



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

# **Marine generator sets**

Operator's manual

TYPE APPROVAL (DNV)

85 GTC

100 GTAC

115 GTC

120 GTAC

U\_CTGR109165T\_EN  
Revision 0



# Introduction

## 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

### Abbreviations

BTDC: Before Top Dead Center

ATDC: After Top Dead Center

BBDC: Before Bottom Dead Center

ABDC: After Bottom Dead Center

API: American Petroleum Institute

ACEA: European Automobile Manufacturers' Association

ASTM: American Society for Testing Materials

TBD: To Be Determined

### Units of measurement

Measurements are based on the International System of Units (SI), and their converted metric values are indicated in parentheses (). For metric conversion, the following rates are used

- Pressure:  $1 \text{ Pa} = 1,0197 \cdot 10^{-5} \text{ kgf/cm}^2 = 1 \cdot 10^{-5} \text{ bar}$
- Torque:  $1 \text{ Nm} = 0,10197 \text{ kgf}\cdot\text{m}$
- Force:  $1 \text{ N} = 0,10197 \text{ kgf}$
- Power:  $1 \text{ W} = 1,341 \cdot 10^{-3} \text{ HP}$

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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.

### **⚠ WARNING**



**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)

# Safety precautions and instructions



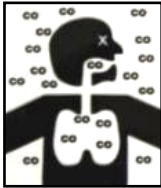
- Continuously discharge entire contents of a halon or CO2 portable fire extinguisher (or other provision) immediately.

## **⚠ 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 (SVT) 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.



# Safety precautions and instructions



Follow these precautions to prevent the starting of the engine by engine controller (SVT), 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.).

## Engine labels

### ⚠ CAUTION - AVISO ⚠

- Over cranking can cause engine water ingestion.

*Excesivos intentos de arranque pueden provocar entrada de agua en el motor.*

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.

### ⚠ AVISO ⚠

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



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

# Safety precautions and instructions

**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.

# Solé Diesel warranty

## 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		Work	
	Months	Hours	Months	Hours
Propulsion Engines	36	1000	12	2000
Generator Sets	36	1000	12	2000

## Solé Diesel extended warranty

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

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

# Solé Diesel warranty

## 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 15.
- 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 kilometers 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 15.
- 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 authorized 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) 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.

# Solé Diesel warranty

## 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 authorized 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

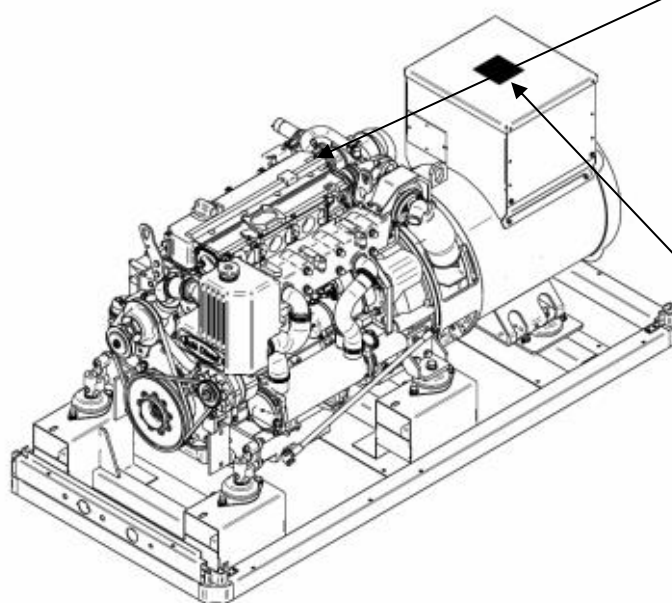
# Genset Information

## 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.



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

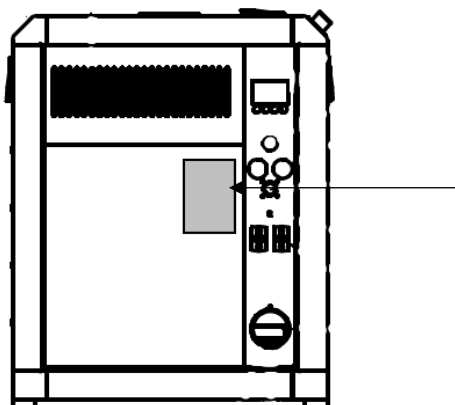


Model: 25 GT S/N: 116027

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

REFER TO OPERATOR'S  
MANUAL FOR MAINTENANCE  
SPECIFICATIONS AND  
ADJUSTMENTS

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



#### GENSET SERIAL NUMBER:

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

### ▲ NOTICE

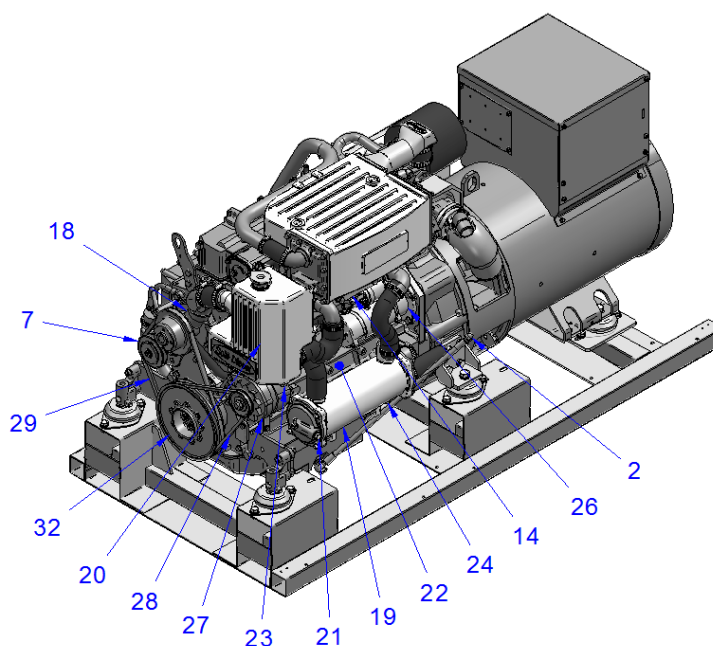
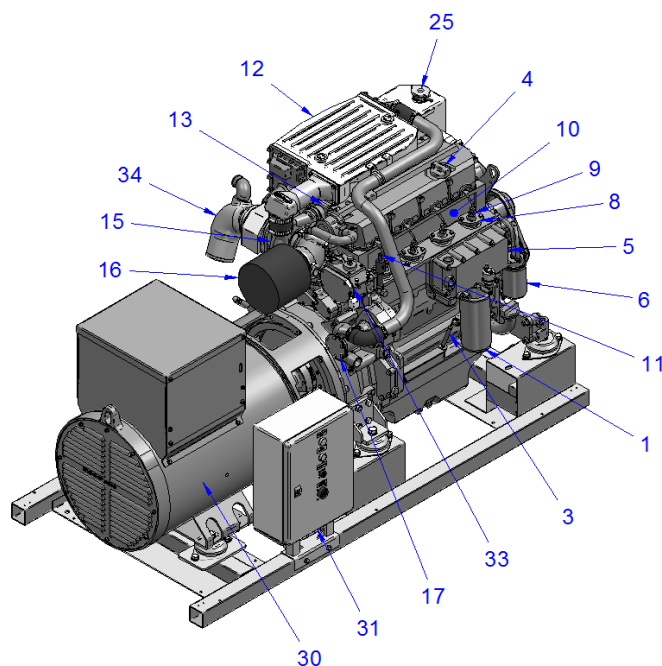
The standard genset can operate at temperatures between -18°C and +45°C.



# Genset Information

## 1.2. Genset parts identification

PIECE	ELEMENT
1	Oil filter
2	Oil drain plug
3	Dipstick
4	Oil filler cap
5	Oil cooler
6	Fuel filter
7	Fuel feed pump
8	Injection pumps
9	Injectors
10	Valves
11	Fuel overflow valve
12	Air cooled (only in 115 GT/GTC and 120 GTA/GTAC)
13	Admission manifold
14	Exhaust manifold
15	Turbocharger
16	Air filter
17	Se water pump
18	Coolant water pump
19	Heat exchanger
20	Expansion tank
21	Anode
22	Coolant drain plug (engine)
23	Coolant drain plug (tank)
24	Coolant drain plug (heat exchanger)
25	Coolant filler cap
26	Starter motor
27	Alternator 24V
28	Alternator belt
29	Coolant pump and fuel feed pump belt
30	AC alternator
31	ECU cabinet
32	Vibration dumper
33	Governor
34	Wet exhaust elbow



# Transport, handling and storage

## Section 2 – Transport, handling and storage

### 2.1 Reception

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

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

#### **⚠ NOTICE**

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

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

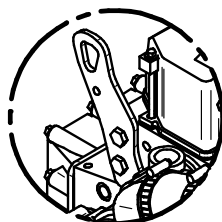
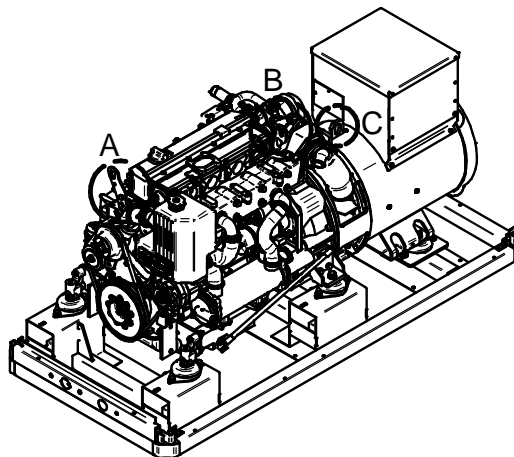




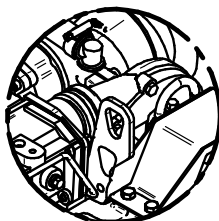
# Transport, handling and storage

## 2.3 Transporting and handling the unpacked genset

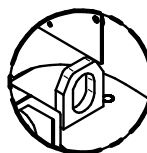
When the genset is unpacked and ready for transport, use **EXCLUSIVELY** the appropriate lifting eyebolts.



DETALLE A



DETALLE B



DETALLE C

## 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.

# Installation

## Section 3 – Installation

### 3.1 Genset information

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 CONTROLLER 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 .

# Operation

## 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 start-up 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.

# Operation

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

1. Use special low temperature coolant or suitable anti-freezing agent concentration.
2. Close the seawater cock, when the genset is stopped. Open the seawater filter cover and start the genset adding a mixture of freshwater and suitable anti-freezing agent concentration (see package labels) until the seawater circuit is filled completely. Stop the genset and replace the seawater filter cover. Before starting the genset again, open the seawater cock.  
Repeat this operation whenever the genset is used at temperatures below 0°C.
3. Use oil with suitable quality and viscosity. SAE 15W40 is recommended. Under extreme conditions contact with technical support.
4. Cover battery with an adequate material to protect it against the cold. Check that the battery is fully charged. It is also advisable to use a dielectric spray on the electrical connections.
5. When starting the genset, make sure that the glow plugs become hot enough.
6. If necessary, replace the diesel oil by a specified diesel oil type for low temperatures. The accumulation of impurities in the fuel tank could cause faulty firing.

## **▲ NOTICE**

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

### 4.3 Winterzation and preservation

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

# Operation

## 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. Verify whether there are any leaks in the fuel, coolant and oil systems.

# Systems and scheduled maintenance



## Section 5 – Systems and scheduled maintenance

### 5.1. Operating description

Information of special tools required and basic safety precautions.

#### Disassembly:

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

#### Reassembly:

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

#### **⚠ NOTICE**

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

### 5.2. Periodic maintenance schedule

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

# Systems and scheduled maintenance

		Intervals							Winter storage and Preservation
Inspection Item		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							
Lubrication system*	Compression pressure.					I			
	Genset oil.	I	C	C			C		C
Fuel system	Oil filter.		C	C					
	Fuel level.	I							
	Fuel tank.							CL	E/CL/I
	Fuel filter.				C				
	Water separator filter (if applicable).		E		C				
	Injection pump.					I			
Intake system	Injector.					I			
	Air filter.		I		C			C	I
Cooling system	Turbocharger							I	
	Coolant.	I						C	C
	Salt water circuit.								I/CL
	Anode			I/C					
	Water filter.	I	CL	CL					
	Sea water cock.	I							
Electrical system	Salt water pump impeller.			I/C	I				I/CL
	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 engine models, the several Pack, consult on the web.

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



### Maintenance task. Screw tightening, fastening

For details of tightening torques see Section 9 Torques.

### Maintenance task. Valve clearance inspection

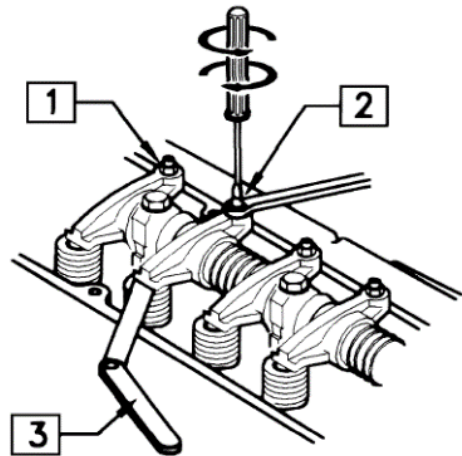
The rocker cover must be dismantled to check the valve clearance. This operation must be carried out when the genset is cold.

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

#### Inspection

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

With piston 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 timing signs of the distribution or timing cover and the crankshaft pulley.



#### **▲ NOTICE**

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



# Systems and scheduled maintenance



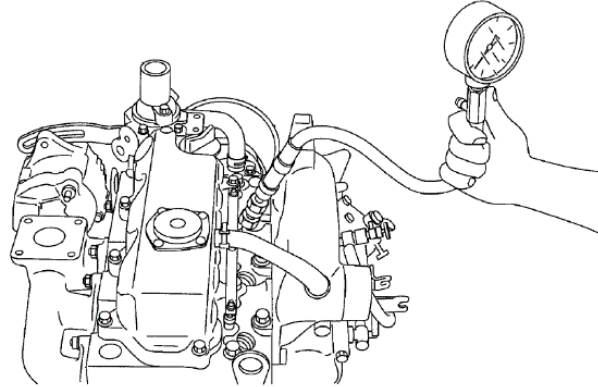
## Maintenance task. Compression pressure inspection

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.



If the compression pressure is lower than repair limit, check the genset parts affected.

Model	Compression pressure
85 GTC / 100 GTAC / 115 GTC / 120 GTAC DNV	3,0 a 3,8 MPa (30,6 a 38,7 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

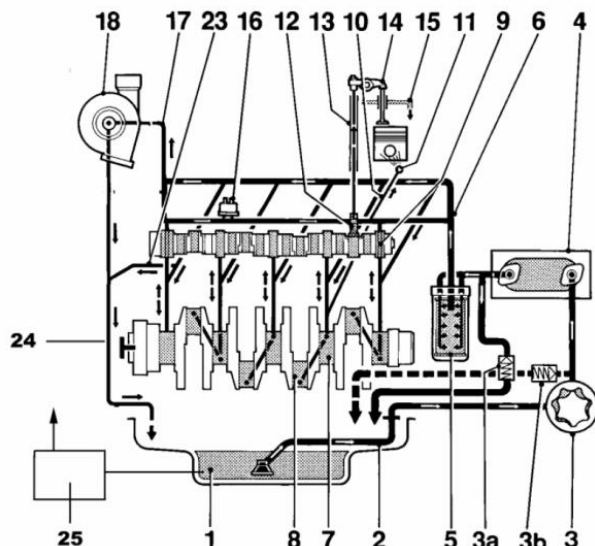


## 5.4. Lubrication system

### Circuit description

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

PIECE	ELEMENT
1	Oil pan
2	Aspiration pipe
3	Oil pump
3(a)	Flow control valve
3(b)	Maximum pressure valve
4	Oil heat exchanger
5	Oil filter
6	Oil pipe
7	Crankshaft bearing
8	Connecting rod bearing
9	Camshaft bearing
10	Cooling cylinder pipe
11	Cooling cylinder pipe
12	Tappet
13	Pushrod
14	Rocker arm
15	Pipe to oil pan
16	Oil pressure sensor
17	Pipe to turbocharger
18	Turbocharger
23	Pipe to oil pan
24	Pipe from turbocharger to oil pan
25	Oil suction pump



Model	*Oil circuit capacity (L)
85 GTC / 100 GTAC / 115 GTC / 120 GTAC DNV	11

\*Including filter change (0,5l)

### 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.

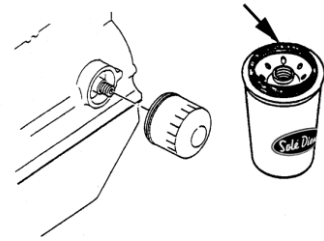


# Systems and scheduled maintenance



## Maintenance task. Oil filter change

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



## Maintenance task. Oil level check

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

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

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

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

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

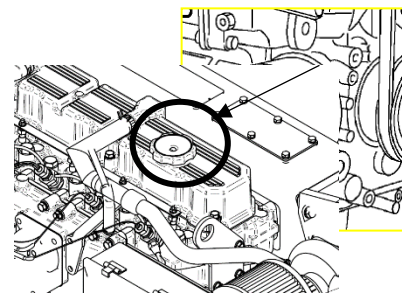
### **⚠ NOTICE**

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

## Maintenance task. Oil fill/change

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

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



### **⚠ NOTICE**

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

# Systems and scheduled maintenance

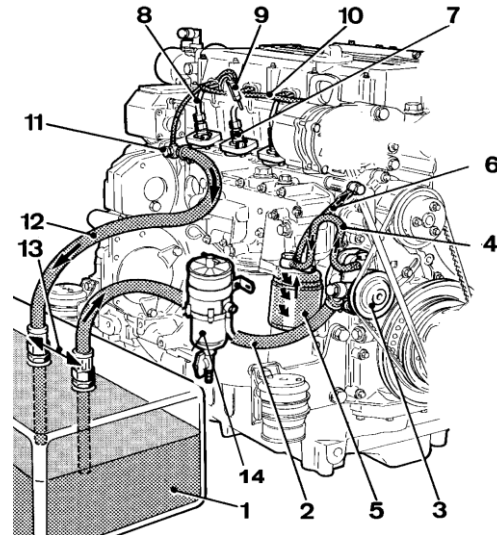


## 5.5. Fuel system

### Circuit description

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

PIECE	ELEMENT
1	Fuel tank (supplied as accessory)
2	Fuel intake line (supplied as accessory)
3	Fuel feed pump
4	Fuel line to fuel filter
5	Fuel filter
6	Fuel line to injection pumps
7	Injection pumps
8	Fuel high-pressure pipes
9	Injectors
10	Fuel return line
11	Pressure holding valve
12	Fuel return to tank
14	Fuel decanting filter (supplied as accessory)



### Fuel specifications

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

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

### Maintenance task. Fuel level inspection

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

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

# Systems and scheduled maintenance



## Maintenance task. Fuel tank clean

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

## Maintenance task. Water separator filter purge

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

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



## Maintenance task. Fuel filter change

Procedure to change the fuel filter:

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



## **CAUTION**

Wash hands after any contact with diesel fuel.

## Maintenance task. Injection pump inspection

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

You must check:

- The presence of exhaust smoke color.  
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

This operation requires special tools and must be carried out by a service workshop licensed by Solé Diesel.

# Systems and scheduled maintenance



## 5.6. Cooling system

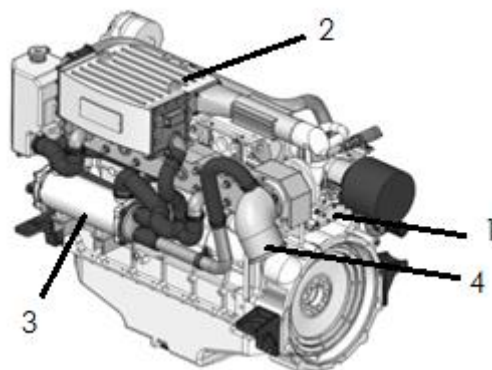
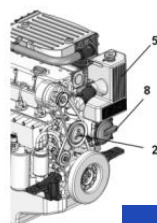
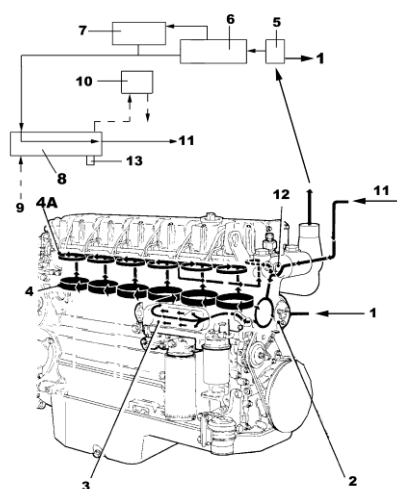
The genset cooling system is based on coolant circulation controlled by centrifugal pump with thermostatic control and heat exchanger, where the coolant is refrigerated by sea water. Moreover, the exhaust manifold is cooled also by sea water.

**Coolant circuit description**

PIECE	ELEMENT
1	Pump prime line
2	Coolant pump
3	Oil cooler
4	Cylinder cooling circuit
4A	Cylinder heat cooling circuit
5	Expansion tank
6	Wet exhaust manifold
7	Turbocharger
8	Heat exchanger
9	Seawater pipe
10	Wet exhaust elbow
11	Coolant pump inlet
12	Thermostat

**Sea water circuit description**

PIECE	ELEMENT
1	Sea water pump
2	Air cooler (only in 115 GT/GTC and 120 GTA/GTAC)
3	Heat exchanger
4	Wet exhaust elbow



Model	Coolant circuit capacity (L)
85 GTC / 100 GTAC / 115 GTC / 120 GTAC DNV	17,5

### Coolant specifications

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

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



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



# Systems and scheduled maintenance

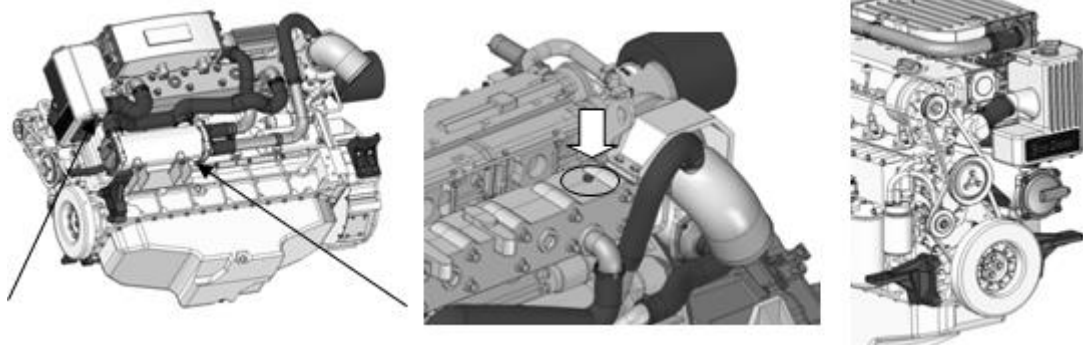


## Maintenance task. Coolant check

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 counter clockwise. Remove the cap after pressure has been completely released and the genset has cooled. Check the coolant level at the tank, the level must be approximately 3/4 full.

## Maintenance task. Coolant fill/change

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



## Maintenance task. Seawater filter inspection

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

To clean this filter:

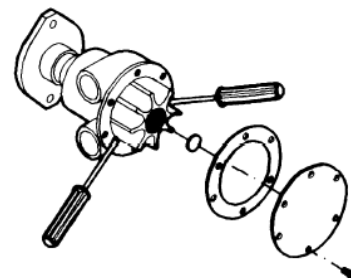
1. Loose the cover top, turning it.
2. Remove the filtering component and clean it.
3. Fit it again taking care that the cover is well seated on the o-ring.
4. Start the genset to check seawater leakages.



## Maintenance task. Seawater pump impeller inspection

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

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



# Systems and scheduled maintenance

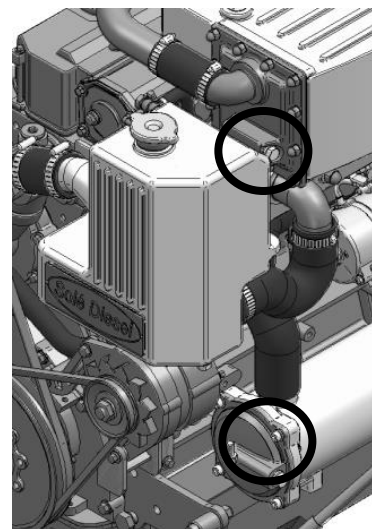


- If it is damaged replace with a new one.
6. Lubricate the impeller with soapy water before installation.
  7. Install the impeller. During installation push and rotate the impeller in the same direction as the genset rotation until it is thoroughly seated in the impeller housing.
  8. Inspect the cover plate and gasket for corrosion and/or damage. Replace components as necessary.
  9. Lubricate the gasket with silicon grease and attach the gasket and cover plate to the seawater pump housing.
  10. Open the seacock.
  11. Start the genset and check for leaks.

## Maintenance task. Zinc anode inspection

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

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



## 5.7. Inlet and exhaust system

### Exhaust circuit description

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

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

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

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

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

C = collector capacity (L)

D = Inside diameter of the tube (mm)

L = Tube length (mm)

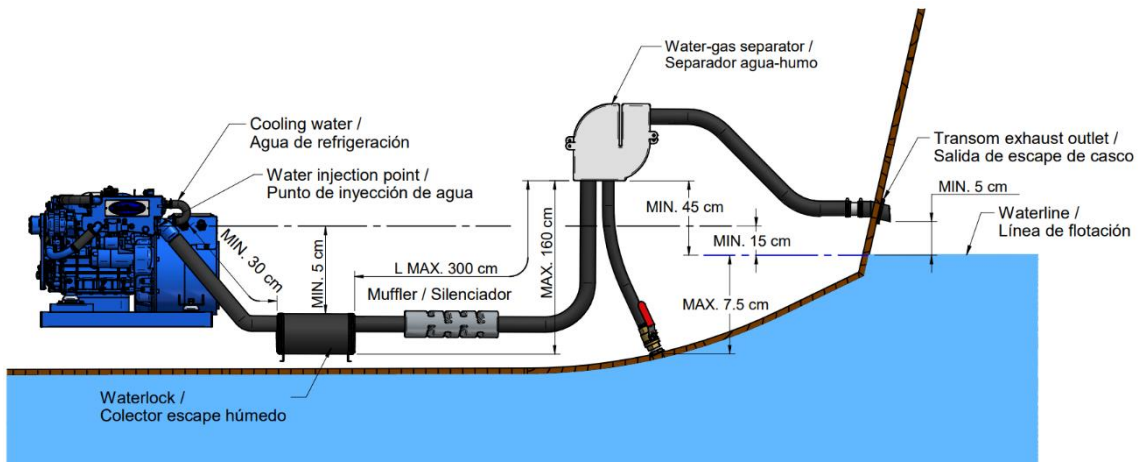
- Goose neck (supplied as accessory)
- Siphon breaker (supplied as accessory) – needed in case there is less than 150 mm between the water injection point of wet exhaust and the waterline, or if the point of injection is below waterline.



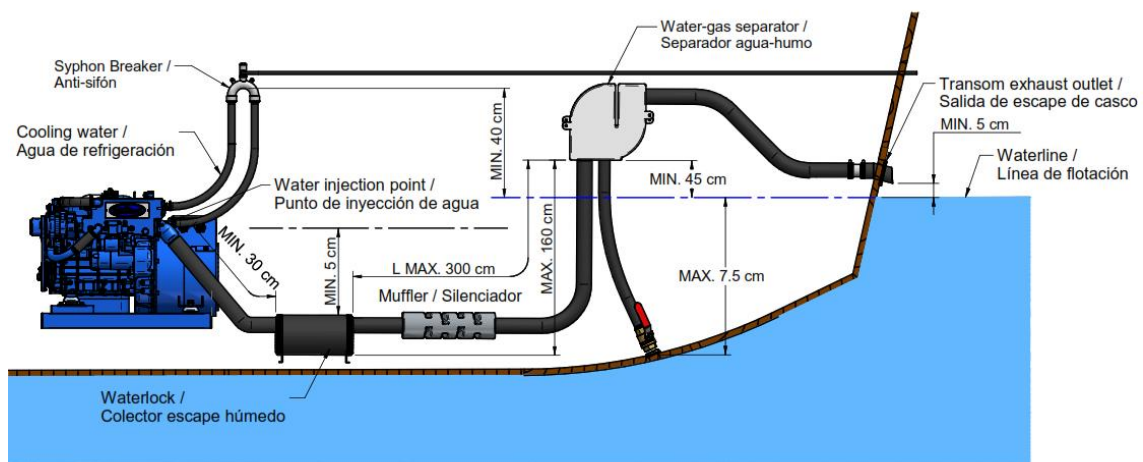
# Systems and scheduled maintenance



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



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



## ⚠ NOTICE

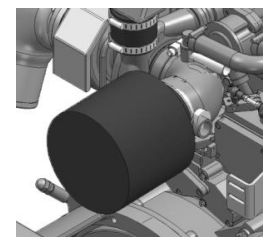
The wet exhaust is the genset's standard equipment. If you want dry exhaust, which is an optional equipment, contact with our dealers.

## Maintenance task. Air filter inspection

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

## ⚠ NOTICE

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



# Systems and scheduled maintenance



## Maintenance task. 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.

## Battery

The minimum recommended capacity is from 100Ah. 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)
85 GTC / 100 GTAC / 115 GTC / 120 GTAC DNV	100

## 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	Intensity (A)
85 GTC DNV (400/230V)	100
85 GTC DNV (230V)	180
100 GTAC DNV (480/277V)	100
100 GTAC DNV (240V)	200
115 GTC DNV (400/230V)	135
115 GTC DNV (230V)	240
120 GTAC DNV (480/277V)	125
120 GTAC DNV (240V)	240

# Systems and scheduled maintenance



## Maintenance task. Starter motor inspection

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



## Maintenance task. Alternator belt tension inspection

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

Item	Assembly Standard
V-belt deflection	10 – 12 mm

### **▲ 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.

# Systems and scheduled maintenance



## 5.7. Alternator

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

### Maintenance task. Control of windings and electrical insulation

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

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

### Maintenance task. Control of bearings

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

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

**Operating time**

20.000 horas

### **⚠ NOTICE**

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

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

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

### Maintenance task. Cleaning and lubrication

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

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

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

# Troubleshooting

## 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 rpm's.
			Check the windings.

# Troubleshooting

GENSET FAILURE	PROBABLE CAUSES		RECOMMENDED ACTIONS
NO LOAD VOLTAGE TOO HIGH	ALTERNATOR (AC)		Calibrate the voltage.
			Change the regulator.
UNDER LOAD VOLTAGE BELOW NOMINAL	ALTERNATOR (AC)		Calibrate the voltage.
			Current too high, $\cos\phi$ very low, speed below 4% of nominal.
			Change the regulator.
			Check the diodes, unhooking the cables.
UNDER LOAD VOLTAGE ABOVE NOMINAL	ALTERNATOR (AC)		Calibrate the voltage.
			Change the regulator.
UNSTABLE VOLTAGE	ALTERNATOR (AC)		Check for uniform rotation.
			Control regulator stability by adjusting potentiometer.
BLACK SMOKE	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.
BLUE SMOKE	GENERAL	Valve clearance incorrect	Adjust the valves.
	LUBRICATION SYSTEM	Oil level too high	Restore the oil to normal operating level.
NOISY GENSET	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.



# Troubleshooting

GENSET FAILURE	PROBABLE CAUSES		RECOMMENDED ACTIONS
<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.
<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>OIL PRESSURE TOO HIGH</b>	LUBRICATION SYSTEM	Oil pressure relief valve sticking	Contact with our dealer
		Faulty oil pressure valve	Contact with our dealer

# Troubleshooting

GENSET FAILURE	PROBABLE CAUSES		RECOMMENDED ACTIONS
<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.
<b>BATTERY CHARGE DEFECTIVE</b>	ELECTRICAL SYSTEM (DC)	Thermostat blocked at open position	Replace thermostat and check the coolant state.
		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.



# Technical specifications

## Section 7 – Technical specifications

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

<b>Active rated power*:</b>	68 kW	<b>Voltage:</b>	400/230 V
<b>Apparent rated power*:</b>	85 kVA	<b>Amperage:</b>	122,7 A
<b>Frequency:</b>	50 Hz	<b>Phases:</b>	3

**Dimensions and weights**

<b>Total lenght without canopy:</b>	1760 mm	<b>Total lenght with canopy:</b>	2007 mm
<b>Total width without canopy:</b>	866 mm	<b>Total width with canopy:</b>	865 mm
<b>Total height without canopy:</b>	969 mm	<b>Total height with canopy:</b>	1048 mm
<b>Dry weight without canopy:</b>	988 Kg	<b>Dry weight with canopy:</b>	1100 Kg

**Engine**

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

**Fuel system details**

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

**Electrical system**

<b>Battery voltage:</b>	24 V	<b>Stop solenoid type:</b>	ETS
<b>Starter motor:</b>	4 kW	<b>Alternator:</b>	35 A
<b>Battery cable section:</b>	50 mm2	<b>Battery cable length:</b>	5 m

**Installation details**

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

**Alternator details**

<b>Brand:</b>	Meccalte	<b>Cos φ:</b>	0,8
<b>Model:</b>	ECP34-1S/4	<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.

# 100 GTA/GTAC DNV



## Three-Phase

### General data

Active rated power*:	76 kW	Voltage:	480/277 V
Apparent rated power*:	95 kVA	Amperage:	114,3 A
Frequency:	60 Hz	Phases:	3

### Dimensions and weights

Total length without canopy:	1779 mm	Total length with canopy:	2007 mm
Total width without canopy:	866 mm	Total width with canopy:	865 mm
Total height without canopy:	969 mm	Total height with canopy:	1048 mm
Dry weight without canopy:	988 Kg	Dry weight with canopy:	1100 Kg

### Engine

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

### Fuel system details

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

### Electrical system

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

### Installation details

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

### Alternator details

Brand:	Meccalte	Cos φ:	0,8
Model:	ECP34-1S/4	Tropicalized:	S
Regulator type:	DSR	Excitation system:	Brushless
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN60034-1, IEC 60034-1
IP protection*:	23	Alternator type:	Synchronous

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

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

<b>Active rated power*:</b>	80 kW	<b>Voltage:</b>	400/230 V
<b>Apparent rated power*:</b>	100 kVA	<b>Amperage:</b>	144,3 A
<b>Frequency:</b>	50 Hz	<b>Phases:</b>	3

**Dimensions and weights**

<b>Total lenght without canopy:</b>	1770 mm	<b>Total lenght with canopy:</b>	2007 mm
<b>Total width without canopy:</b>	865 mm	<b>Total width with canopy:</b>	865 mm
<b>Total height without canopy:</b>	996 mm	<b>Total height with canopy:</b>	1048 mm
<b>Dry weight without canopy:</b>	1010 Kg	<b>Dry weight with canopy:</b>	1117 Kg

**Engine**

<b>Base engine manufacturer:</b>	Deutz	<b>Diameter:</b>	108 mm (4,25 in)
<b>Model Solé Diesel:</b>	SDZ-165	<b>Stroke:</b>	130 mm (5,12 in)
<b>Type:</b>	4 No. of Strokes	<b>Compression ratio:</b>	19:1
<b>Engine RPM:</b>	1500	<b>Injection system:</b>	Mechanical and direct
<b>Number of cylinders:</b>	4	<b>Intake system:</b>	Turbocharged with intercooler
<b>Total displacement:</b>	4764 cc	<b>SAE Flywheel housing:</b>	SAE 2
<b>Oil type:</b>	SAE 15W40	<b>Coolant capacity:</b>	17,5 L (4,62 gal)
<b>Oil capacity:</b>	11 L (2,91 gal)	<b>Flywheel:</b>	SAE 11 1/2
<b>Power:</b>	97 kW (131,92 CV)	<b>Coolant flow rate:</b>	141,5 l/min (37,38 gal/m)
<b>Salt water flow rate:</b>	107,4 l/min (28,37 gal/m)	<b>Intake air flow rate:</b>	6,1 m3/m
<b>Starting aid:</b>	#N/D		

**Fuel system details**

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

**Electrical system**

<b>Battery voltage:</b>	24 V	<b>Stop solenoid type:</b>	ETS
<b>Starter motor:</b>	4 kW	<b>Alternator:</b>	35 A
<b>Battery cable section:</b>	50 mm2	<b>Battery cable length:</b>	5 m

**Installation details**

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

**Alternator details**

<b>Brand:</b>	Meccalte	<b>Cos φ:</b>	0,8
<b>Model:</b>	ECP34-1L/4A	<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.

# 120 GTA/GTAC DNV



## Three-Phase

### General data

Active rated power*:	92 kW	Voltage:	480/277 V
Apparent rated power*:	115 kVA	Amperage:	138,3 A
Frequency:	60 Hz	Phases:	3

### Dimensions and weights

Total length without canopy:	1770 mm	Total length with canopy:	2007 mm
Total width without canopy:	865 mm	Total width with canopy:	865 mm
Total height without canopy:	996 mm	Total height with canopy:	1048 mm
Dry weight without canopy:	1010 Kg	Dry weight with canopy:	1117 Kg

### Engine

Base engine manufacturer:	Deutz	Diameter:	108 mm (4,25 in)
Model Solé Diesel:	SDZ-165	Stroke:	130 mm (5,12 in)
Type:	4 No. of Strokes	Compression ratio:	19:1
Engine RPM:	1800	Injection system:	Mechanical and direct
Number of cylinders:	4	Intake system:	Turbocharged with intercooler
Total displacement:	4764 cc	SAE Flywheel housing:	SAE 2
Oil type:	SAE 15W40	Coolant capacity:	17,5 L (4,62 gal)
Oil capacity:	11 L (2,91 gal)	Flywheel:	SAE 11 1/2
Power:	105 kW (142,8 CV)	Coolant flow rate:	162,1 l/min (42,82 gal/m)
Salt water flow rate:	130,4 l/min (34,45 gal/m)	Intake air flow rate:	7,8 m3/m
Starting aid:	#N/D		

### Fuel system details

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

### Electrical system

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

### Installation details

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

### Alternator details

Brand:	Meccalte	Cos φ:	0,8
Model:	ECP34-1L/4A	Tropicalized:	S
Regulator type:	DSR	Excitation system:	Brushless
Number of poles:	4	Voltage regulation accuracy**:	1%
Isolation type*:	H	Standards:	EN60034-1, IEC 60034-1
IP protection*:	23	Alternator type:	Synchronous

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

# Parallel operation

## Section 8 – Parallel operation

### 8.1. Control connections

This genset can be operated with or without our Parallel Kit. So if you have installed this kit, see the Parallel Kit Manual to operate the genset.

On the other hand, if it has not been installed, you have to design the control part of the genset. For this reason, it is necessary take into account the requirements of the electrical wiring, according to the ECU cabinet connector, where you have to connect.



SPECIFICATIONS						
PIN	IDENTIFICATION	DESCRIPTION	I/O SIGNAL*	SIGNAL REQUIREMENTS		
1	Spare	Not used		-	White	
2	Spare	Not used		-	Grey	
3	Spare	Not used		-	Green	
4	CAN low	CAN-interface SAE J 1939: ECU-Controller communication while ECU is activated.	Input/Output	CANL	Blue	
5	CAN high		Input/Output	CANH	Brown	
6	Screen		Input/Output	Earth point	White	
7	Cranking signal	<i>Cranking relay excitation:</i> This signal closes the cranking relay switch in order to engage the starter motor. *The start sequence should finish when the genset exceeds value of 25% nominal speed.	Input	24 VDC	Pink	
8	ECU power signal	<i>Power supply signal:</i> It has to be always active.	Input	24 VDC	Yellow	
9	+5Vref Speed governor	<i>Engine speed control:</i> Regulation used to correct the genset speed in order to maintain 1500 rpm (50 Hz) or 1800 rpm (60Hz). $U_{in} = 0.5-4.5 \text{ VDC}$ , $f_g = 7 \text{ Hz}$ , $R_i = 220 \text{ k}\Omega$ , $U_{ref} = 5 \text{ VDC} \pm 25 \text{ mV}$ , $I_{max} = 25 \text{ mA}$	Input	5.0 VDC	Blue	
10	Voltage speed governor signal		Input	0.5-4.5 VDC	Brown	
11	GND Speed governor		Input	GND	Yellow-Green	
12	Screen		Input	Cut on its end	White	
13	D+	<i>DC Alternator excitation:</i> Excitation used to begin the current generation.	Input	200 mA / 24 VDC	Red-White	
14	Battery +	<i>Power supply for the controller:</i> Power output available for the controller.	Output	24 VDC	Red	
15	Battery -		Output		Black	
16	AVR remote voltage control signal	Voltage control (AC alternator): Regulation used to correct the genset output voltage. $U_{in} = 0.0-2.5 \text{ VDC}$ or 10K Potentiometer	Input	0-2.5 VDC	Blue	
17	AVR common		Input	GND	Brown	
18	Screen		Input	Earth point	White	
19	Emergency Stop signal	This signal open cranking and ECU relays in order to stop engine	Input	24 VDC	Purple	
20	Spare	Not used		-		
21	Spare	Not used		-		
22	Spare	Not used		-		
23	Spare	Not used		-		
24	Spare	Not used		-		

\*Input: signal from the controller to ECU cabinet.

Output: signal to the controller from ECU cabinet.



# Parallel operation

In case of not install Parallel kit, the genset can be started and stopped manually or by CAN-bus. To operate it manually, follow the instructions below. On the other hand, if it is used CAN-bus, follow the instructions of the installed controller.

## START THE GENSET

### 1. Connect the battery switches

It is necessary to connect positive (+) and negative (-) cables at the same time to assure the correct operation of the genset.

### 2. Energize cranking relay (NO – Normal Open type) to power the starter motor

Apply a voltage of 24 VDC to PIN 7 of the ECU cabinet connector (cranking signal). This signal has to be maintained until the genset achieves 25% of nominal speed. On top of that, it has not exceeded 8 seconds of relay energizing.

\*If the genset does not start after 3 crank attempts, take into account that over cranking can cause water ingestion. So, do not try to restart the genset and identify the crank fault cause.

## STOP THE GENSET

### 1. Energize ECU power relay (NC – Normal Close type) to stop powering the ECU. Consequently, the genset will stop.

Apply a voltage of 24 VDC to PIN 8 of the ECU cabinet connector (ECU power signal). This signal has to be maintained until the genset stops. On top of that, it has not exceeded 10 seconds of relay energizing.

### **NOTICE**

If any occurs, see XX alarm List to identify it.

## 8.2. Alarm list

This genset has four different forms to diagnose any failure or malfunction:

1. Fault indicator lamp
2. Diagnostic button and fault indicator lamp
3. ECU alarm list on the controller (see Parallel kit manual, if installed)
4. Service tool (contact nearest Solé dealer)

### Fault indicator lamp

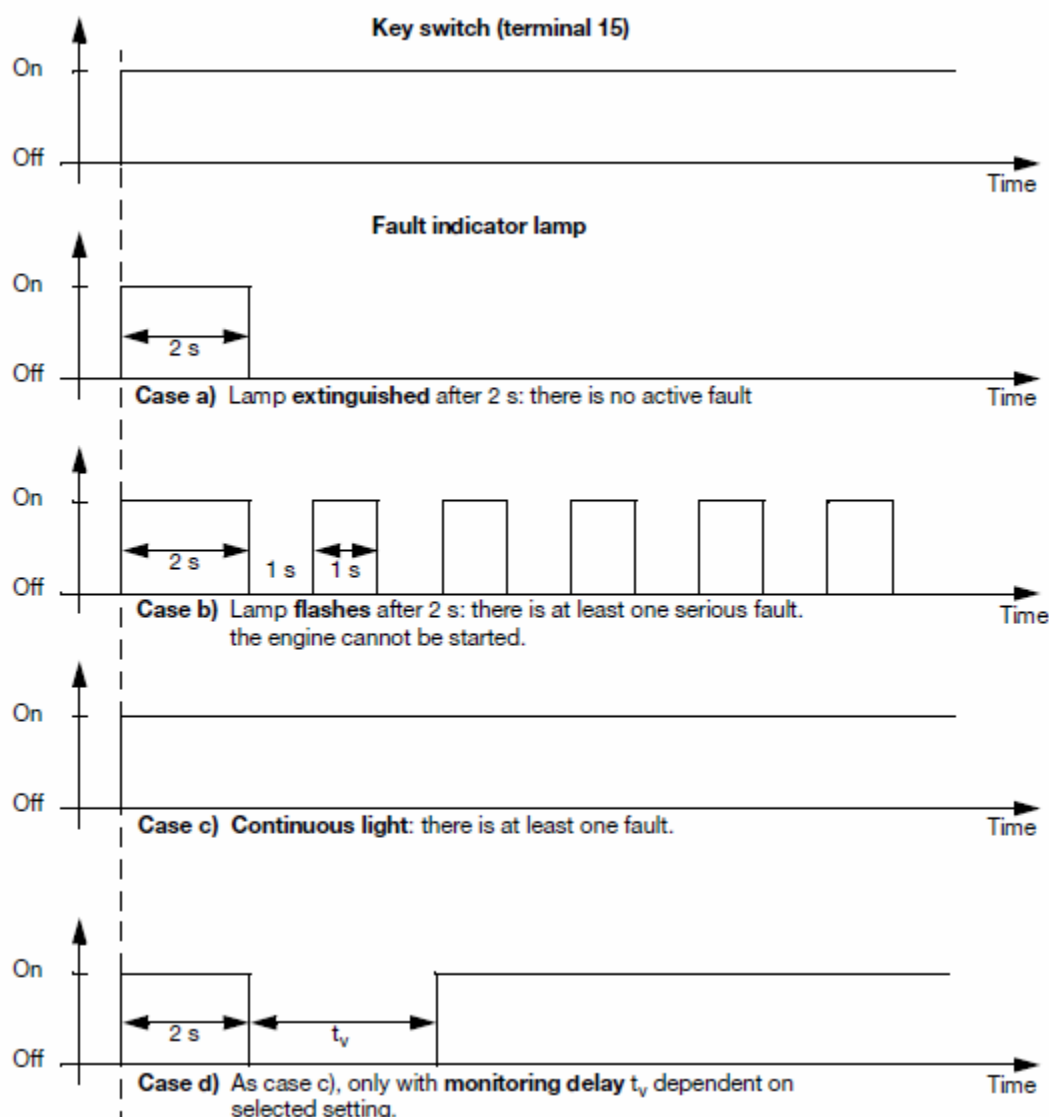
The engine regulator possesses numerous protection functions for the engine - depending on the available measuring points or sensors. Depending on the seriousness of the recognized fault, the engine may run on in reduced mode (limp home), whereby the fault indicator lamp is continuously lit, or the engine is switched off, whereby the fault indicator lamp flashes.

# Parallel operation

A lit fault indicator lamp indicates an error in the wiring (short circuit, cable break) or a defect in the displays of the corresponding sensors. A further source of faults could be falling below or exceeding the measuring value limits.

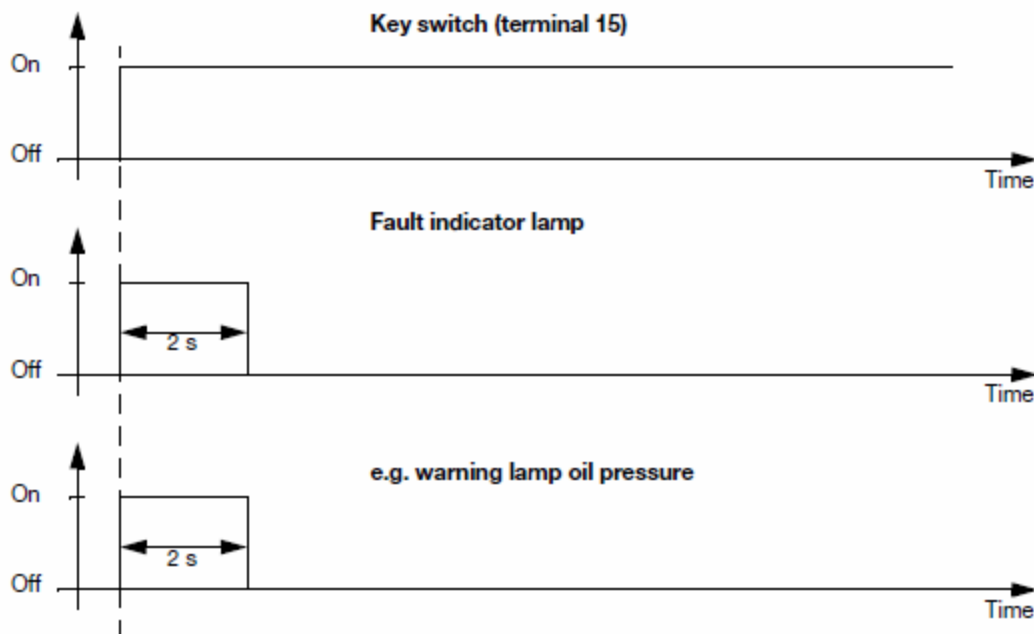
Faults in the electronics are registered or stored in the control unit and shown by the fault indicator lamp. The fault indicator lamp is extinguished as soon as the fault has been removed. Only when the electronics has been switched to emergency running (-speed), need the engine be switched off briefly in order to extinguish the fault indicator lamp.

Also corrected or non-current faults remain stored in the control unit.



**Function control of the configured warning lamps.** With the ECU activation (key switch pin 15), the warning lamp is also switched on for the duration of the self-diagnostic (2s).

# Parallel operation



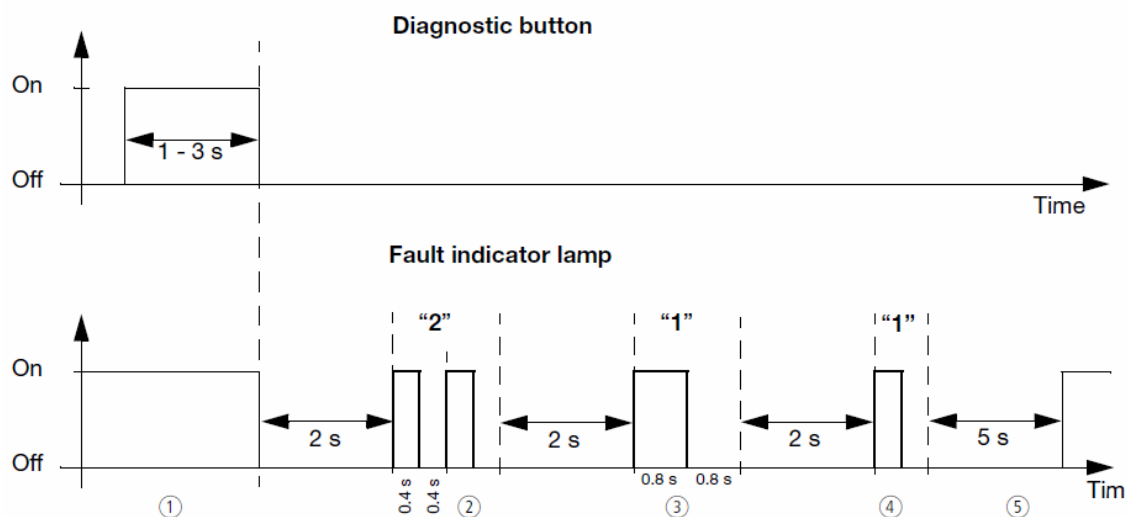
## Diagnostic button and fault indicator lamp

With the diagnostic button there is the possibility of reading out the existing faults as blink codes and to delete the fault memory 1. The Diagnostic button and the fault indicator lamp are situated in the ECU cabinet.

### Reading out a current fault memory blink codes

The fault indicator lamp shows a fault, e.g., it flashes or lights continuously. The Diagnostic button is depressed for a time period of 1 s to 3 s. The regulator recognizes the request for a read out and starts to display the faults. The read-out of the blink code is only possible after extinguishing of fault indicator lamp or after the initialization phase of the operating program.

This means that the fault indicator lamp can also show continuous lighting after switching on if a fault has been recognized already after switching. The ECU only shows active faults as blink codes.



# Parallel operation

**In the following the steps for reading out the first blink code are shown:**

- a. The fault indicator lamp indicates a fault, e.g. it flashes or lights continuously.  
Press diagnostics buttons 1 to 3: the flashing or continuous light of the fault indicator lamp is extinguished.
- b. - After 2 s: recognition by the regulator (2×short flashes).  
Output of the flashing sequence of the first stored fault.  
(example: fault number 01, “speed sensor 1”):
  - After 2 s: 1×long
  - After 2 s: 1×short
  - After fault code output5 s pause, then display of flashing or continuous light.

**Steps for reading out the next fault:**

- a. The fault indicator lamp indicates a fault, e.g. it flashes or lights continuously.  
Press diagnostics buttons 1 to 3: the flashing or continuous light of the fault indicator lamp is extinguished.
- b. After 2 s: recognition by the regulator (2×short flashes).  
The next blink code is output (c, d)
  - After fault code output5 s pause, then display of flashing or continuous light.  
The steps can be repeated until the last stored fault code is output. After that, the first fault code is shown again.

Fault group	Fault no. (in SERDIA)	Fault locality/ Fault description	Blink code			FMI	SPN	Cause	Remarks	Help
			short	long	short					
			0,4 s	0,8 s	0,4 s					
Zero error display	-	No faults	2	-	-	31	524287	No <b>active</b> faults present		
Revolutions / speed acquisition	01	Speed sensor 1	2	1	1	8	190	Sensor failure. Distance from gear too far. Additional fault impulses. Cable joint interrupted.	Governor in emergency operation (if sensor 2 available). Emergency switch-off (if sensor 2 not available or failed).	Check distance. Check cable connection. Check sensor and replace if required.
	02	Speed sensor 2	2	1	2	8	190		Governor in emergency operation (with sensor 1) Emergency switch-off (if sensor 1 not available or failed).	
	03	Speed sensor	2	1	3	8	84	Tacho failed. Additional fault impulses. Cable connection interrupted.	Governor in emergency operation. (see Chapter 4.15).	Check cable connection and Tacho. Replace if required.
	04	Excess speed switch-off	2	1	4	0	190	Speed was/is in excess of limit.e.	Engine stop. (see Chapter 4.3.3)	Check parameter (21). Check speed settings.
								Check PID setting. Check rods. Check actuator and replace if required. Check cable to actuator (impulse on incorrect speed). Check No. of teeth. For vehicles check for possible thrust mode.		
Sensors	05	Set point sensor 1 (accelerator pedal)	2	2	1	2	91	Fault at corresponding sensor entry (e.g. short circuit or cable break).	See Chapter 4.15 influencing fault reaction. With failure of the sensor, the associated monitoring function is de-activated.	Check sensor cable. Check sensor and replace if required. Check fault limits for sensor.
	06	Set point sensor 2 (hand throttle)	2	2	2	2	201			
	07	Charge air pressure	2	2	3	2	102			
	08	Oil pressure	2	2	4	2	100			
	09	Coolant temperature	2	2	5	2	110			
	10	Charge air temperature	2	2	6	2	105			
	11	Fuel temperature	2	2	7	2	174			

Fault group	Fault no. (in SERDIA)	Fault locality/ Fault description	Blink code			FMI	SPN	Cause	Remarks	Help
			short 0,4 s	long 0,8 s	short 0,4 s					
Functional fault warning	30	Oil pressure warning	2	3	1	1	100	Oil pressure below speed-dependent warning line characteristic	Fault message (disappears when oil pressure is again above recovery limit). After a delay time - fill limitation.	Check engine (oil level, oil pump). Check oil pressure sensor and cable. Check oil pressure warning line characteristic.
	31	Coolant temperature warning	2	3	2	0	110	Coolant temperature has exceeded warning level.	Fault message (disappears when coolant temperature again drops below recovery level). After a delay time - fill limitation.	Check coolant. Check coolant temperature sensor and cable.
	32	Charge air temperature warning	2	3	3	0	105	Charge air temperature has exceeded warning level.	Fault message (disappears when charge air temperature gain drops below recovery level). After a delay time - fill limitation.	Check charge air. Check charge air-temperature sensor and cable.
	34	Coolant level warning	2	3	5	1	111	Switch input "Low coolant level" is active.	Fault message.	Check coolant level. Check coolant level sensor and cable.
	35	Speed warning (with thrust mode operation).	2	3	6	14	SID 190	revolutions was/is above (top) revolution speed limit. "Thrust mode" function is active.  Check PID setting. Check rods. Check actuator and replace if required. Check cable to actuator. Check speed sensor (impulses on incorrect speed). Check No. of teeth. For vehicles check for possible thrust mode.	See Chapter 4.3.3 Excess speed protection.	Check parameters. Check speed settings(21).
	36	Fuel temperature warning	2	3	7	0	174	Fuel-temperature has exceeded warning level.	Fault message (disappears when fuel temperature again drops below recovery level).	Check fuel. Check fuel temperature sensor and cable.

Fault group	Fault no. (in SERDIA)	Fault locality/ Fault description	Blink code			FMI	SPN	Cause	Remarks	Help
			short 0,4 s	long 0,8 s	short 0,4 s					
Functional fault, switch-off	40	Oil pressure switch-off	2	3	1	1	100	Oil pressure below switch-off limit	Emergency stop	Check engine (oil level, oil pump). Check oil pressure sensor and cable. Check oil pressure -switch-off limit.
	41	Coolant temperature switch-off	2	3	2	0	110	Coolant temperature has exceeded switch-off limit.		Check coolant level. Check coolant level sensor and cable. Check switch-off limit.
	42	Charge air temperature switch-off	2	3	3	0	105	Charge air temperature has exceeded switch-off limit.		Check charge air. Check charge air-temperature sensor and cable. Check switch-off limit.
	44	Coolant level switch-off	2	3	5	1	111	Switch input "Low coolant level" is active.	Emergency stop. Start lock.	Check coolant level. Check coolant level sensor and cable.
Actuator	50	Feedback	2	5	1	12	SID 24	Actuator not connected. Fault in actuator confirmation.	Emergency switch-off. Actuator cannot be operated.	Check actuator, replace if required. Check cable, check fault limits for "Confirmation".
	52	Reference feedback				13	SID 24			Check actuator, replace if required. Check cable, check fault limits for "Rifeness confirmation".
	53	Control travel difference				7	SID 23	Injection pump/actuator jammed or not connected. Difference between nominal/actual control travel is > 10 % of the overall control path.	Fault message (disappears when difference is < 10 %).	Check actuator/actuator rods / injection pump, replace if required. Check actuator cable.
	59	Auto calibration BOSCH-EDC pumps faulty operation	2	5	2	13	SID 23	No automatic actuator equalization possible. Incorrect input of the actuator reference values.	Engine stop / start lock. Governor cannot be taken into use. EDC actuator calibration required (see Chapter 8.4).	Check actuator and replaced if required. Check feedback cable. Check voltage supply/cables. Check fault limits and reference values of the feedback. Program the fault limits for feedback, save values. Switch ignition off and on again. Check again. If faulty, inform DEUTZ-Service and carry out automatic equalization again. Set fault limits again.

Fault group	Fault no. (in SERDIA)	Fault locality/ Fault description	Blink code			FMI	SPN	Cause	Remarks	Help
			short 0,4 s	long 0,8 s	short 0,4 s					
Hardware inputs/ outputs	60	Digital output 3 (Switch-off solenoid, pin M 2)	2	6	1	2	SID 51	Fault (short circuit / cable break) at digital output.	Driver level is switched off.	Check cable of digital output (cable break or short circuit).
	62	Digital output 6, pin M 7	2	6	2	2	SID 60		Fault message.	
	63	Excess voltage switch-off solenoid	2	6	1	6	SID 51			
	67	Error Hand Setp1	2	6	2	11	91			
	68	Error CAN Setp1				2	898			
Communi- cation	70	CAN-Bus controller	2	7	1	12	SID 231	CAN-controller for CAN-bus is faulty. Fault removal despite re-initialising continuously not possible	Application-dependent.	Check CAN connection, terminating resistor (see Chapter 12.4), Check control unit.
	71	CAN interface SAE J 1939				9	SID 231	Overflow in input buffer or a transmission cannot be placed on the bus.		
	74	Cable break, short circuit or bus-error				14	SID 231			Check CAN connection, cable connection. Check sensor and replace if required.
Memory	76	Parameter programming (write EEPROM)	2	8	1	12	SID 253	Fault in parameter programming in the governor fixed value memory.	Emergency switch-off. engine cannot be started.	Switch ignition off and on again. Check again. If faulty inform DEUTZ Service
	77	Cyclic program test				12	SID 240	Constant monitoring of program memory shows error (so-called "Flash-test").		
	78	Cyclic RAM test				2	SID 254	Constant monitoring of working memory shows error.		Note values of parameters (3895 and 3896). Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.



Fault group	Fault no. (in SERDIA)	Fault locality/ Fault description	Blink code			FMI	SPN	Cause	Remarks	Help
			short 0,4 s	long 0,8 s	short 0,4 s					
Control unit hardware	80	Power supply (Actuator)	2	9	1	2	SID 254	Power supply for actuator not in the permissible range.	Fault message (disappears when power again in the normal range).	Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	83	Reference voltage 1	2	8	2	2	SID 254	Reference voltage for actuator not in the permissible range.	Fault message (disappears when power again in the normal range). Auxiliary value 5 V	Check voltage supply. Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	84	Reference voltage 2				2	SID 254			
	85	Reference voltage 4				2	SID 254			
	86	Internal temperature	2	9	2	12	171	Internal temperature for control unit not in permissible range.	Fault message (disappears when power again in the normal range).	Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	87	Atmospheric pressure				12	108	Atmospheric pressure not in permissible range.	Fault message (disappears when power again in normal range). Atmospheric pressure monitoring function de-activated.	
Program logic	90	Parameter fault (EEPROM retrieval or checksum faulty).	2	10	1	2	SID 253	No data found or checksum of data is faulty (note: fault only occurs during setting of parameter / saving or reset.).	Engine cannot be started.	Check data for correct settings. Save parameters. Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	93	Stack overflow				2	SID 240	Internal calculation fault (so-called "Stack overflow" fault).	Emergency switch-off. Engine cannot be started.	Note parameters (3897 and 3898). Switch ignition off and on again. Check again. If faulty inform DEUTZ Service.
	94	Internal fault				2	SID 254			

# Control Panel

## 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**

# Control Panel

- 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**

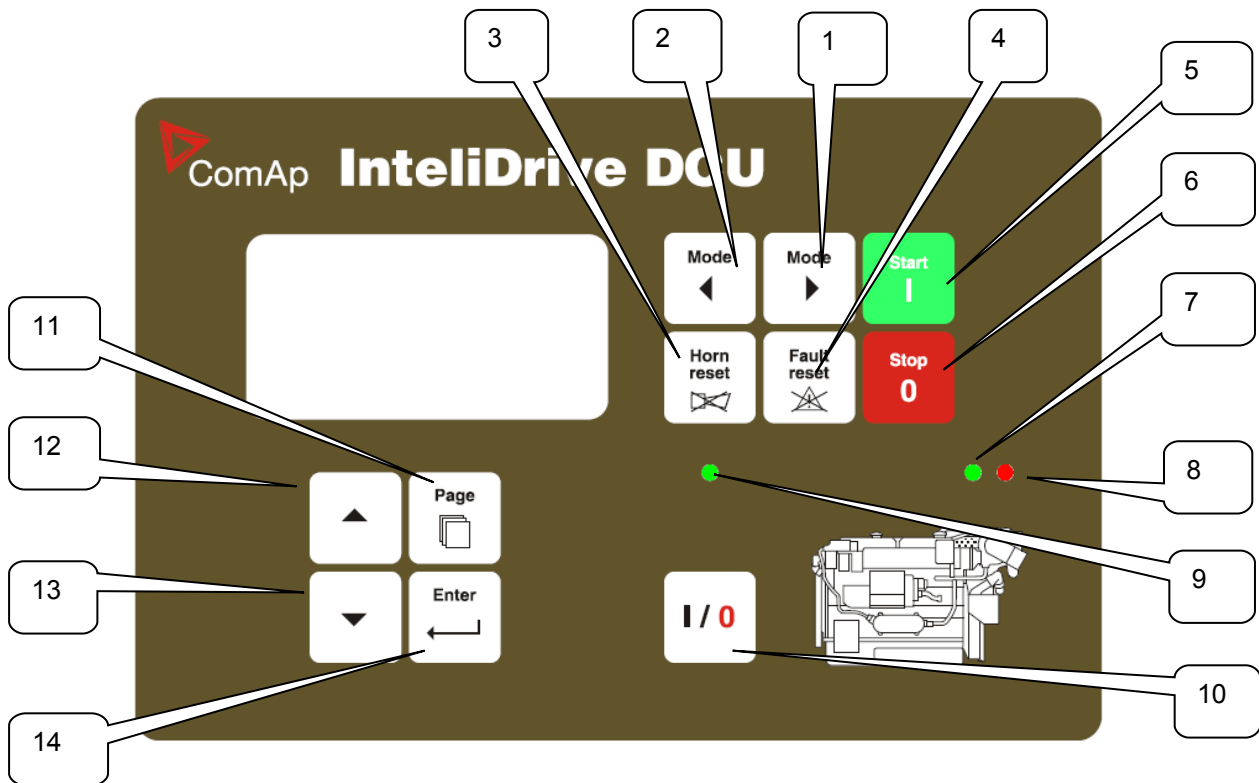
## **Types of Documents on Web page**

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.

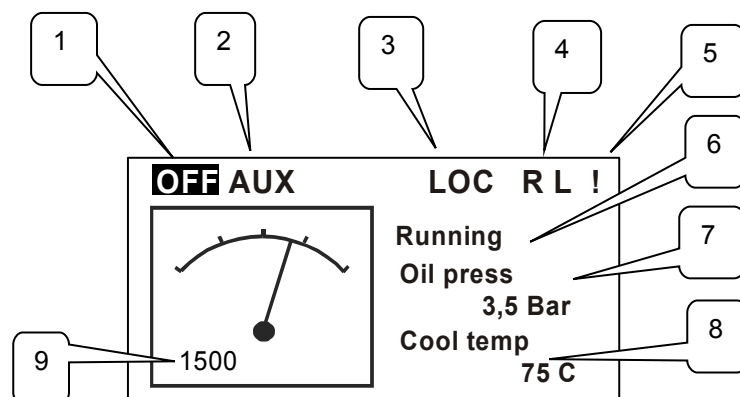
Press **FAULT RESET** accepts all alarms in case if Industrial version and accepts just displayed alarms in case of Marine version. Non-active alarms immediately disappear from the list.

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

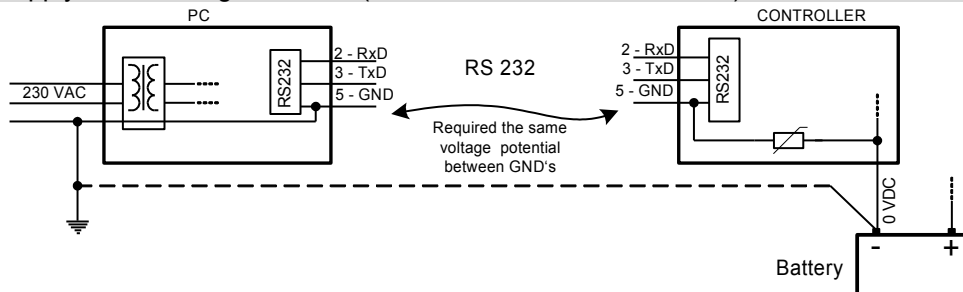
InteliDrive sw pack contains separate PC software tools: DriveConfig (DC) and DriveMonitor (DM). Drive Monitor is meant to be monitoring tool for remote controller connection. DriveMonitor is based on Windows 95/98/NT/ME/2000/XP or higher platform and requires 50 MB of hard disc free space.

## 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.

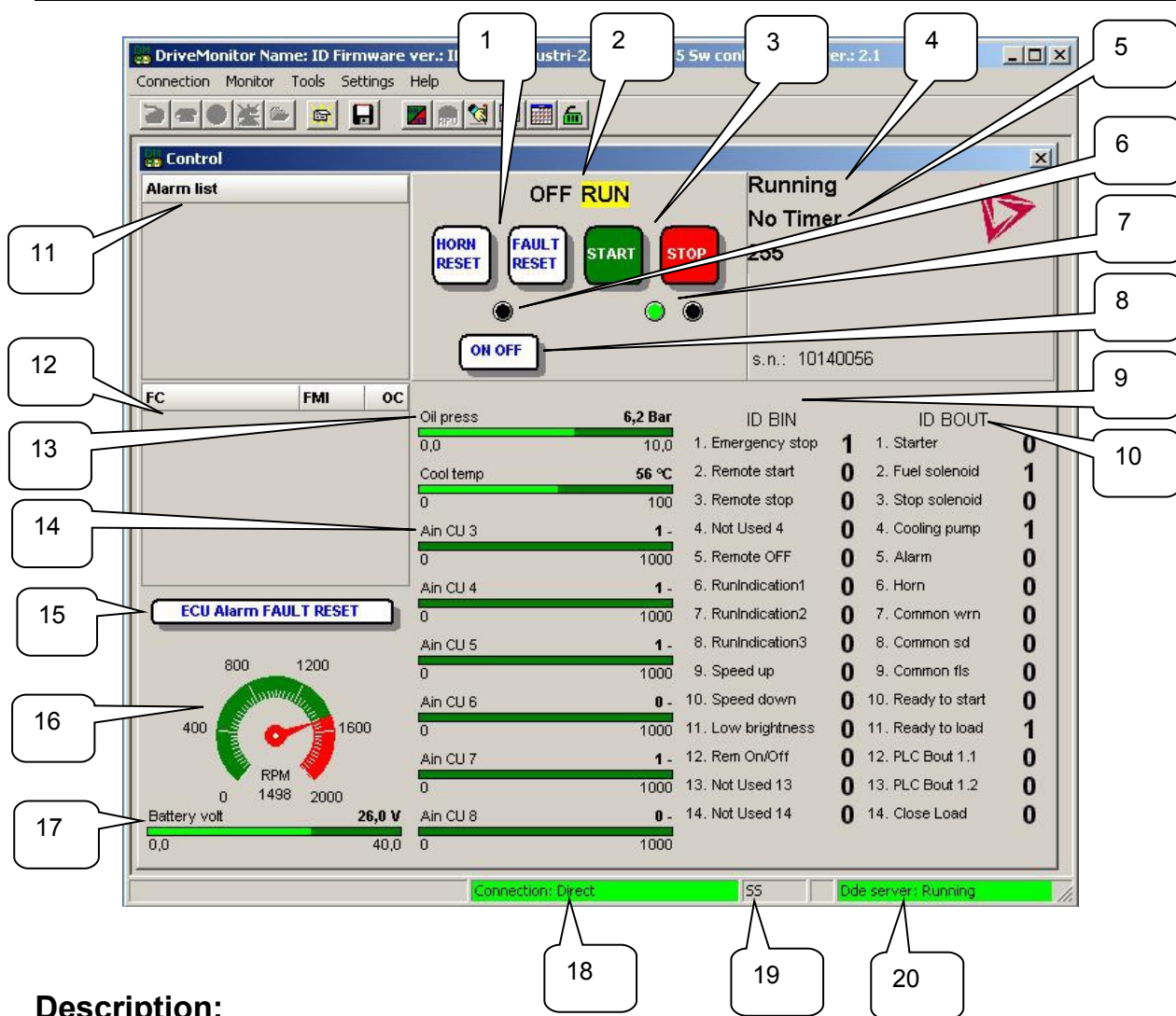
### Hint:

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.**

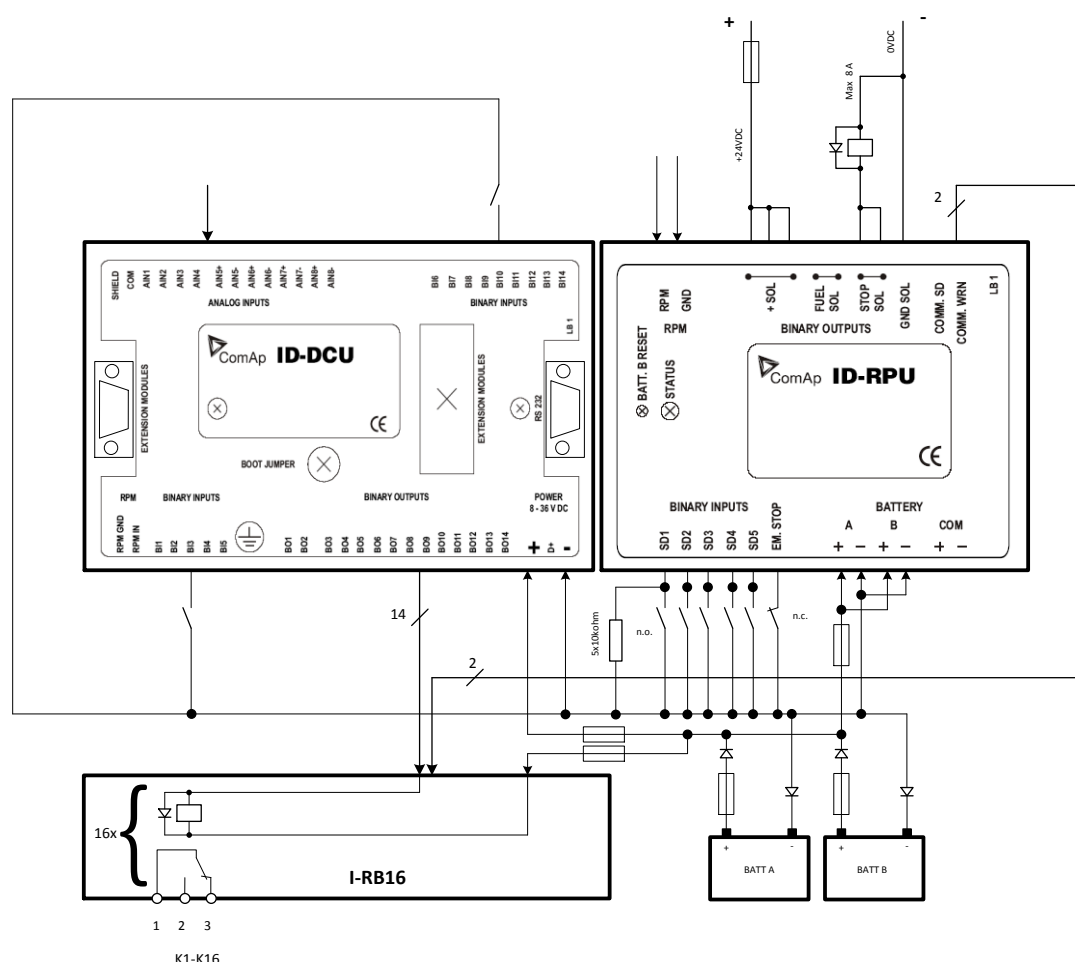
Hint:

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

### 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 kΩ required)
Input resistance	1 kΩ
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 kΩ
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 kΩ
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 ± 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	Broken wire (open circuit) detection
OFF-STATE	Short circuit
ON-STATE	Overload (switch-overheat detection)
	Lost of power supply indication

### Binary outputs

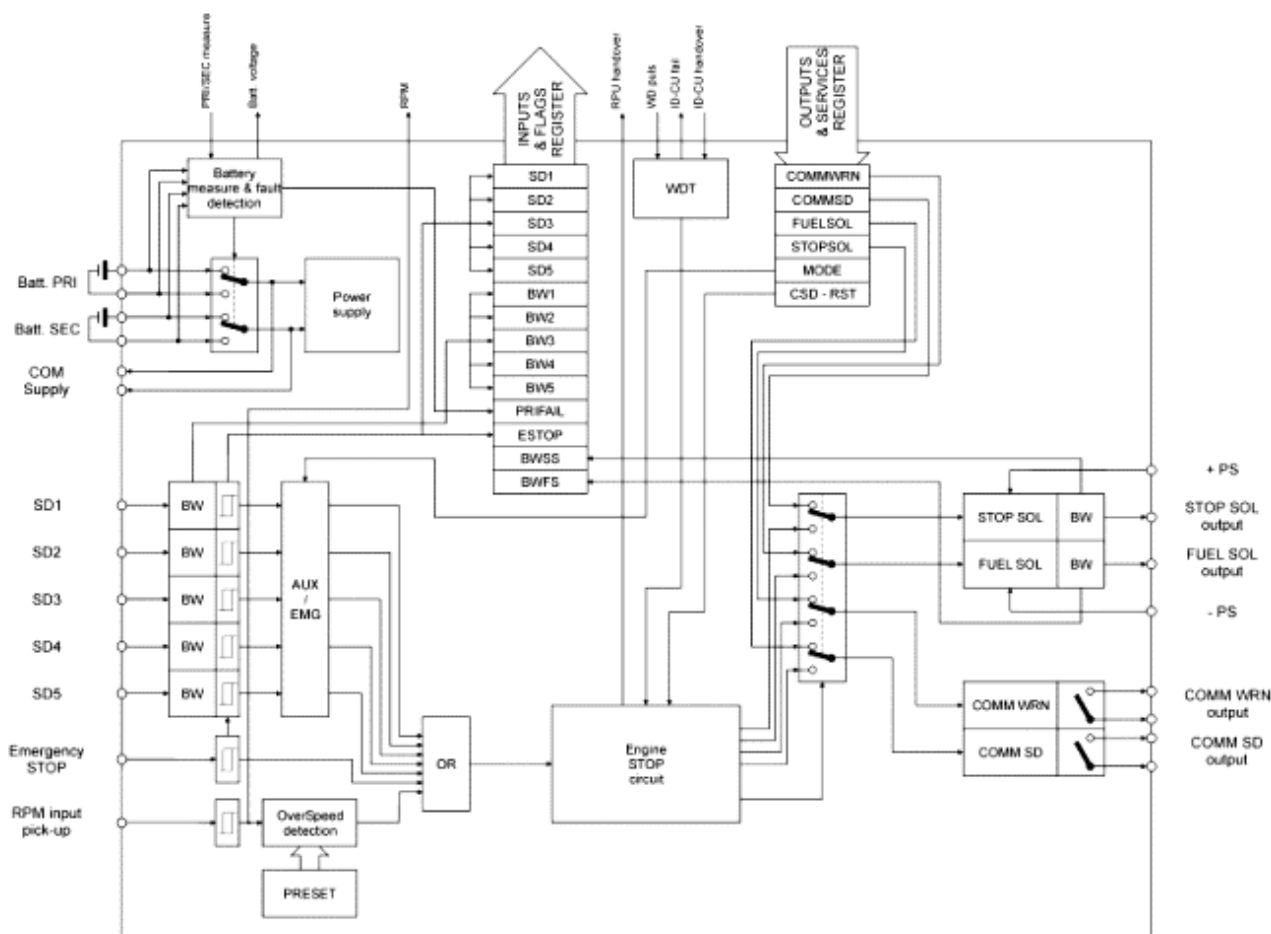
Number of outputs	2 (fix function: Warning and Shut down)
Maximum switching voltage	36 VDC
Maximum current	0,5 A

## 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)

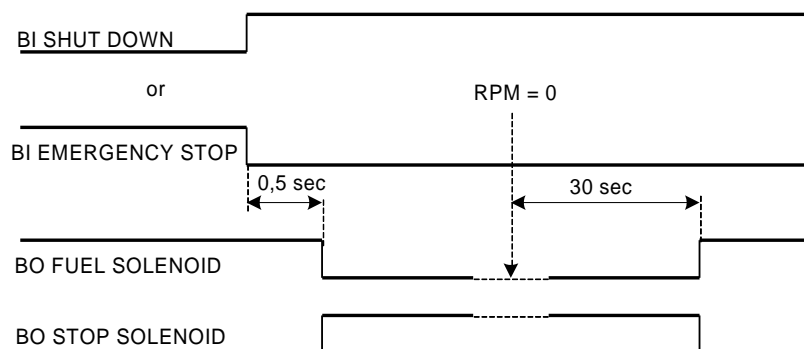
## ID-RPU functions

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

# Control Panel

## Sensor Data

	Emergency Genset	Auxiliary Engine
Coolant temperature sender	N/A	-30 to 130°C Setpoint: 105°C (Warning alarm)
Coolant temperature switch	N/A	-40 to 220°C Setpoint: 112°C (Shutdown)
Lub. Oil pressure sender	0 to 10 bars Setpoint: 2 bars (Warning alarm)	0 to 10 bars Setpoint: 2 bars (Warning alarm)
Lub. Oil pressure switch	N/A	0 to 15 bars Setpoint: 1,9 bars (Shutdown)
Coolant pressure switch	0 to 6 bars Setpoint: 0,3 bars (Warning alarm)	0 to 6 bars Setpoint: 0,3 bars (Warning alarm)
Lub. Oil temperature sender	50°C to 200°C Set point: 112°C (Warning alarm)	-50 to 200°C Setpoint: 112°C (Warning alarm)

### Exhaust temperature sensor\*

Measuring range: -50°C to 800°C

Shutdown: 550°C



# Tightening torques

## Section 10 – Tightening torques

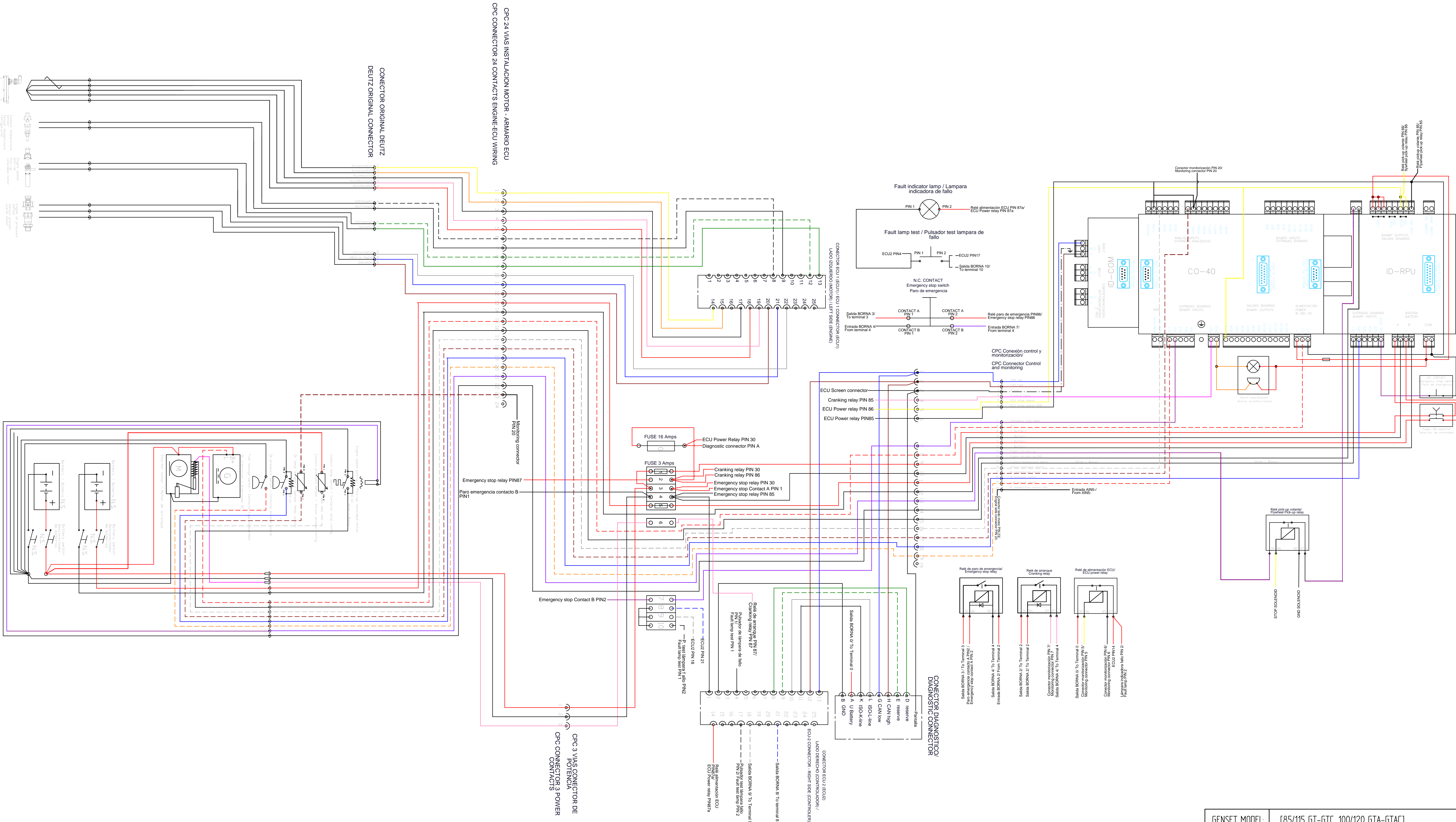
Important nuts and screws.


TIGHTENING VALUES	85 GTC / 100 GTAC / 115 GTC / 120 GTAC DNV	
	N · m (kgf · m)	
Cylinder head	127.5 (13.0)	
Crankshaft pulley	39.0 to 49.0 (4.0 to 5.0)	
Main bearing caps	49.0 (5.0)	
Connecting rod caps	29.5 (3.0)	
Flywheel:		
30-45 mm Bolts	19.5 to 29.5 (2.0 to 3.0)	
50-85 mm Bolts	29.5 to 39.0 (3.0 to 4.0)	
Oil pan drain plug	49.0 (5.0)	
Oil filter	14.7 (1.5)	
Heat exchanger drain plug	22.5 (2.3)	
Nut for B + Terminal of starter	10.8 (1.1)	
General tightening torque	M6	9.8 (1.0)
	M8	24.5 (2.5)
	M10	58.8 (6.0)
	M12	98.0 (10.0)

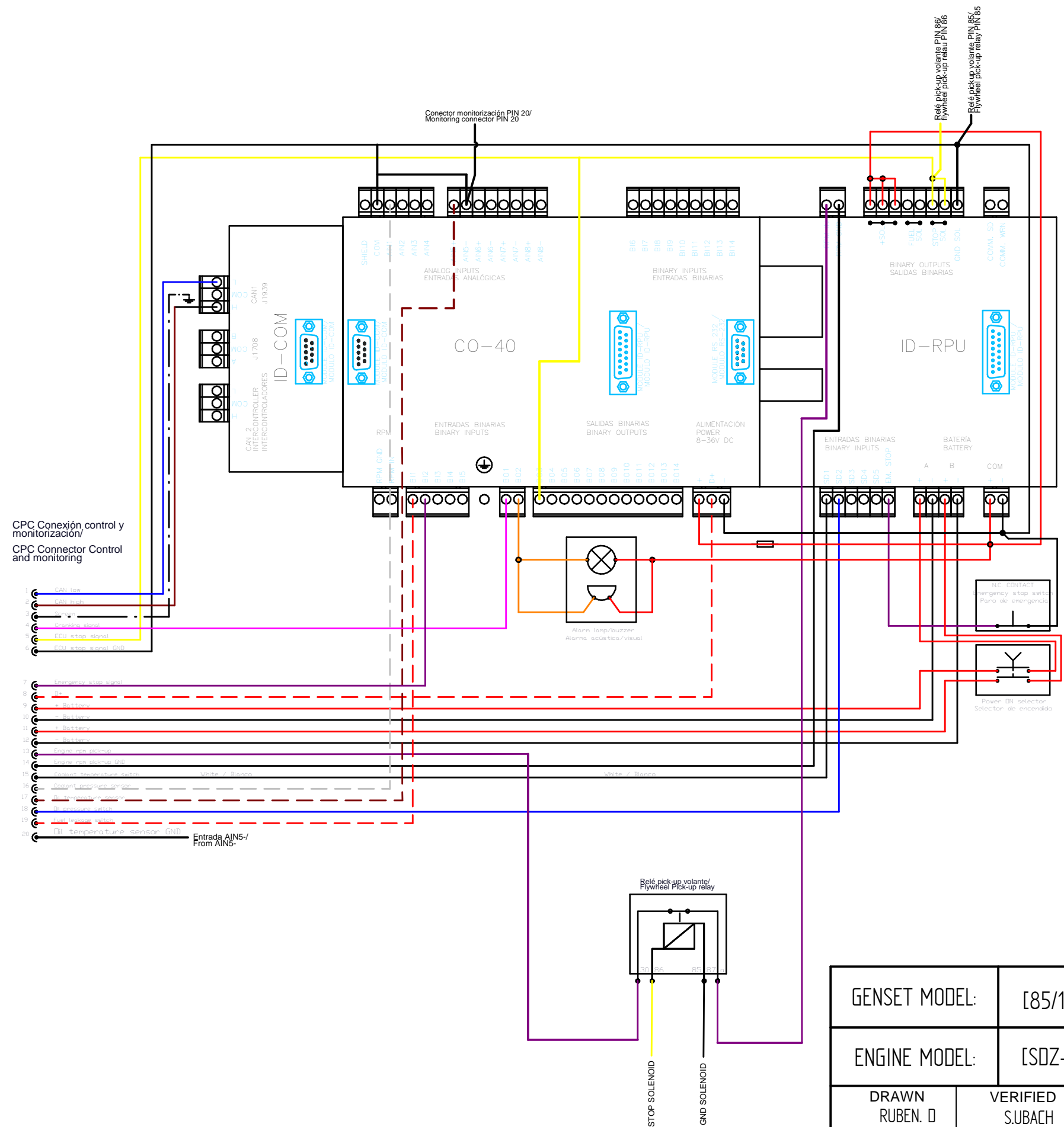



# Wiring diagrams

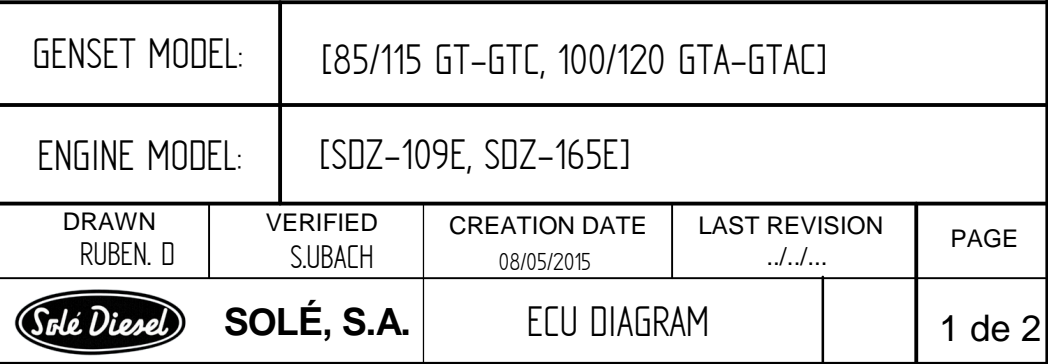
## Section 11 – Wiring Diagrams

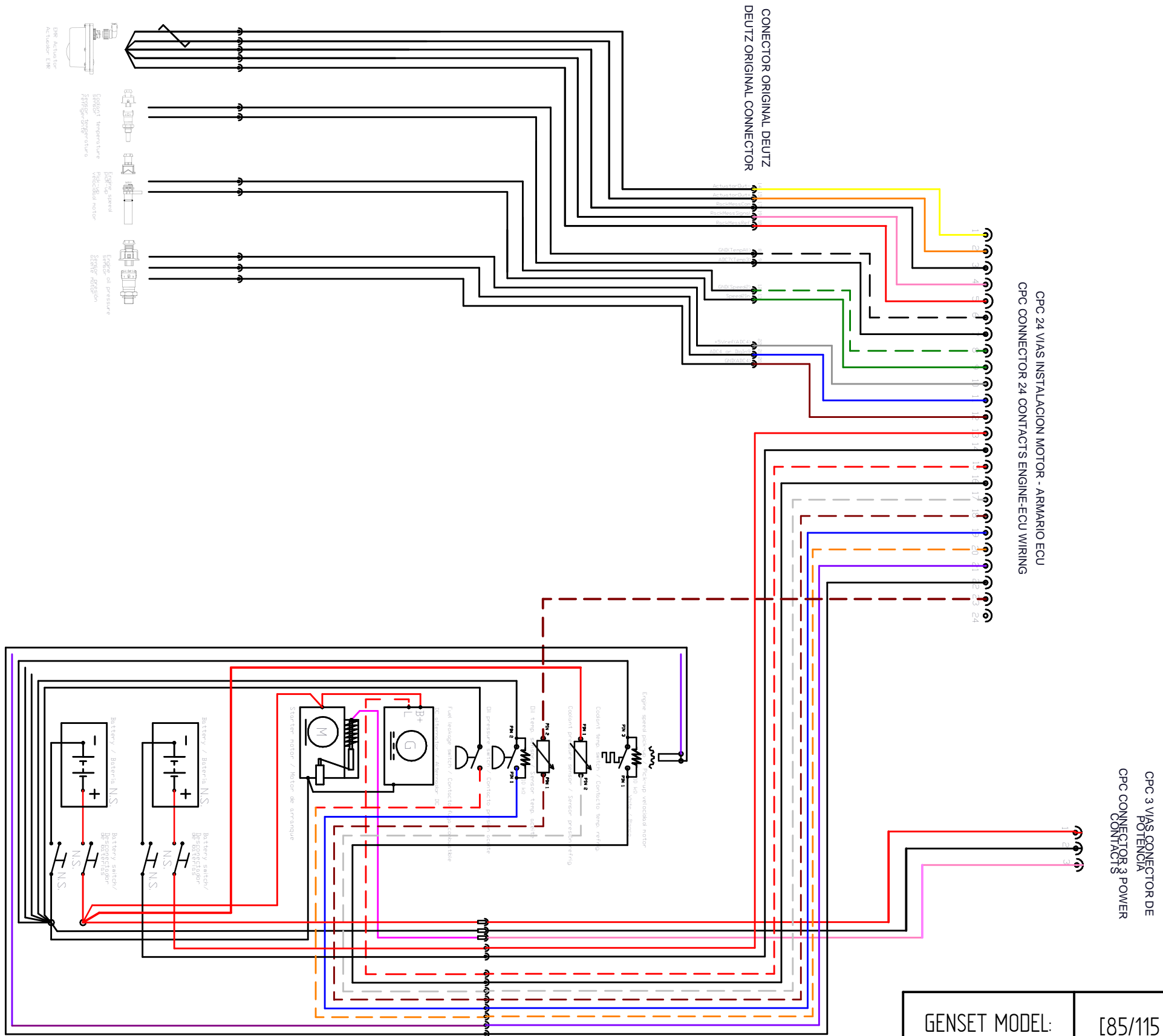



GENSET MODEL:		[85/115 GT-GTC, 100/120 GTA-GTAC]			
ENGINE MODEL:		[SDZ-109E, SDZ-165E]			
DRAWN RUBEN D		VERIFIED SUBACH	CREATION DATE 08/05/2015	LAST REVISION ...	PAGE
		SOLE, S.A.	ELECTRIC DIAGRAM		1 de 1



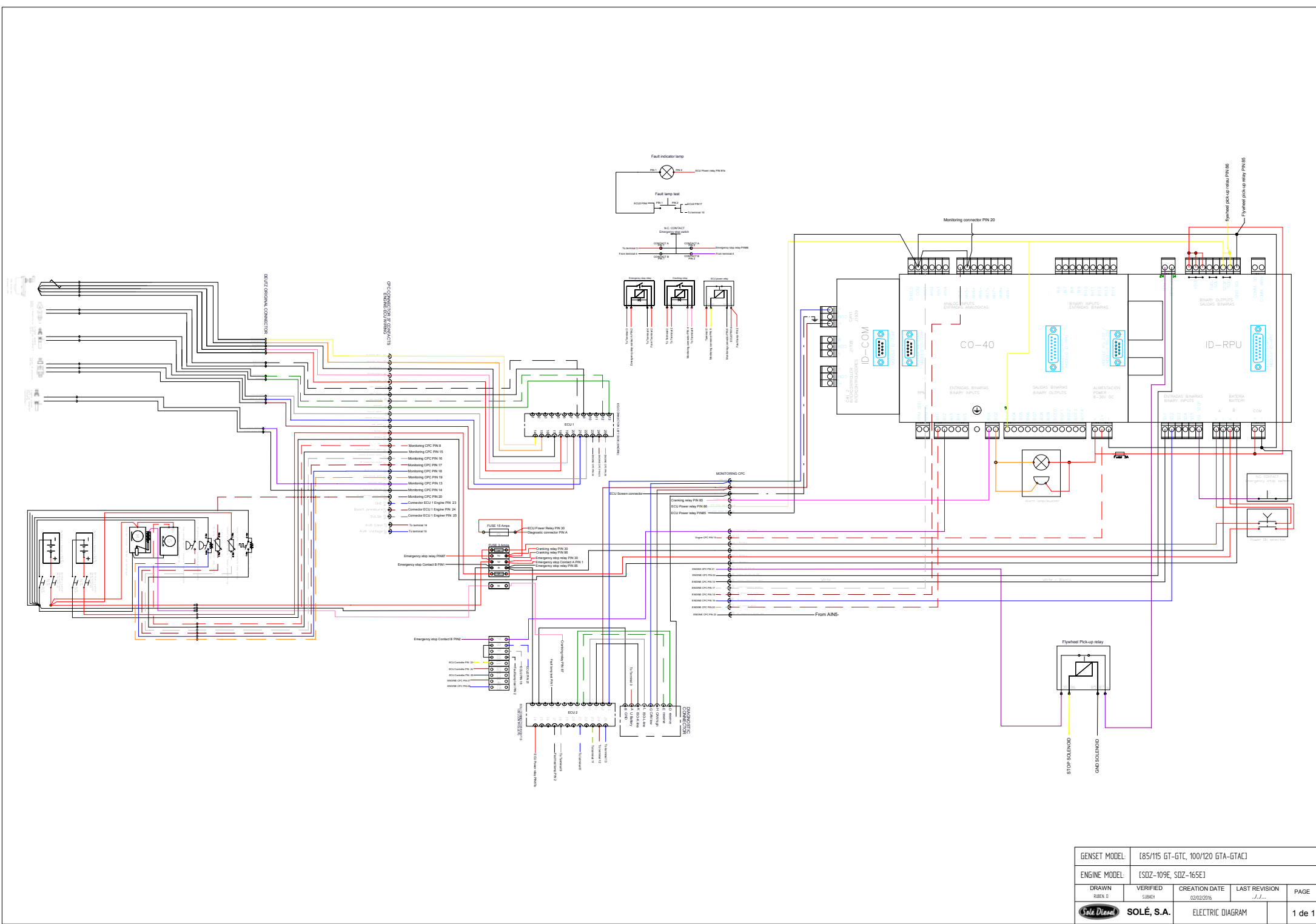
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ENGINE MODEL:		[SDZ-109E, SDZ-165E]		
DRAWN RUBEN. D	VERIFIED SUBACH	CREATION DATE 08/05/2015	LAST REVISION .././...	PAGE
 <b>SOLÉ, S.A.</b>		CONTROLLER DIAGRAM		1 de 2





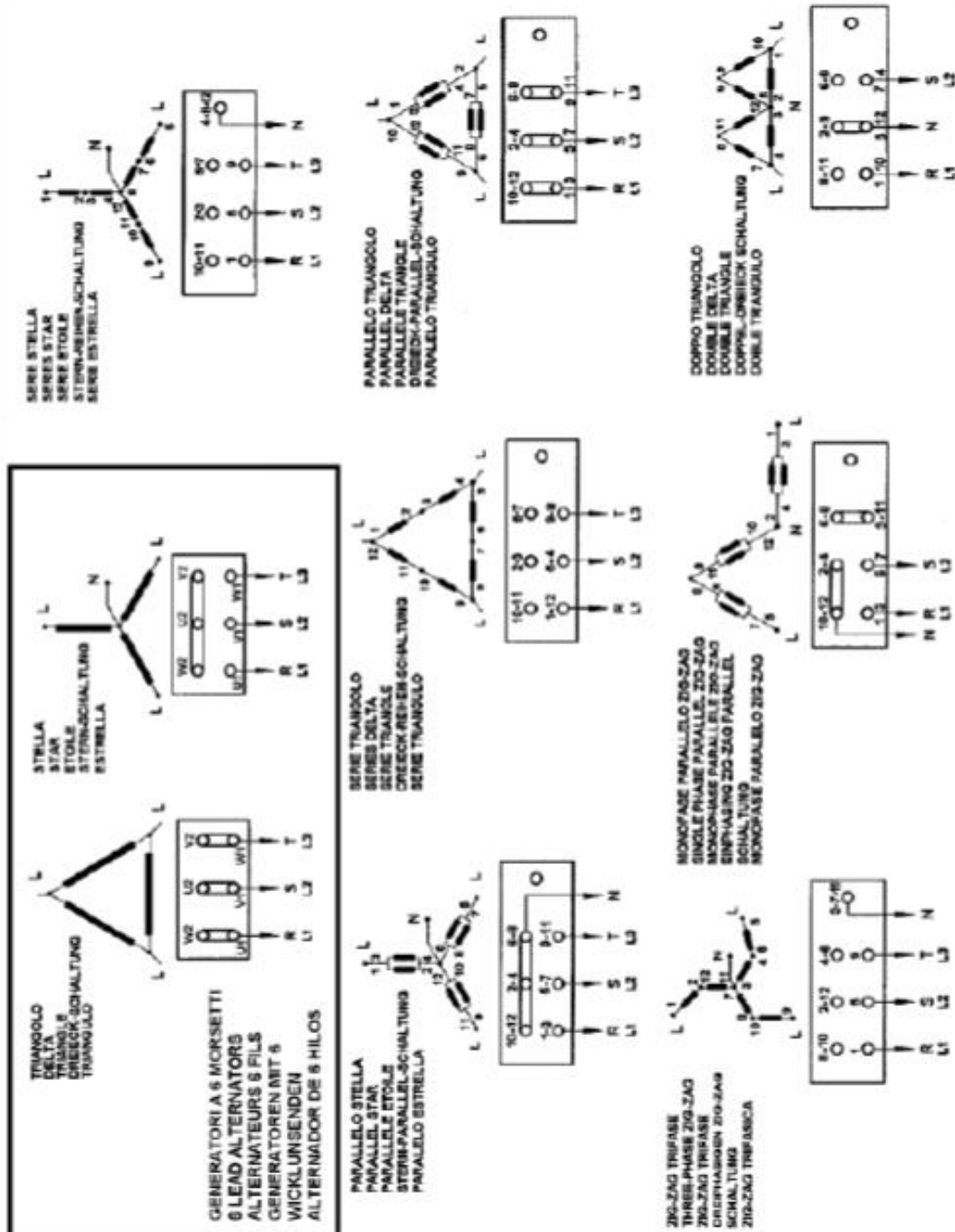
GENSET MODEL:		[85/115 GT-GTC, 100/120 GTA-GTAC]		
ENGINE MODEL:		[SDZ-109E, SDZ-165E]		
DRAWN RUBEN. D	VERIFIED SUBACH	CREATION DATE 08/05/2015	LAST REVISION .././...	PAGE
 <b>SOLÉ, S.A.</b>		ENGINE INSTALLATION DIAGRAM		1 de 2





# Alternator connections

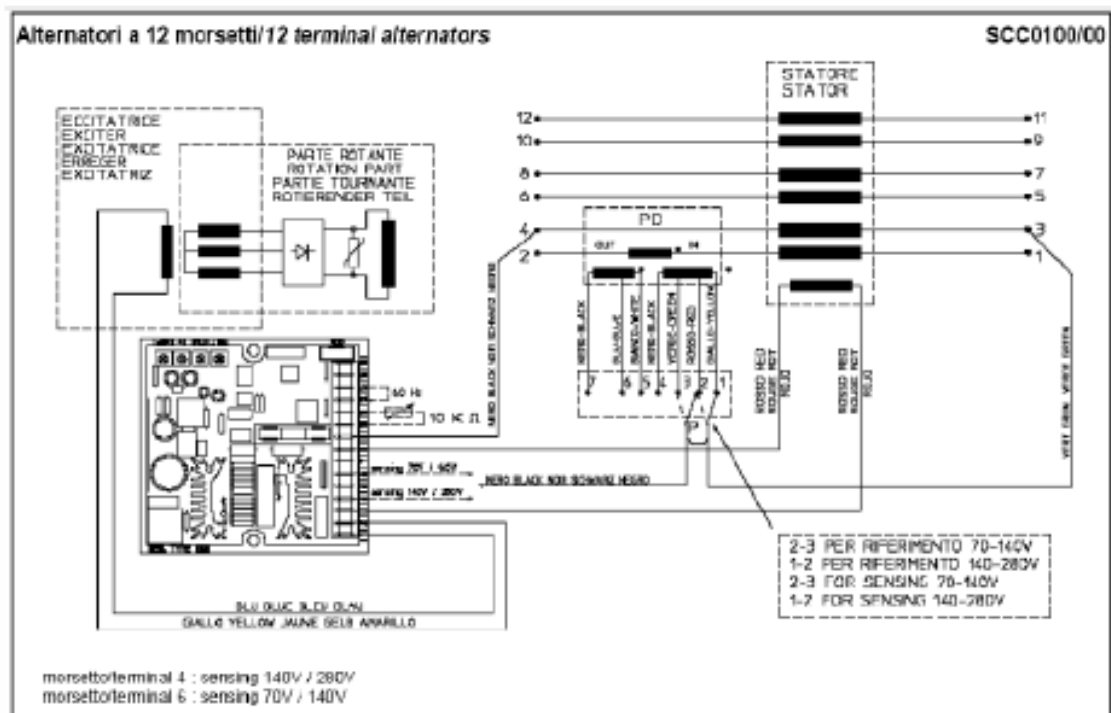
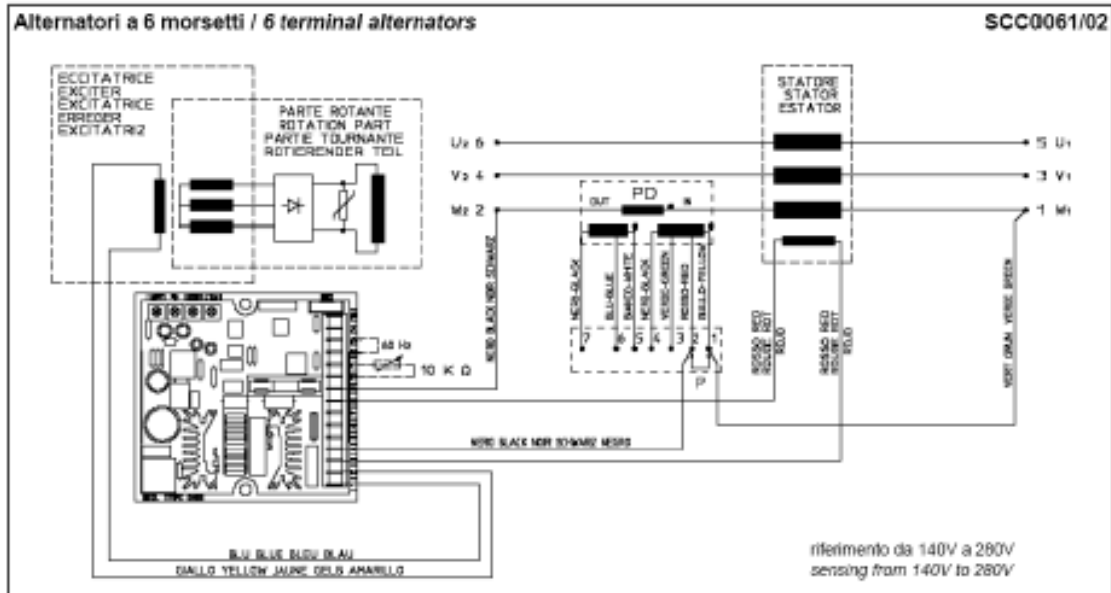
## Section 12 – Alternator connections





## Alternator connections

## 12.1. Regulator connections





# Overall dimensions

## Section 13 – Overall dimensions

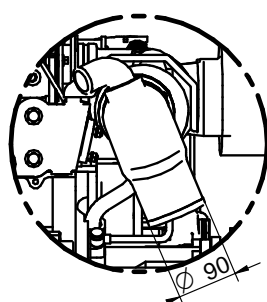
# Instructions to replace and remove




## Section 14 – Instructions to replace and remove

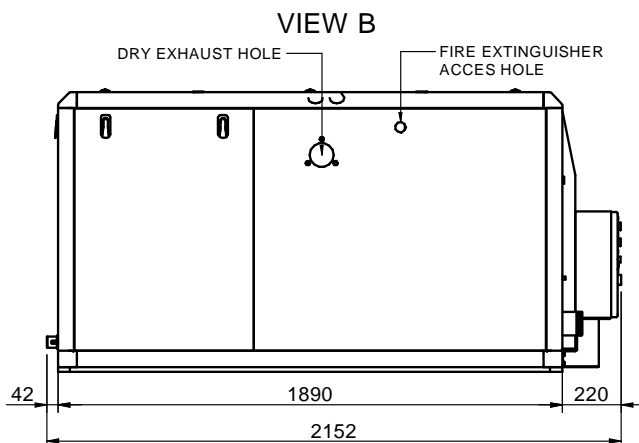
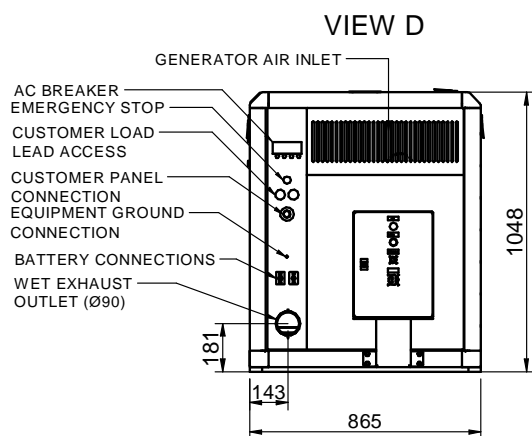
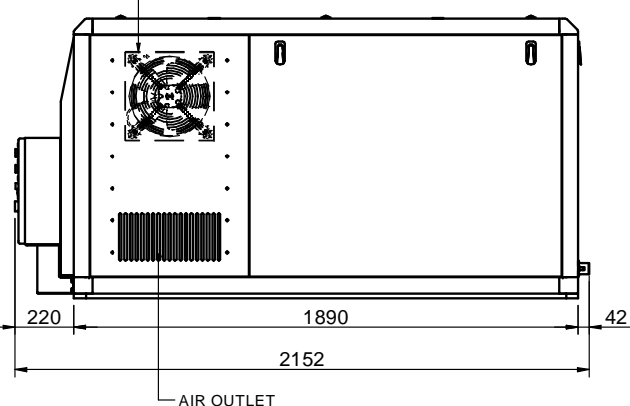
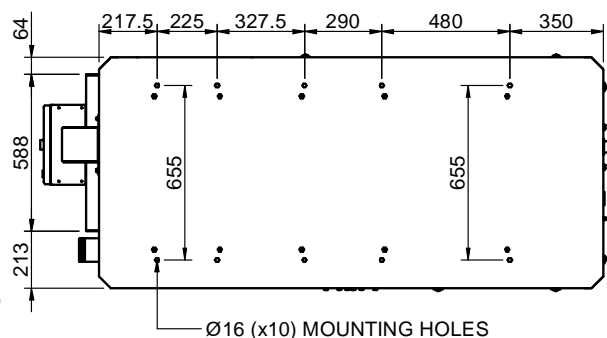
When you decide to replace the genset, please contact Solé Diesel S.A.; will provide relevant instructions regarding the laws in force at the time. When disposing of the whole or parts of this genset, meets LAWS IN FORCE IN THE COUNTRY OF INSTALLATION.

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



Medidas Nominales (mm)	100	85 GT / 100 GTA / 115 GT / 120 GTA									
	30										
	6	MATERIAL		ACABADO		TRATAMIENTO		PRESENTACIÓN		ESCALA	
	0										
	0	DIBUJADO		VERIFICADO		GRADO PRECISIÓN		FECHA CREACIÓN		ÚLTIMA REVISIÓN	
Grado de precisión IN-7/68	a	XAVIER		S.UBACH		MEDIO		29/05/2014			
Fino	±0.1	SOLÉ, S.A.									
Medio	±0.15										
Bastio	±0.3										
	±0.5										
	±1.2										

(USE ONLY FOR A REFERENCE)



Note: Dimensions in millimeters

Medidas Nominales (mm)		85 GTC / 100 GTAC / 115 GTC / 120 GTAC GENSET					
100	30						
a	a						
300	100						
±0.2	±0.15						
±0.5	±0.3						
±1.2	±0.8						
6	a	MATERIAL		ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
30	30						
0	±0.05	DIBUJADO	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN	
6	±0.2	XAVIER	SUBACH		29/05/2014		
Grado de Precisión DIN/7168	Fino	<div>SOLÉ, S.A.</div>					
Medio							
Basto							



# Inspection prior to the delivery of generator sets



## Section 15 – 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.		











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