

IVECO MOTORS

APPLICATION ENGINEERING

ENGINE FOR MARINE APPLICATIONS

INSTALLATION "CHECK LIST"

Manufacturer / Customer: _____

Vessel Model: _____

Name: _____

Engine model: _____

Serial number Left _____ Right _____

Rating: Power _____ kW @ _____ rpm

Torque _____ Nm @ _____ rpm

Installation report n° _____

Product request / FM n° _____

Participants: Name Signature

(Manufacturer / Customer) _____

(Iveco / Dealer) _____

Date and place: _____

Vessel location: _____

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1. Vessel and installation description

Pleasure _____ Fisherman
 Fishing _____ Charter
 Duty Patrol
 Passenger - Ferry
 Other _____

Annual estimated hours of operation _____
 Typical operating cycle _____

Hull type Planing Semi - displacement
 Displacement _____

Length overall _____ Flotation length _____
 Width _____ Hull angle _____
 Vessel displacement _____ Max _____
 Max n° of passengers allowed _____
 Tanks capacity: Water _____ Fuel _____
 Description and remarks _____

ENGINE MOUNTING

Engine Main Auxiliary Duty _____
 Transmission _____
 Position _____

| | Longitudinal | Transversal |
|--|--------------|-------------|
| Mounting inclination | | |
| Max engine inclination (cont. Operation) | | |

Suspension Solid Flexible

Mounts description _____

Mounting bracket Iveco Other Ref. _____
 Flexible mountings Iveco Other Ref. _____

Remarks _____

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PROPULSION SYSTEM

Propeller shafts Stern drive

-> Propeller shafts description

Gear box type Ratio

Flanged

Remote

Flywheel coupling

Shaft

Oil heat exchanger Yes No

Remarks

Single shaft

Thrust bearing No Yes

Coupling No Yes, type

Multiple shafts

V - drive

Transmission type

Omokinetics joint

Double universal joint

Flexible coupling

Mounts and thrust bearing

-> Stern drive description

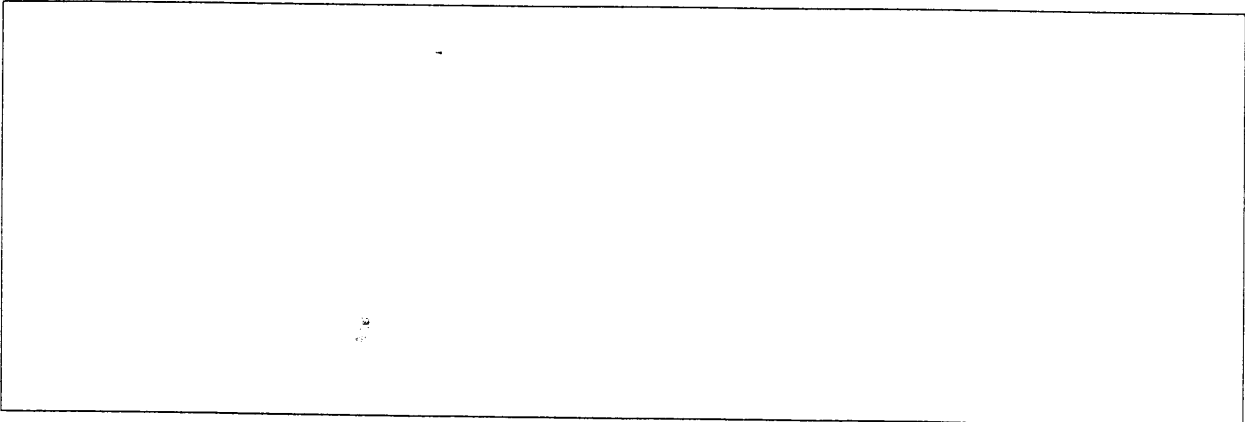
Type Ratio

Connection to engine Direct

Remarks Shaft and coupling type

Remarks

Pictures / Drawings



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PROPELLER

Manufacturer

Diameter Pitch num. of blades

Material

Other characteristic

.....

ENGINE DRIVEN ACCESSORIES

PTO from engine crankshaft front-end

| | DUTY | TYPE OF DRIVE | POWER TAKE OFF DATA |
|--|------|---------------|---------------------|
| <input type="checkbox"/> Axial <input type="checkbox"/> Lateral | | | |
| <input type="checkbox"/> Axial <input type="checkbox"/> Lateral | | | |
| <input type="checkbox"/> Axial <input type="checkbox"/> Lateral | | | |

Remarks

.....

.....

PTO from timing gear

| DUTY | TYPE | POWER TAKE OFF DATA |
|------|------|---------------------|
| | | |
| | | |
| | | |

Remarks

.....

.....

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SERVICE ACCESSIBILITY

| | EASY | DIFFICULT | INADEQUATE |
|------------------------------------|--------------------------|--------------------------|--------------------------|
| Engine oli level check | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Oil filler plug | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Oil pan drain (by extraction pump) | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Oil filter | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Air filter | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fuel filter | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Fuel pre-filter | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Front drive belts | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Expansion tank - level | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Sea water pump | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Air heat exchanger | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Water heat exchanger | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Box relè | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Blow-by | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Cylinder head cover | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Remarks _____

VENTILATION - AIR INTAKE AND EXHAUST SYSTEMS

Ventilation

Dynamic ventilation _____

 Conveyor pipes ϕ _____ Length _____

Forced ventilation with fan n° _____
 Puller _____
 Pusher _____ Flow rate _____
 Conveyor pipes ϕ _____ Length _____

Air outlet _____

Air intake

From engine room _____
 By pipe direct from outside ϕ _____ Length _____

Air filter Iveco _____
 Other Ref. _____

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Splash protection Good
 Uncertain
 Inadequate

Exhaust system

Without riser Pipe lined _____

 With riser Iveco _____
 Other _____

Distance between sea level and riser output _____

Muffler _____

Exhaust pipe ϕ _____ Length _____ Inclination _____

Remarks _____

Remarks about engine room lining _____

COOLING SYSTEM

Open sea water circuit
 Suction pipe ϕ _____ Suction height _____
 Sea water filter _____
 Shut off valve _____

Keel cooling system
 Pipe ϕ _____ Length _____
 Tube plate Manufacturer _____ Model _____

Cooling circuit for charge air cooler _____
 Pump Iveco _____ ϕ _____ suction height _____
 Other _____

Expansion tank volume _____ Total system volume _____

Remarks _____

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Additional expansion tank

Position Above
 Same level primary expansion tank pressure cap _____
 Under

Remarks _____

Auxiliary circuits

| BLEED | TYPE | TAKE OFF DATA | RETURN LINE |
|---|------|---------------|-------------|
| <input type="checkbox"/> Engine coolant <input type="checkbox"/> Sea water | | | |
| <input type="checkbox"/> Engine coolant <input type="checkbox"/> Sea water | | | |
| <input type="checkbox"/> Engine coolant <input type="checkbox"/> Sea water | | | |

Remarks _____

FUEL SYSTEM

Tank

Tank n° _____ n° of tank for engine _____ Connected
 Not connected

Material _____

Fuel lift pump position Above
 Same level the bottom tank height _____
 Under

Suction decantation filter Yes _____ Iveco _____
 No _____ Other Ref. _____

Pipe

φ inside _____ φ outside _____ Length _____

Fuel hose characteristics _____

Distance between suction port to the bottom tank > of 20 mm Yes Yes
 with filter 0,5 mm No No

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Auxiliary tank _____

Pour off by gravity
 by pump

Return line to the tank / alone
 to the auxiliary tank

Remarks _____

ELECTRICAL SYSTEM

Circuit Negative to ground
 Isolated ground

Check ground circuit OK NOT OK check zinc anode connection OK NOT OK

Batteries n° _____ Connections _____
 Type _____ Voltage _____ Reserve capacity _____
 Cold cranking amperage _____
 Remarks _____

- Auxiliary batteries _____
- Additional alternator _____
- Gen-Set _____

Electronic Control Unit and box relé location _____

Wiring and connection

Battery - starter motor ϕ _____ Length _____
 Remarks _____

Wiring _____

Remarks _____

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Transmitter Iveco _____
 Other _____

Instuments

Main dashboard Iveco _____ Digital panel
 Flying bridge Other Ref. _____ Analogic panel

Alarm Iveco _____
 Other _____

Low Oil Pressure setting _____ High Coolant Temperature setting _____

Remarks _____

| | | | |
|-----------------------------------|-----------------------------------|-------------------|---------------------------------|
| <u>Accelerator remote control</u> | <input type="checkbox"/> Mechanic | full stroke check | <input type="checkbox"/> OK |
| | <input type="checkbox"/> Electric | | <input type="checkbox"/> NOT OK |
| <u>Gear box remote control</u> | <input type="checkbox"/> Mechanic | full stroke check | <input type="checkbox"/> OK |
| | <input type="checkbox"/> Electric | | <input type="checkbox"/> NOT OK |

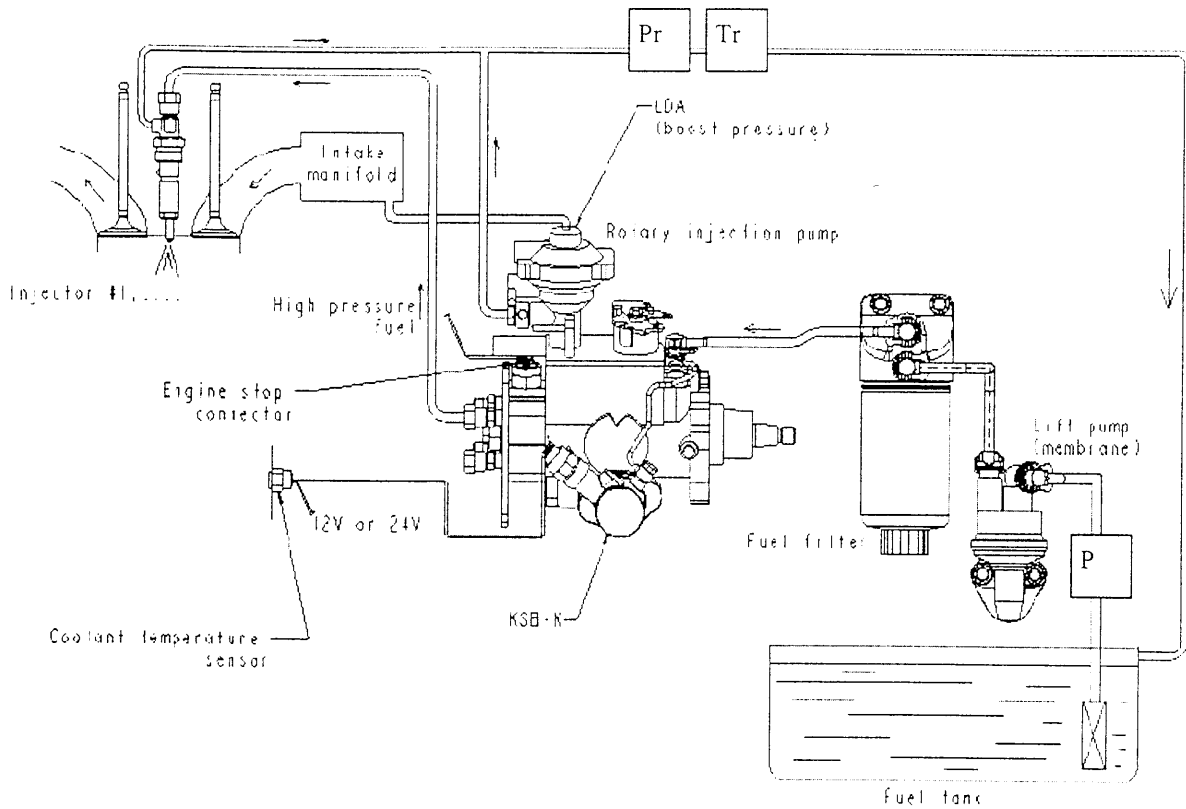
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2. Fuel system

(Mechanical scheme valid for all mechanical engine type)

| | | | |
|---|------|-------|------|
| Pressure before lift pump | [P] | _____ | mbar |
| Return line fuel pressure <i>(by the engine)</i> | [Pr] | _____ | mbar |
| Return line fuel temperature | [Tr] | _____ | °C |



Comments: _____

Acceptable values (relative pressures):

$P \geq -150$ mbar
 $P \leq 300$ mbar
 $Tr \leq 53$ °C

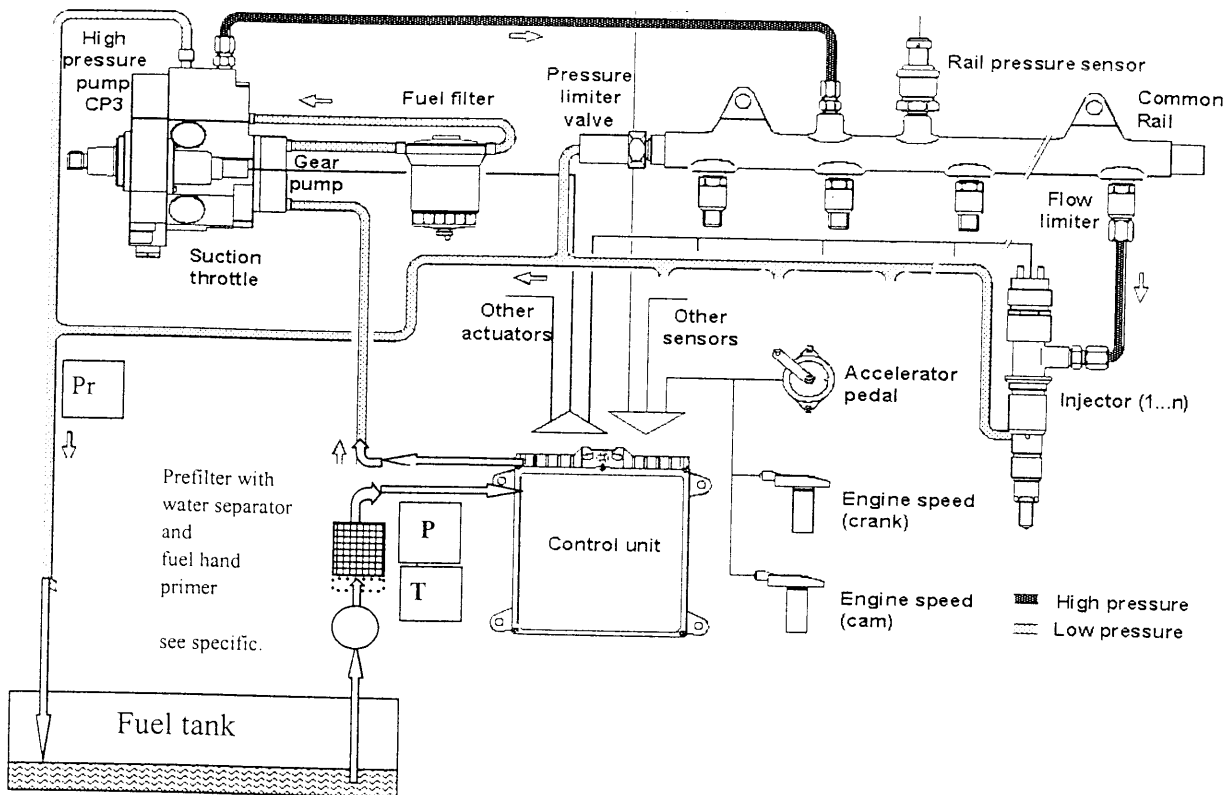
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(NEF Common-rail scheme)

Pressure after fuel pre-filter
Temperature after fuel pre-filter
Return line fuel pressure

[P] ----- mbar
[T] ----- °C
[Pr] ----- mbar



Comments: _____

Acceptable values (relative pressures):

P from -350 mbar to +100mbar
 T ≤ 70°C with minimal quantity of fuel (max 80°C at ECU outlet)
 Pr ≤ 150 mbar

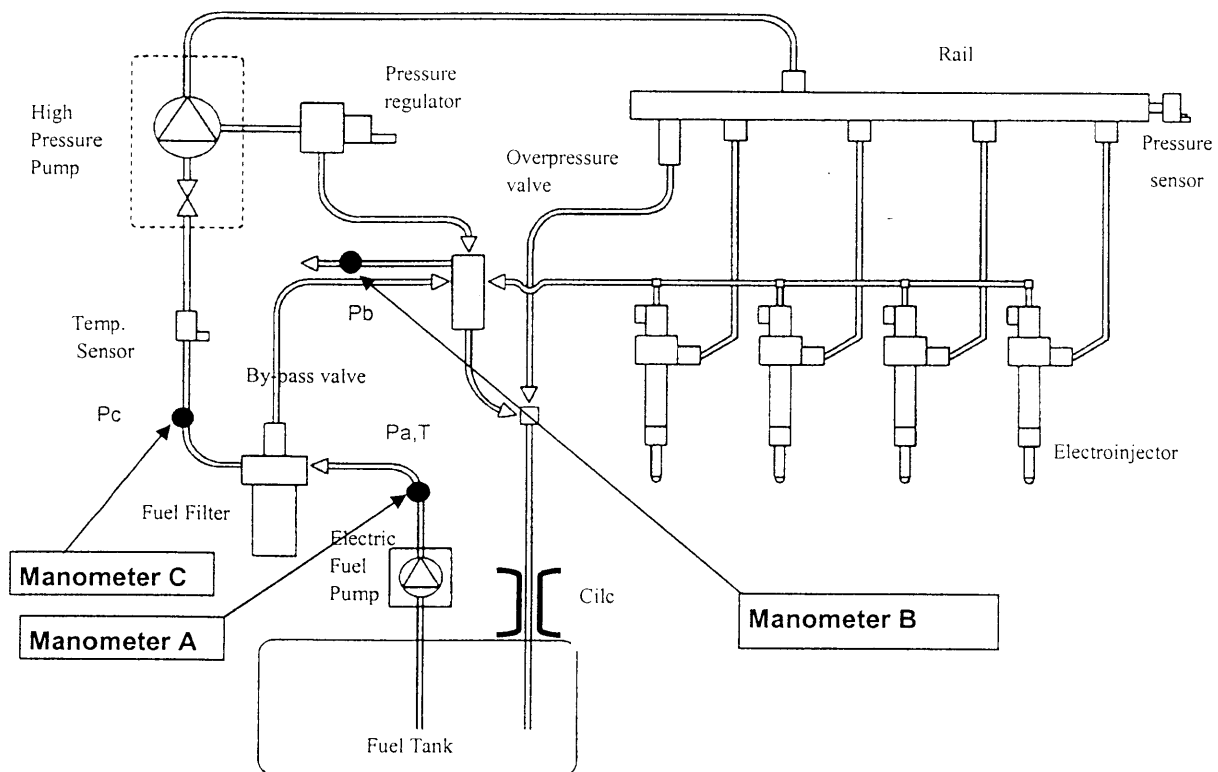
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APPLICATION ENGINEERING

(8100 Common-rail scheme)

Pressure after electrical fuel pump before fuel filter (manometer A)
 CP1 pump inlet fuel pressure (manometer C)
 Fuel temperature before fuel filter
 Fuel line return (to tank) pressure (manometer B)

[Pa] mbar
 [Pc] mbar
 [T] °C
 [Pb] mbar



Comments: _____

Acceptable values (relative pressures):

Pa from 2100mbar to 2600mbar
 T ≤80°C with minimal quantity of fuel
 Pc from 1500mbar to 2500mbar
 Pb from 450mbar to 600mbar

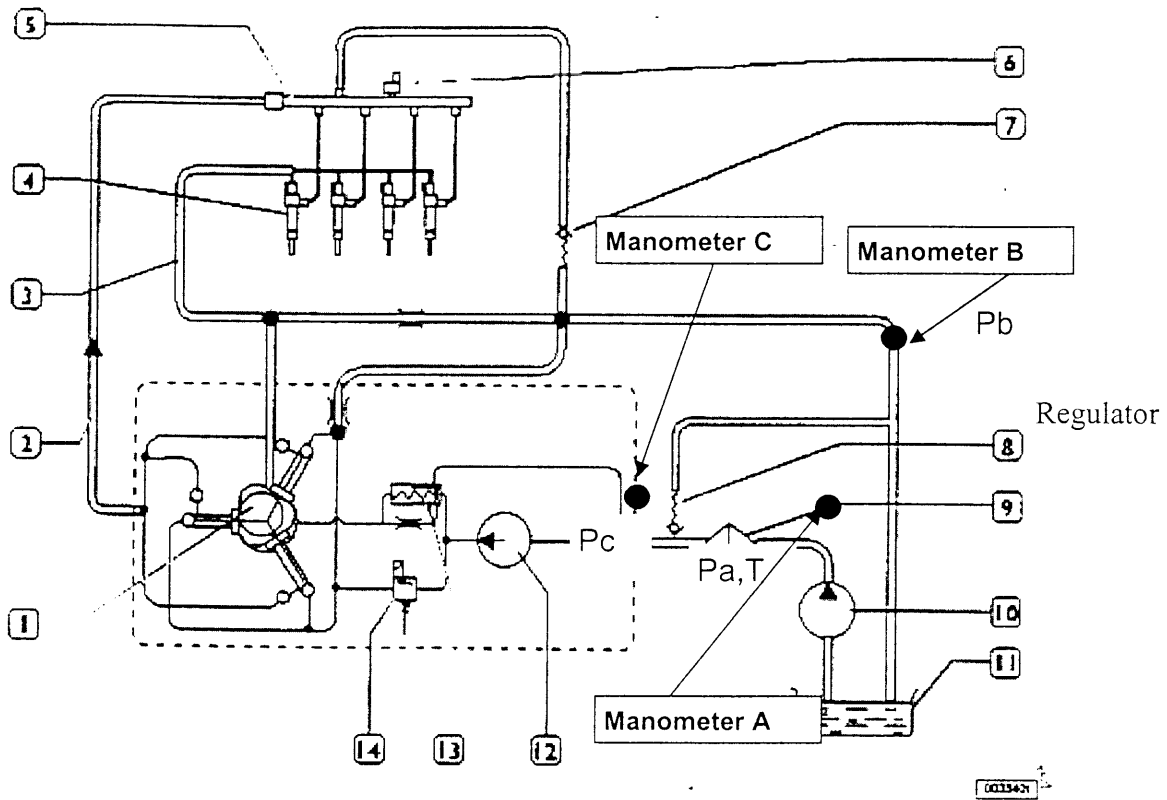
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(F1A Common-rail scheme)

Pressure after electrical fuel pump before fuel filter (manometer A)
 CP3.2 + pump inlet fuel pressure (manometer C)
 Fuel temperature before fuel filter
 Fuel line return (to tank) pressure (manometer B)

[Pa] mbar
 [Pc] mbar
 [T] °C
 [Pb] mbar



Comments:

.....

.....

.....

.....

Acceptable values (relative pressure):

- Pa about 1000mbar
- T ≤70°C with minimal quantity of fuel (90° peak)
- Pc from 300mbar to 800mbar
- Pb ≤ 500mbar

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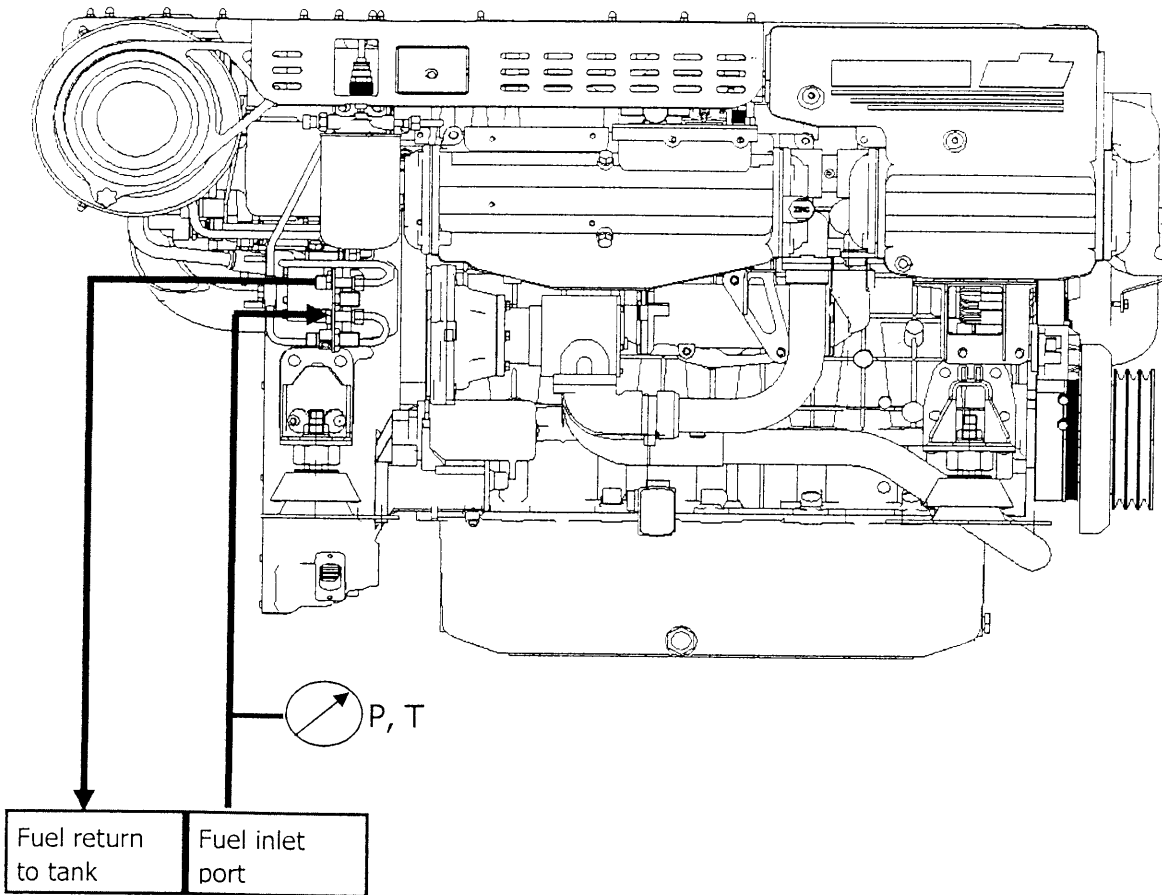
(CURSOR PDE scheme)

Fuel pump inlet pressure

[P] ----- mbar

Fuel pump inlet temperature

[T] ----- °C



Comments:

.....

.....

.....

.....

Acceptable values (relative pressures):

P = from -300 mbar

T ≤ 70°C with minimal quantity of fuel

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3. Sea test – propeller power take off curve

In order to have significant tests the vessel must be at the maximum weight conditions, with water and fuel tanks filled.

It's important to close all access to the engine room so you can have the normal operating conditions.

The should be performed in quiet sea, following a straight sea lane, taking the data, after an adequate period of stabilization, at different rpm increased by 200rpm step.

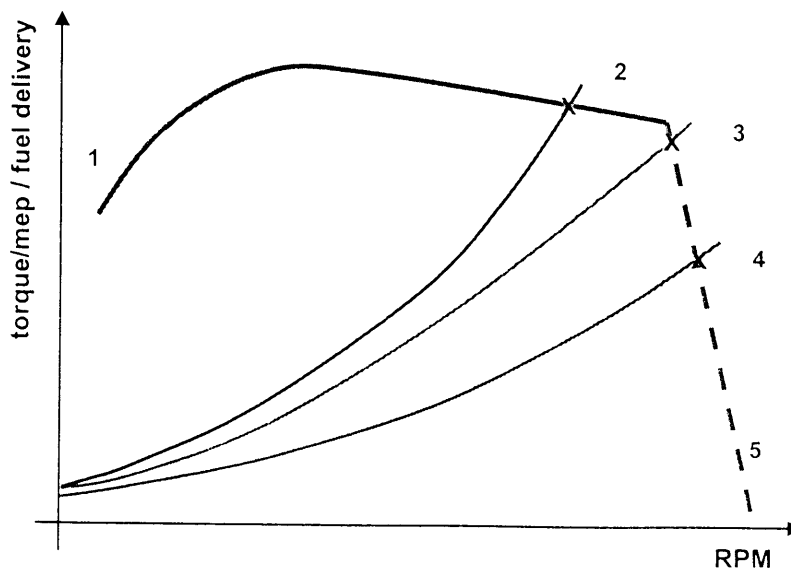
To draw the propeller power take off curve, it's necessary to measure the exhaust gas temperature (before the turbocharger in turbocharged engines).

In case of electronic engines you may record, from the ECU by the diagnostic plug, the actual fuel delivery for each engine rpm step.

From the exhaust temperature you can appreciate, using a proper diagram, how much the engine is under load in term of mean effective pressure MEP , therefore torque and power.

In the electronic engine you can compare the actual fuel delivery with the maximum fuel delivery (consistant to the torque curve) and the theoretic cubic and quadratic curves.

Displacement vessel



1: engine curve (torque/mep/fuel delivery)

2: propeller power take off curve: propeller too big for the vessel

3: propeller power take off curve: propeller correctly dimensioned for the vessel (the curve run close the cubic)

4: propeller power take off curve: propeller too small for the vessel

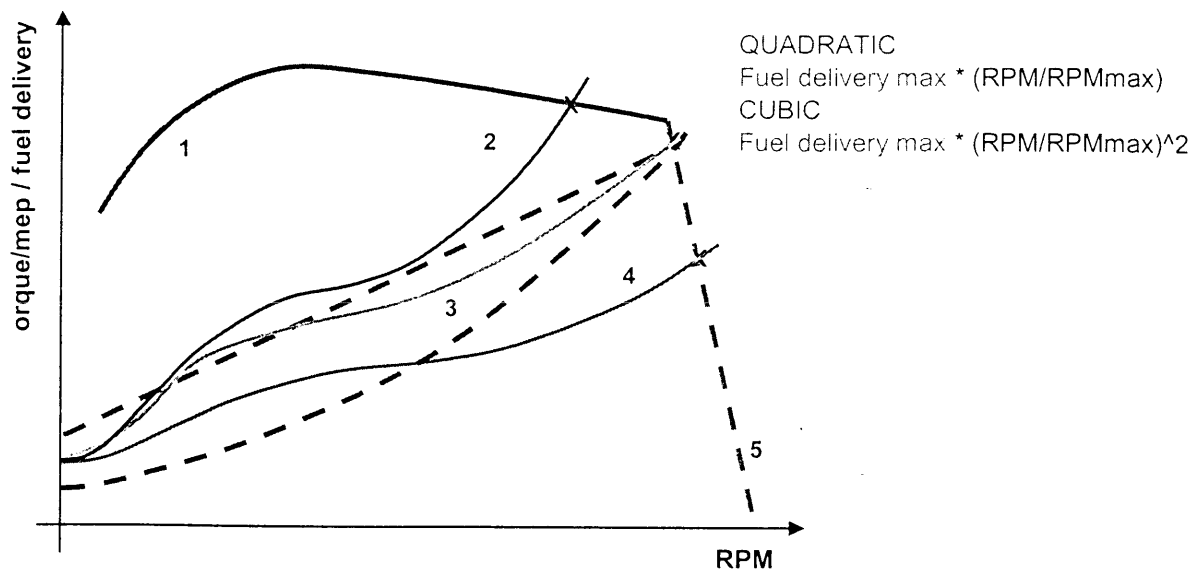
5: speed drop curve

NB: mep means mean effective pressure, proportional to torque

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Planing vessel



- 1: engine curve (torque/mep/fuel delivery)
- 2: propeller power take off curve: propeller too big for the vessel
- 3: propeller power take off curve: propeller correctly dimensioned for the vessel (this curve run between the cubic and the quadratic, except when the vessel starts planing)
- 4: propeller power take off curve: propeller too small for the vessel
- 5: speed drop curve

Note:

- in case of a new vessel and a properly sized propeller, the max RPM should be slightly above the nominal rating.
- the power is the product of torque by speed and so the cubic and the quadratic in the graph torque/mep/fuel delivery vs rpm will be respectively a straight line and a parabola.

In case of planing vessel, it's useful to measure the time needed for planing and rpm which is reached completely.

Planing time [s] speed [rpm]

- Propeller
- Too small (unloaded)
 - Properly sized
 - Too big (overoladed)

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4. Table of acceptable values

| Item / engine | Sofim e F1A | NEF Electr. TAA | NEF/8000 Mech NA | NEF/8000 Mech TC | NEF/8000 Mech TAA | Cursor | Note |
|-------------------------------------|----------------------------|-----------------|------------------|------------------|-------------------|------------|------------------------------------|
| Intake pressure drop ⁽¹⁾ | 35÷65 mbar | 35÷65 mbar | 35÷65 mbar | 35÷65 mbar | 35÷65 mbar | 35÷65 mbar | 35 filter new 65 filter clogged |
| Exhaust back pressure | ≤150mbar (≤120mbar F1A) | ≤100mbar | ≤150mbar | ≤100mbar | ≤100mbar | ≤100mbar | |

(1) The test shall be performed only in case of air filter not supplied by IVECO

5. Engine behaviour on machine – dynamic test

1- Fuel consumption – mission. spec. [kg/h]

Previous: _____
New: _____

Comments:

2- Engine start

Cold start:
Warm start:
Safety devices:

| | |
|----|--------|
| OK | NOT OK |
| OK | NOT OK |
| OK | NOT OK |

Comments:

3- Low idle behaviour

Cold:
Warm:

| | |
|----|--------|
| OK | NOT OK |
| OK | NOT OK |

Comments:

4- Accelerator pedal behaviour/kickdown

Comments:

| | |
|----|--------|
| OK | NOT OK |
|----|--------|

5 - Smoke

Cold:
Warm:

| | |
|----|--------|
| OK | NOT OK |
| OK | NOT OK |

Comments:

6 - Shut - off

Comments:

| | |
|----|--------|
| OK | NOT OK |
|----|--------|

7 - Noise

Comments:

| | |
|----|--------|
| OK | NOT OK |
|----|--------|

8 - Diagnostic errors

Comments:

| | |
|----|--------|
| OK | NOT OK |
|----|--------|

9 - CAN communication

Comments:

| | |
|----|--------|
| OK | NOT OK |
|----|--------|

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6. Installation summary

| | <i>Approv.</i> | <i>Not approv.</i> | <i>Improvements and remarks</i> | <i>Resp.</i> |
|-----------------------------------|----------------|------------------------|---------------------------------|--------------|
| Mounting | | | | |
| Transmission and propeller | | | | |
| PTO | | | | |
| Service accessibility | | | | |
| Ventilation | | | | |
| Intake system | | | | |
| Exhaust system | | | | |
| Cooling system | | | | |
| Fuel system | | | | |
| Electrical system | | | | |

Final remarks _____

The above appraisal report is applicable for the vessel in the configuration at the date of the visit and for the relevant test conditions. The measurements carried out during this test are useful to check the parameters which can affect the proper engine performance. The installation appraisal cannot give any advice about reliability and useful life, which should be provided by a proper endurance test to be made by the vessel manufacturer. The installation approval do not mean any assumption of responsibility and risk by IVECO. The vessel manufacturer is responsible to ensure compliance with the requirements for health and safety.

CUSTOMER:

ENGINE DATA: Tec. Code: Rating: s/n left: s/n right:

 Comm. Code: Dataset: s/n right:

| Time [24h] | Engine speed [rpm] | | Throttle posit. [%] | Injected fuel qty [mg/str] | Speed [knots] | Tilt angle [°] | T air inlet [°C] | | | T engine coolant [°C] | | | T Alternator [°C] | | | Exhaust back P [mbar] | | | REMARKS | | | |
|------------|--------------------|---|---------------------|----------------------------|---------------|----------------|------------------|---|---|-----------------------|---|---|-------------------|---|---|-----------------------|---|---|---------|---|---|---|
| | L | R | | | | | L | R | L | R | L | R | L | R | L | R | L | R | | L | R | L |
| | | | | | | | | | | | | | | | | | | | | | | |
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Sea: **People on board:** **Equipment**

Ambient Temp.: [°C] **Tank capacities:** [liters] **Complete**

Sea Water Temp.: [°C] **Fuel in the tank:** [liters] **Incomplete**

Low idle [rpm]

High idle [rpm]

Left engine **Right engine**

Condition and vessel description:

REMARKS: