

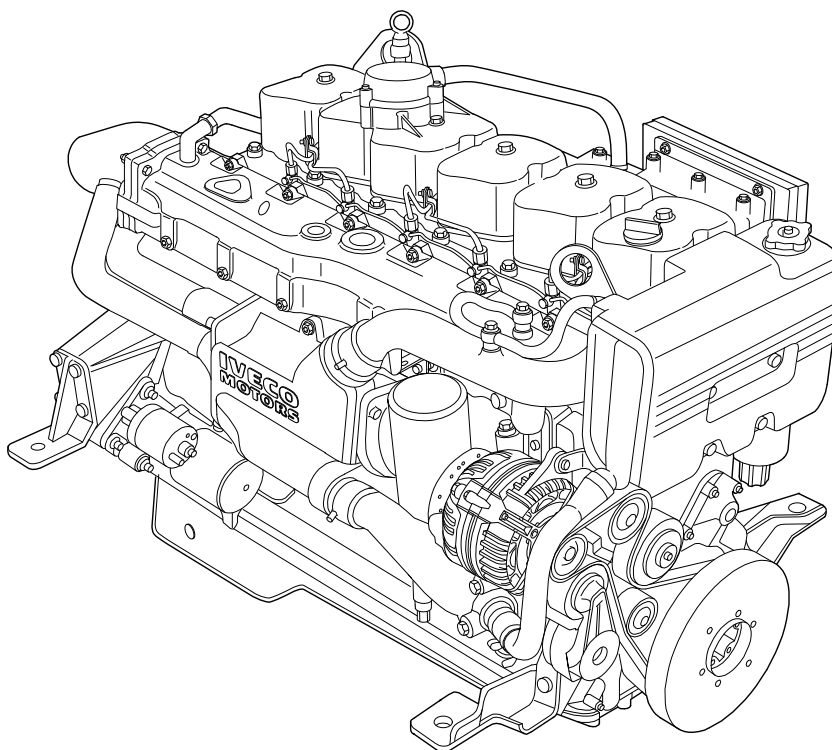
NEF

N45 MNA M10 N67 MNA M15

4 - 6 CYLINDERS IN LINE
DIESEL CYCLE
FOR MARINE APPLICATIONS

INSTALLATION DIRECTIVE

MAY 2006 EDITION



FOREWORD

We strongly recommend that you carefully read the indications contained in this document: compliance with them protects the engine against irregular operation and assures its reliability, safeguarding sea-going and maintenance personnel against accident hazards.

The indications contained in this directive pertain to the N45 MNA M10.00, N45 MNA M10.01, N67 MNA M15.00, N67 MNA M15.01 engines and complement the IVECO MOTORS publication "Guide to the Installation of Marine Engines" the reader should refer to, for anything that is not explained herein.

For more complete information about the engine, please refer to the appropriate technical brochure. Use of fuels and oils with different characteristics from those set out in the operation and maintenance manual may compromise the regular operation of the engine, limiting its performance, reliability and working life.

Exclusive use of IVECO Original Parts is a necessary condition to maintain the engine in its original integrity.

Tampering, making modifications and using non original parts can jeopardize the safety of boat engineers and users.

To obtain spare parts, you must indicate:

- Commercial code, serial number and indications shown on the engine tag;
- Part number of the spare as per spare part catalog.

The information provided below refer to engine characteristics that are current as of the publication date.

IVECO MOTORS reserves the right to make modifications at any time and without advance notice, to meet technical or commercial requirements or to comply with local legal and regulatory requirements

**We refuse all liability
for any errors
and omissions.**

The reader is reminded that the IVECO MOTORS Technical Assistance Network is always at the Customer's side with its competence and professionalism.

Publication IVECO MOTORS edited by:
IVECO PowerTrain
Advertising & Promotion
Pregnana Milanese (MI)
www.ivecomotors.com

Printed **P3D64N003 E** - May 2006 Edition

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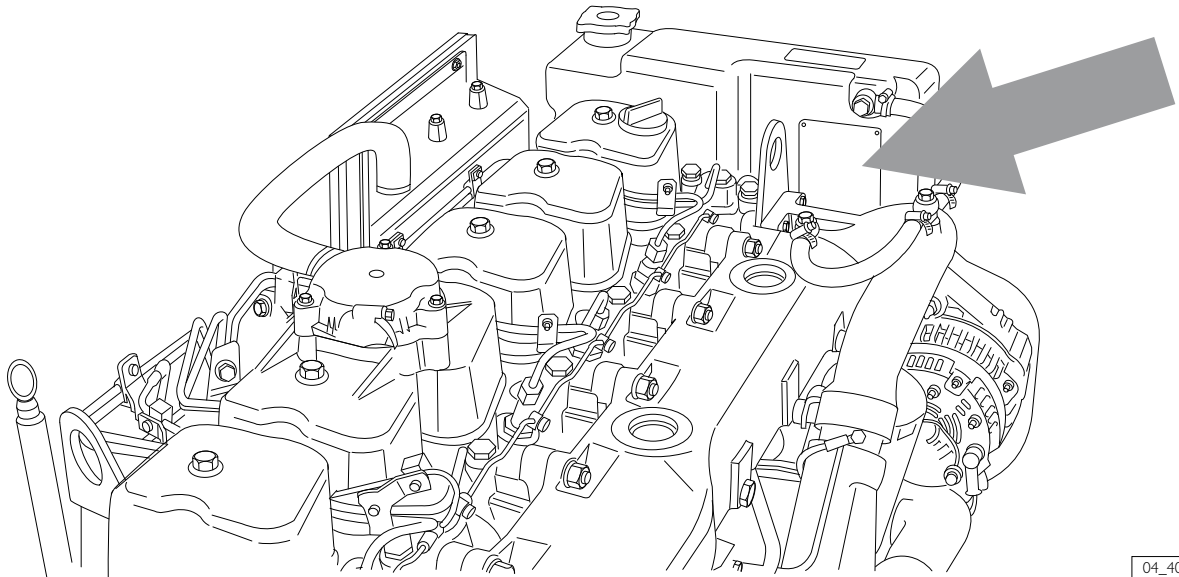
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1. IDENTIFICATION DATA

Figure 1



04_404_N

The engine identification data are stenciled on a tag positioned aside the coolant tank.

Figure 2

IVECO S. p. A.			
Viale dell'Industria, 15/17 - 20010 Pregnana Mil.se MI - ITALY			
ENGINE TYPE			
ENGINE FAMILY		ENGINE DWG	
POWER (KW) AND SPEED (RPM)		POWER SET CODE	
ENGINE S/N		YEAR OF BUILD	
HOMOLOGATION		N°	
COMMERC. TYPE / VERSION		N 67 MNA M15	XX

A

.00

.01

B

06_016_N

The last two figures of the commercial code refer to the engine model (detail A or B in figure n. 2).

Until the beginning of the year 2006 the engines produced had the code N45 MNA M10.00 or N67 MNA M15.00 (detail A in figure n. 2).

During the year 2006 relevant modifications have been made to the electric system and to the fuel supply circuit and a new

model identified with the code N45 MNA M10.01 or N67 MNA M15.01 was created (detail B in figure 2).

This document concerns both the models. The relating contents are developed in different chapters which can be identified thanks to the presence in each title of the extension M10.00/M15.00 or M10.01/M15.01.

Chapters 21 to the end of the document are common to both the models.

2. WARNINGS AND CAUTIONS

To obtain the best engine performance, it is essential not to deviate from the mission profile for which it was produced and set up. The engine must not be used for purposes other than those stated by the manufacturer. IVECO MOTORS is willing to examine any need for particular installations beforehand. Boat outfitters and maintenance specialists are invited to closely follow the instructions contained herein. No modifications to the engine, its accessories and components, are allowed.

Failure to comply with the instructions that follow shall void the warranty and relieve IVECO MOTORS of all liabilities.

For personnel safety

Specialists and installers are cautioned to comply with workplace safety rules and to adopt prescribed individual protection devices when working.

- ❑ Drain the cooling, lubrication and fuel lines only after the fluids have duly cooled. The pressurized cap of the water line may be opened only after the engine has duly cooled.
- ❑ Batteries contain a highly corrosive sulfuric acid solution: must never be upset and must be handled with the utmost caution to prevent spillage. Ensure that the battery compartment is adequately ventilated.

Handling

The engine must be handled by experienced personnel, using the prescribed tool or a rocker arm that keeps the lifting lines parallel and with adequate equipment in terms of capacity and size. The two eyebolts provided for lifting the engine alone must always be used simultaneously.

Installation

- ❑ Knife switches or battery breakers may be used on the power supply line of the engine electrical equipment provided they are not used to shut the engine off.
- ❑ Do not modify the wiring harnesses; their length may not be modified: use only available extensions.
- ❑ Do not use electronic device wiring harnesses not compliant with the IVECO MOTORS directive, in terms of length, type of conductor, location, clamping, connection of the shielding and earth braids.
- ❑ To avoid any interference, the wiring harnesses of the different on-board electronic devices must follow different paths from those of the engine electronic systems.
- ❑ Do not connect any extraneous user device to the engine electrical equipment.
- ❑ Do not place voltage across the boat's on-board electrical system without first verifying that there are no short circuits.
- ❑ Do not branch pipes off to draw fuel from the engine supply lines.

- ❑ Do not make any change to the engine's hydraulic circuits and components.
- ❑ Do not execute arc welding operations before removing the electronic units from their seating, placing them at an adequate safety distance.
- ❑ Do not subject electronic units to temperatures exceeding 80 °C.
- ❑ Do not paint electrical components and their connections.
- ❑ Comply with prescribed procedures and torque values when tightening threaded elements.

Start-up

- ❑ Ready the engine following the procedure set out in Chapter 22.
- ❑ When starting the engine the first time, have suitable means available to cut off air intake in case of a runaway condition.
- ❑ Start the engine after ensuring that it is complete with every part specified by the manufacturer and required by the installation, without attempting to start it with caps and occlusions to the lubrication, cooling and fuel feed lines.
- ❑ Check that the fluid lines are perfectly sealed, especially lines for fuels and lubricants, which may cause fires and consequent harm to persons and equipment.
- ❑ Make sure that the various pipelines are not in contact with warm surfaces or moving parts.
- ❑ The installing yard is required to carry out tests to verify the functional compatibility between the electrical-electronic equipment of the engine and the other electronic equipment present on the boat.

Tests and tuning up

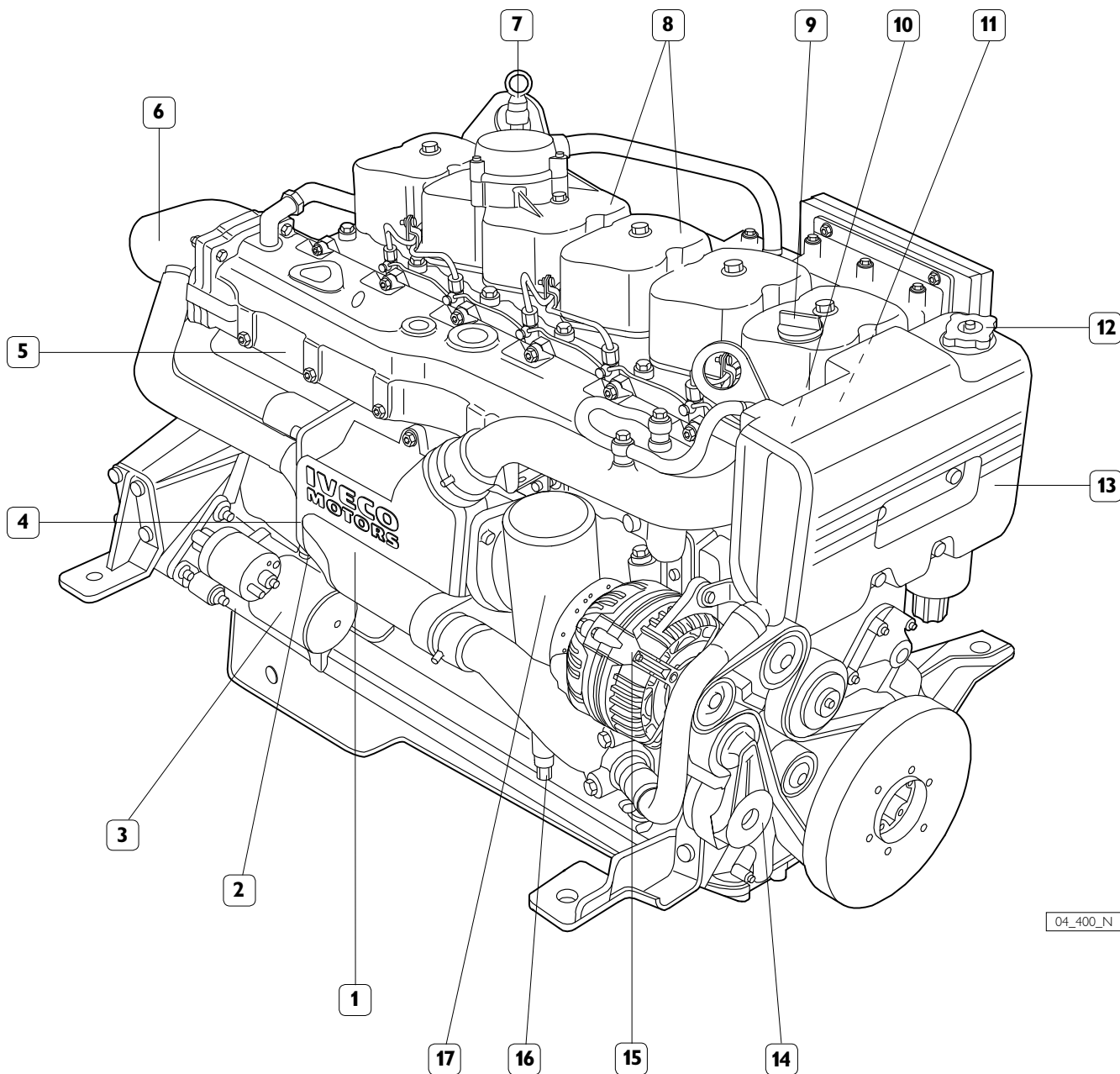
- ❑ Never disconnect the batteries when the engine is running.
- ❑ Remove the electrical connections from the batteries before any operation on the electrical system.
- ❑ Ensure that the battery terminals comply with the exact polarity, are properly tightened and protected against accidental short circuits and corrosion phenomena.
- ❑ Do not connect or disconnect electrical connections when electrical power supply is present.
- ❑ Do not cause sparks in the attempt to verify the presence of electrical voltage.
- ❑ Do not draw fuel through unfiltered lines.
- ❑ Do not clean the engine and its parts with corrosive or abrasive detergent substances, to avoid compromising the integrity of electrical connections.
- ❑ The engine fluids and air, water, and oil filters discarded after use must be properly stored and delivered to appropriate collection centers.

Long engine inactivity periods

Before long periods of inactivity, ready the engine following the procedure set out in Chapter 26.

3. ENGINE PARTS AND COMPONENTS

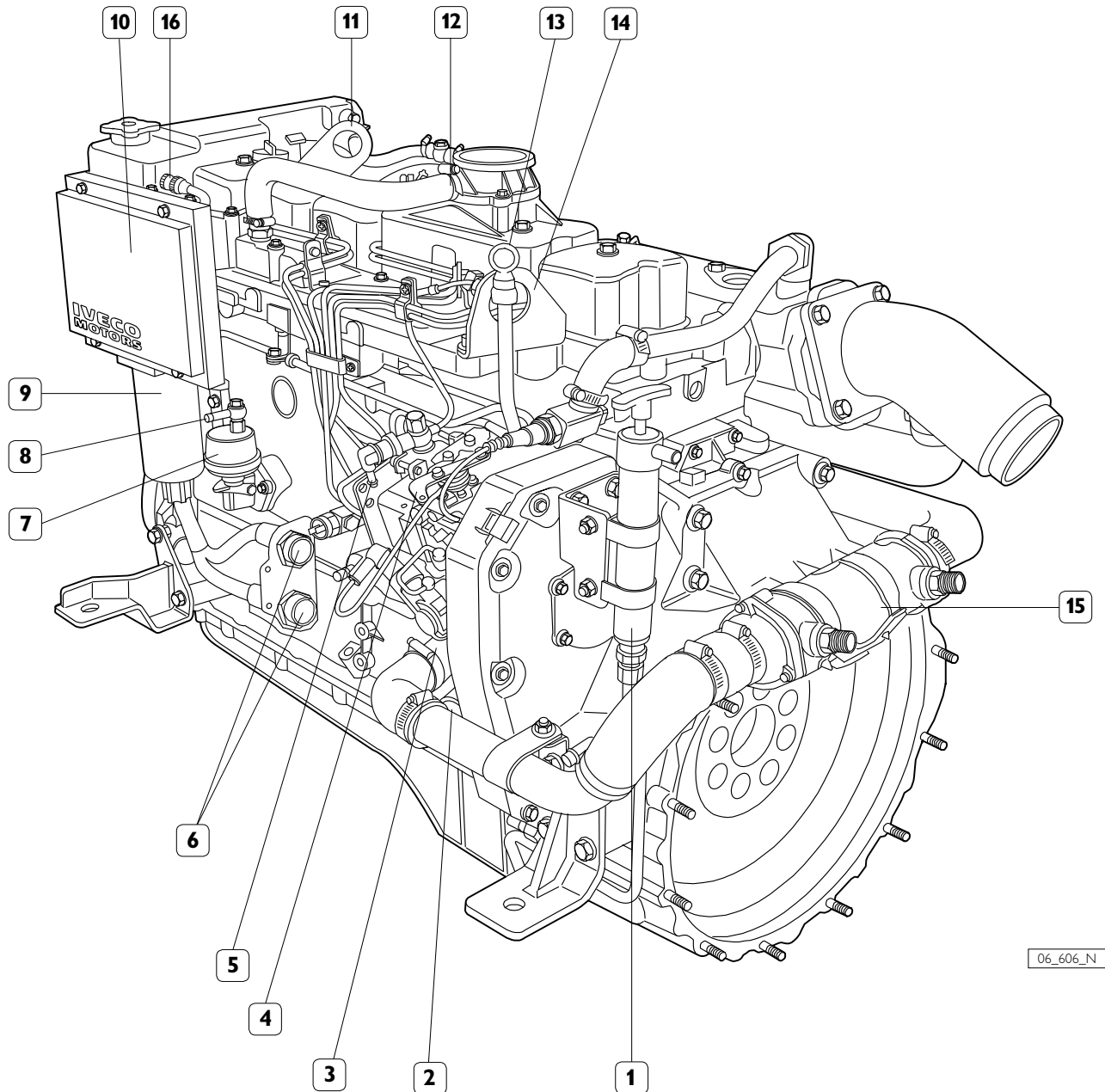
Figure 3



04_400_N

1. Tube bundle engine coolant/sea-water heat exchanger - 2. Engine coolant discharge cap - 3. Electric starter motor - 4. Location of sacrificial anode - 5. Cooled exhaust manifold - 6. Exhaust gas and sea-water discharge pipeline - 7. Lifting eyebolt - 8. Rocker arm covers - 9. Oil refill cap - 10. Location of thermostatic valve - 11. Cap for engine coolant outlet to sanitary water heating system - 12. Coolant refill cap - 13. Engine coolant tank - 14. Auxiliary belt automatic tensioner - 15. Alternator - 16. Cap for engine coolant discharge and recirculation from sanitary water heating system - 17. Oil filter.

Figure 4



06_606_N

1. Manual lubricating oil extraction pump - 2. Sea-water inlet - 3. Sea-water pump - 4. Throttle lever on injection pump -
5. Rubber holder junction for fuel outflow to the tank - 6. Wiring connectors N45 MNA M10.00 and N67 MNA M15.00 -
7. Low pressure mechanical feed pump - 8. Fuel intake fitting - 9. Fuel filter - 10. Combustion air filter - 11. Lifting eyebolt -
12. Oil vapours vent - 13. Oil dipstick - 14. Lifting eyebolt - 15. Sea-water junction pipe from after-cooler to engine coolant/sea-water heat exchanger (Oil gearbox heat exchanger, on request) - 16. Connector for instrument panel connection wire harness N45 MNA M10.01 and N67 MNA M15.01.

4. TECHNICAL DATA FOR INSTALLATION**N45 MNA M10 N67 MNA M15****Combustion and ventilation air when underway**

Static vacuum allowed downstream of the air filter	kPa mmH ₂ O	≤ 3,5 ≤ 350	
Combustion air flow rate	m ³ /h	≥ 340	≥ 510
Engine room ventilation air flow rate (excluding combustion air)	m ³ /h	≥ 1960	≥ 1960
Static vacuum allowed in the engine room	kPa mmH ₂ O	≤ 0,1 ≤ 10	
Temperature allowed in the engine room	°C	≤ 45	
Temperature increase in the engine room to ext. temperature	°C	≤ 15	

Exhaust gas discharge

Allowed static back pressure	kPa mmH ₂ O	≤ 7 ≤ 700	
Exhaust gas temperature at maximum power (turbocharger inlet)	°C	700	720
Flow rate at maximum power	kg/h	400	590
Outer diameter of exhaust mixed with sea water	mm inches	127,5 5	

Fuel supply

Transfer pump delivery at maximum rpm	l/h	140	
Flow rate return to tank	l/h	120	
Fuel temperature	°C	≤ 60	
Inner diameter, intake pipe	mm	≥ 8	
Inner diameter, return pipe	mm	≥ 8	
Thread on pre-filter junctions	M	14 x 1,5	
Free height below filter to replace filter	mm	≥ 30	
Allowed intake vacuum	kPa mmH ₂ O	≤ 15 ≤ 1500	
Allowed on tank return pipe back pressure	kPa mmH ₂ O	≤ 10 ≤ 1000	

Open sea water cooling line

Intake pipeline diameter	mm inches	34,6 1,36	
Pump delivery at maximum rpm	l/h	8600	
Sea water pump height above sea level	m	≤ 2	
Allowed intake vacuum	kPa mmH ₂ O	≤ 20 ≤ 2000	
Discharge pipeline diameter (only if dry gas exhaust)	mm inches	45 1,77	

Allowed engine inclination angles

Maximum longitudinal in continuous operation (static + dynamic)	degrees/360	+20	
Maximum transverse in continuous operation (static + dynamic)	degrees/360	± 22 30'	
Longitudinal for oil level check with standard dipstick	degrees/360	0 to +6	

N45 MNA M10 N67 MNA M15

Power takeoffs (optional)

2-race front pulley for "V" belts

Reference diameter	mm	187
Race dimension	mm	12.7
Power available at 900 rpm	kW	≤ 6
Power available at 1800 rpm	kW	≤ 12
Radial force resulting from belt tension	N	≤ 1340

(*) For direction of the resulting radial force between 60° and 300° with reference to the cylinder axis (piston at top dead center = 0°)

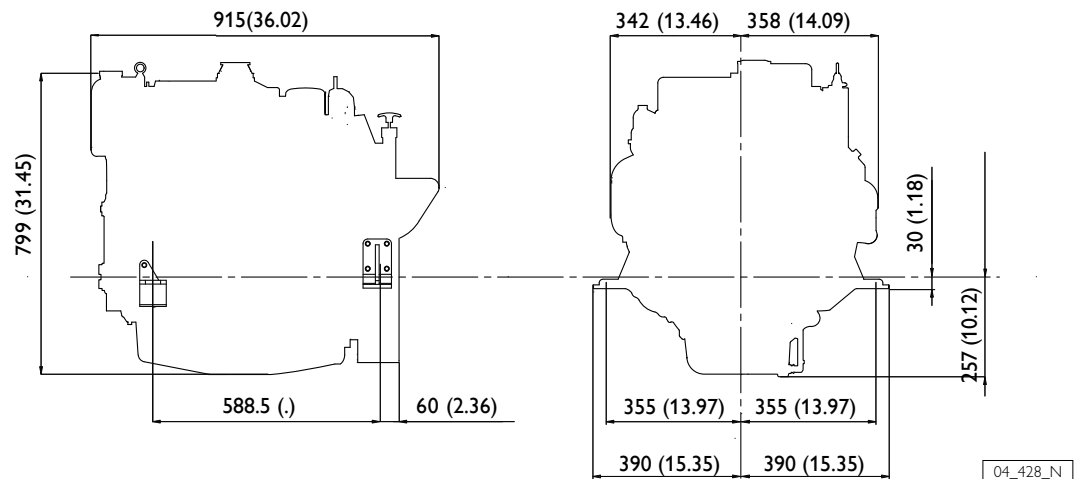
2-race front pulley + elastic joint

Torque available in engine axis	Nm	≤ 150 (15)
Moment of inertia of rigidly added masses	kgm ²	≤ 0,015

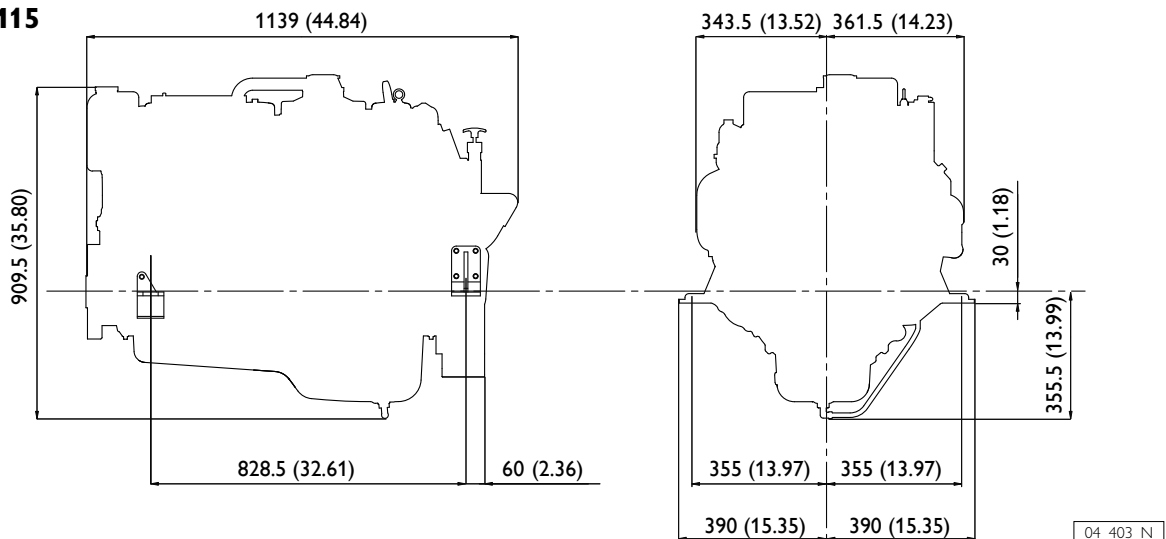
Dimensions

Figure 5

N45 MNA M10



N67 MNA M15



Measurements in millimeters (inches)

5. GENERAL INSTALLATION CRITERIA

Accessibility

The engine must be located in such a way as to allow filling and draining engine liquids when doing servicing operations. Access to relay box shall be allowed even during navigation,

Anchoring

If anchoring is accomplished by interposing shock mounts, they must be able to support the engine's mass and the longitudinal thrust exerted by the propeller shaft in motion. If rigid mounting is adopted, particular care must be given to support alignment and co-planarity.

Information on dimensions and fastening values are provided in the "Installation Diagram".

Combustion and ventilation air

Compliance with prescriptions on the quantity of air required for combustion and ventilation assures a regular operation of the engine even in adverse conditions and it enables to deliver its maximum design power.

Sea water line

It must be provided with an intake capable of preventing the entry of foreign bodies into the suction pipes. Between the intake and the pump, it is best to interpose a gate to be closed in emergencies or for extended idle periods and a filter to stop the smaller impurities; it is also recommended to install a suitably dimensioned and easily replaced zinc anode.

The engine sea water line was provided by the manufacturer with protection anodes to be replaced periodically.

The rubber hoses positioned along the pipeline shall be sufficiently rigid not to create choked areas caused by crushing.

Engine pre-heating

If the engine usage profile requires immediate delivery of power at the highest rpm's, it is recommended to install an auxiliary pre-heater on the closed cooling loop.

Exhaust gas discharge

The exhaust gas discharge conduit shall be compliant with the guidelines contained in the IVECO MOTORS publication "Guide to the installation of marine engines"; it also provides indications to compute the dimensions of the exhaust pipelines, which is the Yard's responsibility.

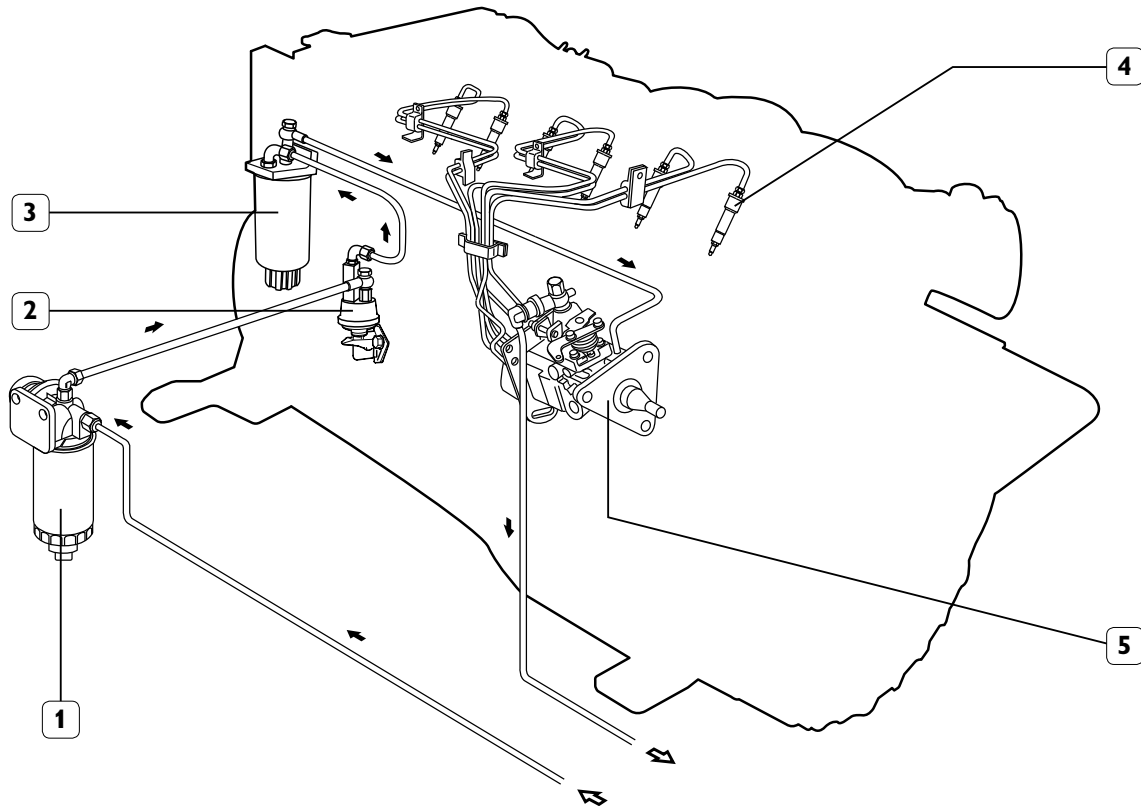
Electric - electronic equipment

Provide a proper positioning of the relay box and of any optional electronic unit. Refer to size and position of wiring and relevant connectors.

Secure units in order to dampen vibrations and stress the hull is subject during navigation and/or created by the rotating engine.

6. FUEL LINE

Figure 6



1. Settling prefilter - 2. Low pressure mechanical feed pump - 3. Fuel filter - 4. Injector - 5. Injection pump.

For the installation, the following connections are required:

- from the tank to the pre-filter
- from the pre-filter to feed pump intake
- from the fuel discharge outlet to the tank

Pre-filter

The pre-filter with priming pump, supplied separately from the engine, must be fastened near the tank, in a relatively low point of the line to allow for easy replacement of the filtering cartridge and/or the operation of the hand pump. Avoid the use of additional mesh or paper filters along the feed lines between pre-filter and engine. To avoid introducing impurities in the feeding lines inside the engine, do not place filter cartridges pre-filled with fuel in the system.

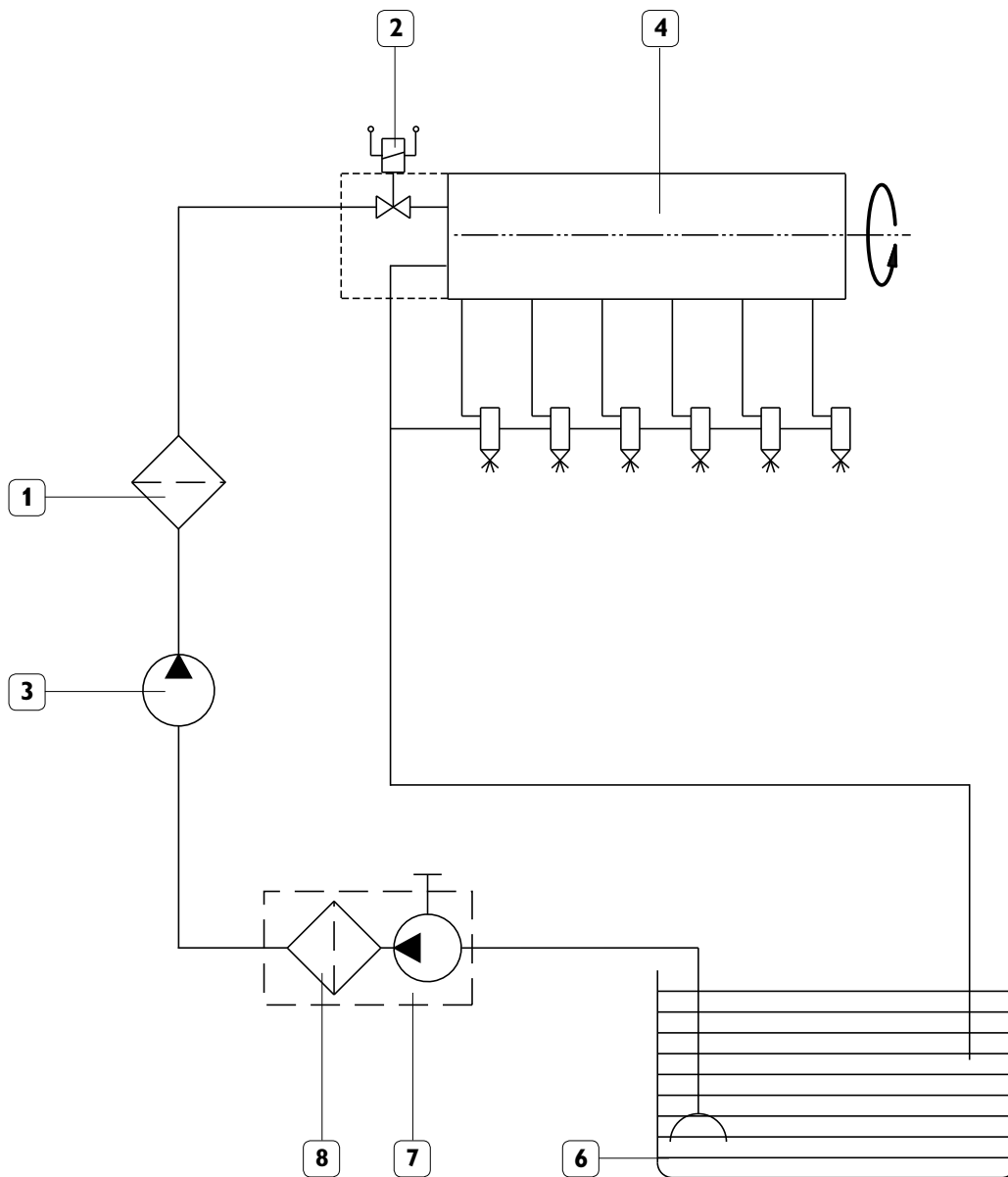
Materials' Characteristics

The fuel tank and the suction and return assembly must withstand the continuous abrasion caused by a flow of fuel oil of 150 l/h at a temperature of 100 °C without noticeable deformation or wear or release of material. Use of metal tanks, preferably made of iron alloys, is allowed, provided they are connected to the negative terminal of the battery to prevent the accumulation of electrostatic charges.

Tanks must be provided with vents to avoid exceeding an internal pressure of $\pm 5\text{ kPa}$ ($\pm 0.5\text{ m}$ of H_2O column); their shape and the suction assembly must be such as to assure a suction at the maximum longitudinal and transverse inclination allowed for the boat, with a residual quantity of fuel oil considered "reserve".

The suction inlet should be positioned in such a way as to avoid taking in sludge. The return flow must be in such a way as to facilitate the mixing of the returning fuel with the fuel in the tank. If the tank is lower than the filter, then the return pipe must always be submerged. The pipes and union fittings of the fuel line must withstand a fuel oil flow rate of 150 l/h at a temperature of 100 °C and a pressure of 3 bar (300 kPa) without noticeable deformation, wear or release of material. Metal tubes, preferably made of iron alloys, are recommended, taking care to connect each individual segment to engine ground to avoid the accumulation of electrostatic charges and inserting a vibration damper elastic joint on each segment. The pipes used must be certified according to the relevant Countries' rules or to the standards issued by classification Bodies.

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Fuel supply system scheme**Figure 7**

04_406_N

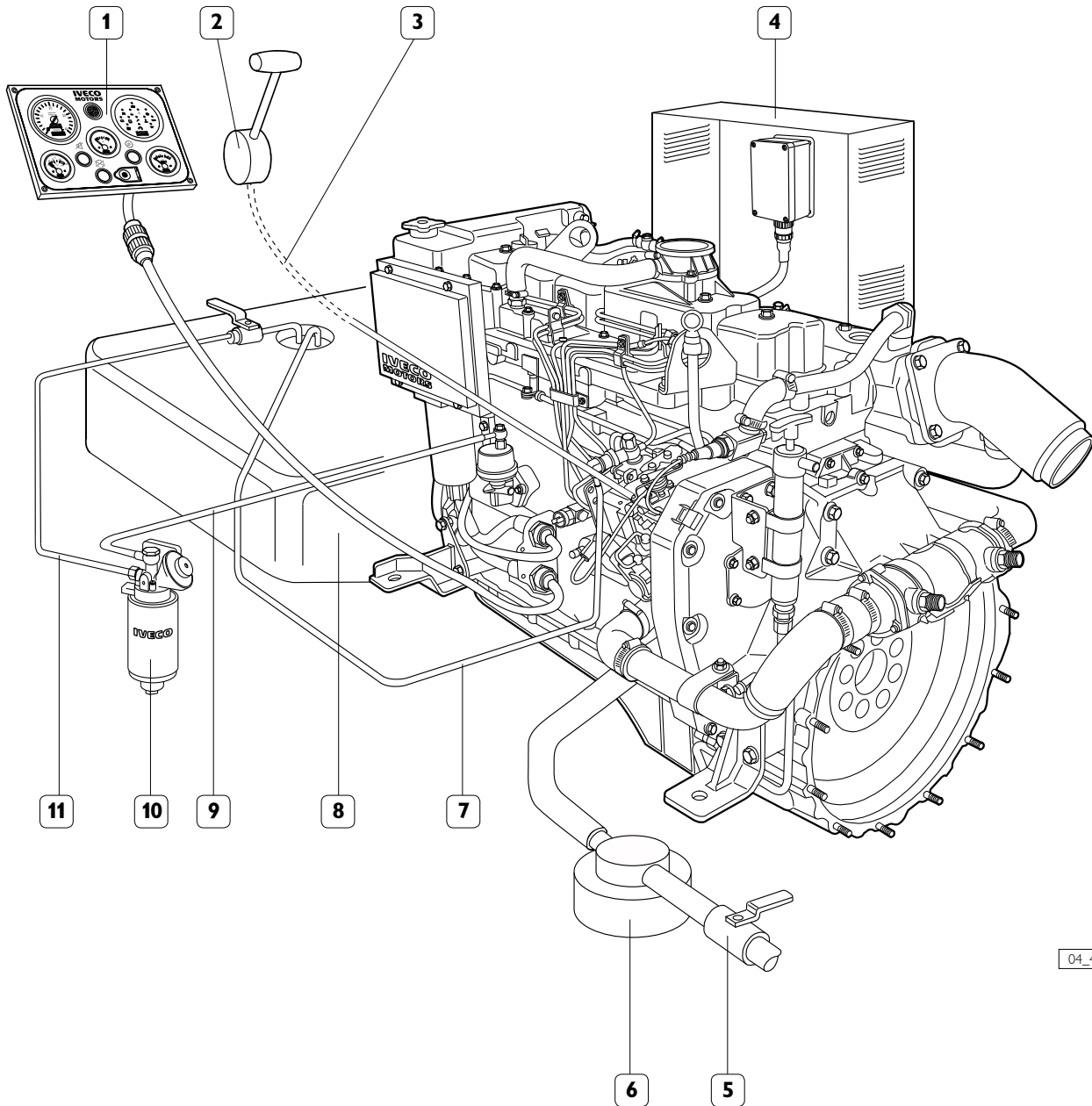
1. Fuel filter - 2. Engine stop solenoid valve - 3. Low pressure mechanical feed pump - 4. Injection pump -
5. Injector - 6. Fuel tank - 7. Manual priming pump - 8. Pre-filter.

N45 MNA M10.00

N67 MNA M15.00

MODEL PRODUCED UNTIL THE BEGINNING OF THE YEAR 2006

SPECIFIC CHAPTERS 7-8-9-10-11-12-13

7. M10.00/M15.00 INSTALLATION OVERVIEW**Figure 8**

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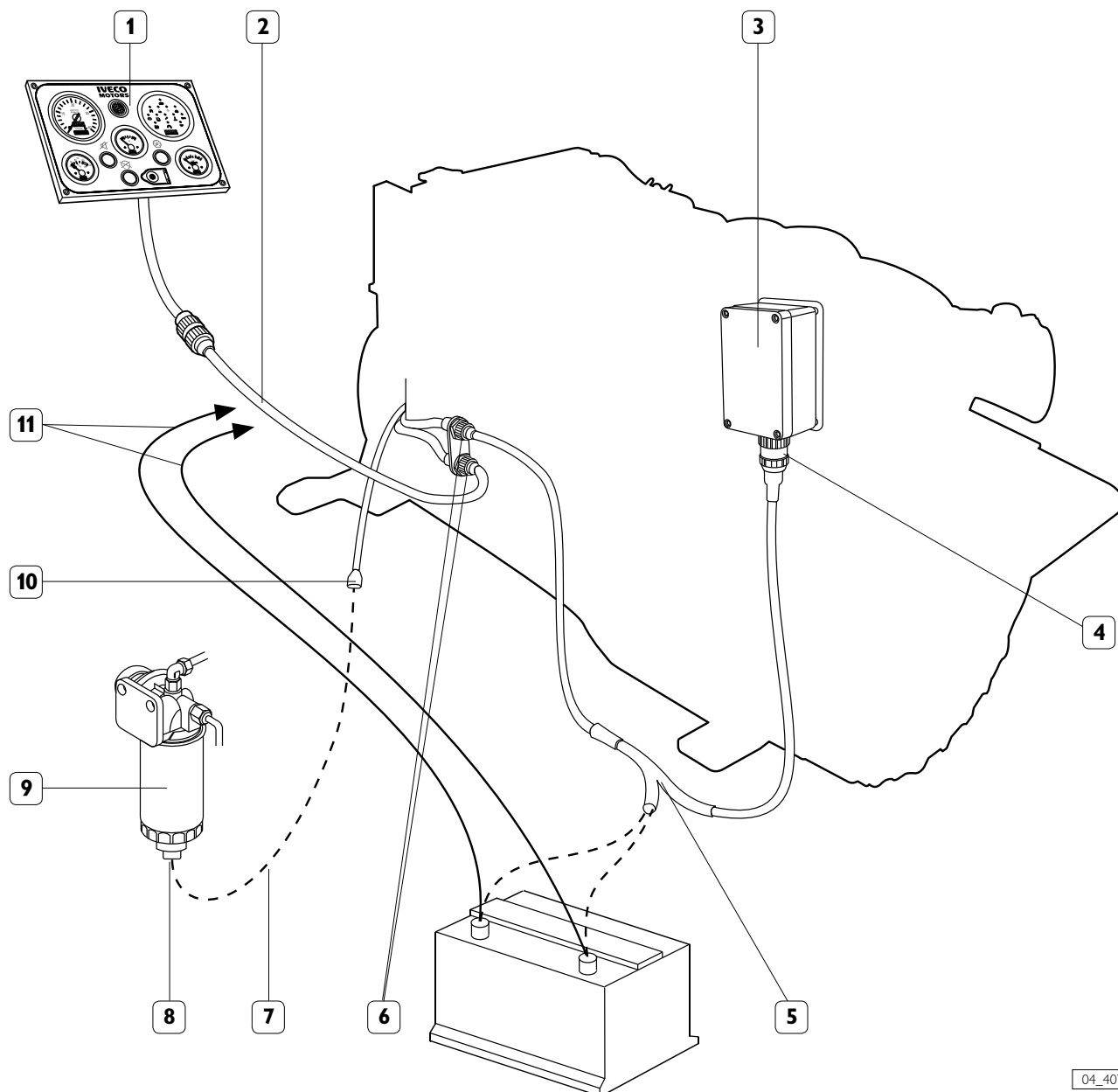
1. Indicator and control panel - 2. Throttle lever - 3. Throttle Bowden rod - 4. Electric panel with relay box and optional electronic units - 5. Filtered sea water intake - 6. Decanter filter - 7. Fuel return pipe to tank - 8. Tank - 9. Fuel to prefilter pipe - 10. Sedimenting prefilter - 11. Fuel to filter pipe.

The figure shows the set of components of an installation, including those supplied with the engine equipment, standard or optional, and those supplied or produced by the yard. It provides a comprehensive picture of the operations required to install the engine. Components arrangement and illustrations are not binding but merely indicative, subject to the choices made by yard

engineers according to their skills, available spaces and the prescriptions set out herein.

8. M10.00/M15.00 ELECTRICAL EQUIPMENT

Figure 9



04_407_N

1. Indicator and control panel - 2. Provided wire harness - 3. Relay box - 4. JF Connection - 5. Power supply and interface wire harness - 6. JA and JB connectors - 7. Wiring harness to be manufactured by the yard - 8. Sensor for the presence of water in the fuel - 9. Sedimenting pre-filter - 10. M Connector - 11. Power line for electric starter motor and alternator.

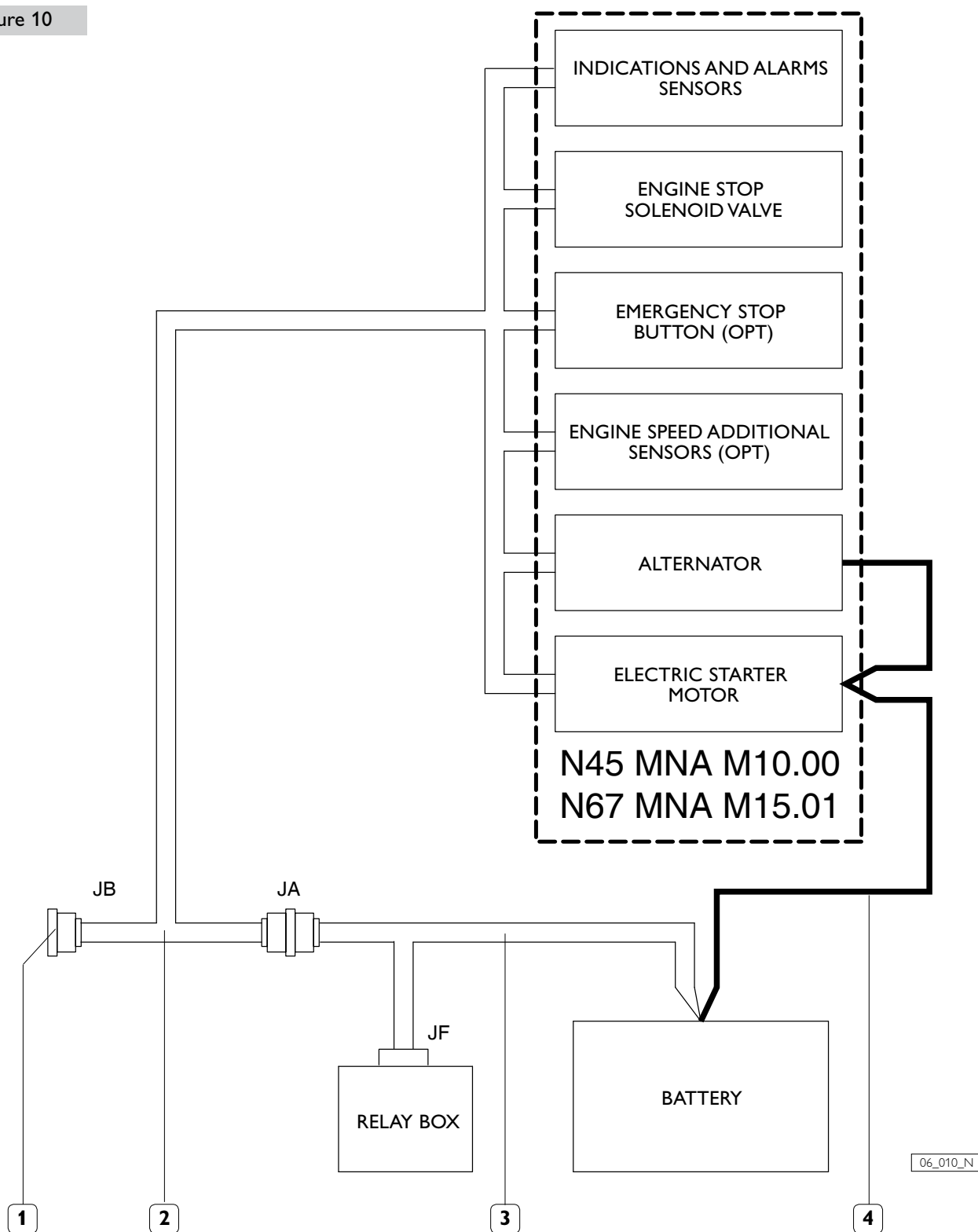
The electrical equipment of the engine comprises a series of components provided separately from the engine to enable an easy and diversified installation, according to the Yard's design choices. The need to make accessible, at sea or underway, the controls to the electrical components contained in the relay box may be met through different installation arrangements.

Along with the coupling of all connectors provided in the wire harnesses, completing the installation also requires to complete the power line and to connect the accumulator to the engine wire harness.

If any, connect wire harness (7) for the sensor for the presence of water in the fuel (8),

Synoptic

Figure 10



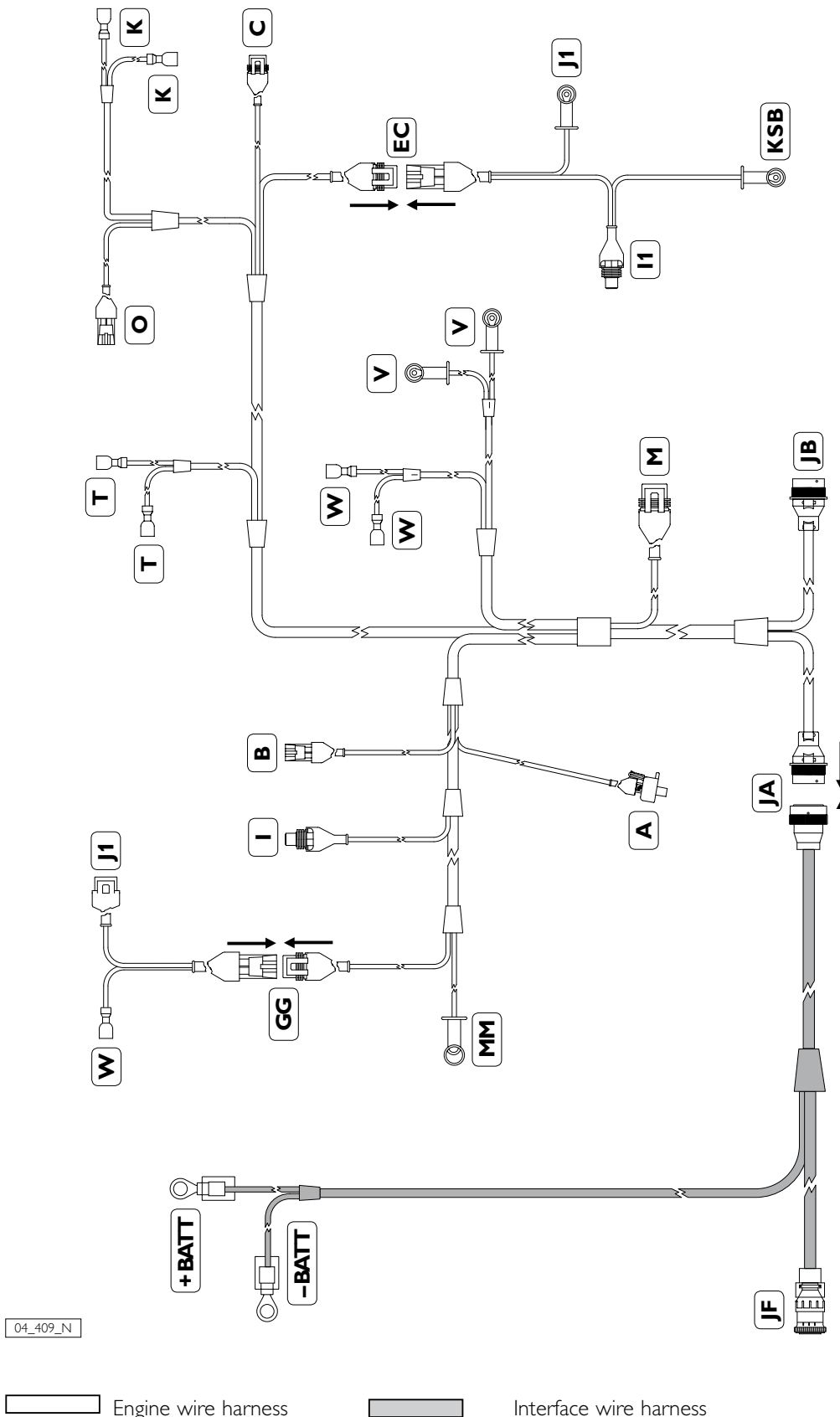
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1. Connector for instrument panel connection wire harness - 2. Engine wire harness -
3. Interface wire harness - 4. Power line.

The wire harnesses provided with the engine include the connectors for all optional components which may be ordered and their connections to the JB connector for the indicator and control panel.

Wire harness

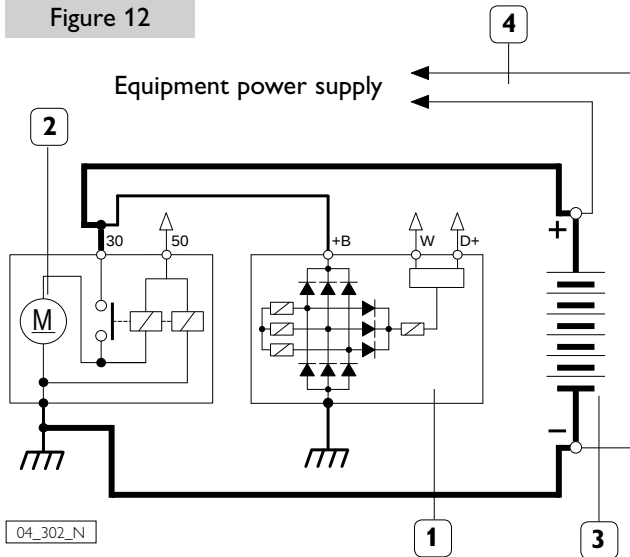
Figure 11



A. Drive shaft sensor (on request) - B. Drive shaft sensor (on request) - C. Emergency shut-down push-button (on request, installer's responsibility) - I. High coolant temperature sensor (for alarm) - K. Air filter clogging sensor (for alarm) - M. Sensor for detecting the presence of water in the fuel pre-filter (for alarm) - O. Exhaust gas temperature sensor (on request) - T. Coolant temperature sensor (for gauge) - V. Oil pressure sensor (for gauge) - W. Low oil pressure sensor (for alarm) - EC. Injection pump connector - I1. KSB Refrigerating liquid temperature sensor - J1. Engine stop solenoid valve - KSB. Cold injection advance adjustment device - GG. Connector for alternator - J1. Alternator excitation - W. Signal for revolution counter - JB. Instrument panel connection wire harness - JF. Relay box - MM. Electric starter motor.

Power supply line

Figure 12



1. Alternator - 2. Electric starter motor - 3. Battery -
4. Engine wire harness.

The connection of the +B terminal of the alternator to the positive +30 terminal of the electric starter motor must be achieved with a conductor having a cross section of at least 10 mm². The connection of the positive +30 terminal of the electric starter motor to the positive pole of the battery, achieved with a conductor having a cross section of at least 70 mm², allows to obtain, as shown in the figure, the simultaneous connection of the alternator to the battery. The connection between the engine ground and the negative pole of the battery must be achieved according to the guidelines provided in the Engine electrical ground paragraph.

CAUTION

Do not use any magneto-thermal activation protection items to stop engine. Using off-the-shelf equipment, you stop the engine energizing the proper solenoid valve. In lack of power supply you could not stop the engine.

Supplementary services battery

To assure that the engine can be started with a sufficient quantity of energy, it is advisable to provide for the installation of a supplementary battery, dedicated to supplying power to the on-board electrical services. The power line to recharge it may be constructed according to the indications provided in Chapter 24. To assure that the engine can be started with a sufficient quantity of energy, it is advisable to provide for the installation of a supplementary battery, dedicated to supplying power to the on-board electrical services. The power line to recharge it may be constructed according to the indications provided in Chapter 13.

If one engine is installed

The battery used for services may be recharged interposing on the power supply line a relay actuated by the recharge signal of the alternator's electronic regulator (D+).

If two engines are installed

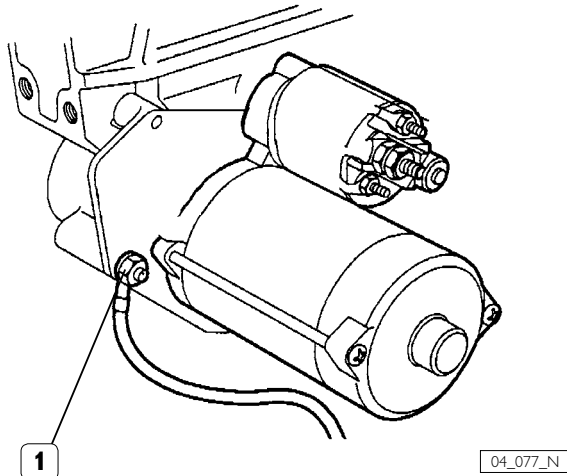
The presence of two generators allows to keep the recharging functions separated: the generator (G1) recharges the battery (AC1) dedicated to starting both engines and powering both electrical/electronic control circuits, whilst the generator (G2) recharges the battery (AC2) used to power the services.

In two-engine applications, it is essential to connect the engine grounds to a common potential; the solution proposed in Chapter 13 fully complies with this need, assuring the full functionality and independence of the two circuits.

Engine electrical ground

The connection of the engine electrical ground is achieved by connecting with a cable of at least 70 mm² cross section to the negative pole of the battery to the tightening point of the electric starter motor as shown in Figure 13.

Figure 13



1. Point of connection of the engine electrical ground.

To anchor the grounding terminal to the engine, proceed as follows:

Completely remove the conducting paint from both parts constituting the connection, using mechanical means or suitable chemical product; if the anchoring operation is to take place on superficially treated parts, completely remove the anaphoretic paint with mechanical means, obtaining a smooth support surface.

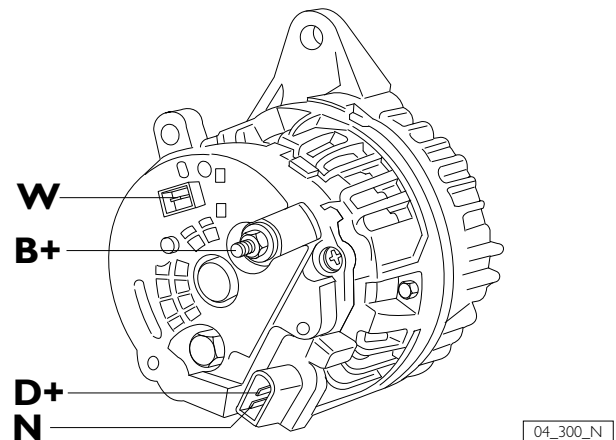
IVECO standard 18-1705:

Apply a uniform layer of BH44D paint with a brush or spray gun.

Join the parts constituting the grounding note within 5 minutes from the time the paint was applied.

Battery recharging

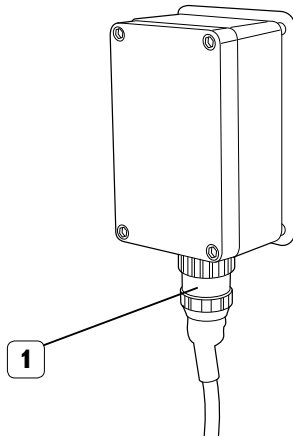
Figure 14



W. Signal for revolution counter -
B+. Connected to the +30 of the electric starter motor - D+. Excitation - N. Not connected.

This is accomplished through the power supply line of the electric starter motor and connection to the +B of the alternator. The electronic regulator of the alternator that equips the engine allows an effective control over the battery recharging operation.

If, due to installation requirements, the batteries need to be positioned at a distance from the engine, we recommend increasing the cross section of the power line conductors and verifying recharging effectiveness by measuring voltage across the battery poles.

Relay box**Figure 15**

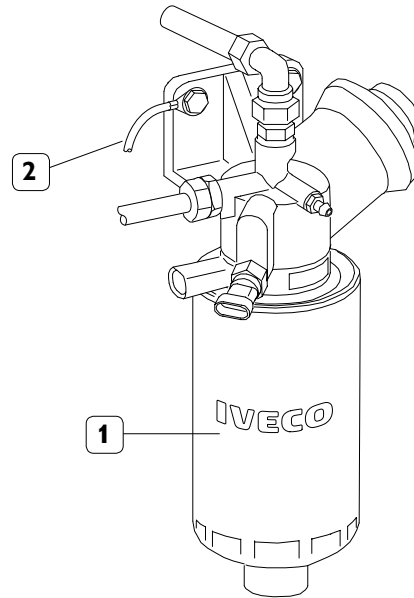
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1. JF Connection.

This shall be installed and anchored in such a way as to dampen the vibrations and stresses occurring when underway, and they shall be accessible during servicing operations and when underway.

Inside the box, there are the relays to manage the power of some parts and two fuses protecting the electrical lines from accidental short circuits or power surge.

Connect it to wiring using the 16 poles JF connector.

Water presence in the pre-filter sensor**Figure 16**

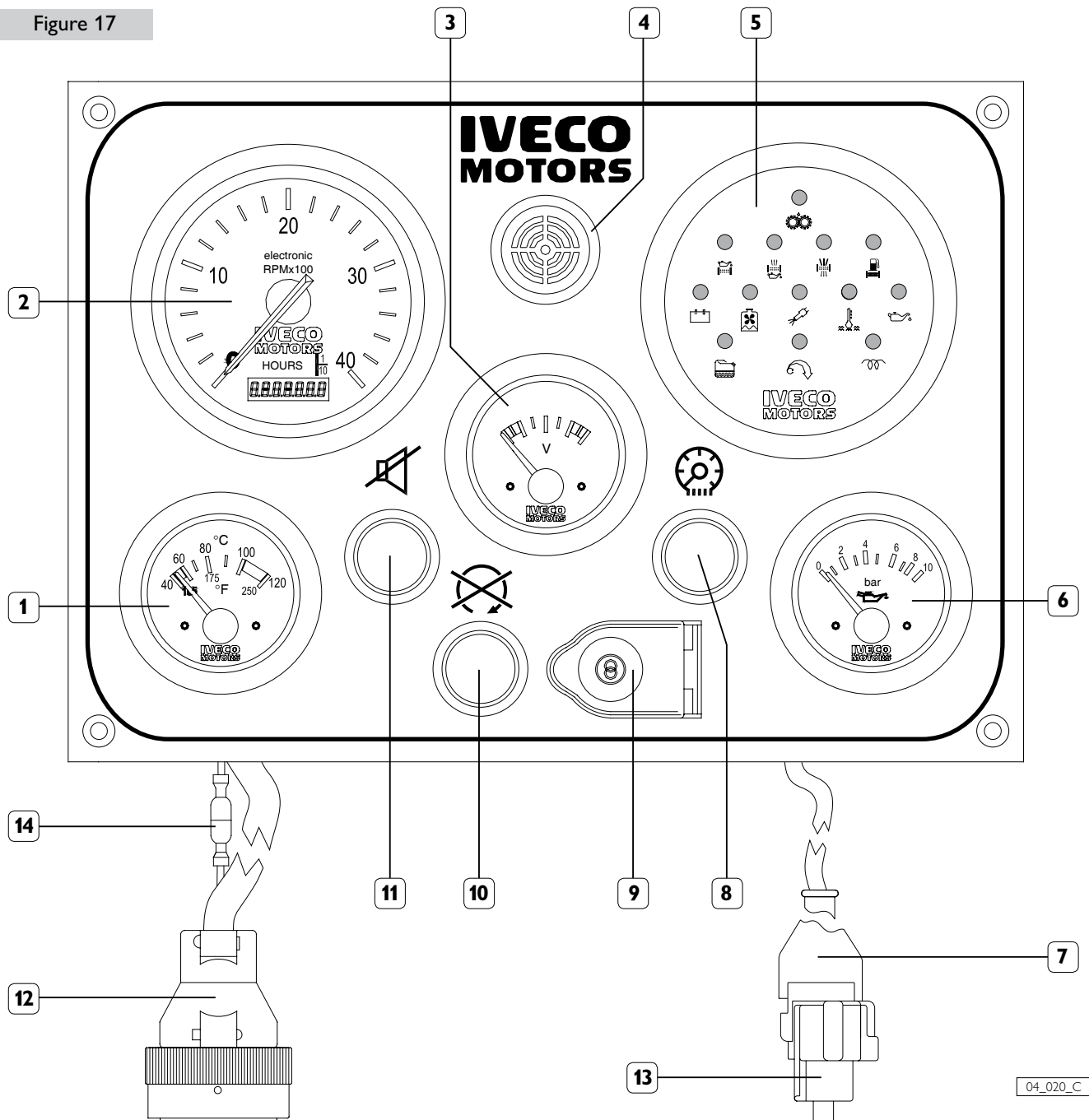
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1. Pre - filter - 2. Conductor to be connected with the negative battery terminal.

CAUTION

In order to enable the proper working of the sensor to detect water in the fuel, it is necessary that the pre-filter support is connected electrically to the negative battery terminal.

In the engine models which use parts with insulated poles it is necessary to electrically insulate the pre-filter support from the boat mass and then connect the support with the negative battery terminal.

9. M10.00/M15.00 MAIN ANALOG INSTRUMENT PANEL**Figure 17**

1. Coolant temperature gauge (TA) - 2. Revolution counter and hour counter (CG) - 3. Voltmeter (V) - 4. Buzzer (SA) - 5. Indications and alarms module (MS) - 6. Engine oil pressure gauge (MO) - 7. Connector for secondary instrument panel (JE) - 8. On board panel instrument light switch (L) - 9. Engine start/stop key switch (CA) - 10. Engine stop push-button (usable only on versions with excitation engine stop) - 11. Sound alarm inhibition push-button (P1) - 12. Connector for main panel wiring (JC) - 13. Cap with electrical continuity connection - 14. SIFC Alarm abilitation connector.

Installation of the IVECO MOTORS onboard panel with analog indicators entails connecting the panel's JC connector to the JB connector on engine wire harness, interposing the appropriate extension wire harness available in 3, 5 and 7 meter-long versions. The JC-JB wire harness comprises 47 lines, each connected to the terminal identified on both connectors by the same number.

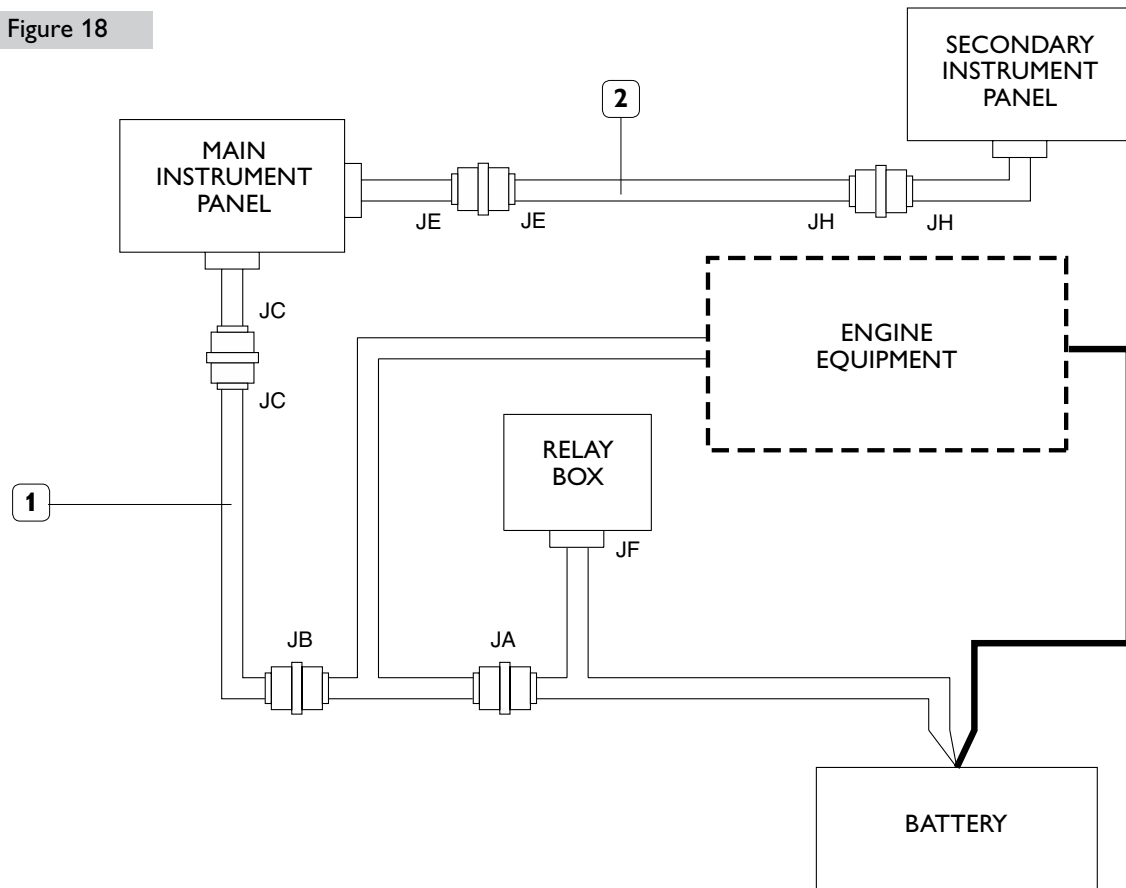
To the main panel is connected the JE connector; provided for connection to the secondary panel; in installations with no secondary panel, do not remove the cap of the JE connector to avoid compromising the electrical continuity of the systems' power supply circuit.

Do not disconnect the connector 14 to avoid wrong fuel filter clogging alarm indication.

04_020_C

Synoptic of the connections of the analog panels

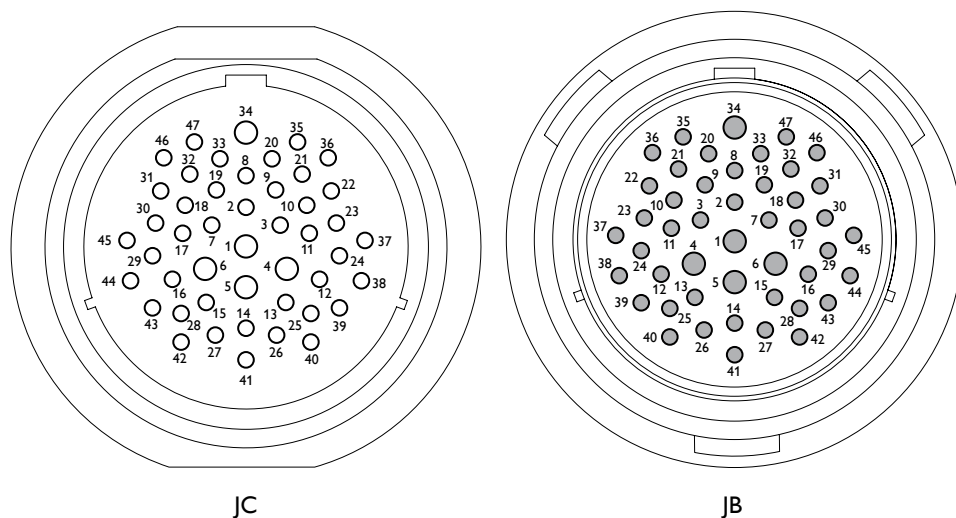
Figure 18



04_254b_N

1. JB-JC xtension wire harness - 2. JE-JH extension wire harness.

Figure 19



04_250_N

CONNECTORS OF THE JB - JC EXTENSION WIRE HARNESS, SEEN FROM THE COUPLING SIDE

To identify the functions served by the individual lines, refer to the electrical diagrams in Chapter 13.

Installation

In order to drill holes on the area where the panel is to be mounted, refer to the dimensions indicated in Chapter 11.

Operation of the panel

After completing the electrical connections and engine preparation, perform the tests required for the first start, as described in Chapter 23.

Verify the proper operation of the panel, proceeding as follows:

- ❑ Turn the key switch on the first position, check the tools to be powered and the Alarm and Signal Module to perform the 5 seconds alarm test according to the following procedure.
- ❑ Once the test is complete, only the indications prescribed for the engine not running must remain lighted: e.g. "alternator charge" and "low oil pressure"; the analog instruments must provide values consistent with the relevant physical parameters.

Testing the engine start function

Turn the key switch to the second position and keep it in it until the engine has started, then release the switch, which will stably return to the first position; after releasing the key, the switch may be brought back to the starting position only after the switch is returned to the resting or zero position.

Checking indications

After starting the engine, verify whether the operating modes of the indications and alarms module are similar to those set out below.

Using appropriate measuring instruments, verify the consistency of the indications provided by the analog instruments.

NOTE

Do not disconnect the connector 14 (see Figure 17) to avoid wrong fuel filter clogging alarm indication.

Verify the indication of the panel revolution counter, comparing it with the one measured by a reference instrument; if the indication is different, proceed as described below.

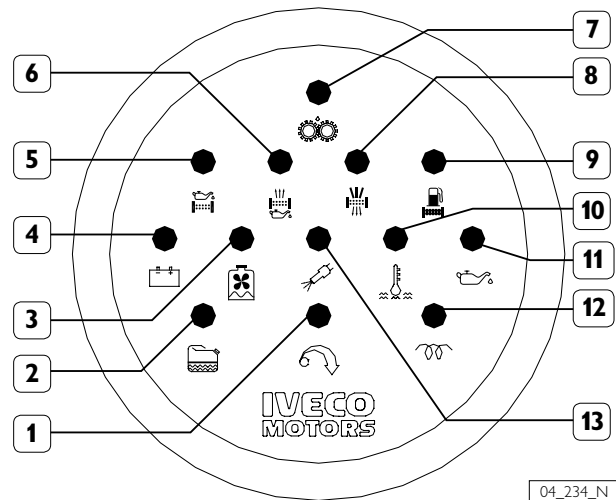
Testing the engine stop function

Stop the engine by pressing the red button on the IVECO MOTORS panel. On customized panels press the similar button.

Should the engine be equipped with a de-energizing stopping device (upon request), stop it turning the key switch in the rest position.

Indications and alarms module

Figure 20



1. Runaway engine (SSV) - 2. Presence of water in fuel pre-filter (SAC) - 3.* Low coolant level (SBLA) - 4. Alternator fault (SS) - 5.* Clogged oil filter (SIFO) - 6.* Clogged oil vapor filter (SIFB) - 7.* Pre-lubrication (SP) - 8. Clogged air filter (SIFA) - 9.* Clogged fuel filter (SIFC) - 10. High coolant temperature (SATA) - 11. Low oil pressure (SBPO) - 12.* Pre-post heating (SCP) - 13.* EDC malfunction (EDC).

* Unavailable function on N45 MNA M10 and N67 MNA M15 engines.

The indications and alarms module comprises the indicator lights and the electronic alarm interface, timing and storage circuit. It is programmed in such a way that when it is powered, all indicator lights are lighted, with the exception of those for "pre-lubrication", "pre-post heating" and "EDC" failure and a sound signal is emitted by the buzzer.

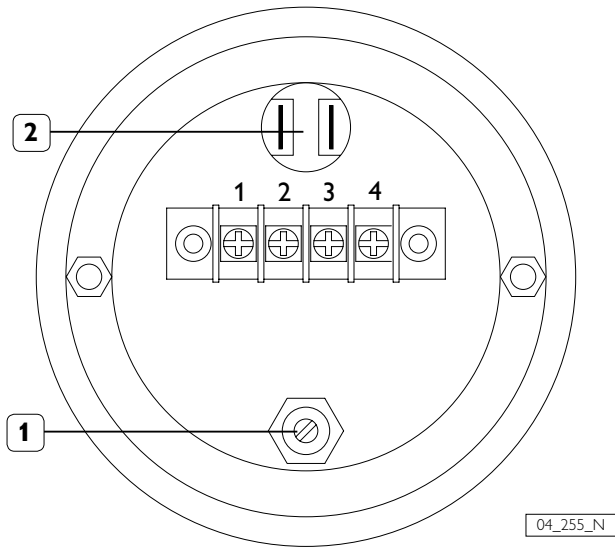
The sound alarm may be silenced before the end of the test, acting on the appropriate control.

During the starting phase and for the subsequent 15 seconds, needed to stabilize the low oil pressure signal, all the module's functions are inhibited; once this time interval has elapsed, every alarm state detected by the sensors will cause the associated indicator to be lighted and the buzzer to be powered.

When a new alarm state is detected, the indicator light will flash to highlight the occurrence with respect to any others which may be ongoing at the time. When the sound alarm is shut off, the light indicator will remain lighted and the alarm will be stored until the engine is stopped.

Revolution-counter calibration

Figure 21



1. Adjustment screw - 2. Panel lighting lamp.

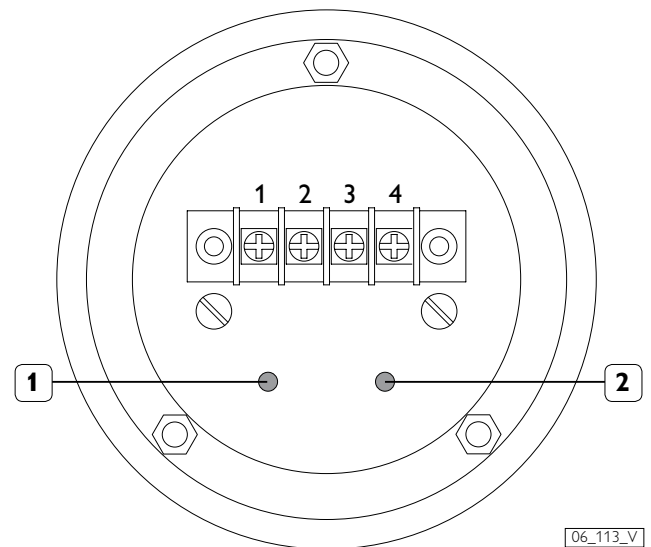
Verify the indication of the panel revolution counter by comparing it with the one measured with a reference instrument; if it differs, operate the adjustment screw (1), located in the rear part of the instrument, until consistency is achieved; repeat the operation for different engine rpms.

Maintenance

Should it become necessary to replace a panel light, remove the lamp holder from the rear part of the instrument (see Figure 21).

Revolution-counter calibration

Figure 22

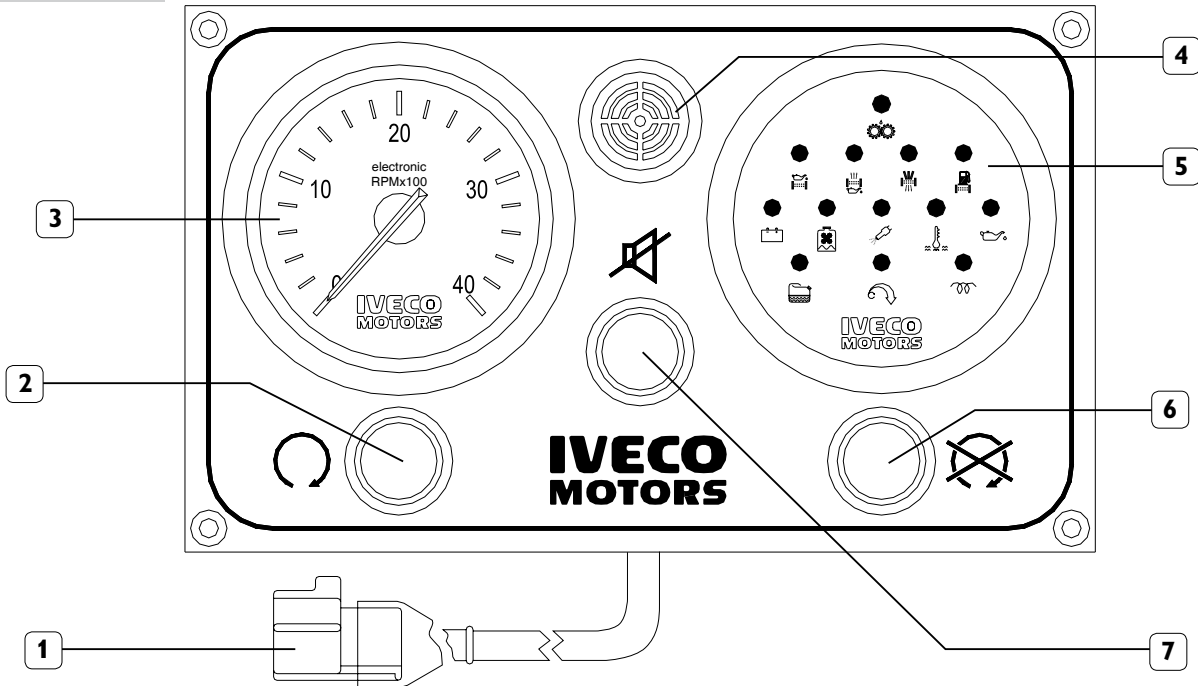


1. Calibration increasing button -
2. Calibration decreasing button.

Verify the indication of the panel revolution counter by comparing it with the one measured with a reference instrument; if it differs, press the button 1 and 2 situated on the rear of the tachometer, until consistency is achieved; repeat the operation for different engine rpms.

Maintenance

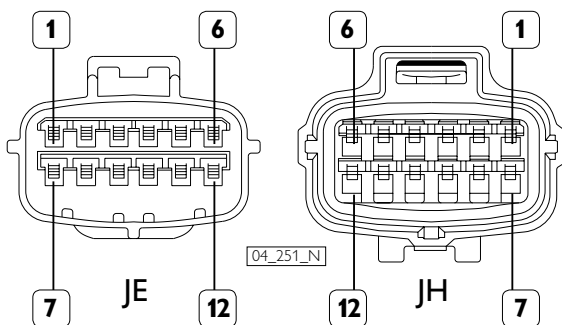
The board is illuminated by not-replaceable internal LEDs.

10. M10.00/M15.00 SECONDARY ANALOG INSTRUMENT PANEL (FLYING BRIDGE)**Figure 23**

04_240_N

- 1.Connector for secondary panel wire harness (JH) - 2. Engine start push-button (CS) - 3. Revolution counter (CG) -
4. Buzzer (SA) - 5. Indications and alarms module (MS) - 6. Engine stop push-button (AS) -
7. Sound alarm inhibition push-button (P1).

The connection is achieved by removing the cap on the JE connector of the main panel, and connecting the JE connector to the JH connector on the secondary panel, interposing the extension wire harness, available in 3, 5 and 7 meter-long versions (see Figure 18). The JE-JH wire harness comprises 12 lines, each connected to the terminal identified on both connectors by the same number (see Figure 24).

Figure 24

CONNECTORS OF THE JE-JH EXTENSION WIRE HARNESS, SEEN FROM THE COUPLING SIDE

Installation

In order to drill holes on the area where the panel is to be mounted, refer to the dimensions indicated in Chapter 11

Operation of the secondary panel

After completing the electrical connection to the main panel and engine preparation, and performing the tests required for the first start (as described in Chapter 23), verify the proper operation of the panel, proceeding as follows:

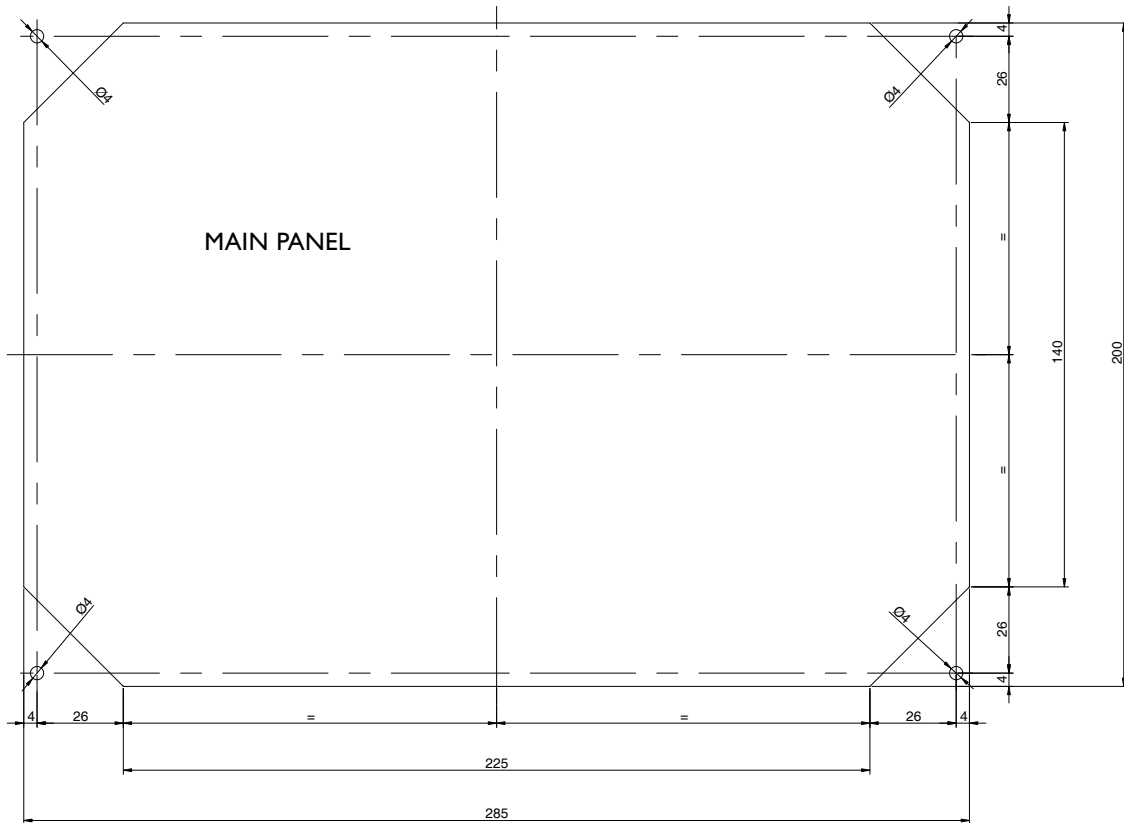
- ☐ Turn the key switch to the first position, thus enabling the operation of both panels.
- ☐ Carry out the same tests for the secondary panel as were carried out for the main panel.
- ☐ Disable the secondary panel by bringing the key switch on the main panel to the resting or zero position.

Testing the engine start and stop function.

With the panel enabled, press the green push-button until the engine starts, then release it; wait for engine rpm to stabilize before stopping it by pressing the red push-button. The starting and stopping operations can be performed several times and consecutively from the secondary panel.

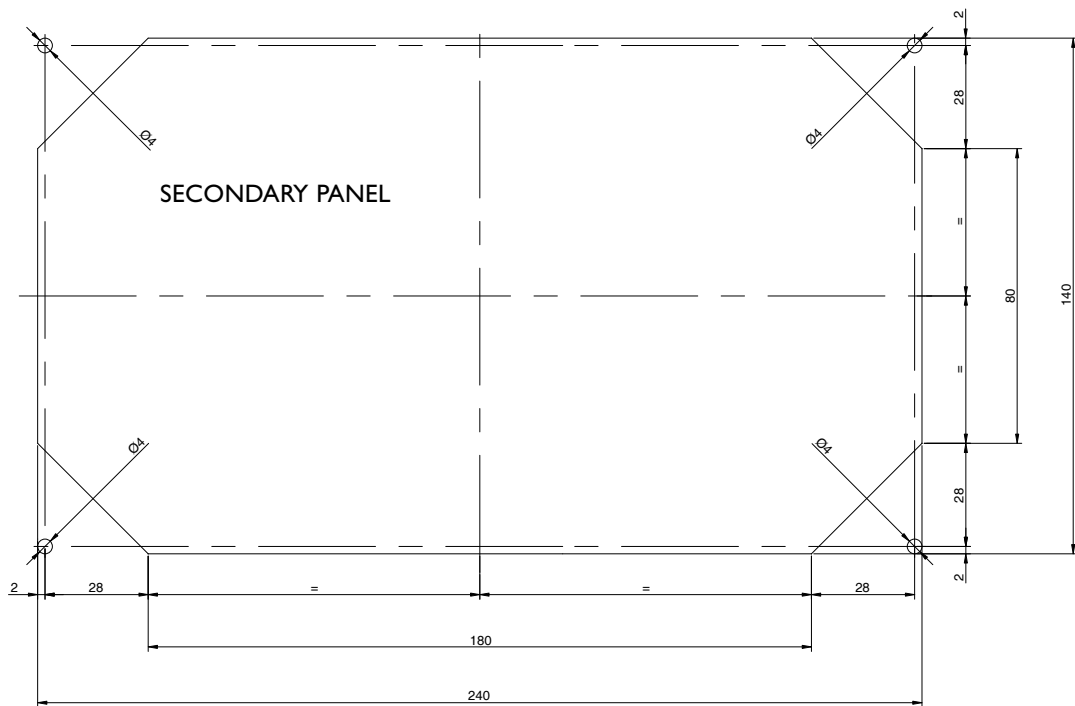
Checking indications

Proceed in the same way as for the main panel.

11. M10.00/M15.00 DRILLING PLANS FOR ANALOG PANELS**Figure 25**

04_311_N

Measurements in millimeters.

Figure 26

04_312_N

Measurements in millimeters.

12. M10.00/M15.00 CUSTOMIZED INSTRUMENT PANEL

Using only the components of the panel that are not wired to allow for panel customization, they will have to be wired using the 10 meter long wire harness, set up at one end for coupling to the JB connector and at the opposite end with conductors with free terminals with identifying numbering on each wire. The conductors will have to be connected to the individual components as indicated in the electrical and wiring diagrams in Chapter 13.

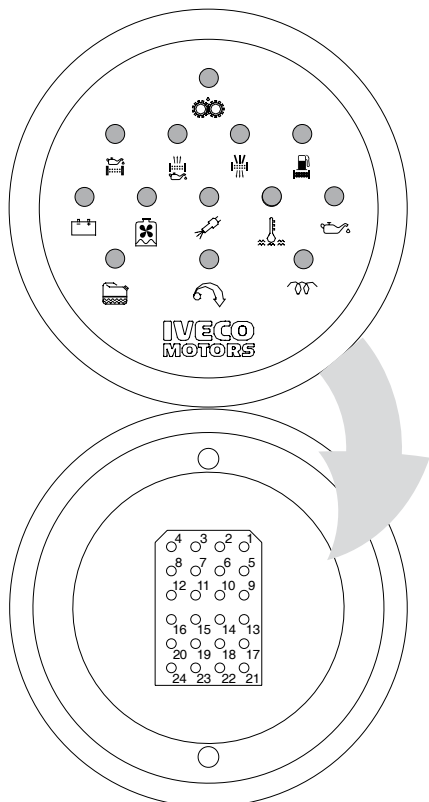
CAUTION

To assure the functionality of the safeties pertaining to the engine start/stop commands from the instrument panel or engine room, it is mandatory to wire the key switch strictly as shown in the electrical diagrams in Chapter 13.

The wiring details of the indications and alarms module alone are provided below; indications for IVECO MOTORS indicator instruments, are shown in the related wiring diagrams in Chapter 13.

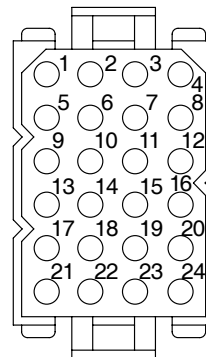
JD Connector for indications and alarms module

Figure 27



VIEW FROM THE INTEGRATED SIDE
IN THE REAR PART OF THE MODULE

Figure 28



04_241_N

VIEW FROM THE TERMINAL SIDE
OF THE COUPLING SIDE WIRING

connector	TRIDENT / ITT CANNON	part TST 24PA00
terminal	female	part 192990-0050
lid	rear	part TST24AH00

JD connects the indications and alarms module to the electrical system of the engine (sensors, power supply, etc.). The terminal part of the wire harness, supplied with the module, must be completed using female terminals, as described in the electrical diagram of Chapter 13. Gather essential information, the following ways must be wired: 1, 7, 8, 9, 10, 13, 14, 15, 17, 18, 19 with the female terminals supplied as standard equipment.

Functions of the JD terminals

PIN	Description	Electric level	
		OFF Indication	ON Indication
1	Module power supply	Positive (+B)	
2	EDC lamp power supply	Power supply positive (+B)	
3	EDC Fault indication	High (+B)	Low (ground)
4	Pre-heating light power supply	Power supply positive (+B)	
5	Pre-heating indication	High (+B)	Low (ground)
6	Pre-lubrication indication	Open circuit	High (+B)
7	Engine start	Power supply positive (+B) while starting	
8	Sound alarm inhibition	Negative (ground) during the request	
9	Module power supply	Negative (ground)	
10	Buzzer power supply	Negative (ground) during the emission of sound	
11	Clogged oil filter indication	Open circuit	Low (ground)
12	Clogged oil vapor filter indication	Open circuit	Low (ground)
13	Clogged air filter indication	Open circuit	Low (ground)
14	Clogged fuel filter indication	Low (ground)	Open circuit
15	Alternator fault indication	High (+B)	Low (1 to 3 V)
16	Low engine coolant level indication	Open circuit	Low (ground)
17	High coolant temperature indication	Open circuit	Low (ground)
18	Low engine oil pressure indication	Open circuit	Low (ground)
19	Presence of water in fuel indication	Open circuit	Low (ground)
20	Overloaded or runaway engine indication	Open circuit	High (+B)
21	Not connected	-	
22	Not connected	-	
23	Reception of data from main panel	NMEA communication protocol (0 to 5 V)	
24	Transmission of data to secondary panel	NMEA communication protocol (0 to 5 V)	

CAUTION

To assure the utmost reliability and safety while underway, all installations must be provided with the following alarm indications:

(SATA) high coolant temperature

(SBPO) low oil pressure

It is also recommended that the following indications be present:

(SAC) presence of water in the fuel pre-filter

(SIFA) clogged air filter

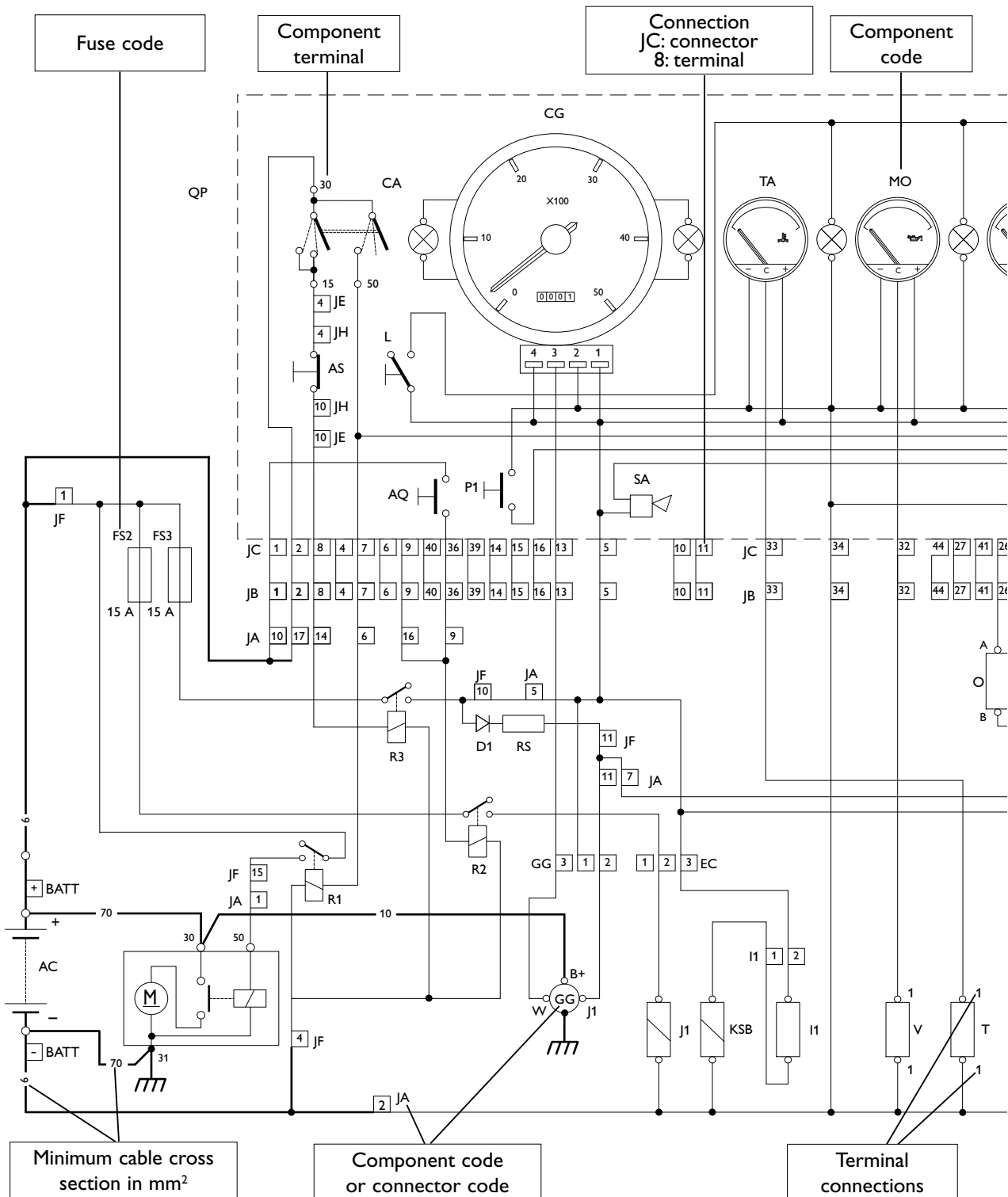
(SS) alternator fault

13. M10.00/M15.00 WIRING DIAGRAMS**Wiring diagram key**

General conditions for the preparation and interpretation of wiring diagrams:

- ☐ Key switch open
- ☐ Engine not running
- ☐ Liquids at efficient levels and pressures

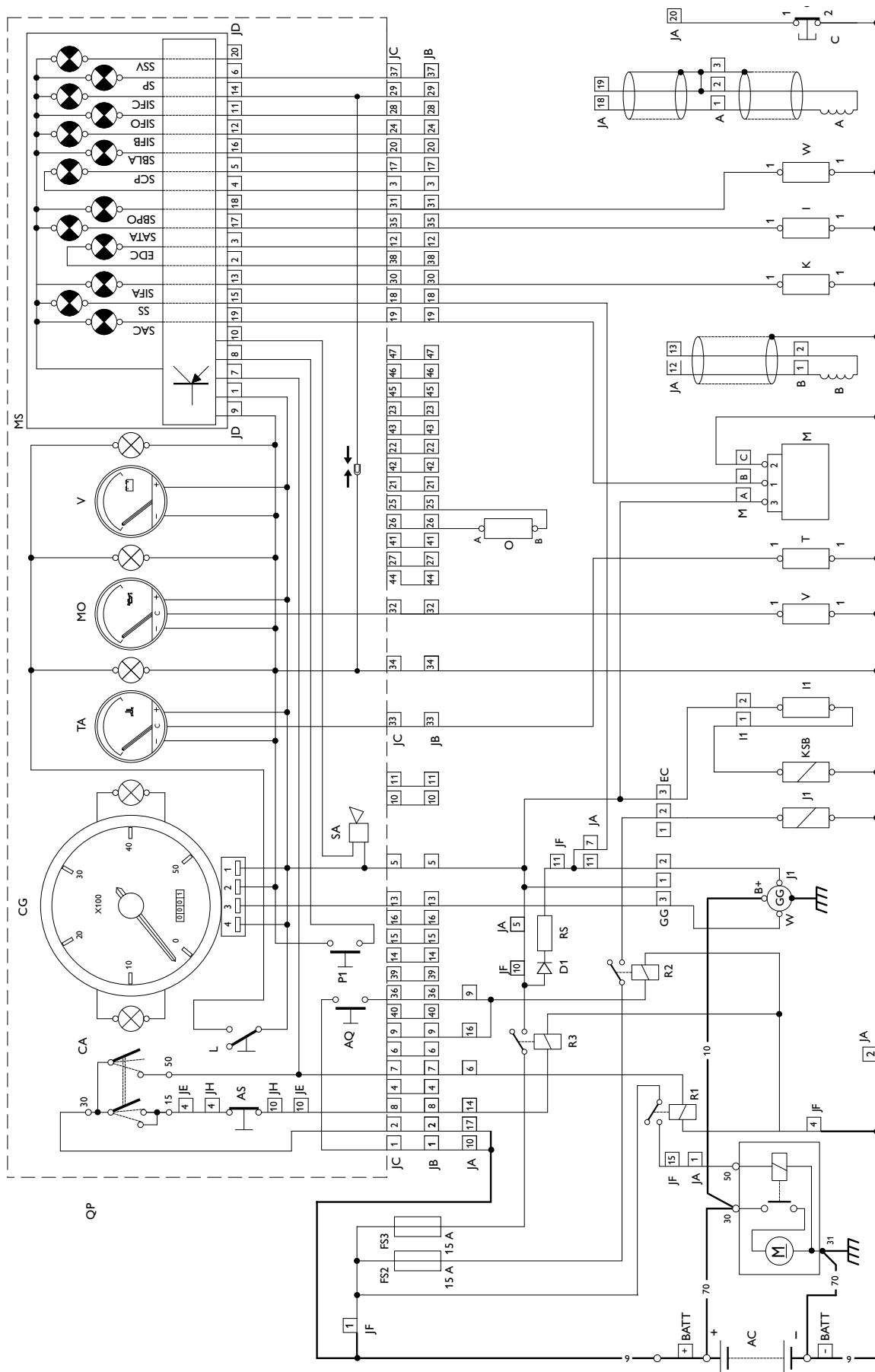
Figure 29



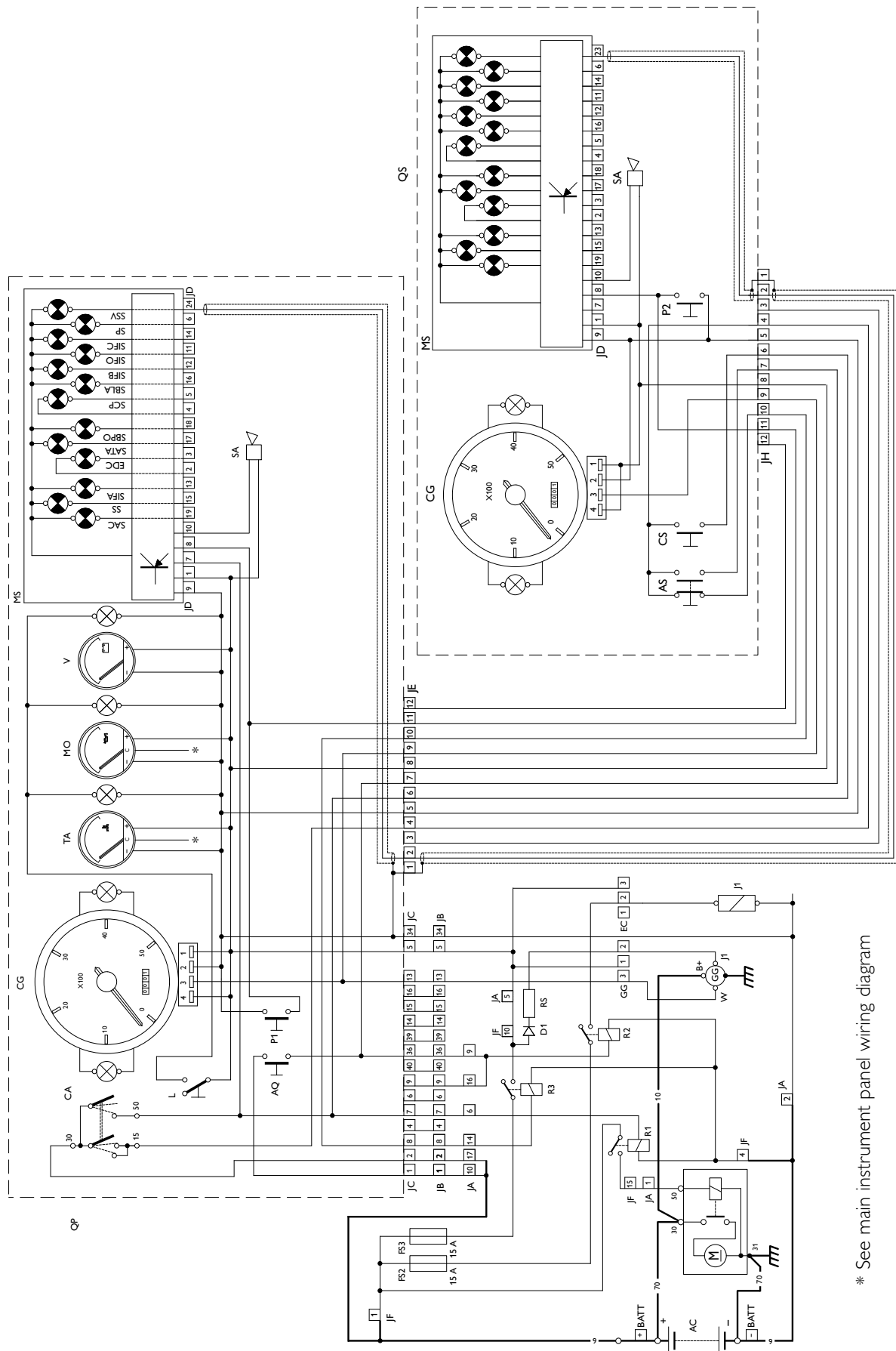
Electrical equipment component code

A	drive shaft sensor (on request)
AC	battery
AQ	engine shut-off push-button on main panel
AS	engine shut-off push-button on secondary panel
B	drive shaft sensor (on request)
C	emergency shut-down push-button (optional, installer's responsibility)
CA	key switch
CS	engine start push-button on secondary panel
EC	injection pump connector
GG	connector for alternator
I	high coolant temperature sensor (for alarm)
I1	KSB refrigerating liquid temperature sensor
J1	engine stop solenoid valve
J1	alternator excitation
K	air filter clogging sensor (for alarm)
KSB	cold injection advance adjustment device
L	instrument panel light switch
M	sensor for detecting the presence of water in the fuel pre-filter (for alarm)
MM	electric starter motor
MS	IVECO MOTORS indications and alarms module
O	exhaust gas temperature sensor (on request)
P1	sound alarm inhibition push-button
QP	main analog instrument panel
QS	secondary analog instrument panel
SA	buzzer
T	coolant temperature sensor (for gauge)
V	oil pressure sensor (for gauge)
W	low oil pressure sensor (for alarm)
W	signal for revolution counter
Connectors	
JA	connection between engine wiring and interface wire harness
JB ON ENGINE WIRE HARNESS	set for connection to the main analog instrument panel
JC ON MAIN ANALOG INSTRUMENT PANEL	set for connection to the engine wire harness
JD	IVECO MOTORS indications and alarms module

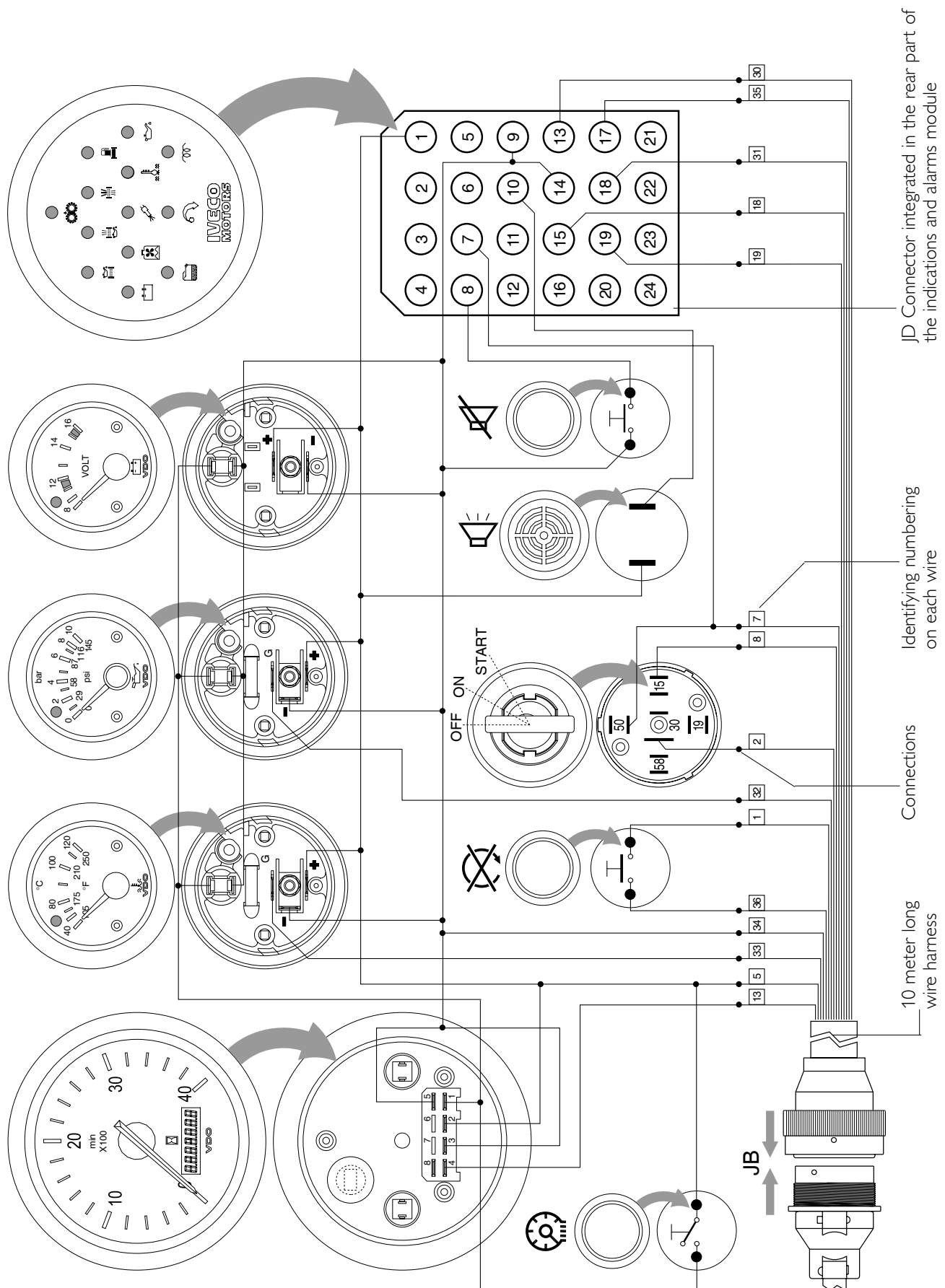
JE ON MAIN ANALOG INSTRUMENT PANEL set for connection to the secondary analog instrument panel	
JF	relay box
JH ON SECONDARY ANALOG INSTRUMENT PANEL set for connection to the main analog instrument panel	
Indicator lights	
EDC	EDC malfunction
SAC	presence of water in fuel pre-filter
SATA	coolant high temperature
SBLA	low coolant level
SBPO	low oil pressure
SCP	pre-post heating
SIFA	clogged air filter
SIFB	clogged oil vapor filter
SIFC	clogged fuel filter
SIFO	clogged oil filter
SP	pre-lubrication
SS	alternator fault
SSV	engine overspeed
Gauges	
CG	revolution-counter
MO	engine oil pressure
TA	engine temperature
V	voltmeter
Relays contained in the relay box	
R1	power supply to terminal 50 of the electric starter motor
R2	emergency engine shut-down provision
R3	key switch electric discharge
Fuses contained in the relay box	
FS 2	on solenoid valve supply line for engine stop
FS 3	on main supply line

M10.00/M15.00 Main analog instrument panel

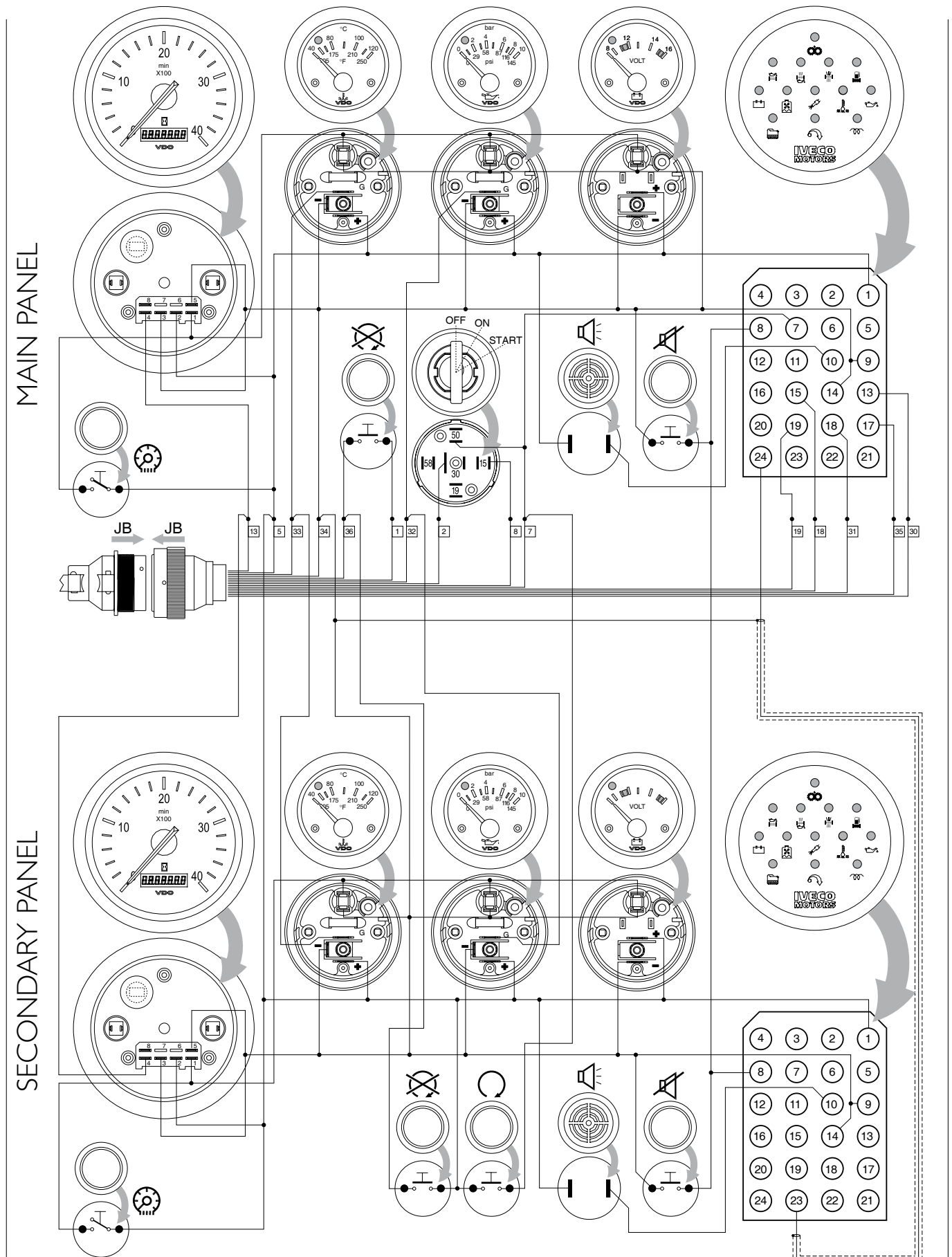
M10.00/M15.00 Secondary analog instrument panel



* See main instrument panel wiring diagram

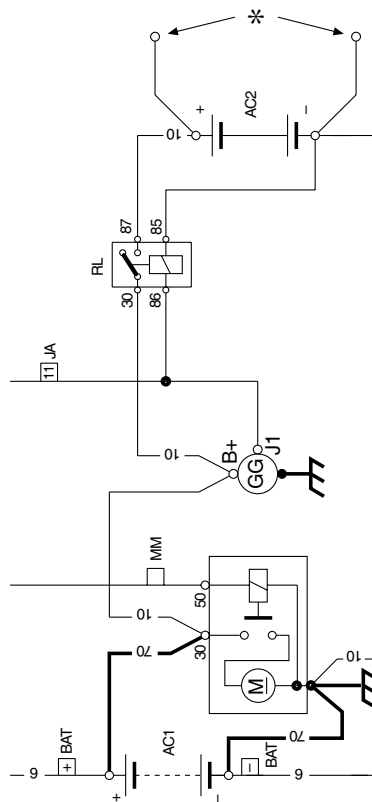
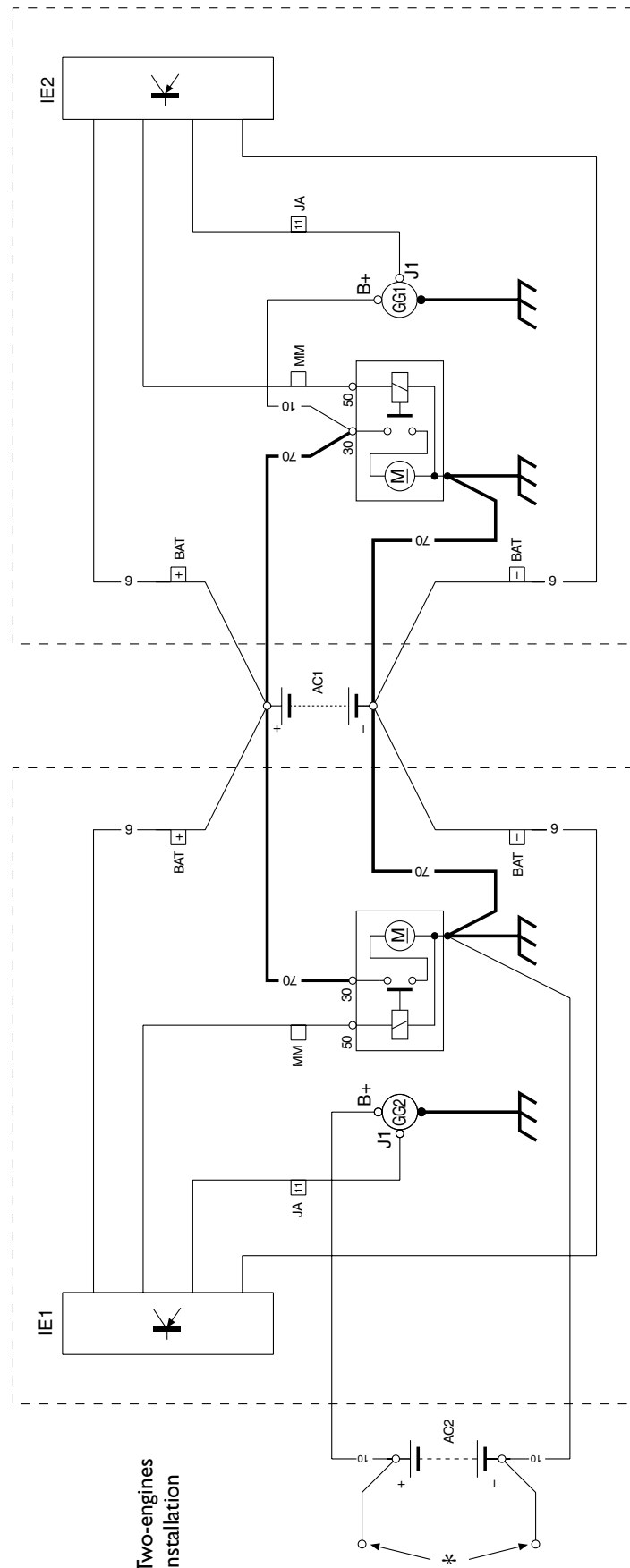
M10.00/M15.00 Wiring a specific personalised instrument board

M10.00/M15.00 Wiring of the double personalised instrument board (main and secondary board)



M10.00/M15.00 Supplementary services battery recharge**Key:**

- AC1: Main Battery
- AC2: Battery for auxiliary services
- IE1: Engine 1 electrical system
- IE2: Engine 2 electrical system
- RL: Relay 50A max.
- *: Electrical power supply for services

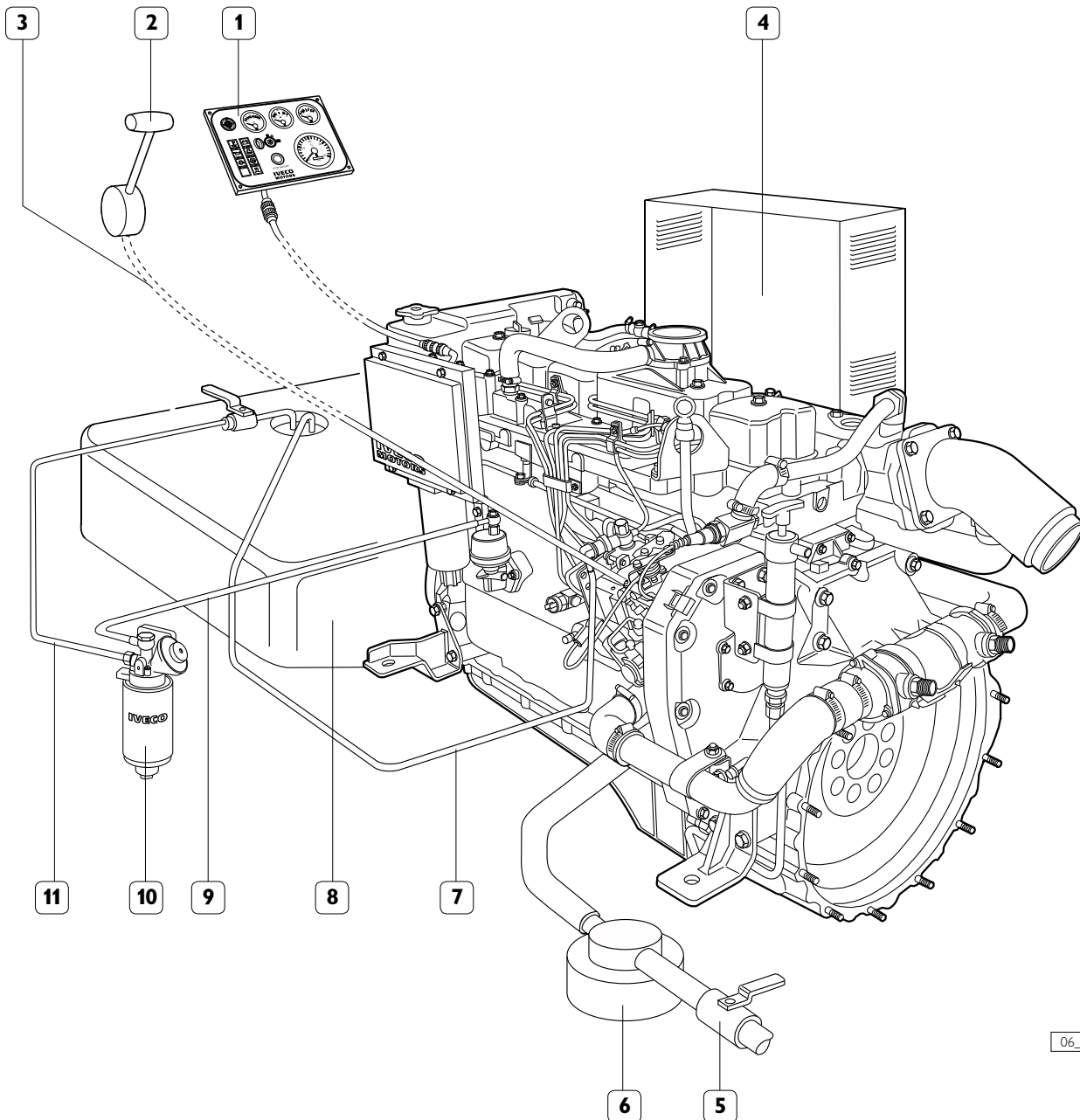
**Single engine
installation****Two-engines
installation**

N45 MNA M10.01

N67 MNA M15.01

MODEL PRODUCED FROM THE YEAR 2006

SPECIFIC CHAPTERS 14-15-16-17-18-19-20

14. M10.01/M15.01 INSTALLATION OVERVIEW**Figure 30**

06_607_N

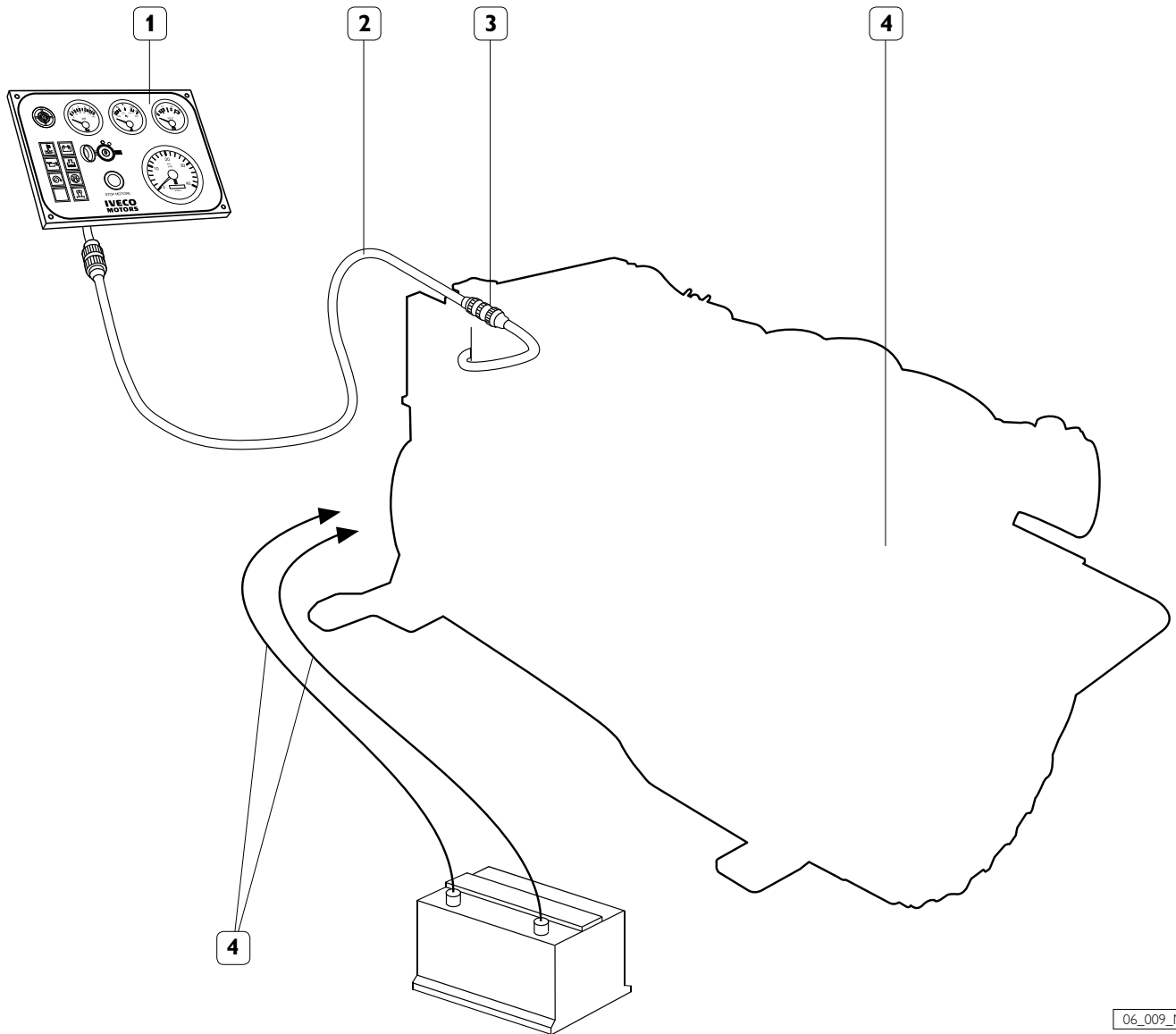
1. Indicator and control panel - 2. Throttle lever - 3. Throttle Bowden rod - 4. Electric panel with optional electronic units -
5. Filtered sea water intake - 6. Decanter filter - 7. Fuel return pipe to tank - 8. Tank -
9. Fuel to prefilter pipe - 10. Sedimenting prefilter - 11. Fuel to filter pipe.

The figure shows the set of components of an installation, including those supplied with the engine equipment, standard or optional, and those supplied or produced by the yard. It provides a comprehensive picture of the operations required to install the engine. Components arrangement and illustrations are not binding but merely indicative, subject to the choices made by yard

engineers according to their skills, available spaces and the prescriptions set out herein.

15.M10.01/M15.01 ELECTRICAL EQUIPMENT

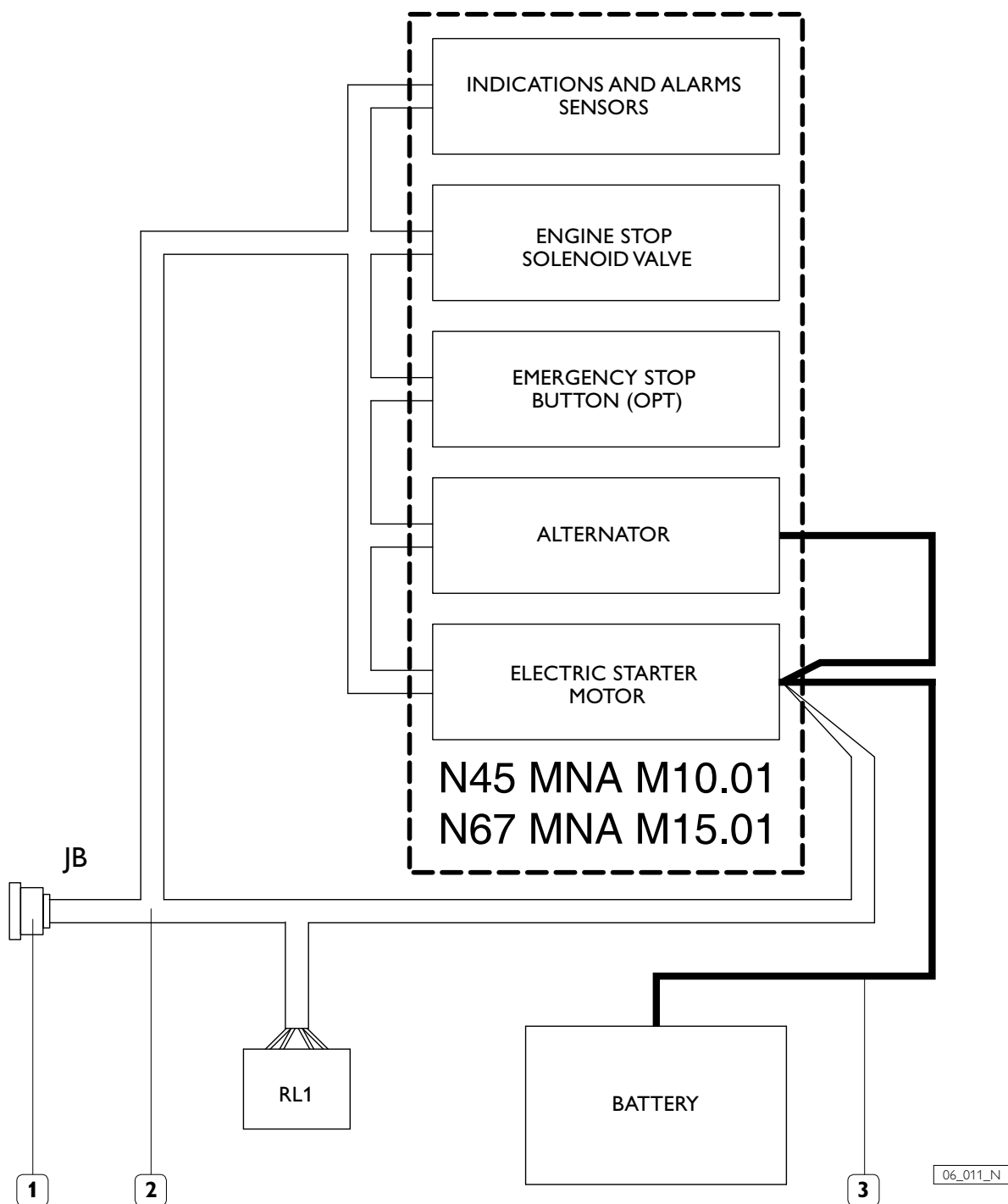
Figure 31



1. Indicator and control panel - 2. Provided wire harness - 3. JB Connection - 4. Power line for electric starter motor and alternator.

The electrical equipment of the engine comprises a series of components provided separately from the engine to enable an easy and diversified installation, according to the Yard's design choices. The need to make accessible, at sea or underway, the controls to the electrical components contained in the relay box may be met through different installation arrangements.

Along with the coupling of all connectors provided in the wire harnesses, completing the installation also requires to complete the power line and to connect the accumulator to the engine wire harness.

Synoptic**Figure 32**

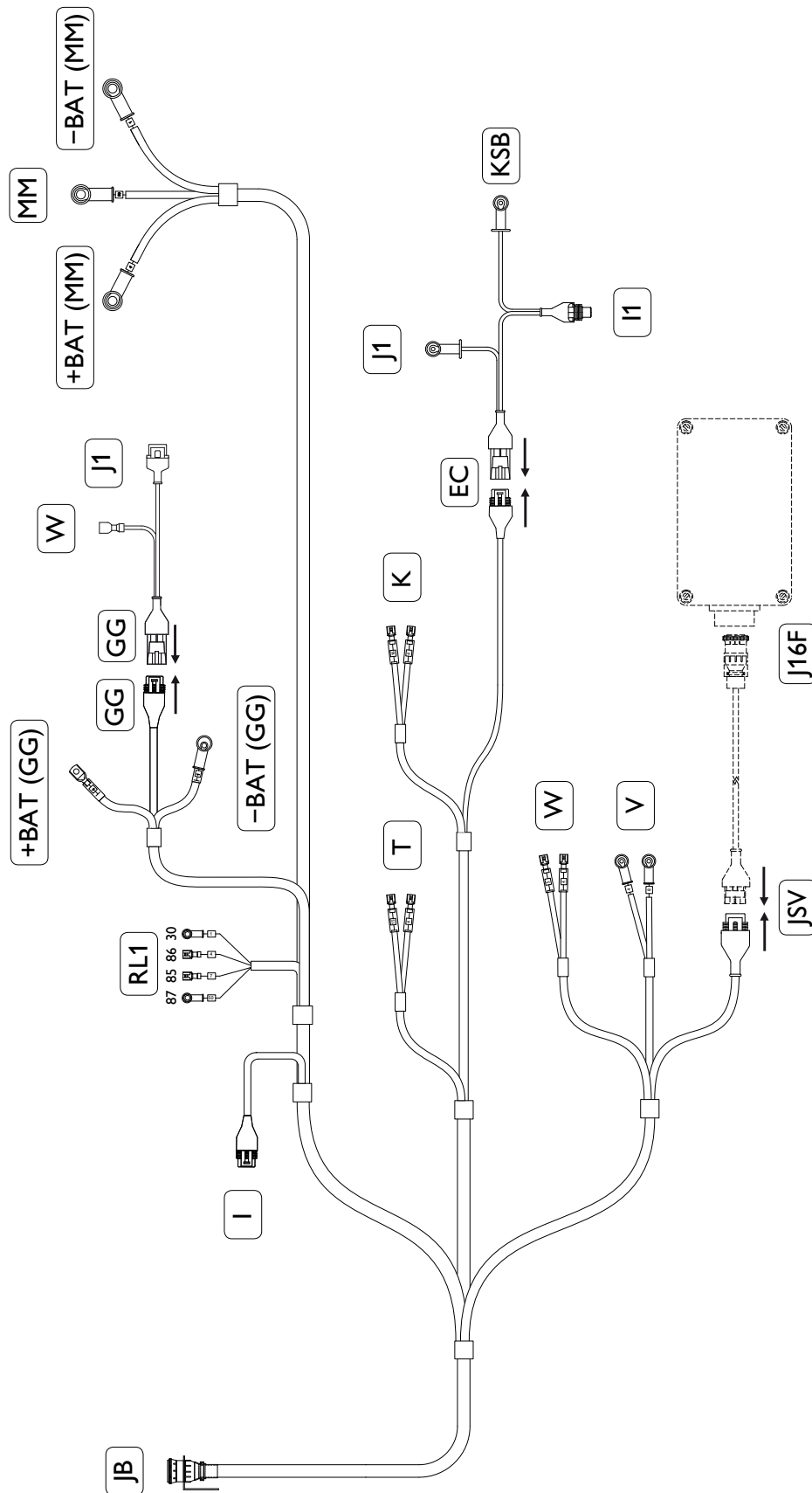
1. Connector for instrument panel connection wire harness - 2. Engine wire harness - 3. Power line.

The wire harnesses provided with the engine include the connectors for all optional components which may ordered

and their connections to the JB connector for the indicator and control panel.

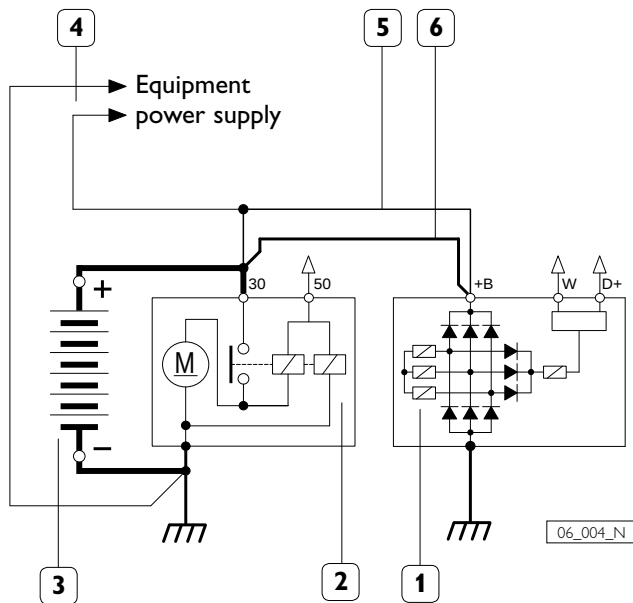
Wire harness

Figure 33



06_012_N

I. High coolant temperature sensor (for alarm) - K. Air filter clogging sensor (for alarm) - T. Coolant temperature sensor (for gauge) - V. Oil pressure sensor (for gauge) - W. Low oil pressure sensor (for alarm) - W. Signal for revolution counter - EC. Injection pump connector - I1. KSB. Refrigerating liquid temperature sensor - J1. Engine stop solenoid valve - KSB. Cold injection advance adjustment device - GG. Connector for alternator - JB. Instrument panel connector - J1. Alternator excitation - JSV. Over speed module connector - J16F. Engine rotation over speed control module (on request) - RL1. Starter relay motor - MM. Electric starter motor.

Power supply line**Figure 38**

1. Alternator - 2. Electric starter motor - 3. Battery -
4. Engine wire harness - 5. This conductor is present on the engine wiring - 6. This conductor must be parallel connected to the existing one.

The connection of the +B terminal of the alternator to the positive +30 terminal of the electric starter motor must be achieved with a conductor having a cross section of at least 20 mm². On the engine wiring there is a 6 mm² section conductor: a 16 mm² section or – or higher – conductor must be connected to it. The connection of the positive +30 terminal of the electric starter motor to the positive pole of the battery, achieved with a conductor having a cross section of at least 70 mm², allows to obtain, as shown in the figure, the simultaneous connection of the alternator to the battery. On the same +30 terminal of the start-up electric engine it is necessary to connect the eye battery lead connection marked with "+ BAT (MM)". The connection between the engine ground and the negative pole of the battery must be achieved according to the guidelines provided in the Engine electrical ground paragraph.

CAUTION

Do not use any magneto-thermal activation protection items to stop engine. Using off-the-shelf equipment, you stop the engine energizing the proper solenoid valve. In lack of power supply you could not stop the engine.

Supplementary services battery

To assure that the engine can be started with a sufficient quantity of energy, it is advisable to provide for the installation of a supplementary battery, dedicated to supplying power to the on-board electrical services. The power line to recharge it may be constructed according to the indications provided in Chapter 20.

If one engine is installed

The battery used for services may be recharged interposing on the power supply line a relay actuated by the recharge signal of the alternator's electronic regulator (D+).

If two engines are installed

The presence of two generators allows to keep the recharging functions separated: the generator (G1) recharges the battery (AC1) dedicated to starting both engines and powering both electrical/electronic control circuits, whilst the generator (G2) recharges the battery (AC2) used to power the services.

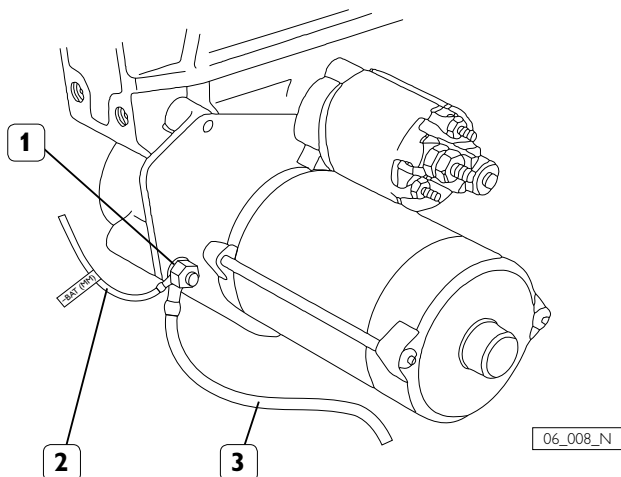
In two-engine applications, it is essential to connect the engine grounds to a common potential; the solution proposed in Chapter 20 fully complies with this need, assuring the full functionality and independence of the two circuits.

Engine electrical ground

The connection of the engine electrical ground is achieved by connecting with a cable of at least 70 mm² cross section to the negative pole of the battery to the tightening point of the electric starter motor as shown in Figure 39.

On the same terminal it is necessary to connect the eye battery lead connection marked with "- BAT (MM)".

Figure 39



1. Point of connection of the engine electrical ground -
2. Engine wiring mass connection - 3. Battery connection to the negative pole.

To anchor the grounding terminal to the engine, proceed as follows:

Completely remove the conducting paint from both parts constituting the connection, using mechanical means or suitable chemical product; if the anchoring operation is to take place on superficially treated parts, completely remove the anaphoretic paint with mechanical means, obtaining a smooth support surface.

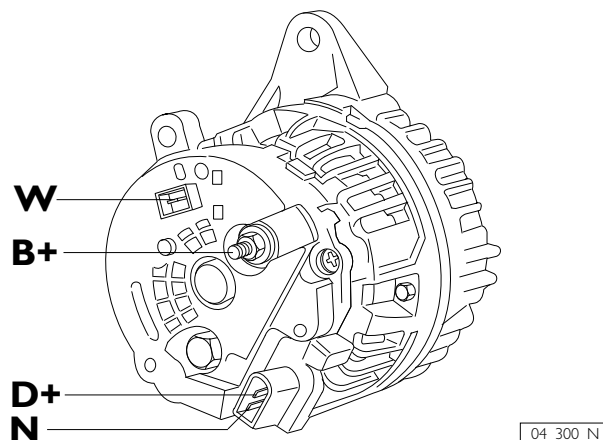
IVECO standard 18-1705:

Apply a uniform layer of BH44D paint with a brush or spray gun.

Join the parts constituting the grounding note within 5 minutes from the time the paint was applied.

Battery recharging

Figure 40



- W. Signal for revolution counter -
- B+. Connected to the +30 of the electric starter motor -
- D+. Excitation - N. Not connected.

This is accomplished through the power supply line of the electric starter motor and connection to the +B of the alternator. The electronic regulator of the alternator that equips the engine allows an effective control over the battery recharging operation.

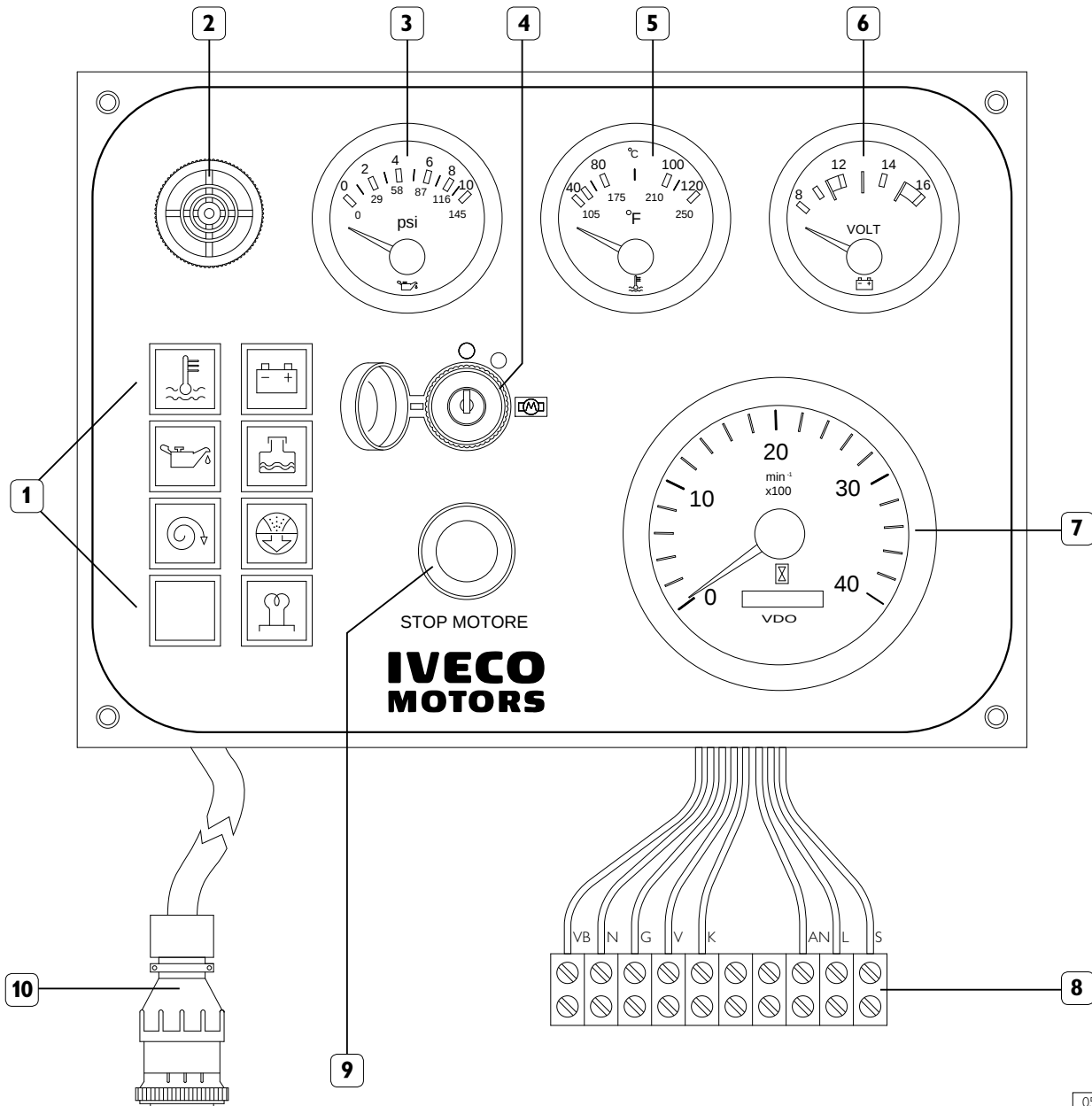
If, due to installation requirements, the batteries need to be positioned at a distance from the engine, we recommend increasing the cross section of the power line conductors and verifying recharging effectiveness by measuring voltage across the battery poles.

Verification of the engine rotation over speed

This function is carried out by the specific J16F module, which is connected to the engine wiring on the JSV connector through the JSV-J16F extension lead. This module is able to recognize the over speed condition and to command the activation of the relating signal on the instrument board.

The consequent engine stop is carried out by the specific circuits situated in the main board supplied by IVECO MOTORS or in the Signalling and Alarms module supplied by IVECO MOTORS to carry out personalized boards. In both cases the electronic commands a relay which is used to manage the supply of the engine stopping electro-valve.

To produce the boards which do not use the above mentioned components supplied by IVECO MOTORS, it is necessary to use similar circuits which carry out the required function.

16. M10.01/M15.01 MAIN ANALOG INSTRUMENT PANEL**Figure 37**

05_009_N

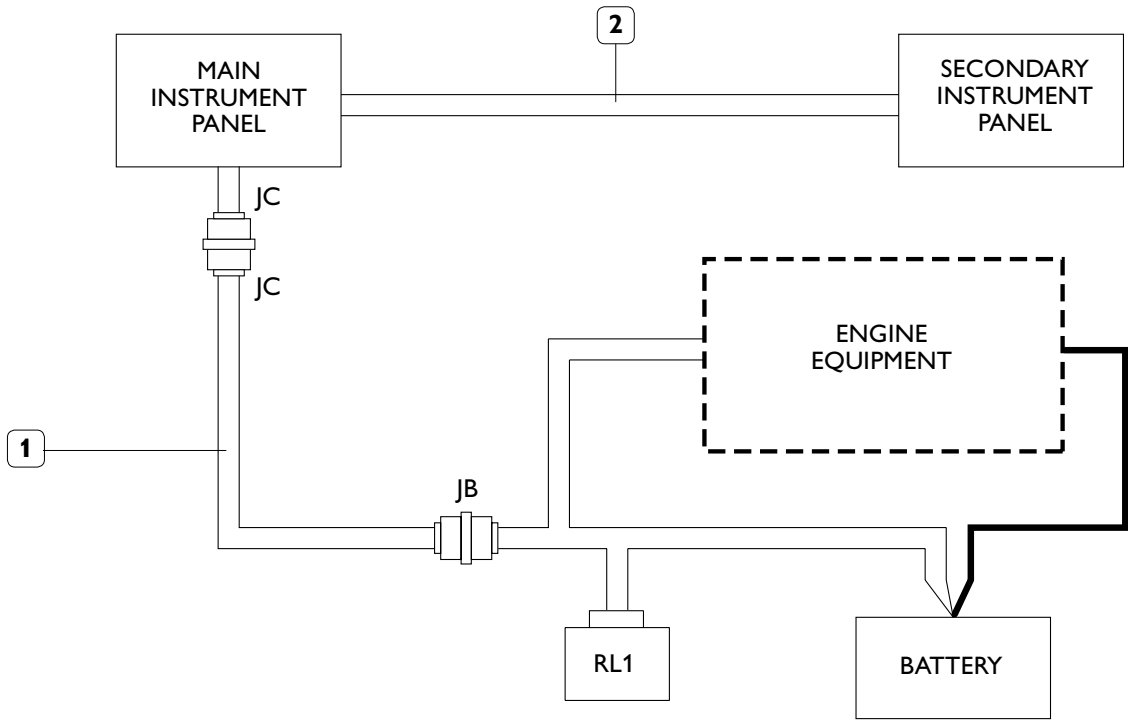
1. Warning lights - 2. Buzzer (SA) - 3. Engine oil pressure gauge (MO) - 4. Engine start/stop key switch (CA) - 5. Coolant temperature gauge (TA) - 6. Voltmeter (V) - 7. Revolution counter and hour counter (CG) - 8. Secondary board connecting clamp (MP) - 9. Engine stop push-button (AQ) - 10. Connector for main panel wiring (JC).

Installation of the IVECO MOTORS onboard panel with analog indicators entails connecting the panel's JC connector to the JB connector on engine wire harness, interposing the appropriate extension wire harness available in 3, 5 and 7 meter-long versions. The JC-JB wiring is made of 16 lines each one leading to a wire of a different colour (see the table on the following page).

The MP clamp is set for the connection to the secondary board; in the models without secondary board the clamp is not used.

Synoptic of the connections of the analog panels

Figure 42

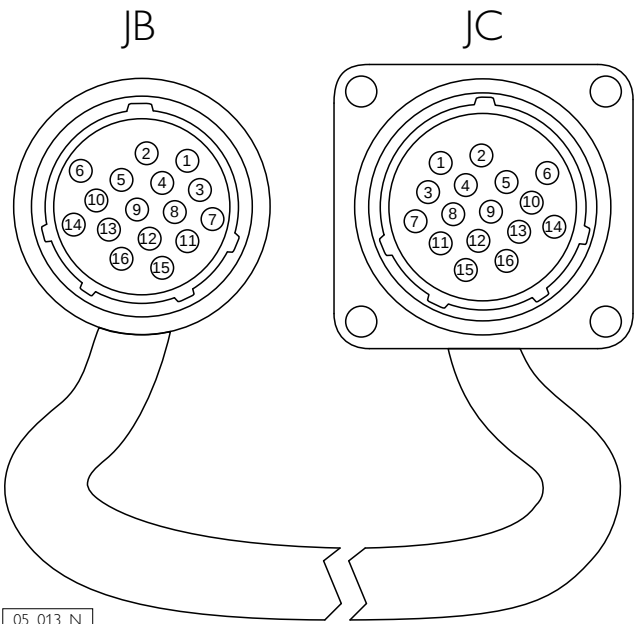


05_010_N

1. JB-JC extension wire harness - 2. Wiring to be carried out by the installing technician.

Connectors of the JB - JC extension wire harness

Figure 43



05_013_N

CONNECTORS OF THE JB - JC EXTENSION WIRE HARNESS, SEEN FROM THE COUPLING SIDE

PIN CONNECTOR	CABLE COLOUR
1	red
2	sky blue
3	sky blue - black
4	black
5	green
6	yellow
7	blue
8	green - black
9	orange
10	white
11	purple
12	pink - black
13	pink
14	white - black
15	grey
16	brown

To identify the functions served by the individual lines, refer to the electrical diagrams in Chapter 20.

Installation

In order to drill holes on the area where the panel is to be mounted, refer to the dimensions indicated in Chapter 18.

Operation of the panel

After completing the electrical connections and engine preparation, perform the tests required for the first start, as described in Chapter 23.

Verify the proper operation of the panel, proceeding as follows:

- ❑ Turn the key switch on the first position, check the tools to be powered and the Alarm and signal Module to perform the 5 seconds alarm test according to the following procedure.
- ❑ Once the test is complete, only the indications prescribed for the engine not running must remain lighted: e.g. "alternator charge" and "low oil pressure"; the analog instruments must provide values consistent with the relevant physical parameters.

Testing the engine start function

Turn the key switch to the second position and keep it in it until the engine has started, then release the switch, which will stably return to the first position; after releasing the key, the switch may be brought back to the starting position only after the switch is returned to the resting or zero position.

Checking indications

After starting the engine, verify whether the operating modes of the indications and alarms module are similar to those set out below.

Using appropriate measuring instruments, verify the consistency of the indications provided by the analog instruments.

Verify the indication of the panel revolution counter, comparing it with the one measured by a reference instrument; if the indication is different, proceed as described below.

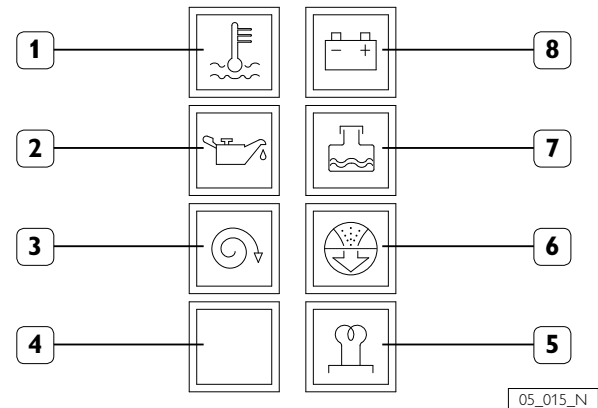
Testing the engine stop function

Stop the engine by pressing the red button on the IVECO MOTORS panel. On customized panels press the similar button.

Should the engine be equipped with a de-energizing stopping device (upon request), stop it turning the key switch in the rest position.

Indicator lights

Figure 44



1. High coolant temperature (SATA) - 2. Low oil pressure (SBPO) - 3. Runaway engine (SSV) - 4. Not used - 5.* Pre-post heating (SCP) - 6. Clogged air filter (SIFA) - 7.* Low coolant level (SBLA) - 8. Alternator fault (SS).

* Unavailable function on N45 MNA M10 - N67 MNA M11 engines.

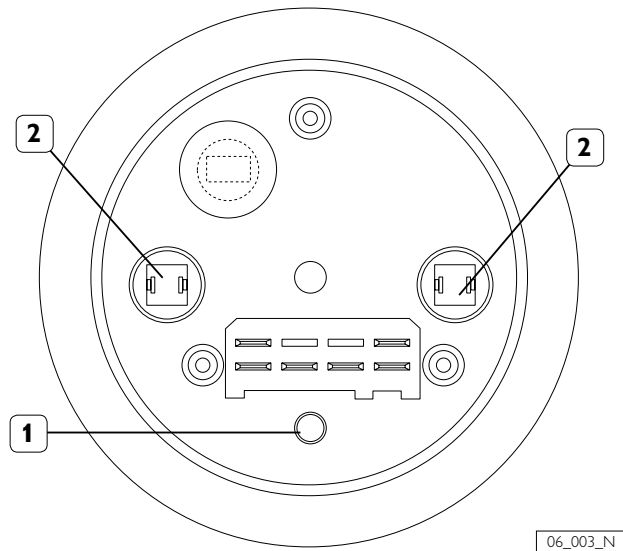
The warning lights are commanded by a specific alarm timing and recording electronic circuit. The circuit is programmed so that when it is powered all the warning lights switch on and the horn produces an acoustic signal.

During the starting phase and for the subsequent 4 seconds, needed to stabilize the low oil pressure signal, all the module's functions are inhibited (apart from the engine over-speed stopping function); once this time interval has elapsed, every alarm state detected by the sensors will cause the associated indicator to be lighted and the buzzer to be powered.

The identification of the engine out of rotation condition and the consequent activation of the relating warning light is carried out by the J16F over speed control module (on request). The alarm managing module is also equipped with the circuit which controls the contactor which causes the engine to stop through an electro-valve situated on the injection pump.

Revolution-counter calibration VDO

Figure 45



1. Calibration button -
2. Panel lighting lamp.

The tachometer enables different and independent calibration methods: "PULSE" and "ADJUST"; there is also a further "PRECISION CALIBRATION" procedure which enables the attainment of the higher level of precision.

PULSE CALIBRATION

- ❑ Measure the external diameter of the (M) engine pulley and of the (AL) alternator pulley and then apply the following formula to calculate the rotation impulses:

$$N \text{ (rotation impulses)} = \frac{\varnothing M \text{ (mm)}}{\varnothing AL \text{ (mm)}} \times 6$$

- ❑ Interrupt the electric supply to the instrument, insert a rod, possibly not made of metal, until the regulation button (1) is pressed and keep it pressed.
- ❑ Restart the electric supply to the instrument and check that the messages "PULSE" and "ADJUST" are alternately shown by the display.
- ❑ When the display shows "PULSE", release the regulation button (1), wait for about 3 seconds and then check that the display shows the message "P-" followed by a numeric value.
- ❑ Input the numeric value N previously calculated as shown.
- ❑ Wait for the flashing of the first figure on the right and for the others in a sequence. The figure which flashes can be modified by pressing the regulating button (1).
- ❑ When the calibration is finished, wait for a few seconds; the display returns automatically to the counter function.

ADJUST CALIBRATION

To be carried out through the comparison with a reference instrument

- ❑ Supply electric power to the instrument and verify that the display alternately shows the messages: "PULSE" and "ADJUST".
- ❑ When the display shows "ADJUST" release the regulation button (1) and then start the engine and take it to a constant rotation speed.
- ❑ The display shows the messages "UP" or "dn" which set the regulation direction for the instrument index. To select one of the two regulation methods - "UP" or "dn" - press and release the regulation button (1).
- ❑ When the display shows the message "UP" the regulation is carried out increasing, when the display shows the message "dn" it is carried out decreasing.
- ❑ Register the rotation number through the reference tachometer and compare it with the value shown by the tachometer which is being calibrated. If necessary press and keep pressed the regulation button (1) until the required number is shown and wait for about 30 seconds for the automatic RESET of the instrument, which is shown by the fact that number of rotations on the instrument index goes to zero and then goes up again.

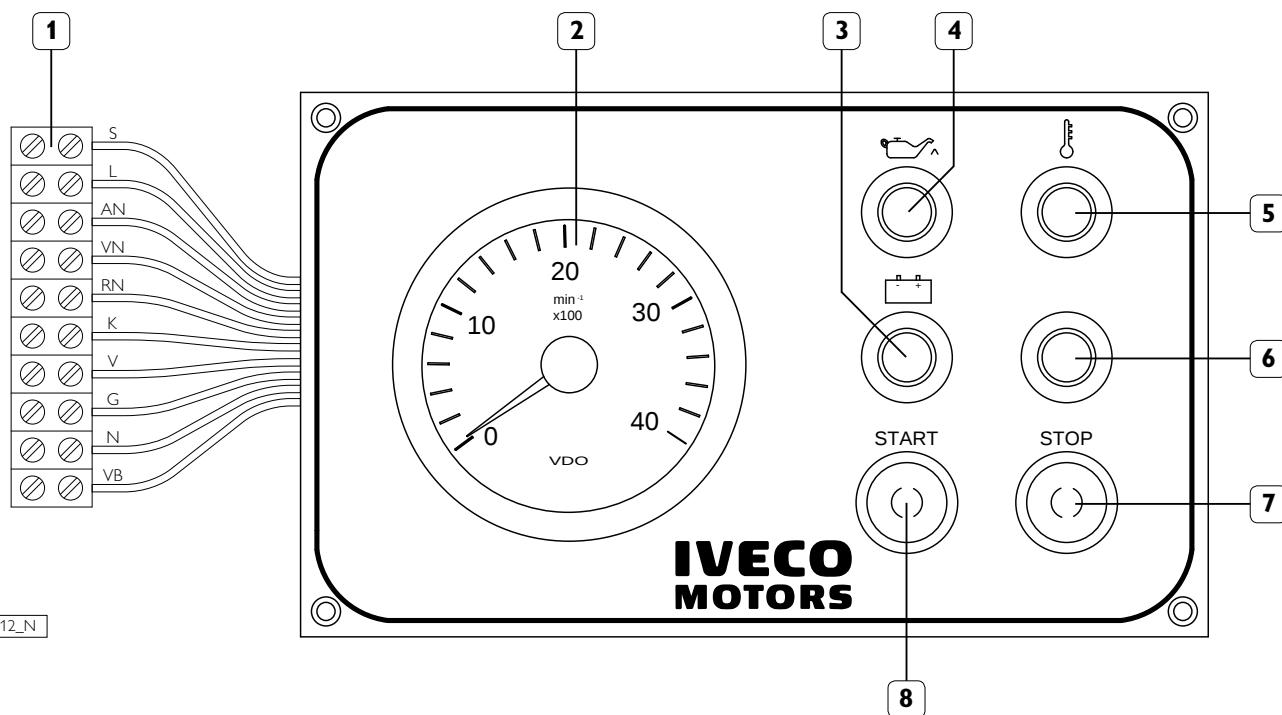
PRECISION CALIBRATION

This procedure enables a regulation $\pm 20\%$ better than the value previously set.

- ❑ When the engine is rotating at a constant speed, press the regulating button (1). The display shows the message "A 0.0".
- ❑ Press and keep pressed the regulation button (1) to make the displayed value increase in 0.5 % step.
- ❑ If the regulation button (1) is released for 2 seconds and then it is pressed again, the calibration value goes down in 0.5 % steps.
- ❑ When the required value is reached release the regulation button (1) and wait for at least 5 seconds for the settings carried out to be recorded. The display returns automatically to the counter function.

Maintenance

Should it become necessary to replace a panel light, remove the lamp holder from the rear part of the instrument (see Figure 41).

17. M10.01/M15.01 SECONDARY ANALOG INSTRUMENT PANEL (FLYING BRIDGE)**Figure 42**

1. Clamp for the connection to the main instrument board (MF) - 2. Revolution counter and hour counter (CG) -
3. Alternator warning light (SS) - 4. Oil low pressure warning light (SBPO) - 5. Cooling liquid high temperature warning light (SATA)
- 6. Warning light (not used) - 7. Engine stop push-button (AS) - 8. Engine start push-button (CS).

The secondary board MF clamp is connected to the main board MP clamp. This connection requires a cable with 8 conductors to connect the wires with the same colour of the two clamps. The warning light (6) is not used in this model and consequently the two wires black and green and black and red which are present in the MF clamp must not be connected.

Installation

In order to drill holes on the area where the panel is to be mounted, refer to the dimensions indicated in Chapter 18.

Operation of the secondary panel

After completing the electrical connection to the main panel and engine preparation, and performing the tests required for the first start (as described in Chapter 23), verify the proper operation of the panel, proceeding as follows:

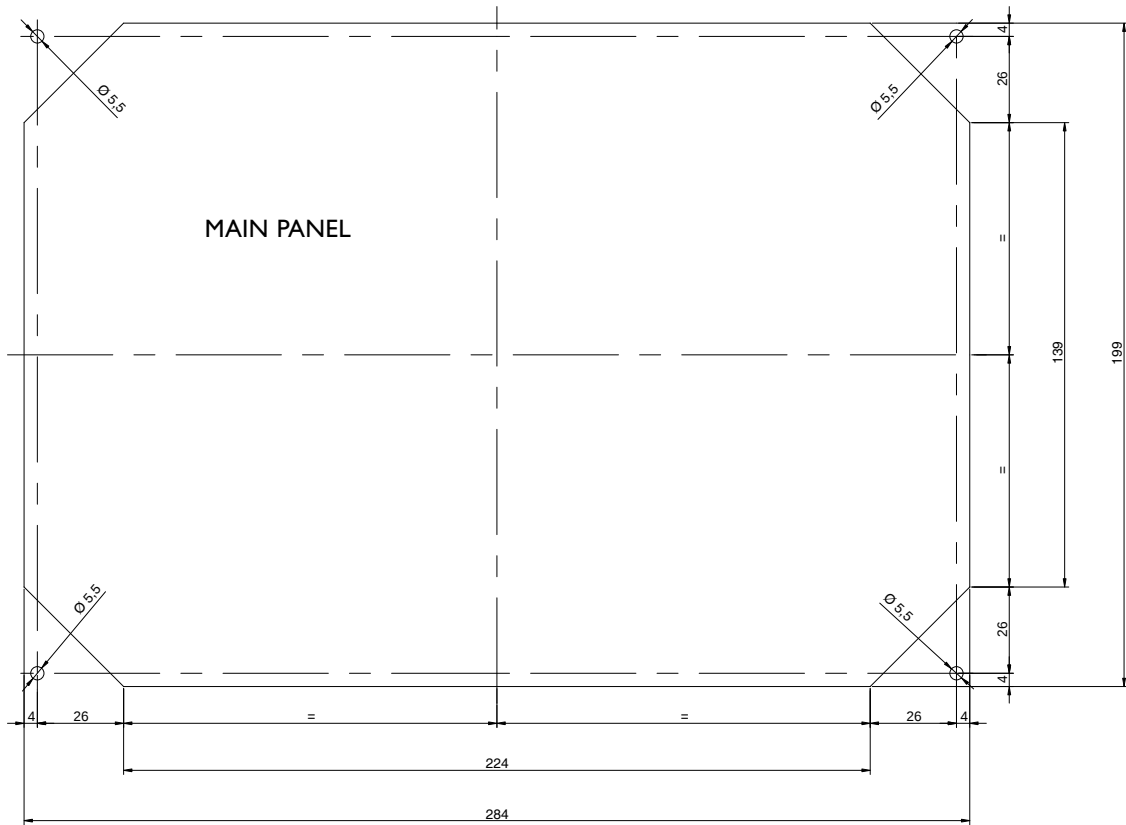
- ☐ Turn the key switch to the first position, thus enabling the operation of both panels.
- ☐ Carry out the same tests for the secondary panel as were carried out for the main panel.
- ☐ Disable the secondary panel by bringing the key switch on the main panel to the resting or zero position.

Testing the engine start and stop function.

With the panel enabled, press the START push-button until the engine starts, then release it; wait for engine rpm to stabilize before stopping it by pressing the red push-button. The starting and stopping operations can be performed several times and consecutively from the secondary panel.

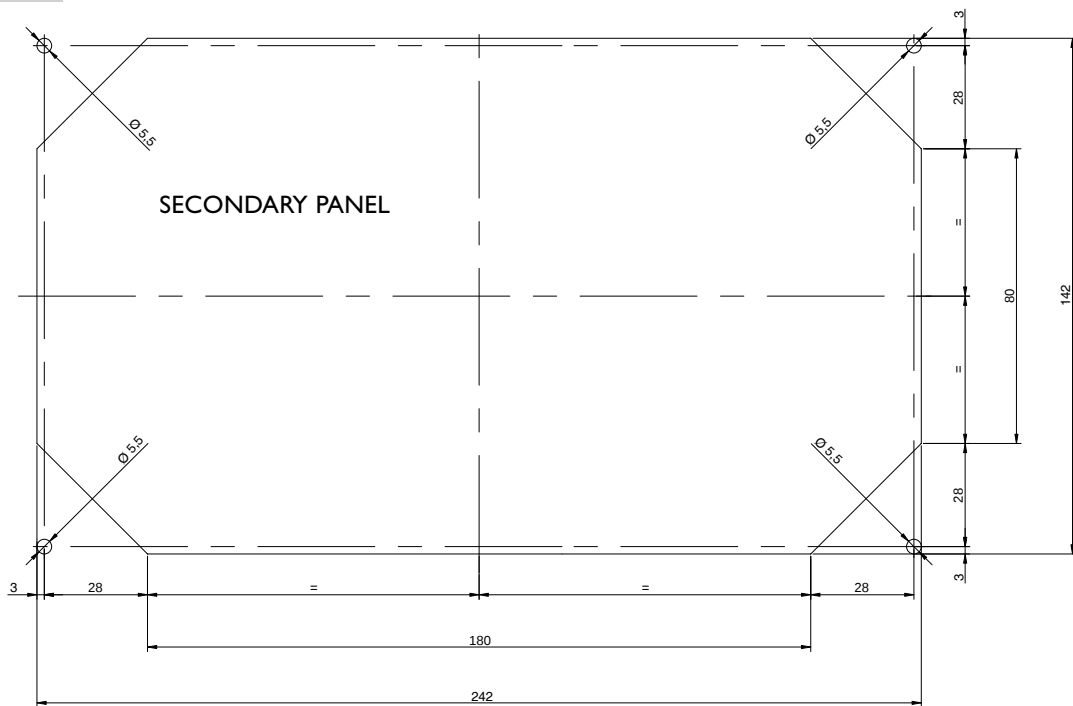
Checking indications

Proceed in the same way as for the main panel.

18. M10.01/M15.01 DRILLING PLANS FOR ANALOG PANELS**Figure 43**

06_001_N

Measurements in millimeters.

Figure 44

06_002_N

Measurements in millimeters.

19.M10.01/M15.01 CUSTOMIZED INSTRUMENT PANEL

Using only the components of the panel that are not wired to allow for panel customization, they will have to be wired using the 10 meter long wire harness. The JC-JB wiring is made of 16 lines each one leading to a different coloured wire (see the relating table in chapter 16).

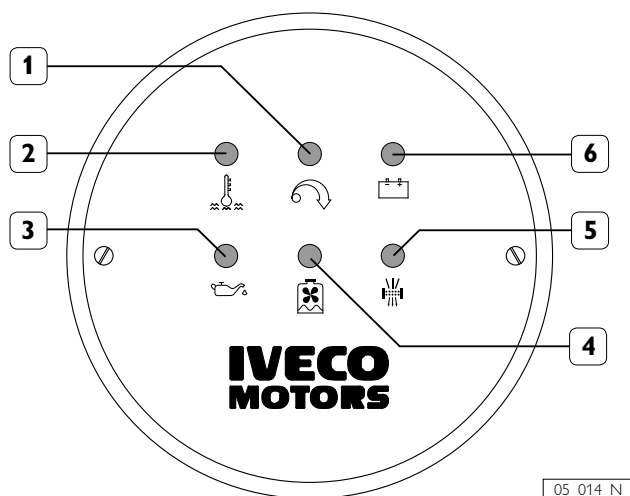
The JB connector must be connected to the JB connector situated on the engine wiring; on the JC side it is necessary to connect a connector with conductors wired to the specific components as shown in the electric and wiring schemes shown in Chapter 20.

CAUTION

To assure the functionality of the safeties pertaining to the engine start/stop commands from the instrument panel or engine room, it is mandatory to wire the key switch strictly as shown in the electrical diagrams in Chapter 20.

Indications and alarms module

Figure 45



1. Runaway engine (SSV) - 2. High coolant temperature (SATA) - 3. Low oil pressure (SBPO) - 4.* Low coolant level (SBLA) - 5. Clogged air filter (SIFA) - 6. Alternator fault (SS).

* Unavailable function on N45 MNA M10 - N67 MNA M11 engines.

The indications and alarms module comprises the indicator lights and the electronic alarm interface, timing and storage circuit. It is programmed in such a way that when it is powered, all indicator lights are lighted, with the exception of those for "pre-lubrication", "pre-post heating" and "EDC" failure and a sound signal is emitted by the buzzer.

The sound alarm may be silenced before the end of the test, acting on the appropriate control.

During the starting phase and for the subsequent 15 seconds, needed to stabilize the low oil pressure signal, all the module's functions are inhibited; once this time interval has elapsed, every alarm state detected by the sensors will cause

the associated indicator to be lighted and the buzzer to be powered.

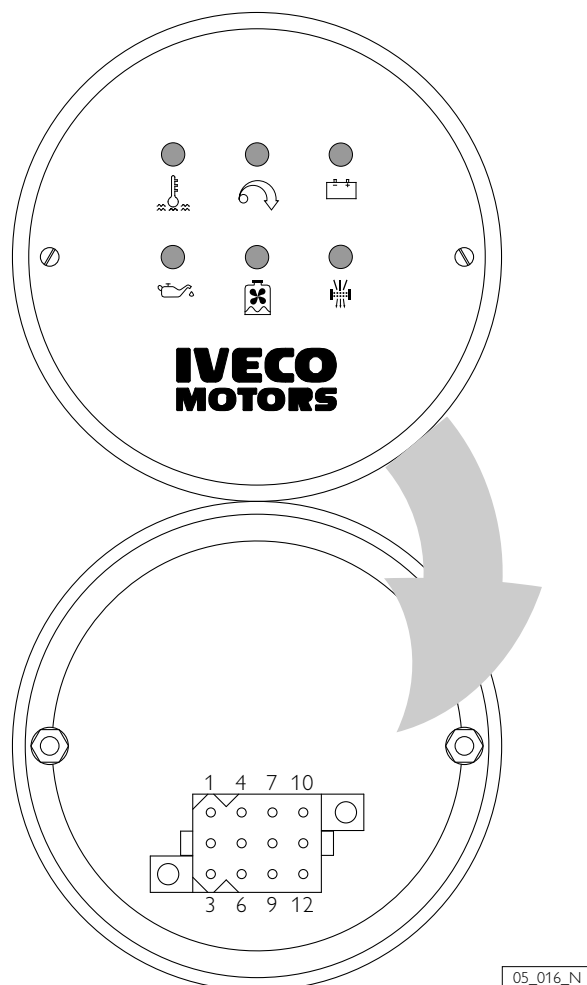
When a new alarm state is detected, the indicator light will flash to highlight the occurrence with respect to any others which may be ongoing at the time. When the sound alarm is shut off, the light indicator will remain lighted and the alarm will be stored until the engine is stopped.

The identification of the engine out of rotation condition and the consequent activation of the relating warning light is carried out by the J16F over speed control module (on request). The alarm managing module is also equipped with the circuit which controls the contactor which causes the engine to stop through an electro-valve situated on the injection pump.

The wiring details of the indications and alarms module alone are provided below; indications for IVECO MOTORS indicator instruments, are shown in the related wiring diagrams in Chapter 20.

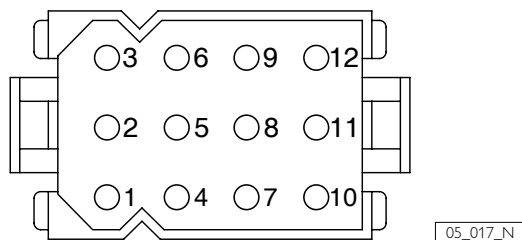
JA Connector for indications and alarms module

Figure 46



VIEW FROM THE INTEGRATED SIDE
IN THE REAR PART OF THE MODULE

Figure 47



VIEW FROM THE TERMINAL SIDE
OF THE COUPLING SIDE WIRING

connector	IVECO code	8044005 ED
terminal	IVECO code	8036141 ED
lid	IVECO code	8044006 ED

JA connects the indications and alarms module to the electrical system of the engine (sensors, power supply, etc.). The terminal part of the wire harness, supplied with the module, must be completed using female terminals, as described in the electrical diagram of Chapter 20. Gather essential information, the following ways must be wired: 1, 2, 3, 5, 6, 8, 11, 12 with the female terminals supplied as standard equipment. If the over-speed engine stopping function is required, also the following circuits must be wired: 4, 9, 10.

Functions of the JA terminals

PIN	Description	Electric level	
		OFF Indication	ON Indication
1	Module power supply	Positive (+B)	
2	Module power supply	Negative (ground)	
3	High coolant temperature indication	Open circuit	Low (ground)
4	Overloaded or runaway engine indication	Open circuit	Low (ground)
5	Alternator fault indication	High (+B)	Low (1 to 3 V)
6	Low engine oil pressure indication	Open circuit	Low (ground)
7	Low engine coolant level indication	Open circuit	Low (ground)
8	Clogged air filter indication	Open circuit	Low (ground)
9	Engine stop command output (for electro valves which stop the engine when they are stressed)	Positive (+B) during the stop caused by the over speed	
10	Engine stop command output (for electro valves which stop the engine when they are not stressed)	Circuit open during the stop caused by the over speed	
11	Buzzer power supply	High (+B) during the emission of sound	
12	Buzzer power supply	Negative (ground) during the emission of sound	

CAUTION

To assure the utmost reliability and safety while underway, all installations must be provided with the following alarm indications:

(SATA) high coolant temperature
(SBPO) low oil pressure

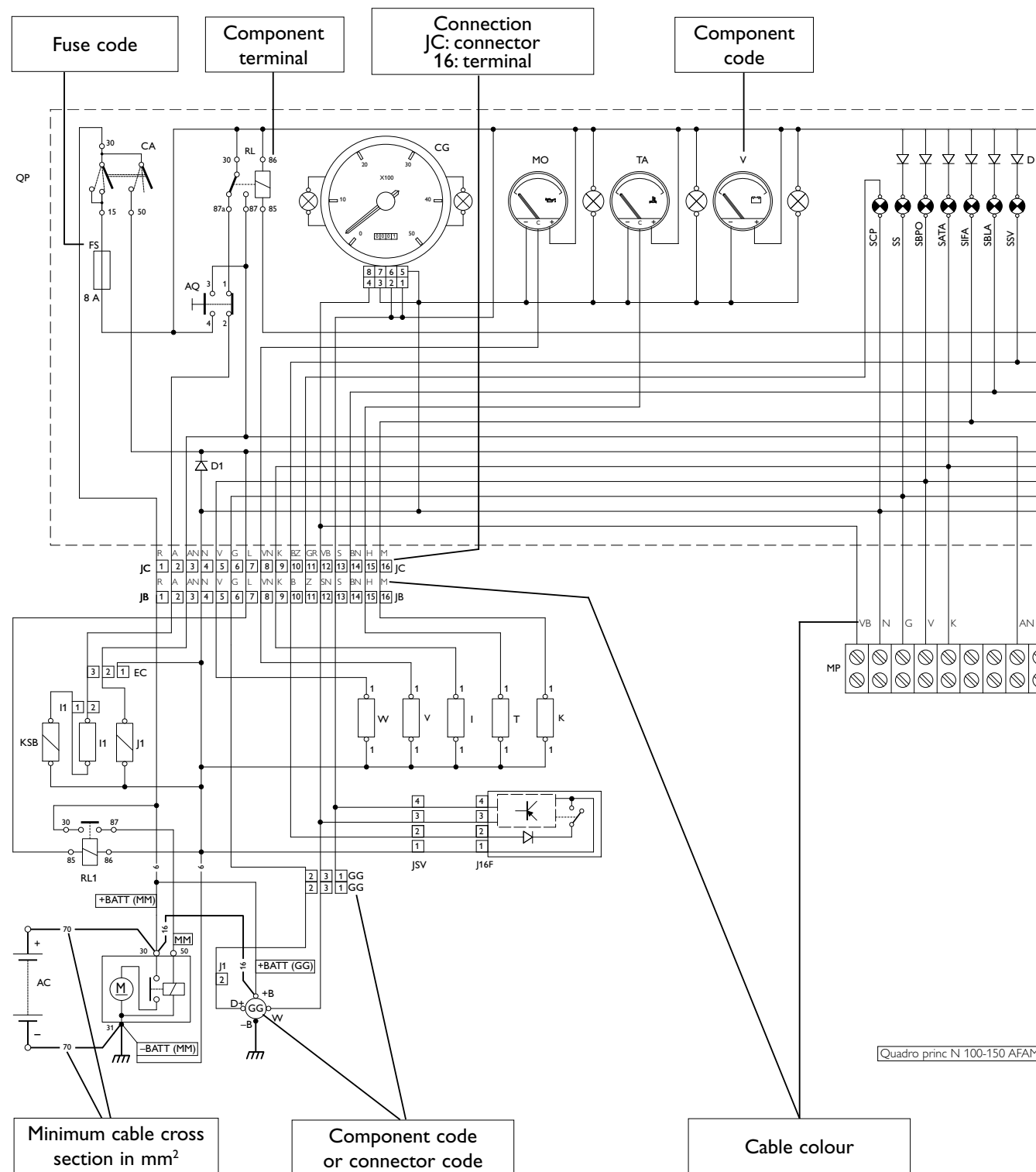
It is also recommended that the following indications be present:

(SIFA) clogged air filter
(SS) alternator fault

20. M10.01/M15.01 WIRING DIAGRAMS**Wiring diagram key**

General conditions for the preparation and interpretation of wiring diagrams:

- ☐ Key switch open
- ☐ Engine not running
- ☐ Liquids at efficient levels and pressures

Figure 48

Electrical equipment component code

AC	battery
AQ	engine shut-off push-button on main panel
AS	engine shut-off push-button on secondary panel
CA	key switch
CS	engine start push-button on secondary panel
D	6 diodes block
D1	Protection diode (on the main board)
GG	alternator
I	high coolant temperature sensor (for alarm)
I1	KSB refrigerating liquid temperature sensor
J1	engine stop solenoid valve
J1	alternator excitation
K	air filter clogging sensor (for alarm)
KSB	cold injection advance adjustment device
MA	alarms management module
MM	electric starter motor
QP	main analog instrument panel
QS	secondary analog instrument panel
SA	buzzer
T	coolant temperature sensor (for gauge)
V	oil pressure sensor (for gauge)
W	low oil pressure sensor (for alarm)
J16F	Engine rotation over speed control module (on request)

Connecteurs

JA	IVECO MOTORS indications and alarms module
JB ON ENGINE WIRE HARNESS	set for connection to the main analog instrument panel
JC ON MAIN ANALOG INSTRUMENT PANEL	set for connection to the engine wire harness
JSV	Over speed module connector
MF ON SECONDARY ANALOG INSTRUMENT PANEL	pre-set clamp for connection to the main analog instrument panel
MP ON MAIN ANALOG INSTRUMENT PANEL	pre-set clamp for connection to the secondary analog instrument panel

Lampes de signalisation

SAC	Presence of an alarm on the personalized board (if the IVECO MOTORS alarm and signalling module is not present)
SATA	coolant high temperature
SBLA	low coolant level
SBPO	low oil pressure
SCP	pre-post heating
SIFA	clogged air filter
SS	alternator fault
SSV	runaway engine

Gauges

CG	revolution-counter
MO	engine oil pressure
TA	engine temperature
V	voltmeter

Relays

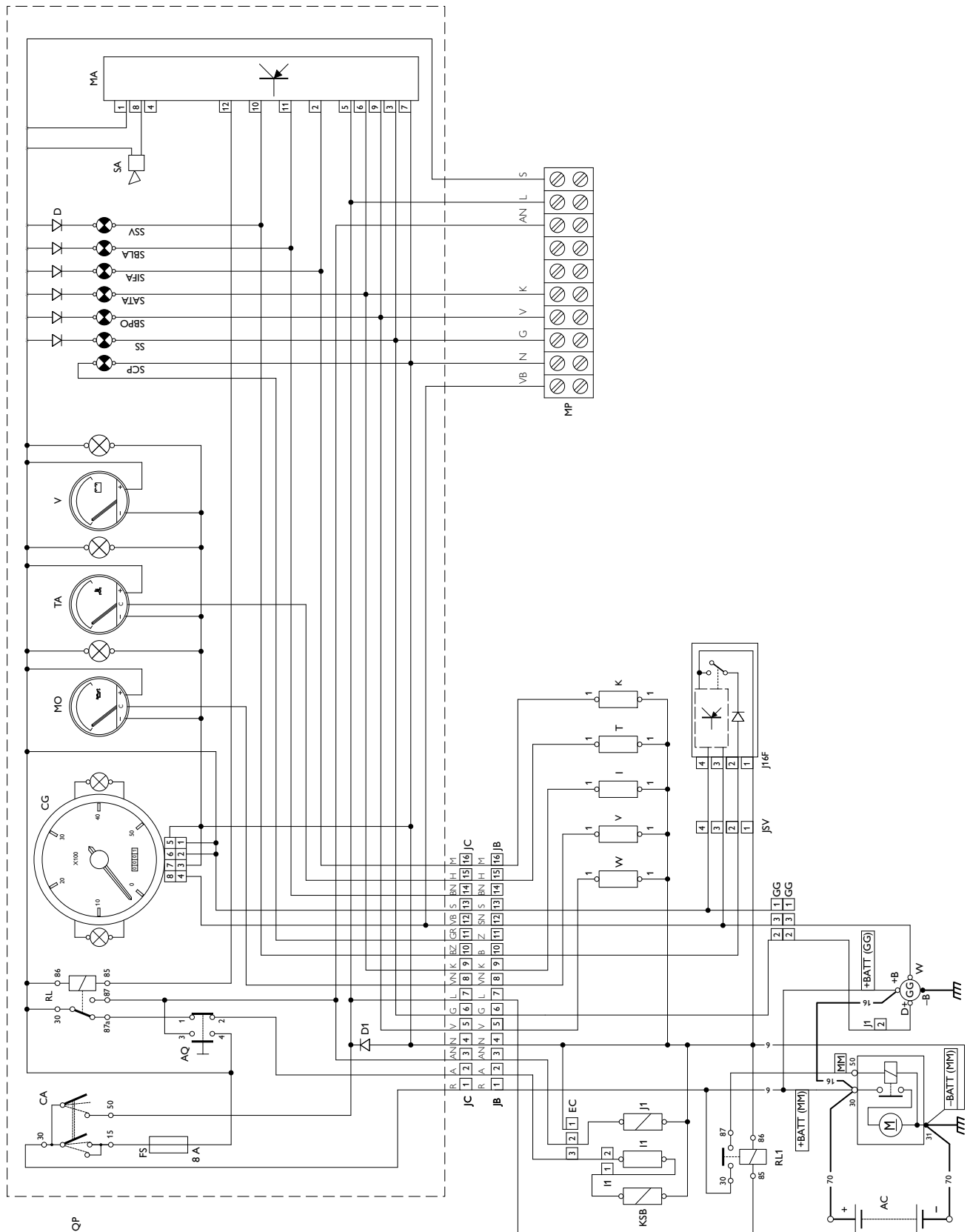
RL1	power supply to terminal 50 of the electric starter motor
RL	For engine stop from alarm module

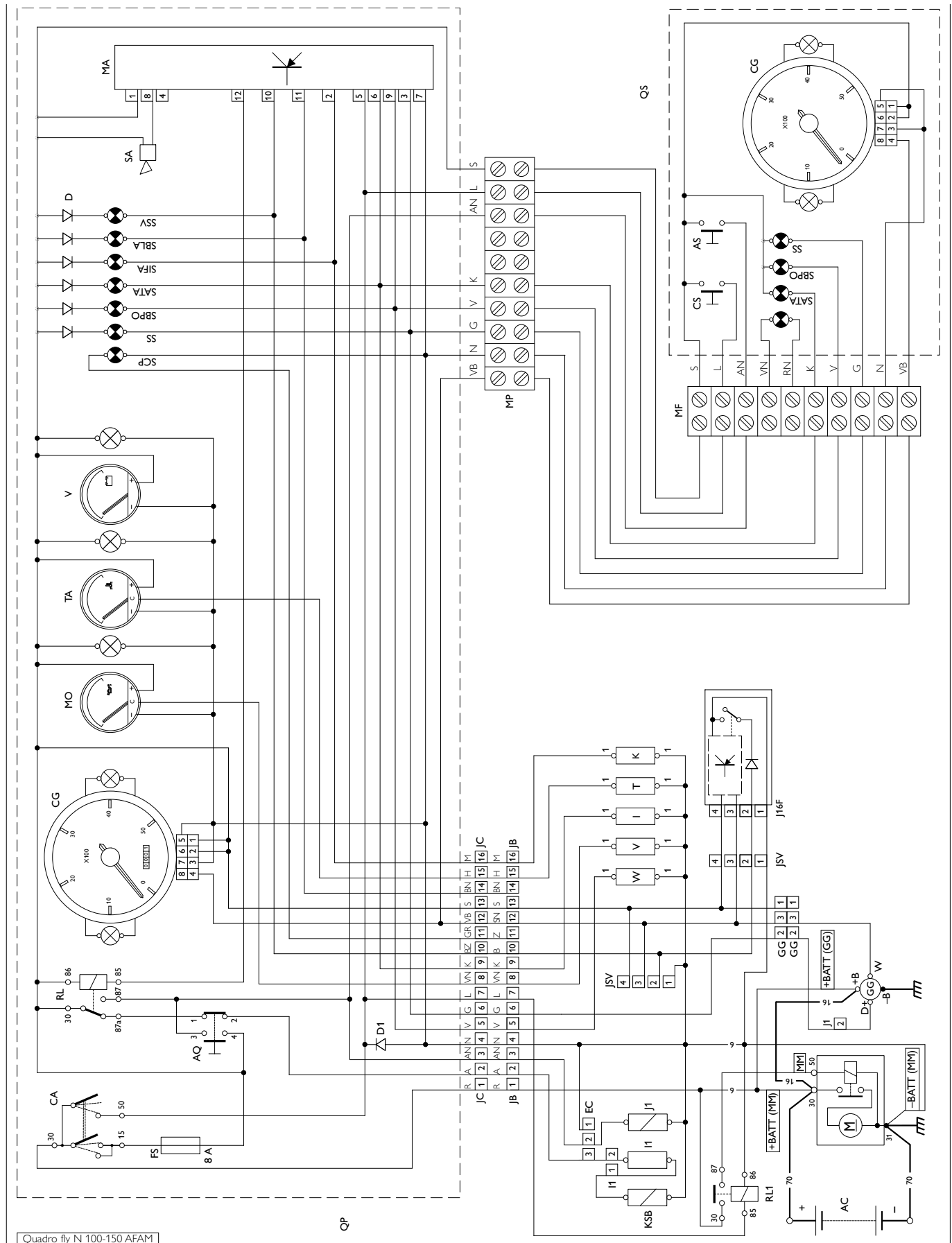
Fusibles

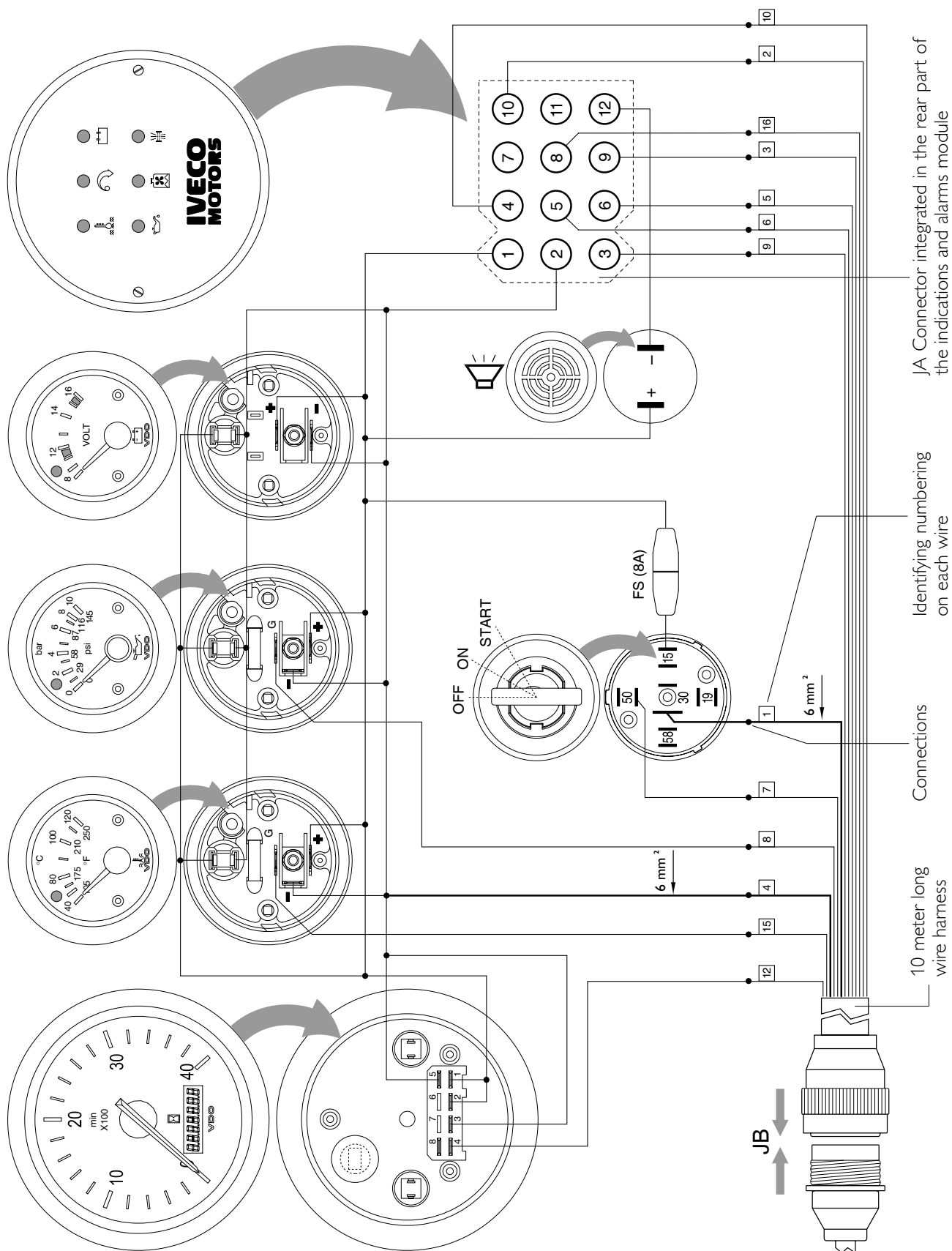
FS	on "15" supply line
----	---------------------

Board electric cables colour index

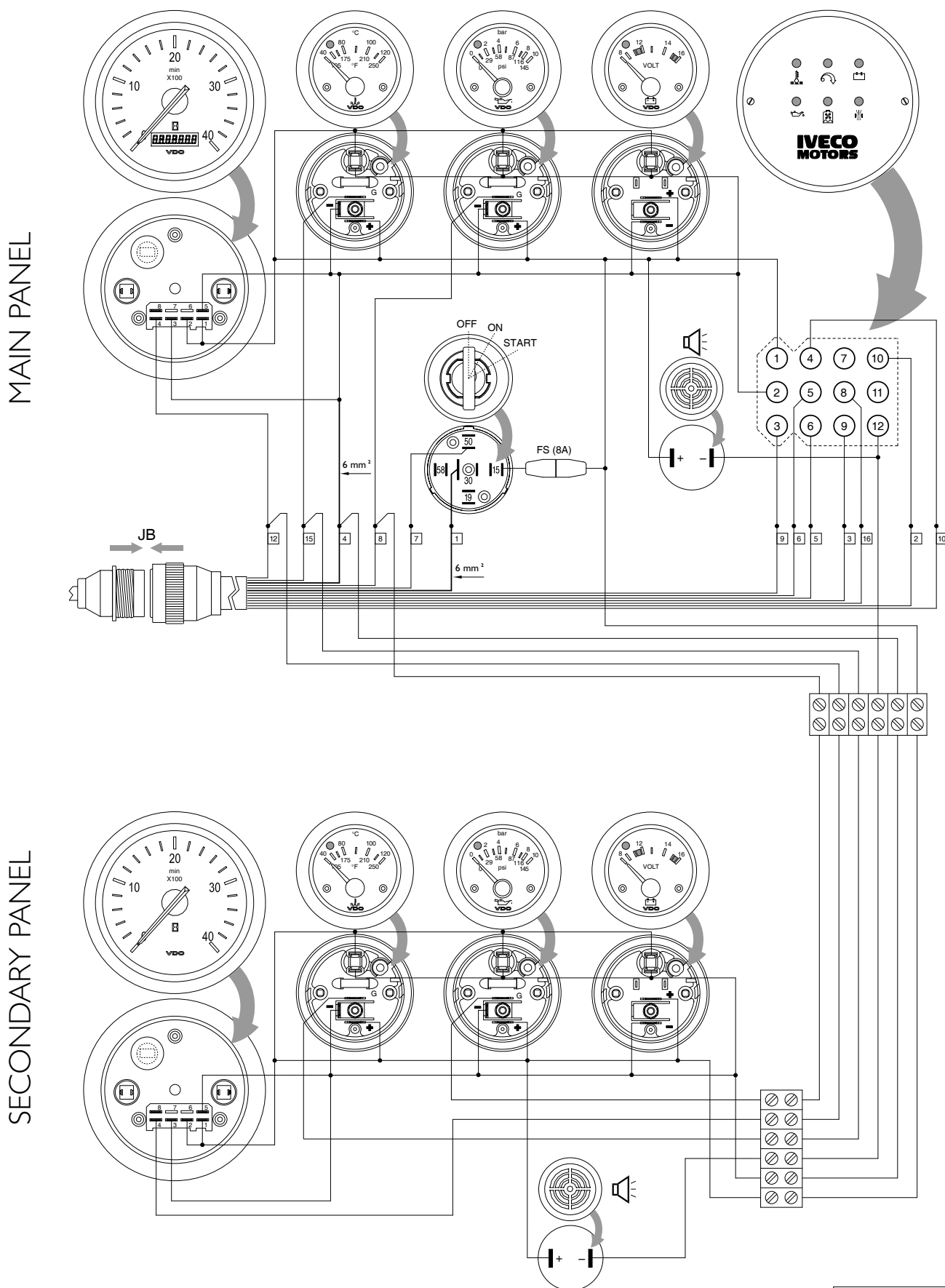
K	orange
A	sky blue
B	white
L	blue
G	yellow
H	grey
M	brown
N	black
S	pink
R	red
V	green
Z	purple

M10.01/M15.01 Main analog instrument panel

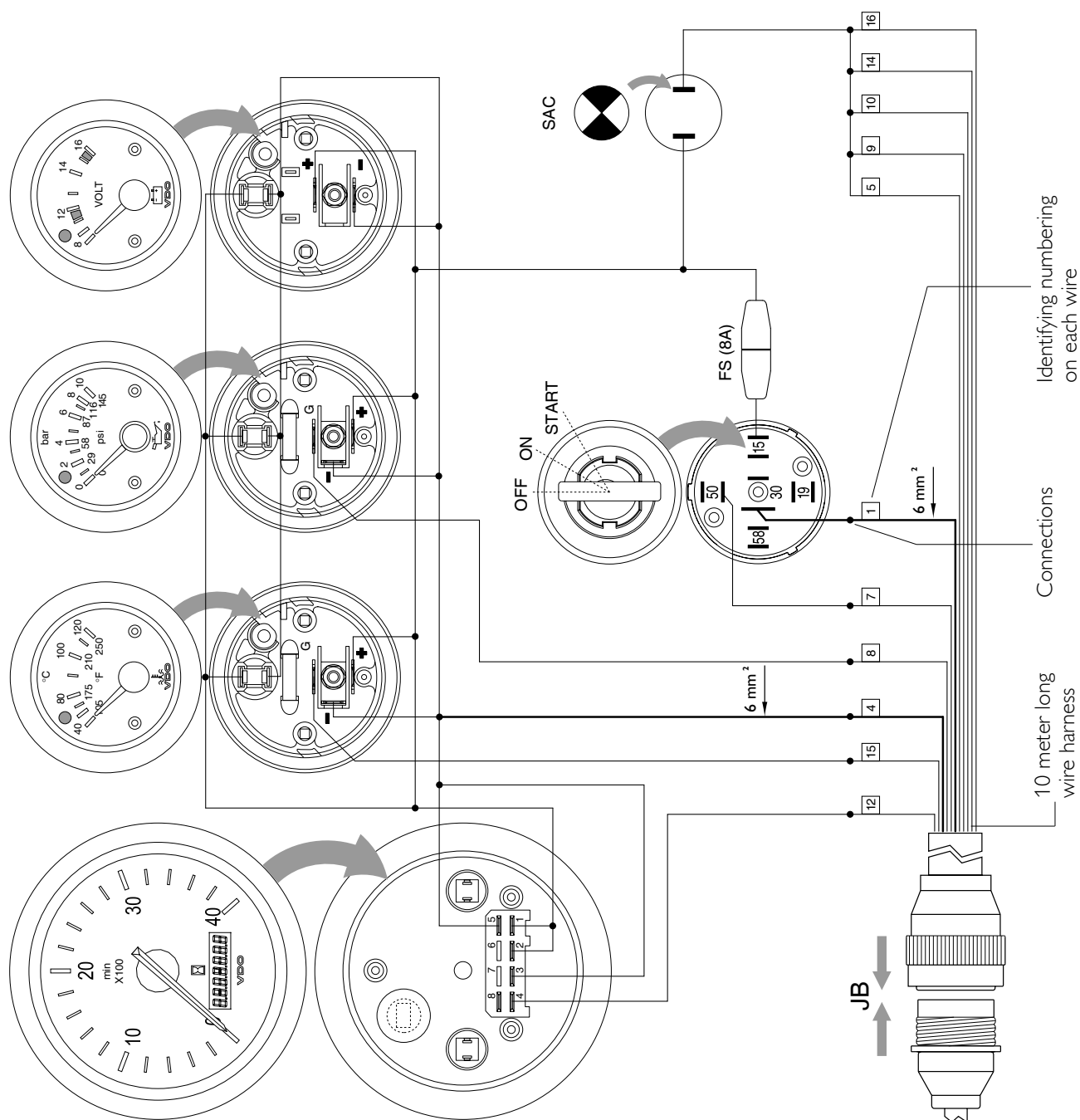
M10.01/M15.01 Secondary analog instrument panel

M10.01/M15.01 Wiring of a specific personalised instrument board with alarm and signalling module

M10.01/M15.01 Wiring of the double personalised instrument board (main with alarm and signalling module and secondary board)

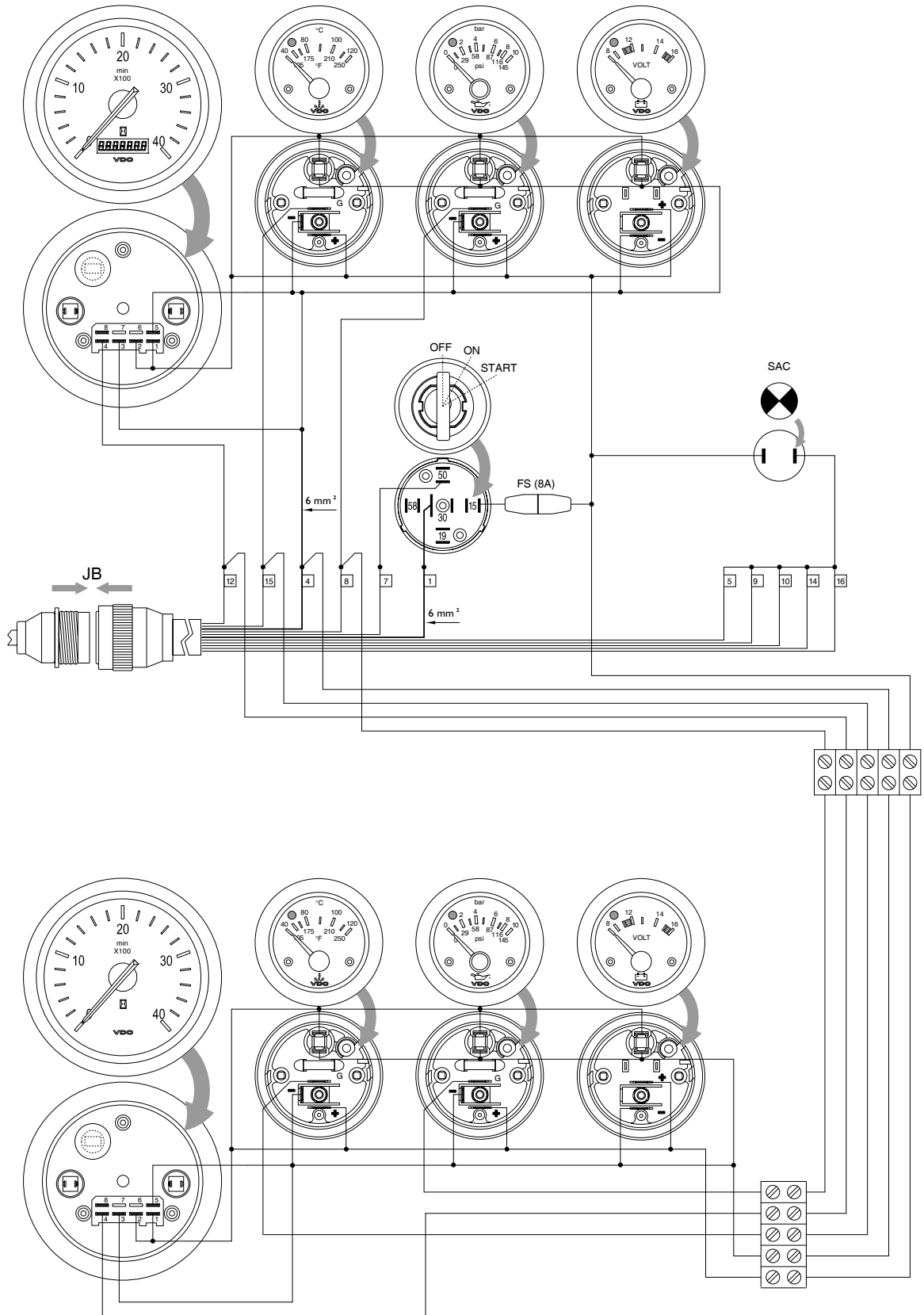


M10.01/M15.01 Wiring of a specific personalised instrument board (with SAC light)



**M10.01/M15.01 Wiring of the double personalised instrument board
 (main with SAC light and secondary board)**

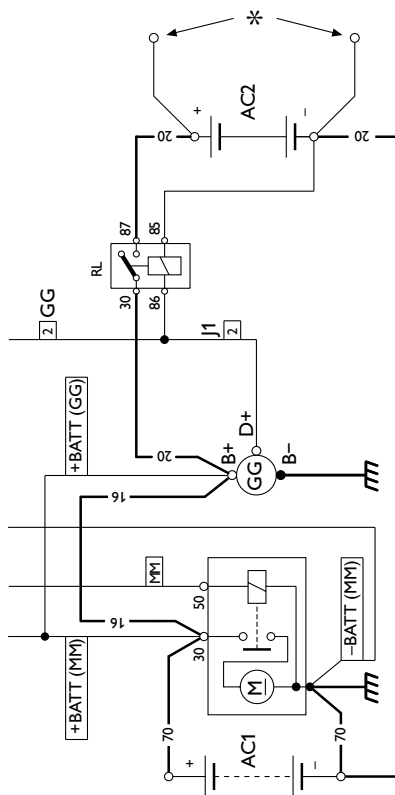
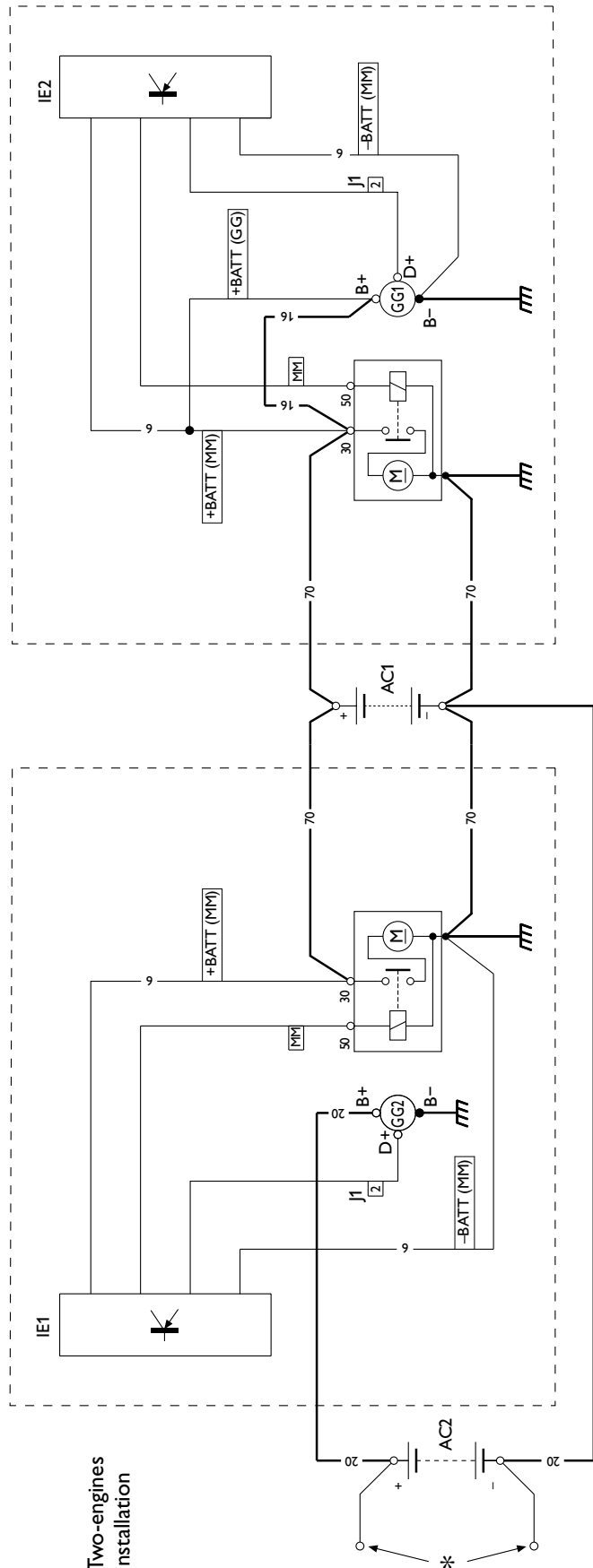
MAIN PANEL



SECONDARY PANEL

M10.01/M15.01 Supplementary services battery recharge**Key:**

- AC1: Main Battery
- AC2: Battery for auxiliary services
- IE1: Engine 1 electrical system
- IE2: Engine 2 electrical system
- RL: Relay 50A max.
- *: Electrical power supply for services

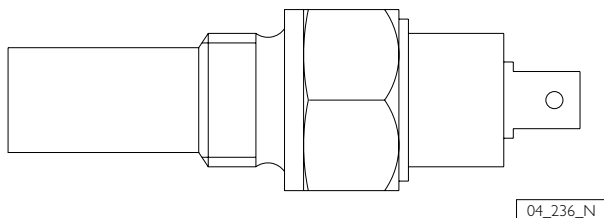
**Single engine
installation****Two-engines
installation**

COMMON CHAPTERS

21. SENSORS FOR DETECTION AND PANEL SIGNALING

Coolant temperature sensor

Figure 49



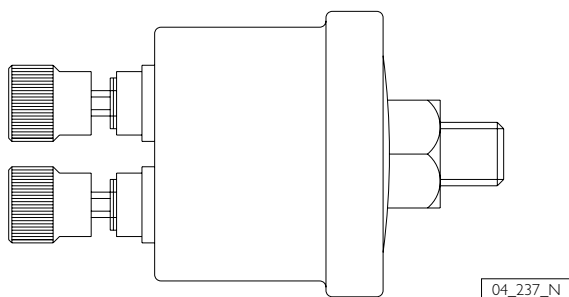
04_236_N

Resistor with negative temperature coefficient, providing the signal for analog temperature indication.

Operating voltage	from 6V to 24 V
Calibration range	from 0 °C to 120 °C
Resistance value at 90 °C	$51,2 \pm 4,3 \Omega$
Poles	isolated

Oil pressure sensor

Figure 50



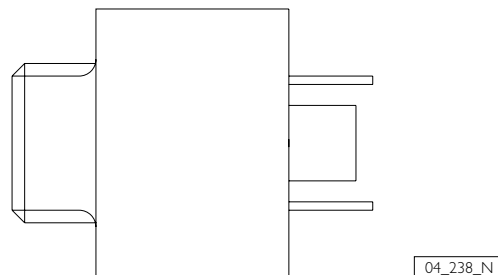
04_237_N

Rheostat component providing the signal for the analog indication of pressure.

Operating voltage	from 6V to 24 V
Calibration range	from 0 bar to 10 bar
Resistance value at 0 bar	$10 \Omega +3/-5 \Omega$
Resistance value at 2 bar	$52 \pm 4 \Omega$
Resistance value at 4 bar	$88 \pm 4 \Omega$
Resistance value at 6 bar	$124 \pm 5 \Omega$
Maximum value of resistance	184Ω
Operating temperature	from -25 °C to +100 °C
Poles	isolated

Air filter clogging sensor

Figure 51



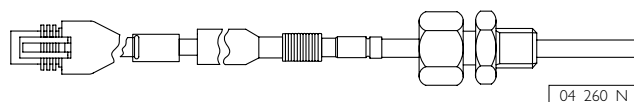
04_238_N

Vacuum switch, providing the signal for the clogged air filter alarm indicator.

Operating voltage	from 6V to 24 V
Condition at ambient pressure	normally open
Closing vacuum	$\geq 52 \text{ mbar}$
Operating temperature	from - 22 °C to +80 °C
Maximum current	0,1 A (not inductive)
Poles	isolated

Exhaust gas temperature sensor (N45 MNT M10.00-N67 MNT M15.00)

Figure 52



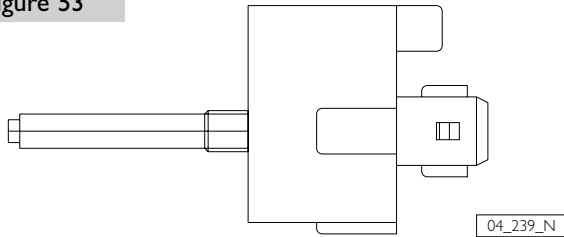
04_260_N

NiCr-Ni thermocouple sensor with insulated poles, providing the signal for the analog indication of exhaust gas temperature.

Temperature	Voltage
°C	mV
100	4,10
200	8,13
300	12,21
400	16,40
500	20,65
600	24,91
700	29,14
800	33,30
900	37,36

Sensor to detect the presence of water in fuel (N45 MNT M10.00-N67 MNT M15.00)

Figure 53

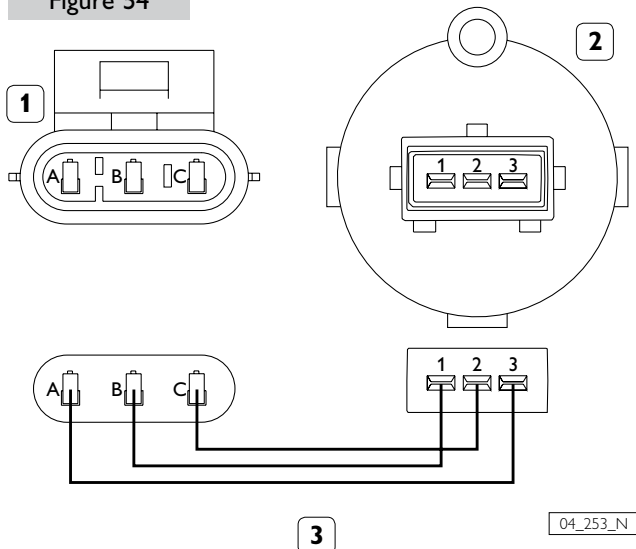


Fuel resistivity sensor, integrated with the control and amplification electronic circuit, providing the signal for the indicator of the presence of water in the fuel.

Operating voltage	from 12V to 24 V
Condition in the absence of water	open circuit
Closed condition	resistance of the liquid $\leq 1 \text{ M}\Omega$
Operating temperature	from - 20 °C to +80 °C

Connections of the sensor detecting the presence of water in fuel

Figure 54



1. M Connector of the engine wire harness -
2. Sensor detecting the presence of water in the fuel -
3. Wiring harness (outfitter's responsibility).

The three pole connection between the sensor for detecting the presence of water in the fuel and the engine wire harness must be produced by the outfitter according to the position of the fuel pre-filter in the boat.

Connection to the engine wire harness requires a METRI-PACK 150 three-pole connector with three male terminals; connection to the sensor requires a JUNIOR TIMER three-pole connector with three female terminals.

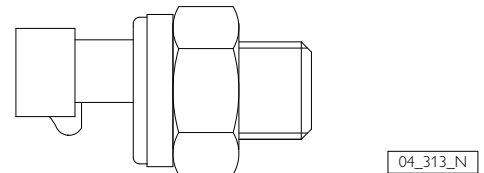
CAUTION

In order to enable the proper working of the sensor to detect water in the fuel, it is necessary that the pre-filter support is connected electrically to the negative battery terminal.

In the engine models which use parts with insulated poles it is necessary to electrically insulate the pre-filter support from the boat mass and then connect the support with the negative battery terminal.

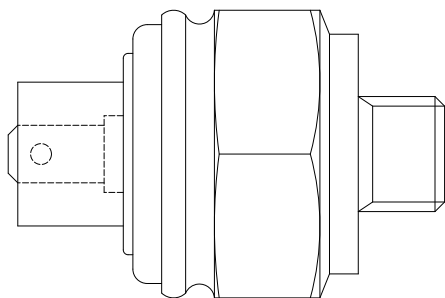
High coolant temperature sensor

Figure 33



Switching coolant temperature sensor, providing the signal for the related indicator.

Operating voltage	from 6 V to 24 V
Condition at ambient temperature	normally open
Closing temperature	$100 \pm 3 \text{ }^{\circ}\text{C}$
Poles	isolated

Low oil pressure sensor**Figure 55**

Pressure switch, providing the signal for the related indicator.

Operating voltage	from 6 V to 24 V
Condition at ambient pressure	normally closed
Calibration range	from 0,5 bar a 0,8 bar
Closing pressure	0,5 bar
Opening pressure	0,8 bar
Maximum current	15A (not inductive)
Poles	isolated

22. PREPARING THE ENGINE FOR FIRST START-UP

1. Drain the residual 30/M protective oil from the sump.
2. Pour into the lubricating loop only lubricating oil of the type and in the quantities set out in the Refilling Table.
3. Drain the CFB protective liquid from the fuel loop, completing the operations as indicated under item 3. of Chapter 26.
4. Remove the caps and/or seals from the engine intake, exhaust, aeration and venting ports, restoring normal conditions of use. Connect the inlet of the turbocharger to the air filter.
5. Connect the fuel loops to the boat tank, completing the operations set out in item 4. of Chapter 26. During filling operations, connect the pipe returning fuel to the tank to a collecting container; to prevent residues of CFB protective liquid from ending up into the boat tank.
6. Verify and refill engine coolant as prescribed.
7. Remove from the engine the labels with the inscription "ENGINE WITHOUT OIL".

23. TESTS BEFORE THE FIRST START-UP

Although they are extremely important, "common sense" checks such as the exposure of sensitive parts (plastics, wire harness, electronic units, etc...) to heat, and those that for years have characterized the quality of the work performed in the yard, are not mentioned herein.

Tests of the proper operation of the engine and the components of the system may be performed rapidly and with the utmost reliability using specific diagnostic tools, available from IVECO MOTORS Technical Assistance Centers.

Fuel tank suction

Verify the fuel suction at the maximum allowed longitudinal and transverse inclination, with the residual quantity of fuel considered "RESERVE", such as to cause the reserve indicator light to be permanently lighted.

Instrument panel

Verify the efficiency of all light indicators, as described in the related Chapters.

24. FIRST ENGINE START

Before starting the engine, please make sure the sea water gate valve is open, check the levels of the lubricating oil and of the engine coolant, and complete venting the air from the fuel feed loop, acting on the hand pump of the pre-filter or with the aid of a dedicated electrical pump.

Loosen the vent fitting on the pre-filter and operate the pump until only fuel without air flows out.

Tighten the vent fitting and continue pumping during the initial start-up phases.

Make sure that the fuel that flows out of the fitting is not dispersed in the environment.

NOTE

A few moments after start-up, make sure sea water is correctly drained from the relevant circuit.

Once the first start-up phase is complete, verify that:

- ☐ There are no liquid leaks from the coolant loop pipeline junction hoses.
- ☐ There are no exhaust gas leaks into the hull.
- ☐ Complete the instrument panel operation tests as described in the related Chapters.
- ☐ Verify that the power supply voltage across the battery, after about 15 minutes with the engine running, is no less than about 13 V.

25. UNDERWAY CHECKS

Engine compartment vacuum

Verify that value of ambient air pressure in the engine room with the engine(s) at full load and maximum power output complies with the value specified herein.

Combustion air temperature

Verify that the temperature in the engine room, after 30 minutes underway at full engine power, does not exceed 40 °C and, in any case, does not exceed the value of external temperature by more than 15 °C.

Exhaust back-pressure

Verify that the value of back-pressure present at the inlet of the exhaust gas conduit, with the engine(s) at full load and maximum power output, complies with the value specified herein.

Exhaust temperature

Verify that the temperature of the exhaust gases under maximum engine power output conditions is close to the prescribed value.

Fuel temperature

Verify that the temperature of the fuel in the low pressure line, while underway at full power and with a stable quantity of fuel in reserve, does not exceed 60 °C, an upper value would result in a reduction of the cooling power of the injection pump parts.

If the tendency to reach the maximum allowed temperature is noted, install a heat exchanger for the fuel.

Pressure in the fuel supply line

To assure the regular operation of the engine and the reliability of the components of the fuel supply and injection system, you need to verify that:

- ☐ vacuum in the fuel oil supply line to the low pressure pump is less than 0.15 bar relative 1500 mmH₂O);
- ☐ pressure in the fuel oil return line to the tank is less than 0.1 bar relative (1000 mmH₂O).

Measures are carried out inserting a "T" junction near the fuel inlet and outlet, taking care to avoid any air suction. Values are read at variable rpm, from idle to maximum, at 200 rpm intervals.

If there are any symptoms indicating the possible presence of air in the fuel supply line, a check may be made by inserting a clear tube, arranged as an inverted U, before the engine inlet junction.

26. PREPARING THE ENGINE FOR LONG IDLE PERIODS

To prevent oxidation to the internal parts of the engine and to some components of the injection system, if idle periods exceeding two months are expected, the engine needs to be prepared with **six-months periodicity**, proceeding as follows:

1. Drain the lubricating oil from the sump, after heating the engine.
2. Pour 30/M protective oil (alternatively, oil conforming with MIL 2160B Type 2 specifications) into the engine to the "minimum" level marked on the dipstick.
Start the engine and let it run for about 5 minutes.
3. Drain the fuel from the injection line and from the filter, taking care to avoid letting the fuel come in contact with the auxiliaries belt.
4. Connect the fuel line to a tank containing CFB protective liquid (ISO 4113) and assist the inflow of the liquid by pressurizing the line and turning the engine over for about 2 minutes, after excluding the operation of the injection system. The required operation may be carried out by directly polarizing the terminal 50 of the electric starter motor with positive voltage 12 V, using a conductor prepared for the occasion.
5. Nebulize 30/M type protective oil at the rate of about 10 g per liter of displacement:
N45 MNA M10 = 45g
N67 MNA M15 = 70g
into the engine intake, while the engine is turning over as described above;
6. Close with suitable stoppers or seal with adhesive tape all engine intake, exhaust, aeration and venting ports.
7. Drain the residual 30/M protective oil from the sump; it may be re-used for 2 more engine preparation operations.
8. Apply tags with the inscription "ENGINE WITHOUT OIL" on the engine and onboard panel.
9. Drain the coolant, if it has not been mixed with anti-freeze and corrosion inhibiting agents, affixing tags to indicate that the operation has been carried out.

If external parts of the engine are to be protected, spray protective liquid OVER 19 AR onto unpainted metal parts, such as flywheel, pulleys and others; avoid spraying belts, connector cables and electrical equipment.

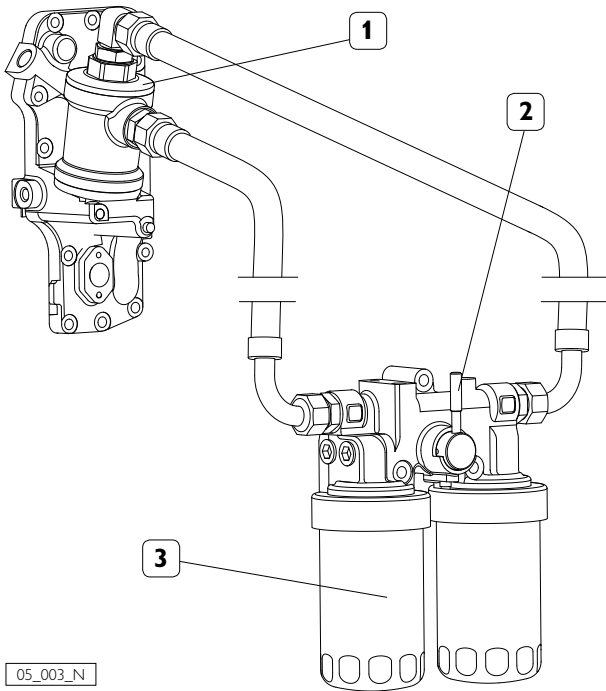
27. APPENDIX

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REMOTE OIL FILTERS

If required, a second model of the oil filter support is available. This enables the replacement of the filters when the motor is rotating. During replacement, cartridges are alternatively excluded from the lubrication system in order to guarantee the continuity of the filtering action through the cartridge which is kept in the circuit (see figure 1). The replacement method is described in the "use and maintenance" manual.

Figure 1



1. Connecting element - 2. Commutation lever -
3. Lubricating oil filters.

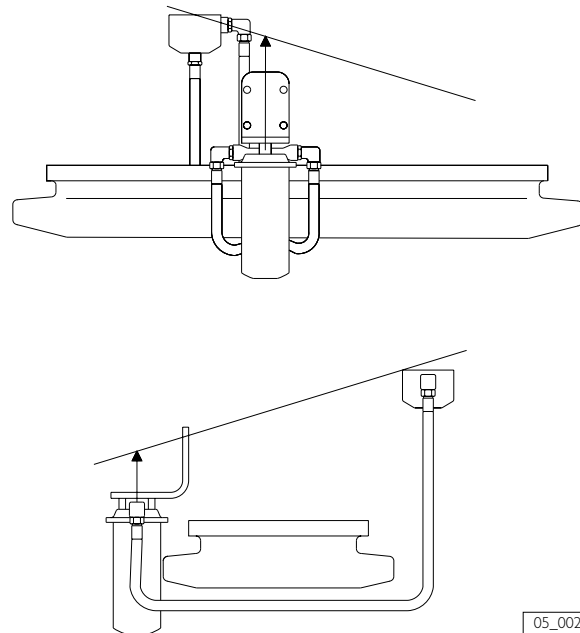
For the cases where it is required to position the filter in a more accessible place, a connecting element is available. This enables the bypassing of the filter in coming pipes (see figure 2). In order to guarantee that the correct pressure value is maintained in the lubrication system during the installing of remote filters, do as follows:

CAUTION

The filter must be installed in a vertical position.
The point where the filter is screwed to the support should always be under the connecting point of the adaptor on the engine.

- ❑ For a correct preparation, draw a line from the adaptor connecting point. The angle between this line and the horizontal surface must be equal to the maximum inclination which the boat can reach on the longitudinal and transversal axis. The screwing point must be positioned under this line (see figure n. 2).

Figure 2



Prescriptions

- ❑ Pipes must be adapted to the temperature and pressure conditions typical of the engine model.
- ❑ The pressure fall in each pipe, including its connection, must be lower than 0,05 bar at 20 °C under maximum range conditions.
- ❑ The pipes must not touch engine parts and they must be fixed at least in two intermediate points between the ends. The lengths of each pipe must not be more than 1200 mm.
- ❑ Tubes must be flexible.

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