

USE AND MAINTENANCE  
USO E MANUTENZIONE  
UTILISATION ET ENTRETIEN  
BETRIEB UND WARTUNG  
USO Y MANTENIMIENTO

# NEF SERIES

## N67ENTM57

### ELECTRONIC INJECTION SYSTEM

MARINE ENGINES



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# **NEF SERIES**

## **ELECTRONIC INJECTION SYSTEM**

### **N67ENTM57**

## **USE AND MAINTENANCE**

### **INTRODUCTION**

We would like to thank you for buying an FPT product, and compliment you on your choice of engine.

Before you carry out any operation involving the engine or its fittings, please read the contents of this manual carefully; compliance with the instructions provided in the manual is the best way to guarantee trouble-free, long term operation of the engine.

The contents of this manual refer to the standard configuration of the engine, and the illustrations are purely indicative. Some instructions are provided by giving the sequence of operations to be carried out in order to allow the engine and/or its fittings to perform in a certain way. In some cases they will be dependent on the configuration of the commands and the set-up of the vessel on which the engine is installed; for any points that differ from the contents of this manual, please consult the instructions provided by the Boatbuilder or a specific manual.

The information provided below was current at the date of publication.

The Manufacturer reserves the right to make modifications at any time without prior notice, for technical or commercial reasons or to update the engines to comply with legal requirements in the various Countries.

The Manufacturer declines all liability for any errors or omissions.

Please remember that the FPT Technical Service Network is available to offer you its experience and professional skills, wherever you may be.

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## ■ GENERAL INFORMATION

### GUARANTEE

In order to ensure that your engine gives the best possible performance and to take advantage of the FPT guarantee, you must follow the indications provided in this publication with great care; failure to do so may result in invalidation of the guarantee.

### SPARE PARTS

Always use Original FPT Spare parts. This is essential to keep the engine in original running order.

The use of non-original spare parts will not only invalidate the guarantee, but will mean that FPT will not be considered liable in any way during the whole working life of the engine.

### LIABILITY

The Manufacturer will only be considered liable subject to performance of the control and maintenance operations indicated and described in this manual; to this effect, proof that these operations have been performed must be provided. Any special maintenance operations that may be necessary must be carried out by qualified technicians from Workshops in the FPT Network, using the instruments and equipment provided for the purpose.

### SAFETY

The following information is intended to encourage caution when using the engine, so as to avoid damage to persons or property as a result of improper or incorrect behaviour.

- ❑ The engines must only be used for the purposes indicated by the Manufacturer.
- ❑ Any tampering, modification and use of non-original spare parts may compromise proper operation of the engine and safe navigation; **never, under any circumstances** make modifications to the wiring and to the units equipping the engine, or connect them to other power systems.
- ❑ Pay particular attention to moving parts of the engine, to high temperature components and to circuits containing pressurised fluids; its electrical equipment houses electrical currents and voltage.
- ❑ The exhaust fumes produced by the engine are bad for your health.
- ❑ The engine must only be moved using suitable lifting tackle, making use of the U-bolts provided on the engine for that purpose.
- ❑ The engine must not be started up and used until the vessel in which it installed has satisfied all necessary safety requirements, or until the vessel has been guaranteed to comply with local laws and regulations.
- ❑ The operations required to guarantee the best possible use and preservation of the engine must only be carried out by persons of proven experience, equipment with tools considered suitable by FPT.

For the purpose of safety, further recommendations are given in the chapter CONTROLS AND MAINTENANCE.

## ENGINE TECHNICAL DATA N67ENTM57

The technical code and serial number are indicated on a plate, which is located on different parts of the engine, according to the model: flywheel casing, tappet cover, coolant tank.

<b>Code</b>	<b>N67ENTM57</b>
Engine family	F4
Cycle	4-stroke diesel
Number and arrangement of cylinders	6 in line
Bore x stroke	104 x 132 mm
Total displacement	6,700 cm <sup>3</sup>
Air system	Supercharged and Inter-refrigerated
Injection type	Direct/
Engine direction of rotation	Anticlockwise (seen from flywheel side)
Dry weight	650 kg

<b>Electrical system</b>	<b>12 V (24 V on request)</b>
Accumulator/s	
- capacity	180 Ah or above
- discharge current	800 A or above

### Available settings (\*)

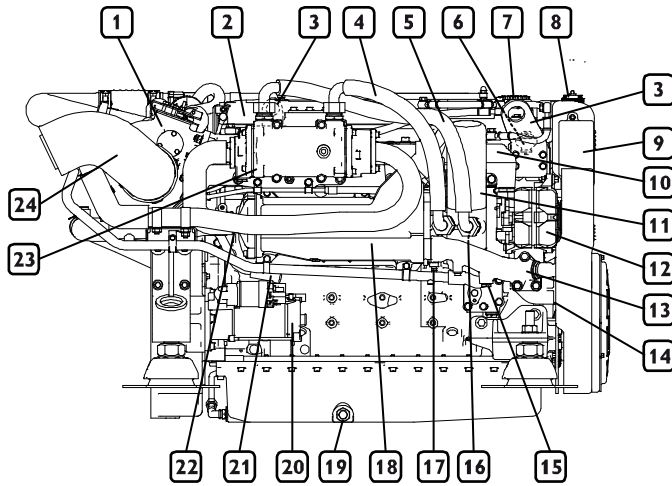
### N67ENTM57

419 kW (570CV) @ 3000 rpm

(\*)Net power to the flywheel in compliance with ISO 3046-1. Test conditions: T 25 °C; atmospheric pressure 100 kPa; relative humidity 30%.

### WARNING

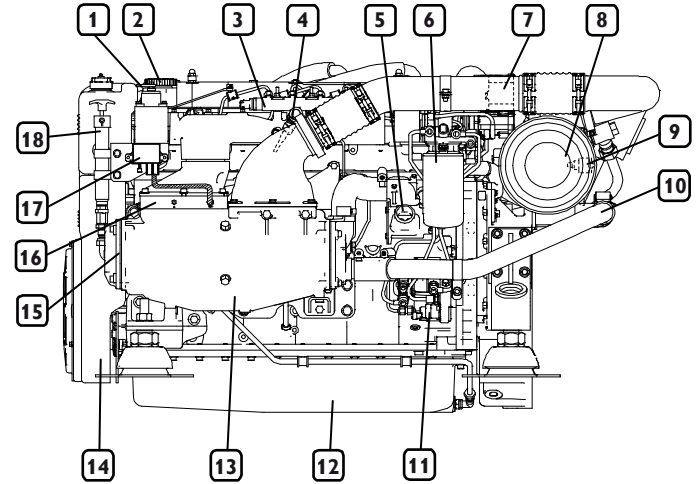
*Any alteration of the above mentioned characteristics, in particular modification of the data stored in the injection system electronic units or the characteristics of the engine and its fittings, is strictly prohibited, penalty invalidation of the guarantee and absence of all liability on the part of FPT.*



13\_010\_N

## N67ENTM57

1. Turbocharger - 2. Rocker cover - 3. Lifting eyelet - 4. Oil inlet pipe - 5. Oil outlet pipe - 6. Thermostatic valve position - 7. Oil filling cap - 8. Coolant inlet plug - 9. Coolant tank - 10. Cooled exhaust manifold - 11. Oil filter - 12. Alternator - 13. Coolant entry point into engine - 14. Automatic ancillary belt tensioner - 15. Domestic water heating system - 16. Oil temperature sensor - 17. Sea water discharge plug - 18. Engine coolant/sea water tube heat exchanger - 19. Lubricating oil discharge plug - 20. Electric starter motor - 21. Engine coolant discharge plug - 22. Sacrificial anode - 23. Oil /sea water heat exchanger - 24. Exhaust gas and sea water pipe.



13\_011\_N

## N67ENTM57

1. Accelerator potentiometer - 2. Oil filling cap - 3. Common-rail transfer box - 4. Oil level dipstick - 5. Sea water pump inlet - 6. Fuel filter - 7. Oil vapour separator - 8. Air filter - 9. Air filter clogged indicator - 10. Connecting hose for sea water from aftercooler to engine coolant/sea water heat exchanger - 11. High pressure common-rail injection pump - 12. Oil sump - 13. Heat exchanger - 14. Auxiliary units - 15. Sacrificial anode - 16. Grid Heater - 17. Grid Heater control box - 18. Manual pump for extracting lubricating oil.

## SIGNS

Certain warning signs are affixed to the engine, and their meanings are indicated below.

**NOTE:** The signs with an exclamation mark on them underline a potential **danger**.



Lifting point (engine only).



Fuel Cap  
(on the fuel tank, if there is one).



Oil Cap.



Oil dipstick.

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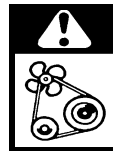
Danger of burning:  
Expulsion of hot water under pressure.



Danger of burning:  
Presence of high temperature parts.



Danger of fire:  
Fuel present.



Danger of impact or catching  
on moving parts:  
Presence of fans, pulleys, belts or the like.

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## ■ USE

### PRELIMINARY CHECKS

Before starting the engine each time:

- ❑ Make sure that the sea-water inlet valve is open. Operation of the sea water pump without water would cause irreparable damage to the internal rotor within a very few seconds.
- ❑ Check the level of technical fluids (fuel, engine oil and coolant).

#### CAUTION!



*Before starting the engine, make sure that no combustible vapours or gasses are present in the engineroom.*

## STARTING AND STOPPING THE ENGINE

### For vessels equipped with instrument panels that are not manufactured by FPT

The start-up and shut-down operations described below apply to an on-board control panel manufactured by FPT; if the vessel is fitted with an instrument panel that has been customised by the Boatbuilder or Fitter, these operations may vary according to the various choices made during construction. In these cases, follow the start-up/shut-down sequence and use the instrument panel description provided by the Boatbuilder on specific documentation.

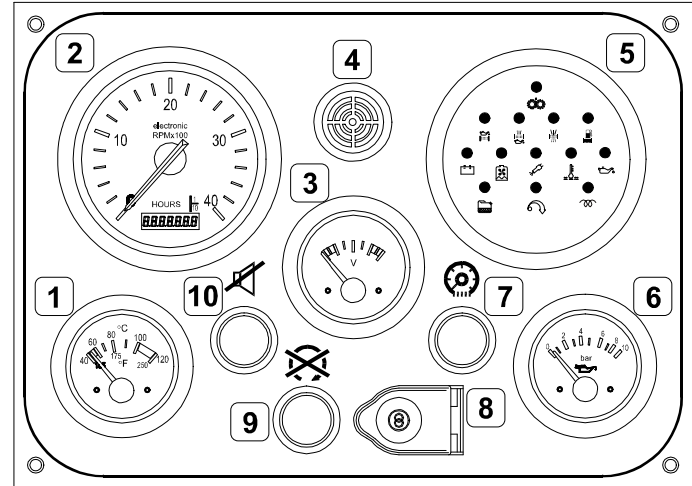


## STARTING AND STOPPING THE ENGINE FROM THE ANALOGUE CONTROL PANEL

### Start-up procedure from main analogue instrument panel (supplied on demand)

Make sure that the electric switch with the indication "ENGINE ROOM - BRIDGE" on the complete single module on the Relay Box unit, (usually located in the engine room) is on "BRIDGE" and then proceed as follows:

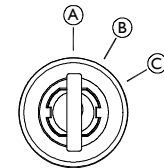
1. Lift the protective cover over the key switch (8), insert the key and turn it to the right to position **B**.
2. Make sure that the analogue instruments are showing values that conform with the relevant physical parameters (temperature, battery voltage and oil pressure).
3. Wait for the beeper to stop sounding and for the alarm indicator lights on the indicator module (5) to switch off, with the exception of the "alternator recharge" and "low oil pressure" indicators. At the same time, check that the indicator test has been performed successfully (information on how to interpret this test and indications on the module are given in the relevant paragraph).
4. Turn the key to position **C**; once the engine has started, release the key and do not accelerate.
5. Make sure that the analogue instruments are showing values that conform with the relevant physical parameters (temperature, battery voltage and oil pressure).
6. If the engine does not start, after releasing the key it will only be possible to turn it back to the start position after first returning the switch to the rest position **A**.



08\_057\_C

1. Coolant temperature indicator - 2. Rev counter and hour counter - 3. Voltmeter - 4. Beeper - 5. Indicator and alarm module - 6. Engine oil pressure indicator - 7. Control panel instrument light switch - 8. Key switch to start/stop the engine - 9. Button to stop the engine - 10. Button to disable the beeper.

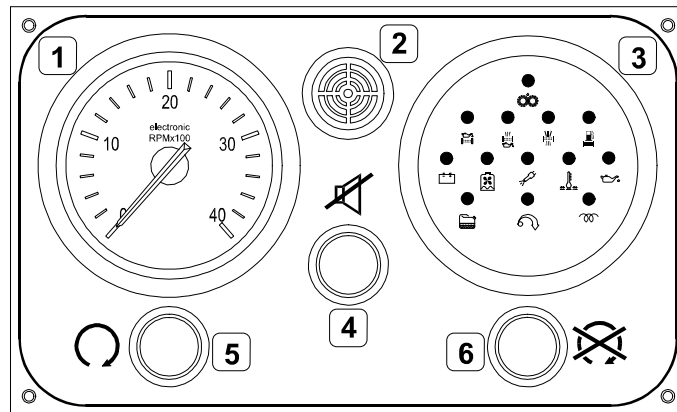
### Detail of the key switch



13\_005\_N

## Start-up procedure from the secondary analogue instrument panel or fly-bridge (supplied on demand)

1. **Enable the functioning of the secondary analogue instrument panel by putting the main analogue instrument panel key switch to B** (see warnings and procedure given in previous paragraph).
2. Wait for the beeper to stop sounding and for the alarm indicators on the indicator module (3) to switch off, with the exception of the “alternator recharge” and “low oil pressure” indicators. At the same time, check that the indicator test has been performed successfully (information on how to interpret this test and indications on the module are given in the relevant paragraph).
3. Press the green button (5) and release it when the engine has started.
4. Check that the rev indicator shows a plausible value.



1. Rev counter and hour counter - 2. Beeper - 3. Indicator and alarm module - 4. Button to disable the beeper - 5. Engine start button - 6. Engine stop button.

## Stopping the engine

Before stopping the engine it is recommended you run it for a few minutes at minimum speed with no load; this will allow the temperature to drop evenly and will avoid harmful thermal shocks.

A. The stop engine procedure **from the main analogue instrument panel** has two different options:

- Turn the key switch from + 15 to OFF (**A**);
- Press the motor stopping button (9) (the stop button cuts off the power supply to the coil of a relay), then turn the key switch to OFF. When the button is released the system checks all the functions connected to the panel.

### WARNING



*The stopping procedure for R.I.N.A. homologated systems is different from standard systems.*

### For R.I.N.A. homologated systems only:

Turn the key switch to OFF (**A**), then press the motor stopping button (the motor stopping button will excite the coil of a relay).

**NOTE:** In the case of emergency braking or dangerous situations, press the buttons to stop the engine.

Then, to stop the supply to the engine control unit, turn the ignition switch to the OFF (**A**) position and press the R.I.N.A. (9) stop button.

B. Stopping via the **secondary analogue instrument panel** is performed by pressing the red button (6) on the panel.

### To re-start the engine from the main control panel:

1. Return the key switch to the rest position **A** to reset all the on-board control panel functions.
2. Proceed as indicated.

### To re-start the engine from the secondary control panel:

1. Make sure that the panel has been enabled (key switch on the main control panel turned to position **B**).
2. Press the green button (5) and release it when the engine has started, making sure that the rev indicator is showing a plausible reading.

## RECOGNISING ALARMS

FPT on-board control panels with analogue instruments are fitted with an electronic module that includes the indicator lights and the interface, timer and alarm storage circuits.

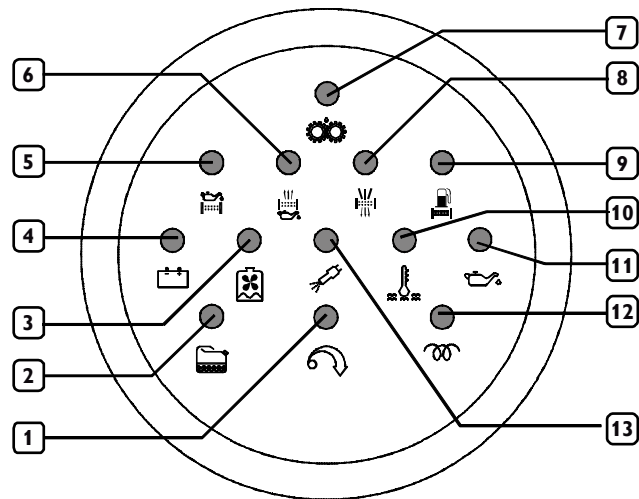
The figure shows the quadrant of the "Warning signals and alarms" module while the key shows the meaning of the alarm ideograms for all the warning light indicators; some types of engines and the relative equipment only make some of the aforementioned functions available. If the Boatyard uses different technical options there may also be changes to the above.

### Operation

When the key switch is turned to position **B** the signals and alarms module will perform an efficiency test on all the indicator lights, lasting 5 seconds, with the exception of the "Pre-lubrication", "Pre-post heating", "EDG system malfunction" indicators, and simultaneously the beeper sounds.

It is possible to stop the beeper before the end of the test, by pressing the relevant button.

During start-up and for the following 15 seconds, all alarm functions are disabled; after this period, each alarm detected by the sensors provided on the engine will result in the relevant indicator flashing and a simultaneous warning sound from the beeper. If the beeper is disabled by pressing the relevant button, the indicator light will turn on without flashing and the alarm will be stored until the engine is next stopped.



08\_027 C

1. Overrevving - 2. Water in fuel filter - \*3. Low engine coolant level - 4. Alternator malfunction - \*5. Oil filter clogged - \*6. Blow-by filter clogged - \*7. Pre-lubrication in progress - 8. Air filter clogged - \*9. Fuel filter clogged - 10. High temperature of coolant - 11. Low oil pressure - \*12. Pre-post heating - 13. EDC failure.

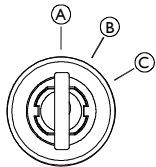
\*Functions not available for engines N67 ENT M56.

## STARTING AND STOPPING THE ENGINE FROM THE DIGITAL INSTRUMENT PANEL

### Start-up procedure from the main digital instrument panel

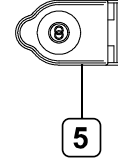
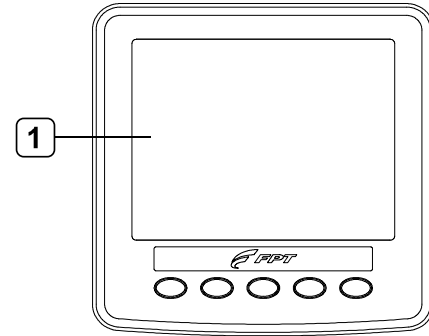
Make sure that the electric switch with the indication "ENGINE ROOM - BRIDGE" on the complete single module on the Relay Box unit, (usually located in the engine room) is on "BRIDGE" and then proceed as follows:

1. Lift up the protective cover for the ignition switch (5), introduce the key and turn it to the right to position B.
2. Check that the panel readings are plausible with the physical parameter figures.
3. Wait for the acoustic alarm signal to stop, except for "Alternator faulty" and "Loe oil pressure" and, at the same time check that the outcome of the test is positive (see RECOGNITION OF ALARM STATES section).
4. Turn the key to position C; once the engine is started, release it avoiding accelerating.
5. Check that the readings are plausible with the new physical parameter figures (temperature, oil pressure and voltage).
6. If starting fails, after having released the key it will only be possible to return to the starting position after having placed the switch in rest position A.



View of switch withkey

13\_005\_N



08\_019\_N

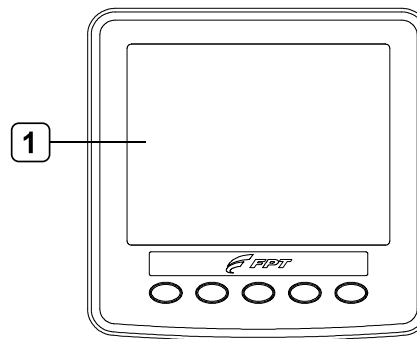
1. Engine control panel - 2. Horn / Horn relay - 3. Horn inhibitor button - 4. Energizing cut out button - 5. Ignition switch for starting/stopping engine

**The aforementioned elements (2, 3, 4, 5) are provided separately from the FPT and are to be positioned in the instrument panel by the Building Site or Fitters.**

## Start-up procedure from the secondary digital instrument panel or fly-bridge

(supplied on request)

1. Enable the functioning of the secondary digital instrument panel by putting the instrument panel key switch (analogue, digital or deluxe) to B.
2. Wait for the alarm to stop and the alarm indicators to go out except for the "Alternator faulty" and "Low oil pressure" (see RECOGNITION OF ALARM STATES section).
3. Press the green START button (3) and after starting release it checking that the readings are plausible with the new physical parameters.



08\_020\_N

1. Engine control panel - 2. Horn - 3. Engine starting button - 4. Horn inhibitor button - 5. Engine cut out button (energizing or de-energizing).

**The aforementioned elements (2, 3, 4, 5) are provided separately from the FPT and are to be positioned in the instrument panel by the Building Site or Fitters.**

## Stopping the engine

Before stopping the engine it is advisable to keep it turning over for several minutes idling in no load conditions; this will allow a uniform reduction of the temperature and prevent damaging thermal shock.

A. **From main instrument panel:** on standard systems the engine is stopped by turning the ignition key to the rest position **A**.

WARNING	
	<i>The stopping procedure for R.I.N.A. homologated systems is different from standard systems.</i>

### For R.I.N.A. homologated systems only:

Turn the key switch to OFF (**A**), then press the motor stopping button (4) (the motor stopping button will excite the coil of a relay).

**NOTE:** In the case of emergency braking or dangerous situations, press the buttons to stop the engine.

Then, to stop the supply to the engine control unit, turn the ignition switch to the OFF (**A**) position and press the R.I.N.A. (4) stop button.

B. **From secondary instrument panel:** the engine is stopped by pressing the red STOP (5) button.

### To restart the engine from the main panel:

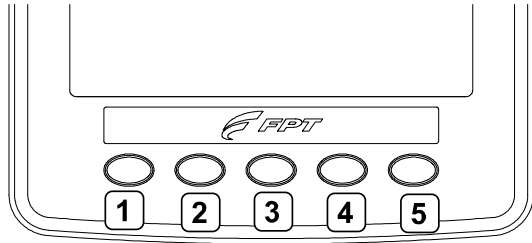
1. Turn the ignition key to the rest position **A** to reset all the functions carried out by the control panels.
2. Proceed as described in the appropriate paragraph.

### To restart the engine from the secondary panel:

1. Make sure that the panel is enabled (main panel ignition switch in position **B**).
2. Press the green START button (3) and after starting release it checking that the readings are plausible.

## DIGITAL INSTRUMENT PANEL FOR ENGINE PARAMETER READINGS AND ALARM DISPLAY

The digital instrument panel for reading the operating parameters of the engine has, at the bottom of the screen an instrument bar which outlines, in the form of icons, the structure displayed by each key. The choice of function is made by pressing the corresponding button, from left to right. The instrument bar disappears after 5 seconds of inactivity.



08\_021\_N

Button 1	Button 2	Button 3	Button 4	Button 5
Display of parameters in three independent windows	Display of parameters in four independent windows	Graphic display of parameters time progress in one single window	Alarm display.	Monitor adjustment and contrast or, if pressed for 3 seconds, access to configuration menu



When the display is turned on an initial screen with the FPT logo appears for about 7 seconds. The display will carry out an autodiagnosis at the same time. If the display gives a "beep" for more than a second this means that the autodiagnosis has failed.




















As soon as the initial screen with the FPT logo disappears, the monitor will show the readings of its virtual indicators (Tri screen). A few moments later the last screen displayed before switching off will appear.



## Display of engine version parameters (in standard configuration)

The table lists the parameters transmitted by the CAN line (J1939) and displayed on the control monitor in the modes described previously: screen with one, three or four windows. The DB in the table indicates the internal data base that stores all the data transmitted by the engine. The complete list of the internal data base can be consulted, on the monitor, by means of the configuration menu under the item "DB Viewer". If the parameter requested is not available it will not be possible to select it and if it becomes unavailable during the display the following will be shown on the monitor "- - -".

SYMBOL	PARAMETER	Datalinks		Screen windows			
		J1939	3	4	I	DB	
ELECTRICAL SECTION Volt or Ampere							
	Battery voltage	√	√	√	√	√	√
Fuel (L, Gal, lGal) o (L/h, Gal/h, lGal/h) o (km/L, MPG, o lMPG)							
	Residual fuel with GPS	√	√				√
	Instantaneous Fuel Economy	√	√				√
Distance (km, milia, o Nmilia)							
	Remaining distance with GPS	√	√	√			

SYMBOL	PARAMETER	Datalinks	Finestre schermo			
		J1939	3	4	I	DB
Pressure (kPa, PSI o bar)						
	Barometric pressure	√	√	√		√
	Turbocharging pressure	√	√	√		√
	Engine oil pressure	√	√	√	√	√
	Reverse gear oil pressure	√	√	√	√	√
Temperature (°C o °F)						
	Engine coolant temperature	√	√	√	√	√
	Fuel temperature	√	√			√
	Exhaust gas temperature	√	√	√	√	√
Percentage (%)						
	Acceleration position	√	√	√	√	
	Refrigerant level	√	√	√	√	
	Engine torque current percentage	√	√	√	√	
	Engine torque at rpm	√	√	√	√	
Speed (RPM, km/h, MPH o KTS)						
	Engine speed	√	√	√	√	√
Time (h)						
	Total hours of engine operation	√	√			

## Alarm display



When an active alarm is received by the monitor a flashing window or a general alarm symbol appears depending on the control unit setting, superimposed on the screen in use at the time with the failure warning. A warning sound is activated at the same time.

TOTAL ALARMS : 10	SRC	DESCRIPTION	FAIL MODE
10.	0:00	ENG OIL PRESS. ENG HRS : 1257 SPN : 100 OCC CNT : 8	TOO LOW MS FMI : 1
9.	0:00	AIR INLET PRESS. ENG HRS : 1257 SPN : 106 OCC CNT : 10	FMI : 2B
8.	0:00	AIR INLET TEMP. ENG HRS : 1257 SPN : 105 OCC CNT : 9	UNKNOWN FMI : 11

The list of active alarms is accessed by pressing any of the buttons. The alarms that have not yet been recognized are grey on a black background.

TOTAL ALARMS : 10	SRC	DESCRIPTION	FAIL MODE
10.	0:00	ENG OIL PRESS. ENG HRS : 1257 SPN : 100 OCC CNT : 8	TOO LOW MS FMI : 1
9.	0:00	AIR INLET PRESS. ENG HRS : 1257 SPN : 106 OCC CNT : 10	FMI : 2B
8.	0:00	AIR INLET TEMP. ENG HRS : 1257 SPN : 105 OCC CNT : 9	UNKNOWN FMI : 11

After recognizing the alarms the screen returns to black characters on a grey background and the possibility of exiting the screen returns ("door open" symbol).

### WARNING

The seriousness of the alarm is displayed in the flashing window:

**MS:** VERY SERIOUS

**MOD:** MODERATELY SERIOUS

**LS:** LESS SERIOUS

## Memorizing alarms

When accessing the list of alarms memorized the display automatically shows the most recent alarm. It is possible to scroll through the list using buttons 1 and 2 under the arrows (↓ and ↑). It is not possible to exit this screen until all the alarms have been recognized. Recognition of the alarms takes place by pressing button 3 (under the HOLD RESET symbol). The alarms are automatically cancelled when no alarm signal is transmitted to the monitor for a long time.

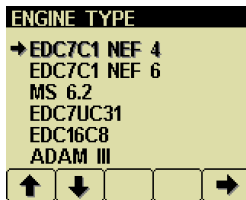
TOTAL STORED ALARMS : 7	SRC	DESCRIPTION	FAIL MODE
6	0:16	ENG OIL FILTER PRESS. SPN : 99 OCC CNT : 5	DISCONNECTED FMI : 5
5	0:00	ENG OIL LEVEL SPN : 98 OCC CNT : 4	VOLTAGE LOW FMI : 4
4	0:00	WATER IN FUEL SPN : 97 OCC CNT : 3	VOLTAGE HIGH FMI : 3

The alarms memorized can be displayed by pressing button 4. If no alarm is memorized an error message is displayed.

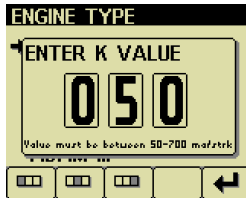
All the alarms memorized in the monitor can be deleted by pressing button 3.

## Initial launch of engine control monitor

The FPT monitor for reading parameters can operate with 6 different types of engines. It will be the fitter or the rigger's job to programme the correct operating modes for the specific type of engine. The information relating to fuel consumption requires the correct programming of the maximum introduction data relating to the performance of the engine. Proceed as follows:



Using the buttons underneath the arrows (↓ and ↑) select the engine control unit. Once it is set, the screen for the engine control unit will not be displayed during the normal operation of the monitor.



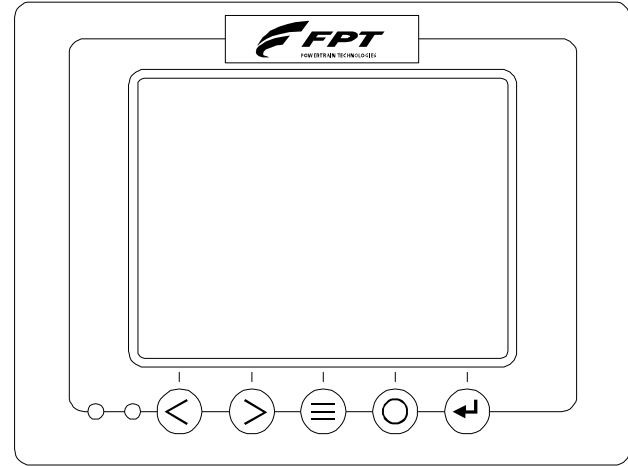
Keep the standard basic set value

## STARTING AND STOPPING THE ENGINE FROM THE DELUXE DIGITAL INSTRUMENT PANEL

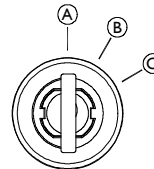
### Start-up procedure from main deluxe digital instrument panel

Make sure that the electric switch with the indication "ENGINE ROOM - BRIDGE" on the complete single module on the Relay Box unit, (usually located in the engine room) is on "BRIDGE" and then proceed as follows:

1. Lift the protective cover of the key switch (5), insert the key and turn it to the right to position **B**.
2. Check that the panel gives indications which are plausible with the values of the relative physical parameters.
3. Wait for the acoustic signal to stop, with the exception of "Alternator malfunction" and "Low oil pressure", and at the same time check that the test has a positive outcome (see the section RECOGNISING THE ALARM STATES).
4. Turn the key to position **C**; start the engine, release it avoiding acceleration.
5. Check that the reading provides indications which are plausible with the new values of the relative physical parameters (temperature, voltage and oil pressure).
6. In the case of a failed start-up, after releasing the key it will only be possible to return to the start-up position after having put the switch back to the rest position **A**.



13\_006\_N



13\_005\_N

## Stopping the engine

Before stopping the engine it is advisable to keep it turning over for several minutes idling in no load conditions; this will allow a uniform reduction of the temperature and prevent damaging thermal shock.

A. **From main instrument panel:** on standard systems the engine is stopped by turning the ignition key to the rest position **A**.



### For R.I.N.A. homologated systems only:

Turn the key switch to OFF (**A**), then press the motor stopping button (4) (the motor stopping button will excite the coil of a relay).

**NOTE:** In the case of emergency braking or dangerous situations, press the buttons to stop the engine.

Then, to stop the supply to the engine control unit, turn the ignition switch to the OFF (**A**) position and press the R.I.N.A. (4) stop button.

B. **From secondary instrument panel:** the engine is stopped by pressing the red STOP (5) button.

### To restart the engine from the main panel:

1. Turn the ignition key to the rest position **A** to reset all the functions carried out by the control panels.
2. Proceed as described in the appropriate paragraph.

### To restart the engine from the secondary panel:

1. Make sure that the panel is enabled (main panel ignition switch in position **B**).
2. Press the green START button (3) and after starting release it checking that the readings are plausible.

## **DELUXE DIGITAL INSTRUMENT PANEL FOR ENGINE PARAMETER READINGS AND ALARM DISPLAY**

The deluxe digital instrument panel acquires, checks and records all the information coming from the engine and the navigation devices. The unit is made up of an advanced monitoring system together with a 5.7" TFT high luminosity touch-screen (500cd) and a membrane keyboard.

In the front there is a green led monitoring the power supply and a red alarm led.

The acoustic alarm is usually activated by an external buzzer driven by a built-in relay.

The unit shows the **monitoring pages**, each of which is made up of a number of analogue and digital indicators.

In order to interact with the unit it is possible to use the keys on the keyboard or the touch-screen.

Press the key "<<" and ">>" to scroll through the pages and view all the monitored dimensions.

Press the touch-screen on an analogue indicator to change the analogue presentation to digital and vice-versa.

## ALARM DISPLAY

The system performs a complete and uninterrupted scan of all the inputs irrespective of the monitoring page which is displayed.

Up to four alarm thresholds can be activated for each inlet:

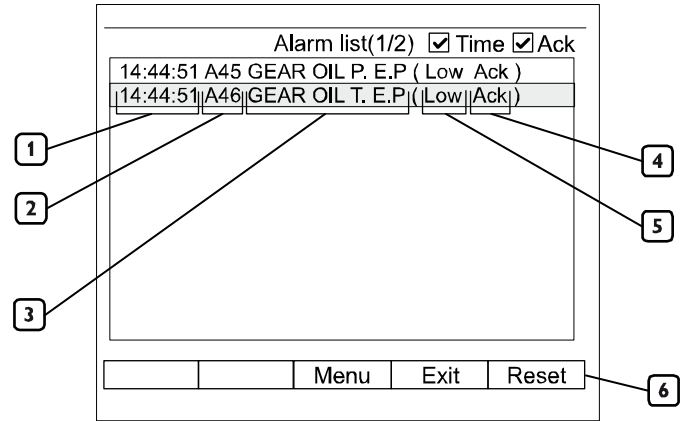
- low
- low pre-alarm
- high pre-alarm
- high

When an alarm threshold is activated, the alarm page opens automatically, the alarm input is marked with a red flashing led. The acoustic output relay is activated.

The acoustic alarm can be silenced by pressing the "Reset" button (6). The alarm continues until the "Reset" is acknowledged and the cause of the alarm has been removed.

Slf a new alarm is detected during normal operation, the unit automatically displays the alarm page.

From the alarm page which can be accessed from the menu page, it is possible to view the time (1), the description (5) and the state of all the alarms/events which are active during the current work session. This page resets each time the system is switched off however, the list of alarms is recorded in the permanent memory of the system and can be viewed in the "Records" section.



13\_007\_N

1. Time of event/alarm - 2. Identifying input/output - 3. Description of input/output - 4. Event/alarm state - 5. Description of alarm type - 6. Button to silence and acknowledge the alarms.

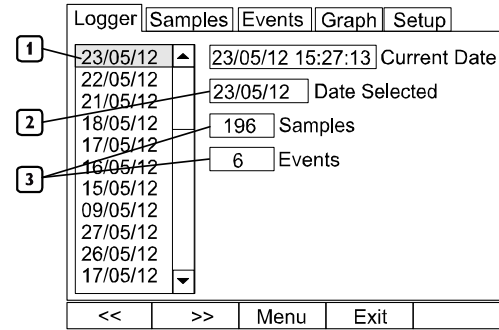
## ADJUSTMENTS

By using a selectable time interval, the system automatically records all the monitored parameters and their relative state (no alarm, alarm etc) in a daily file.

All the daily files of the samples are ordered by recording date. To recall the stored data, it is possible to select the date required on the screen and then move to the section "Samples" or "Graphs" to view the data.

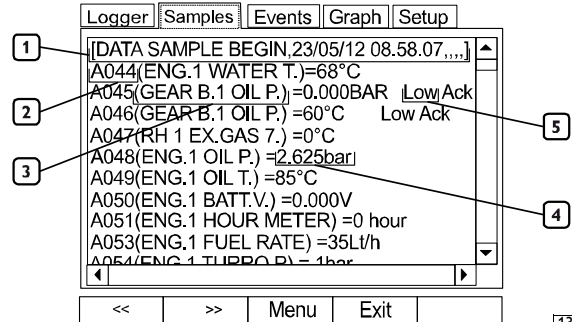
After having selected the file required (as described in the previous paragraph), it is possible to view the content by selecting from the "Samples" section. The recorded data is displayed in text format and can be viewed by scrolling down the side bar.

The file includes all the samples recorded on the date to which it refers and, for each one, the date and time of the sample is indicated.



13\_008\_N

1. Sample file (organized by date) - 2. Selected file - 3. No. of samples and events recorded on the date selected



13\_009\_N

1. Time and date of sample - 2. Identifying input/output - 3. Description of input/output - 4. Recorded value - 5. Description of alarm state



## FIRST START-UP FROM ENGINE CONTROL DELUXE DIGITAL INSTRUMENT PANEL

On the first start-up the panel will carry out a configuration set-up whereby the type of control unit with which the engine is equipped and other important parameters must be set.

The set-up will only be carried out on the first start-up.

Setup

ECU Type	K Factor	Engines
EDC7UC31	0	2
Layout	Mode	Battery
Classic	Double	24 V.
Oil Serv. Hour	Fuel Serv. Hour	Unit Meas.
300	250	EU

Save Setup

187873

Fill out the ECU Type and K Factor fields indicating the type of engine which is installed.

The number of engines (1 or 2) and the battery voltage (12V or 24V).

In this menu it is possible to set the maintenance interval for the Oil filter, Fuel and the unit of measurement for the system.

## Complete single module electric equipment

### Control unit, Relay box, Converter module

The N67ENTM57 engine is equipped with a complete single module which has three components inside:

- EDC 7 UC31 electronic control unit
- Relay box
- Converter module

### Engine management from Relay Box

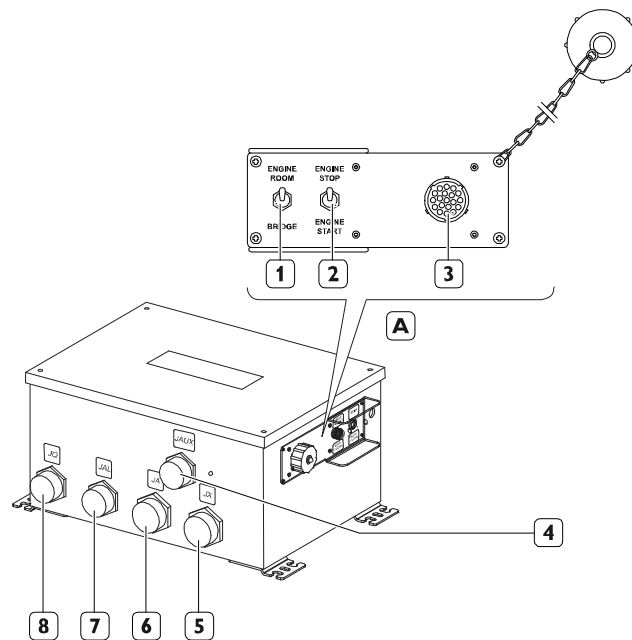
The relay box (A) is on the side of the complete single module. With the electrical controls on the panel it is possible to control the "start and stop" (2) of the engine directly from the engine room, excluding the possibility of accidentally starting the engine from the bridge (1).

A multipolar connector is on the relay box, protected by a screw-on cover (3). The diagnosis instruments prearranged by the FPT can be connected to it.

Inside the box, anchored to a printed circuit, there are relays to manage the power of some components and the elements which protect the electrical lines from any accidental short circuit or excessive power draw.

These components have the same function as those of the fuses, preventing almost entirely, the need for intervention in order to restore the electrical power in circuits with malfunction.

These components are able to limit and eliminate the short circuit currents without fusing, restoring the electrical power and that of the circuit when the cause of the malfunction is removed.



187793

1. Selector for starter motor from engine room or instrument panel - 2. Manual accelerator control in engine room - 3. Diagnosis connector - 4. Connector for remote control configuration and client interface - 5. Connector for remote connection - 6. Connector for remote connection - 7. Connector for power supply - 8. Connector for connection to instrument panel

## Start-procedure from engine room

Moving the switch (1) of the relay box in the Complete Single Module to the position "ENGINE ROOM" (this operation must not, under any circumstances, be performed with the engine turning over), it enables, irrespective of the position of the key switch on the signalling and control panel, the use of the adjacent button for ENGINE START – ENGINE STOP (2).

This way it is possible to start-up and stop independently from the controls on the bridge.

Putting the switch (1) to the position "BRIDGE" inhibits the use of the "ENGINE START - ENGINE STOP" button on the Complete Single Module allowing start-up only via the controls on the bridge.

## Management of rotation speed

In order to allow trouble-free management of the rotation speed of the engine from the "engine room", a simultaneous acceleration/ deceleration function (SET+ / SET-) has been implemented in the "start" function and which is only active when the switch (1) is on "ENGINE ROOM".

### Acceleration (SET +)

If the button "ENGINE START - ENGINE STOP" is kept on "ENGINE START" with the engine turning over, there is a progressive increase in the rpm; the increase stops when the button is released allowing the engine to turn over at the required rpm.

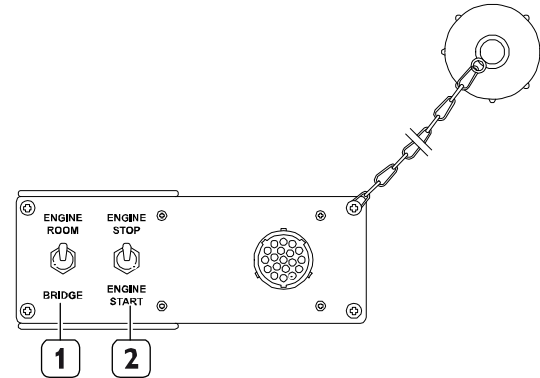
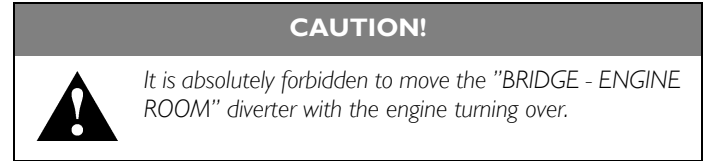
### Deceleration (SET –)

Putting the "ENGINE START – ENGINE STOP" button once again to the "ENGINE START" position after having previously released it during the rpm increase phase, there is a progressive reduction in the rotation speed; when the button is released the function will be

inhibited and the speed which has been reached at that moment will be maintained.

**NOTE:** Further button changes will produce an alternating increase-decrease of the engine rpm.

The "stop" function has priority and always stops the engine.



187808

1. Selector for starter motor from engine room or instrument panel - 2. Manual accelerator control in engine room

## FOR PROPER USE OF THE ENGINE

- ❑ Do not continue to press the starter, when the engine has started.
- ❑ Do not remain in dock while waiting for the engine to warm up, but after starting, commence navigation at low speed; the working temperature will be reached properly with the engine running at medium speeds.
- ❑ Do not operate the engine at minimum speed for long periods, as this encourages the production of harmful exhaust and does not guarantee optimum performance.
- ❑ The engine speed must be increased and decreased gradually, to allow regular combustion and proper operation of all engine components.
- ❑ The maximum cruising speed must not be more than 90% of the speed corresponding to maximum power (see section on ENGINE TECHNICAL DATA).
- ❑ During navigation, check that:
  - The engine coolant temperature does not reach the alarm threshold.
  - The oil pressure remains within normal values.

## SPECIAL WARNINGS

### Coolant temperature high

If the temperature indicated on the instrument is considered too high, or if the alarm is displayed, reduce speed and return to port to check the state of the sea water intake and cooling system circuits; also check and have checked:

- tension of the water pump and alternator command belts.
- operation of the thermostat valve.
- whether or not the heat exchangers are clean.

### CAUTION!



*When the engine is warm, a pressure liable to cause hot liquid to be expelled with extreme violence is created within the cooling circuits. This results in a danger of burning. Only open the coolant tank cap if strictly necessary, and only when the engine is cold.*

### Low lubricant pressure

If the pressure indicated by the instrument is considered insufficient, or if the “low oil pressure” indicator lights up, stop the engine and check the oil level. Top up if necessary (see CONTROL AND MAINTENANCE section).

If the condition persists, return to port at low speed and contact a Service Centre.

## Water in the fuel pre-filter

It is a good rule to drain the water from the filters, before the relevant indicator comes on.

Avoid using the engine with the fuel tank only a small reserve of fuel; this encourages the formation of condensation and makes it more likely you will suck up dirt or air, resulting in engine stoppage.

### CAUTION!



*When refuelling, always pay great care to ensure that no solid or liquid pollutants enter the fuel tank; you must also remember that smoking and live flames are prohibited when refuelling.*

## Air filter blocked and exhaust circuit inefficient

Inspect the cleanliness of the air intakes and discharge pipes on a regular basis. The maintenance intervals indicated in this manual only take into account the performance of engine components, and not any additional fittings installed by the Boatbuilder and any external events.

### CAUTION!



*Visually check that the exhaust circuit is not blocked or damaged, so as to prevent dangerous fumes within the vessel.*

## Alternator malfunction

Check it or have it checked periodically for cleanliness, wear and proper tensioning of the drive belt.

### CAUTION!



*The drive members are located under protective casings. These must only be removed when the engine is not turning.*

## Irregularities in the electrical system

Periodically check, particularly during the winter, to ensure that the batteries are clean and in full working order, checking and topping up as indicated in the section CONTROLS AND MAINTENANCE, always taking due note of the WARNINGS provided. If it should be necessary to replace them, always comply with the characteristics indicated in the section ENGINE TECHNICAL DATA.

## RUNNING IN

Thanks to modern engine construction technology, no particular running in procedure is required. However, it is recommended that, for the first 50 hours, you do not use the engine at high power for long periods.

## REFUELLING

Parts to be supplied	litres (kg)
Cooling circuit <sup>(1)</sup>	24.5
Lubrication circuit <sup>(2)</sup> total capacity <sup>(3)</sup>	16,5 (14.8)
Periodic changing: oil sump at minimum level oil sump at maximum level	9 (8.1) 14.5 (13)
Fuel tank <sup>(4)</sup>	-

- (1) Use a 50% mix of water/PARAFLU 11 or the equivalent corresponding to the specification SAE J 1034.
- (2) Use lubricants that comply with international specifications ACEA E5/E7 – (high power engines).  
Oil consumption is considered acceptable when it reaches a maximum of 0.5% of fuel consumption.
- (3) The amounts indicated refer to initial refuelling, and include filling the engine, sump and filter.
- (4) Only use normal commercial diesel fuel (EN 590 standards).

### WARNING

*Refuelling from drums or tanks may result in pollution of the diesel fuel, with the risk of damage to the injection system; if necessary, filter the fuel in a suitable manner or allow sedimentation of the impurities before refuelling.*

### Low temperature diesel

EN 590 specifications distinguish different classes of diesel fuel, identifying the characteristics of those best suited to low temperatures. It is entirely up to the Oil companies to comply with these regulations, which foresee that fuels suited to the climactic and geographic conditions of the various Countries be distributed.

### Filling up with marine gear oil

For the amount and types of oil to be used in the marine gear, please see the manual provided by the Manufacturer.

## ■ CONTROLS AND MAINTENANCE

### MAINTENANCE PERSONNEL

The engine control and maintenance operations described in the following chapter require training, experience and compliance with current safety regulations; for this reason they must be carried out by special technicians, as indicated below.

**Controls:** by workshop technicians or the vessel user if necessary.

**Periodic maintenance:** by qualified personnel equipped with suitable equipment and adequate means of protection. Operations marked by the key symbol (see illustration).



**Special maintenance:** by qualified personnel from Service Centres who have detailed technical information and specific equipment. Operations marked by the key symbol (see illustration).



The most qualified Assistance Centres are those which make up the FPT Technical Assistance Network.

### ACCIDENT PREVENTION

- Always wear heavy-duty footwear and overalls.
- Never wear loose, flapping garments, rings, bracelets and/or necklaces in the vicinity of engines or moving parts.
- Always wear protective gloves and goggles when:
  - filling up batteries with acid solution
  - refuelling with inhibitors or antifreeze

- replacing or topping up lubricant (hot engine oil may cause burns and scalds. Only carry out these operations when the oil has dropped to a temperature of below 50°C).
- When working in the engine compartment, pay particular attention to how you move, to avoid contact with moving parts or high temperature components.
- Wear goggles and use high pressure air jets (maximum air pressure used to clean is 200 kPa (2 bar, 30 psi, 2 kg/cm<sup>2</sup>).
- Wear a protective helmet when working in an area where there are suspended loads or systems installed at head-height.
- Use protective hand cremes.
- Immediately replace wet overalls.
- Always keep the engine clean, removing oil, grease and coolant stains.
- Store cloths in flame-proof containers.
- Do not leave foreign bodies on the engine.
- Use suitable, safe containers for used oil.
- When completing a repair, make suitable provisions to stop the engine taking in air if, after start-up, an uncontrolled increase in engine speed were to occur.

## CAUTION!



*Do not carry out maintenance operations when the electric power supply is turned on: always check to ensure that the appliances are properly earthed. During diagnosis and maintenance operations, make sure that your hands and feet are dry, and whenever possible use insulating stands*

## FREQUENCY

Controls	Frequency
Check oil level in engine	Every start
Check oil level in marine gear	Every start
Check engine coolant level	Every start
Check exhaust pipe/s for damage	Every start
Drain water from the fuel pre-filter	150 hours <sup>(1)</sup>
Check/top up electrolyte level in batteries and clean terminals	300 hours

The maintenance intervals indicated below take into account the typical working factors for various types of engine use; the most suitable interval for maintenance operations for the various applications will be indicated by the maintenance staff, according to the way and working conditions in which the engine is used.



## Planned maintenance

## Frequency

Clean air filter/s	300 hours <sup>(2) (3)</sup>
Check corrosion of zinc anodes	300 hours <sup>(3) (4)</sup>
Check state of oil vapour filter	300 hours <sup>(3)</sup>
Drain/suck condensation from fuel tank/s	600 hours <sup>(1) (3)</sup>
Change engine oil	300 hours <sup>(3) (5)</sup>
Change oil filter/s	300 hours <sup>(3) (5) (7)</sup>
Change fuel filter/s	500 hours <sup>(1) (3) (7)</sup>
Change fuel pre-filter	500 hours <sup>(1) (3)</sup>
Change oil in the marine gear	Consult the manufacturer's data
Inspect sea chest	300 hours <sup>(3)</sup>
Check tension and state of belt	600 hours
Change coolant	1200 hours or 2 years
Change air filter	2 years
Change oil vapour filter/s	2 years <sup>(5)</sup>





## Special maintenance

## Frequency

Check wear in sea water pump rotor	300 hours <sup>(3)</sup>
Replace belt	1200 hours or 3 years
Clean heat exchangers	300 hours <sup>(3)</sup> <sup>(6)</sup>
Visual inspection of turbocharger	300 hours <sup>(3)</sup> <sup>(5)</sup>
Adjust play in valves-rocker arms	3000 hours

- 1) Maximum period when using good quality fuel, (EN 590 standard); this is reduced if the fuel is contaminated and alarms are triggered due to blockage of the filters and presence of water in the pre-filter. When blockage of the filter is indicated, it must be replaced. If the water in pre-filter indicator does not go out after drainage, the pre-filter must be replaced.
- 2) The frequency with which operations are carried out will depend on the working conditions and efficiency/wear of the product. If the engine is not used for long periods of time, check it before you start it.
- 3) Must be performed annually, even if the required number of working hours are not reached.
- 4) The anode must be replaced if corrosion has exceeded 50% of the volume of zinc.
- 5) Replace lubricants according to the frequency indicated in the REFUELLING table.

- 6) Sea water/combustion air heat exchanger: clean both the air and water sections; engine coolant/sea water heat exchanger: clean the sea water section; optional sea water/marine gear oil heat exchanger: clean the sea water section.
- 7) Only use filters with the following characteristics:
  - filtration level  $< 10 \mu\text{m}$
  - filtering efficiency  $\beta > 200$ .

## WARNING

*When using fuel with a percentage sulphur exceeding 0.5%, or when using oils that do not comply with the specifications provided in the refuelling table, the times at which the engine oil, engine oil filter and oil vapour filter must be changed will vary according to the use and working conditions of the engine itself; for further information, please consult the technicians responsible for maintenance.*

## REQUIREMENTS

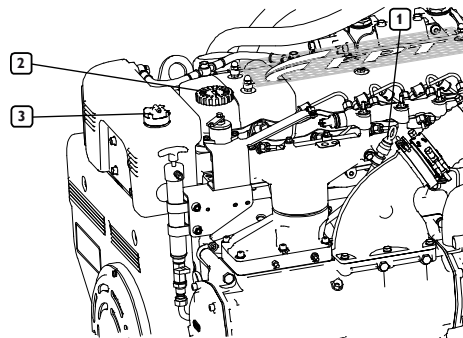
1. Do not disconnect the batteries with the engine running.
2. Do not carry out arc welding operations in the vicinity of the engine without first removing electrical cables and electronic units.
3. After each maintenance operation involving disconnection of the battery/batteries, make sure that the terminals have been properly locked onto the poles.
4. Do not use battery chargers to start the engine.
5. Disconnect the on-board network battery/batteries when recharging.
6. Do not paint the appliances, components and electrical connectors equipping the engine.
7. Disconnect the battery/batteries before any electrical operations.
8. Contact the Boatyard before installing electronic equipment on board (two-way radios, echo-sounding equipment, etc.).

## HOW TO PROCEED

### Check oil level in engine

Only proceed with the engine stopped and at a low temperature, so as to avoid the risk of burning.

- Using the dipstick (1), check that the oil level is between the "Min" and "Max" levels.
- If the level is too low, top up through the inlet on the cylinder head, after first removing the relevant cap (2).



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### WARNING

- After topping up, make sure that the oil level does not exceed the "Max" limit marked on the dipstick.
- Make sure that the dipstick is inserted properly and the filler cap is turned in a clockwise direction until it stops turning completely.

## Check oil level in marine gear

Check the oil level in the marine gear following the indications provided in the marine gear Manufacturer's manual.

## Check coolant level

Only proceed with the engine stopped and at a low temperature, so as to avoid the risk of burning.

- ❑ Remove the loading tank pressurisation cap (3 - previous page).
- ❑ Visually check the coolant level.
- ❑ Top up the tank if necessary, using a mixture of 50% clean water (not distilled) and Parafliù 11 (see REFUELLING table).

### CAUTION!



*Only open the coolant tank cap when the engine is cold.*

## Check exhaust pipe/s for damage

Visually check that the exhaust system is not blocked or damaged.

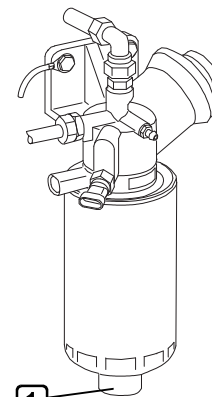
- ❑ Make sure that there is no risk of dangerous fumes within the vessel. Contact the Boatyard if necessary.

## Draining water from the fuel pre-filter

The high risk of refuelling with fuel that is polluted by foreign bodies and water means that it is necessary to perform this control even if no alarm is shown on the on-board control panel.

Proceed with the engine stopped.

- ❑ Place a container under the pre-filter to collect the fluid.
- ❑ Unscrew the tap plug (1) in the bottom part of the pre-filter; in some lay-outs the plug includes a sensor to detect the presence of water in the diesel.
- ❑ Drain off liquid until only "diesel" can be seen.
- ❑ Close the plug again, tightening it completely by hand.
- ❑ Dispose of the drained fluids according to current requirements.



## Checking the level of electrolyte solution in the batteries

Place the batteries on a level surface, then proceed as follows.

- ❑ Visually check that the fluid level is between the "Min" and "Max" limits; in the absence of references, check that the fluid covers the Lead plates inside the elements by approximately 5 mm.
- ❑ If necessary, top up with distilled water only those elements in which the level is below minimum.
- ❑ Contact specialised technical staff if the battery needs recharging.

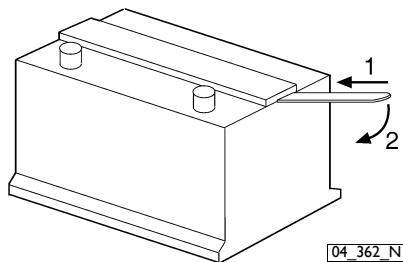
- ❑ Have the efficiency of the battery recharging system tested if a voltage of less than 11 V (for 12 V rated systems) or 22 V (for 24 V rated systems) is detected with the engine running.
- ❑ On this occasion, make sure that the terminals and clamps are clean, properly locked and protected by vaseline.

### CAUTION!



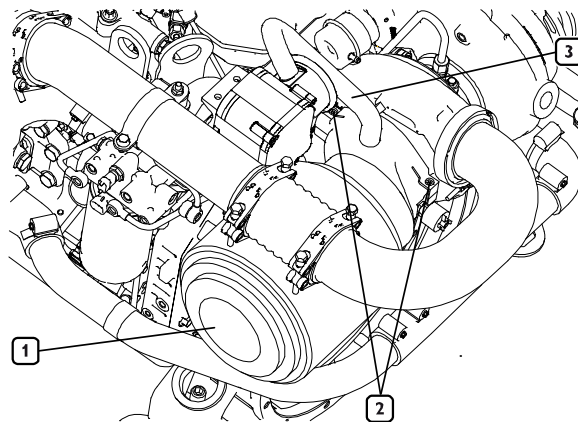
- ❑ *The batteries contain sulphuric acid, which is extremely caustic and corrosive; always wear protective gloves and goggles when topping them up. Whenever possible it is recommended that this control be carried out by specialised personnel.*
- ❑ *Do not smoke or use live flames near the batteries during controls, and make sure that the room you are working in is adequately ventilated.*

Some types of battery have a single cover for all the inspection plugs. To access the elements, use a lever as shown in the figure.



### Cleaning the air filter

- ❑ Remove the pipe (3) from the air filter body (1).
  - ❑ Loosen the 2 screws (2) indicated in the figure.
  - ❑ Remove the air filter body.
  - ❑ Blow dehumidified compressed air through the filter element, from the inside outward (maximum pressure 200 kPa), or wash with water only. Do not use detergents; **do not use diesel**.
  - ❑ Replace the filter if any breakages are found.
- NOTE: Replace the filter once every 2 years.**
- ❑ Position the filter in its seat and secure it with the 2 screws (2).
  - ❑ Insert the pipe (3) in the filter body (1).



## Check the state of corrosion of the zinc anode on the air/sea water heat exchanger

### CAUTION!

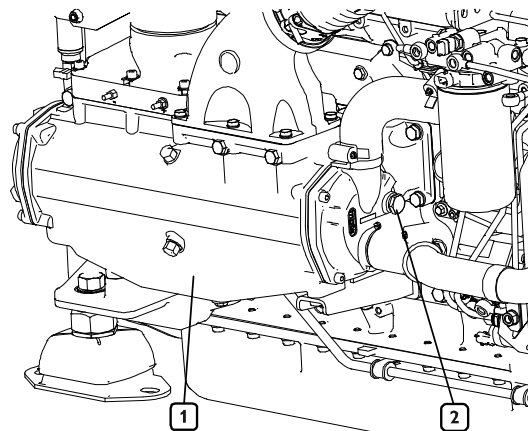


*Only proceed when the engine is not turning over and is at a low temperature.*

Remove the zinc anode (2) by unscrewing it from the air/sea water heat exchanger (1).

**NOTE:** Use a container to collect the liquid.

Check the level of corrosion of the zinc anode (2); if the corrosion exceeds 50% of the volume, replace it.  
Insert the zinc anode (2) into the air/sea water heat exchanger (1).



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## Check the state of corrosion of the zinc anode on the engine coolant/sea water heat exchanger

### CAUTION!



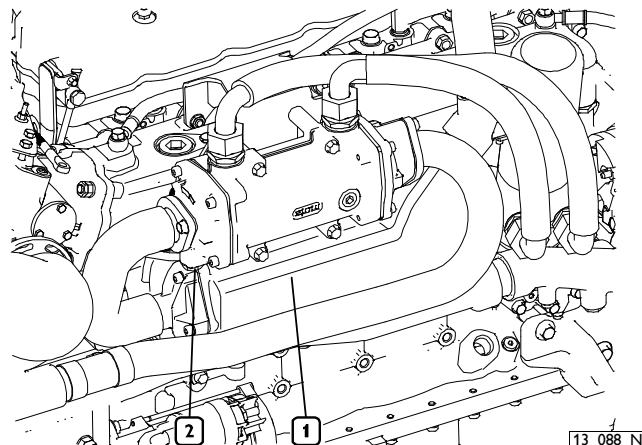
Only proceed when the engine is not turning over and is at a low temperature.

Remove the zinc anode (2) by unscrewing it from the engine coolant/sea water heat exchanger (1).

**NOTE:** Use a container to collect the liquid.

Check the level of corrosion of the zinc anode (2); if the corrosion exceeds 50% of the volume, replace it.

Insert the zinc anode (2) into the engine coolant/sea water heat exchanger (1).



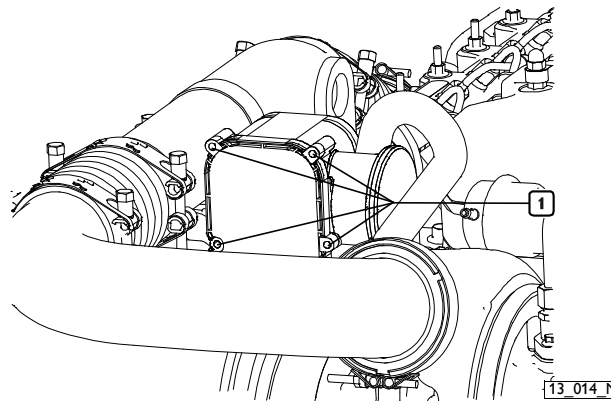
## Check the condition of the oil vapour filter

### CAUTION!



Only proceed when the engine is not turning over and is at a low temperature.

- Loosen the screws and remove the cover (1) of the filter housing.
- Remove the two filters and check that there are no deposits; if there are, replace the filters.
- Replace the cover on its seat.



## Changing engine oil

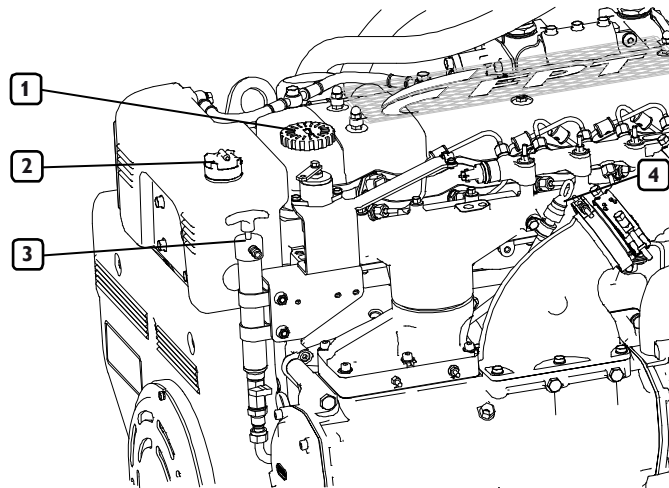
### CAUTION!



*Only proceed with the engine stopped and at a low temperature, so as to avoid the risk of burning.*

- ❑ Place a container to collect the used oil below the outlet pipe (3) of the hand pump (2).
- ❑ Unscrew the plug of the filler hole and act on the appropriate hand pump (2), used specifically for extracting the oil, until the oil sump has been completely emptied.
- ❑ Fill up with fresh oil through the feeder hole (1) on the timer cover, using the types and amounts of oil indicated in the table REFUELLING.
- ❑ Screw down the filler cap.
- ❑ Using the dipstick (4), check that the oil level is between the "Min" and "Max" levels.

**NOTE:** Dispose of used oil according to current requirements.



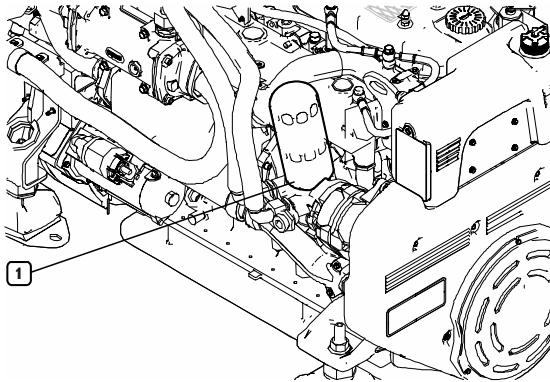
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## Changing the engine oil filter

Only proceed with the engine stopped and at a low temperature, so as to avoid the risk of burning.

Only use filters with a filtration level equivalent to the ones you are replacing (see section FREQUENCY).

- ❑ Place a container under the filter support (1), to collect the used oil.
- ❑ Unscrew the filter and remove it.
- ❑ Carefully clean the surfaces of the support that are in contact with the filter seal.
- ❑ Damp the new filter seal with a thin layer of oil.
- ❑ Hand screw the new filter into place until the seal gasket touches the support, then lock by a further 3/4 of a turn.
- ❑ Dispose of the old filter according to current requirements.

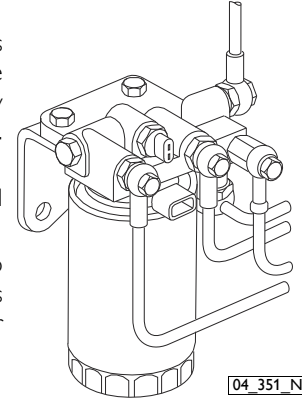


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## Changing the fuel filter

Only proceed with the engine stopped and at a low temperature

- ❑ Remove the filter by unscrewing it.
- ❑ Check that the new filter has performance levels that satisfy the needs of the engine (e.g. by comparing them with the old one. See section on FREQUENCY).
- ❑ Damp the new filter seal with diesel or engine oil.
- ❑ Hand screw the new filter into place until the seal gasket touches the support, then lock by a further 3/4 of a turn.



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### WARNING

*Do not fill up the new filter before fitting it to the support, to avoid introducing harmful impurities into the injection system and circuit.*

### CAUTION!



*Do not attempt to bleed in any way, as this is unnecessary and extremely dangerous, and also, if the high pressure circuit connectors are loosened there will be negative effects on start-up of the engine.*

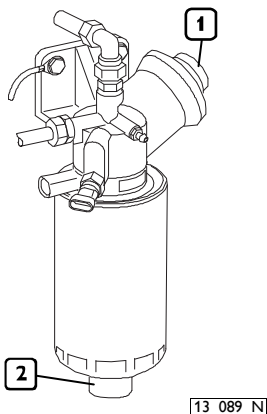


## Changing the fuel pre-filter

Only proceed with the engine stopped and at a low temperature

- ❑ Remove the pre-filter by unscrewing it.
- ❑ Check that the new filter has performance levels that satisfy the needs of the engine (e.g. by comparing them with the old one).
- ❑ Damp the new filter seal with diesel or engine oil.
- ❑ Hand screw the new filter into place until the seal gasket touches the support, then lock by a further 3/4 of a turn.
- ❑ Loosen the bleeder screw (2) on the pre-filter support and activate the hand pump (1) until the supply circuit is full. Ensure that any fuel coming out is not dispersed into the environment.
- ❑ Lock the bleeder screw tightly.
- ❑ Start the engine and run it at minimum speed for a few minutes to eliminate any residual air.

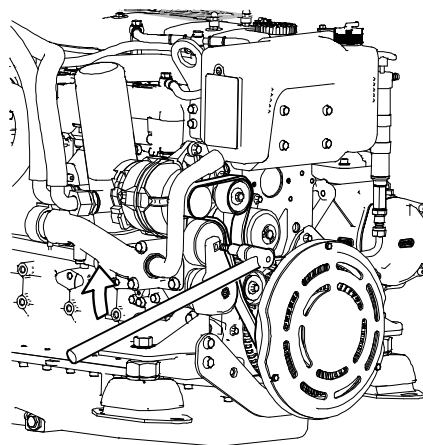
**NOTE:** should it be necessary to accelerate the bleeding phase, the hand pump can be used during start-up.



## Check tension and state of the auxiliary member drive belt

Only proceed with the engine stopped and at a low temperature, so as to avoid the risk of burning.

- ❑ Remove the casing protecting the pulleys.
- ❑ Check that the pulleys are not torn or worn, and that there are no lubricants or fuel on them. If this is not the case, replace them.
- ❑ At the same time, make sure that the tensioning device is working properly, proceeding as indicated in the figure.
- ❑ Replace the guard casing in its housing, and lock all the seal elements.



## Replace coolant

Only proceed with the engine stopped and at a low temperature, so as to avoid the risk of burning.

- ❑ Provide suitable containers to ensure that no coolant is dispersed into the environment.
- ❑ Remove the plugs on the circuit components and wait until the circuit has drained completely (the location of plugs is given in the section ENGINE TECHNICAL DATA). After emptying, replace the plugs in their housings, making sure that the seal rings are all undamaged.
- ❑ Fill up the circuit as indicated in the table REFUELLING.
- ❑ Bleed the circuit and top-up if necessary.



### WARNING

*The operations listed below must only be carried out by qualified staff from the FPT Service Centres or by staff from the Boatbuilders. The methods used to perform them are described in the Technical and Repair Manuals.*

**Drain/suck condensation from fuel tank/s**

**Inspect sea chest**

**Check sea water pump rotor**

**Clean heat exchangers**

**Clean the turbocharger**

**Adjust play in valves-rocker arms**

The method used to change the oil in the marine gear is indicated in the relevant documentation supplied by the Manufacturer of the marine gear itself.

## MOVING THE ENGINE

The operations necessary to embark and disembark the engine must only be carried out by technicians from Service Centres.

When lifting the **engine only**, use the U-bolts indicated in this manual in the section ENGINE TECHNICAL DATA and marked on the engine with special stickers.

Lifting must be carried out using a rocker arm that keeps the metal cables supporting the engine parallel, using all the U-bolts provided simultaneously; the use of a single U-bolt only is not allowed.

The engine lifting system must have a capacity and size suited to the weight and dimensions of the engine; check that there is no interference between the lifting system and the engine components.

Do not lift the engine before removing the transmission members that are coupled to it.

## DISPOSAL OF WASTE

The engine is made up of parts and elements that, if discarded, may cause damage to the environment.

The materials listed below must be handed over to specialised Collection Centres; the laws in force in the various Countries foresee severe penalties for transgressors:

- Starter batteries.
- Used lubricants.
- Mixtures of water and antifreeze.
- Filters.
- Additional cleaning materials (e.g. greasy or fuel-soaked cloths).

## ■ LONG PERIODS OF INACTIVITY

### PREPARING THE ENGINE FOR A LONG PERIOD OF INACTIVITY

In order to prevent oxidation of the internal parts of the engine and of certain components in the injection system, when the engine is expected to be inoperative for periods of more than two months, the following operations must be carried out in preparation for this:

1. Drain the lubricant from the sump, after first warming up the engine.
2. Fill the engine with protective oil type 30/M (or alternatively oil that complies with MIL 2160B type 2 specifications), up to the "minimum" level indicated on the dipstick. Start the engine and keep it running for approximately 5 minutes.
3. Drain the fuel from the injection circuit, from the filter and from the injection pump pipes.
4. Connect the fuel circuit to a tank containing CFB (ISO 4113) protective fluid, and feed in the fluid by putting the circuit under pressure and running the engine for approximately 2 minutes, after first disabling the injection system. This operation can be performed by polarising terminal 50 of the starter motor with a positive voltage equivalent to the rated voltage of the system, using a conductor provided for that purpose.
5. Nebulise approximately 60 g of 30/M protective oil (10 g per litre displacement) into the turbocompressor suction inlet, during the pressurised filling operation described in the previous point.
6. Close all the suction, delivery, ventilation and bleeder openings in the engine with suitable plugs, or seal them with adhesive tape.

7. Drain the residual 30/M protective oil from the sump. This oil can be used again for a further 2 preparation operations.
8. Fit signs reading ENGINE WITHOUT OIL to the engine and to the on-board control panel.
9. Drain the coolant, if it has not been mixed with suitable antifreeze and corrosion inhibitors, and affix a sign to indicate the fact.

In the event of prolonged inactivity, the operations described must be repeated every 6 months, following the procedure given below:

- A) drain the 30/M protective oil from the sump;
- B) repeat the operations described from point 2 to point 7.

Should you intend to protect external parts of the engine, proceed by spraying OVER 19 AR protective liquid on unpainted metal parts, such as the flywheel, pulleys and the like, avoiding belts, connector cables and electrical equipment.

## **RESTARTING THE ENGINE AFTER A LONG PERIOD OF INACTIVITY**

1. Drain the residual 30/M protective oil from the sump.
2. Fill the engine, as prescribed, with lubricant of the type and amount indicated in the table REFUELLING.
3. Drain the CFB protective fluid from the fuel circuit, carrying out this operation as indicated under point 3. of PREPARING THE ENGINE FOR A LONG PERIOD OF INACTIVITY.
4. Remove the plugs and/or seals from the suction, delivery, ventilation and bleeder openings in the engine, restoring it to a normal state of use. Connect the turbocharger suction inlet to the air filter.
5. Connect the fuel circuits to the vessel's fuel tank, completing the operations as indicated in point 4. of PREPARING THE ENGINE FOR A LONG PERIOD OF INACTIVITY. During filling operations, connect the fuel return pipe to a collection tank, so as to prevent any residual CFB protective fluid from flowing into the vessel's fuel tank.
6. Check the engine and fill it up with coolant as prescribed.
7. Start the engine and keep it running until the idling speed rate has stabilised completely.
8. Check that the instruments on the on-board control panel/s are showing plausible values, and that no alarms are shown.
9. Stop the engine.
10. Remove the ENGINE WITHOUT OIL signs from the engine and from the on-board control panel.

## ■ ENGINE MALFUNCTIONS

The electronic unit overseeing management and control of all operation of the engine is capable of recognising any malfunctions that may occur, and of adopting strategies that will allow you to navigate in full safety.

The event, signalled by light-up of the EDC MALFUNCTION indicator on the on-board control panels, results in programmed limitation of power within certain thresholds, set according to the severity of the case.

In the case of temporary malfunctions the reduction in performance will remain in force until the engine is stopped.

### **Accelerator electronic circuit malfunction**

When certain problems in the accelerator electric circuit are recognised, the Electronic Unit controlling the engine adopts a strategy known as “accelerated minimum speed running”, that will enable navigation to continue in emergency mode.

The possible operating modes are as follows:

- A.** The accelerator lever does not “respond”: the running speed stabilises at 750 rpm. to allow the vessel to proceed slowly and be manoeuvred simply by turning the marine gear on and off, **without accelerating.**
- B.** The accelerator lever “responds partially”: the minimum running speed is set to 750 rpm. When the accelerator lever is moved to approximately half way, the speed gradually increases up to 2000 rpm.; when the lever is returned to minimum the speed rapidly decreases to 750 rpm.

### **CAUTION!**



*The engine electronic control unit can adopt safety strategies at any time during navigation, should conditions arise that are considered to put the engine at risk. When conditions of this kind occur, proceed with the greatest possible care and attention, first making sure that all those on board are secure and holding on to safe hand-holds.*

**NOTE:** In mode “**A**” it is possible to proceed at speeds higher than the accelerated minimum, managing start/stop, acceleration and deceleration functions as illustrated in the section MANAGING THE ENGINE FROM THE RELAY BOX. Should it be necessary to operate the engine as above, **always comply with the accident prevention rules** provided in the Section “Controls and maintenance.

### **CAUTION!**



*Management of the engine from the “Relay box” involves inhibition of the bridge controls; as a result of this, **when running the vessel from the bridge, the only way to stop propeller thrust in the engine quickly** is using the marine gear disengagement lever.*

## ■ EMERGENCIES ON BOARD

The user of a vessel that has been constructed according to safety regulations, when following the instructions provided in this manual and the indications given on the engine labels, will be working in safe conditions.

Should improper conduct result in accidents, always request the intervention of trained first aid specialists immediately.

In an emergency and while awaiting the arrival of first aid specialists, follow the instructions given below.

### Engine malfunctions

When navigating with a malfunctioning engine, take the greatest possible care when manoeuvring and make sure that all those aboard are holding firmly to safe hand-holds (see section on ENGINE MALFUNCTIONS).

### In case of fire

Extinguish the fire using the fire-fighting equipment provided aboard, and in the manner indicated by Fire prevention authorities (the fire-fighting equipment required on board is compulsory under current safety legislation).

### Burns and scalds

1. Extinguish any flames on the burned person's clothing, by:
  - throwing water over them;
  - using a powder fire-extinguisher, without directing the jet at the person's face;
  - covering with blankets or rolling the victim on the ground.

2. Do not attempt to remove pieces of clothing that may have stuck to the skin;
3. In the case of scalding, immediately but carefully remove any clothing that may be soaked in the hot liquid;
4. Cover the burn with a special burn dressing or sterile bandage.

### Carbon monoxide intoxication (CO)

Carbon monoxide from the engine exhaust is without smell, and is dangerous both because it causes intoxication, and because when combined with air it forms an explosive mixture.

In closed rooms, carbon monoxide is extremely dangerous, as it can reach critical concentrations within a very short time.

When assisting an intoxicated person in a closed room:

1. Ventilate the room immediately, to reduce the concentration of gas.
2. When entering the room, hold your breath, do not light flames, lights or ring electric doorbells or phones, to avoid the risk of explosion.
3. Carry the intoxicated person out into the fresh air or into a well ventilated room, resting him on one side if he is unconscious.

### Electrocution

The engine's electrical 12 V or 24 V electrical system does not involve the risk of electrocution, however, in the event of a short-circuit caused, for example, by a metal tool, there is a risk of burning due to overheating of the object through which the electrical current runs. In these circumstances:

1. Remove the object that caused the short-circuit, using means that provide sufficient heat insulation.
2. Switch off the power at the main switch, if there is one.

## Injuries and fractures

The vast number of possible circumstances and the specific nature of operations required means that the intervention of a medical team is necessary.

1. In the event of bleeding, keep the edges of the wound pressed together until help arrives.
2. If there is any suspicion of a fracture, do not move the injured part and only move the patient if absolutely necessary.

## Caustic burns

Caustic skin burns are caused by contact with extremely acid or alkaline substances.

For electric maintenance technicians these are typically caused by acid from batteries; in these circumstances, proceed as follows:

1. Remove any clothing soaked in the caustic substance.
2. Wash the area with lots of running water, avoiding parts that have not been burned.

If either battery acid, lubricants or diesel come into contact with the eyes: wash the eyes with water for at least 20 minutes, keeping the eyelids open so that the water flows over the eyeball (move the eye in all directions to wash more thoroughly).



## CONTROL PANEL USER REQUIREMENTS

The following data refer to branded equipment in its original configuration.

The requirements and technical features of conversions may differ from these specifications and specific information must be supplied by those responsible for the conversion.

Control panels	With analogue instruments	With digital instruments
<b>Environmental operating conditions</b>		
Operating temperature range	from -10°C to +60°C;	from -10°C to +60°C;
Temperature limits while moored	min. -20°C / max. +75°C	min. -20°C / max. +75°C
Protection level against dust and rain (front)	IP 65 – DIN 40050 – IEC 529	IP 66
Salt spray resistance (reference Standard)	IEC 60068-2-52	IEC 60068-2-52
<b>Electrical and electromagnetic properties</b>		
Operating voltage (excluding polarity reversals)	min. 9 V / max. 32 V (*)	min. 9 V / max. 32 V (*)
Maximum permitted over-voltage	60 V for 1 ms	60 V for 1 ms
Maximum current uptake by main panel	1.1 A (12 V) – 1 A (24 V)	310 mA (12 V) – 200 mA (24 V)
Maximum current uptake by secondary panel	400 mA (12 V) – 400 mA (24 V)	310 mA (12 V) – 200 mA (24 V)
Electromagnetic compatibility (reference Standard)	IEC 945	IEC 945
Wiring connector requirements (reference Standard)	MIL 1344/1001	MIL 1344/1001
Wiring requirements (reference Standard)	CEI 20/22 - CEI 20/38 - CEI 2000/532/CE	
<b>Mechanical properties</b>		
Vibration resistance (expressed as acceleration due to gravity)	1 g max. eff. -25-500 Hz	2 g max. eff. -25-500 Hz
Impact resistance (expressed as acceleration due to gravity)	15 g - 1.5 ms - sinusoidal wave	15 g - 1.5 ms - sinusoidal wave

(\*) 16 V max. with reference to equipment for which power is required only at rated voltage of 12 V.