



[www.solediesel.com](http://www.solediesel.com)

# Marine generator sets

Operator's manual  
TYPE APPROVAL (DNV)

20 GSC	25 GSAC
25 GTC	30 GTAC
35 GTC	40 GTAC
29 GSC	32 GSAC
45 GTC	54 GTAC
50 GTC	60 GTAC
68 GTC	84 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.

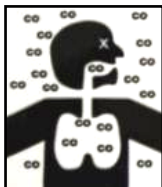
# Safety precautions and instructions

## **⚠ 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.

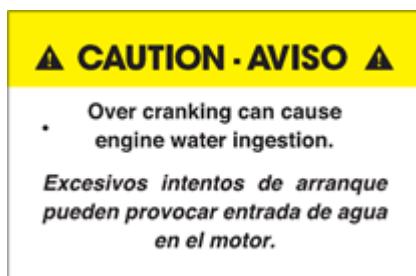
Hearing protection. Use to avoid hearing loss when handling the motor.

## **⚠ 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.
2. The installer / operator of the engine has to wear personal protective equipment such as gloves, work shoes, eye and hearing protection as required by the task.
3. The area in which the operator is working has to be kept tidy and free of oil and other liquid spillages and solid waste (metal chips, etc.).

# Safety precautions and instructions

## Engine labels



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

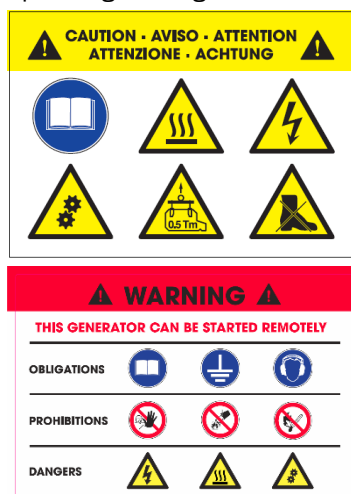
- 1) Close the seacock.
- 2) Drain the water from the exhaust system in the water trap.
- 3) Do not try to restart the engine until the cause of the start fail is identified.



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 6.7. Intake and exhaust system.

# Transport, handling and storage



## 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		Commercial	
	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	Product		Product	
	Months	Hours	Months	Hours
Propulsion Engines	24	1500		
Generator Sets	24	1000		

## Restrictions

### Coverage:

- a) To validate the warranty is necessary fill and send the inspection prior to the delivery of propulsion engines or genset to Solé Diesel through an official installer. See SECTION 14.
- 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 14.
- c) The warranty shall not apply if the revisions and maintenance services indicated in the User and Maintenance Manuals have not been adhered to properly. In case of implemented warranty, supporting document of the revisions and maintenance service should be exhibited, proving the requirements outlined in the manuals have been followed.
- d) Deterioration resulting from time of storage exceeding 6 months and/or storage conditions that do not comply with the procedures described in the User and Maintenance Manuals.
- e) Deterioration resulting from not complying with the procedure for winter storage while the engine is not in service, as described in the User and Maintenance Manuals.
- f) Faults due to negligence, lack of service, accidents, abnormal use and inadequate service or installation.
- g) Faults due to the use of components not manufactured or sold by Solé Diesel.
- h) Faults due to electrical installations that do not comply with Solé Diesel design specifications or are not expressly approved by Solé Diesel.
- i) Faults due to the use of and operation with fuels, oils or lubricants that are not authorised by Solé Diesel.
- j) Faults due to water entering the cylinder(s) through the exhaust system.
- k) Faults in propulsion engines due to the use of a propeller that is inadequate for the load or application. We recommend contacting Solé Diesel to consult the choice of the correct propeller(s).
- l) Failure for general omission of the procedures described in the User and Maintenance Manuals.
- m) Components subjected to normal operating wear and tear.
- n) n) Costs due to phone communications, loss of time or money, discomfort, launching, grounding, removal or replacement of vessel parts or materials because the design of the vessel makes it necessary to do so to access the engine, and damage and/or accidents caused as a result of a failure.



## Responsibilities

### Responsibilities of the manufacturer:

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

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

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

### Responsibilities of the purchaser:

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

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

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

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

## After-sales service contact

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

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

The following information must also be provided by the purchaser:

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

For an updated list of our distribution network, visit Dealers section in our web page [www.soleDiesel.com](http://www.soleDiesel.com).

Or request this information by contacting Solé Diesel at:

**e-mail:** [info@soleDiesel.com](mailto:info@soleDiesel.com)

**Phone:** +34 93 775 14 00



# Genset information

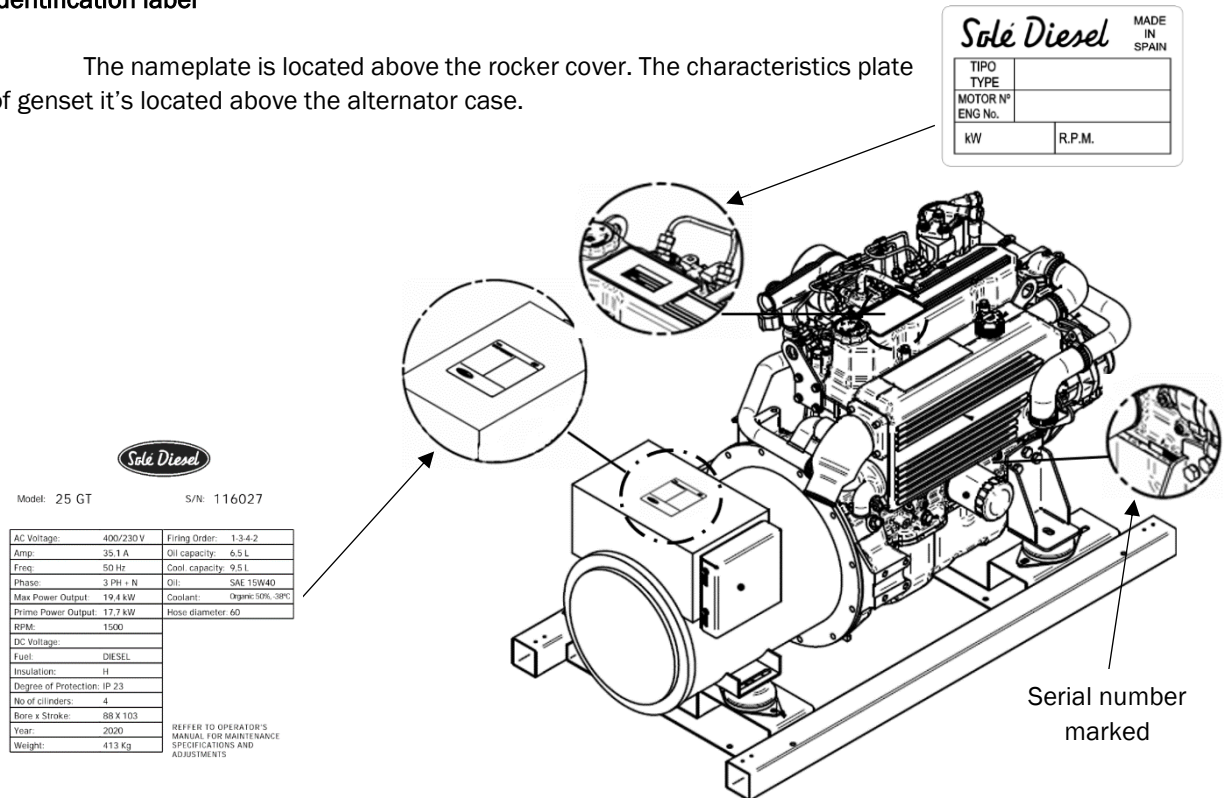


## Section 1 – Genset Information

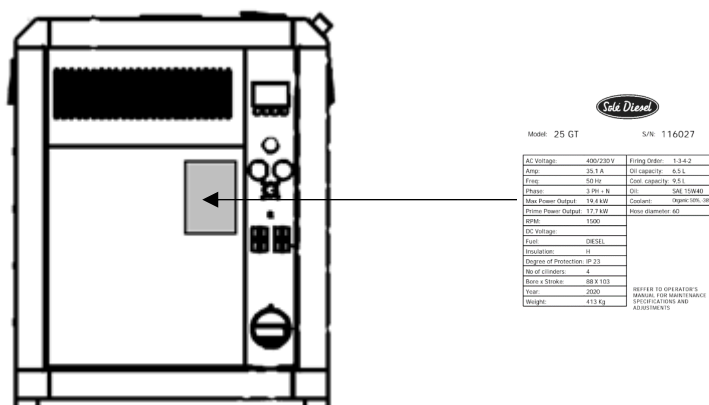
### 1.1. Genset Identification

#### Identification label

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



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



#### GENSET SERIAL NUMBER:

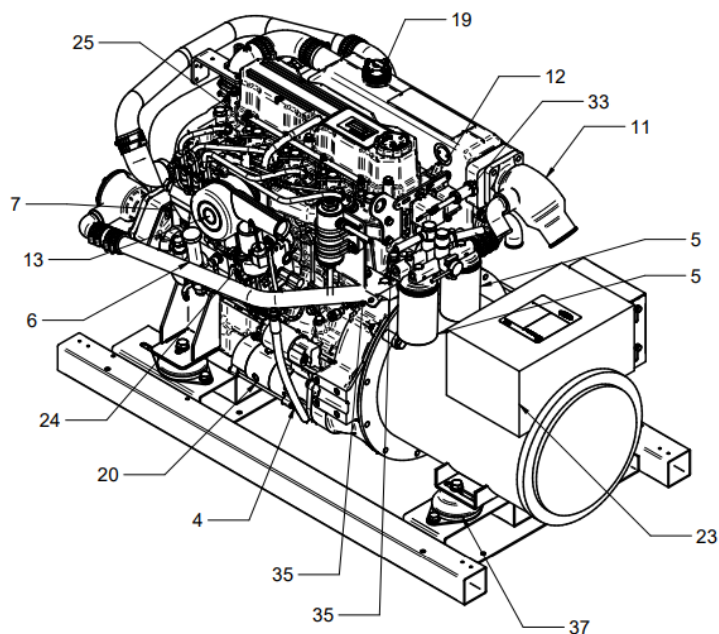
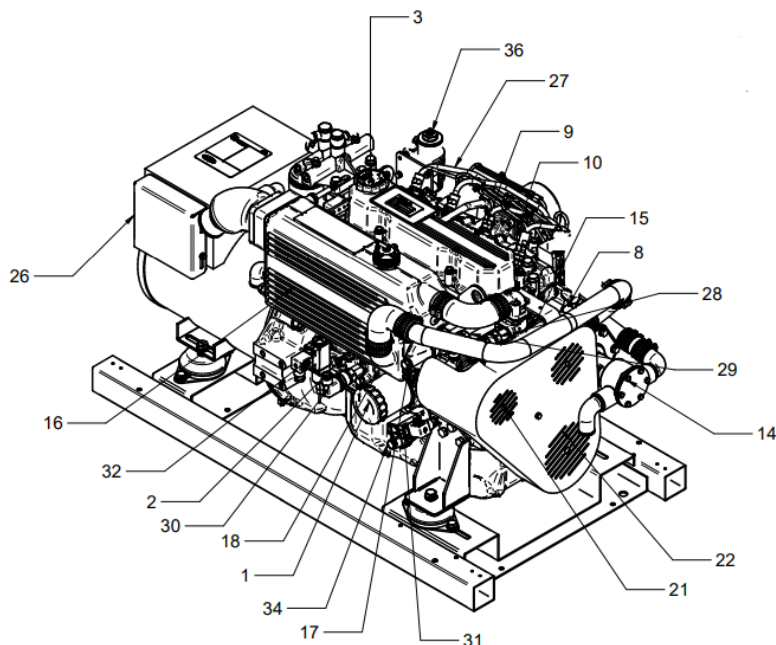
In addition, all gensets are marked with the serial number on the block, on the fuel injection pump.

# Genset information



## 1.2. Genset parts identification

Gensets: 20 GSC / 25 GSAC / 25 GTC / 30 GTAC

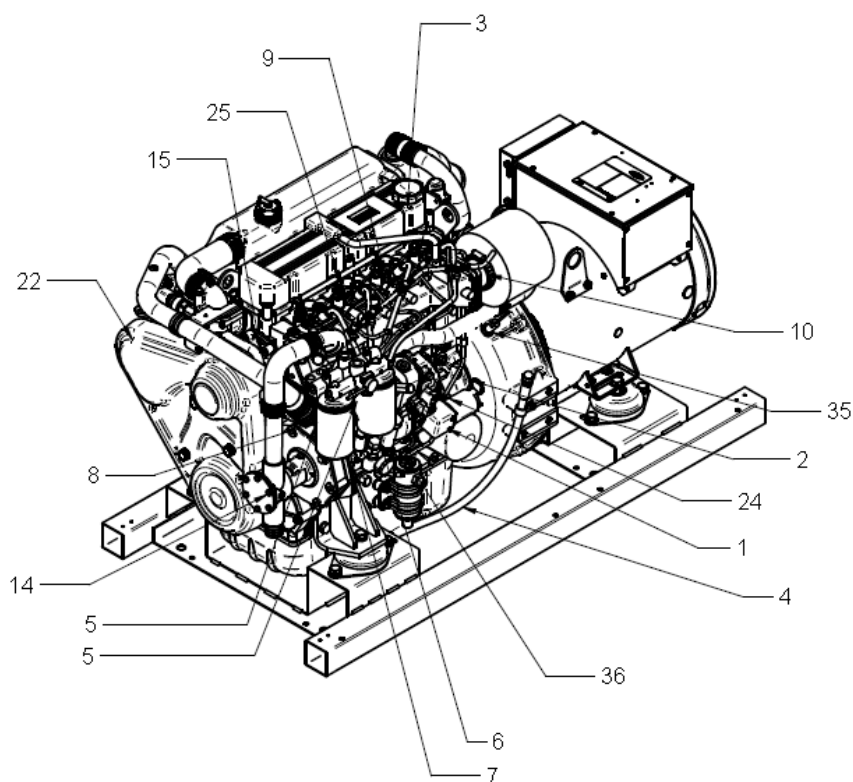
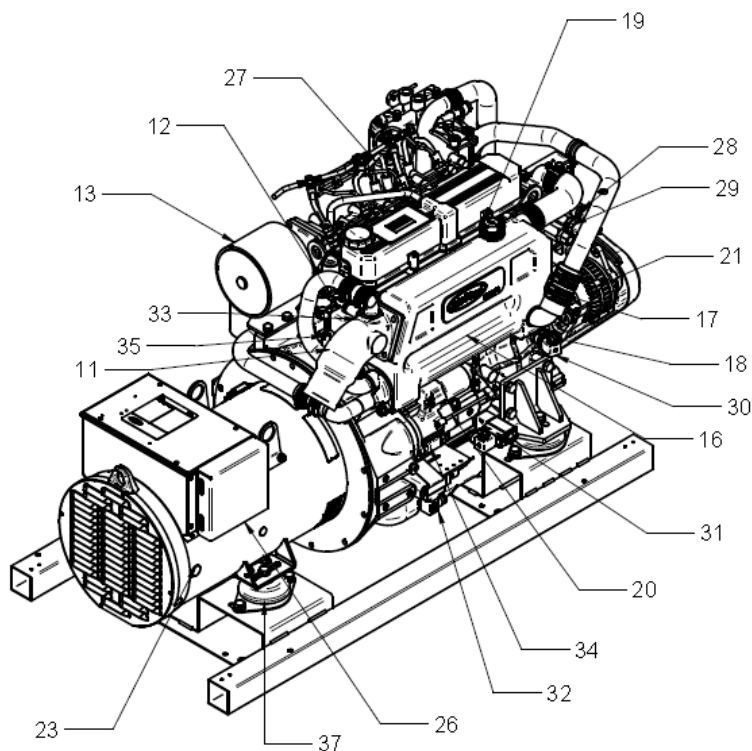


PIECE	ELEMENT
1	Oil filter
2	Oil level stick
3	Oil fill cap
4	Oil drain tuve
5	Fuel filter
6	Manual priming
7	Fuel regulator
8	Fuel feed pump
9	Nozzles
10	Air inlet elbow
11	Wet exhaust elbow
12	Turbocharger
13	Air filter
14	Sea water pump
15	Fresh water pump
16	Heat exchanger
17	Anode
18	Coolant drain plug
19	Coolant fill plug
20	Starter
21	Alternator AC
22	Belt guard
23	AC alternator
24	Stop solenoid
25	Glow plug
26	ECU (parallel version)
28	Pressure control
29	Temperature switch
30	Oil pressure transmitter
31	Oil pressure control
32	Thermostat
34	Oil thermostat
35	Pick up
36	Fuel leak alarm
37	Anti-vibration mounts

# Genset information



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

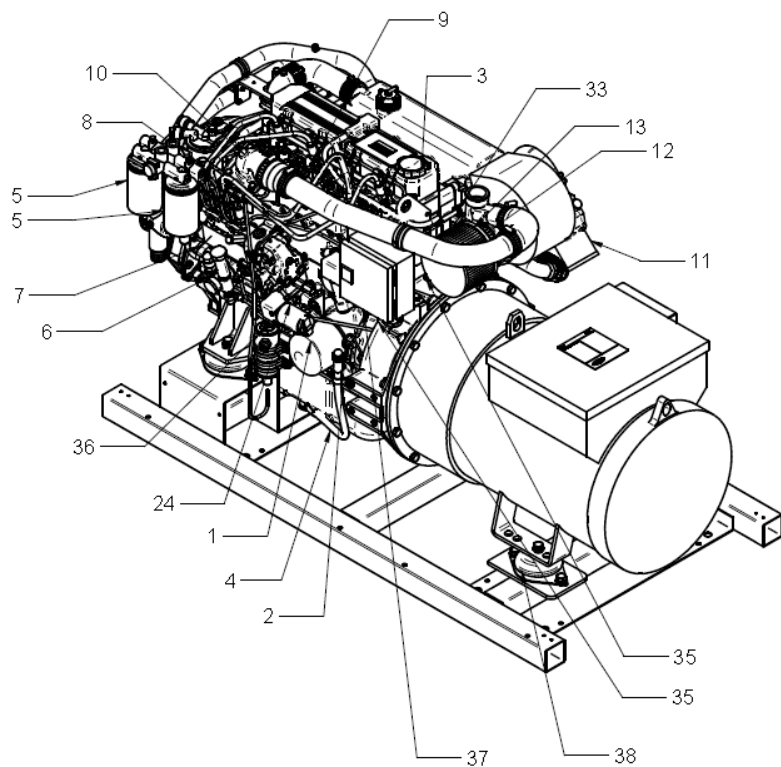
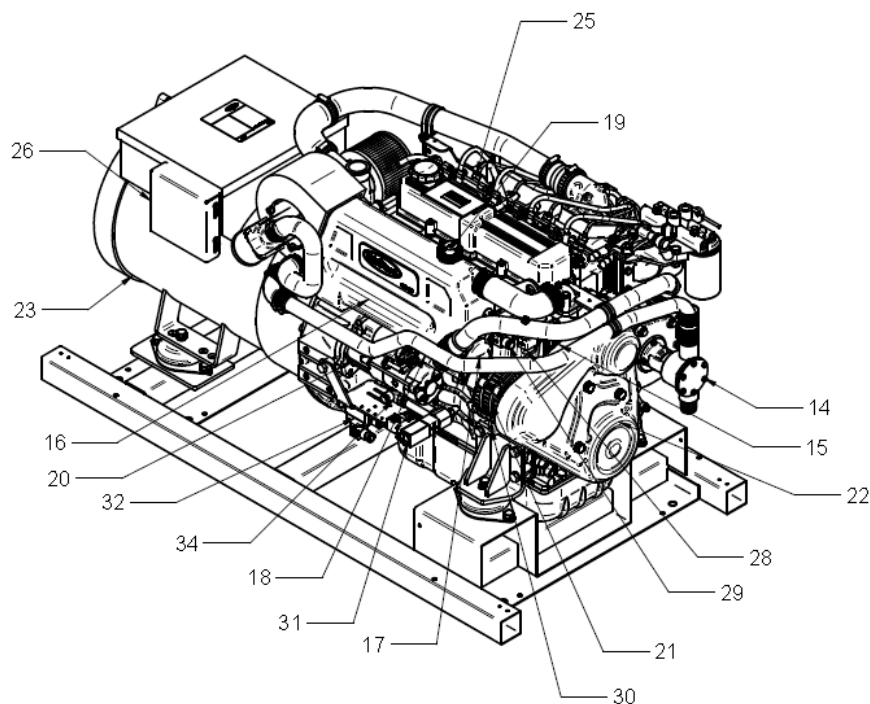


PIECE	ELEMENT
1	Oil filter
2	Oil level dipstick
3	Oil fill cap
4	Oil drain tuve
5	Fuel filter
6	Manual priming
7	Fuel regulator
8	Fuel feed pump
9	Nozzles
10	Air inlet elbow
11	Wet exhaust elbow
12	Relay
13	Air filter
14	Sea water pump
15	Fresh water pump
16	Heat exchanger
17	Anode
18	Coolant drain plug
19	Coolant drain plug
20	Starter
21	CA Alternator (engine)
22	Belt guard
23	CA alternator
24	Stop solenoid
25	Glow plug
26	ECU (parallel version)
27	Double wall pipes
28	Pressure control
29	Temperature switch
30	Oil pressure transmitter
31	Oil pressure control
32	Thermostat
33	Exhaust temperature sensor
34	Oil thermostat
35	Pick up
36	Fuel leak alarm
37	Anti-vibration mounts

# Genset information



Gensets: 45 GTC / 54 GTAC DNV:



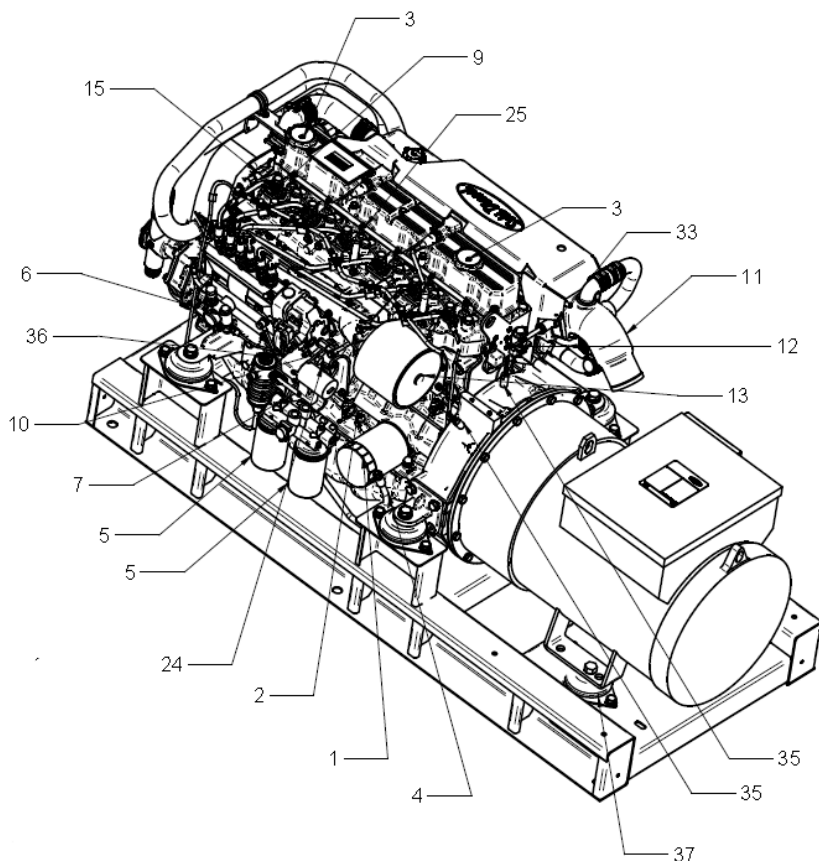
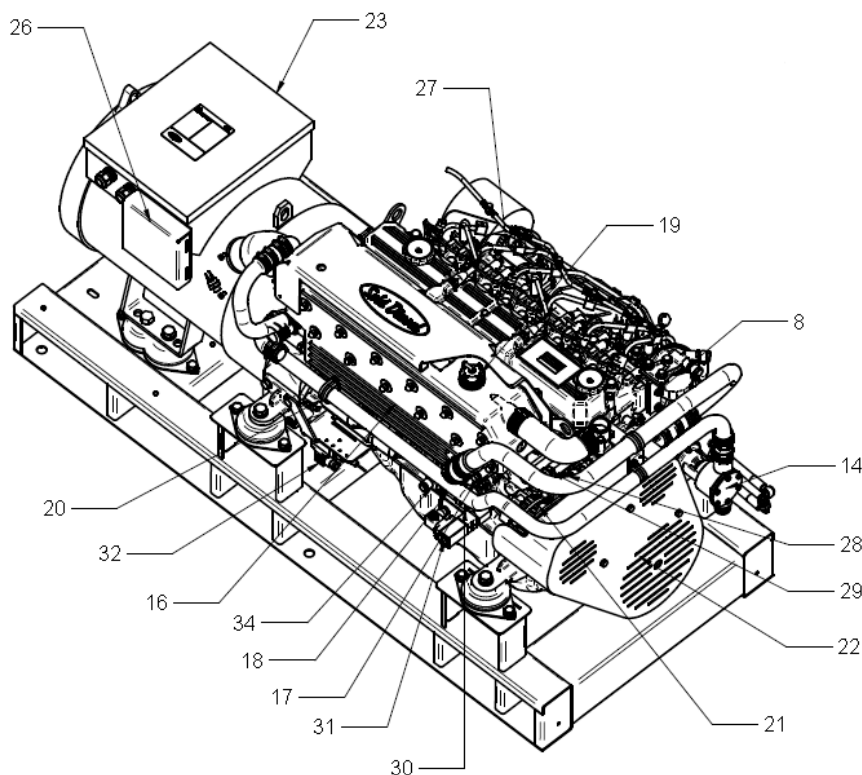
PIECE	ELEMENT
1	Oil filter
2	Oil level stick
3	Oil fill cap
4	Oil drain tuve
5	Fuel filter
6	Manual priming
7	Fuel regulator
8	Fuel feed pump
9	Nozzles
10	Air inlet elbow
11	Wet exhaust elbow
12	Turbocharger
13	Air filter
14	Sea water pump
15	Fresh water pump
16	Heat exchanger
17	Anode
18	Coolant drain plug
19	Coolant fill plug
20	Starter
21	Alternator AC
22	Belt guard
23	AC alternator
24	Stop solenoid
25	Glow plug
26	ECU (parallel version)
28	Pressure control
29	Temperature switch
30	Oil pressure transmitter
31	Oil pressure control
32	Thermostat
34	Oil thermostat
35	Pick up
36	Fuel leak alarm
37	Relay box
38	Anti-vibration mounts



# Genset information



Gensets: 50 GTC / 60 GTAC DNV:

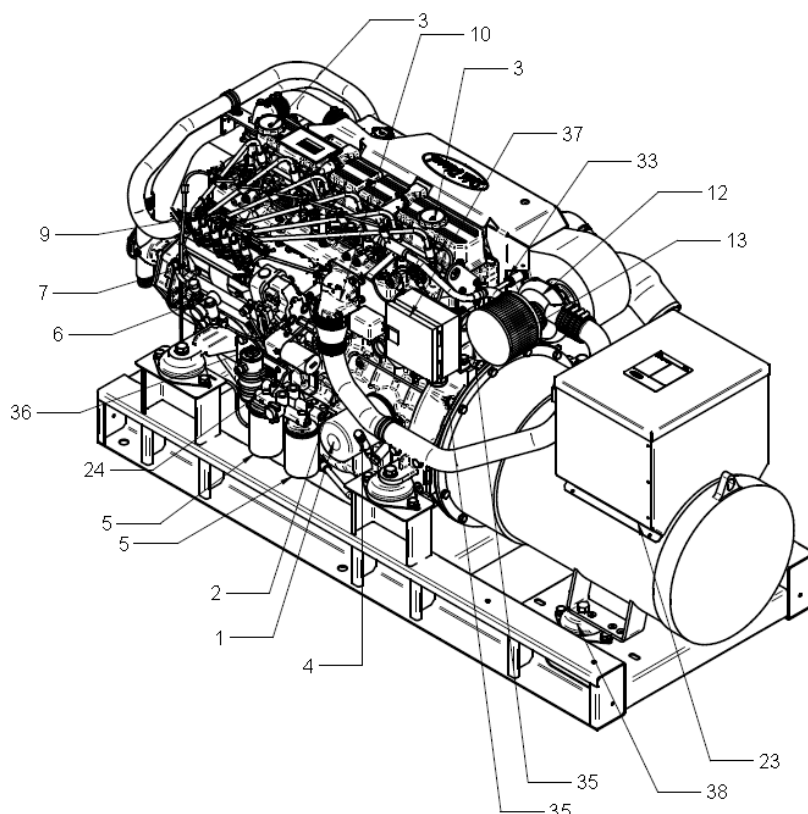
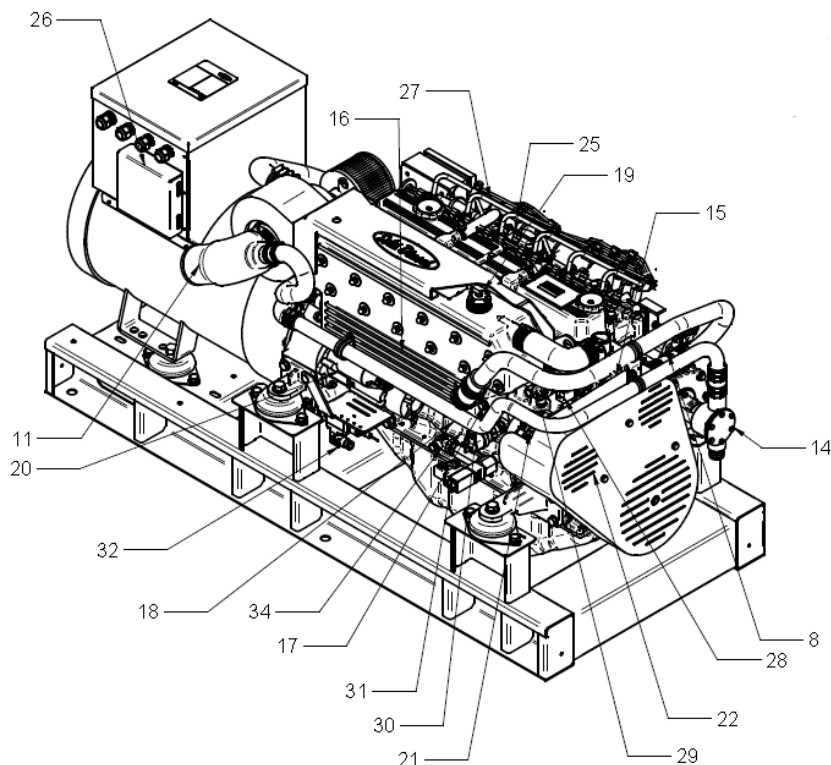


PIECE	ELEMENT
1	Oil filter
2	Oil level dipstick
3	Oil fill cap
4	Oil drain tuve
5	Fuel filter
6	Manual priming
7	Fuel regulator
8	Fuel feed pump
9	Nozzles
10	Air inlet elbow
11	Wet exhaust elbow
12	Relay
13	Air filter
14	Sea water pump
15	Fresh water pump
16	Heat exchanger
17	Anode
18	Coolant drain plug
19	Coolant drain plug
20	Starter
21	CA Alternator (engine)
22	Belt guard
23	CA alternator
24	Stop solenoid
25	Glow plug
26	ECU (parallel version)
27	Double wall pipes
28	Pressure control
29	Temperature switch
30	Oil pressure transmitter
31	Oil pressure control
32	Thermostat
33	Exhaust temperature sensor
34	Oil thermostat
35	Pick up
36	Fuel leak alarm
37	Anti-vibration mounts

# Genset information



Gensets: 68 GTC / 84 GTAC DNV:



PIECE	ELEMENT
1	Oil filter
2	Oil level stick
3	Oil fill cap
4	Oil drain tuve
5	Fuel filter
6	Manual priming
7	Fuel regulator
8	Fuel feed pump
9	Nozzles
10	Air inlet elbow
11	Wet exhaust elbow
12	Turbocharger
13	Air filter
14	Sea water pump
15	Fresh water pump
16	Heat exchanger
17	Anode
18	Coolant drain plug
19	Coolant fill plug
20	Starter
21	Alternator AC
22	Belt guard
23	AC alternator
24	Stop solenoid
25	Glow plug
26	ECU (parallel version)
28	Pressure control
29	Temperature switch
30	Oil pressure transmitter
31	Oil pressure control
32	Thermostat
34	Oil thermostat
35	Pick up
36	Fuel leak alarm
37	Relay box
38	Anti-vibration mounts

## 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.



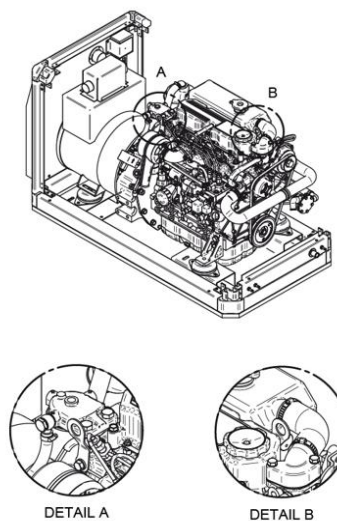
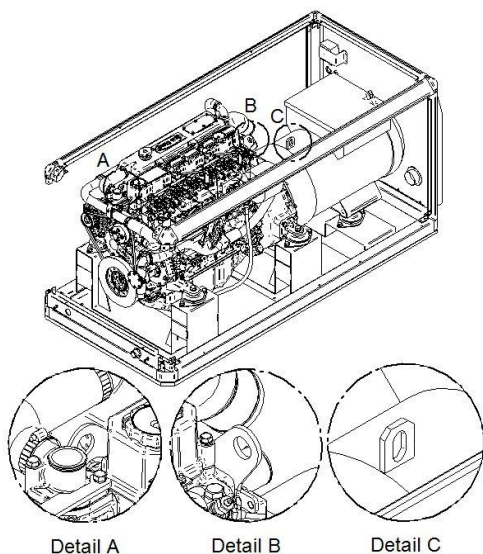
### 2.3. Transporting and Handling the Unpacked Genset

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

# Genset information

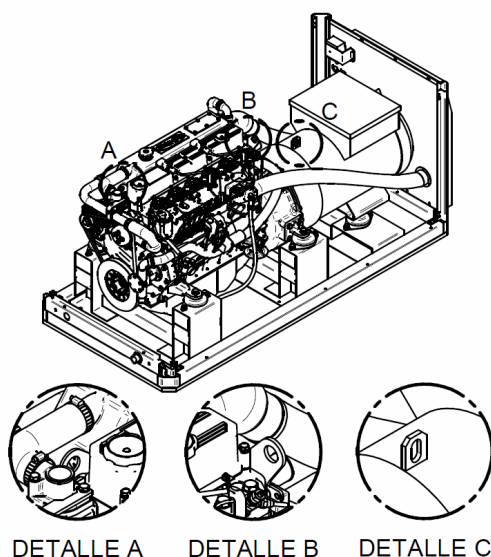
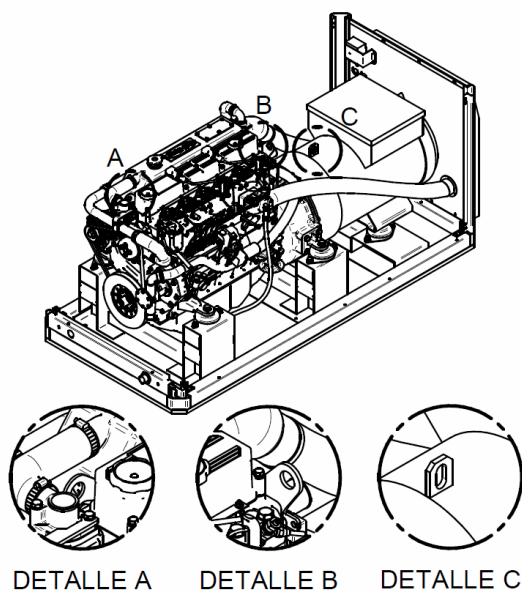


Gensets: 29 GSC / 32 GSAC / 35 GTC / 40 GTAC DNV    20 GSC / 25 GSAC / 25 GTC / 30 GTAC DNV:



Gensets: 45 GTC / 54 GTAC / 50 GTC / 60 GTAC DNV

Gensets: 68 GTC / 84 GTAC DNV



## 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. Genset installation

Follow these steps to install the genset:

1. FIX GENSET.
2. CONNECT EXHAUST OUTLET.
  1. WET EXHAUST OUTLET
  2. DRY EXHAUST OUTLET + SEAWATER OUTLET
3. CONNECT SIPHON BREAKER. (if installed)
4. CONNECT SEAWATER INLET.
5. CONNECT FUEL INLET.
6. CONNECT LEAK COOLANT OUTLET.
7. FILL WITH OIL.
8. FILL WITH COOLANT.
9. CHECK EACH PIPE CONNECTION for oil or coolant leaks.
10. CONNECT TO EARTH.
11. PRIME THE FUEL SYSTEM.
12. CONNECT TO CONTROL PANEL.
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.

## Section 4 – Operation

### 4.1. Prestart checklist

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

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

*AIR INLETS:* Check for clean and unobstructed air inlets.

*BATTERY:* Check for tight battery connections.

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

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

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

Check that the exhaust outlet is unobstructed.

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

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

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

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

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

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

### 4.2. Genset Operation at Low Temperatures

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

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

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

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

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

## **⚠ NOTICE**

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

### **4.3. Winterization and Preservation**

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

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

## 4.4. Maintenance during the storage

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

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

Realize the following steps at least once per month:

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

## 4.5. Restoration of Operational Conditions

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

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

## Section 5 – Systems and Scheduled Maintenance

### 5.1. Operating Description

Information of special tools required and basic safety precautions.

#### Disassembly:

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

#### Reassembly:

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

#### **NOTICE**

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

### 5.2. Periodic Maintenance Schedule

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

# Systems and scheduled maintenance

	Inspection Item	Intervals							Winter storage and Preservation
		Daily	1st 20h-50h	Every 200h	Every 400h	Every 800h	Every year	Every 2 years	
General	Screw tightening, fastening.		I		I				
	Genset block.								CL
	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							
	Fuel tank.							CL	E/L/I
	Fuel filter.				C				
	Water separator filter (if applicable).		E		C				
	Injection pump.					I			
	Injector.					I			
Intake system	Air filter.		I		C			C	I
	Turbocharger							I	
Cooling system	Coolant.	I						C	C
	Salt water circuit.								I/CL
	Anode			I/C					
	Water filter.	I	CL	CL					
	Sea water cock.	I							
	Salt water pump impeller.			I/C	I				I/CL
Electrical system	Incandescent glow plug.				I				
	Starter motor and alternator 12/24V.				I				
	Alternator 12/24V belt and tension.		I		I	C			I
	Battery level.		I	I		C			

\* 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, for these genset models, a maintenance kit:

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



## Maintenance task. Screw tightening, fastening

For details of tightening torques see Section 9 Torques.

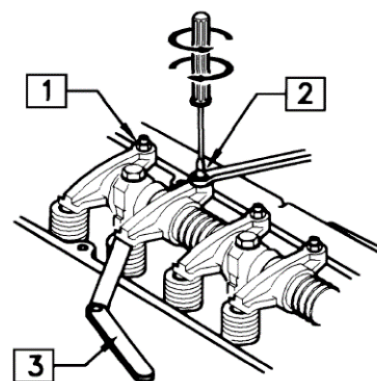
## Maintenance task. Valve clearance inspection

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

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

### Inspection

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



With piston n°1 in the top dead centre of the compression cycle, adjust the play of the intake and exhaust valves of cylinder n° 1. Proceed similarly as with the other cylinders. The position of the BTDC can be confirmed with the aligning signs of the distribution or timing cover and the crankshaft pulley.

The adjustment of the valve play must be made after the cylinder head screws are again tightened. (Strictly comply with the operation sequence indicated in the heading 4.1)

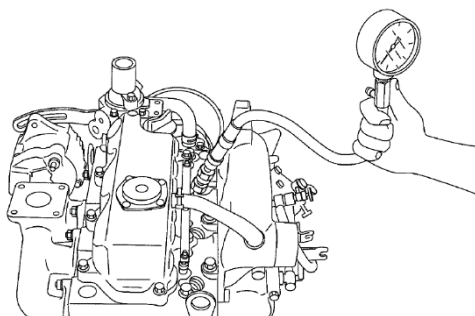
# Systems and scheduled maintenance



## 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	Genset speed	Compression pressure	Repair limit
20 GSC / 25 GSAC / 25 GTC / 30 GTAC	150 – 200 RPM	2,94 MPa (30 kgf/cm <sup>2</sup> )	2,55 MPa (26 kgf/cm <sup>2</sup> )
29 GSC / 32 GSAC / 35 GTC / 40 GTAC	300 RPM	3,2 MPa (33 kgf/cm <sup>2</sup> )	2,8 MPa (29 kgf/cm <sup>2</sup> )
45 GTC / 54 GTAC	300 RPM	3,2 MPa (33 kgf/cm <sup>2</sup> )	2,8 MPa (29 kgf/cm <sup>2</sup> )
50 GTC / 60 GTAC	300 RPM	3,2 MPa (33 kgf/cm <sup>2</sup> )	2,8 MPa (29 kgf/cm <sup>2</sup> )
68 GTC / 84 GTAC	300 RPM	3,23 MPa (33 kgf/cm <sup>2</sup> )	2,8 MPa (29 kgf/cm <sup>2</sup> )

### **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.



# Systems and scheduled maintenance

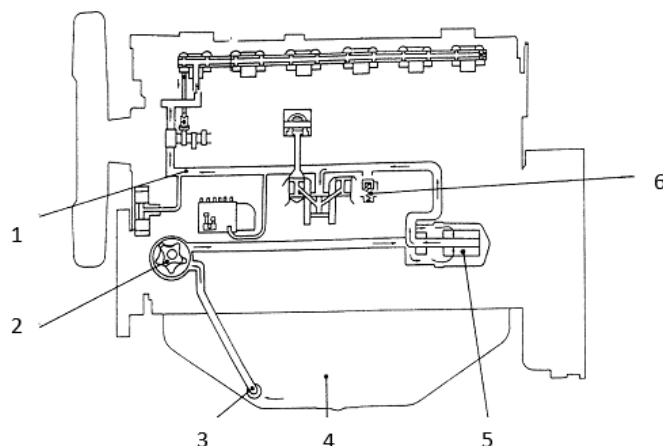
## 5.4. Lubrication System

### Circuit description

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

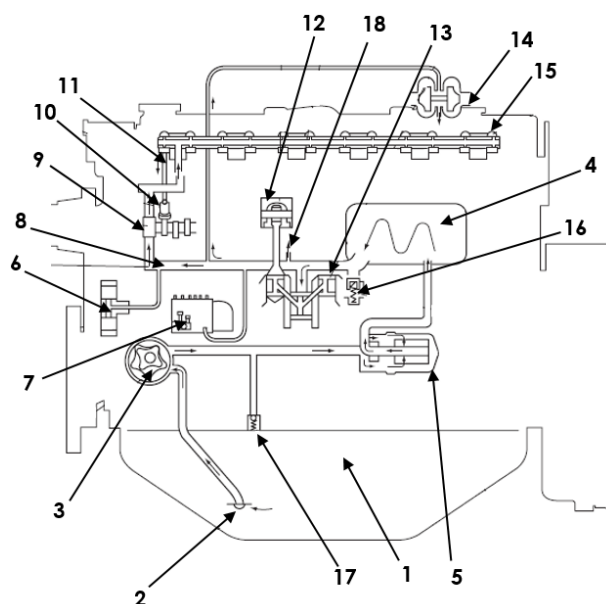
Gensets 20 GSC / 25 GSAC / 25 GTC / 30 GTAC / 29 GSC / 32 GSAC / 35 GTC / 40 GTAC / 50 GTC / 60 GTAC DNV:

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



Gensets 45 GTC / 54 GTAC / 68 GTC / 84 GTAC DNV:

PIECE	ELEMENT
1	Oil pan
2	Oil strainer
3	Oil pump
4	Oil cooler
5	Oil filter
6	Intermediate gear
7	Fuel injection pump
8	Oil main gallery
9	Camshaft
10	Tappet
11	Pushrod
12	Piston
13	Crankshaft
14	Turbocharger
15	Valve mechanism
16	Relief valve
17	Safety valve
18	Oil jet



Model	*Oil circuit capacity (L)
20 GSC / 25 GSAC / 25 GTC / 30 GTAC DNV	6,5
29 GSC / 32 GSAC / 35 GTC / 40 GTAC DNV	10
45 GTC / 54 GTAC DNV	10
50 GTC / 60 GTAC DNV	12
68 GTC / 84 GTAC DNV	12

\*Including filter change (0,5l)

# Systems and scheduled maintenance



The minimum oil pressure in all lubrication system is **0,1 kg/cm<sup>2</sup>**.

## Oil specifications

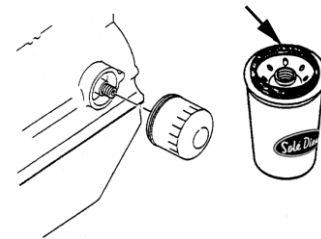
Use oil with 15W40 viscosity (this is an all-season oil for temperatures ranging between -15°C and +40°C) or select the most suitable oil viscosity for the atmospheric temperatures on which the genset is going to be operated. On the other hand, use oil quality no less than ACEA E5/E3 or API CH-4/SJ.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



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

## Maintenance task. Oil filter change

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



## Maintenance task. Oil level check

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

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

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

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

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

## **⚠ NOTICE**

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

## Maintenance task. Oil fill / change

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

# Systems and scheduled maintenance

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

## NOTICE

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

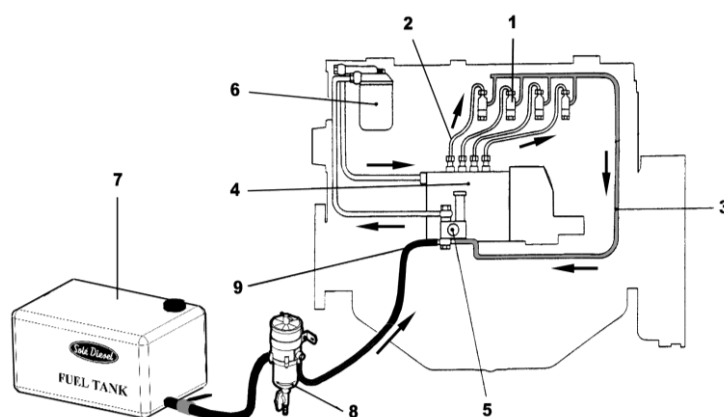
## 5.5. Fuel System

### Circuit description

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

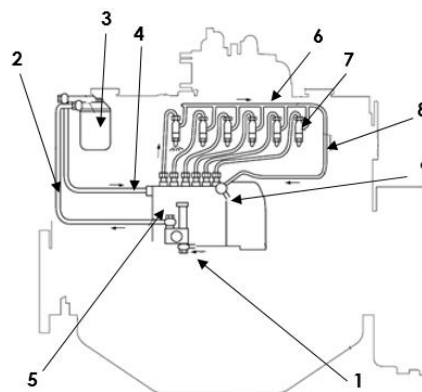
Gensets 20 GSC / 25 GSAC / 25 GTC / 30 GTAC / 29 GSC / 32 GSAC / 35 GTC / 40 GTAC:

PIECE	ELEMENT
1	Fuel injection nozzle
2	Fuel injection pipe
3	Fuel leak-off pipe
4	Injection pump
5	Priming pump
6	Fuel filter
7	Tank (supplied as accessory)
8	Fuel decanting filter (supplied as accessory)
9	Fuel intake pipe (supplied accessory)



Gensets 50 GTC / 60 GTAC / 68 GTC / 84 GTAC:

PIECE	ELEMENT
1	Fuel inlet
2	Fuel line to fuel filter
3	Fuel filter
4	Fuel line to injection pump
5	Injection pumps
6	Fuel high-pressure pipes
7	Injectors
8	Fuel return line
9	Fuel return to tank



# Systems and scheduled maintenance



## Fuel specifications

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

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

## Maintenance task. Fuel level inspection

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

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

## Maintenance task. Fuel tank clean

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

## Maintenance task. Water separator filter purge

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

1. Loosen the bottom nut to eliminate water.
2. Shut it off again.
3. Check for any leakage.



## Maintenance task. Fuel filter change

Procedure to change the fuel filter:

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



**CAUTION**

Wash hands after any contact with Diesel fuel.

# Systems and scheduled maintenance



## Maintenance task. Injection pump inspection

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

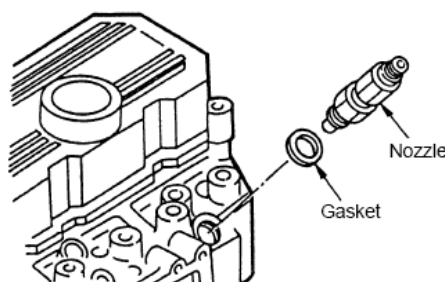
You must check:

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

## Maintenance task. Injector inspection

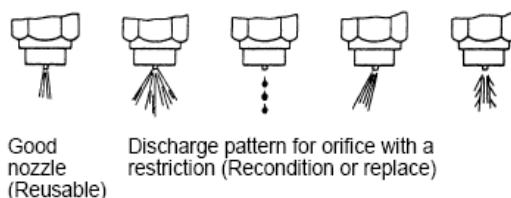
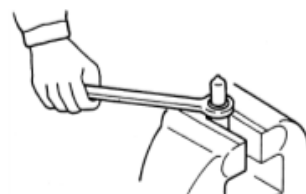
To check the injection pressure of injectors (opening pressure) you have to follow these steps:

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



Model	Injection pressure
20 GSC / 25 GSAC / 25 GTC / 30 GTAC DNV	13 MPa (140 kgf/cm <sup>2</sup> )
29 GSC / 32 GSAC / 35 GTC / 40 GTAC DNV	11,77 MPa (120 kgf/cm <sup>2</sup> )
45 GTC / 54 GTAC DNV	11,77 MPa (120 kgf/cm <sup>2</sup> )
50 GTC / 60 GTAC DNV	11,77 MPa (120 kgf/cm <sup>2</sup> )
68 GTC / 84 GTAC DNV	12 MPa (122,36 kgf/cm <sup>2</sup> )

5. To adjust the injection pressure, increase or decrease the amount of shims fitted to the nozzle holder.
6. Look at the orifice discharge pattern (shape of discharge) when fluid begins to flow through the injection nozzle. The discharge must be finely and uniformly atomized. Any change is an indication of a bad nozzle.



7. If the nozzle is bad, remove the tip from the nozzle and wash needle valve and body in clean washing solution.  
And if the nozzle is still bad after the tip has been washed, replace the tip.
8. When installing the new tip, remove synthetic resin film from the tip and slide the needle valve in the body in clean Diesel fuel to wash off inhibitor completely

# Systems and scheduled maintenance

9. The washer shown on figure must be replaced.

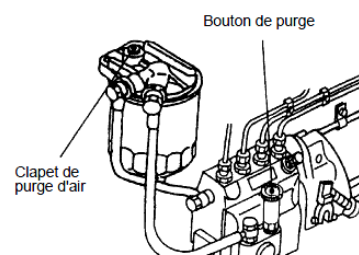
## ⚠ WARNING

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

## Maintenance task. Bleeding air from the fuel system

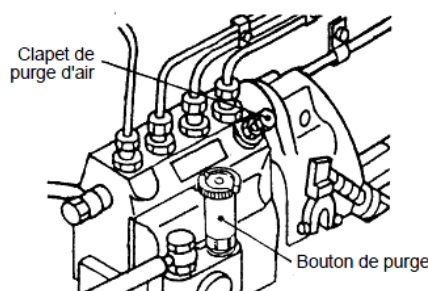
Prime the fuel system to bleed the air from the circuit. Trapped air in the fuel system can cause difficult starting and erratic engine operation. It is necessary to prime the system:

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



### Fuel filter:

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



### Fuel injection pump:

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

## ⚠ CAUTION

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

## 5.6. Cooling system

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

Gensets: 20 GSC / 25 GSAC / 25 GTC / 30 GTAC / 29 GSC / 32 GSAC / 35 GTC / 40 GTAC / 50 GTC / 60 GTAC DNV:

### Coolant circuit description

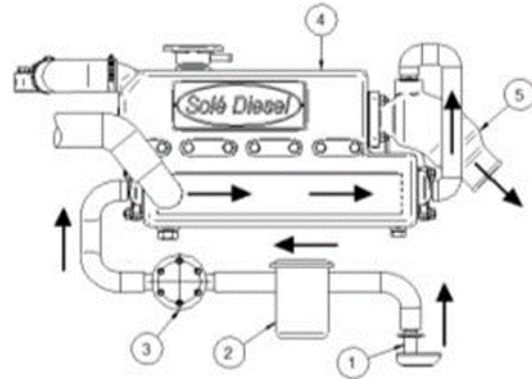
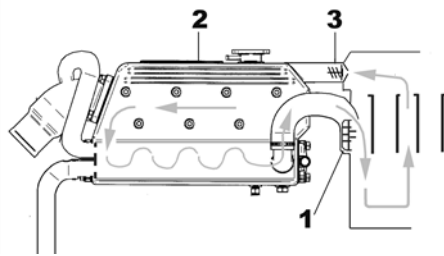
PIECE	ELEMENT
1	Fresh water pump
2	Heat exchanger
3	Thermostat

### Seawater circuit description

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



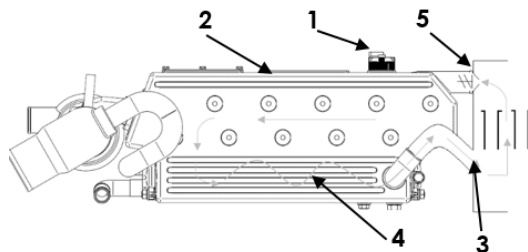
# Systems and scheduled maintenance



Gensets 45 GTC / 54 GTAC / 68 GTC / 84 GTAC DNV:

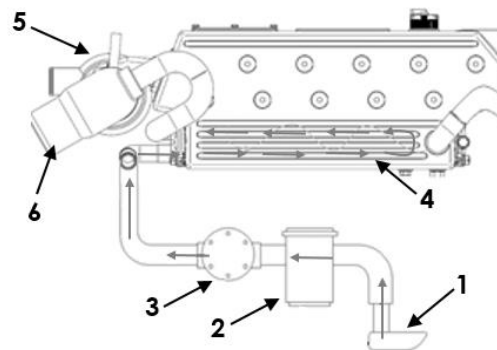
## Coolant circuit description

PIECE	ELEMENT
1	Coolant fill cap
2	Water cooler body
3	Fresh coolant water
4	Heat exchanger
5	Thermostat



## Seawater circuit description

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



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

## Thermostatic valve

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

## Coolant specifications

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

# Systems and scheduled maintenance

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.

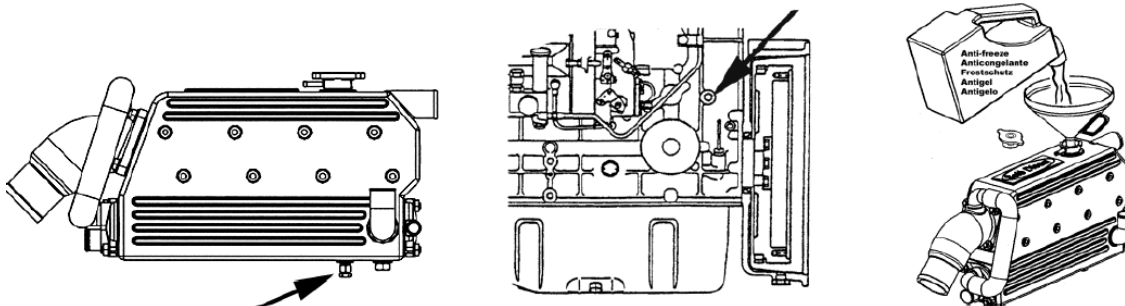
### Maintenance task. Coolant check

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.

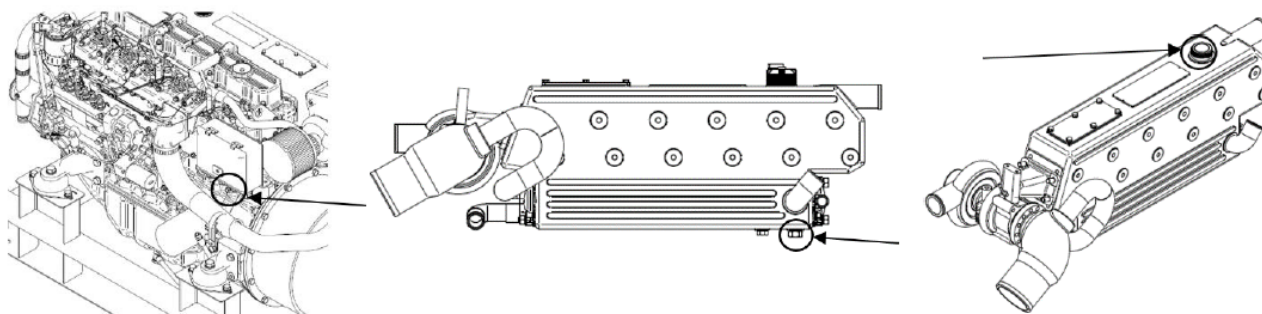
### Maintenance task. Coolant fill / change

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

Gensets: 20 GSC / 25 GSAC / 25 GTC / 30 GTAC / 29 GSC / 32 GSAC / 35 GTC / 40 GTAC / 50 GTC / 60 GTAC DNV:



Gensets 45 GTC / 54 GTAC / 68 GTC / 84 GTAC DNV:





# Systems and scheduled maintenance



## Maintenance task. Seawater filter inspection

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

To clean this filter:

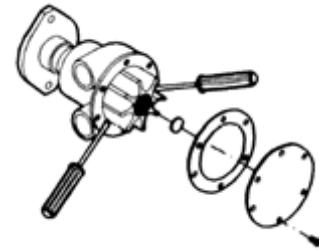
1. Loose the cover top, turning it.
2. Remove the filtering component and clean it.
3. Fit it again taking care that the cover is well seated on the o-ring.
4. Start the genset to check seawater leakages.



## Maintenance task. Seawater pump impeller inspection

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

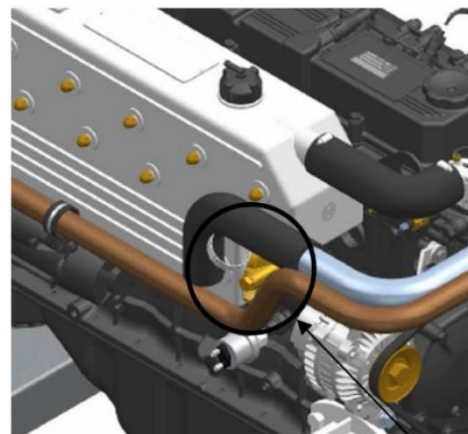
1. Close the seawater cock.
2. Remove the seawater pump cover plate.
3. Remove the impeller from the shaft.
4. Clean the housing.
5. Inspect the impeller for damaged, cranked, broken, missing or flattened vanes. The impeller vanes should be straight and flexible.
6. If it is damaged replace with a new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



## Maintenance task. Zinc anode inspection

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

1. With the genset cooled, close the seacock, open the coolant drain plug and drain the coolant into a suitable container.
2. Remove the anticorrosion zinc anode (plug) from the heat exchanger.
3. Use a wire brush to remove the loose corrosion on the anticorrosion zinc anode.



# Systems and scheduled maintenance

4. Clean the threaded hole of the heat exchanger and coat the threads of anticorrosion zinc anode. Install the anticorrosion zinc anode into the heat exchanger.
5. Close the coolant drain plug and open the seacock. Refill the coolant circuit.
6. Start the genset and check for leaks at the anticorrosion zinc anode location. The pump is operating if the seawater flows from the exhaust outlet.

## 5.7. Inlet and Exhaust System

### Exhaust circuit description

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

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

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

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

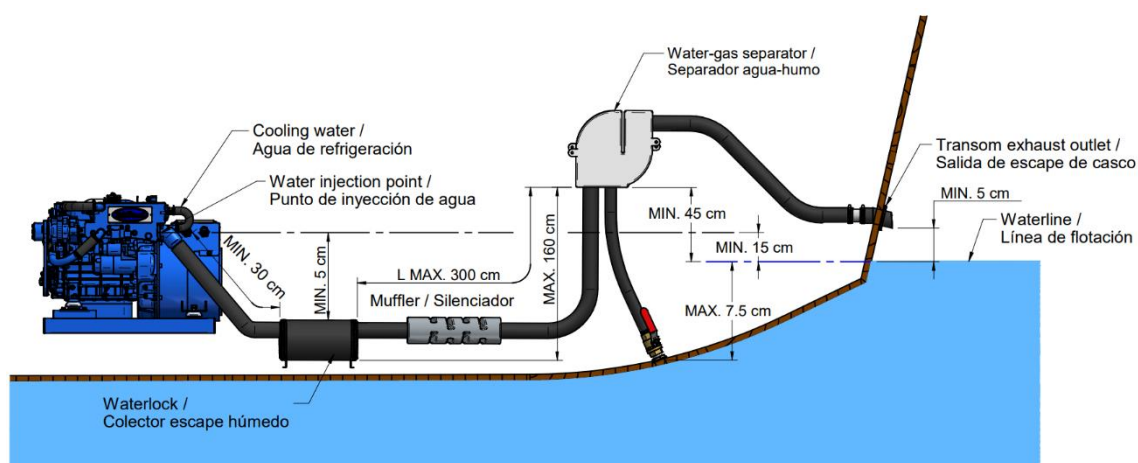
$$C = \frac{\left(\frac{\pi}{4} D^2 * L\right)}{1000000} * 0.5$$

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

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

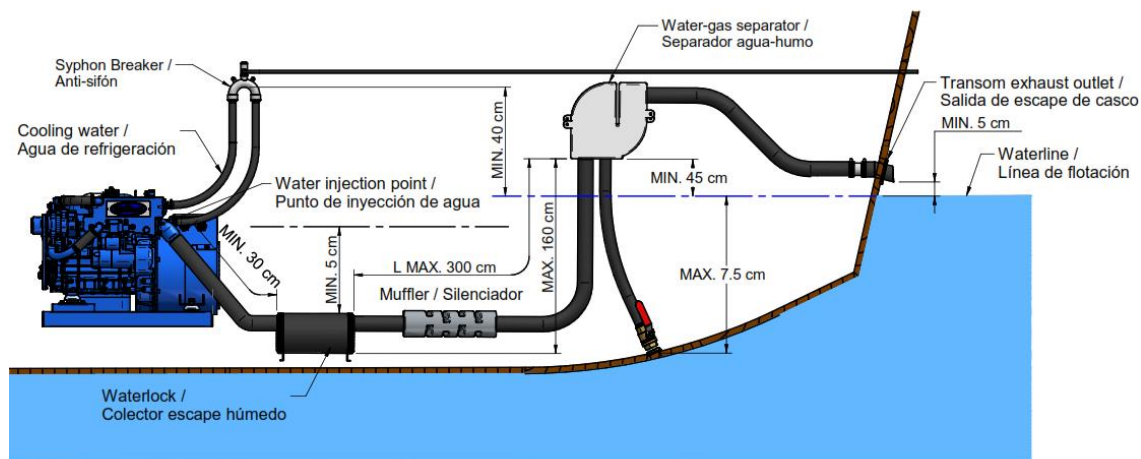
**Contrapresión de gases de escape (kPa)      Max – 6,57**

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



# Systems and scheduled maintenance

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

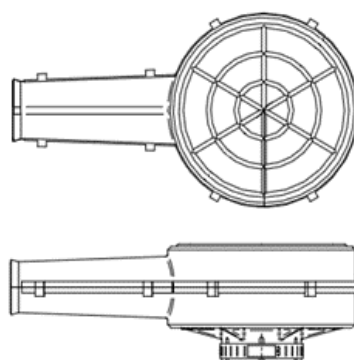
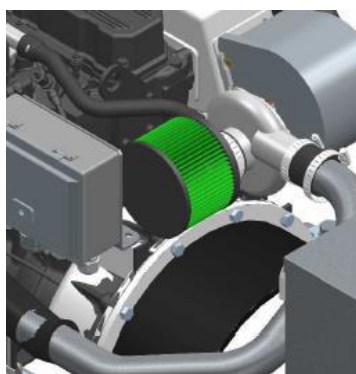
The wet exhaust is the genset's standard equipment. If you want dry exhaust, which is an optional equipment, contact with our dealers.

## 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. Exhaust gas, noise and vibrations inspection

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

### Exhaust system inspection points

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

## 5.8. Electrical System

### Battery

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

The connection of the battery for a standard engine:

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

The connection of the battery for an earth isolated engine.

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

Genset model	Battery capacity (Ah)	
	12V	24V
20 GSC / 25 GSAC / 25 GTC / 30 GTAC DNV	60	PD
29 GSC / 32 GSAC / 35 GTC / 40 GTAC DNV	90	55
45 GTC / 54 GTC DNV	90	55
50 GTC / 60 GTAC DNV	120	70
68 GTC / 84 GTAC DNV	120	70

### Circuit protection

AC Breaker interrupts the genset output in the event of an overload or short circuit. It is located in front panel as is showed in the section 10.

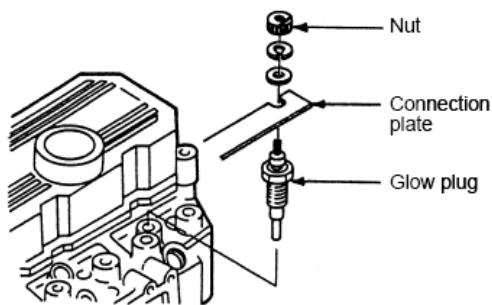
Genset model	Current (A)
20 GSC / 25 GSAC / 25 GTC / 30 GTAC DNV	40
29 GSC / 32 GSAC / 35 GTC / 40 GTAC DNV	40
45 GTC / 54 GTAC DNV	63
50 GTC / 60 GTAC DNV	63
68 GTC / 84 GTAC DNV	63

# Systems and scheduled maintenance

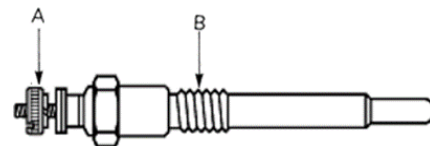


## Maintenance task. Incandescent glow plug inspection

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



Rated voltage - Current	12 V	9,7-10,5 A
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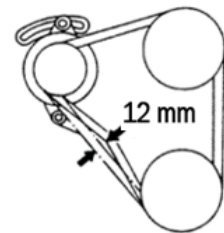


## Maintenance task. Starter motor inspection

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

## Maintenance task. Alternator belt tension inspection

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



Item	Assembly Standard
V-belt deflection	12 mm

### **NOTICE**

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

### **CAUTION**

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

## Maintenance task. battery level

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

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

### **5.9. Alternator**

The maintenance and fault diagnostic procedures involve risks that may cause severe injury or even death. These procedures should therefore be carried out solely by qualified electrical and mechanical

# Systems and scheduled maintenance

specialists. Before any maintenance and cleaning work make sure that there are no live parts that the generator housing has cooled to ambient temperature, that the genset cannot be accidentally started up and that all procedures are strictly observed.

## Maintenance task. control of windings and electrical insulation

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

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

## Maintenance task. Control of bearings

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

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

Operating time
20.000 hours

## **⚠ 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 shutdown and the mains power is shut off before cleaning the outside of the genset with compressed air.

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



## Section 6 – Troubleshooting

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

- Within the period of warranty:

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

- Outside the period of warranty:

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

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

# Troubleshooting

GENSET FAILURE	PROBABLE CAUSES		RECOMMENDED ACTIONS
<b>FAILURE TO CRANK</b>	ELECTRICAL SYSTEM (DC)	Battery discharged or dead	Recharge or replace the battery.
		Battery connections loose, corroded or incorrect	Verify that the battery connections are correct, clean and tight.
		Faulty cranking relay/stop solenoid	Check the cranking relay and the stop solenoid. If necessary, replace.
		Faulty starter motor	Replace if it is inoperative.
<b>FAILURE TO START</b>	ELECTRICAL SYSTEM GENSET	Blown fuse	Replace the controller fuse. If the fuse blows again, troubleshoot the controller.
		Battery discharged or dead	Recharge or replace the battery.
		Battery connections loose, corroded or incorrect	Verify that the battery connections are correct, clean and tight.
		Faulty cranking relay/stop solenoid	Check the cranking relay and the stop solenoid. If necessary, replace.
		Faulty starter motor	Replace if it is inoperative.
	GENERAL	Compression weak	Check the compression.
	LUBRICATION SYSTEM	Oil viscosity too high	Check the oil viscosity (according to technical specifications).
	FUEL SYSTEM	Fuel pump faulty or clogged	Check fuel pump inlet.
		Fuel lines obstructed	Check fuel lines.
		Fuel filter clogged	Replace fuel filter.
		Faulty injection pump	Contact with our dealer
		Air in fuel system	Bleed fuel system.
		Fuel injectors dirty or faulty	Clean, test and/or replace the inoperative fuel injector.
		Fuel injection timing out of adjustment	Adjust the fuel injection timing.
		Fuel tank empty or fuel valve shut off	Add fuel and move the fuel valve to opened position.
	INLET AND EXHAUST SYSTEM	Air filter clogged	Replace air filter element.

# Troubleshooting

GENSET FAILURE	PROBABLE CAUSES		RECOMMENDED ACTIONS
<b>STARTS THEN STOPS</b>	GENERAL	Governor inoperative	Contact with our dealer
	FUEL SYSTEM	Fuel pump faulty or clogged	Check inlet of fuel pump.
		Fuel filter clogged	Replace fuel filter.
		Air in fuel system	Bleed fuel system.
		Injection pump incorrectly set	Contact with our dealer
		Fuel outlet cock closed	Open fuel outlet cock.
	COOLING SYSTEM	Coolant level low	Restore the coolant to normal operating level.
<b>NO OR LOW OUTPUT VOLTAGE</b>	GENERAL	Engine overload	Reduce the electrical load.
		Governor inoperative	Contact with our dealer
	ALTERNATOR (AC)	AC output circuit breaker open	Close AC circuit breaker.
		Wiring, terminals or pin in the exciter field open	Check for continuity.
		Main field (rotor) inoperative (open or grounded)	Test and/or replace the rotor.
		Stator inoperative (open or grounded)	Test and/or replace the stator.
		The genset will not excite	Check the fuse.
			Increase speed by 15%.
			Apply a 12V voltage for an instant across the electronic regulator terminals using a battery with a 30 Ohm resistance in series and remember to respect the polarities.
		After the genset is excited it deactivates	Check the wiring against the diagrams in appendix.
<b>NO LOAD VOLTAGE TOO LOW</b>	ALTERNATOR (AC)		Calibrate the voltage.
			Check the rpms.
			Check the windings.
<b>NO LOAD VOLTAGE TOO HIGH</b>	ALTERNATOR (AC)		Calibrate the voltage.
			Change the regulator.

# Troubleshooting

GENSET FAILURE	PROBABLE CAUSES		RECOMMENDED ACTIONS
<b>UNDER LOAD VOLTAGE BELOW NOMINAL</b>	ALTERNATOR (AC)		Calibrate the voltage.
			Current too high, cosφ very low, speed below 4% of nominal.
			Change the regulator.
			Check the diodes, unhooking the cables.
<b>UNDER LOAD VOLTAGE ABOVE NOMINAL</b>	ALTERNATOR (AC)		Calibrate the voltage.
			Change the regulator.
<b>UNSTABLE VOLTAGE</b>	ALTERNATOR (AC)		Check for uniform rotation.
			Control regulator stability by adjusting potentiometer.
<b>BLACK SMOKE</b>	FUEL SYSTEM	Fuel filter clogged	Change fuel filter.
		Fuel injectors dirty or faulty	Clean, test and/or replace the inoperative fuel injector.
		Injection pump incorrectly set	Contact with our dealer
	INLET AND EXHAUST SYSTEM	Air filter clogged	Replace air filter element.
	LOAD GENSET	Propeller too large (not enough rpm)	The power curve of the genset is not adequate. Carry out a propulsive power study.
<b>BLUE SMOKE</b>	GENERAL	Valve clearance incorrect	Adjust the valves.
	LUBRICATION SYSTEM	Oil level too high	Restore the oil to normal operating level.
<b>GENSET OVER- HEATING</b>	GENERAL	Compression weak	Check the compression.
		Overload	Propeller too large, replace.
		Incorrect injection time	Adjust the injection time of the injection pump.
	LUBRICATION SYSTEM	Faulty oil pump	Contact with our dealer
		Oil viscosity too high	Check oil specifications (oil used must be chosen according to Technical Specifications).
		Oil level too low	Restore the oil level. Inspect the genset for oil leaks.
	COOLING SYSTEM	Faulty coolant pump	Check coolant pump (impeller, pump sealing).
		Seawater cock clogged or restricted	Clean the cock, check the seawater pump impeller for damage.
		Faulty seawater pump	Check seawater pump (impeller, pump sealing).
		Water cooler clogged	Clean the water cooler and the tube stack fitted in the heat exchanger.
		Coolant level low	Restore the coolant to normal operating level.
		Thermostat inoperative	Replace the thermostat.
	INLET AND EXHAUST SYSTEM	Air filter clogged	Replace air filter.

# Troubleshooting

GENSET FAILURE	PROBABLE CAUSES		RECOMMENDED ACTIONS
<b>LOW OIL PRESSURE</b>	LUBRICATION SYSTEM	Faulty oil pump	Contact with our dealer
		Oil pressure relief valve sticking	
		Oil pressure too low	Check oil level.
		Oil level too low	Restore the oil level. Inspect the genset for oil leaks.
		Faulty oil pressure valve	Contact with our dealer
		Faulty oil pressure gauge or switch	Check and/or replace oil pressure switch.
<b>NOISY GENSET</b>	GENERAL	Compression weak	Check the compression.
		Overload	Reduce the electrical load.
		Exhaust system leak	Inspect the exhaust system. Replace the inoperative exhaust system components.
		Vibration excessive	Tighten all loose nuts and bolts.
		Valve clearance incorrect	Adjust the valves.
<b>OIL PRESSURE TOO HIGH</b>	LUBRICATION SYSTEM	Oil pressure relief valve sticking	Contact with our dealer
		Faulty oil pressure valve	Contact with our dealer
<b>LOW POWER</b>	GENERAL	Valve clearance incorrect	Contact with our dealer
	FUEL SYSTEM	Fuel filter clogged	Contact with our dealer
		Fuel injectors dirty or faulty	Contact with our dealer
		Water in fuel system	Contact with our dealer
		Fuel injection timing out of adjustment	Contact with our dealer
	INLET AND EXHAUST SYSTEM	Air filter clogged	Replace air filter element.
		Exhaust backfires	Inspect the exhaust system. Replace the inoperative exhaust system components.
<b>HIGH FUEL CONSUMPTION</b>	GENERAL	Compression weak	Check the compression.
		Overload	Reduce the electrical load.
		Governor inoperative	Contact with our dealer
	FUEL SYSTEM	Fuel injection timing out of adjustment	Adjust the fuel injection timing.
	INLET AND EXHAUST SYSTEM	Air filter clogged	Replace air filter.
	COOLING SYSTEM	Thermostat blocked at open position	Replace thermostat and check the coolant state.
<b>BATTERY CHARGE DEFECTIVE</b>	ELECTRICAL SYSTEM (DC)	Battery discharged or dead	Recharge or replace the battery.
		Battery connections loose, corroded or incorrect	Verify that the battery connections are correct, clean and tight.
		Governor inoperative	Contact with our dealer
		Alternator belt tension	Check belt tension and change it if necessary.

## Section 7 – Technical specifications



**Single-Phase****General data**

<b>Active rated power*:</b>	17,5 kW	<b>Voltage:</b>	230 V
<b>Apparent rated power*:</b>	17,5 kVA	<b>Amperage:</b>	87,4 A
<b>Frequency:</b>	50 Hz	<b>Phases:</b>	1

**Dimensions and weights**

<b>Total lenght without canopy:</b>	1140 mm	<b>Total lenght with canopy:</b>	1310 mm
<b>Total width without canopy:</b>	610 mm	<b>Total width with canopy:</b>	610 mm
<b>Total height without canopy:</b>	662 mm	<b>Total height with canopy:</b>	698 mm
<b>Dry weight without canopy:</b>	402 Kg	<b>Dry weight with canopy:</b>	426 Kg

**Engine**

<b>Base engine manufacturer:</b>	Mitsubishi	<b>Diameter:</b>	88 mm (3,46 in)
<b>Model Solé Diesel:</b>	MINI-63	<b>Stroke:</b>	103 mm (4,06 in)
<b>Type:</b>	4 No. of Strokes	<b>Compression ratio:</b>	22:1
<b>Engine RPM:</b>	1500	<b>Injection system:</b>	Mechanical and indirect
<b>Number of cylinders:</b>	4	<b>Intake system:</b>	Naturally aspirated
<b>Total displacement:</b>	2505 cc	<b>SAE Flywheel housing:</b>	SAE 4
<b>Oil type:</b>	SAE 15W40	<b>Coolant capacity:</b>	9,5 L (2,51 gal)
<b>Oil capacity:</b>	6,5 L (1,72 gal)	<b>Flywheel:</b>	SAE 7 1/2
<b>Power:</b>	21,5 kW (29,24 CV)	<b>Coolant flow rate:</b>	52 l/min (13,74 gal/m)
<b>Salt water flow rate:</b>	38 l/min (10,04 gal/m)	<b>Intake air flow rate:</b>	1,65 m3/m
<b>Starting aid:</b>	Glow plugs		

**Fuel system details**

<b>Consumption:</b>	2,4 L/H (0,63 Gal/H)	<b>Fuel type:</b>	Diesel
<b>Consumption at 50 %:</b>	3,5 L/H (0,92 Gal/H)	<b>Fuel standards:</b>	Fueloil diesel ASTM
<b>Consumption at 75 %:</b>	4,75 L/H (1,25 Gal/H)	<b>Injection pump type:</b>	In line
<b>Consumption at 100 %:</b>	6,4 L/H (1,69 Gal/H)	<b>Governor type:</b>	Electronic

**Electrical system**

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

**Installation details**

<b>Exhaust hose inner diameter:</b>	60 mm (2,36 in)	<b>Maximum fuel lift height:</b>	0,6 m (1,97 ft)
<b>Sea water hose inner diameter:</b>	32 mm (1,26 in)	<b>Maximum raw water lift height:</b>	3 m (118,11 in)
<b>Fuel feeding hose inner diameter:</b>	8 mm (0,31 in)	<b>Maximum sea water temperature:</b>	32 °C (32 °F)
<b>Fuel return hose inner diameter:</b>	6 mm (0,24 in)	<b>Maximum installation angle***:</b>	15 °
<b>Minimum battery capacity:</b>	12 V 95 Ah		

**Alternator details**

<b>Brand:</b>	Sincro	<b>Cos φ:</b>	1
<b>Model:</b>	SK160LA1	<b>Tropicalized:</b>	S
<b>Regulator type:</b>	BL4	<b>Excitation system:</b>	BRUSHLESS
<b>Number of poles:</b>	4	<b>Voltage regulation accuracy**:</b>	1%
<b>Isolation type*:</b>	H	<b>Standards:</b>	EN 60034-1, IEC 60034-1, ISO 8528-3
<b>IP protection*:</b>	23	<b>Alternator type:</b>	Synchronous

\*There is a 10% of overload power capacity for the indicated power.

**Three-Phase****General data**

<b>Active rated power*:</b>	13,6 kW	<b>Voltage:</b>	480/277 V
<b>Apparent rated power*:</b>	17 kVA	<b>Amperage:</b>	20,4 A
<b>Frequency:</b>	60 Hz	<b>Phases:</b>	3

**Dimensions and weights**

<b>Total lenght without canopy:</b>	1036 mm	<b>Total lenght with canopy:</b>	1181 mm
<b>Total width without canopy:</b>	580 mm	<b>Total width with canopy:</b>	580 mm
<b>Total height without canopy:</b>	612 mm	<b>Total height with canopy:</b>	668 mm
<b>Dry weight without canopy:</b>	282 Kg	<b>Dry weight with canopy:</b>	344 Kg

**Engine**

<b>Base engine manufacturer:</b>	Mitsubishi	<b>Diameter:</b>	78 mm (3,07 in)
<b>Model Solé Diesel:</b>	MINI-44	<b>Stroke:</b>	92 mm (3,62 in)
<b>Type:</b>	4 No. of Strokes	<b>Compression ratio:</b>	22:1
<b>Engine RPM:</b>	1800	<b>Injection system:</b>	Mechanical and indirect
<b>Number of cylinders:</b>	4	<b>Intake system:</b>	Naturally aspirated
<b>Total displacement:</b>	1758 cc	<b>SAE Flywheel housing:</b>	SAE 5
<b>Oil type:</b>	SAE 15W40	<b>Coolant capacity:</b>	8 L (2,11 gal)
<b>Oil capacity:</b>	6 L (1,59 gal)	<b>Flywheel:</b>	SAE 7 1/2
<b>Power:</b>	19,5 kW (26,52 CV)	<b>Coolant flow rate:</b>	66 l/min (17,44 gal/m)
<b>Salt water flow rate:</b>	20 l/min (5,28 gal/m)	<b>Intake air flow rate:</b>	1,4 m3/m
<b>Starting aid:</b>	Glow plugs		

**Fuel system details**

<b>Consumption:</b>	2,2 L/H (0,58 Gal/H)	<b>Fuel type:</b>	Diesel
<b>Consumption at 50 %:</b>	3 L/H (0,79 Gal/H)	<b>Fuel standards:</b>	Fueloil diesel ASTM
<b>Consumption at 75 %:</b>	4,1 L/H (1,08 Gal/H)	<b>Injection pump type:</b>	In line
<b>Consumption at 100 %:</b>	5,4 L/H (1,43 Gal/H)	<b>Governor type:</b>	Electronic

**Electrical system**

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

**Installation details**

<b>Exhaust hose inner diameter:</b>	50 mm (1,97 in)	<b>Maximum fuel lift height:</b>	0,3 m (0,98 ft)
<b>Sea water hose inner diameter:</b>	20 mm (0,79 in)	<b>Maximum raw water lift height:</b>	2 m (78,74 in)
<b>Fuel feeding hose inner diameter:</b>	8 mm (0,31 in)	<b>Maximum sea water temperature:</b>	32 °C (32 °F)
<b>Fuel return hose inner diameter:</b>	6 mm (0,24 in)	<b>Maximum installation angle***:</b>	25 °
<b>Minimum battery capacity:</b>	12 V 80 Ah		

**Alternator details**

<b>Brand:</b>	Sincro	<b>Cos φ:</b>	0,8
<b>Model:</b>	SK160MA	<b>Tropicalized:</b>	S
<b>Regulator type:</b>	BL4	<b>Excitation system:</b>	BRUSHLESS
<b>Number of poles:</b>	4	<b>Voltage regulation accuracy**:</b>	1%
<b>Isolation type*:</b>	H	<b>Standards:</b>	EN 60034-1, IEC 60034-1, ISO 8528-3
<b>IP protection*:</b>	23	<b>Alternator type:</b>	Synchronous

\*There is a 10% of overload power capacity for the indicated power.

**Three-Phase****General data**

<b>Active rated power*:</b>	17,6 kW	<b>Voltage:</b>	400/230 V
<b>Apparent rated power*:</b>	22 kVA	<b>Amperage:</b>	31,8 A
<b>Frequency:</b>	50 Hz	<b>Phases:</b>	3

**Dimensions and weights**

<b>Total lenght without canopy:</b>	1140 mm	<b>Total lenght with canopy:</b>	1310 mm
<b>Total width without canopy:</b>	610 mm	<b>Total width with canopy:</b>	610 mm
<b>Total height without canopy:</b>	662 mm	<b>Total height with canopy:</b>	698 mm
<b>Dry weight without canopy:</b>	351 Kg	<b>Dry weight with canopy:</b>	412 Kg

**Engine**

<b>Base engine manufacturer:</b>	Mitsubishi	<b>Diameter:</b>	88 mm (3,46 in)
<b>Model Solé Diesel:</b>	MINI-63	<b>Stroke:</b>	103 mm (4,06 in)
<b>Type:</b>	4 No. of Strokes	<b>Compression ratio:</b>	22:1
<b>Engine RPM:</b>	1500	<b>Injection system:</b>	Mechanical and indirect
<b>Number of cylinders:</b>	4	<b>Intake system:</b>	Naturally aspirated
<b>Total displacement:</b>	2505 cc	<b>SAE Flywheel housing:</b>	SAE 4
<b>Oil type:</b>	SAE 15W40	<b>Coolant capacity:</b>	9,5 L (2,51 gal)
<b>Oil capacity:</b>	6,5 L (1,72 gal)	<b>Flywheel:</b>	SAE 7 1/2
<b>Power:</b>	21,5 kW (29,24 CV)	<b>Coolant flow rate:</b>	52 l/min (13,74 gal/m)
<b>Salt water flow rate:</b>	38 l/min (10,04 gal/m)	<b>Intake air flow rate:</b>	1,65 m3/m
<b>Starting aid:</b>	Glow plugs		

**Fuel system details**

<b>Consumption:</b>	2,4 L/H (0,63 Gal/H)	<b>Fuel type:</b>	Diesel
<b>Consumption at 50 %:</b>	3,5 L/H (0,92 Gal/H)	<b>Fuel standards:</b>	Fueloil diesel ASTM
<b>Consumption at 75 %:</b>	4,75 L/H (1,25 Gal/H)	<b>Injection pump type:</b>	In line
<b>Consumption at 100 %:</b>	6,4 L/H (1,69 Gal/H)	<b>Governor type:</b>	Electronic

**Electrical system**

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

**Installation details**

<b>Exhaust hose inner diameter:</b>	60 mm (2,36 in)	<b>Maximum fuel lift height:</b>	0,6 m (1,97 ft)
<b>Sea water hose inner diameter:</b>	32 mm (1,26 in)	<b>Maximum raw water lift height:</b>	3 m (118,11 in)
<b>Fuel feeding hose inner diameter:</b>	8 mm (0,31 in)	<b>Maximum sea water temperature:</b>	32 °C (32 °F)
<b>Fuel return hose inner diameter:</b>	6 mm (0,24 in)	<b>Maximum installation angle***:</b>	15 °
<b>Minimum battery capacity:</b>	12 V 95 Ah		

**Alternator details**

<b>Brand:</b>	Sincro	<b>Cos φ:</b>	0,8
<b>Model:</b>	SK160LA	<b>Tropicalized:</b>	S
<b>Regulator type:</b>	BL4	<b>Excitation system:</b>	BRUSHLESS
<b>Number of poles:</b>	4	<b>Voltage regulation accuracy**:</b>	1%
<b>Isolation type*:</b>	H	<b>Standards:</b>	EN 60034-1, IEC 60034-1, ISO 8528-3
<b>IP protection*:</b>	23	<b>Alternator type:</b>	Synchronous

\*There is a 10% of overload power capacity for the indicated power.

**Single-Phase****General data**

<b>Active rated power*:</b>	21,5 kW	<b>Voltage:</b>	240 V
<b>Apparent rated power*:</b>	21,5 kVA	<b>Amperage:</b>	104,6 A
<b>Frequency:</b>	60 Hz	<b>Phases:</b>	1

**Dimensions and weights**

<b>Total lenght without canopy:</b>	1140 mm	<b>Total lenght with canopy:</b>	1310 mm
<b>Total width without canopy:</b>	610 mm	<b>Total width with canopy:</b>	610 mm
<b>Total height without canopy:</b>	662 mm	<b>Total height with canopy:</b>	698 mm
<b>Dry weight without canopy:</b>	402 Kg	<b>Dry weight with canopy:</b>	426 Kg

**Engine**

<b>Base engine manufacturer:</b>	Mitsubishi	<b>Diameter:</b>	88 mm (3,46 in)
<b>Model Solé Diesel:</b>	MINI-63	<b>Stroke:</b>	103 mm (4,06 in)
<b>Type:</b>	4 No. of Strokes	<b>Compression ratio:</b>	22:1
<b>Engine RPM:</b>	1800	<b>Injection system:</b>	Mechanical and indirect
<b>Number of cylinders:</b>	4	<b>Intake system:</b>	Naturally aspirated
<b>Total displacement:</b>	2505 cc	<b>SAE Flywheel housing:</b>	SAE 4
<b>Oil type:</b>	SAE 15W40	<b>Coolant capacity:</b>	9,5 L (2,51 gal)
<b>Oil capacity:</b>	6,5 L (1,72 gal)	<b>Flywheel:</b>	SAE 7 1/2
<b>Power:</b>	27,2 kW (36,99 CV)	<b>Coolant flow rate:</b>	65 l/min (17,17 gal/m)
<b>Salt water flow rate:</b>	45 l/min (11,89 gal/m)	<b>Intake air flow rate:</b>	2,1 m3/m
<b>Starting aid:</b>	Glow plugs		

**Fuel system details**

<b>Consumption:</b>	2,9 L/H (0,77 Gal/H)	<b>Fuel type:</b>	Diesel
<b>Consumption at 50 %:</b>	4,2 L/H (1,11 Gal/H)	<b>Fuel standards:</b>	Fueloil diesel ASTM
<b>Consumption at 75 %:</b>	5,5 L/H (1,45 Gal/H)	<b>Injection pump type:</b>	In line
<b>Consumption at 100 %:</b>	7,6 L/H (2,01 Gal/H)	<b>Governor type:</b>	Electronic

**Electrical system**

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

**Installation details**

<b>Exhaust hose inner diameter:</b>	60 mm (2,36 in)	<b>Maximum fuel lift height:</b>	0,6 m (1,97 ft)
<b>Sea water hose inner diameter:</b>	32 mm (1,26 in)	<b>Maximum raw water lift height:</b>	3,5 m (137,8 in)
<b>Fuel feeding hose inner diameter:</b>	8 mm (0,31 in)	<b>Maximum sea water temperature:</b>	32 °C (32 °F)
<b>Fuel return hose inner diameter:</b>	6 mm (0,24 in)	<b>Maximum installation angle***:</b>	15 °
<b>Minimum battery capacity:</b>	12 V 95 Ah		

**Alternator details**

<b>Brand:</b>	Sincro	<b>Cos φ:</b>	1
<b>Model:</b>	SK160LA1	<b>Tropicalized:</b>	S
<b>Regulator type:</b>	BL4	<b>Excitation system:</b>	BRUSHLESS
<b>Number of poles:</b>	4	<b>Voltage regulation accuracy**:</b>	1%
<b>Isolation type*:</b>	H	<b>Standards:</b>	EN 60034-1, IEC 60034-1, ISO 8528-3
<b>IP protection*:</b>	23	<b>Alternator type:</b>	Synchronous

\*There is a 10% of overload power capacity for the indicated power.

**Three-Phase****General data**

<b>Active rated power*:</b>	21,6 kW	<b>Voltage:</b>	480/277 V
<b>Apparent rated power*:</b>	27 kVA	<b>Amperage:</b>	39 A
<b>Frequency:</b>	60 Hz	<b>Phases:</b>	3

**Dimensions and weights**

<b>Total lenght without canopy:</b>	1140 mm	<b>Total lenght with canopy:</b>	1310 mm
<b>Total width without canopy:</b>	610 mm	<b>Total width with canopy:</b>	610 mm
<b>Total height without canopy:</b>	662 mm	<b>Total height with canopy:</b>	698 mm
<b>Dry weight without canopy:</b>	351 Kg	<b>Dry weight with canopy:</b>	412 Kg

**Engine**

<b>Base engine manufacturer:</b>	Mitsubishi	<b>Diameter:</b>	88 mm (3,46 in)
<b>Model Solé Diesel:</b>	MINI-63	<b>Stroke:</b>	103 mm (4,06 in)
<b>Type:</b>	4 No. of Strokes	<b>Compression ratio:</b>	22:1
<b>Engine RPM:</b>	1800	<b>Injection system:</b>	Mechanical and indirect
<b>Number of cylinders:</b>	4	<b>Intake system:</b>	Naturally aspirated
<b>Total displacement:</b>	2505 cc	<b>SAE Flywheel housing:</b>	SAE 4
<b>Oil type:</b>	SAE 15W40	<b>Coolant capacity:</b>	9,5 L (2,51 gal)
<b>Oil capacity:</b>	6,5 L (1,72 gal)	<b>Flywheel:</b>	SAE 7 1/2
<b>Power:</b>	27,2 kW (36,99 CV)	<b>Coolant flow rate:</b>	65 l/min (17,17 gal/m)
<b>Salt water flow rate:</b>	45 l/min (11,89 gal/m)	<b>Intake air flow rate:</b>	2,1 m3/m
<b>Starting aid:</b>	Glow plugs		

**Fuel system details**

<b>Consumption:</b>	2,9 L/H (0,77 Gal/H)	<b>Fuel type:</b>	Diesel
<b>Consumption at 50 %:</b>	4,2 L/H (1,11 Gal/H)	<b>Fuel standards:</b>	Fueloil diesel ASTM
<b>Consumption at 75 %:</b>	5,5 L/H (1,45 Gal/H)	<b>Injection pump type:</b>	In line
<b>Consumption at 100 %:</b>	7,6 L/H (2,01 Gal/H)	<b>Governor type:</b>	Electronic

**Electrical system**

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

**Installation details**

<b>Exhaust hose inner diameter:</b>	60 mm (2,36 in)	<b>Maximum fuel lift height:</b>	0,6 m (1,97 ft)
<b>Sea water hose inner diameter:</b>	32 mm (1,26 in)	<b>Maximum raw water lift height:</b>	3,5 m (137,8 in)
<b>Fuel feeding hose inner diameter:</b>	8 mm (0,31 in)	<b>Maximum sea water temperature:</b>	32 °C (32 °F)
<b>Fuel return hose inner diameter:</b>	6 mm (0,24 in)	<b>Maximum installation angle***:</b>	15 °
<b>Minimum battery capacity:</b>	12 V 95 Ah		

**Alternator details**

<b>Brand:</b>	Sincro	<b>Cos φ:</b>	0,8
<b>Model:</b>	SK160LA	<b>Tropicalized:</b>	S
<b>Regulator type:</b>	BL4	<b>Excitation system:</b>	BRUSHLESS
<b>Number of poles:</b>	4	<b>Voltage regulation accuracy**:</b>	1%
<b>Isolation type*:</b>	H	<b>Standards:</b>	EN 60034-1, IEC 60034-1, ISO 8528-3
<b>IP protection*:</b>	23	<b>Alternator type:</b>	Synchronous

\*There is a 10% of overload power capacity for the indicated power.

**Single-Phase****General data**

<b>Active rated power*:</b>	25 kW	<b>Voltage:</b>	230 V
<b>Apparent rated power*:</b>	29 kVA	<b>Amperage:</b>	123,5 A
<b>Frequency:</b>	50 Hz	<b>Phases:</b>	1

**Dimensions and weights**

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

**Engine**

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

**Fuel system details**

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

**Electrical system**

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

**Installation details**

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

**Alternator details**

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

\*There is a 10% of overload power capacity for the indicated power.



**Three-Phase****General data**

<b>Active rated power*:</b>	25,6 kW	<b>Voltage:</b>	400/230 V
<b>Apparent rated power*:</b>	22 kVA	<b>Amperage:</b>	46,2 A
<b>Frequency:</b>	50 Hz	<b>Phases:</b>	3

**Dimensions and weights**

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

**Engine**

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

**Fuel system details**

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

**Electrical system**

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

**Installation details**

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

**Alternator details**

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

\*There is a 10% of overload power capacity for the indicated power.

**Single-Phase****General data**

<b>Active rated power*:</b>	28 kW	<b>Voltage:</b>	240 V
<b>Apparent rated power*:</b>	28 kVA	<b>Amperage:</b>	131,7 A
<b>Frequency:</b>	60 Hz	<b>Phases:</b>	1

**Dimensions and weights**

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

**Engine**

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

**Fuel system details**

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

**Electrical system**

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

**Installation details**

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

**Alternator details**

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

\*There is a 10% of overload power capacity for the indicated power.

**Three-Phase****General data**

<b>Active rated power*:</b>	31,2 kW (39 kVA)	<b>Voltage:</b>	480/277 V
<b>Apparent rated power*:</b>	28,4 kW	<b>Amperage:</b>	50,5 A
<b>Frequency:</b>	60 Hz	<b>Phases:</b>	3

**Dimensions and weights**

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

**Engine**

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

**Fuel system details**

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

**Electrical system**

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

**Installation details**

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

**Alternator details**

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

\*There is a 10% of overload power capacity for the indicated power.

**Three-Phase****General data**

<b>Active rated power*:</b>	36 kW	<b>Voltage:</b>	400/230 V
<b>Apparent rated power*:</b>	45 kVA	<b>Amperage:</b>	65,5 A
<b>Frequency:</b>	50 Hz	<b>Phases:</b>	3

**Dimensions and weights**

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

**Engine**

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

**Fuel system details**

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

**Electrical system**

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

**Installation details**

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

**Alternator details**

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

\*There is a 10% of overload power capacity for the indicated power.

**Three-Phase****General data**

<b>Active rated power*:</b>	42,4 kW	<b>Voltage:</b>	480/277 V
<b>Apparent rated power*:</b>	53 kVA	<b>Amperage:</b>	76,5 A
<b>Frequency:</b>	60 Hz	<b>Phases:</b>	3

**Dimensions and weights**

<b>Total lenght without canopy:</b>	1675 mm	<b>Total lenght with canopy:</b>	1875 mm
<b>Total width without canopy:</b>	840 mm	<b>Total width with canopy:</b>	840 mm
<b>Total height without canopy:</b>	800 mm	<b>Total height with canopy:</b>	848 mm
<b>Dry weight without canopy:</b>	690 Kg	<b>Dry weight with canopy:</b>	795 Kg

**Engine**

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

**Fuel system details**

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

**Electrical system**

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

**Installation details**

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

**Alternator details**

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

\*There is a 10% of overload power capacity for the indicated power.

**Three-Phase****General data**

<b>Active rated power*:</b>	49,6 kW	<b>Voltage:</b>	400/230 V
<b>Apparent rated power*:</b>	62 kVA	<b>Amperage:</b>	89,5 A
<b>Frequency:</b>	50 Hz	<b>Phases:</b>	3

**Dimensions and weights**

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

**Engine**

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

**Fuel system details**

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

**Electrical system**

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

**Installation details**

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

**Alternator details**

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

\*There is a 10% of overload power capacity for the indicated power.



**Three-Phase****General data**

<b>Active rated power*:</b>	60 kW	<b>Voltage:</b>	480/277 V
<b>Apparent rated power*:</b>	75 kVA	<b>Amperage:</b>	108,3 A
<b>Frequency:</b>	60 Hz	<b>Phases:</b>	3

**Dimensions and weights**

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

**Engine**

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

**Fuel system details**

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

**Electrical system**

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

**Installation details**

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

**Alternator details**

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

\*There is a 10% of overload power capacity for the indicated power.

**Three-Phase****General data**

Active rated power*:	32 kW	Voltage:	400/230 V
Apparent rated power*:	40 kW	Amperage:	57,7 A
Frequency:	50 Hz	Phases:	3

**Dimensions and weights**

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

**Engine**

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

**Fuel system details**

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

**Electrical system**

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

**Installation details**

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

**Alternator details**

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

\*There is a 10% of overload power capacity for the indicated power.

**Three-Phase****General data**

<b>Active rated power*:</b>	38,4 kW	<b>Voltage:</b>	480/277 V
<b>Apparent rated power*:</b>	48 kVA	<b>Amperage:</b>	69,3 A
<b>Frequency:</b>	60 Hz	<b>Phases:</b>	3

**Dimensions and weights**

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

**Engine**

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

**Fuel system details**

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

**Electrical system**

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

**Installation details**

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

**Alternator details**

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

\*There is a 10% of overload power capacity for the indicated power.

## Section 8 – Parallel operation elements

### 8.1. Controller Connections

#### Operation

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

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

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

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

### 8.2. Magnetic speed sensor (Pickup)

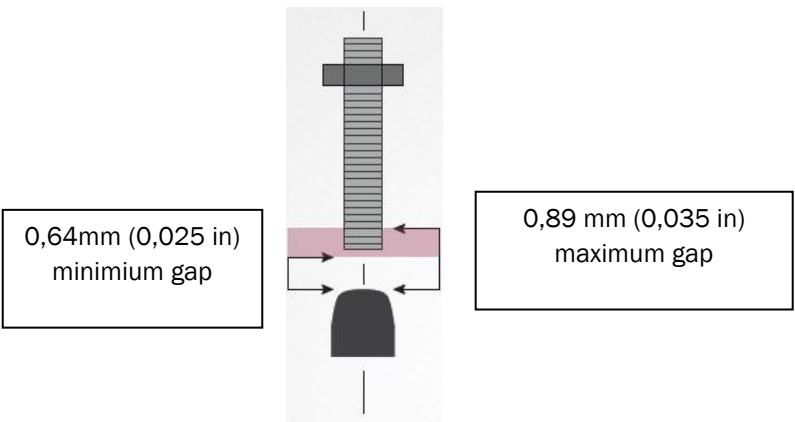
The magnetic speed sensor is used for detecting the engine speed. This element sends a signal to the controller with the engine speed information. Requires no energizing from the ECU.

# Parallel operation elements



## Installation

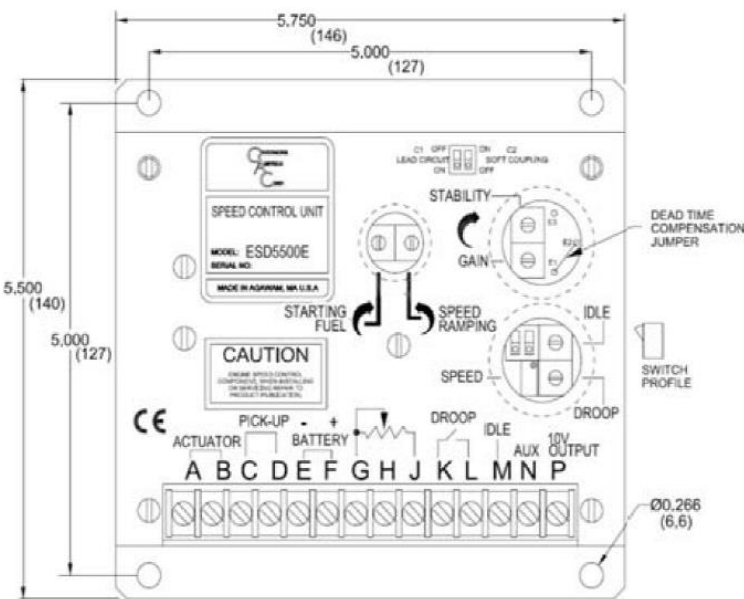
- Insert the magnetic speed pickup into the hole and turn it until the magnetic speed pickup makes contact with the face of the gear.
- Back out the magnetic pickup by turning it counterclockwise (about a 3/4 turn). The gap between the pickup and gear should be no smaller than 0,64 mm (0.025 in) and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



## 8.3. Electronic control unit (ECU)

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

## Connections



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

# Parallel operation elements



## Adjustments before engine startup

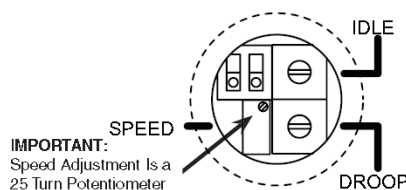
COMPONENT	POSITION
GAIN	Middle position
STABILITY	Middle position
SPEED TRIM CONTROL	Middle position
STARTING FUEL	Full CW (Maximum fuel)
SPEED RAMPING	Full CCW (Fastest)

## Start the engine

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

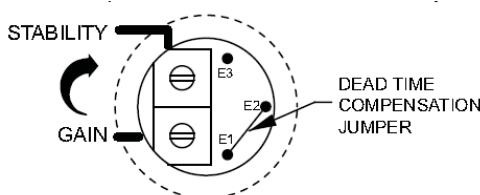
Crank the engine with DC power applied to the governor system. The actuator will energize to the maximum fuel position until the engine starts. The governor system should control the engine at a low idle speed. If the engine is unstable after starting, refer to Section 8 ADJUSTING FOR STABILITY.

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



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

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



# Parallel operation elements

## 8.4. Electrical actuator

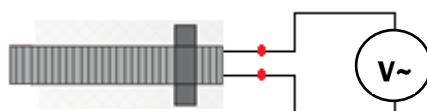
Engines managed electronically are controlled by the ECU through the electric actuator. This regulates the fuel flow by acting on the fuel injection pump according to the orders sent by the ECU.

## 8.5. Parallel operation troubleshooting

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

### Magnetic speed sensor

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



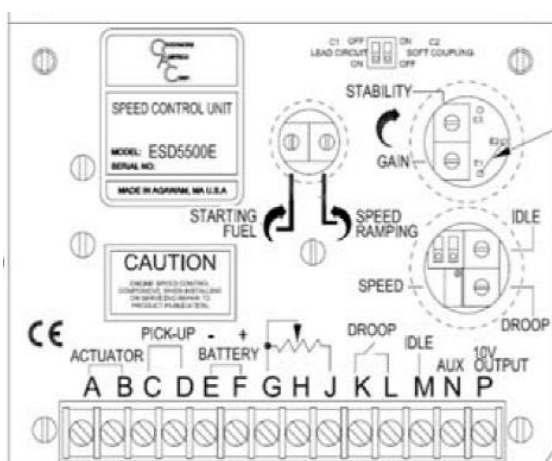
Disconnect the wires and measure the voltage (AC) between wires. The voltage value should be **1V**. If the voltage value is around 1 V – 3 V, it is correct, and the pickup works correctly. If the value is less than 1 V:

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

### Electronic control unit and governor (ECU)

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

1. Check the voltage between following PINS:



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



# Parallel operation elements



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

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

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

Terminals	Value
C & D	30 $\Omega$ to 1200 $\Omega$

## Section 9 – Control Panel

The following guide details its function and operation of any DNV Genset Control Panel. All of them are composed by three parts: the main controller CO-40 and two modules, the ID-COM and ID-RPU. Together are exchanging information all the time. CO-40 is the main controller, IR-RPU controls all CO-40 parameters and it is his power supply. ID-COM reads all information and translate it to CAN language, also is connected to ECU and exchange all information.

### CO-40

#### **POWER TERMINALS**

- Power supply. Comes from ID-RPU. Connected to buzzer/lamp alarm.
- DC Alternator excitation. Connected directly to pin L (or D+) of DC Alternator.
- Ground: Comes from ID-RPU. Connected to other ground terminals of analog inputs.

#### **BINARY OUTPUTS**

- ECU Stop Signal: 24V when controller wants to stop engine
- Alarm lamp/buzzer: 0V when controller wants to activate alarm
- Cranking Signal: 0V when controller wants to start engine

#### **ANALOG INPUTS**

- ECU Stop Signal: Comes from to binary output cranking signal through cranking relay.
- Coolant Pressure Sensor: Comes from sensor of engine
- Oil Temperature Sensor: Connected directly to sensor of engine
- Oil Temperature Sensor: Comes from to analog Oil Temperature Sensor through sensor of engine.

### ID-RPU

#### **POWER TERMINALS**

- Battery A Power Supply: Comes from Positive Terminal of main battery
- Battery A Ground: Comes from Negative Terminal of main battery
- Battery B Power Supply: Comes from Positive Terminal of auxiliary battery
- Battery B Ground: Comes from Negative Terminal of auxiliary battery
- Power Supply output (COM+): Power supply of CO-40, connected also to binary output positive
- Ground output (COM-): Ground of CO-40 and its analog inputs

## ***BINARY INPUTS***

- Oil Pressure Switch: Comes from switch of engine
- Coolant Temperature Switch: Comes from switch of engine
- Emergency Stop: Comes from Emergency Stop Switch

## ***BINARY OUTPUTS***

- ECU Stop Signal: 24V when controller wants to stop engine. Connected to binary output pick-up relay.
- Pick-up Relay: 24V when controller wants to stop engine. Connected to binary output ECU Stop Signal.
- Pick-up Relay (-): Comes from to binary output pick-up relay through pick-up relay

*Compact Controller for Industrial and Marine Applications*

# ***InteliDrive DCU***

## ***Expandable engine controller***

with electronic engines support

Industrial Applications: SS and AS

Marine Applications: AUX, EME, CMB and PRP

January 2013

version r2



## **Operator guide**

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# Abbreviations

aid	Archive file extension for IntelliDrive controller
AIN	Controller or extension module Analog input
Alarm	General term for any active engine protection Warning, Shutdown, ... etc.
Alarm list	Controller or PC DriveMonitor screen with list of active and unaccepted alarms detected from ID controller.
AS	Controller All Speed mode
ECU Alarm list	Controller or PC DriveMonitor screen with list of active and unaccepted alarms detected from engine ECU.
AOUT	Controller Analog OUTput or outputs group.
Archive	Usually aid file that contains all controller data: configuration, setpoints setting and history records.
AUX	Controller application (archive, operational mode) for Auxiliary engines.
BI	Controller binary input.
BIN	Controller binary inputs group.
BO	Controller binary output.
BOUT	Controller binary outputs group.
CAN	Control Area Network – serial data link.
Cd	Cool down protection, cooling period is included before engine stops.
CMB	Controller Combined mode.
D+	Controller function for battery charging function check and/or engine running indication.
DC	DriveConfig, PC software for IntelliDrive configuration.
DM	DriveMonitor, PC software for IntelliDrive monitoring.
DriveConfig	PC software for IntelliDrive configuration.
DriveMonitor	PC software for IntelliDrive monitoring.
ECU	Engine Electronic (injection) Control Unit.
ECU alarm	Alarm detected in engine electronic control unit that is received via J1939.
EME	IntelliDrive Emergency operational mode.
EMS I.	Electronic Management System – version I.
EMS II.	Electronic Management System – version II.
FIs	Controller sensor fail alarm.
FMI	Failure Mode Identifier.
GSM modem	Modem for Global System of Mobile communication
History	List of alarms and operational states with Reason, Date and Time and adjustable values set that is stored in controller, can be listed from the screen or DriveMonitor.
HRB	Controller Harbor mode.
I-CB	Inteli - Communication bridge = controller interface for other electronic engines like MTU, CAT etc.. that are not supported yet.
ID	IntelliDrive controller.
ID-COM	IntelliDrive communication module with interface to J1939, J1587 and to other controllers.
ID-DCU	IntelliDrive – DieselControlUnit.
ID-MCU	IntelliDrive – Industrial Controller Unit with Volvo Penta front panel modification.
ID-RPU	IntelliDrive – Redundancy Protection Unit = ID backup unit for Over speed and Emergency stop protection in Marine applications.
ID-SCM	IntelliDrive - Speed Control Module = interface unit for IntelliDrive Industrial.
IG-IB	InteliGen – Internet Bridge = controller interface for internet communication.
IGL-RA15	Remote Annunciator = external 15 LED indication panel (three colors, configurable).
IG-MU	InteliGen – Modem Unit = controller interface for multiple engines application – one point communication with group or one point modem connection.
IGS-PTM	Controller extension module with 8 binary inputs and outputs and 4 analog inputs.
I-RB	Inteli Relay board = interface board with 16 free contact relays.

I-RB16	Inteli Relay board = interface board with 16 free contact relays.
I-RD	Inteli Remote Display (Remote Panel) = the same panel like on controller, all data received via CAN2 bus.
I-RD-CAN	Inteli Remote Display (Remote Panel) = the same panel like on controller, all data received via CAN2 bus.
I-RP	Inteli Remote Display (Remote Panel) = the same panel like on controller, all data received via CAN2 bus.
IS-AIN8	InteliSys – Analog input module = extension module with 8 analog inputs.
IS-BIN16/8	InteliSys – Binary input/output module = extension module with 16 binary inputs and 8 binary outputs.
J1587	The J1587 bus is mainly used for redundant signals; system diagnosis and software download on after market tools.
J1587/J1708	See J1587
J1939	The J1939 bus is mainly used for engine controls and engine monitoring.
KWP2000	Scania Communication protocol.
LOC	Controller Local mode
mhx	Extension for controller firmware (Motorola HeX file).
MID	Message Identification Assignments.
OFF	Controller mode when power supply is switched on, but all binary outputs and start commands are disabled = engine start is blocked.
PID	Parameter Identification Assignments.
PPID	Proprietary Parameter Identification Assignments.
PRP	Controller application (archive, operational mode) for Propeller engines.
RPM	Engine Revolution Per Minute – engine speed.
PCB	Printed Circuit Board
PSID	Proprietary Parameter Identification Assignments.
RS232	Standard serial data line for PC or Modem connection (controller programming or monitoring).
Sd	Shut down protection.
SID	Subsystem Identification Assignments.
SPN	Suspect Parameter Number
SS	Controller Single Speed mode
Wrm	Warning protection.



# Conformity declaration



Following described machine complies with the appropriate basic safety and health requirement of the EC Low Voltage Directive No: 73/23 / EEC and EC Electromagnetic Compatibility Directive 89/336 / EEC based on its design and type, as brought into circulation by us.

## !!! CAUTION !!!

**Always properly connect grounding terminals!**

### Adjust set points

All parameters are preadjusted to their typical values. But the set points in the “**Basic settings**” settings group **!!must!!** be adjusted before the first startup of the gen-set.

**!!! WRONG ADJUSTMENT OF BASIC PARAMETERS  
CAN DESTROY THE ENGINE !!!**

**The following instructions are for qualified personnel only.  
To avoid personal injury do not perform any action not specified in the User guides for ID-DCU Marine or ID-DCU Industrial !!!**

## **WARNING – VERY IMPORTANT !!!**

**Be aware that the binary outputs can change state during and after software reprogramming.  
Before the controller is used again ensure that the proper configuration and setpoint settings  
are set in the controller.**

Disconnect the Binary outputs Starter and Fuel or press EMERGENCY STOP button to avoid unexpected automatic start of genset during any work or maintenance on the engine or switchboard.

### **Note:**

ComAp believes that all information provided herein is correct and reliable and reserves the right to update at any time. ComAp does not assume any responsibility for its use unless otherwise expressly undertaken.

# General description

This guide provides general information on how to operate the IntelliDrive controller. More detailed information is available in the User guides for ID-DCU Marine or ID-DCU Industrial.

IntelliDrive ID-DCU Industrial and ID-DCU Marine engine controllers controls, monitors and protects the engine in single or variable speed operational modes (ID-DCU-Industrial) and propeller, emergency, auxiliary and harbor modes (ID-DCU-Marine). The controllers can communicate with Engine Management System via the CAN serial line using standard J1939 or another (KWP2000) communication protocol.

IntelliDrive controllers are equipped with a powerful graphic display with icons, symbols and bar-graphs and panel buttons for intuitive operation.

IntelliDrive ID-DCU-Marine central unit together with ID-RPU provides redundant engine control. Switches itself to the backup mode in the case of controller failure, protects engine using its own Shut down and Emergency stop inputs and Fuel, Stop outputs. Monitors power supply, switches to the secondary power and measures also the secondary RPM.

## **Engine functions**

- ♦ Engine sequencing and control (start/stop, warm-up and cool-down, pre-lubrication etc.)
- ♦ Different operational modes – single or variable speed (ID-DCU-Industrial) and emergency, auxiliary, harbor or propulsion (ID-DCU-Marine)
- ♦ Engine monitoring and protections (2 or more level analog inputs protection, adjustable delays)
- ♦ Speed measurement from magnetic pick-up or from ECU (+ redundant channel – ID-DCU-Marine only)
- ♦ Running hours meter, number of starts counter
- ♦ Configurable 14 Binary inputs and Outputs and 8 Analog inputs
- ♦ Setpoints are adjustable via IntelliDrive panel or via PC software
- ♦ 3 level password protection
- ♦ On screen Alarm and ECU Alarm indication
- ♦ Event and time driven engine history for back tracing
- ♦ Two or more languages selectable in controller

## **Communication**

- ♦ RS232 / Modbus RTU
- ♦ Analog or GSM modem
- ♦ Engines with Engine Electronic Control Unit: J1939, J1587, KWP2000
- ♦ Extension units for more I/O and Remote Display panel

## **Physical**

- ♦ 180x120 mm front panel mounted case
- ♦ Graphic back-lit LCD display 128x64 pixel resolution with icons and bar graphs
- ♦ LED status indicators / Lamp test

## **Available modules**

- ♦ ID-RPU Redundant Protection Unit (at ID-DCU-Marine only)
- ♦ ID-SCM Speed control module (at ID-DCU-Industrial only)
- ♦ IS-AIN8 Extension module with 8 analog inputs
- ♦ IS-BIN16/8 Extension module with 16 binary inputs and 8 binary outputs
- ♦ IGS-PTM Extension module with 4 analog inputs and 8/8 binary in/outputs
- ♦ IGL-RA15 Extension module with 15 indicating LED

# Manuals

To download manuals according to the specific controller:

1. Open <http://www.comap.cz/> in your browser. To access manuals on ComAp website, please, register in [ComAp club](#)
2. Where to find documentation on web

**Products / Engine controllers / IntelliDrive-DCU (Marine) / Downloads / Manuals**

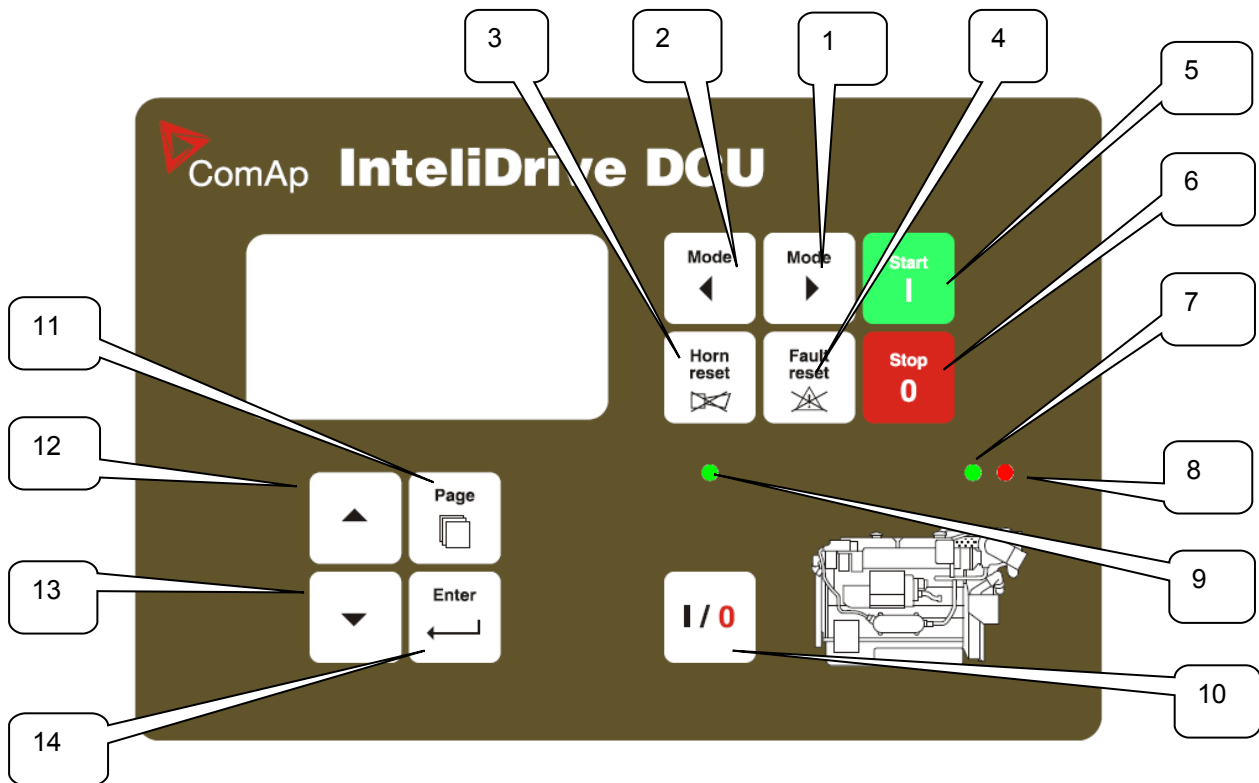
## **Types of Documents on Web page**

All the documents are intended for everybody who is concerned with the installation, operation and maintenance of an engine application.

- **Data Sheets** describe basic technical specification and purpose of various types of controllers.
- **Getting Started Guide** will help you to answer some basic questions that typically occur during the first contact with engine controller.
- **User guide** is Installation, Application and Reference guide in one book.
- **Communication Guides** describe communication interface among controller(s) and superior system. From this manual you can get information on all available types of communication.
- **ComAp Electronic Engines Support** describes all supported ECU, wiring and functionality.

# Operator Interface

## Pushbuttons and LEDs



### Pushbuttons and LED's:

- |                       |   |
|-----------------------|---|
| 1. <b>MODE ►</b>      | Cycle forward through engine operation modes OFF -> RUN (AUX, EME, HRB and PRP in case of Marine version).  |
| 2. <b>MODE ◄</b>      | Cycle backward through engine operation modes OFF <- RUN (AUX, EME, HRB and PRP in case of Marine version). |
| 3. <b>HORN RESET</b>  | Deactivates the HORN.   |
| 4. <b>FAULT RESET</b> | Acknowledges faults and alarms.   |
| 5. <b>START</b>       | Starts the engine in SS or AS mode.   |
| 6. <b>STOP</b>        | Stops the engine in SS or AS mode (hold time =1 sec).   |
| 7.                    | GREEN = Engine running.   |
| 8.                    | Flashing RED = Not acknowledged (new) alarm present in Alarm List.  |
|                       | Stable RED = Acknowledged alarm present in Alarm List.  |
| 9.                    | GREEN = On/Off output is active.  |
| 10. <b>On/Off</b>     | Button for Close load or Clutch Binary output control.  |
| 11. <b>PAGE</b>       | Cycles through the display screens MEASUREMENT -> ADJUSTEMENT -> HISTORY.                                   |
| 12. <b>▲</b>          | Select the set point, select the screen or increase set point value.  |
| 13. <b>▼</b>          | Select the set point, select the screen or decrease set point value.  |
| 14. <b>ENTER</b>      | Confirm set point value.  |

## ***How to select engine mode?***

---

Use **MODE ►** or **MODE ◀** to select requested engine operation mode.

### ***Hint:***

Switching to OFF mode is blocked on running engine.

## ***Display menus***

---

There are 4 display menus available: MEASUREMENT, External measurement, ADJUSTMENT and HISTORY.

Each menu consists of several screens. Pressing the **PAGE** button repeatedly will scroll the user through the menu screens.

## ***How to view measured data?***

---

Pressing the **PAGE** button repeatedly will scroll the user through the menu screens. Select the MEASUREMENT screen. Use **▲** or **▼** to select the screen with requested data.

## ***How to view and edit set points?***

---

1. Pressing the **PAGE** button repeatedly will scroll the user through the menu screens. Select the ADJUSTMENT screen.
2. Use **▲** or **▼** to select requested set points group.
3. Press **ENTER** to confirm.
4. Use **▲** or **▼** to select requested set point.
5. Set points marked “\*” are password protected, necessary to input corresponding password first to enable setpoint edit.
6. Press **ENTER** to edit.
7. Use **▲** or **▼** to modify the set point. When **▲** or **▼** is pressed for 2 sec, auto repeat function is activated.
8. Press **ENTER** to confirm or **PAGE** to leave without change.

Press **PAGE** to leave selected set points group.

### ***Hint:***

Depending on the configuration of ID-DCU controller there can occur some PLC logic modules in configuration. Then the user can adjust them from “PLC” set point group.

## ***How to view the HISTORY menu?***

---

1. Pressing the **PAGE** button repeatedly will scroll the user through the menu screens. Select the HISTORY screen.
2. Use **▲** or **▼** to select a requested record.
3. Use **ENTER** to select requested screen (record items) within displayed records.

## ***How to change the display contrast?***

---

Press **ENTER** and **▲** or **▼** at the same time to adjust the best display contrast.

### ***Hint:***

Only in MEASUREMENT menu.

## ***How to check the serial number and software revision?***

---

Hold down the **ENTER** and the press **PAGE**. On the display you can see Controller INFO screen for 10 seconds:

Controller name (see **Basic setting** group)  
Controller serial number (8 character number)  
SW version: The firmware version number.  
Application: ID  
Branch: IntelliDrive

### Hint:

Only in MEASUREMENT screen.

## ***How to change the display backlight intensity?***

---

Press **ENTER** and **▲** or **▼** at the same time to adjust the best display backlight.

### Hint:

Only in INFO screen.

## ***How to change controller language?***

---

Press **PAGE** on controller INFO screen to go to Language screen. Select language **▲** or **▼** and press **ENTER** to confirm selection and exit window.

## ***How to find active alarms ?***

---

Active alarm list and J1939 alarm list are the last two screens in the MEASUREMENT menu.

Select MEASUREMENT menu. Press **▲** ( **▲** ). You will see the list of all active alarms with the number of alarms at the top-right corner. Inverted alarms are still active. Non-inverted alarms are not active, but not yet confirmed.

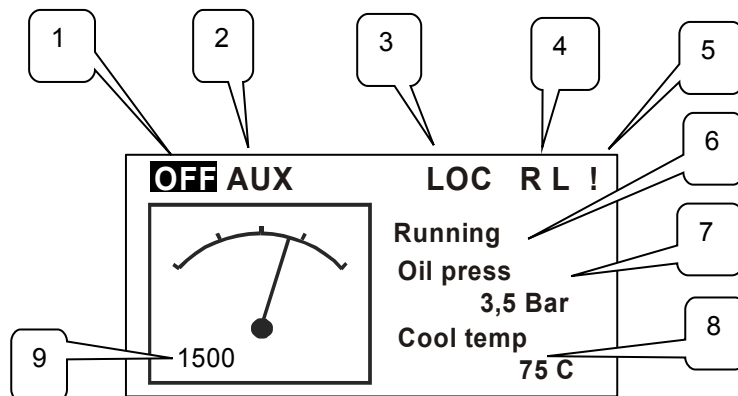
Press **FAULT RESET** accepts all alarms in case if Industrial version and accepts just displayed alarms in case of Marine version. Non-active alarms immediately disappear from the list.

Active alarm list appears on the screen when a new alarm comes up and Main MEASUREMENT screen is active.

### Hint:

Alarm list does not activate when you are reviewing the values, parameters or history.

## Main screen indication



1. Active controller mode (inverse)
2. Available mode
3. Controller Local mode indication
4. R = Remote connection indication (connection to DriveMonitor is opened)  
L = Access lock indication
5. Record in Alarm list
6. State machine indication
7. Oil press indication
8. Coolant temperature indication
9. RPM indication

## Controller screens

There are three screen groups available on ID-DCU controller: Measuring – Setpoints – History. Measuring screen will be divided to more groups – ID-DCU, BIN/BOU, AIN

### Measuring (instrument) screens

Screen	Content
Hidden, but available by Key combination – see <a href="#">Function available from ID-DCU front panel keys</a>	
	Info screen: Fw and App. version, s.n., ... Language list and switch.
	Language screen
	Fast edit screen
Available using Up or Down front panel keys	
	ECU diagnostics code list
	Alarm list
1 =Main screen	ID Mode, RPM1, Vbatt, Engine state, Indication: Local, Alarm (in AL or ECU list), Remote data connection active, Access Lock
2	Analog 1 to Analog 4 , 4x single bargraph
3	Analog 5 to Analog 8 , 4x single bargraph
4	Battery ID-DCU, bargraph
5	ID-DCU BI 1 to 7
6	ID-DCU BI 8 to 14
7	ID-DCU BO 1 to 7
8	ID-DCU BO 8 to 14
9	Statistics: Run hours, Number of starts, Service time
Following screens appears depending on configuration	
Opt	Analog 1 to Analog 8, Name- value dimension, active alarm is negative (1x IS-AIN8)
Opt	IS-BIN BI indication 1 to 8
Opt	IS-BIN BI indication 9 to 16
Opt	IS-BIN BO indication 1 to 8
Opt	ECU values I.
Opt	ECU values II.

**Setpoints screens** correspond with Setpoint table above.



## Alarm, ECU Alarm list screen

See the Alarm management chapter

### Info screen

Info	Comment
CBH IntelliDrive	Product type
ComAp 2003 – 2013	Company name
ID-DCU-Industrial	Controller name
Serial: 0200FFFF	Controller serial number
Sw ver: 3.0	Software version
Appl: SS	Application
Branch: DCU Industrial	Customer branch

### Statistic values

		It is calculated:
1	Number of starts	Each successful start (starter is switched off due to RPM> Starting RPM) is calculated. External (manual) engine start
2	Running hours	Each finished 60 minutes when engine is running.
3	Number of unsuccessful starts	Each finished cranking due to <i>MaxCrank time</i> is over

Statistic values can be adjusted from DriveMonitor, password 3 level protected.

### History records

Following table does not contain Wrm, Sd and Fls messages from external units.

Events specification	Protection type	Information available on binary output
<b>Alarms</b>		
Wrm Analog input 1 to 8	WRN	YES
Sd Analog input 1 to 8	SD	YES
ID-DCU Binary input 1 to 14	Configurable	YES
ID-DCU Battery voltage <, >	WRN	YES
Battery flat	WRN	
Start fail	WRN	YES
ParamFail	NONE	
Overspeed	SD	YES
Underspeed	WRN	YES
EmergencyStop	SD	
Pickup fail	WRN	
Stop fail	WRN	YES
WrmServiceTime	WRN	
ChrgAlternFail	WRN	YES
Fault reset		
Local mode ON		YES
Local mode OFF		
Harbour mode ON		YES
Harbour mode OFF		
SecBattery		YES
Emergency stop		

Engine events	Note
<b>Starts</b>	
Button start	Start from ID panel
CAN control + Button start	Start from ID RD
RS232 control + Button start	Start from DriveMonitor
Remote start	Start from BI
<b>Stops</b>	
Engine stop	Stop from ID panel or BI
CAN control + Engine stop	Stop from ID RD
RS232 control + Engine stop	Stop from DriveMonitor
Remote start	ID-DCU binary input
Blackout start	ID-DCU binary input
Button start	ID-DCU panel button
Fault reset	ID-DCU panel button
Local mode ON	ID-DCU panel button
Local mode OFF	ID-DCU panel button
HRB mode ON	ID-DCU panel button
HRB mode OFF	ID-DCU panel button
RS232 control	Start, Stop, Fault reset, On/Off button from DriveMonitor or I-RD
Modem control	Start, Stop, Fault reset, On/Off from Modem
SMS control	Received command from GSM modem
CAN control	Received command via CAN bus e.g. from I-RD or IG-MU
ActCallCH1-OK	Successful active call on channel 1
ActCallCH2-OK	Successful active call on channel 2
ActCallCH3-OK	Successful active call on channel 3
Extern start	Manual engine starter handling.
Engine stop	Engine changed state from
Emerg.man ON	Emergency manual mode ON
Emerg.man OFF	Emergency manual mode OFF
Clutch ON	Binary output clutch was closed
Clutch OFF	Binary output clutch was opened
Stop button	ID-DCU panel button
Switched on	Controller was switched on
Cfg loaded	Configuration archive was changed
FwLoaded	Firmware upgrade
Time stamp	Depends on setpoint setting period
Password set	Any level from any terminal
Password changed	Any level from any terminal
Access set	Access code was set
Access changed	Access code was changed
Watchdog	Controller internal watchdog protection
Param fail	Setpoints checksum fail
RTC battery	RTC battery fail

**Hint:**

Value name can't exceed 11 characters to be recorded to History file with prefix (Wrm, Fls etc..). Longer names characters are canceled.

Corresponding Sd BINx, Sd BOUTx or Sd AINx is indicated in Alarm list and history record when communication with any extension units (IS-BIN, IS-AIN, IGS-PTM) interrupted.

Example:

When IS-BIN16/8 is configured for addresses: Binary inputs = BIN1, BIN2 and Binary outputs = BOUT1, then three messages Sd BIN1, Sd BIN2, Sd BOUT1 are indicated after communication is interrupted.

**Hint:**

Any "State" information can be configured to any binary output by DriveConfig software.

## ***Functions available from ID-DCU front panel keys***

Function	Key combination	From where
Contrast increase	Enter - Up	Main screen
Contrast decrease	Enter - Down	
Info screen	Enter - Page	
Local mode ON	Enter - Mode > (Right)	
Local mode OFF	Enter - Mode < (Left)	
Fast edit	Enter hold for 4 sec.	
Fault code reset	Fault reset	Alarm list
ECU fault code reset	Fault reset	ECU Alarm list
Requested speed increase	Up	Fast edit screen
Requested speed decrease	Down	
Request confirmation and exit	Enter active when <b>Engine params:</b> <i>EnLocalSpeed</i> = ENABLED	
Exit without confirmation	Page	
Backlight increase	Enter - Up	Info screen
Backlight decrease	Enter - Down	
Go to Language screen	Page	
Info screen exit	Automatic after 10 sec to Main screen	
Language selection	Up or Down key	Language screen
Language screen exit	Enter	

# Alarm management

Following alarms are available in IntelliDrive-DCU:

Binary alarms	Analog alarms
No protection	None
Warning	Warning
Shutdown	Sensor fail
Cool down	Wrm+shut down
Sensor fail	Wrm+cool down
Warning + BW	Alarm only
Shutdown + BW	HisRecOnly
Warning + Fls	

A new record containing selected values is written to the history file in the moment of any alarm comes up. Detection of each binary input alarm is fix 1 sec time delayed. Use DriveConfig to modify binary or analog inputs.

## **Warning**

---

When warning comes up, only alarm outputs are closed.

Possible warnings:

- Binary inputs configured as Warning (alarms are displayed and stored under configured name)
- Analog inputs configured as Warning (alarms are displayed and stored under configured name)
- Battery voltage alarm level

## **Shut down**

---

When a shutdown occurs, IntelliDrive-DCU opens outputs FUEL SOLENOID, STARTER.

Possible shut-down alarms:

- Over speed
- Under speed
- Start fail
- Binary inputs configured as Shut down (alarms are displayed and stored under configured name)
- Analog inputs configured as Shut down (alarms are displayed and stored under configured name)

## **Cool down**

---

When the cool down alarm comes up IntelliDrive unloads engine, waits for *Cooling time* and opens FUEL SOLENOID output.

Binary inputs configured as Cooldown (alarms are displayed and stored under configured name)

## **Sensor fail**

---

Sensor fail Fls is detected when measured value is 6,2 percent out of range. The controller screen will display ##### instead of the measured value.

## Alarms indication

There can be following actions when Alarm is active (depends on Alarm type and configuration):

- Alarm list record
- History list record
- Active call (when is enabled and modem is installed)
- Controller front panel LED indication
- Binary output ALARM is closed when Alarm is active or when was deactivated and FAULT RESET button was not pressed to confirm.  
Binary output ALARM opens when Alarm was deactivated (no other Alarm is active) and FAULT RESET button was pressed to confirm.
- Binary output HORN is closed for adjustable time when any new Alarm occurs.
- Corresponding value reading (binary input state, analog input value, generator voltage, .. ) is inverse (e.g. **100** ) on IntelliDrive screen when value is out of limits (binary input protection is active).

## Broken wire

Broken wire (BW) alarm is indicated on ID-RPU module only.

## Alarm indication

Alarm list and History record prefixes

Prefix	Meaning
Wrn	Warning
Sd	Shutdown
Cd	Cooldown
Bw	Broken wire
Fls	Sensor fail

Three state Alarm list indication

* Wrn Water temp	Active not accepted alarm
Wrn Water temp	Active accepted alarm
* Wrn Water temp	Inactive not accepted alarm
	Inactive accepted alarm

## ECU Alarm list - SPN/FMI codes screen

ECU Alarm list displays alarms from ECU unit of the engine. In the case there is no SPN translation available, the SPN number is displayed only.

E n g O i l P r e s s	W R N
B o o s t P r e s s	F L S
E n g O i l T e m p	F L S
6 2 9	F L S
> C o n t r o l l e r # 1	
E n g C o o l T e m p	W R N
F C : 1 1 0	O C : 7
	F M I : 3

# Controller monitoring

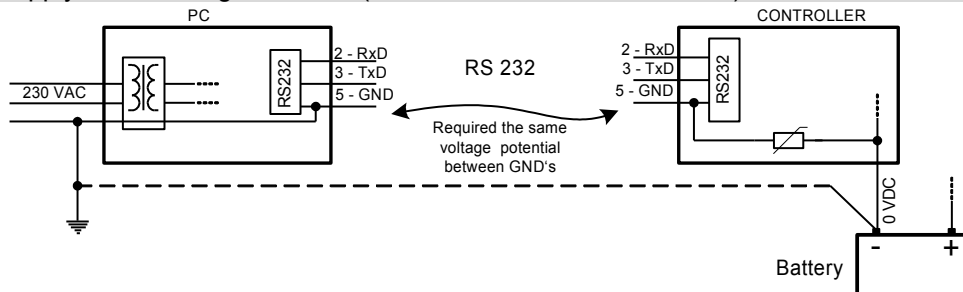
InteliDrive sw pack contains separate PC software tools: DriveConfig (DC) and DriveMonitor (DM). Drive Monitor is meant to be monitoring tool for remote controller connection. DriveMonitor is based on Windows 95/98/NT/ME/2000/XP or higher platform and requires 50 MB of hard disc free space.

## Direct connection to the PC

InteliDrive can be connected directly with PC via RS232 interface. Use the standard cable RS232 cable to connect PC with InteliDrive controller.

### Hint:

Make sure the grounding system on controller and PC – COM port (negative of the PC DC supply) are identical – before the first direct connection. There must not be any voltage between these two points otherwise the internal PTC protection activates and interrupts RS232 communication. In such case disconnect RS232 line wait a minute for PTC recovery and try again. The simple solution is to assure, that the PC supply 240/20V is ground free (GND terminal is not connected).








## DriveMonitor

### Functions

- On-line direct, Modem or Internet connection to one engine
- Active Modem or Internet call from engine to PC (activated by selected Alarm)
- Continuous one engine monitoring in on-line connection
- On-line or Off-line History record listing
- Setpoints listing and adjusting (password protected)
- Statistics value (e.g. Running hours) Set/Reset
- Password and Access code change

## Connection type








-  Direct connection via RS232 (up to 10m). For longer distance use RS232/RS485 converters (e.g. ADVANTECH – ADAM 4520).
-  Modem connection via Analog, ISDN or GSM modem.
-  Internet via IG-IB (InteliGen internet interface unit). IG-IB Internet - Ethernet or Dial-up connection is available.
-  Active call (via modem). Controller calls to the preselected telephone number and sends the AID file when active call is activated. To receive AID file the DriveMonitor must be in Active call waiting window.
-  Off line connection enables open and list Application AID file stored in PC.

### Hint:

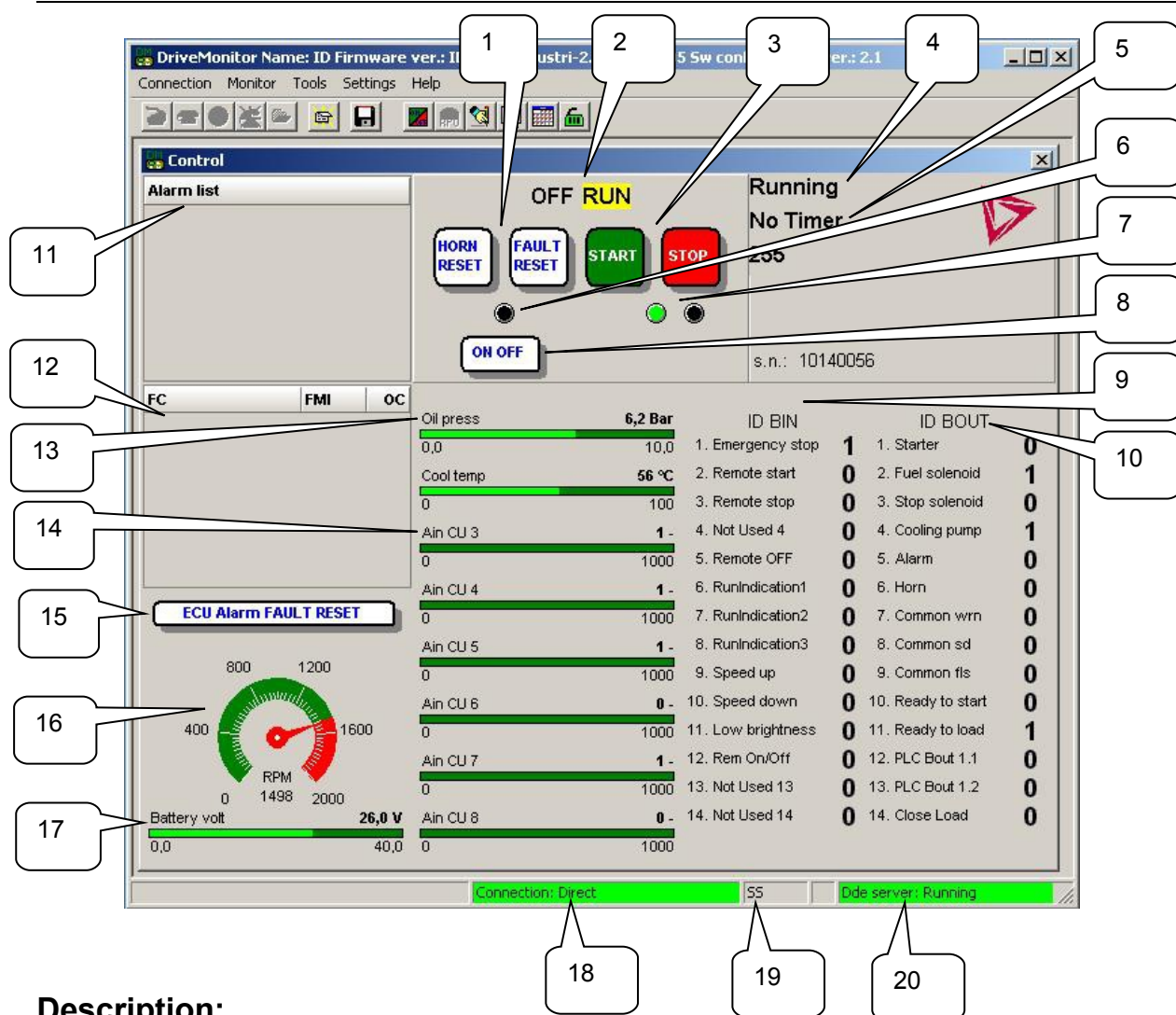
More detail regarding different types of connection see in IG-IS Communication guide.



-  Control window: displays all ID-DCU and I/O states, enables engine control.
-  ID-RPU window ... not available in Industrial version
-  Setpoints: listing and adjusting
-  Values: reading of all I/O include external modules
-  History list: complete history list.



## DriveMonitor screen example (ID-DCU-Industrial, SS)



### Description:

- Buttons to deactivate Fault and Horn reset.
- Buttons to switch-over the engine operation modes OFF and RUN (in ID-DCU-Industrial).
- Buttons for Start or Stop of the engine.
- Engine operation state indication.
- Engine timer indication.
- LED indication for load or clutch – GREEN = On/Off load is Closed / Opened, see point 8.
- LED indication of engine state: GREEN = Engine running, RED = event in Alarm List.
- Button for Close / Open load or clutch (Binary output control).
- Binary inputs list
- Binary outputs list.
- Alarm list
- ECU Alarm list
- Defined analog input bar graph – Oil press.
- Undefined analog input.
- ECU Alarm fault reset button.
- Engine speed measurement.
- Bar graph of battery voltage.
- Connection indication.
- Archive type indication.
- DDE Server indication.

### Hint:

More details of DriveMonitor software can be found in DriveMonitor User guide.

## Password protection

---

Password is a four-digit number. Only setpoints associated with the entered password level can be modified.

There are three levels of password protection:

0. User level allows change of non-protected setpoints only
1. Operator level allows change of setpoints protected by Operator level 1.
2. Master level allows change of setpoints protected by Operator 1. and Master level 2.
3. Supervisor highest level allows all setpoints or configuration changes, firmware upgrade.

There can be password protected:

- ♦ Setpoints (depends on configuration)
- ♦ Statistics values (Level 3 only)
- ♦ Engine commands (depends on configuration)

Even though one level may have been set from the front panel, the affected setpoints are not accessible from DriveMonitor (direct or Modem) until this level is set in DriveMonitor (direct or Modem). Setpoints opened from front panel are automatically closed 15 minutes after the last key has been depressed or when wrong value of password is set.

Password is a four-digit number. Only setpoints associated with the entered password level can be modified.

Any password can be changed once that level password or higher has been entered.

## Modbus protocol

---

- ♦ Direct connection: RS232, RS422, RS485
- ♦ Modem connection
- ♦ 9600, 19200 or 38400 bps, 8 data bits, 1 stop bit, no parity
- ♦ Transfer mode RTU
- ♦ Function 3 (Read Multiple Registers)
- ♦ Function 6 (Write Single Register)
- ♦ Function 16 (Write Multiple Registers)
- ♦ The response to an incoming message is sent with minimum 4.096 ms delay after message reception

The complete description of Modbus communication protocol can be found in *Modbus Protocol Reference Guide PI-MBUS-300* and *Open Modbus Specification Release 1.0*. Both documents are available from web site at <http://www.modicon.com/openmbus/>.

## Modbus Multipack message

It is special communication object that contains all values that are used for History record (configurable) and can be read by one command.

Hint:

Detail Modbus command description see in ComAp Communication guide.

## Communication object vs. Register

All the data intended for communication has its representation as communication objects in the controller. The communication object is represented by the n-byte array in the controller memory and identified by the unique 16-bit communication object number. The register, according to Modbus communication protocol, represents a two-byte data and in communication functions is referenced by 16-bit register address. Further in the description of communication functions **the communication object number will always be used as a register address** and length of the communication object will be expressed by number of registers. **Just one communication object can be read or written by one communication function.**

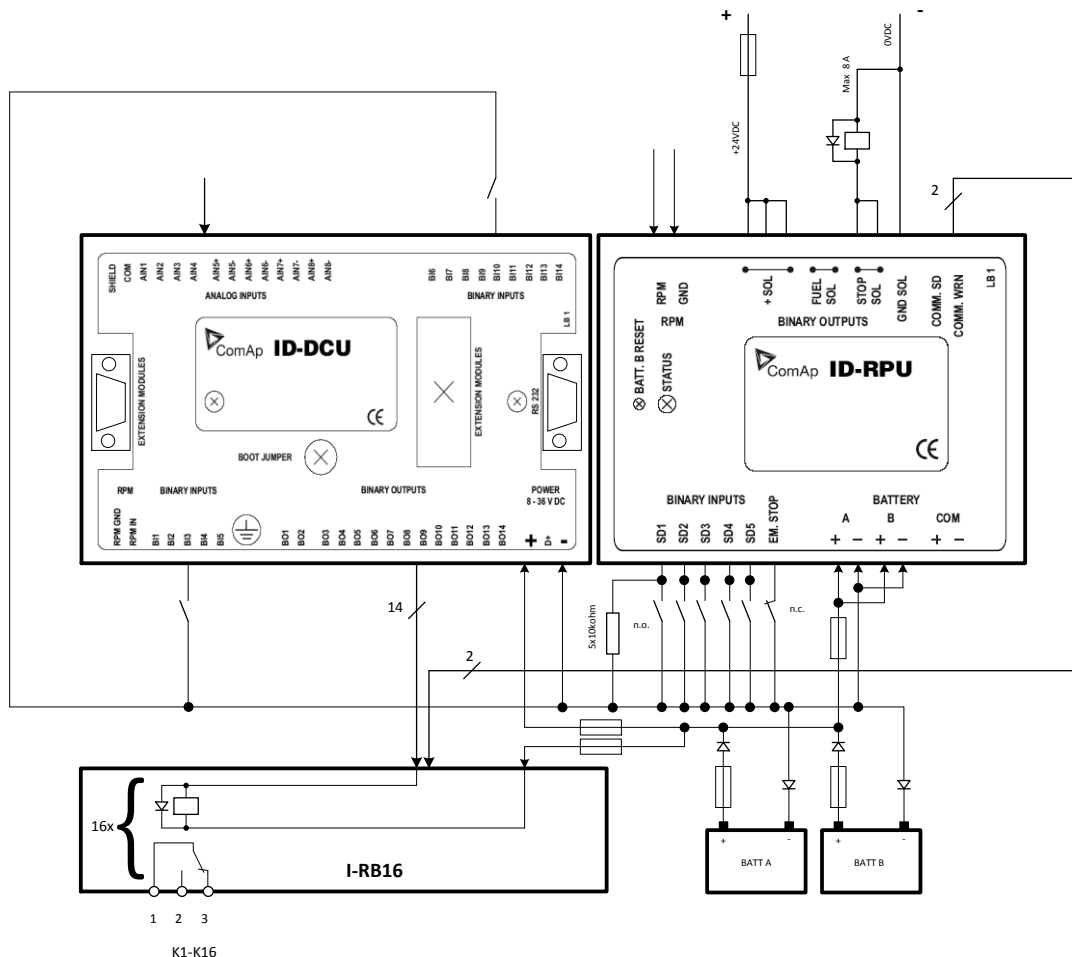
Hint:

It is possible to download the Actual IntelliDrive controller object description corresponding to actual configuration from on-line controller or from aid archive using DriveConfig software.

# Appendix

## Recommended wiring according DNV rules

There is recommended wiring diagram of IntelliDrive DCU Marine controller + ID-RPU module following latest DNV requirements for mutual independency of control, alarm and safety systems. IntelliDrive DCU Marine provides features of control and alarm system, ID-RPU provides features of safety system.



### Hint:

Fuses must be dimensioned in descending order in direction from batteries to devices.

### Hint:

It is required to use two independent actuators for engine stopping

1. Actuator controlled by ID-RPU / **STOP SOL** output
2. Actuator controlled by ID-DCU / **BOX** output (configured to *Stop Solenoid* function)

### Hint:

Emergency stop button contacts type NC (Normally Closed) can be directly incorporated into circuit controlling ID-RPU / **EM. STOP** input. It is also acceptable to use relay NC contacts in the circuit connected to ID-RPU / **EM. STOP** input (relay coil is controlled by emergency stop circuit) in case of NO (Normally Opened) emergency stop circuit type, if it is required by application.

# Technical data

## ID-DCU MARINE

### Power supply

Nominal power supply	24 VDC
Power supply range	8 – 36 VDC
Current consumption (depends on supply voltage)	0,34A at 8VDC 0,12A at 24VDC 0,09A at 36VDC
Battery voltage measurement tolerance	2 % at 24V
RTC battery life-cycle	10 year

### Hint:

RTC battery flat causes wrong Date&Time information only.

### Operating conditions

Operating temperature ID-DCU MARINE	-20 to +70 °C
Operating temperature ID-DCU-LT	-40 to +70 °C
Storage temperature	-30 to +80 °C
Humidity	95% without condensation
Flash memory data retention time	10 years
Protection front panel	IP65
Standard conformity	
Low Voltage Directive	EN 61010-1:95 +A1:97
Electromagnetic Compatibility	EN 61000-6-2, October 2001 EN 61000-6-4, October 2001 IEC 60533, Ed. 2; 1999-11
Vibration	5 - 25 Hz, $\pm 1,6$ mm 25 - 100 Hz, $a = 4$ g
Shocks	$a = 200$ m/s <sup>2</sup>

### Dimensions and weight

Dimensions	(183x123x47mm)
Weight	See chapter terminals and dimensions 800g

### Binary inputs

Number of inputs	14
Input impedance	4,7 k $\Omega$
Input range	0-36 VDC
Switching voltage level for close contact indication	0-2 V
Voltage level for open contact indication	8-36 V
Minimal input duration	110 ms

### Binary open collector outputs

Number of outputs	14
Maximum current - outputs BO1, BO2	1A
Maximum current - outputs BO3 - BO14	0,5 A
Maximum switching voltage	36 VDC

## Speed pick-up input

Type of sensor

magnetic pick-up (connection by shielded cable is recommended)

Input impedance

10 k $\Omega$

Minimum input voltage

2 V<sub>pk-pk</sub> (from 4 Hz to 4 kHz)

Maximum input voltage

50 V<sub>eff</sub>

Minimum measured frequency

4 Hz

Maximum measured frequency

10 kHz (min. input voltage 6V<sub>pk-pk</sub>)

Frequency measurement tolerance

1,5 %

## D+ function

Max. D+ output current

300 mA

Guaranteed level for signal Charging OK

90% of supply voltage

## Analog inputs

Not electrically separated

### Group 1 AI1 – AI4

Number of inputs

4 unipolar

Resolution

10 bits

Jumper selectable range

V,  $\Omega$ , mA

Maximal resistance range

2500  $\Omega$

Maximal voltage range

4,0 V

Maximal current range

0 – 20 mA

Input impedance

180  $\Omega$  for mA measuring

Input impedance

> 100 k $\Omega$  for V measuring

Resistance measurement tolerance

$\pm 2 \% \pm 2 \Omega$  out of measured value

Voltage measurement tolerance

$\pm 1 \% \pm 1\text{mV}$  out of measured value

Current measurement tolerance

$\pm 1 \% \pm 0,5\text{mA}$  out of measured value

### Group 2 AI5 – AI8

Number of inputs

4 bipolar

Resolution

Up to 16 bits

Jumper selectable range

V,  $\Omega$ , mA, thermo coupler

Maximal resistance range

2500  $\Omega$

Maximal voltage range

$\pm 1000 \text{ mV}$  or 100 mV or 5 V

### Hint:

The maximal input voltage offset is in the range from –2 to +5 VDC against controller minus power supply when AI5 to AI8 is used for differential voltage measuring.

Maximal current range

$\pm 0 - 20 \text{ mA}$  active

0 - 20 mA passive

Input impedance

50  $\Omega$  for mA measuring

Input impedance

> 100 k $\Omega$  for V measuring

Resistance measurement tolerance

$\pm 0,5 \% \pm 2 \Omega$  out of measured value

Voltage measurement tolerance

$\pm 0,5 \% \pm 1 \text{ mV}$  out of measured value

Current measurement tolerance

$\pm 0,5 \% \pm 0,5 \text{ mA}$  out of measured value

## RS232 interface

Maximal distance

10m

Speed

19.2kBd

## I-RD-CAN-ID-DCU-MARINE

Basic technical data are equal to ID-DCU MARINE. There are no binary and analog inputs and outputs.  
Communication interface CAN, RS232

## ID-RPU

### Power supply

Voltage range 8 - 36V DC

### Binary inputs

Number of inputs Sd1 – Sd5 5 (broken wire detection, 10 k $\Omega$  required)  
 Input resistance 1 k $\Omega$   
 Input range 0 - 5 VDC  
 Switching voltage level for close contact indication 0 - 1,5 V  
 Max voltage level for open contact indication 3 - 4,5 V  
 Voltage range for broken wire indication 4,5 - 5 V  
 Resistance limit for broken wire detection 20 k $\Omega$   
 Emergency stop input (normally closed) 1 (no BW detection)

### Speed pick-up input

Type of sensor magnetic pick-up (connection by shielded cable is recommended)  
 Input impedance 10 k $\Omega$   
 Minimum input voltage 2 Vpk-pk (from 4 Hz to 4 kHz)  
 Maximum input voltage 50 Veff  
 Minimum measured frequency 4 Hz  
 Maximum measured frequency 10 kHz (min. input voltage 6Vpk-pk)  
 Frequency measurement tolerance 1,5 %

### Solenoid driver (power) outputs

Galvanic separated separate terminals for  $\pm$  supply  
 Number of outputs 2 (Fuel solenoid, Stop solenoid)  
 Maximum current 8 A DC (one channel only)  
 Maximum current 12 A DC (both channels together)  
 Supply voltage range 8 - 36 VDC  
 Protections  
     OFF-STATE Broken wire (open circuit) detection  
     ON-STATE Short circuit  
     Overload (switch-overheat detection)  
     Lost of power supply indication

### Binary outputs

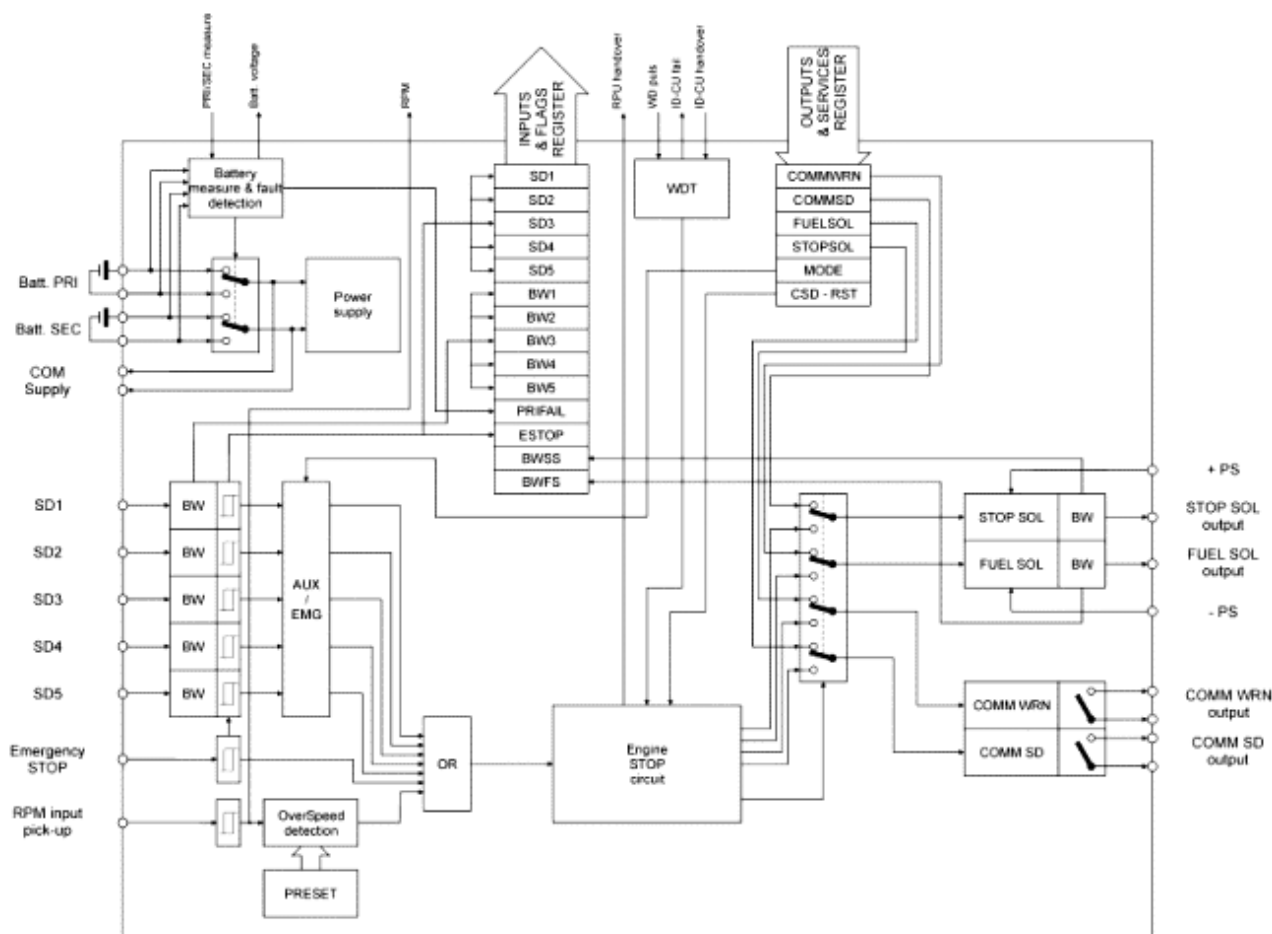
Number of outputs 2 (fix function: Warning and Shut down)  
 Maximum switching voltage 36 VDC  
 Maximum current 0,5 A

## ID-SCM

Nominal power supply 24 VDC  
 Power supply range 8 – 36 VDC  
 Max consumption 100 mA  
 Mechanical dimensions: 108 x 108 x 25 mm,  
 Interface to controller direct mounted (SUB25)  
 Binary inputs and outputs no  
 Analog input no  
 Operating temperature -30...+70°C

# ID-RPU

Redundancy protection unit



Binary information from ID-RPU to ID-DCU MARINE

Symbol	Meaning
SD1 ... SD5	State of all binary inputs SD1-SD5
BW1 ... BW5	State of all BW protections
PRIFAIL	Primary A battery fail = switched to B battery
ESTOP	Binary input Emergency stop state
BWSS	Stop solenoid output BW indication
BWFS	Fuel solenoid output BW indication

Binary information from ID-DCU MARINE to ID-RPU

Symbol	Meaning
COMMWRN	Binary output Common warning
COMMMSD	Binary output Common shut down
FUELSOL	Binary output Fuel solenoid
STOPSOL	Binary output Stop solenoid
MODE	Controller application <b>AUX – EME</b> (or Sd override active)



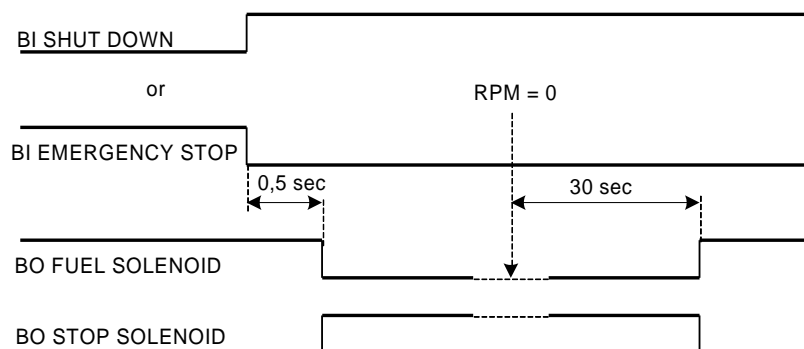
## ID-RPU functions

ID-RPU (InteliDrive Redundant Protection Unit) is designed for marine applications. This no microprocessor unit provides redundant engine protection, RPM measuring and back-up power supply switching for the control system.

ID-RPU monitors InteliDrive central unit and in the case of fail switches itself to the backup mode or Emergency backup mode and protects the engine using its own binary EMERGENCY STOP and SHUT DOWN inputs and FUEL and STOP SOLENOID outputs.

The ID-RPU unit has three operational modes:

- **Normal**  
ID-DCU MARINE is working and periodically sends the watchdog impulses to the ID-RPU. All ID-RPU inputs and outputs are processed via ID-DCU MARINE.
- **Backup**  
ID-RPU unit doesn't receive watchdog impulses from the ID-DCU MARINE. The Shut down (Sd1 to Sd5), Emergency stop inputs (fix 0,5 sec delay) and Over speed protection are processed via RPU only. ID-RPU stays in the mode that was before ID-DCU MARINE fail.
- **Emergency backup**  
ID-DCU MARINE was in EME mode (or Sd override function was active) before fail. The only Emergency stop and Over speed protection is active in this mode. Shut down Sd1 to Sd5 inputs are inactive. ID-RPU starts to Emergency backup mode after power on without active ID-DCU MARINE.



## Power supply terminals A+, A-, B+, B-, COM+, COM-

The ID-RPU module has two independent power input terminals and one power output terminals. The power output is supplied from battery A and if this voltage drops under 8V, the relay switches to the power supply B.

Battery B is switched to A when: Batt A > 10VDC and Fault reset button is pressed on ID-DCU MARINE or Batt reset button is pressed on ID-RPU when ID-DCU MARINE is out of order. The voltage switching levels is fix set in the ID-RPU.

### Hint:

Short supply drop out occurs during battery A to B or B to A switching. Connect B terminals in parallel to A when redundant battery B is not used.

## Binary inputs SD1 ... SD5 – shutdown channels

Include broken wire detection. The input logic is Normally Opened. Inputs are active only if ID-DCU MARINE unit is in **AUX** mode (and Sd **override is not closed**). No LED indication.

### Hint:

There is no I/O state or Broken wire LED indication on ID-RPU module. All indications are visible on ID-DCU MARINE screen include Alarm list and History record.

## Binary input Emergency stop

No Broken wire detection. The input logic is Normally Closed. Input is active in both ID-DCU MARINE EME and **AUX** modes. No LED indication.

## Binary output COMM SD

Output indicates any shutdown Alarm.

**Normal mode:** the output is controlled from ID-DCU MARINE (Binary output Comm Sd)

**Backup mode:** the output is activated if RPU emergency stop or SD1 – SD5 become active.

## Binary output COMM WRN

Common warning indication.

**Normal mode:** the output is controlled from ID-DCU MARINE (Binary output Comm Wrn)

**Backup mode:** the output is ACTIVE.

## Binary output STOP SOL

Stop solenoid output (high side switch) with broken wire (BW) detection active on opened output.

**Normal mode:** the output is controlled from the ID-DCU MARINE. The logical output Stop solenoid must be configured to this output in the configuration of ID-DCU MARINE. In case the stop solenoid is not used, the output must be configured as not used, otherwise broken wire protection will be detected.

**Backup mode:** the output is activated in case of any shutdown and released 10s after zero RPM reached.

## Binary output FUEL SOL

Fuel solenoid output (high side switch) with broken wire (BW) detection active on opened output.

**Normal mode:** the output is controlled from the ID-DCU MARINE. The logical output Fuel solenoid must be configured to this output in the configuration of ID-DCU MARINE. In case the fuel solenoid is not used, the output must be configured as not used, otherwise broken wire protection will be detected.

**Backup mode:** If no shutdown protection active, the output is closed.

## SEC RPM IN, SEC RPM GND

Terminals for the secondary RPM pickup. It is possible to connect two redundancy pickups or one pickup to ID-DCU MARINE and to the ID-RPU in parallel. The ID-RPU will detect over speed failure on running engine.

## Battery voltage measuring

ID-RPU senses battery voltage on both power supply inputs. Those values are connected to the ID-DCU MARINE through the CANON connector. There is one common Battery V>, V< and delay limit for all three batteries.

## Watchdog

ID-DCU MARINE periodically (~ 0.2s) sends an impulse to the ID-RPU. ID-RPU backup mode is activated after 1s without watchdog pulse.

## Over speed protection

The ID-RPU over speed protection is active in the case of ID-DCU MARINE fail only (backup mode). Over speed limit can be set by DIP switch (accessible after cover removal).

## ID-RPU Emergency / Auxiliary mode operation

ID-RPU only reflects ID-DCU MARINE setting following way. ID-DCU MARINE controller modes are selected on ID-DCU MARINE only.

ID-RPU binary inputs	Emergency mode	Auxiliary mode
Emergency stop	Active	Active
Shut down Sd1 – Sd5	Inactive	Active

ID-RPU is switched to Emergency mode after power-on reset without ID-DCU MARINE.

## ID-RPU operation in the case of ID-DCU MARINE fault

The ID-RPU itself can never start the engine because of the engine starter is controlled from ID-DCU MARINE.

ID-RPU will leave all own binary outputs in the last state when ID-DCU MARINE fail is detected (engine stays running after ID-DCU MARINE fail). ID-RPU activates corresponding binary outputs when Emergency stop, Engine over speed protection or some Shutdown input (in **AUX** mode only), is activated.

## ID-RPU over speed setting

ID-RPU Over speed limit is set via two DIP switches: Prefix and Speed preset.

OT switch in On (1) position activates Over speed Test = Reduce Over speed limit to 50%.



### Example of Prefix and Speed preset calculation:

Required over-speed limit: RPMover = 1600 RPM

Basic settings: Gear teeth = 120

Speed preset formula:  $N = \left\lceil \left( \frac{\text{RPMover} \times \text{Gear teeth}}{60} \right) / C \right\rceil + 1$ ;

1. Step:  $X = (\text{RPMover} \times \text{Gear teeth}) / 60 = 3200$ ;

2. Step select coefficient C according table and corresponding DIP Prefix:

Table 1.

X range	C	Prefix
2016 to 8128	32	1000
504 to 2032	8	0100
126 to 508	2	0010
1 to 127	0,5	0001

X = 3200 is in the range 2016 to 8128 -> C = 32; Prefix = 1000;

3. Step: Speed preset =  $3200 / 32 + 1 = 101$ ; -> 01100101 in binary format.

4. Step: set Prefix = 1000 and Speed preset = 01100101;

Table 2. Another examples of overspeed setting

RPMover	Gear teeth	Prefix	Speed preset	DIP8
1800	150	1000	141	10001101
1800	120	1000	113	01110001
1800	60	0100	226	11100010
1000	30	0010	251	11111011

Speed preset binary conversion examples

Speed preset	DIP8
0	00000000
1	00000001
2	00000010
4	00000100
8	00001000
16	00010000
32	00100000
64	01000000
128	10000000
255	11111111

## Sensor Data

### Coolant temperature sensor

Measuring range: -40°C to 130°C

Shutdown: 93°C

### Coolant pressure sensor

Measuring range: 0 to 6 bar

Shutdown: 0,5 Bar

### Coolant temperature switch

Measuring range: -40°C to 250°C

Shutdown: 95°C

Differential range: 6°C

### Oil pressure sensor

Measuring range: 0 to 10 bar

Shutdown: 1,6 bar

### Oil temperature sensor

Measuring range: -50°C to 200°C

Shutdown: 95°C

### Oil pressure switch

Measuring range: 0,5 to 3 bar

Shutdown: 1,4 bar (delay < 4 ms)

Differential range: 0,25 to 0,80 bar

### Exhaust temperature sensor\*

Measuring range: -50°C to 800°C

Shutdown: 550°C

**\*Optional equipment.**

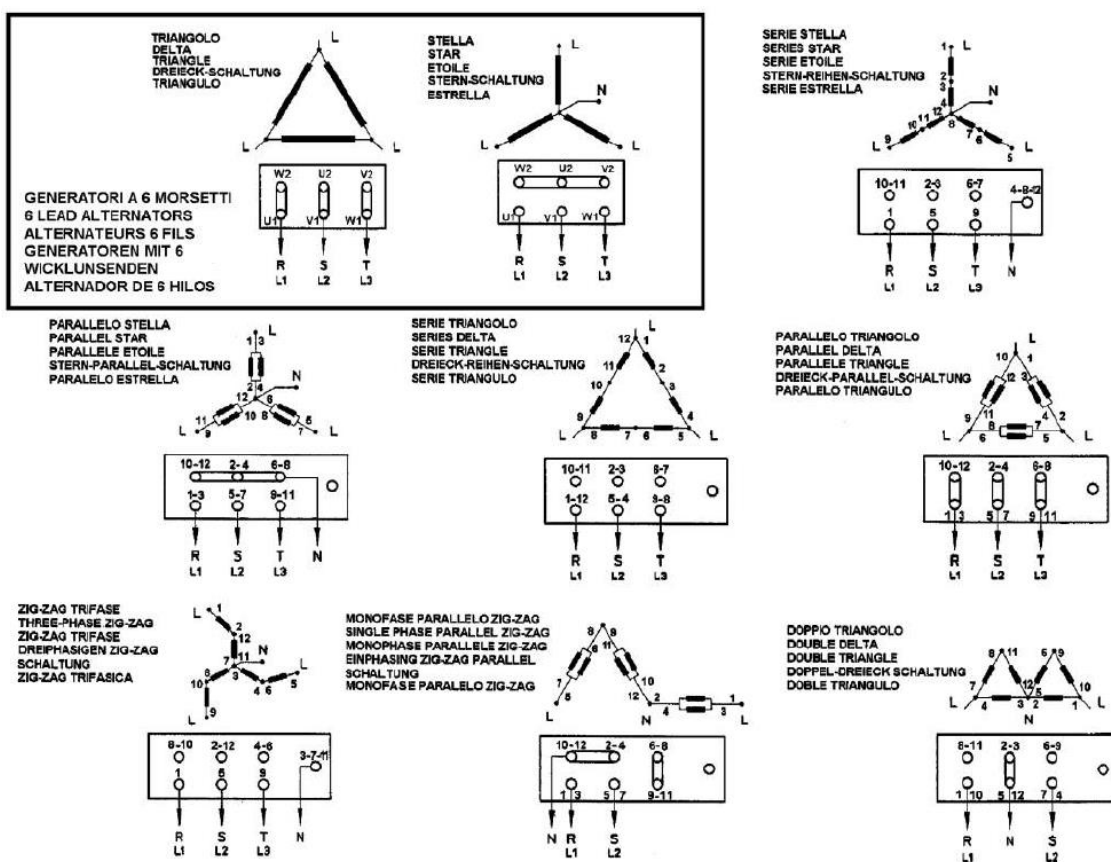
# Alternator connections

## Section 10 – Alternator connections

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

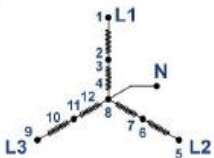
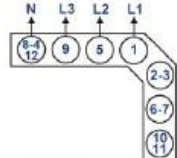
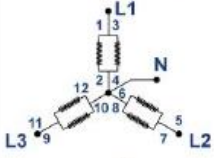
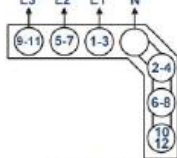
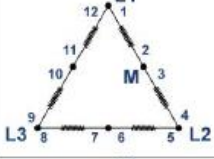
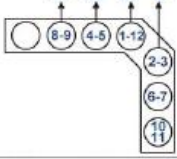
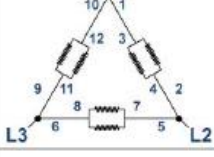
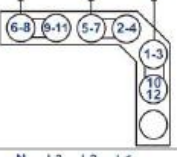
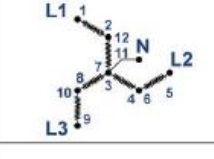
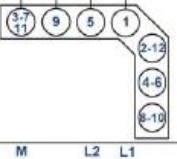
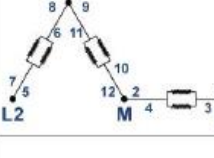
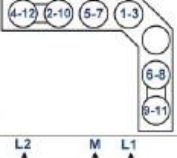
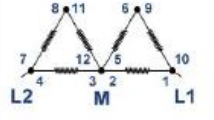
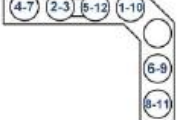
- Connection type 1: Meccalte alternator 1
- Connection type 2: Meccalte alternator 2
- Connection type 3: Sincro alternator

### Connection's type 1



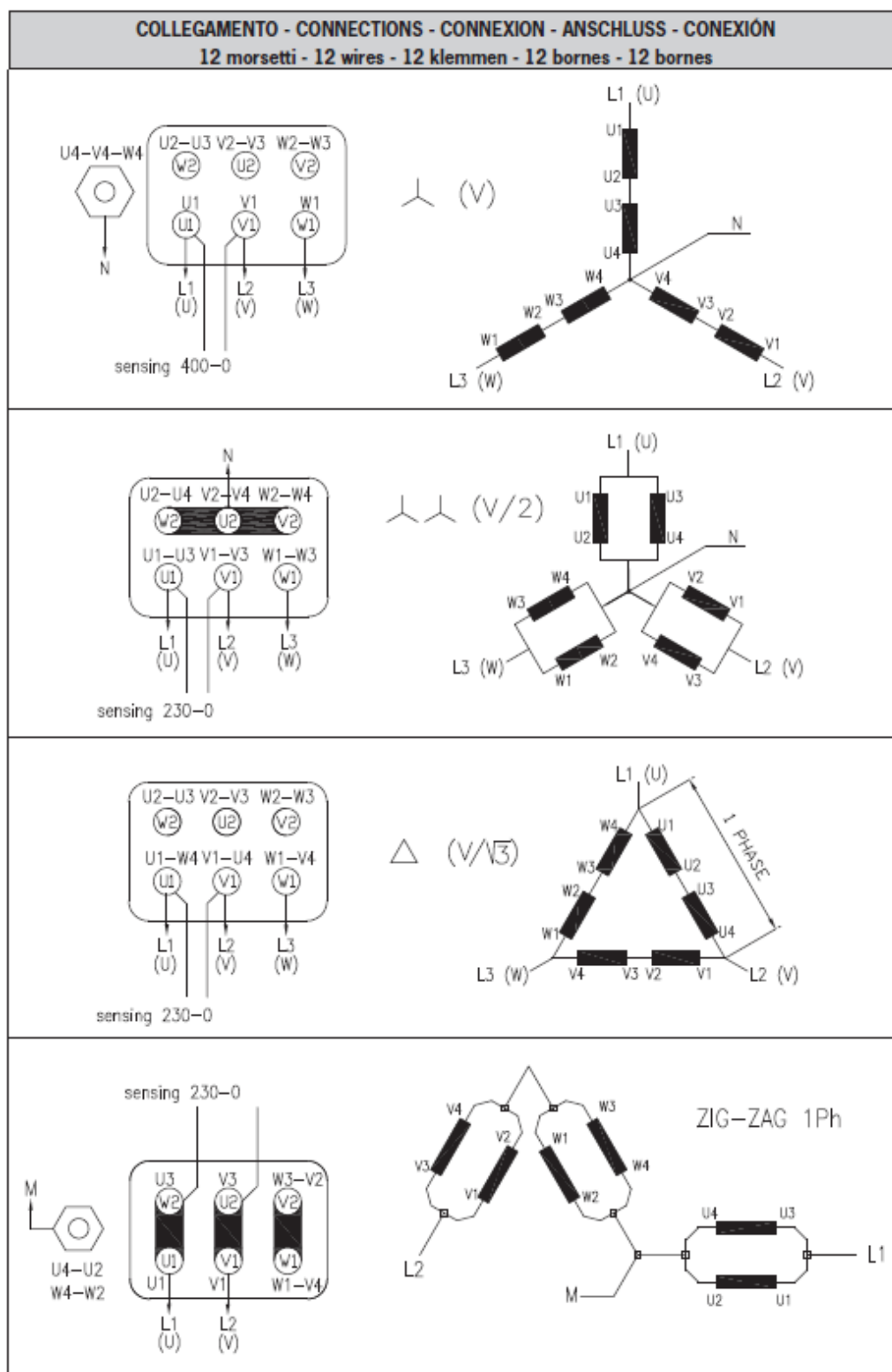
# Alternator connections

## Connection type 2

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

# Alternator connections

## Connection type 3





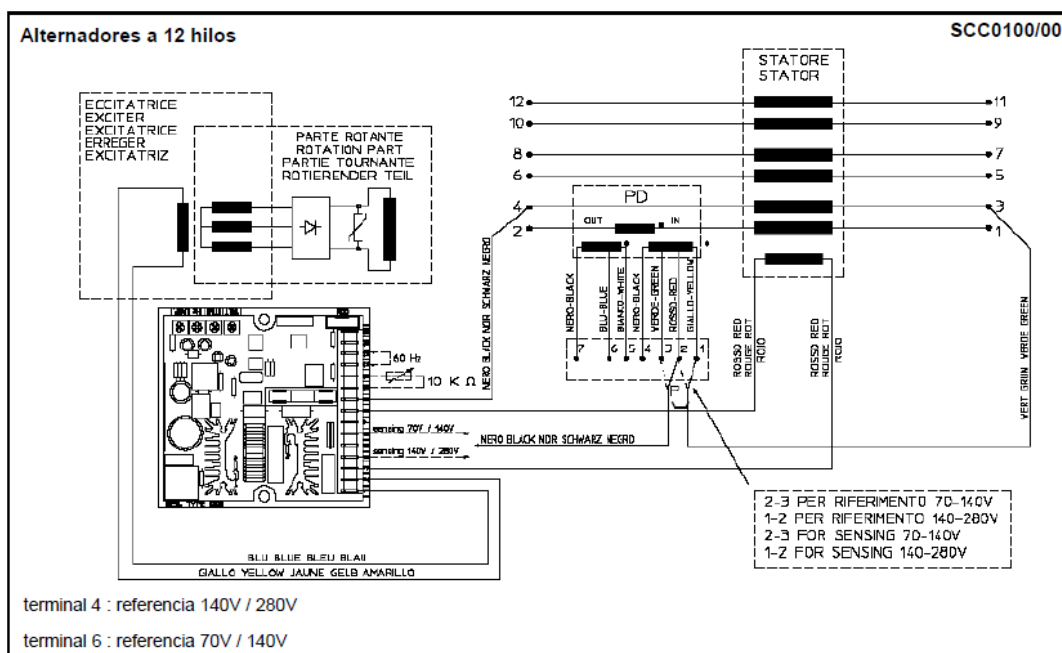
# Alternator connections

## 10.1. Regulator connections

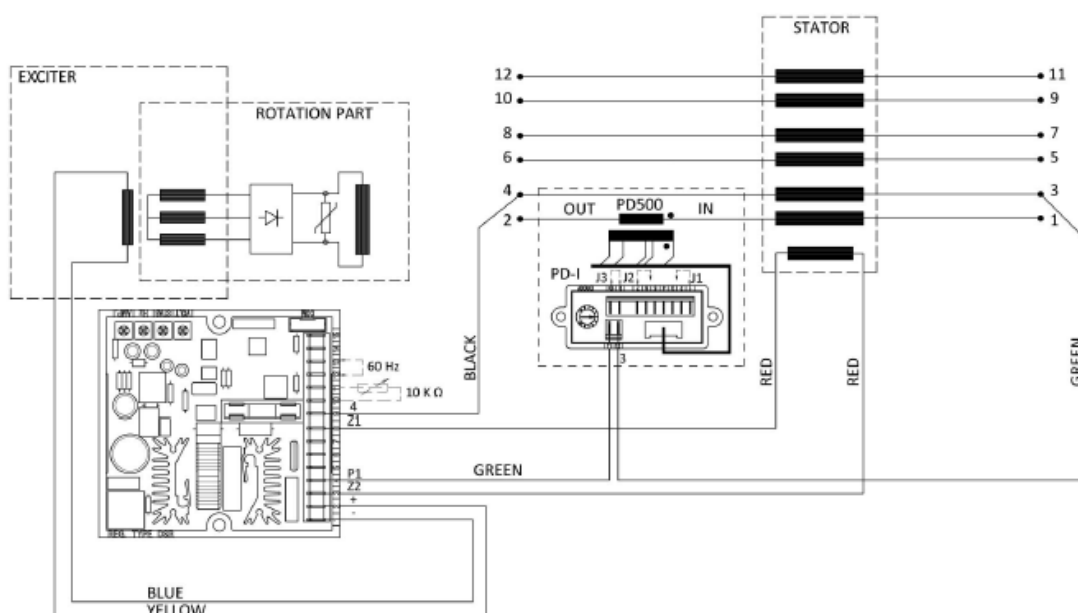
According to genset model, consult the regulator's connection:

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

### Connection type 1



### Connection type 2

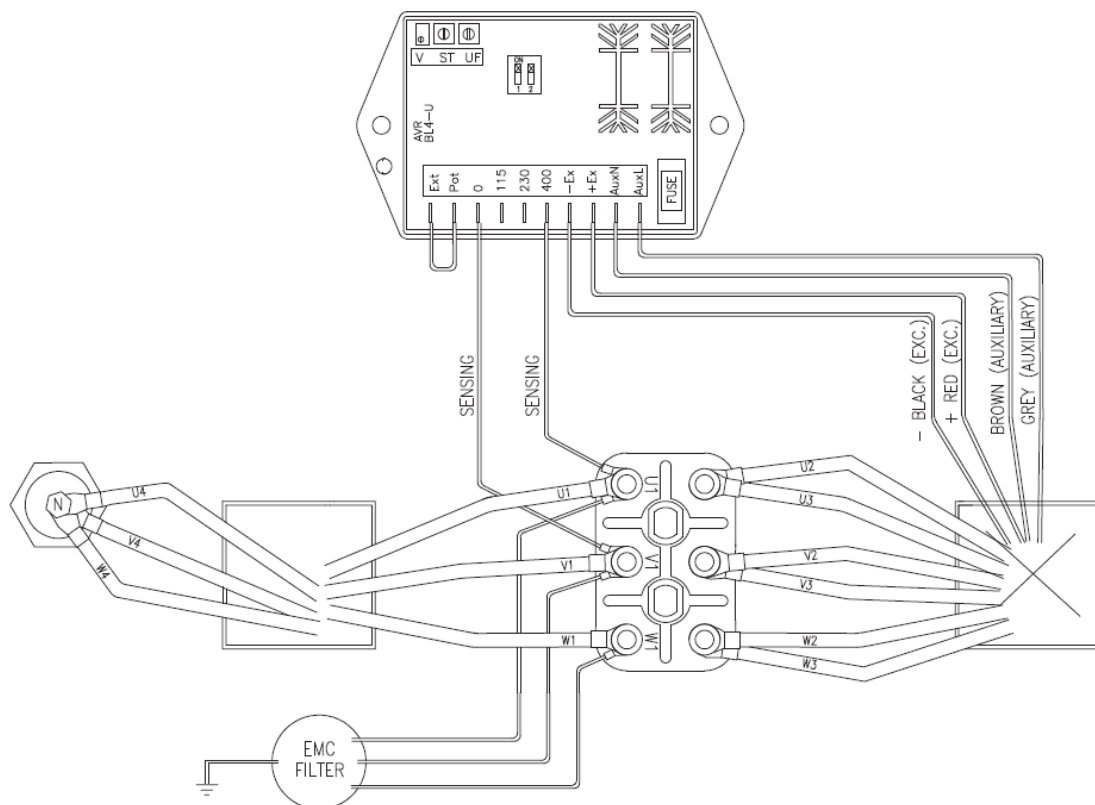




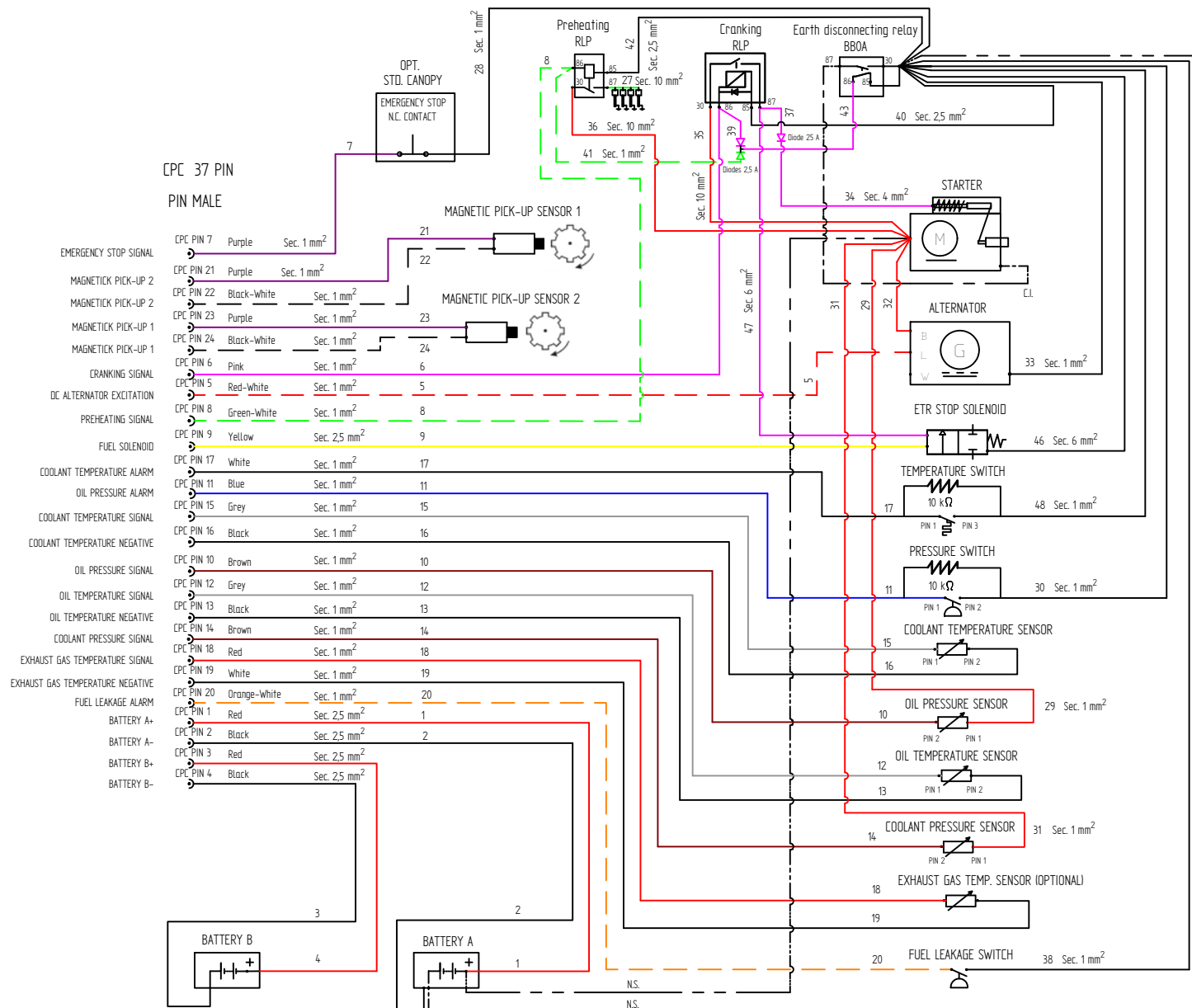
# Alternator connections



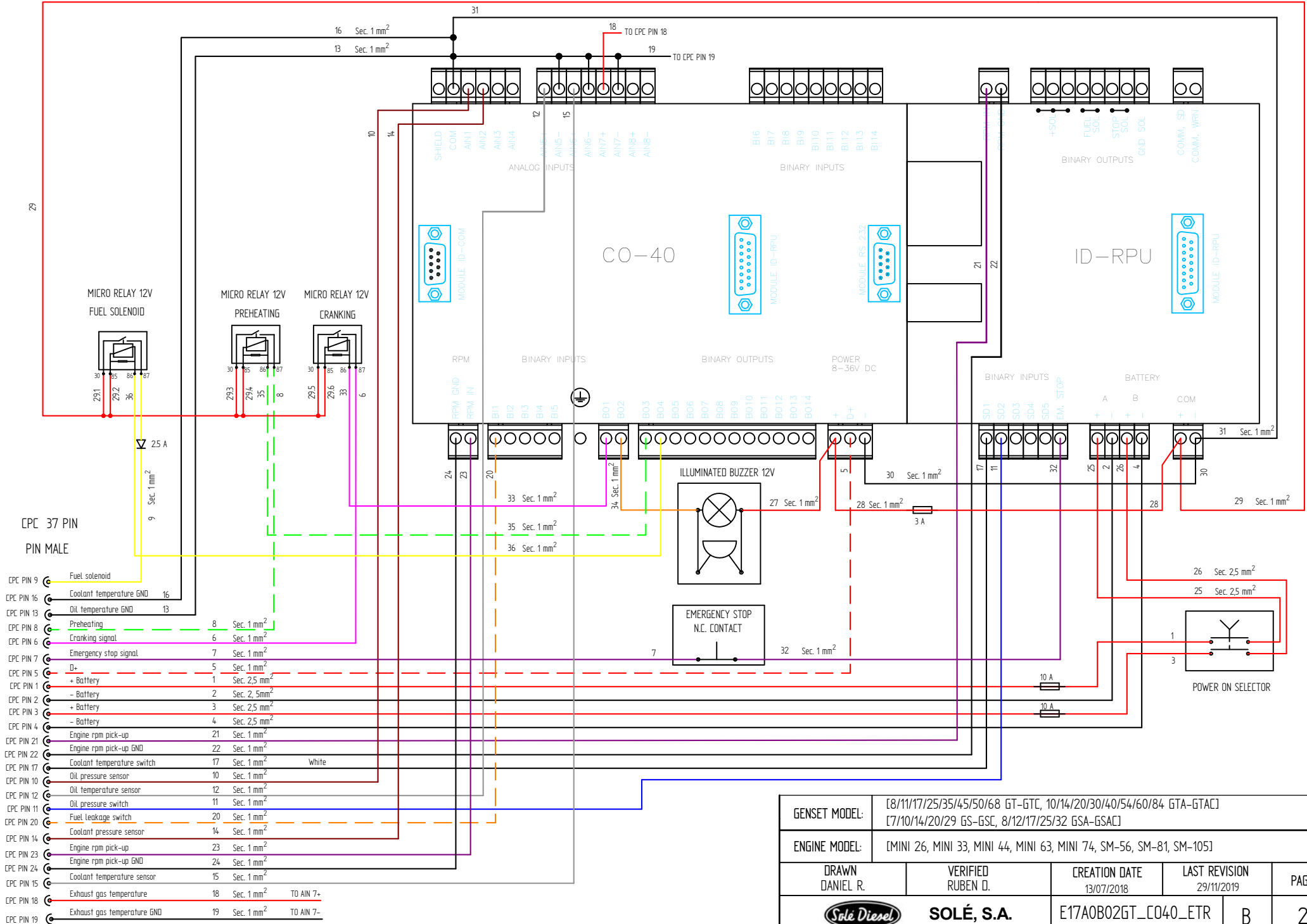
## Connection type 3

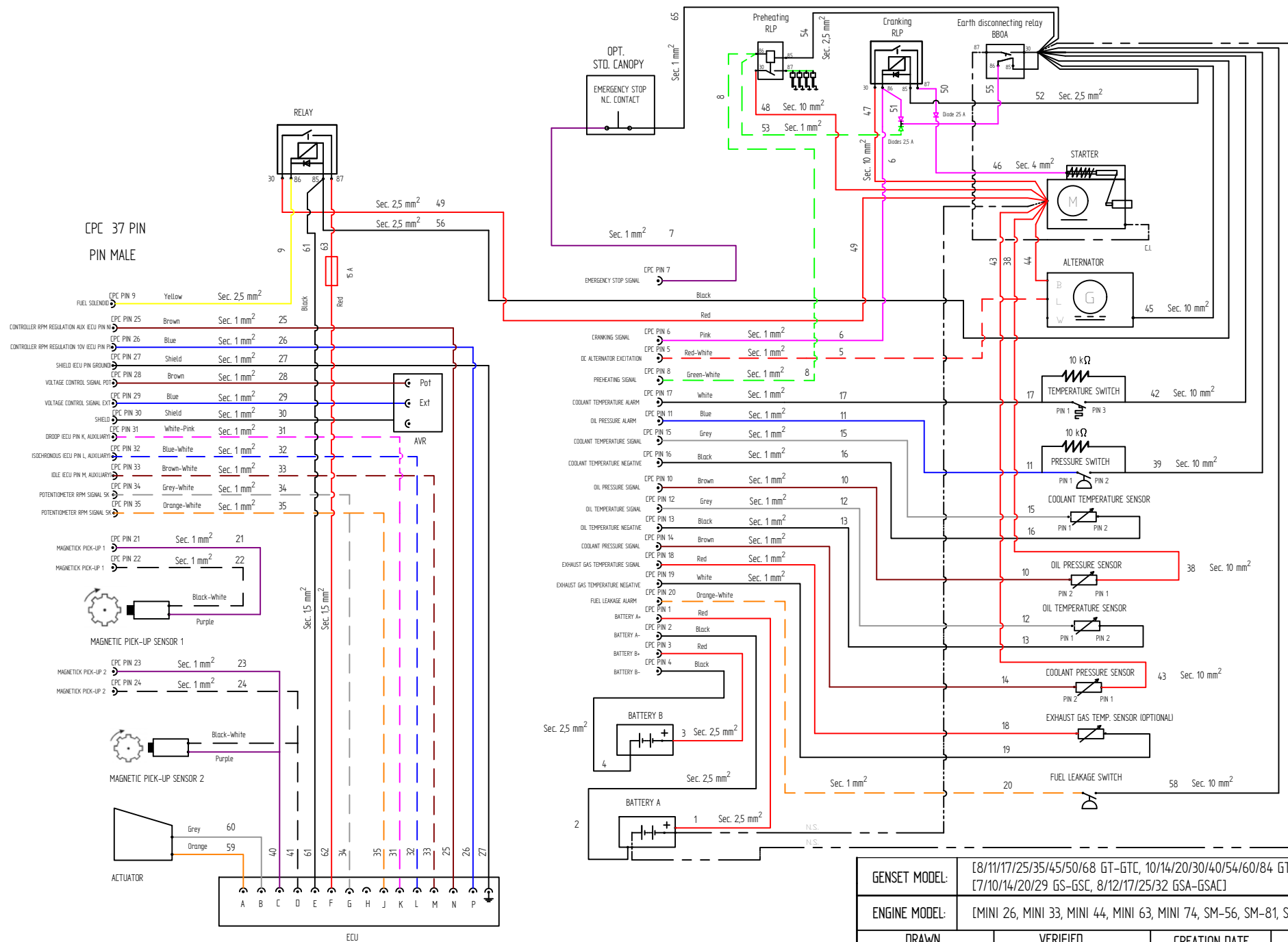



## Section 11 – Wiring diagrams

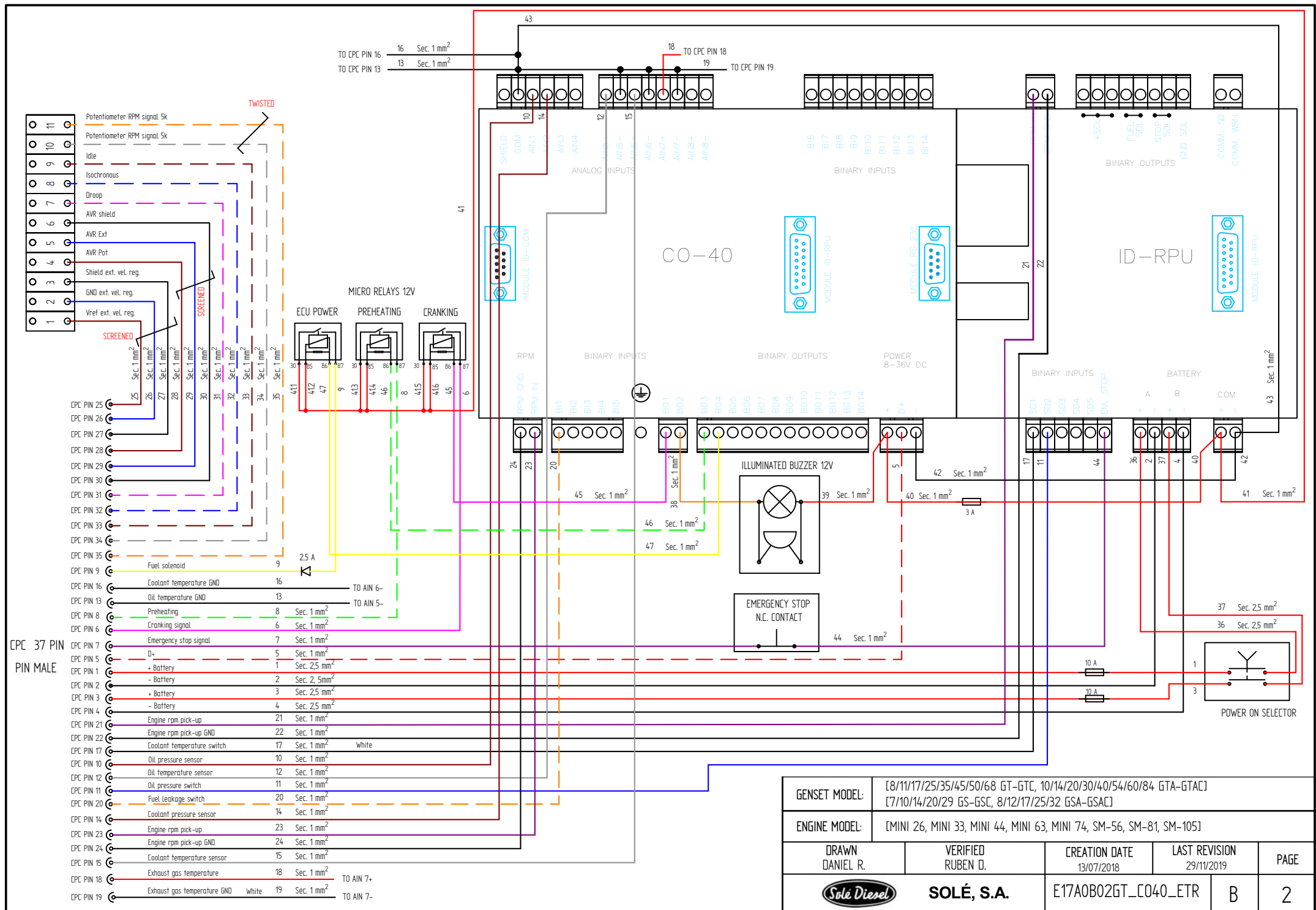


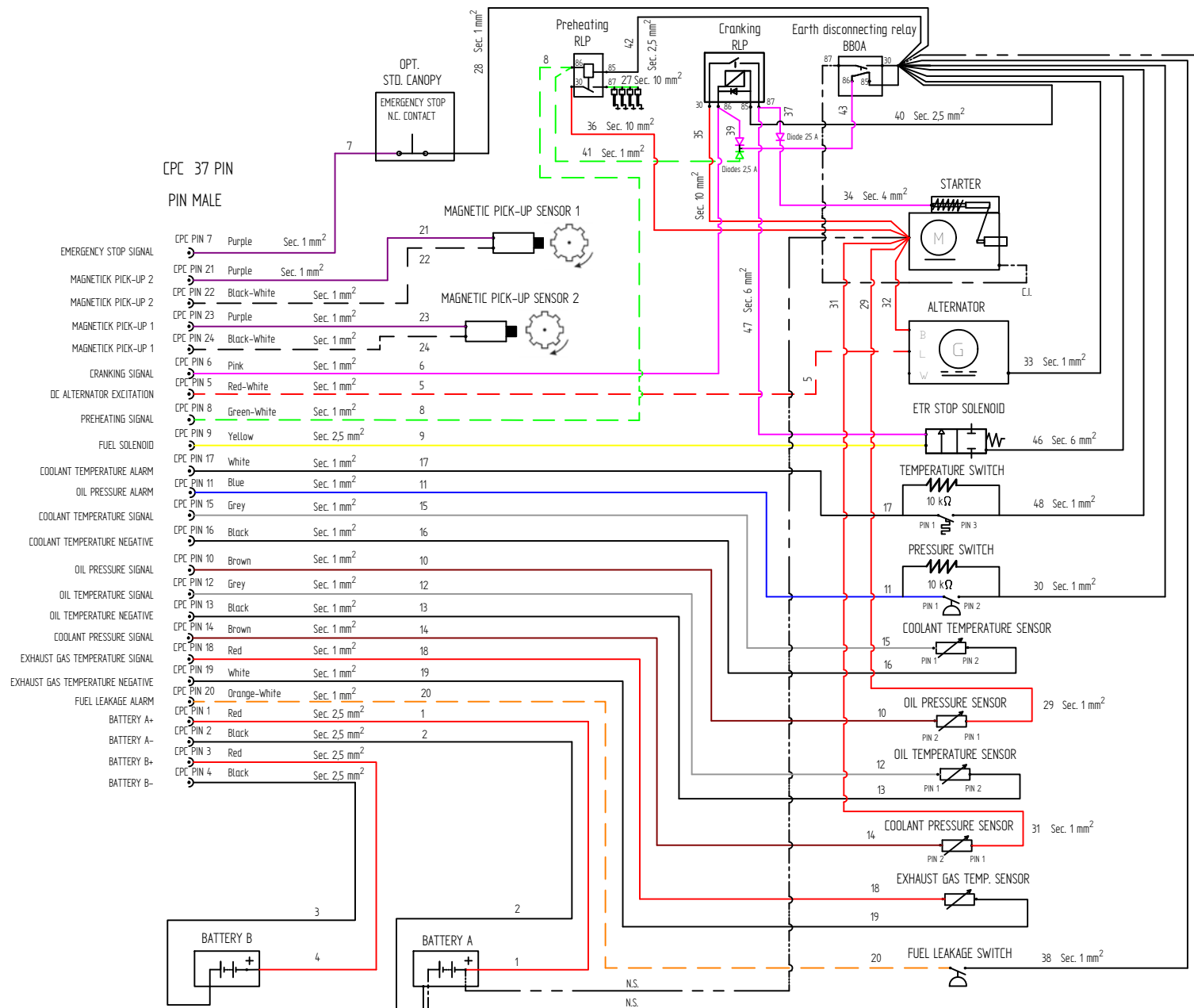
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ENGINE MODEL:		[MINI 26, MINI 33, MINI 44, MINI 63, MINI 74, SM-56, SM-81, SM-105]		
DRAWN DANIEL R.		VERIFIED RUBEN D.		CREATION DATE 13/07/2018
				LAST REVISION 29/11/2019
		SOLÉ, S.A.		E17A0B02GT_C040_ETR
		B		1




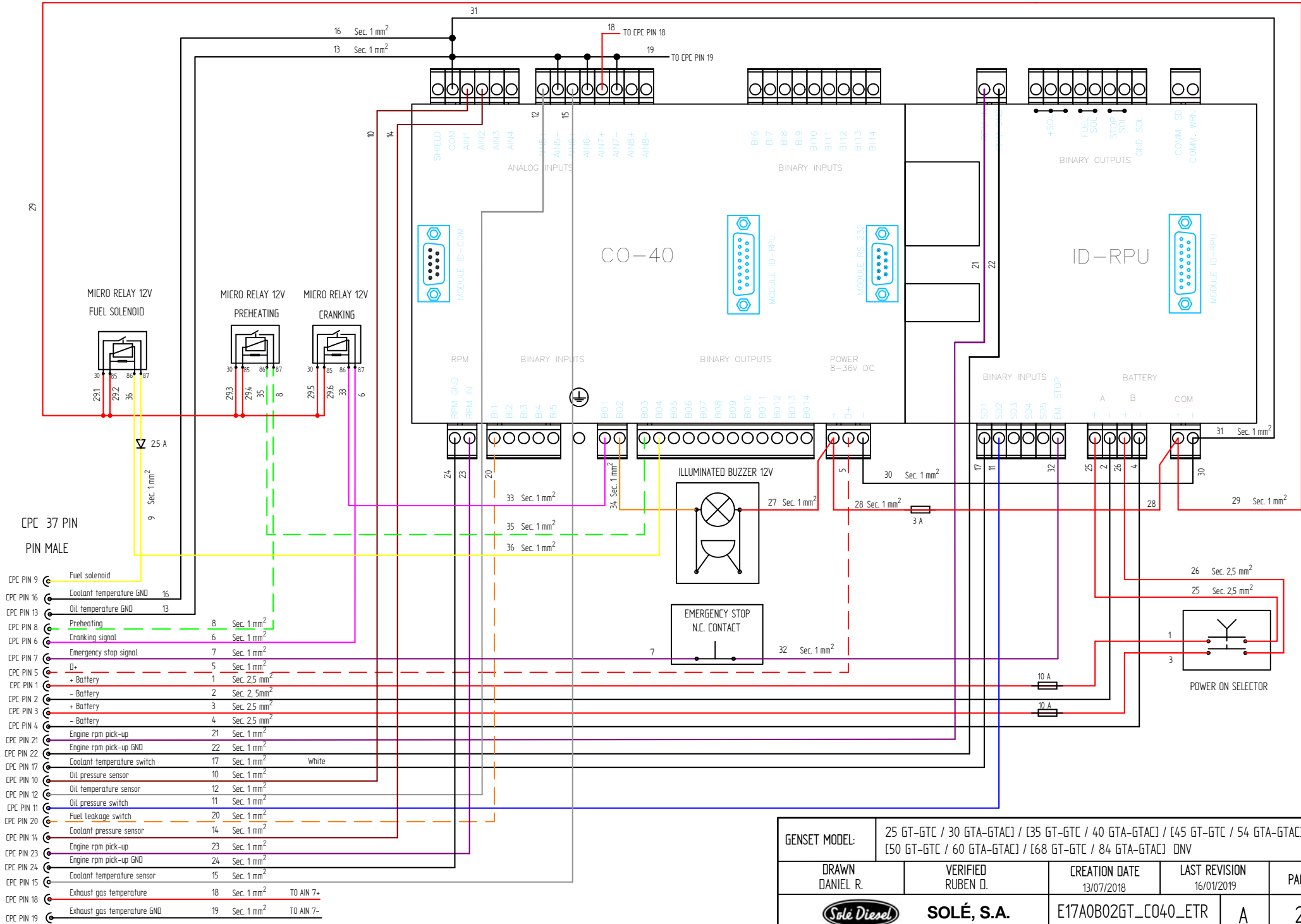



GENSET MODEL:	[8/11/17/25/35/45/50/68 GT-GTC, 10/14/20/30/40/54/60/84 GTA-GTAC] [7/10/14/20/29 GS-GSC, 8/12/17/25/32 GSA-GSAC]			
ENGINE MODEL:	[MINI 26, MINI 33, MINI 44, MINI 63, MINI 74, SM-56, SM-81, SM-105]			
DRAWN DANIEL R.	VERIFIED RUBEN D.	CREATION DATE 13/07/2018	LAST REVISION 29/11/2019	PAGE
 <b>SOLE, S.A.</b>		E17A0B02GT_C040_ETR	B	1



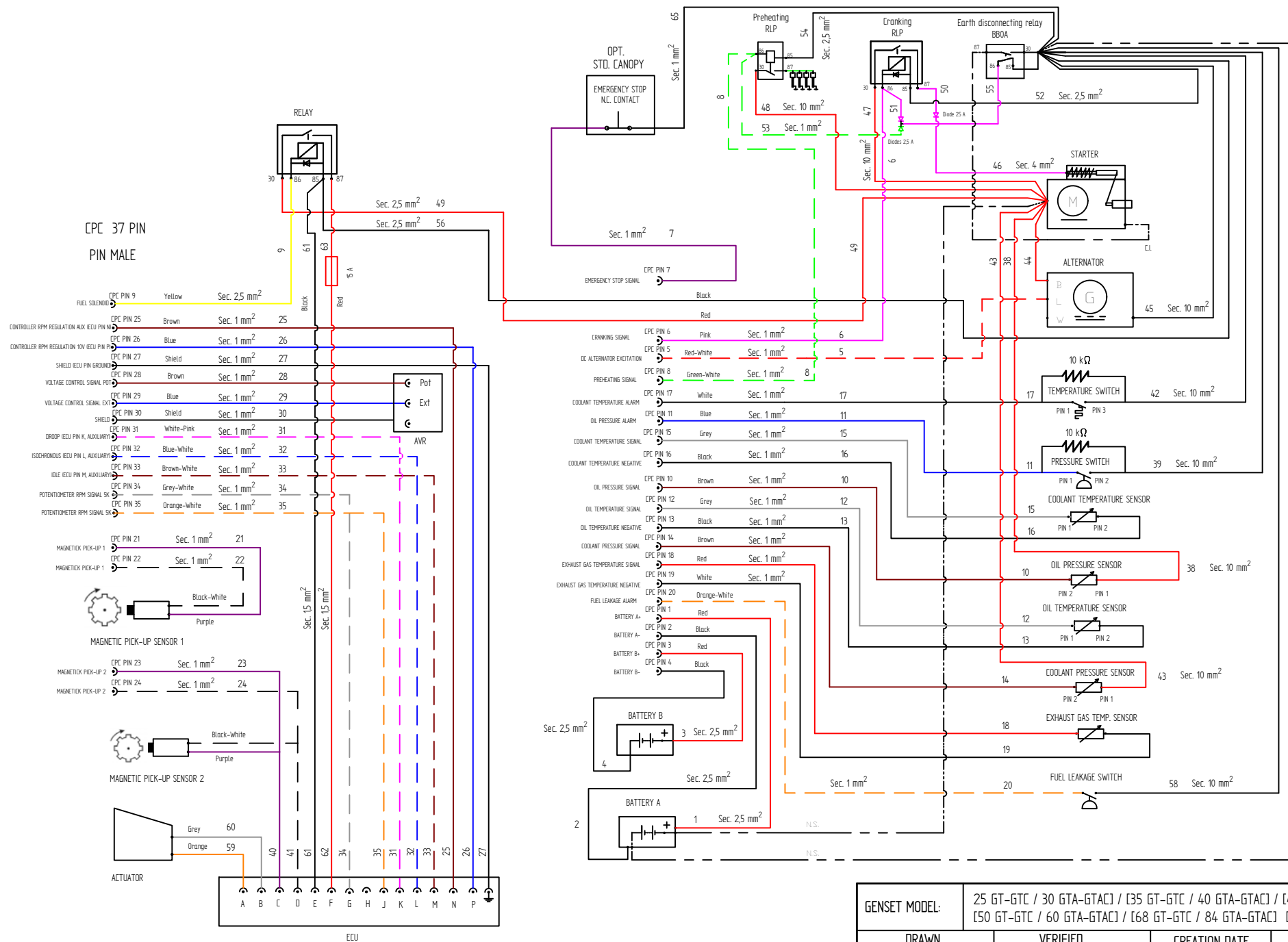



GENSET MODEL:		25 GT-GTC / 30 GTA-GTAC] / [35 GT-GTC / 40 GTA-GTAC] / [45 GT-GTC / 54 GTA-GTAC] / [50 GT-GTC / 60 GTA-GTAC] / [68 GT-GTC / 84 GTA-GTAC] DNV			
DRAWN DANIEL R.	VERIFIED RUBEN D.	CREATION DATE 13/07/2018	LAST REVISION 16/01/2019	PAGE	
		SOLE, S.A.		E17A0B02GT_C040_ETR	A 1



GENSET MODEL:		25 GT-GTC / 30 GTA-GTAC] / [35 GT-GTC / 40 GTA-GTAC] / [45 GT-GTC / 54 GTA-GTAC] / [50 GT-GTC / 60 GTA-GTAC] / [68 GT-GTC / 84 GTA-GTAC] DNV				
DRAWN DANIEL R.		VERIFIED RUBEN D.		CREATION DATE 13/07/2018	LAST REVISION 16/01/2019	PAGE
		SOLE, S.A.		E17A0B02GT_C040_ETR		A
						2

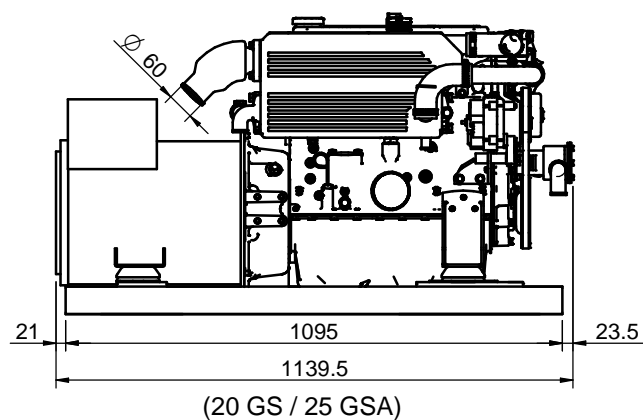




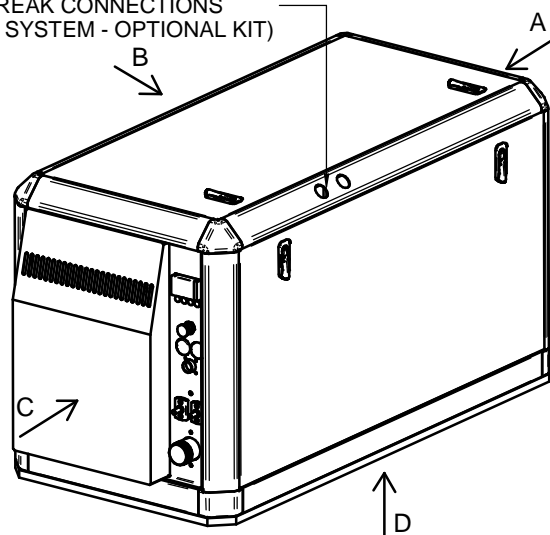
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DRAWN DANIEL R.		VERIFIED RUBEN D.		CREATION DATE 13/07/2018	LAST REVISION 16/01/2019
		<b>SOLE, S.A.</b>		E17A0B02GT_C040_ETR	A
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## Section 12 – Overall dimensions

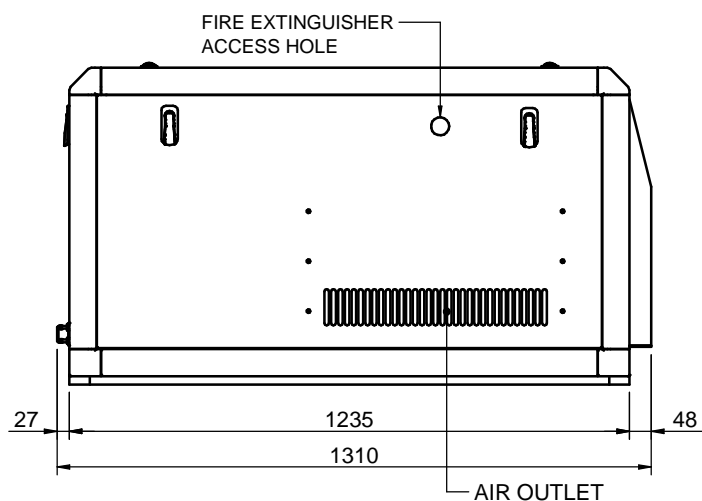
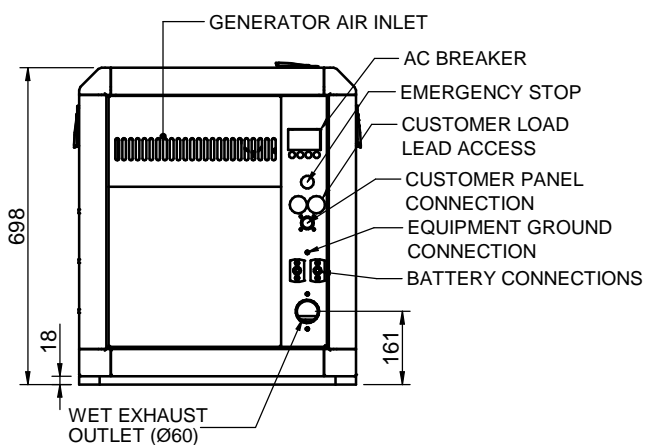


SIPHON BREAK CONNECTIONS  
(AIR VENT SYSTEM - OPTIONAL KIT)



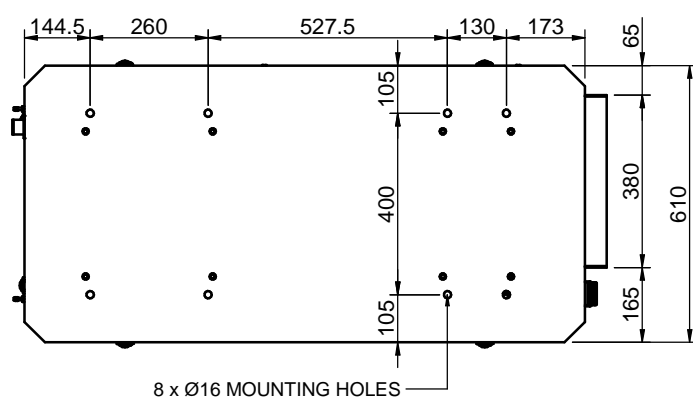
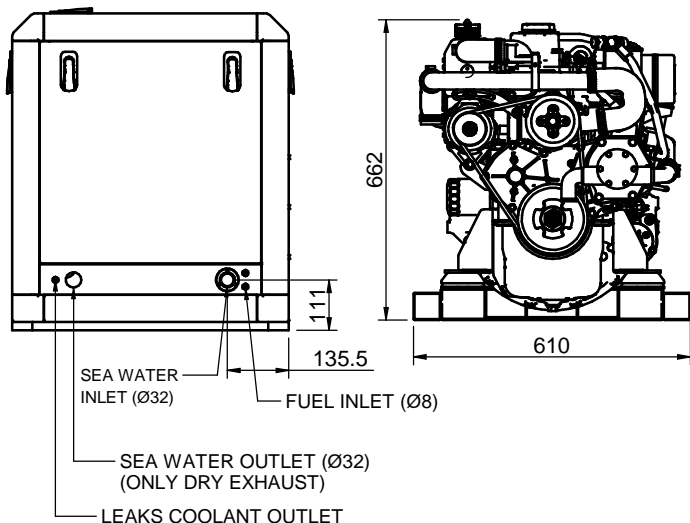
VIEW C

VIEW B



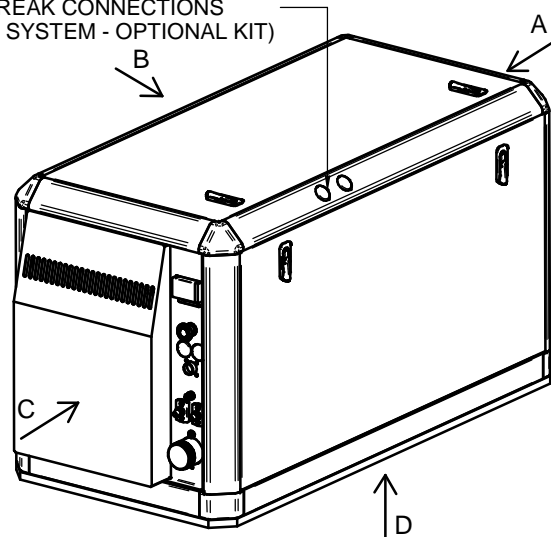
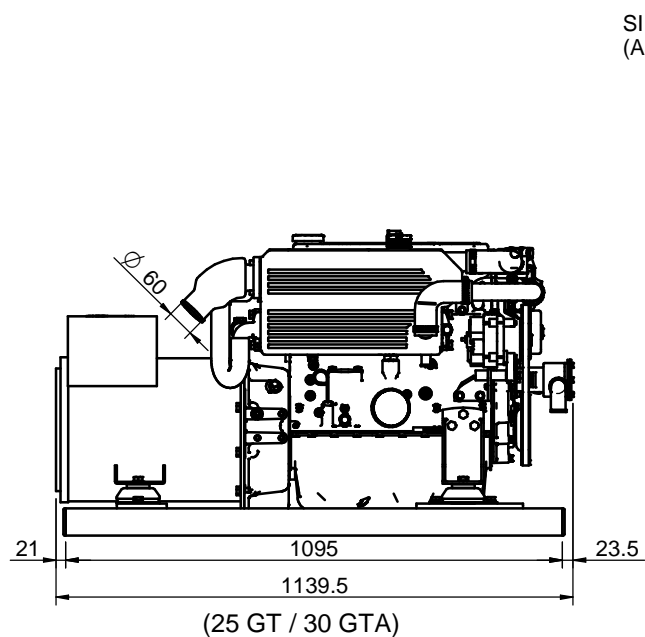
VIEW A

VIEW D

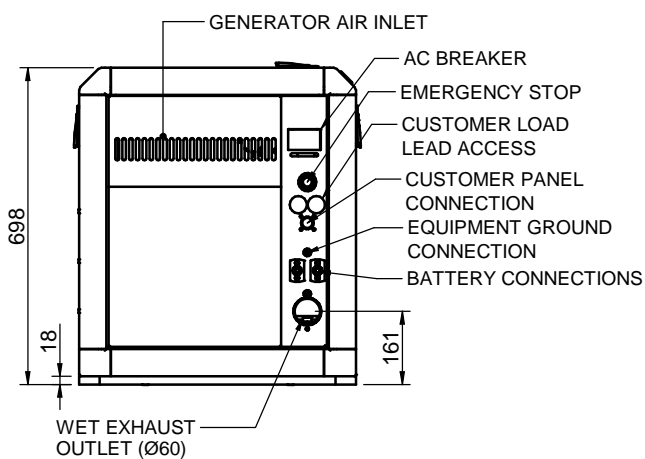


## GRUPO 20 GS-20 GSC / 25 GSA-25 GSAC GENSET 20 GS-20 GSC / 25 GSA-25 GSAC

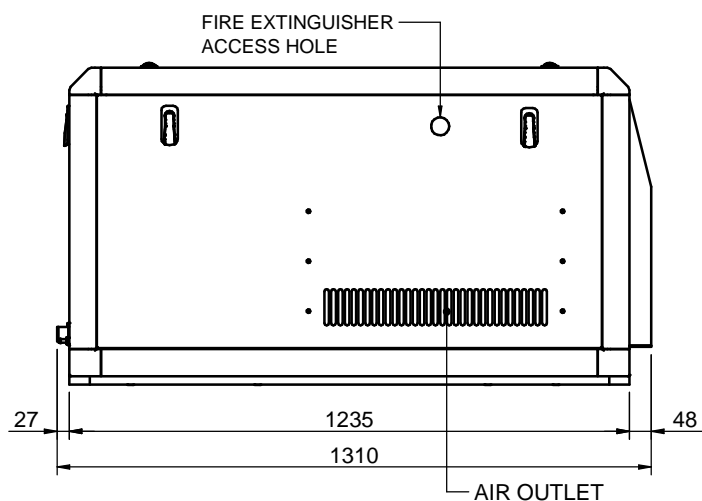
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DIBUJADO XAVIER	VERIFICADO S.UBACH	GRADO PRECISIÓN	FECHA CREACIÓN 08/04/2013	ÚLTIMA REVISIÓN
		SOLÉ, S.A.		GKAU/GKMU



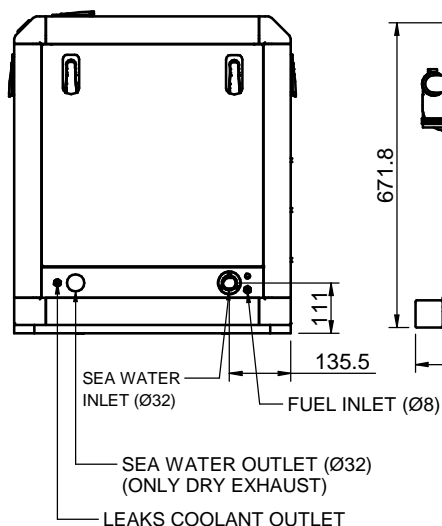
VIEW C



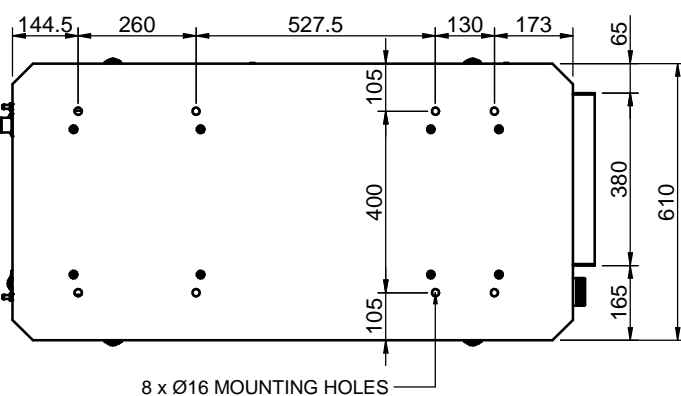
VIEW B



VIEW A



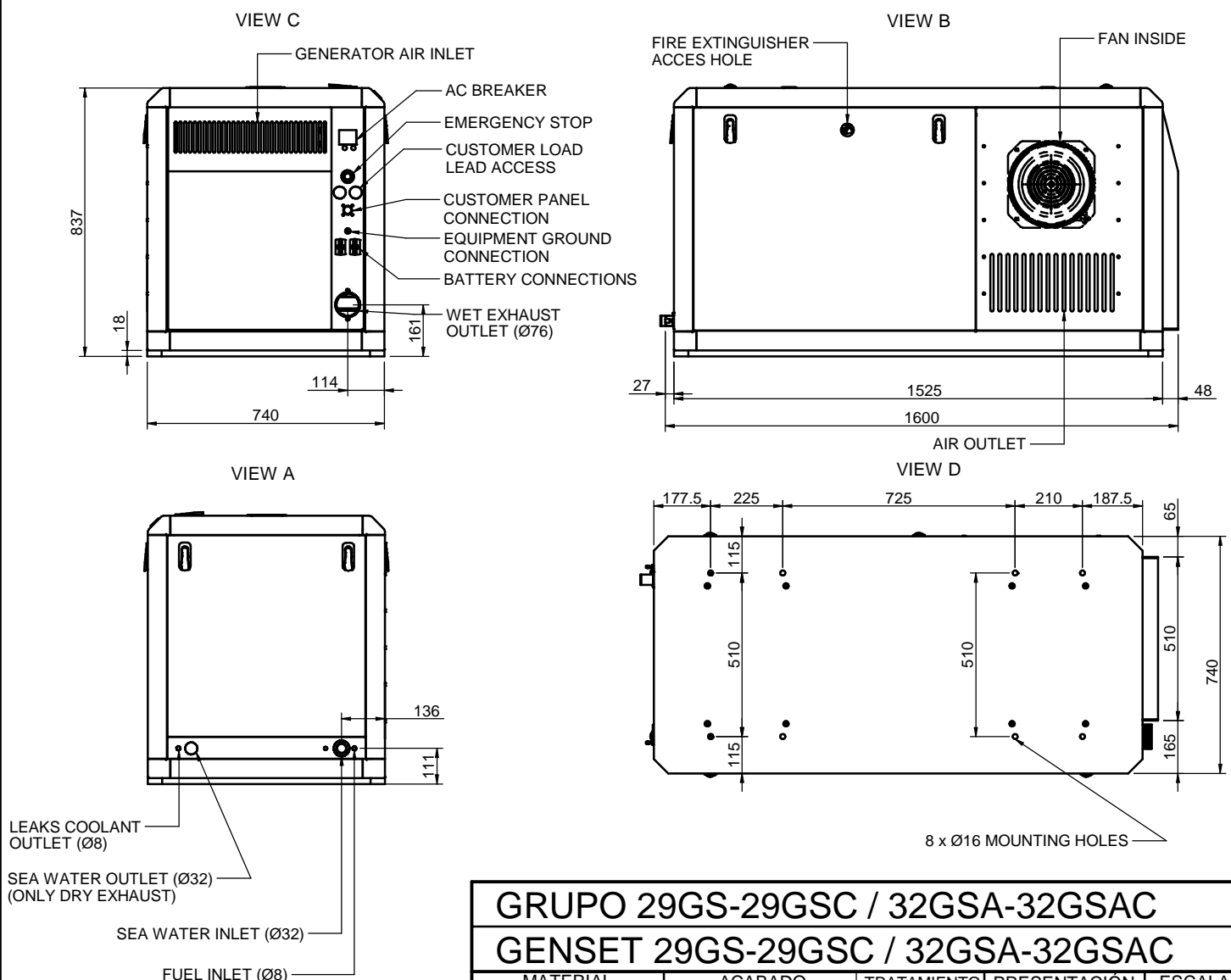
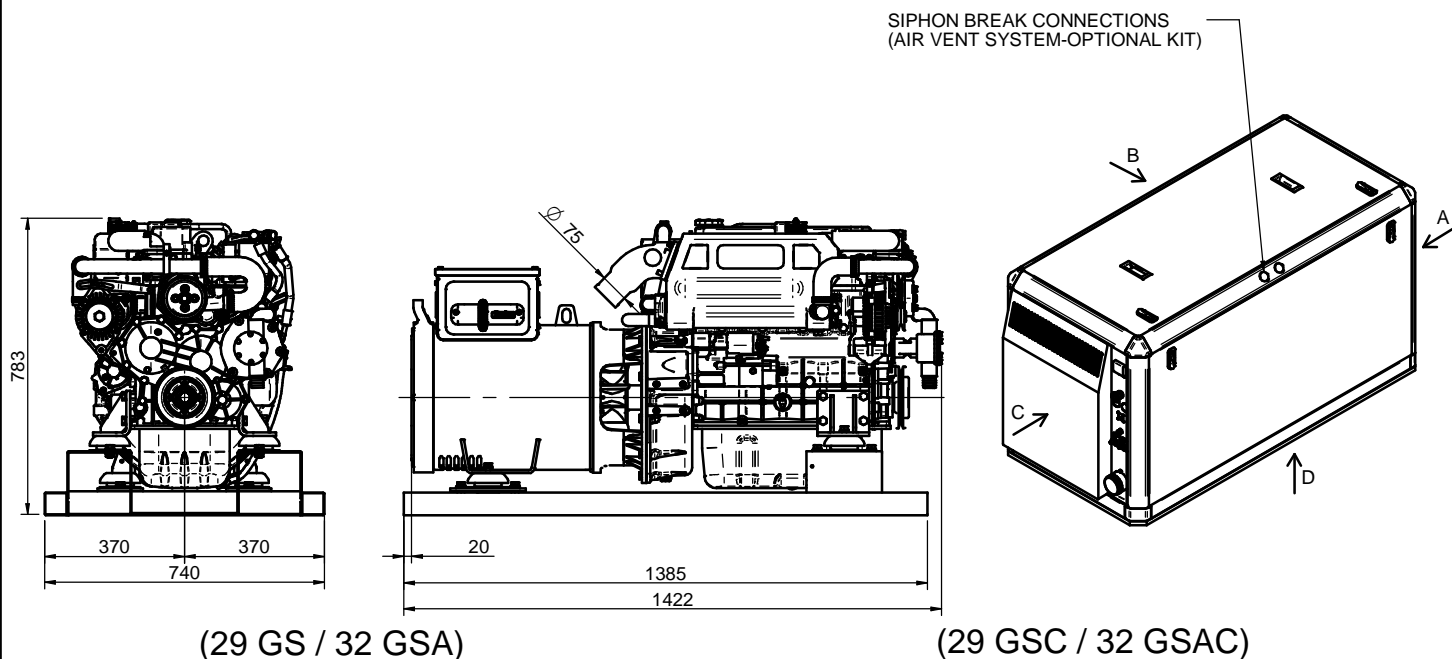
VIEW D



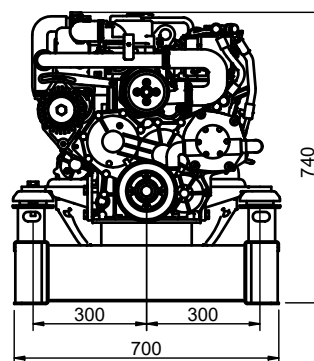
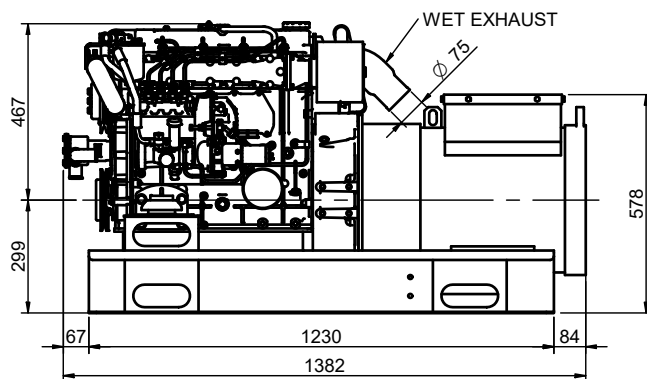
## GRUPO 25 GT-25 GTC / 30 GTA-30 GTAC

## GENSET 25 GT-25 GTC / 30 GTA-30 GTAC

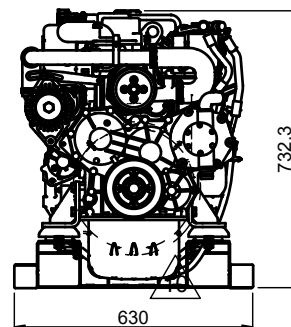
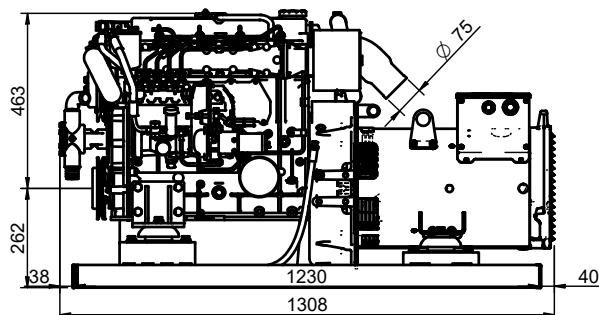
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DIBUJADO XAVIER	VERIFICADO S.UBACH	GRADO PRECISIÓN	FECHA CREACIÓN 08/04/2013	ÚLTIMA REVISIÓN
		SOLÉ, S.A.		GKBJ/GKMY



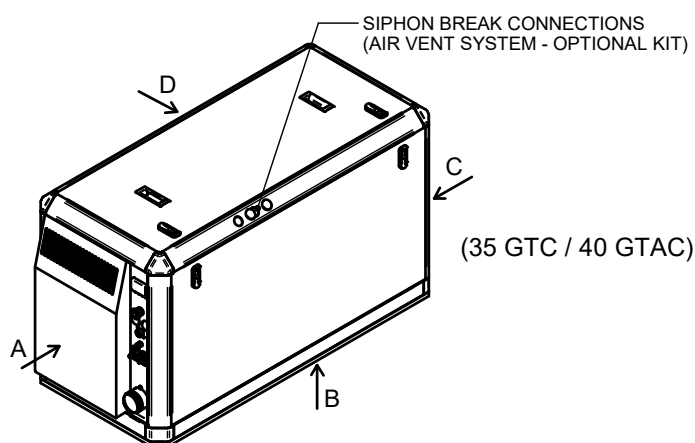
GRUPO 29GS-29GSC / 32GSA-32GSAC				
GENSET 29GS-29GSC / 32GSA-32GSAC				
MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
				-/-
DIBUJADO P. IGLESIAS	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN 15/04/2020	ÚLTIMA REVISIÓN 01/01/2022
		SOLÉ, S.A.		FA0711 FA0720



(G-35T-15)

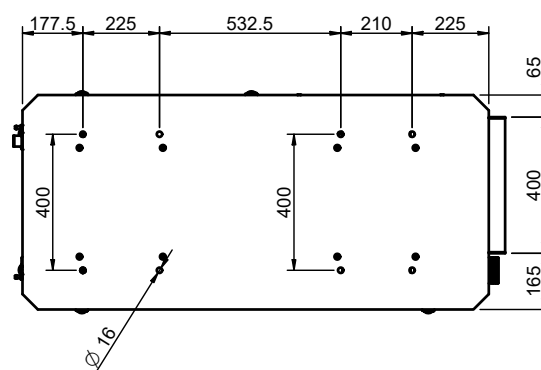


(35 GT / 40 GTA)

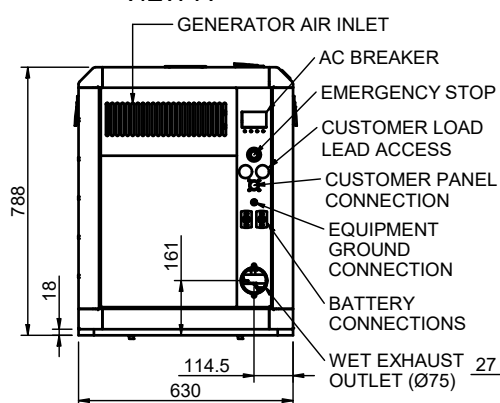


(35 GTC / 40 GTAC)

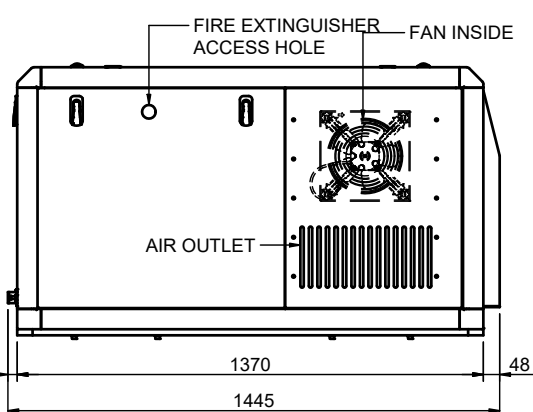
VIEW B



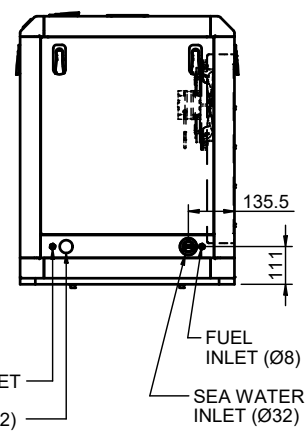
VIEW A



VIEW D

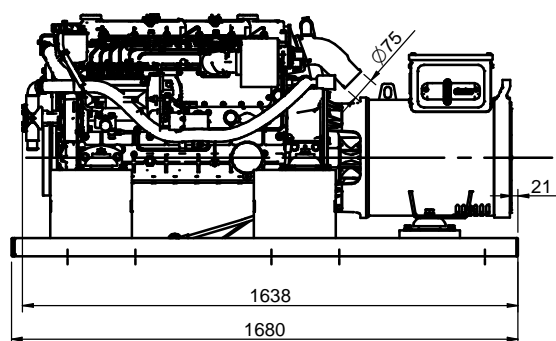


VIEW C

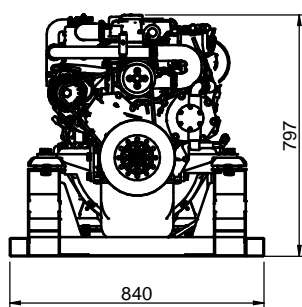


LEAKS COOLANT OUTLET  
SEA WATER OUTLET (Ø32)  
(ONLY DRY EXHAUST)

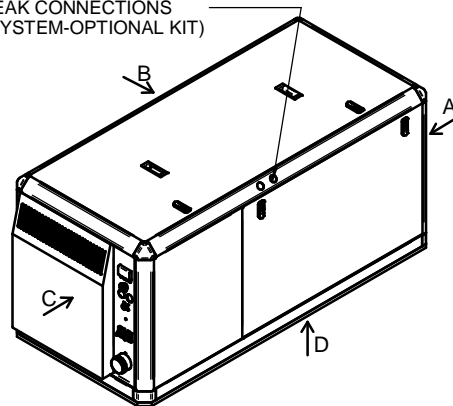
GRUPO 35 GT-35 GTC / 40 GTA-40 GTAC / G-35T-15				
GENSET 35 GT-35 GTC / 40 GTA-40 GTAC / G-35T-15				
MATERIAL	ACABADO	TRATAMIENTO	PRESENTACION	ESCALA
DIBUJADO XAVIER	VERIFICADO S. UBACH	GRADO PRECISION	FECHA CREACION 01-03-2013	ULTIMA REVISION
Solé Diesel		SOLÉ, S.A.		GGAZ/GGMZ/GGAE



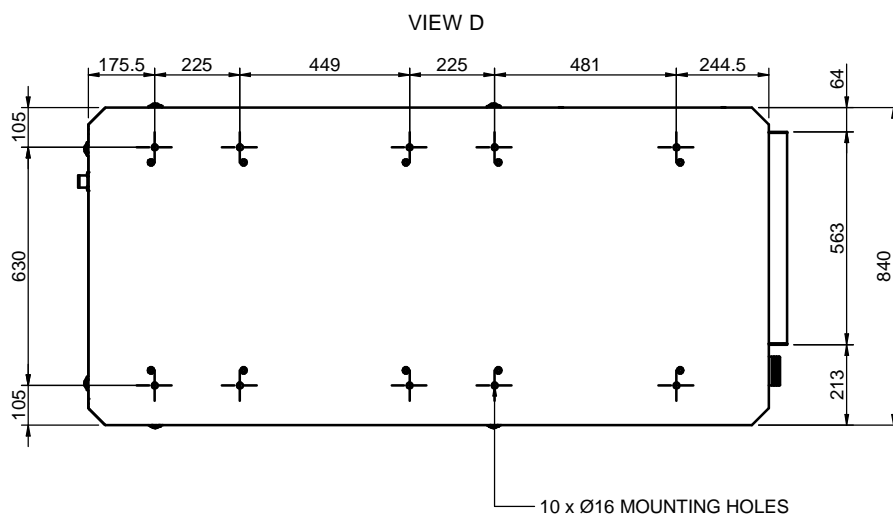
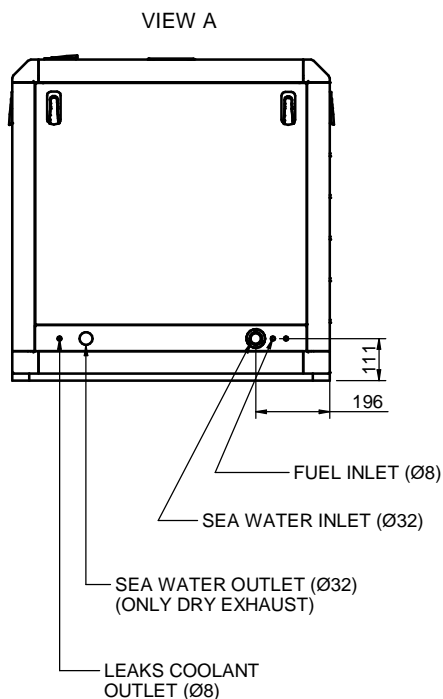
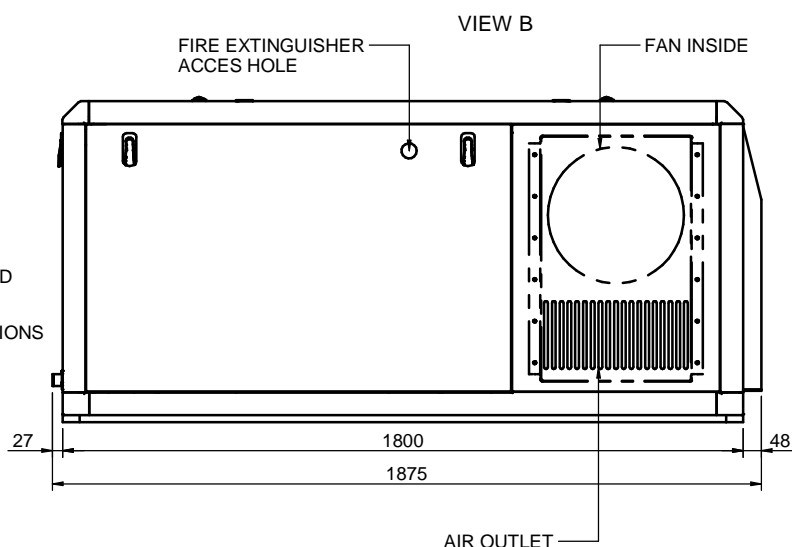
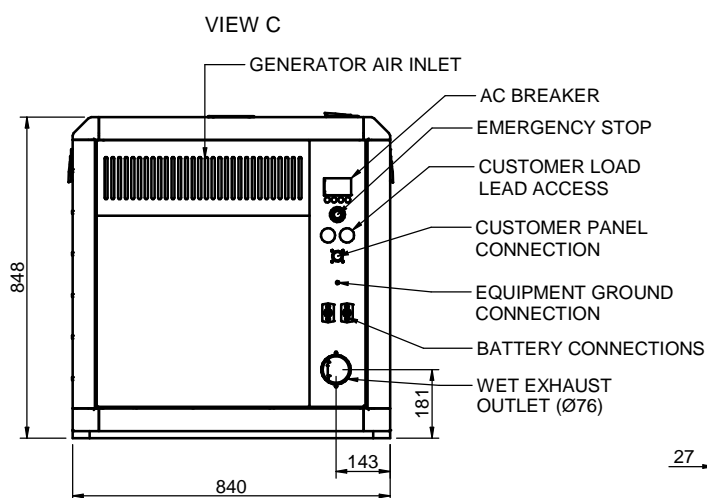
(50 GT / 60 GTA)



SIPHON BREAK CONNECTIONS  
(AIR VENT SYSTEM-OPTIONAL KIT)



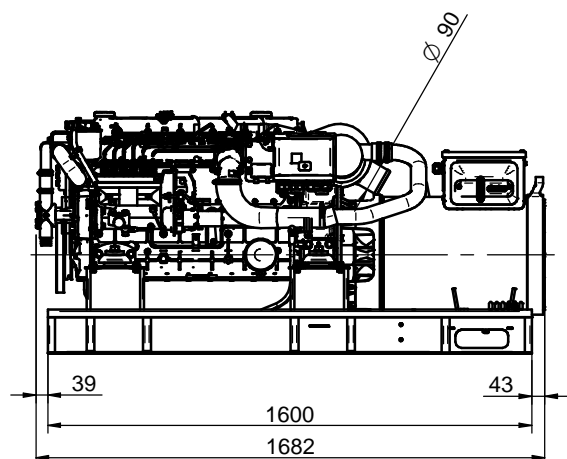
(50 GTC / 60 GTAC)



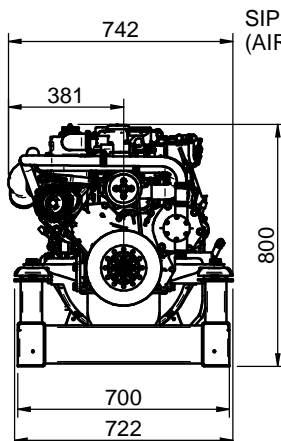
## GRUPO 50 GT-50 GTC / 60 GTA-60 GTAC GENSET 50 GT-50 GTC / 60 GTA-60 GTAC

MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
				-/-
DIBUJADO P. IGLESIAS	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN 15/04/2020	ÚLTIMA REVISIÓN 01/01/2022
		<b>SOLÉ, S.A.</b>		<b>FA0728 FA0730</b> <b>FA0737 FA0729</b>

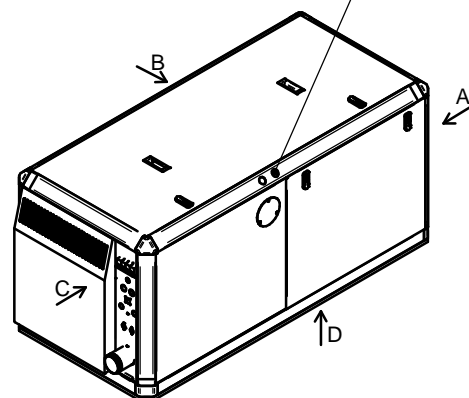




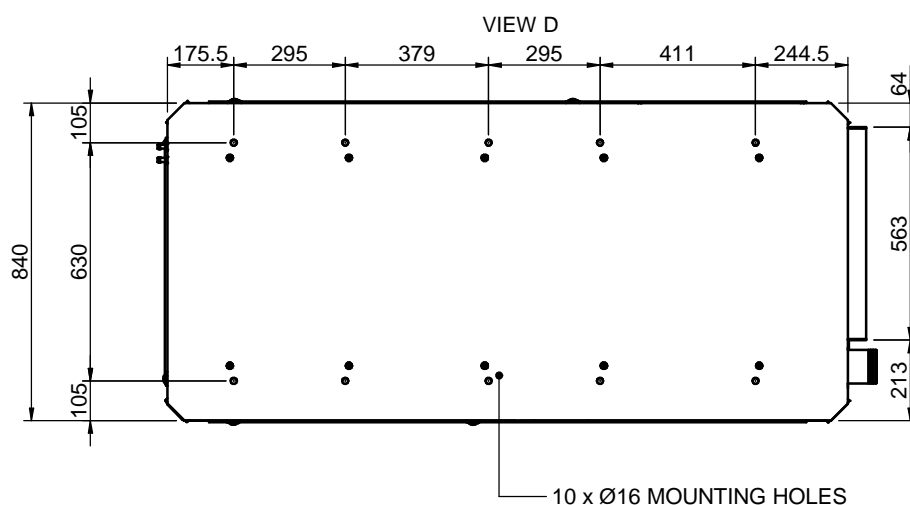
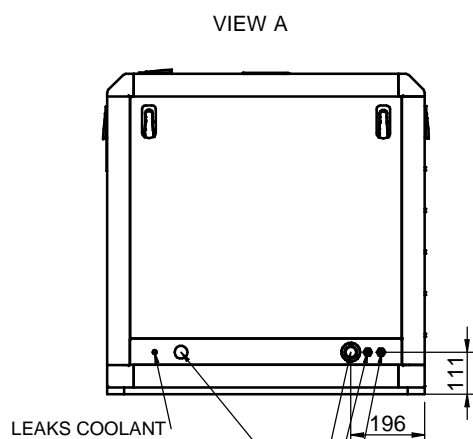
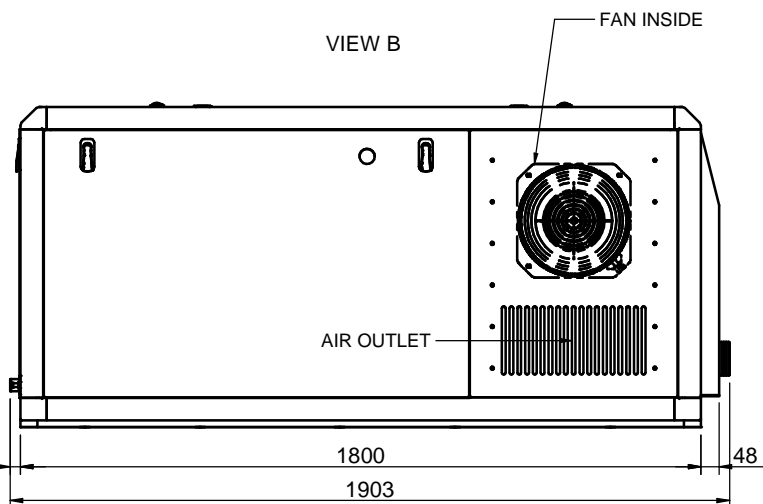
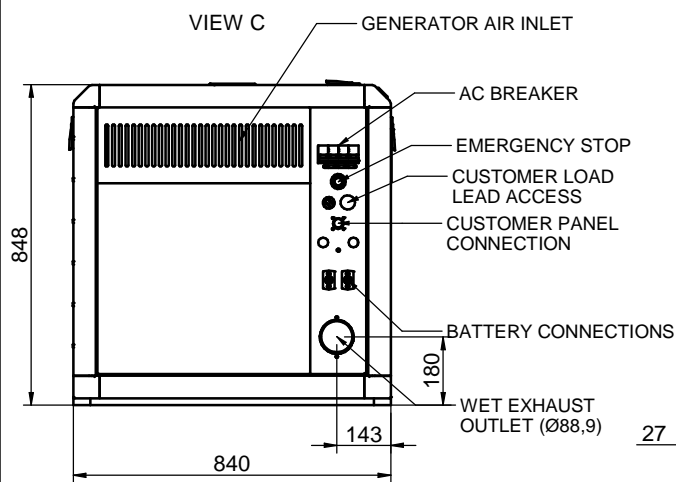
(68 GT / 84 GTA)



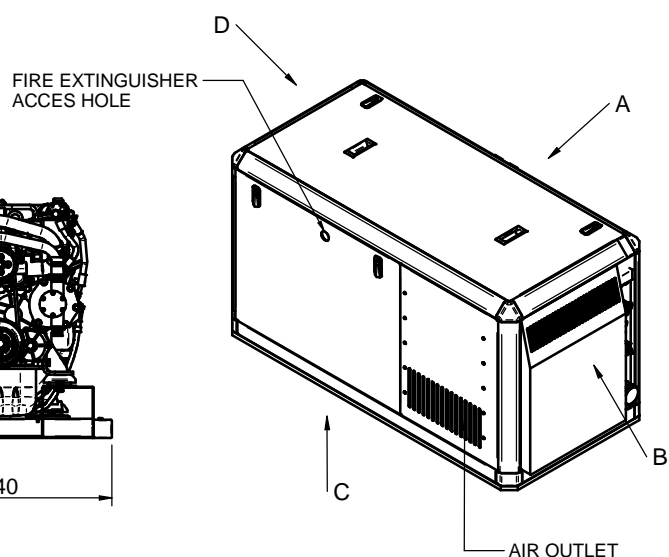
SIPHON BREAK CONNECTIONS  
(AIR VENT SYSTEM-OPTIONAL KIT)



(68 GTC / 84 GTAC)

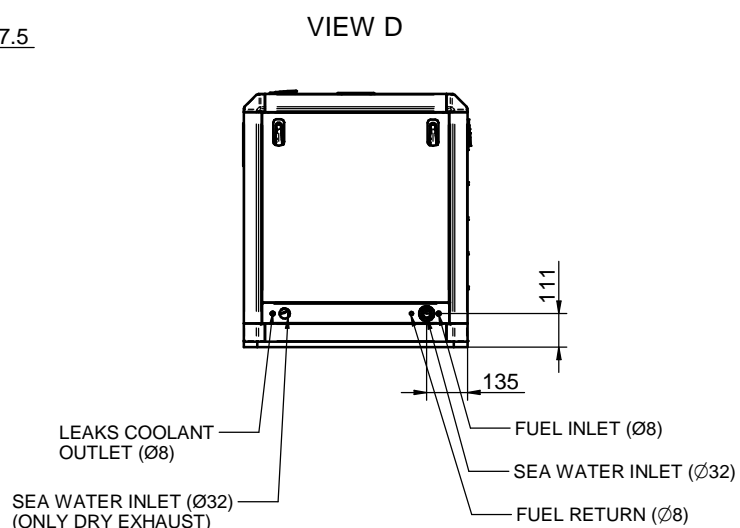
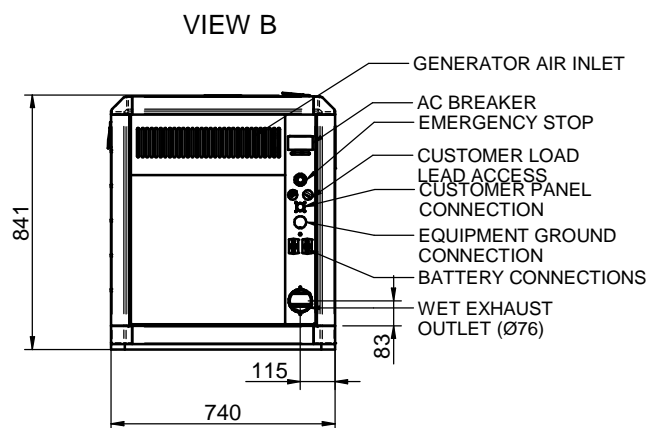
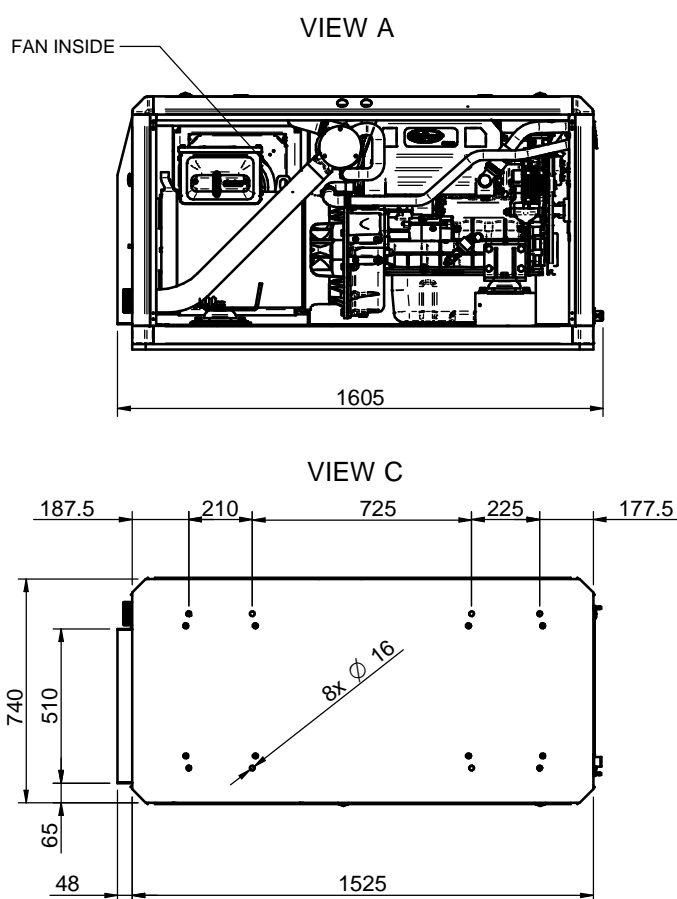



Medidas Nominales (mm)		GRUPO 68 GT-68 GTC / 84 GTA-84 GTAC				
		GENSET 68 GT-68 GTC / 84 GTA-84 GTAC				
		MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
		DIBUJADO	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN
		P.IGLESIAS			20/10/2017	01/01/2022
		SOLE, S.A.				
		FA0780 FA0781 FA0788 FA1304				



(45 GT / 54 GTA)

(45 GTC / 54 GTAC)



Medidas Nominales (mm)		100	GRUPO 45 GT-45 GTC / 54 GTA-54 GTAC										
		30	GENSET 45 GT-45 GTC / 54 GTA-54 GTAC										
		6	MATERIAL		ACABADO		TRATAMIENTO	PRESENTACIÓN	ESCALA				
		0	DIBUJADO P.IGLESIAS		VERIFICADO V.MIRAVET		GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN				
Grado de Precisión DIN-7168		Fino	±0.05	±0.1	±0.15	±0.3	±0.5	±1.2	11/11/2019		01/01/2022		
		Medio	±0.05	±0.1	±0.15	±0.3	±0.5	±1.2					
		Basto	±0.05	±0.1	±0.15	±0.3	±0.5	±1.2					
										SOLÉ, S.A.		FA1256/FA1393 FA1395/FA1396	

# Instructions to replace and remove



## Section 13 – 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 14 – Inspection prior to the delivery of generator sets

### INSPECTION PRIOR TO THE DELIVERY OF GENERATOR SETS

<b>Installer / Marina information</b>			
Installer Company:		Installation Date:	
Contact Tel. No.:		E-mail:	
<b>Owner's Information</b>			
Name and surnames:			
Contact Tel. No.:		Email:	
<b>Generator Set Information</b>			
Generator set model:			
Generator set serial number:		Alternator serial No. (if applicable):	
<b>Installation Information</b>			
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
<b>Exhaust, Cooling and Fuel Line Information</b>			
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
<b>Verifications Prior to Start-Up</b>		<b>V/x</b>	<b>Notes</b>
Correct engine alignment.			
Electrical installation connections.			
Engine oil level			
Coolant level and concentration.			
Control panel operation.			
Transmission belts and belt tension.			
Airtight water cock			
<b>Verification of Generator Set No. - Load Operation</b>		<b>V/x</b>	<b>Notes</b>
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



## Maintenance log

DATE	HOURS	DESCRIPTION	SERVICE NAME

# Maintenance log



DATE	HOURS	DESCRIPTION	SERVICE NAME







**MARINE DIESEL ENGINES · GENSSETS · PROPELLERS · ACCESSORIES**

C-243 b, km 2 · 08760 Martorell (Barcelona)  
Tel. +34 93 775 14 00 · Fax +34 93 775 30 13  
[www.solediesel.com](http://www.solediesel.com) · [info@solediesel.com](mailto:info@solediesel.com)

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Revision 1  
07/2022