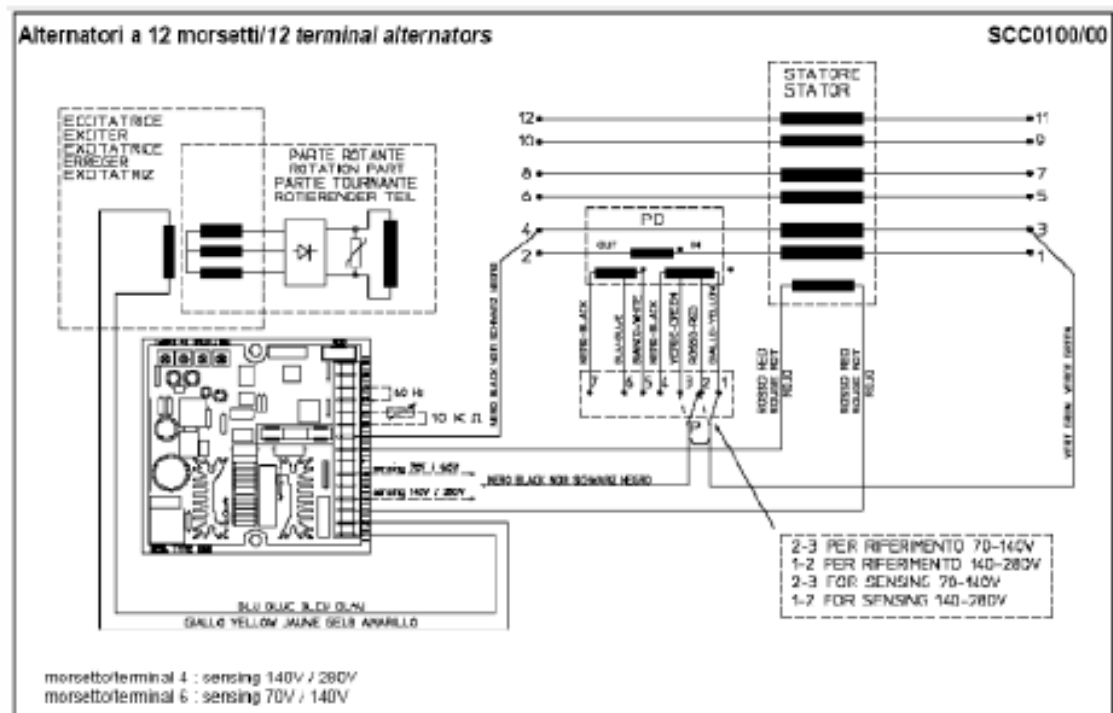
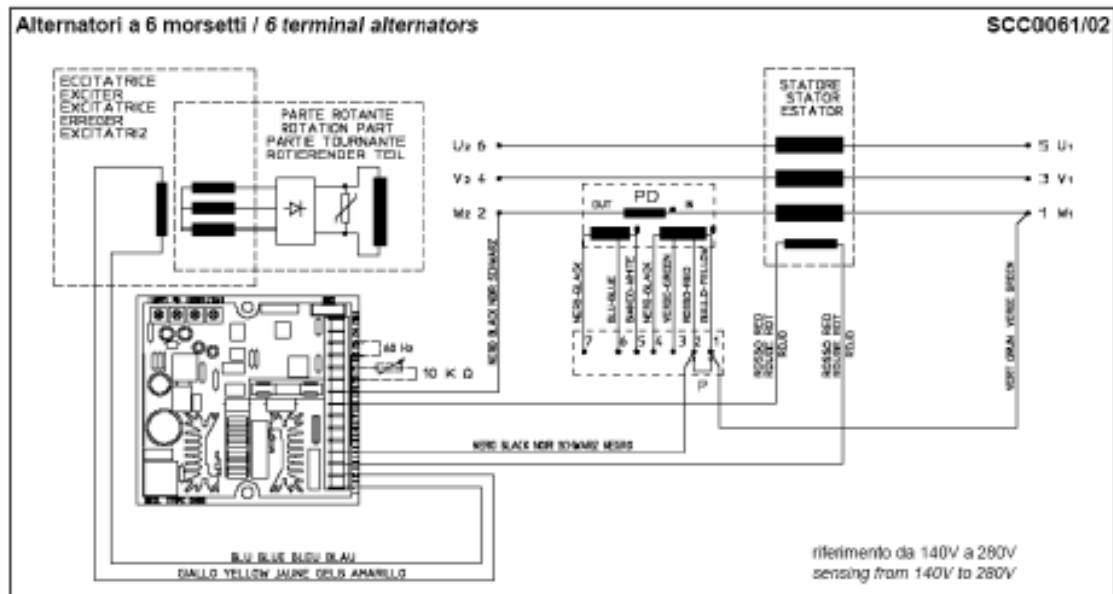
Connection's type 1





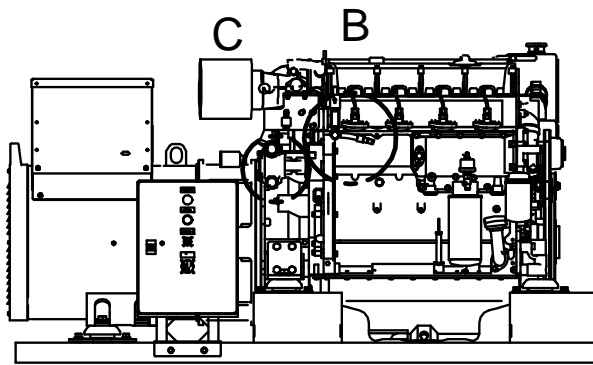
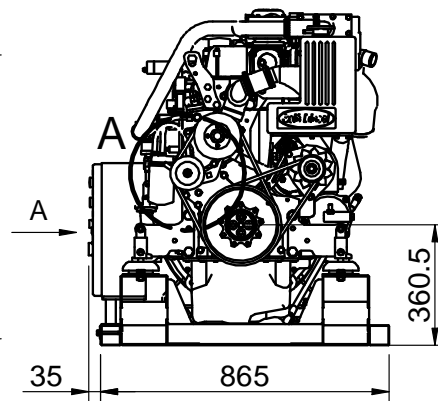
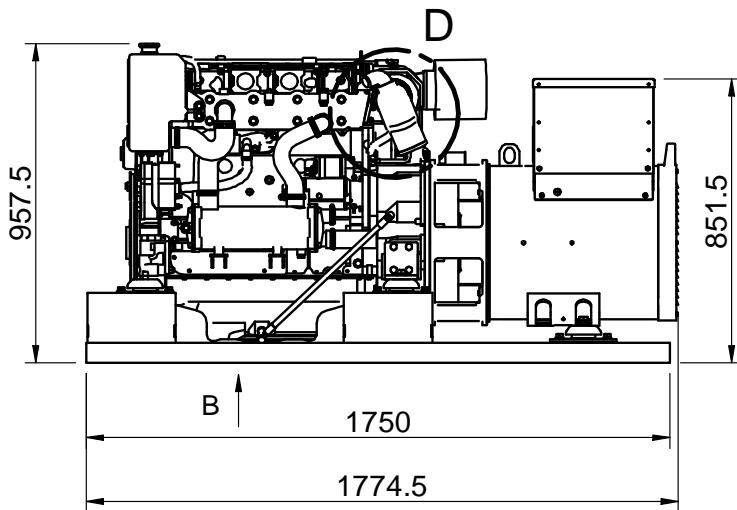
Technical appendices

Connection's type 2

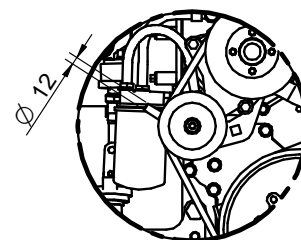


11.4. Overall dimensions

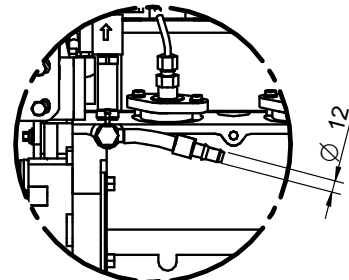
(USE ONLY FOR A REFERENCE)



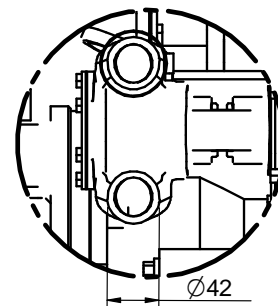
VIEW A



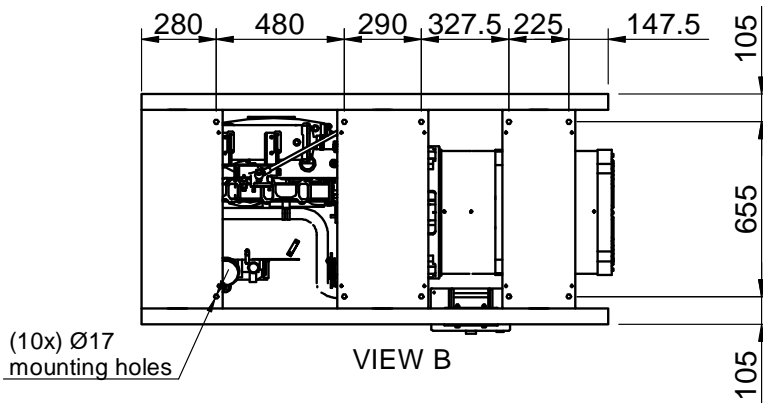
Detail A
(Fuel Inlet)



Detail B
(Fuel Outlet)

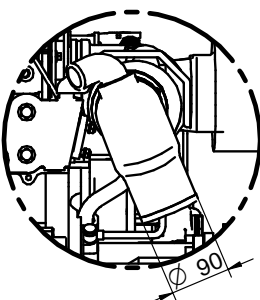


Detail C
(Sea water Inlet)



VIEW B

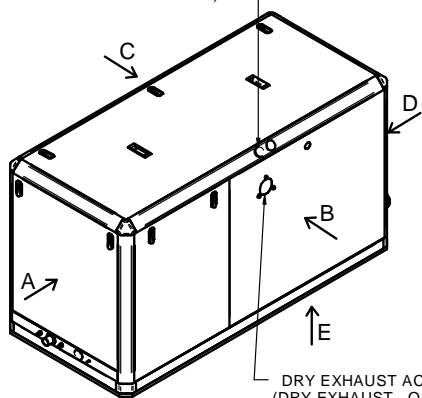
Detail D
(Wet Exhaust)



85 GT / 100 GTA / 115 GT / 120 GTA									
Medidas Nominales (mm)	100	300							
	100	300							
	30	100							
	6	30							
	0	6							
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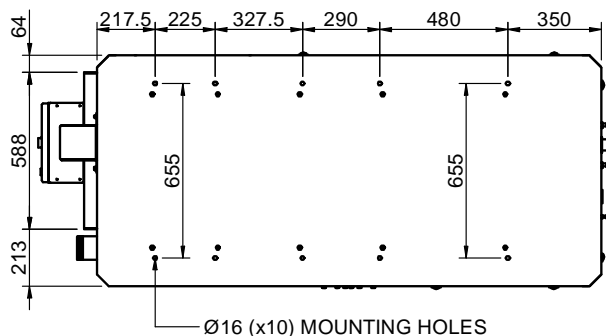
SIPHON BREAK CONNECTIONS
(AIR VENT SYSTEM-OPTIONAL KIT)

(USE ONLY FOR A REFERENCE)

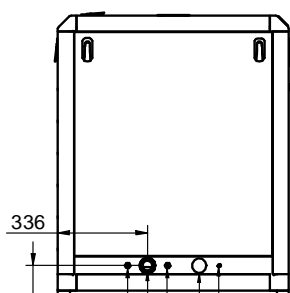


DRY EXHAUST ACCESS
(DRY EXHAUST - OPTIONAL KIT)

VIEW E

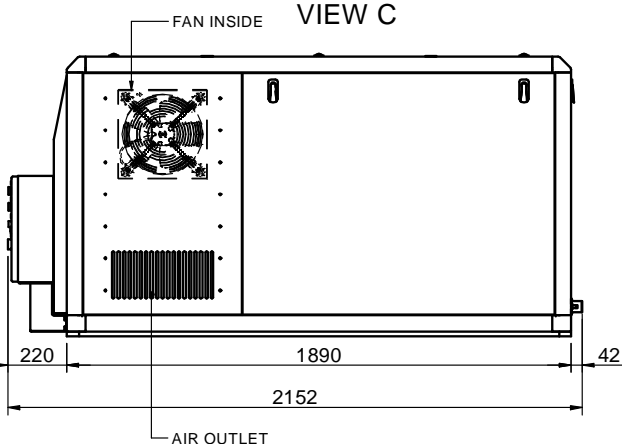


VIEW A

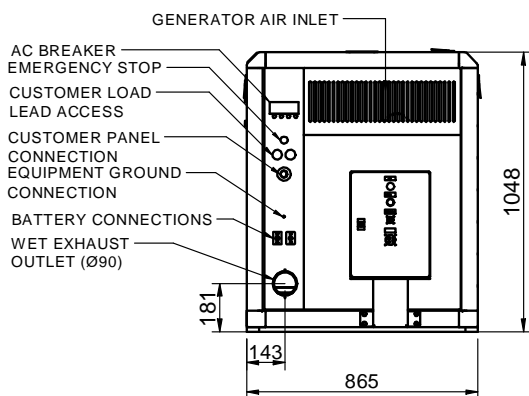


LEAKS COOLANT OUTLET (Ø8)
SEA WATER OUTLET (Ø42)
(ONLY DRY EXHAUST)
FUEL OUTLET (Ø12)
SEA WATER INLET (Ø42)
FUEL INLET (Ø12)

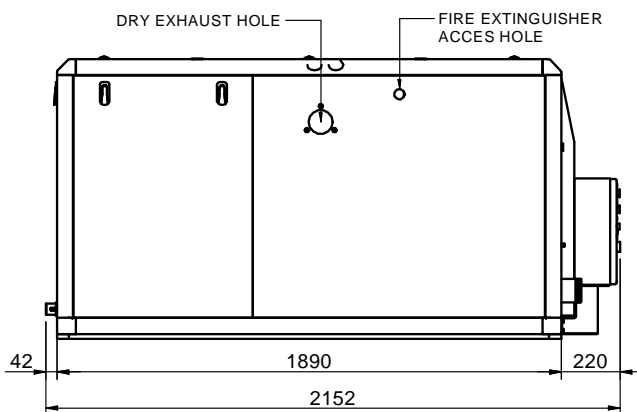
VIEW C



VIEW D

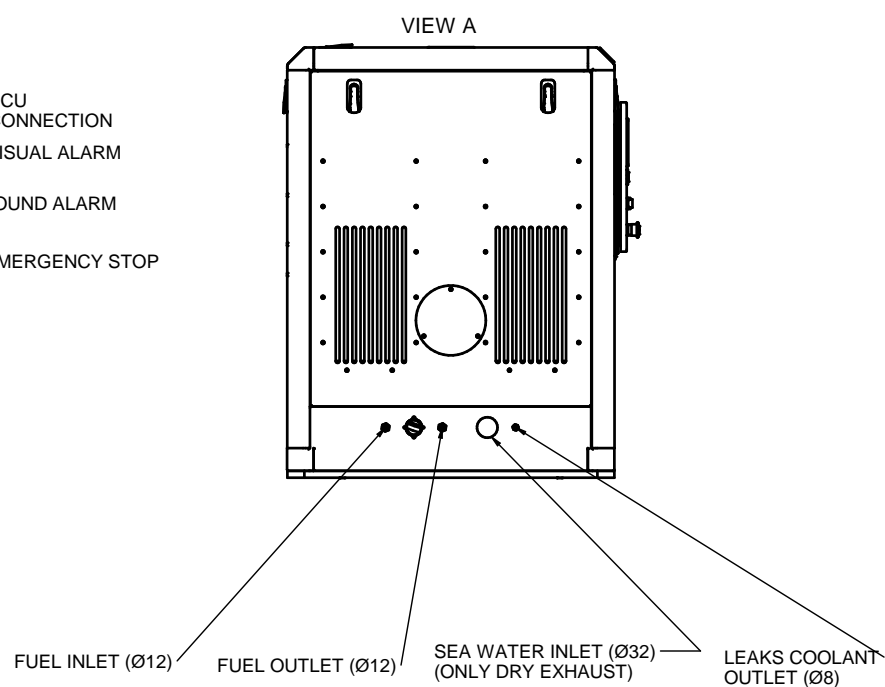
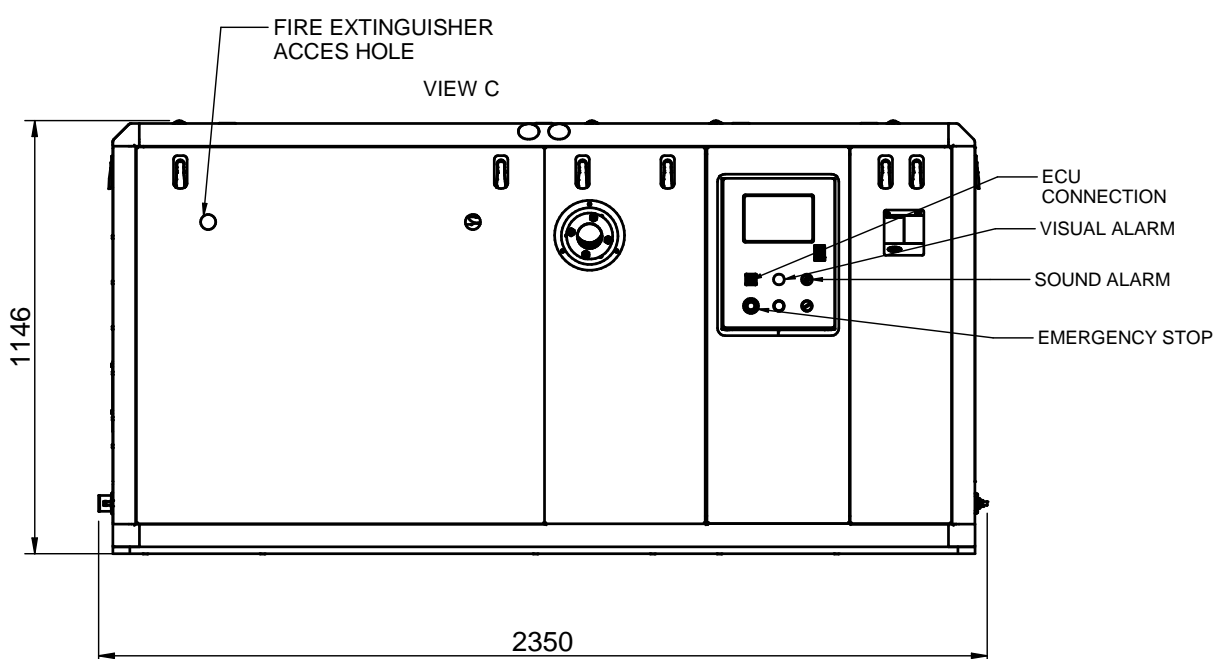
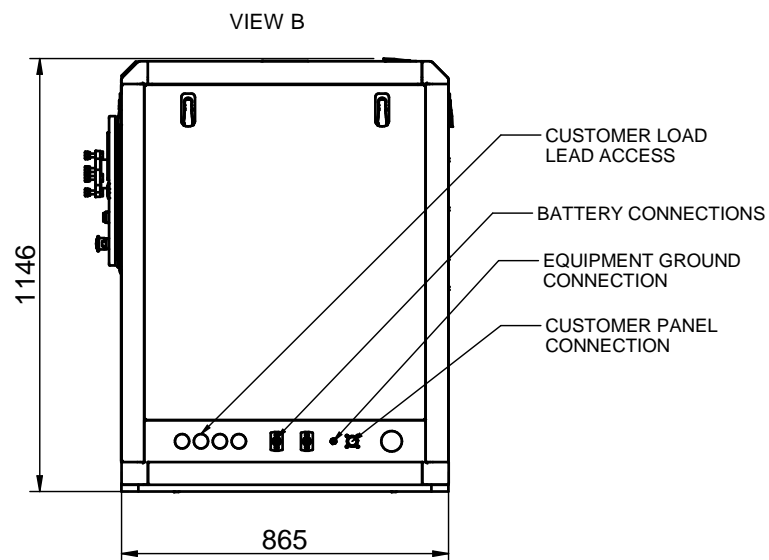
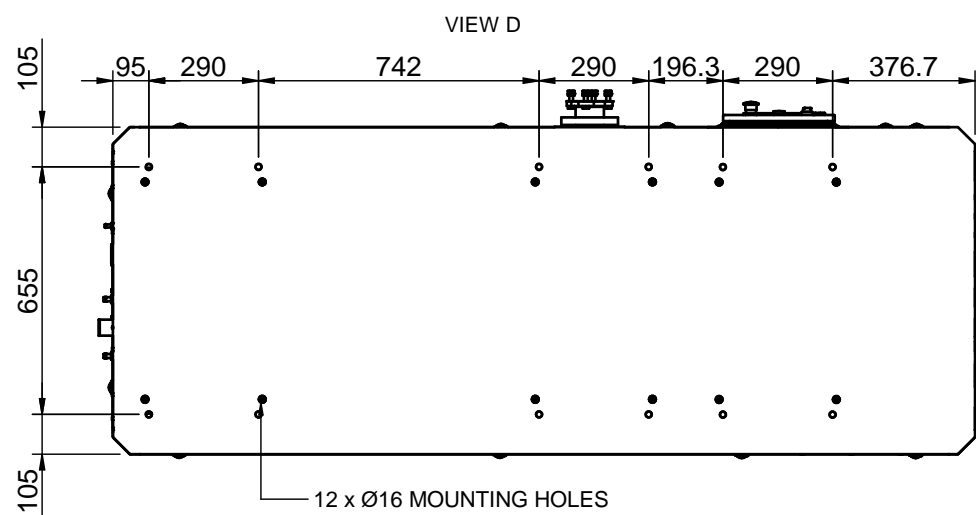
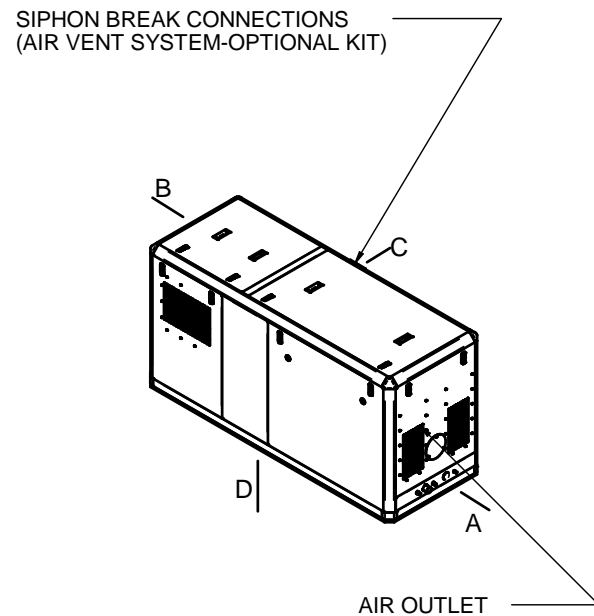
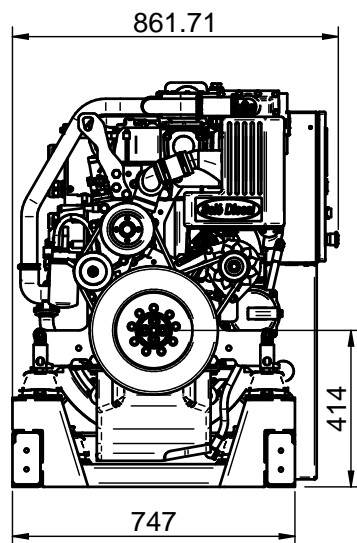
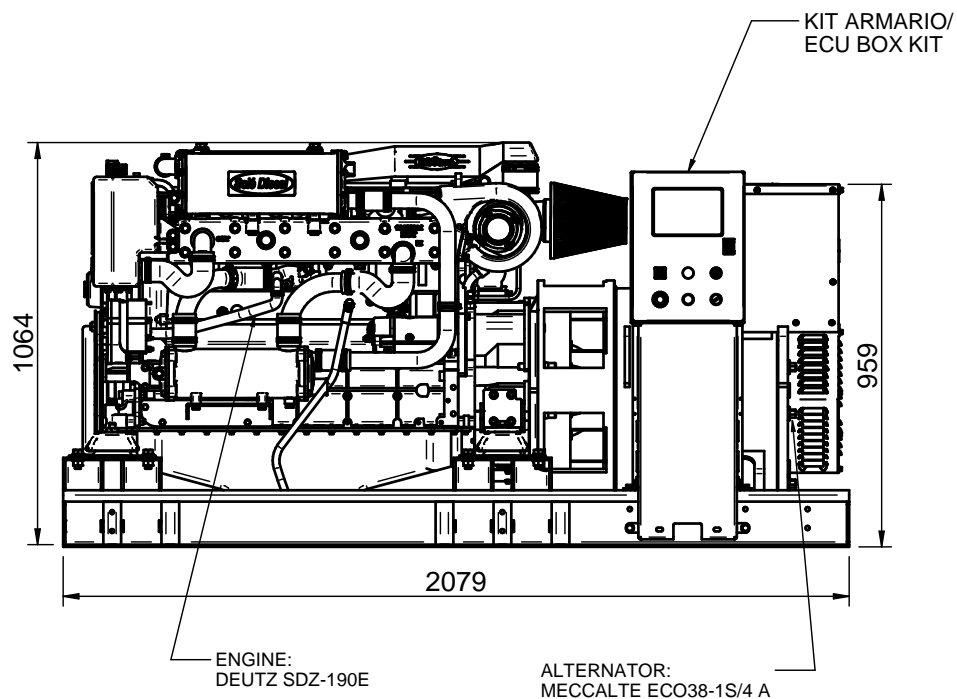


VIEW B



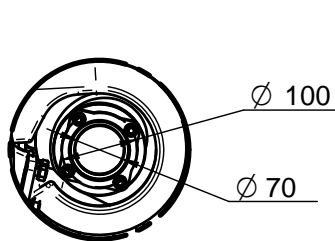
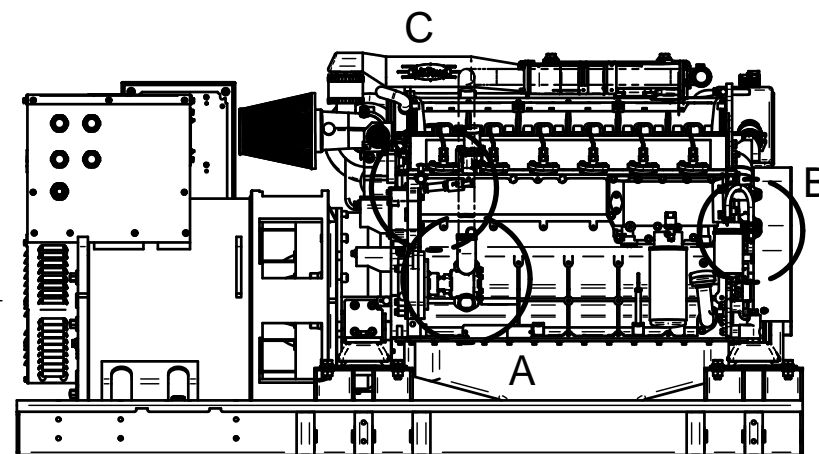
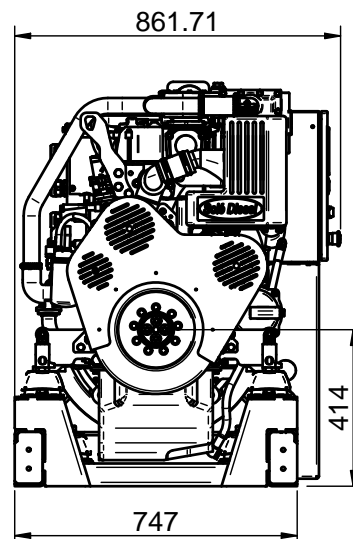
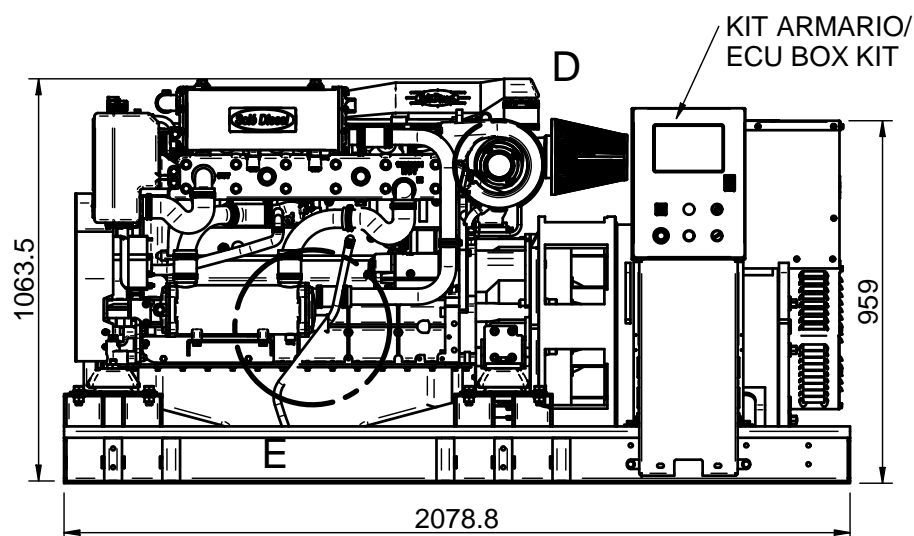
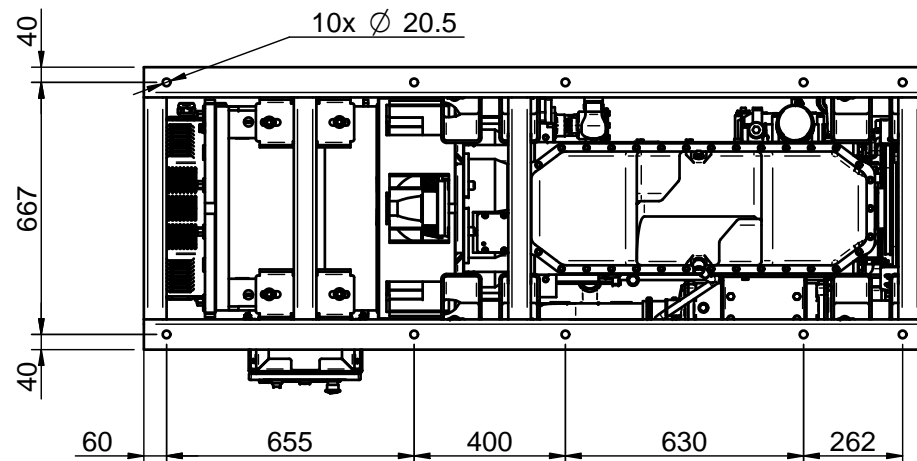
Note: Dimensions in millimeters

Medidas Nominales (mm)		100	85 GTC / 100 GTAC / 115 GTC / 120 GTAC GENSET					
		30						
		a						
		300						
		6						
Grado de Precisión DIN7168	a	6	MATERIAL		ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
	30	±0.1	☒					☒
	6	±0.05	DIBUJADO	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN	
	Fino	±0.1	XAVIER	S.UBACH		29/05/2014		
	Medio	±0.2	SOLÉ, S.A.					
Basto	±0.5							
	±1.2							




GRUPO 165 GT/GTC // 180 GTA/GTAC				
GENSET 165 GT/GTC // 180 GTA/GTAC				
Medidas Nominales (mm)	6	30	100	300
	a	a	a	a
	±0.1	±0.15	±0.2	±0.5
Grado de Precisión DIN 7168	0	6	6	6
	Fino	Medio	Basto	Basto
	±0.05	±0.1	±0.2	±0.5
MATERIAL ACABADO TRATAMIENTO PRESENTACIÓN ESCALA				
DIBUJADO P. IGLESIAS VERIFICADO MEDIO GRADO PRECISIÓN MEDIO FECHA CREACIÓN 12/02/2020 ÚLTIMA REVISIÓN				
Sole Diesel SOLÉ, S.A. FA1245, FA1466, FA1400 FA1477, FA1642				

Technical drawing of a circular machine component, likely a pump or motor housing, shown in cross-section. A dimension line indicates a diameter of 12.



Detalle/Detail E
Salida agua mar/
Sea water Outlet

Limits for Nominal sizes (mm)	over	over	GRUPO 180 GTA 24V 480/277V									
	100	30	ENGINE 180 GTA 24V 480/277V									
	to	to										
	100	100										
	300	300										
	+0.2	+0.15										
	over	over										
	6	3										
	to	to										
	30	100										
+0.1	+0.3											
from	from											
0	6											
to	to											
6	6											
+0.05	+0.1											
+0.1	+0.2											
+0.2	+0.5											
+0.8	+1.2											
. . . MATERIAL FINISH TREATMENT Remove All Burrs. SCALE												
And Sharp Edges . /.												
. DRAWN .		. CHECKED .		. Tolerance Class .		. DRAWN DATE LAST DATE REV. .				
P.IGLESIAS		V.MIRAVET		Medium		12/12/2017		--				
Tolerance Class DIN-7168		Fine		Medium		Coarse		<div></div> <div>SOLÉ, S.A.</div> <div>G9606M1802S00</div>				

Instructions to replace and remove



Section 12 – 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 13 – 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			
Bleed 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.		

Maintenance log



Section 14 - Maintenance log

DATE	HOURS	DESCRIPTION	SERVICE NAME



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07/2022