



## Engine instructions manual

**GB**



## GENERAL INDEX

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## GENERAL INFORMATION

### INTRODUCTION

**GB**

Dear Client, we wish to thank you for purchasing an engine manufactured by VM MOTORI S.P.A.

Our Technical Assistance and Spare Part department has recently been strengthened to ensure even better service to all our Clients.

Only by using original spare parts and by relying on our specialised staff you can ensure the best performance to your engine.

Let us advise you to rely **EXCLUSIVELY** on our Technical Assistance and Spare Part Service for the maintenance of engines manufactured by VM MOTORI S.P.A.

If engines designed and built by VM MO-

TORI S.P.A. are repaired by unauthorised technicians, if the planned maintenance operations foreseen are not carried out, if **NON ORIGINAL** spare parts are used, if the coolants, engine oil and fuels used do not comply with the manufacturer's specifications, then any service or technical guarantee provided by VM MOTORI S.P.A. will immediately expire.

We are confident that you will understand the technical importance of this recommendation, which is mainly aimed at protecting our Clients from any unpleasant situation.

Please get in touch with us for any requirements. Best regards,

### QUALITY SYSTEM CERTIFICATE ISO 9001-QS 9000-ISO 14001

VM MOTORI S.P.A. has obtained the certification of its quality assurance regime in compliance with UNI EN ISO 9001 standards and with the even stricter prescriptions established by Ford, Chrysler and General Motors car manufacturer asso-

ciation under the QS-9000 Quality System Standard for the manufacture of Diesel engines. Moreover, its environmental management system has been certified against the ISO 14001 standard.



ISO 14001 - Cert. n° 0043A



ISO 9001 - Cert. n° 0295  
ISO/TS 16949 - Cert. n° 2920

This is the result of a working plan which involves all company levels.

The quality and environmental policy, with a special focus on the continuous improvement principle, is an essential part of VM MOTORI S.P.A top management 's strategy and it is being implemented in all company departments in accordance with internationally accepted quality and environmental management systems and while respecting the environment and the population.

Customer satisfaction, efficiency and personnel motivation, intended as a set of

services rendered inside and outside the company, are the most important elements of the quality concept.

All VM MOTORI S.P.A. employees are committed to the achievement of quality and environmental policy goals.

Regular training ensures a suitable and constantly updated knowledge to VM MOTORI S.P.A.. employees.

VM MOTORI S.P.A. considers quality as a dynamic process of continuous improvement in all activities to achieve the goals.

## PURPOSE OF THE MANUAL

This manual is an essential part of the engine and it has been written by the manufacturer to provide all the information necessary to those who are authorized to interact with it throughout its expected life: handlers, carriers, installers and users.

Besides adopting a good operation technique, the recipients of the information should carefully read it and apply it rigorously.

Spend some of your time reading this information to avoid any risk for people's health and safety as well as economic damage.

Keep this manual throughout the life of the engine in a place within easy reach, so that it is always at hand and you can consult it at all times.

Besides the actual installation of the engine, this manual may contain additional information which, however, will not hinder the general understanding.

The manufacturer reserves the right to make changes without any prior notice.

The relevance of certain parts of the manual and of some specifications is pointed out by a few symbols whose meaning is described below.



### **Danger - Warning**

**It indicates very dangerous situations which can seriously endanger people's health and safety if they are neglected.**



### **Caution - Precaution**

**It indicates that a correct behaviour should be adopted to avoid any risk for people's health and safety as well as any economic damage.**



### **Important**

**It indicates some very important pieces of technical information which should not be neglected.**

## MANUFACTURER AND ENGINE IDENTIFICATION

The identification plate shown is applied directly on the engine. It contains all the references and indications needed for a safe operation.

**GB**

A) Manufacturer identification

B) Serial number

C) Weight

D) Type

E) Family

F) Model

G) Version

H) Maximum power (kW)

L) Maximum number of revolutions

M) Homologation number

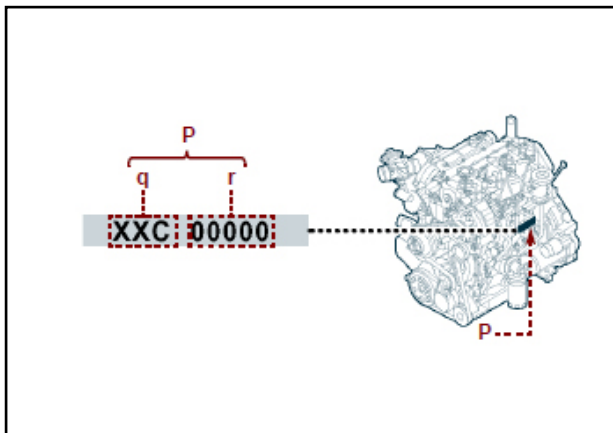
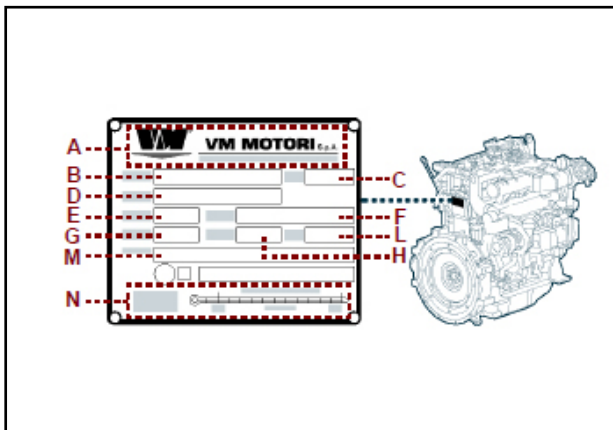
N) Lubricating oil features

P) Engine serial number

(punched on the crankcase)

q) Engine code

r) Consecutive number



The table helps you to identify the model through the engine code.

| Engine code | Engine model |
|-------------|--------------|
| 05D         | R754EU5      |
| 06D         | R756EU5      |
| 20D         | R754IE3      |
| 80C         | R756IE3      |
| 45D         | R754TE4      |
| 34D         | R754IE4      |
| 39D         | R754ISE4     |

## PROCEDURE TO REQUEST TECHNICAL ASSISTANCE

Please state the data contained in the identification plate, the serial number, approximate hours of operation and the type of defect detected in every request of technical assistance for the engine.

In case of need, please apply to the

manufacturer's Technical Assistance Service or to an authorised workshop (see attached documentation "Address booklet of assistance and spare part centres")

Further information are available in the website: [www.vmmotori.it](http://www.vmmotori.it), in the "Contacts – Request Info" section.

## WARRANTY CONDITIONS

The warranty conditions are stated in the attached documentation (see "Warranty sheet")

## ATTACHED DOCUMENTATION

The stated documentation is supplied to the client along with this manual.

–Address booklet of assistance and spare part centres

–Warranty sheet

## TECHNICAL INFORMATION

### ENGINE GENERAL DESCRIPTION

#### Engines of series **R754 EU5 - R756 EU5**

EU5 were designed and manufactured to be installed on road vehicles, such as for example road-cleaning vans, lorries, etc., on condition that they have been type-approved according to EURO 5 anti-pollution directives. **Model R754IE3, R756IE3, R754TE4-IE4-ISE4 engines** have been

designed for off-road use, fitted in agricultural machinery or load lifting machines.

The models of engine differ from each other in both power and performance (See “**Technical data R754EU5, R756EU5, R754IE3, R756IE3, R754TE4-IE4-ISE4**”).

#### **Main components R754IE3, R756IE3, R754EU5, R756EU5**

**A) Cooler:** cools the engine oil by heat exchange with the coolant fluid.

**B) Turbo device:** Made up of a turbine which exploits a part of the exhaust gas energy to carry out the engine turbocharging.

**C) “EGR” valve:** modulates the recirculation of exhaust gasses before they flow into the suction manifold.

**D) “waste-gate” valve:** It controls the turbo device activation, depending on the pressure of the exhaust gases.

**E) Heat expansion valve:** It adjusts the water temperature according to the engine working temperature

**F) Fuel filter:** It traps any impurity

**G) Oil filter:** It traps any impurity

**H) Oil sump:** It contains the engine lubrication oil

**L) Suction manifold:** conveys the combustion air into the combustion chamber.

**M) Water pump:** feeds the cooling circuit

**N) Driving belt (type Poly-V):** it starts service devices, the alternator (Q) and the water pump (M).

**P) Automatic belt tightener:** it keeps the belt constantly tightened.

**Q) alternating current generator:** It produces and regulates the electric system voltage

**R) Starter:** It is used to start the engine

**S) Exhaust manifold:** It is used to expel the combustion gases

**T) Water manifold:** It is used to collect the coolant from the heads

**U) high pressure injection pump:** It feeds the injectors with fuel under pressure

**V) Injector:** injects pressurised fuel into the combustion chamber.

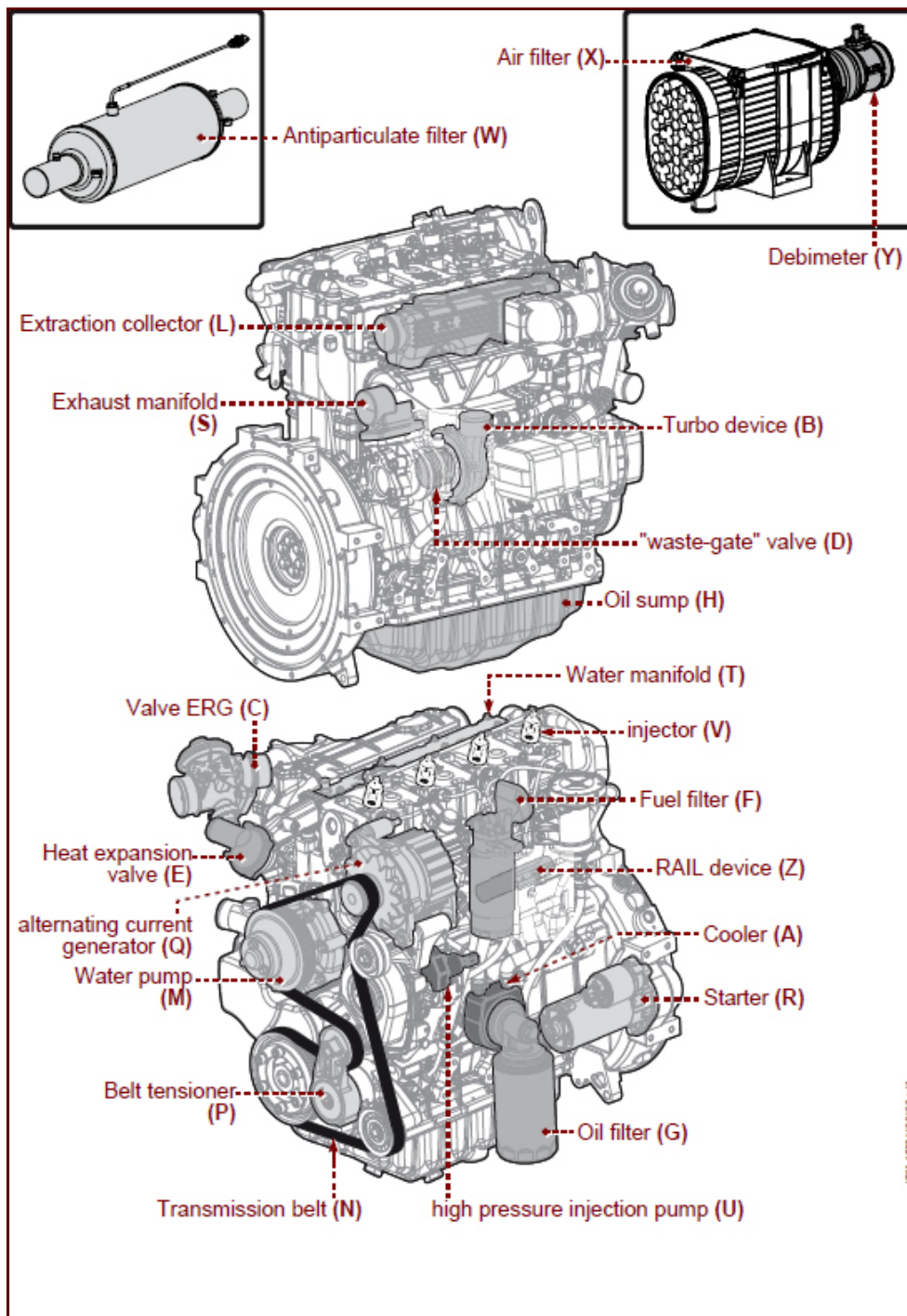
**W) Antiparticulate filter **R754EU5, R756EU5**:** this is installed in the engine exhaust pipe conduit. It serves to retain the particulate so as to reduce the emissions from diesel engines, which are responsible for atmospheric pollution.

**X) Air filter:** for engine intake.

The air is filtered over 3 phases: in the cyclone pre-separator, in the main filter and in the safety filter.

**Y) Debimeter **R754EU5, R756EU5**:** it detects the air mass that feeds the engine.

**Z) Rail:** stores pressurised fuel and distributes it to the injectors.



**Main components R754TE4 - IE4 - ISE4****GB**

**A)** Cooler: cools the engine oil by heat exchange with the coolant fluid.

**B)** Turbo device: Made up of a turbine which exploits a part of the exhaust gas energy to carry out the engine turbocharging.

**C)** “EGR” valve: modulates the recirculation of exhaust gasses before they flow into the suction manifold.

**D)** “waste-gate” valve: It controls the turbo device activation, depending on the pressure of the exhaust gases (**Only for R754IE4**).

**E)** Heat expansion valve: It adjusts the water temperature according to the engine working temperature

**F)** Fuel filter: It traps any impurity

**G)** Oil filter: It traps any impurity

**H)** Oil sump: It contains the engine lubrication oil

**L)** Suction manifold: conveys the combustion air into the combustion chamber.

**M)** Water pump: feeds the cooling circuit

**N)** Driving belt (type Poly-V): it starts service devices, the alternator (Q) and the water pump (M).

**P)** Automatic belt tightener: it keeps the belt constantly tightened.

**Q)** alternating current generator: It produces and regulates the electric system voltage

**R)** Starter: It is used to start the engine

**S)** Exhaust manifold: It is used to expel the combustion gases

**U)** high pressure injection pump: It feeds the injectors with fuel under pressure

**V)** Injector: injects pressurised fuel into the combustion chamber.

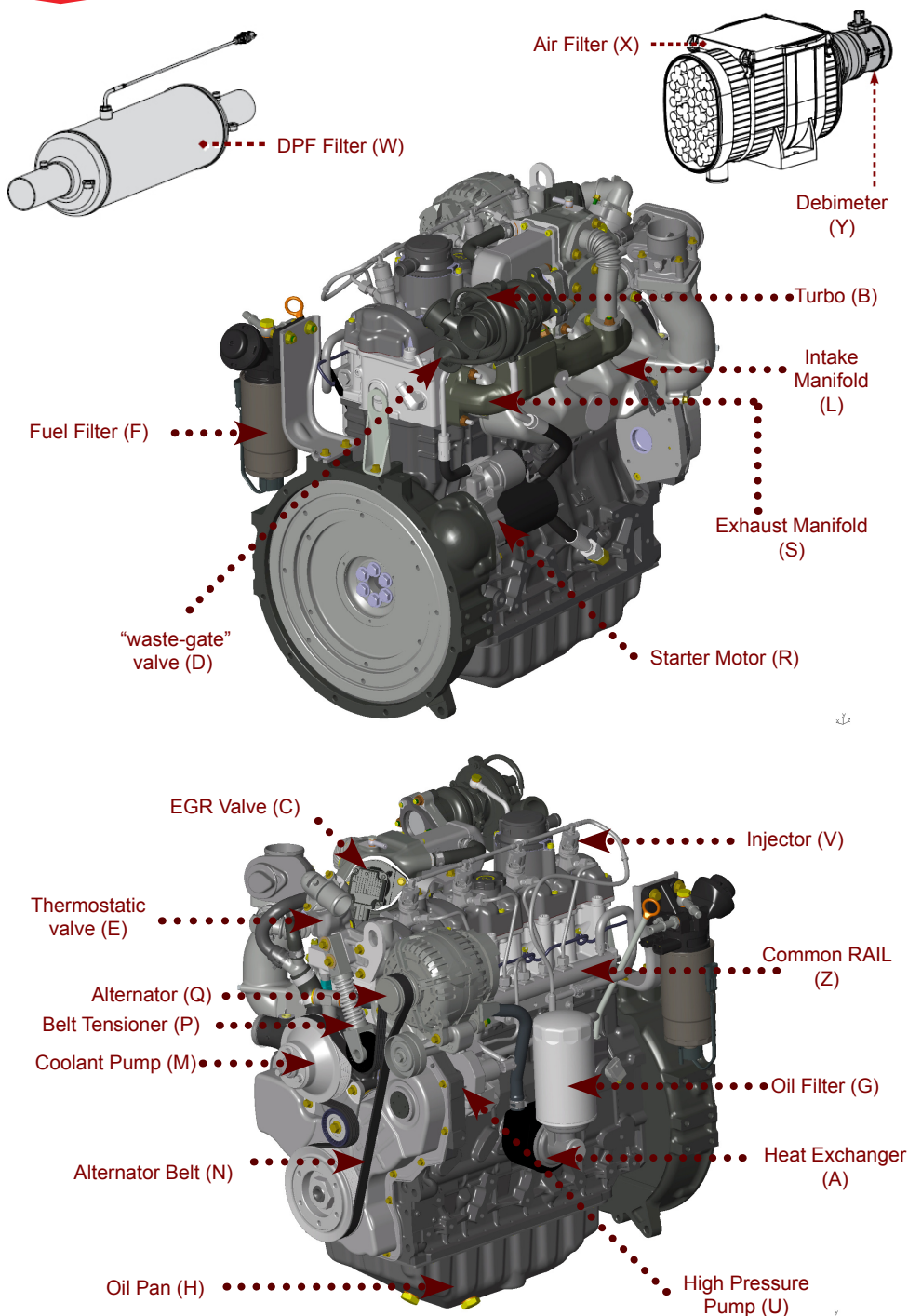
**W)** Antiparticulate filter: this is installed in the engine exhaust pipe conduit. It serves to retain the particulate so as to reduce the emissions from diesel engines, which are responsible for atmospheric pollution.

**X)** Air filter: for engine intake.

The air is filtered over 3 phases: in the cyclone pre-separator, in the main filter and in the safety filter.

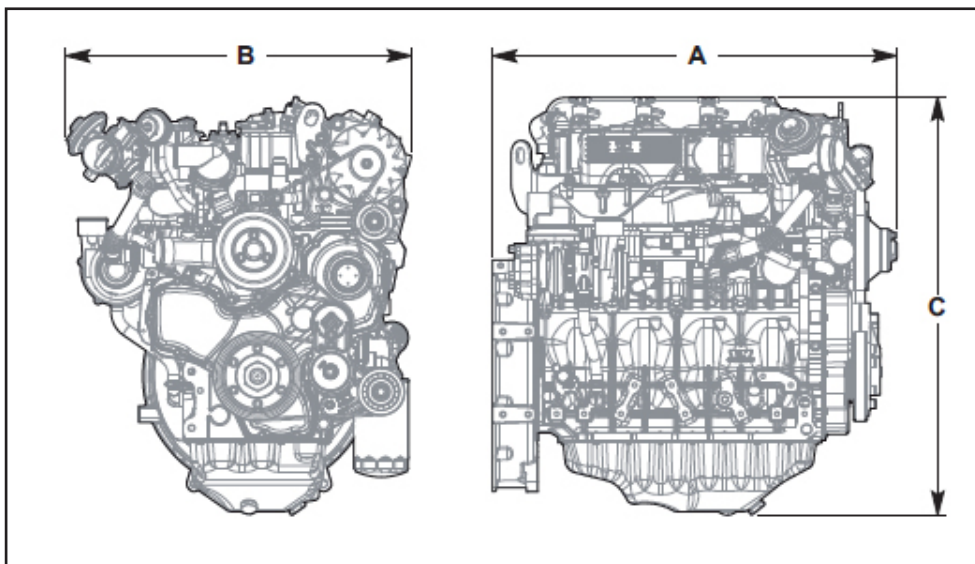
**Y)** Debimeter: it detects the air mass that feeds the engine.

**Z)** Rail: stores pressurised fuel and distributes it to the injectors.



**TECHNICAL DATA**

These technical data and specifications refer exclusively to standard VM MOTORI S.P.A. engines.

**GB**

**TECHNICAL DATA (R754 EU5-R756 EU5)**

|                   | Unit of measurement | R754EU5 | R756EU5 |
|-------------------|---------------------|---------|---------|
| <b>Dimensions</b> |                     |         |         |
| A                 | mm                  | 704     | 943     |
| B                 | mm                  | 602     | 602     |
| C                 | mm                  | 722     | 734     |

|                     | Unit of measurement | R754EU5                                                  | R756EU5      |
|---------------------|---------------------|----------------------------------------------------------|--------------|
| <b>General data</b> |                     |                                                          |              |
| Cycle               |                     | Four stroke diesel                                       |              |
| Total displacement  | Liters              | 2,970                                                    | 4,455        |
| Number of cylinders | nr.                 | 4                                                        | 6            |
| Bore and stroke     | mm                  | 94x107                                                   | 94x107       |
| Compression ratio   |                     | 17,8 ± 0,5:1                                             | 17,8 ± 0,5:1 |
| Intake              |                     | Turbocharged and inter-cooled circuit - (Dry) air filter |              |
| Cooling             |                     | Water circuit                                            |              |

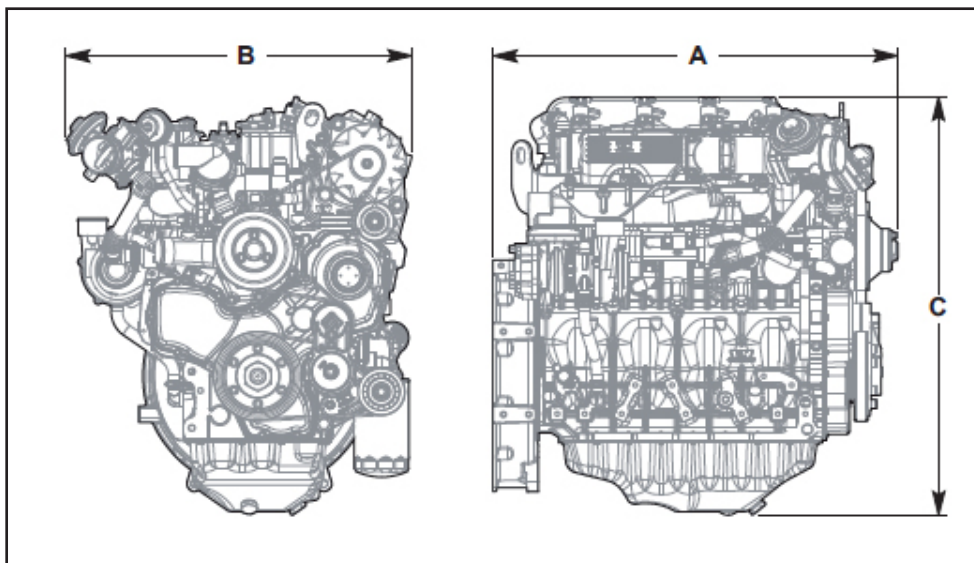
|                                                                | Unit of measurement | R754EU5                                                                                                                                                                                                                                                                                                                                   | R756EU5          |
|----------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| Cooler                                                         |                     | water/oil                                                                                                                                                                                                                                                                                                                                 |                  |
| Crankshaft rotation                                            |                     | Anticlockwise (observing the engine from the handwheel side)                                                                                                                                                                                                                                                                              |                  |
| Combustion sequence                                            |                     | 1-3-4-2                                                                                                                                                                                                                                                                                                                                   | 1-5-3-6-2-4      |
| Timing                                                         |                     | Pushrods and rocker arms                                                                                                                                                                                                                                                                                                                  |                  |
|                                                                |                     | With hydraulic tappets and camshaft                                                                                                                                                                                                                                                                                                       |                  |
|                                                                |                     | Gear cascade control and camshaft fitted on the crankbase                                                                                                                                                                                                                                                                                 |                  |
| Minimum idling speed (standard engine)                         | rpm                 | 800 +/-50                                                                                                                                                                                                                                                                                                                                 | 750 +/-50        |
| Dry shipping weight of engine                                  | kg                  | 260                                                                                                                                                                                                                                                                                                                                       | 335              |
| Maximum permanent lengthwise inclination (with handwheel up)   | degrees             | 30°                                                                                                                                                                                                                                                                                                                                       | 30°              |
| Maximum permanent lengthwise inclination (with handwheel down) | degrees             | 35°                                                                                                                                                                                                                                                                                                                                       | 35°              |
| Maximum permanent crosswise inclination                        | degrees             | 30°                                                                                                                                                                                                                                                                                                                                       | 30°              |
| <b>Power and torque</b>                                        |                     |                                                                                                                                                                                                                                                                                                                                           |                  |
| Maximum operating speed                                        | rpm                 | 3000                                                                                                                                                                                                                                                                                                                                      | 3000             |
| Maximum power                                                  | kW (CV) @ rpm       | 74 (100) @ 3000                                                                                                                                                                                                                                                                                                                           | 120 (163) @ 3000 |
| Maximum torque                                                 | Nm (kgm) @ rpm      | 340 (34,68) @ 1350                                                                                                                                                                                                                                                                                                                        | 500 (51) @ 1350  |
| <b>Consumption at maximum power</b>                            |                     |                                                                                                                                                                                                                                                                                                                                           |                  |
| Specific fuel consumption                                      | g/kWh               | 274                                                                                                                                                                                                                                                                                                                                       | 254              |
| Specific oil consumption                                       | g/KWh               | 0,2                                                                                                                                                                                                                                                                                                                                       | 0,2              |
| <b>Fuel supply circuit</b>                                     |                     |                                                                                                                                                                                                                                                                                                                                           |                  |
| Type of injection                                              |                     | Common Rail direct injection                                                                                                                                                                                                                                                                                                              |                  |
| Type of fuel                                                   |                     | The engine has been designed to be powered by standard fuels available on the European market (according to specifications DIN EN 590). If it is to be powered by BIODIESEL fuels (according to specifications UNI EN 14214), it can be mixed, up to 5%, with fuel available on the European market (according to regulation DIN EN 590). |                  |
|                                                                |                     |  <b>IMPORTANT</b><br><b>Do not use fuels with specifications other than those indicated.</b>                                                                                                                                                           |                  |

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|                                                                           | Unit of measurement                                                                                                                                                                                 | R754EU5                      | R756EU5                                                                                                                                               |
|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fuel supply                                                               |                                                                                                                                                                                                     | Gear pump                    |                                                                                                                                                       |
| Injector supply                                                           |                                                                                                                                                                                                     | High pressure injection pump |                                                                                                                                                       |
| <b>Lubrication circuit</b>                                                |                                                                                                                                                                                                     |                              |                                                                                                                                                       |
| Type of lubrication                                                       |                                                                                                                                                                                                     | Forced lubrication           |                                                                                                                                                       |
| Circuit fuel supply                                                       |                                                                                                                                                                                                     | Rotor pump                   |                                                                                                                                                       |
| Oil change including filter (standard sump)                               | liters (kg)                                                                                                                                                                                         | 10 (8,7)                     | 13,8 (12) ÷ 18.9 (16,5)<br>The oil quantity at maximum level ( 12÷16,5 kg) depends on the capacity of the oil sump with which the engine is equipped. |
| Oil quantity at minimum level (standard sump)                             | liters (kg)                                                                                                                                                                                         | 5,8 (5,1)                    | 7,5 (6,6)                                                                                                                                             |
| Oil quantity at maximum level (standard sump)                             | liters (kg)                                                                                                                                                                                         | 8,5 (7,4)                    | 10,9 (9,5)                                                                                                                                            |
| Oil pressure at minimum speed (with started engine)                       | bar                                                                                                                                                                                                 | 1,4 - 1,8                    |                                                                                                                                                       |
| Oil cooling                                                               |                                                                                                                                                                                                     | Oil/water cooler             |                                                                                                                                                       |
| <b>Cooling circuit</b>                                                    |                                                                                                                                                                                                     |                              |                                                                                                                                                       |
| Total capacity of cooling circuit (excluding radiator and relevant pipes) | liters                                                                                                                                                                                              | 5                            | 7,5                                                                                                                                                   |
| Setting pressure of the expansion tank plug                               | bar                                                                                                                                                                                                 | 1,1                          | 1,1                                                                                                                                                   |
| Coolant                                                                   | 50% demineralised or distilled water and 50% Petronas Paraflu Up (protective radiator fluid with monoethylene glycol and organic inhibitor formulation complying with ASTM D 3306 type 1 Standards) |                              |                                                                                                                                                       |
| Coolant maximum temperature alarm                                         | °C                                                                                                                                                                                                  | 107                          | 107                                                                                                                                                   |
| <b>Electric system</b>                                                    |                                                                                                                                                                                                     |                              |                                                                                                                                                       |
| Nominal voltage                                                           | V                                                                                                                                                                                                   | 12                           | 12                                                                                                                                                    |
| Alternating current generator (nominal voltage)                           | V                                                                                                                                                                                                   | 14                           | 14                                                                                                                                                    |
| Alternating current generator (nominal current)                           | A                                                                                                                                                                                                   | 105                          | 105                                                                                                                                                   |
| Starter motor output                                                      | kW                                                                                                                                                                                                  | 2,5                          | 2,5                                                                                                                                                   |
| Recommended battery capacity                                              | Ah                                                                                                                                                                                                  | 140                          | 140                                                                                                                                                   |
| Battery breakaway current                                                 | A                                                                                                                                                                                                   | 950                          | 950                                                                                                                                                   |
| <b>Suction circuit</b>                                                    |                                                                                                                                                                                                     |                              |                                                                                                                                                       |
| Maximum depression allowed with new air filter                            | mbar                                                                                                                                                                                                | 40                           | 40                                                                                                                                                    |

**TECHNICAL DATA (R754 IE3-R756 IE3)**

These technical data and specifications refer exclusively to standard VM MOTORI S.P.A. engines.

**GB**

**Table 2: Technical data of the engine**

|                   | Unit of measurement | R754IE3 | R756IE3 |
|-------------------|---------------------|---------|---------|
| <b>Dimensions</b> |                     |         |         |
| A                 | mm                  | 704     | 943     |
| B                 | mm                  | 601     | 601     |
| C                 | mm                  | 722     | 734     |

|                     | Unit of measurement | R754IE3                                                  | R756IE3      |
|---------------------|---------------------|----------------------------------------------------------|--------------|
| <b>General data</b> |                     |                                                          |              |
| Cycle               |                     | Four stroke diesel                                       |              |
| Total displacement  | Liters              | 2,970                                                    | 4,455        |
| Number of cylinders | nr.                 | 4                                                        | 6            |
| Bore and stroke     | mm                  | 94x107                                                   | 94x107       |
| Compression ratio   |                     | 17,8 ± 0,5:1                                             | 17,8 ± 0,5:1 |
| Intake              |                     | Turbocharged and inter-cooled circuit - (Dry) air filter |              |
| Cooling             |                     | Water circuit                                            |              |

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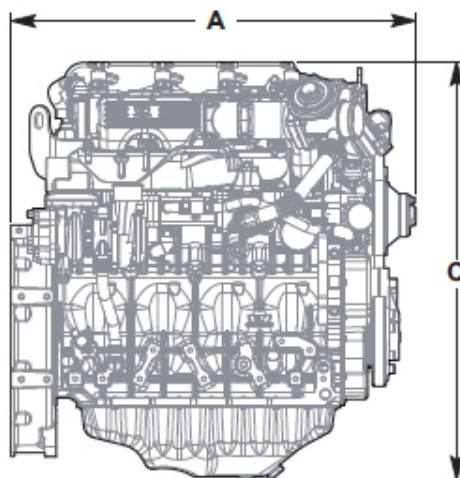
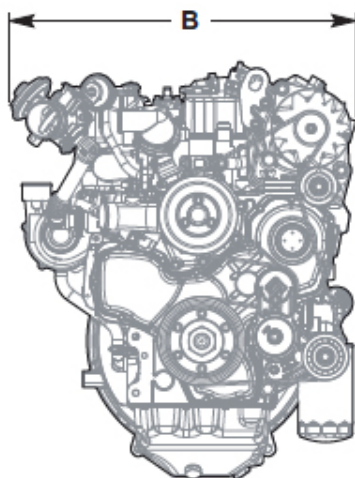
|                                                                | Unit of measurement | R754IE3                                                                                                                                                                                                                                                                                                                                   | R756IE3            |
|----------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| Cooler                                                         |                     | water/oil                                                                                                                                                                                                                                                                                                                                 |                    |
| Crankshaft rotation                                            |                     | Anticlockwise (observing the engine from the handwheel side)                                                                                                                                                                                                                                                                              |                    |
| Combustion sequence                                            |                     | 1-3-4-2                                                                                                                                                                                                                                                                                                                                   | 1-5-3-6-2-4        |
| Timing                                                         |                     | Pushrods and rocker arms                                                                                                                                                                                                                                                                                                                  |                    |
|                                                                |                     | With hydraulic tappets and camshaft                                                                                                                                                                                                                                                                                                       |                    |
|                                                                |                     | Gear cascade control and camshaft fitted on the crankbase                                                                                                                                                                                                                                                                                 |                    |
| Minimum idling speed (standard engine)                         | rpm                 | 800 +/-50                                                                                                                                                                                                                                                                                                                                 | 750 +/-50          |
| Dry shipping weight of engine                                  | kg                  | 260                                                                                                                                                                                                                                                                                                                                       | 335                |
| Maximum permanent lengthwise inclination (with handwheel up)   | degrees             | 30°                                                                                                                                                                                                                                                                                                                                       | 30°                |
| Maximum permanent lengthwise inclination (with handwheel down) | degrees             | 35°                                                                                                                                                                                                                                                                                                                                       | 35°                |
| Maximum permanent crosswise inclination                        | degrees             | 30°                                                                                                                                                                                                                                                                                                                                       | 30°                |
| <b>Power and torque</b>                                        |                     |                                                                                                                                                                                                                                                                                                                                           |                    |
| Maximum operating speed                                        | rpm                 | 3000                                                                                                                                                                                                                                                                                                                                      | 3000               |
| Maximum power                                                  | kW (CV) @ rpm       | 74 (100) @ 3000                                                                                                                                                                                                                                                                                                                           | 120 (163) @ 3000   |
| Maximum torque                                                 | Nm (kgm) @ rpm      | 420 (42.80) @ 1000                                                                                                                                                                                                                                                                                                                        | 500 (50.90) @ 1400 |
| <b>Consumption at maximum power</b>                            |                     |                                                                                                                                                                                                                                                                                                                                           |                    |
| Specific fuel consumption                                      | g/kWh               | 254                                                                                                                                                                                                                                                                                                                                       | 284                |
| Specific oil consumption                                       | g/kWh               | 0,2                                                                                                                                                                                                                                                                                                                                       | 0,2                |
| <b>Fuel supply circuit</b>                                     |                     |                                                                                                                                                                                                                                                                                                                                           |                    |
| Type of injection                                              |                     | Common Rail direct injection                                                                                                                                                                                                                                                                                                              |                    |
| Type of fuel                                                   |                     | The engine has been designed to be powered by standard fuels available on the European market (according to specifications DIN EN 590). If it is to be powered by BIODIESEL fuels (according to specifications UNI EN 14214), it can be mixed, up to 5%, with fuel available on the European market (according to regulation DIN EN 590). |                    |
|                                                                |                     |  <b>IMPORTANT</b><br><b>Do not use fuels with specifications other than those indicated.</b>                                                                                                                                                           |                    |

|                                                                           | Unit of measurement | R754IE3                                                                                                                                                                                             | R756IE3    |
|---------------------------------------------------------------------------|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Fuel supply                                                               |                     | Gear pump                                                                                                                                                                                           |            |
| Injector supply                                                           |                     | High pressure injection pump                                                                                                                                                                        |            |
| <b>Lubrication circuit</b>                                                |                     |                                                                                                                                                                                                     |            |
| Type of lubrication                                                       |                     | Forced lubrication                                                                                                                                                                                  |            |
| Circuit fuel supply                                                       |                     | Rotor pump                                                                                                                                                                                          |            |
| Oil change including filter (standard sump)                               | liters (kg)         | 10 (8,7)                                                                                                                                                                                            | 13,8 (12)  |
| Oil quantity at minimum level (standard sump)                             | liters (kg)         | 5,8 (5,1)                                                                                                                                                                                           | 7,5 (6,6)  |
| Oil quantity at maximum level (standard sump)                             | liters (kg)         | 8,5 (7,4)                                                                                                                                                                                           | 10,9 (9,5) |
| Oil pressure at minimum speed (with started engine)                       | bar                 | 1,4 - 1,8                                                                                                                                                                                           |            |
| Oil cooling                                                               |                     | Oil/water cooler                                                                                                                                                                                    |            |
| <b>Cooling circuit</b>                                                    |                     |                                                                                                                                                                                                     |            |
| Total capacity of cooling circuit (excluding radiator and relevant pipes) | liters              | 5                                                                                                                                                                                                   | 7,5        |
| Setting pressure of the expansion tank plug                               | bar                 | 1,1                                                                                                                                                                                                 | 1,1        |
| Coolant                                                                   |                     | 50% demineralised or distilled water and 50% Petronas Paraflu Up (protective radiator fluid with monoethylene glycol and organic inhibitor formulation complying with ASTM D 3306 type 1 Standards) |            |
| Coolant maximum temperature alarm                                         | °C                  | 107                                                                                                                                                                                                 | 107        |
| <b>Electric system</b>                                                    |                     |                                                                                                                                                                                                     |            |
| Nominal voltage                                                           | V                   | 12                                                                                                                                                                                                  | 12         |
| Alternating current generator (nominal voltage)                           | V                   | 14                                                                                                                                                                                                  | 14         |
| Alternating current generator (nominal current)                           | A                   | 110                                                                                                                                                                                                 | 110        |
| Starter motor output                                                      | kW                  | 2,5                                                                                                                                                                                                 | 2,5        |
| Recommended battery capacity                                              | Ah                  | 140                                                                                                                                                                                                 | 140        |
| Battery breakaway current                                                 | A                   | 950                                                                                                                                                                                                 | 950        |
| <b>Suction circuit</b>                                                    |                     |                                                                                                                                                                                                     |            |
| Maximum depression allowed with new air filter                            | mbar                | 40                                                                                                                                                                                                  | 40         |

**GB**

**TECHNICAL DATA (R754 TE4-R754 IE4 - R754ISE4)**

These technical data and specifications refer exclusively to standard VM MOTORI S.P.A. engines.

**GB**


|                   | Unit of measurement | R754TE4 | R754IE4 | R754ISE4 |
|-------------------|---------------------|---------|---------|----------|
| <b>Dimensions</b> |                     |         |         |          |
| A                 | mm                  | 704     | 704     | 704      |
| B                 | mm                  | 554     | 554     | 554      |
| C                 | mm                  | 766     | 766     | 766      |

|                     | Unit of measurement | R754TE4                                                                                                    | R754IE4        | R754ISE4       |
|---------------------|---------------------|------------------------------------------------------------------------------------------------------------|----------------|----------------|
| <b>General data</b> |                     |                                                                                                            |                |                |
| Cycle               |                     | Four stroke diesel                                                                                         |                |                |
| Total displacement  | Liters              | 2,970                                                                                                      | 2,970          | 2,970          |
| Number of cylinders | nr.                 | 4                                                                                                          | 4              | 4              |
| Bore and stroke     | mm                  | 94x107                                                                                                     | 94x107         | 94x107         |
| Compression ratio   |                     | 17.5 ± 0.5 : 1                                                                                             | 17.5 ± 0.5 : 1 | 17.5 ± 0.5 : 1 |
| Intake              |                     | R754TE4 - R754ISE4 Turbocharged circuit - R754IE4 Turbocharged and inter-cooled circuit - (Dry) air filter |                |                |
| Cooling             |                     | Water circuit                                                                                              |                |                |

|                                                                | Unit of measurement | R754TE4                                                                                                                                                                                                                                                                                                                                   | R754IE4           | R754ISE4           |
|----------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|--------------------|
| Cooler                                                         |                     | water/oil                                                                                                                                                                                                                                                                                                                                 |                   |                    |
| Crankshaft rotation                                            |                     | Anticlockwise (observing the engine from the handwheel side)                                                                                                                                                                                                                                                                              |                   |                    |
| Combustion sequence                                            |                     | 1-3-4-2                                                                                                                                                                                                                                                                                                                                   | 1-3-4-2           | 1-3-4-2            |
| Timing                                                         |                     | Pushrods and rocker arms With hydraulic tappets and camshaft                                                                                                                                                                                                                                                                              |                   |                    |
|                                                                |                     | Gear cascade control and camshaft fitted on the crankbase                                                                                                                                                                                                                                                                                 |                   |                    |
| Minimum idling speed (standard engine)                         | rpm                 | 800                                                                                                                                                                                                                                                                                                                                       | 800               | 800                |
| Dry shipping weight of engine                                  | kg                  | 260                                                                                                                                                                                                                                                                                                                                       | 260               | 260                |
| Maximum permanent lengthwise inclination (with handwheel up)   | degrees             | 30°                                                                                                                                                                                                                                                                                                                                       | 30°               | 30°                |
| Maximum permanent lengthwise inclination (with handwheel down) | degrees             | 35°                                                                                                                                                                                                                                                                                                                                       | 35°               | 35°                |
| Maximum permanent crosswise inclination                        | degrees             | 30°                                                                                                                                                                                                                                                                                                                                       | 30°               | 30°                |
| <b>Power and torque</b>                                        |                     |                                                                                                                                                                                                                                                                                                                                           |                   |                    |
| Maximum operating speed                                        | rpm                 |                                                                                                                                                                                                                                                                                                                                           | 2600              | 2600               |
| Maximum power                                                  | kW (CV) @ rpm       |                                                                                                                                                                                                                                                                                                                                           | 80 (108.8) @ 2600 | 55.4 (75.3) @ 2600 |
| Maximum torque                                                 | Nm (kgm) @ rpm      |                                                                                                                                                                                                                                                                                                                                           | 420 (42.8) @ 1100 | 310 (31.6) @ 1100  |
| <b>Consumption at maximum power</b>                            |                     |                                                                                                                                                                                                                                                                                                                                           |                   |                    |
| Specific fuel consumption                                      | g/kWh               |                                                                                                                                                                                                                                                                                                                                           | 222.5             | 217.7              |
| Specific oil consumption                                       | g/kWh               |                                                                                                                                                                                                                                                                                                                                           | 0,2               | 0.2                |
| <b>Fuel supply circuit</b>                                     |                     |                                                                                                                                                                                                                                                                                                                                           |                   |                    |
| Type of injection                                              |                     | Common Rail direct injection with high pressure injection pump                                                                                                                                                                                                                                                                            |                   |                    |
| Type of fuel                                                   |                     | The engine has been designed to be powered by standard fuels available on the European market (according to specifications DIN EN 590). If it is to be powered by BIODIESEL fuels (according to specifications UNI EN 14214), it can be mixed, up to 5%, with fuel available on the European market (according to regulation DIN EN 590). |                   |                    |
|                                                                |                     |  <b>IMPORTANT</b><br><b>Do not use fuels with specifications other than those indicated.</b>                                                                                                                                                           |                   |                    |

**GB**

|                                                                                 | Unit of<br>measure-<br>ment | R754TE4                                                                                                                                                                                                         | R754IE4 | R754ISE4 |
|---------------------------------------------------------------------------------|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|----------|
| Lubrication circuit                                                             |                             |                                                                                                                                                                                                                 |         |          |
| Type of lubrication                                                             |                             | Forced lubrication                                                                                                                                                                                              |         |          |
| Circuit fuel supply                                                             |                             | Rotor pump                                                                                                                                                                                                      |         |          |
| Oil change including filter<br>(standard sump)                                  | liters (kg)                 | 11 (9.57)                                                                                                                                                                                                       |         |          |
| Oil quantity at minimum level<br>(standard sump)                                | liters (kg)                 |                                                                                                                                                                                                                 |         |          |
| Oil quantity at maximum level<br>(standard sump)                                | liters (kg)                 |                                                                                                                                                                                                                 |         |          |
| Oil pressure at minimum speed<br>(with started engine)                          | bar                         | 2                                                                                                                                                                                                               |         |          |
| Oil cooling                                                                     |                             | Oil/water cooler                                                                                                                                                                                                |         |          |
| Cooling circuit                                                                 |                             |                                                                                                                                                                                                                 |         |          |
| Total capacity of cooling circuit<br>(excluding radiator and relevant<br>pipes) | liters                      | 5                                                                                                                                                                                                               |         |          |
| Setting pressure of the expansion<br>tank plug                                  | bar                         | 1,1                                                                                                                                                                                                             |         |          |
| Coolant                                                                         |                             | 50% demineralised or distilled water and 50%<br>Petronas Paraflu Up (protective radiator fluid<br>with monoethylene glycol and organic inhibitor<br>formulation complying with ASTM D 3306 type 1<br>Standards) |         |          |
| Coolant maximum temperature<br>alarm                                            | °C                          | 107                                                                                                                                                                                                             |         |          |
| Electric system                                                                 |                             |                                                                                                                                                                                                                 |         |          |
| Nominal voltage                                                                 | V                           | 12                                                                                                                                                                                                              |         |          |
| Alternating current generator<br>(nominal voltage)                              | V                           | 14                                                                                                                                                                                                              |         |          |
| Alternating current generator<br>(nominal current)                              | A                           | 110                                                                                                                                                                                                             |         |          |
| Starter motor output                                                            | kW                          | 2,5                                                                                                                                                                                                             |         |          |
| Recommended battery capacity                                                    | Ah                          | 140                                                                                                                                                                                                             |         |          |
| Battery breakaway current                                                       | A                           | 950                                                                                                                                                                                                             |         |          |
| Suction circuit                                                                 |                             |                                                                                                                                                                                                                 |         |          |
| Maximum depression allowed with<br>new air filter                               | mbar                        | 30                                                                                                                                                                                                              |         |          |

**SAFETY INFORMATION****GENERAL SAFETY WARNINGS**

–During the design and construction phases, the Manufacturer paid special attention to the aspects which are liable to cause any risk for the safety and health of people interacting with the engine. Besides complying with the relevant legislation in force, he followed all the “rules for a good construction technique”. The purpose of this information is making users aware of the need to pay the utmost attention to prevent any risk. Caution is however imperative. Safety also depends on all the operators who interact with the engine.

–Read carefully the instructions contained in the manual supplied and those applied on the engine, in particular follow those concerning safety. Spend some of your time reading the instructions to avoid unpleasant accidents.

–Pay attention to the meaning of the symbols in the applied plates; their shape and colour have a specific meaning related to safety. Keep them visible and follow the stated information.

–Use the engine only for the tasks authorised by the manufacturer and do not tamper with any device to achieve a different performance from the intended one.

– The staff carrying out any type of intervention throughout the life of the engine should have precise technical skills, specific abilities and experiences acquired and acknowledged in this sector. The lack of these requirements may cause damages to people's safety and health.

–All the installation phases should have been taken into account since the development of the initial project. The designer has to observe with the engine fixing points and the general indications provided by the manufacturer.

–Carry out the handling of the engine in compliance with the information stated directly on the engine, on the packaging and in the operating instructions supplied by the manufacturer.

–When lifting or transporting unpacked engines use means of appropriate load capacity which must be properly anchored.

–When lifting and transporting packaged engines, means of appropriate load capacity as stated on the packaging itself.

–Before carrying out other transfers, create the conditions required to guarantee stability and to prevent any engine part from being damaged.

–Before starting the installation, the installer has to implement a “safety plan” and to follow the designer's indications. Do not make changes to the engine components for any reason.

– It is necessary to make sure that the installation area is fitted with all intake, fuel supply and exhaust connections.

–The manufacturer cannot be held responsible for any damage resulting from the misuse of the engine, from the failure to follow the indications contained in this manual and from any tampering with or change made without the manufacturer's authorization.

**GB**

–If appropriate, before using the engine for the first time, after gathering all the necessary information, simulate a few trial manoeuvres to identify the controls and their main functions, especially those related with starting and stop operations.

–Do not operate the engine in a closed and insufficiently ventilated environment; the exhaust fumes are harmful and can have serious consequences on people's health.

–Do not keep using the engine if anomalies are detected and in particular if suspect vibrations occur.

–In case of anomaly, stop immediately the engine or reduce the speed as much as possible and reach the closest assistance centre.

–Start again the engine only when the normal operating conditions have been restored.

–Unless otherwise stated, all interventions should be carried out when the engine has been stopped, cooled down and the ignition key has been removed. Those authorized to carry out these interventions should follow all the precautions needed to guarantee the safety of the people involved, in compliance with the require-

ments laid down in the applicable legislation regarding safety at the workplace.

–Keep the equipment as much efficient as possible and carry out the scheduled maintenance operations established by the manufacturer. A good maintenance will ensure the highest performance, a longer working lifetime and a constant compliance with safety requirements.

–Replace any worn part with original spare parts. Use the oils and greases recommended by the manufacturer. All this will ensure the engine good operation and the prescribed safety level.

–Do not throw away any polluting material in the environment. Carry out their disposal in compliance with the relevant legislation in force.

–During all maintenance operations always use the individual protection clothing and/or devices indicated in the operating instructions supplied by the manufacturer and those provided by the applicable legislation concerning safety at the workplace.

–All maintenance operations should be carried out by using suitable and efficient equipment and tools.

## **SAFETY WARNINGS FOR THE ENVIRONMENTAL IMPACT**

Each organization is responsible for implementing procedures aimed at identifying, evaluating and controlling the environmental impact of its own activities (products, services, etc.).

The procedures to be followed to identify any significant environmental impact should take into account the following factors:

- Emissions in the atmosphere
- Discharged liquids

–Waste disposal

–Soil contamination

–Use of raw materials and natural resources

– Local problems related to the environmental impact

In order to reduce the environmental impact, the manufacturer provides below a few indications to be taken into account by all those who will interact with the engine throughout its expected life.

–All packaging components should be disposed of in accordance with the legislation in force in the country where disposal takes place.

–When installing the engine, ensure a suitable air renewal in the environment to protect the operators from a high concentration of harmful substances.

–During operation and maintenance, do not throw away polluting products (oils, greases, etc) in the environment and carry out the differentiated waste disposal

according to the composition of the different materials and in compliance with the legislation in force. Electric and electronic components should be carried out as special waste.

–Keep the exhaust pipelines efficient to limit the noise level of the engine and to reduce atmospheric pollution.

–While decommissioning the engine, divide all the components depending on their chemical composition and dispose of them accordingly.

### SAFETY WARNINGS FOR THE ELECTRICAL EQUIPMENT

The electrical equipment was designed and manufactured according to the provisions of the standards in force on the matter. The list specifies some warnings to be complied with for the correct operation of the electrical equipment.

–Do not use boosters or quick starters to start the engine.

–Do not disconnect the electrical power supply when the engine is ON.



#### **Important**

**Before disconnecting the electrical power supply, turn off the engine and wait for at least 30 sec. so that the electronic control unit can perform the “after -run” procedure.**

**–Before performing arc welding on the frame where the engine is installed, ALWAYS disassemble the electronic control unit and protect all electrically connected devices that are installed close to the negative pole (mass).**



### RESIDUAL RISKS

During the design and construction phases, the Manufacturer paid special attention to the aspects which are liable to cause any risk for the safety and health of people interacting with the engine.

Despite this, some potential and hidden risks still exist.

#### **Danger of injuring your arms**

Do not put your hands inside any moving part.

#### **Danger of being burnt**

Pay attention to hot surfaces

## HANDLING AND INSTALLATION INFORMATION

### RECOMMENDATIONS FOR HANDLING AND INSTALLATION

Carry out handling and installation following the information provided by the manufacturer and stated directly on the packaging and operating instructions.

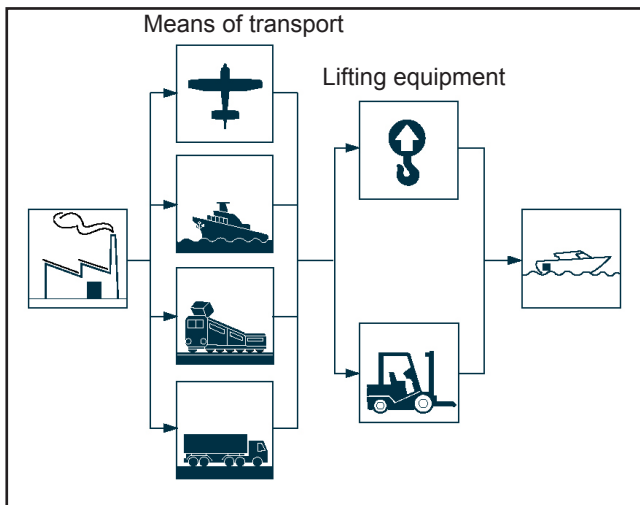
Those authorized to carry out these operations should prepare, if necessary, a "safety plan" to protect and the safety of people directly involved.

### PACKAGING AND TRANSPORT

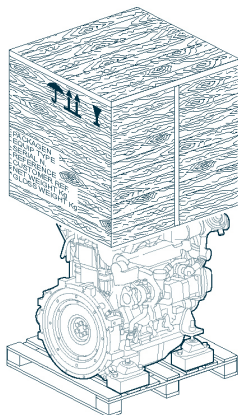
The packaging is also made according to the type of transport chosen to keep sizes as small as possible.

- By road
- By railway
- By sea
- By air

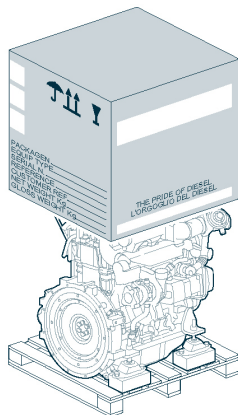
The engine can be transported with different types of packaging according to the destination, the transport system and preset technical-commercial specifications.



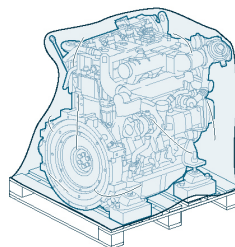
#### PACKAGING WITH WOODEN



#### PACKAGING WITH CARDBOARD BOX



#### PACKAGING WITH CELLOPHANE

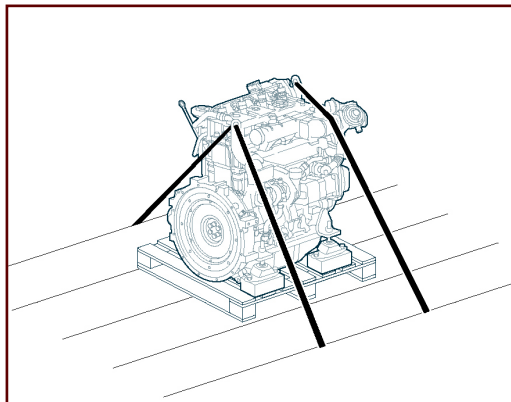


In order to guarantee the perfect conservation of all engine components, an “overseas” packaging should be used in case of maritime transport.

The packaging contains all the information needed to carry out the loading and unloading operations.

During transport, make sure the load is properly secured to the means of transport to avoid unexpected displacements.

When transporting the uncovered engine by road, use the lifting points provided to secure it steadily and prevent components from being damaged.


**GB**

## UNPACKING

Follow the procedure below.

1- Remove the cover of the packaging.

The packaging includes a bag with all the relevant technical documentation and standard components.

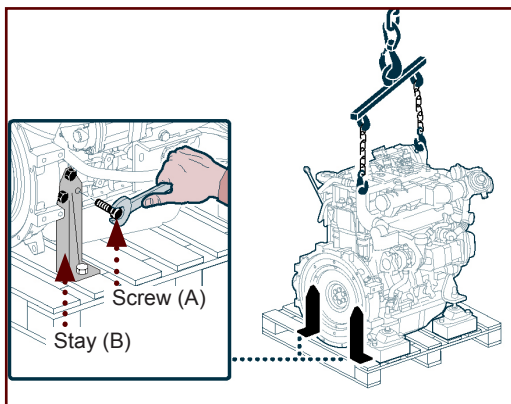
2- While unpacking, make sure the components are intact and their quantity is correct.

3- Place the lifting device as shown in the figure.

4- Loosen the screws (A) and disassemble the side supports (B).

5- Move the engine to the installation area.

If necessary, keep the material in case you need to pack the engine in the future.



### Important

**In case of any damage or missing part, contact the manufacturer's Assistance Service to establish the procedure to be adopted.**

**The packaging material should be suitably eliminated in compliance with the applicable legislation.**

## HANDLING AND LIFTING

Secure the engine with a lifting device (lifting beam) of appropriate capacity.



### Important

The angle formed by the lifting device chains must not exceed 5°, as shown in the figure.

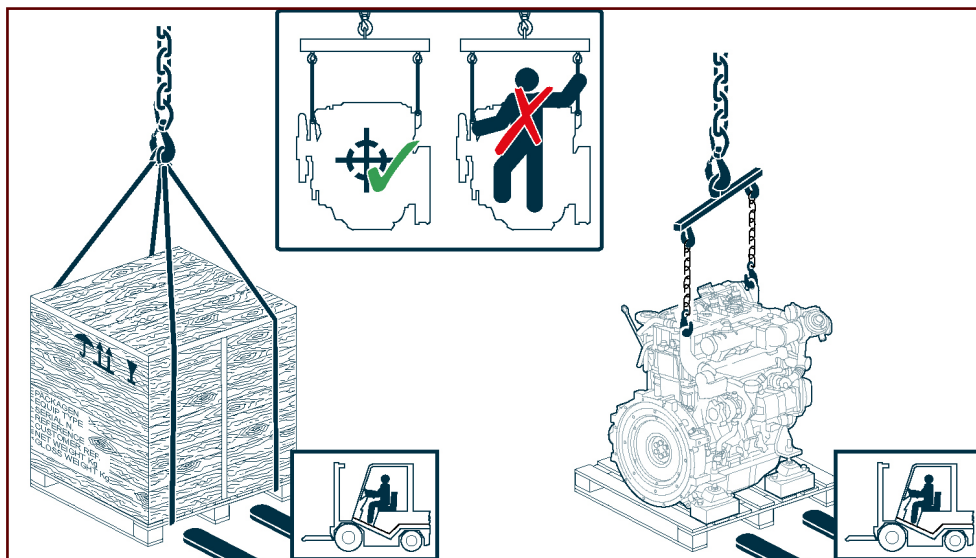
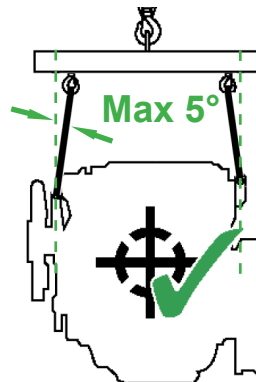
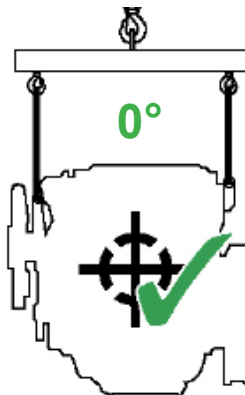
–Hook the lifting device to the fixing points as shown in the figure.

–Before carrying out the lifting, identify the barycentre position of the load.



### Important

The brackets of the fixing points have been designed to lift the engine only without any additional weight. Do not lift the engine using a different procedure from the prescribed one; otherwise, the warranty for damages will be invalidated.



## ENGINE STORAGE

The manufacturer supplies the engine with a protection treatment which is valid for 6 months from the delivery date.

**If the engine is still not being used 6 months after delivery, then a specific “protection procedure” must be carried out in order to extend the storage period for a further 6 months.**



### Caution - Precaution

The staff carrying out any type of intervention throughout the life of the engine should have precise technical skills, specific abilities and experiences acquired and acknowledged in this sector. The lack of these requirements may cause damages to people's safety and health.

**VM Motori recommends that this protection procedure is only carried out by VM-authorised personnel.**



### Important

– All packaging components should be disposed of in accordance with the legislation in force in the country where disposal takes place.

**The protection procedure is only considered complete when all the following tasks have been performed:**

- 1) protection against external corrosion**
- 2) protection against internal corrosion**
- 3) packaging and storage**

**This procedure is valid for the following engine situations:**

- on a vehicle
- on a pallet

**For engines on pallets, it is necessary to install the following accessories for engine start-up:**

- battery
- fuel tank
- cooling radiator (for liquid-cooled engines only)
- command belt for the alternating current generator
- command belt for the water pump (for liquid-cooled engines only)

## 1) EXTERNAL PROTECTION

**UNPAINTED SURFACES:** the unpainted metal components and surfaces (for instance the engine handwheel) must be protected with “FL MECA FLUID / P118V” anticorrosion oil.

**RUBBER COMPONENTS:** unpainted manifolds and pipes must be protected with talcum powder. Check the tightening of the relative fixing clips.

**DRIVE BELTS:** after applying the internal protection, remove the belts and put them into storage. Protect the surfaces of the metal pulleys with “FL MECA FLUID / P118V” spray.

**ENGINE OPENINGS:** Seal all the engine openings, including the exhaust. Use cardboard, plywood or metal covers, making sure they do not leave behind any fragments of material. All the engine openings (e.g. air suction ducts or turbocharger air inlet) must be protected with covers or guards to prevent the entry of solids, liquids or dusts that delay the evaporation of the anticorrosion agents. Apply plugs to the fuel inlet and outlet pipes of the injection system.

**BATTERY:** Disconnect the battery. When it is fully charged, store it in a safe place. Before doing this, protect the terminals against corrosion by applying an anti-rust spray.

## 2) INTERNAL PROTECTION

**COMBUSTION CHAMBER:** Remove the heating glowplugs from the head, check the piston is in its lowest stroke position (lower standstill point), then spray with Petronas PROT 30 M protective oil. Repeat the operation for the other cylinders, then reinstall the glowplugs.

**TURBOCHARGER:** Remove the inlet plug from the pipe that delivers oil to the turbocharger, and fill with Petronas PROT 30 M protective oil. Replace the inlet plug, applying the correct tightening torque.

**ELECTRIC COMPONENTS:** Apply anti-corrosion spray to the electric contacts and connectors.

**AIR SUCTION SYSTEM:** check the air filter is in good condition, and no foreign bodies/liquids are present:

- If the air filter is damaged, replace it
- If there are any foreign bodies, remove them

**LUBRICATION SYSTEM:** this procedure must be carried out together with the injection system protection procedure.

- Using the oil dipstick and check whether there is engine oil in the sump.
- Drain the oil from the sump.
- Fill the engine with Petronas PROT 30 M protective oil.

- Check the coolant level (for water-cooled engines only). The coolant mixture must be 50% demineralised or distilled water and 50% Petronas Paraflu Up (protective radiator fluid with monoethylene glycol and organic inhibitor formulation complying with ASTM D 3306 type 1 Standards).

- Start up the engine and run it until it reaches the right temperature for water-cooled engines (about 70°- 80°C); for air-cooled engines, run the engine for about 20 (twenty) minutes.

- With the engine up to temperature, carry on for about 5 minutes so that the system components are lubricated.

- Switch off the engine and wait for it to cool down.

- Drain the oil from the sump.

- Drain off the coolant.

- Check for any fluid leakage (and make any necessary repairs).

- Disconnect the engine from all the components used for the test.

**INJECTION SYSTEM:** this procedure must be carried out together with the lubrication system protection procedure.

- Make sure there are no deposits or sediments in the fuel tank.
- Prepare a mixture of diesel fuel complying with the DIN EN 590 specifications, and Petronas DIESEL TMF PLUS additive. The ratio must be at least 1:400 (1 litre of additive to 400 litres of fuel). If you use Biodiesel (complying with the UNI EN 14214 specifications), it must be mixed with diesel fuel up to 5%;

**Important**

VM Motori, however, recommends the use of diesel without Biodiesel.

**Important**

The use of any other fuel is forbidden.

- Fill the tank with this fuel mixture.
- Where relevant, check there is no interference between the radiator fan blades and the relative air duct.

Start up the engine and run it until it reaches the right temperature for water-cooled engines (about 70°- 80°C); for air-cooled engines, run the engine for about 20 (twenty) minutes.

- Drain the fuel tank.
- Check for any fluid leakage (and make any necessary repairs).
- Switch off the engine and wait for it to cool down.

**SEAWATER SYSTEM** (for marine engines and on-board auxiliary units only): this procedure must be carried out together with the injection system protection procedure.

- Connect the seawater intake of the seawater pump to an auxiliary tank

containing a mixture of 40% freshwater and 60% Petronas Paraflu Up (protective radiator fluid with monoethylene glycol and organic inhibitor formulation complying with ASTM D 3306 type 1 Standards), making sure it seeps out from the drainage point.

- Check for any fluid leakage (and make any necessary repairs).
- Switch off the engine and wait for it to cool down.
- Disconnect the engine from all the components used for the test

**3) STORAGE CONDITIONS****- Engines on pallets**

After applying the anticorrosion protection, the engine must be placed in a dry, well-ventilated environment and adequately covered. The covering must be applied in such a way that air can circulate around the engine, preventing the formation of condensation.

**- Engines on vehicles**

The vehicle must be stored so as to minimise exposure to atmospheric agents

**START-UP****- Engines on pallets**

Remove the covers and protective elements applied to the engine openings (for instance, air suction ducts or turbocharger air inlet, exhaust gas ducts or turbocharger guard).

Check there is no damage to the external engine components; make any necessary repairs.

Clean the throats of the metal belt pulleys, using a suitable solvent. Install the service belts

Check the rubber tubes and manifolds are in good condition, and check the tightening of the relative fixing clips; if they are damaged, replace them.

All surfaces and components protected with "FL MECAFLUID / P118 V" protective oil can be cleaned with a suitable solvent.

Check the level of the fluids: engine oil and coolant. Top up if necessary.

**- Engines on vehicles**

Check there is no damage to the external engine components; make any necessary repairs.

Clean the throats of the metal belt pulleys, using a suitable solvent. Install the service belts.

Check the rubber tubes and manifolds are in good condition, and check the tightening of the relative fixing clips; if they are damaged, replace them.

All surfaces and components protected with "FL MECAFLUID / P118 V" protective oil can be cleaned with a suitable solvent.

Check the level of the fluids: engine oil and coolant. Top up if necessary.

**Important**

Nothing needs to be done to remove the internal protection (either for engines on pallets or on vehicles).

## INSTALLATION DESIGN

In order to ensure the highest performance while protecting people, the product itself and the environment, a full project has to be developed before carrying out the installation.

The design phase should take into account the technical data of the engine (see "Technical data") and all the risks which may occur during its expected lifetime, from installation to disposal.



### Important

**During the design and installation phases, it is advisable to consult the service manual supplied by VM MOTORI S.P.A..**

Further information are available in the website: [www.vmmotori.it](http://www.vmmotori.it), in the "Contacts – Request Info" section.

**GB**

## OPERATING INFORMATION

### RECOMMENDATIONS FOR USE AND OPERATION

**GB**

The engine has been designed and manufactured to satisfy all the operating conditions indicated by the manufacturer.

Tampering with any device to achieve a different performance from the intended one can entail risks for people's safety and health as well as economic damages.

### RECOMMENDATIONS FOR USE

The engine is delivered by the factory in the running order.

However, during operation the following indications should be observed:

1- During running-in (first 50 working hours) and throughout the engine lifetime, carry out the maintenance in compliance with the intervals established by the manufacturer. (See "Engine maintenance")

2- Avoid using the engine at the highest speed for prolonged periods during running-in.

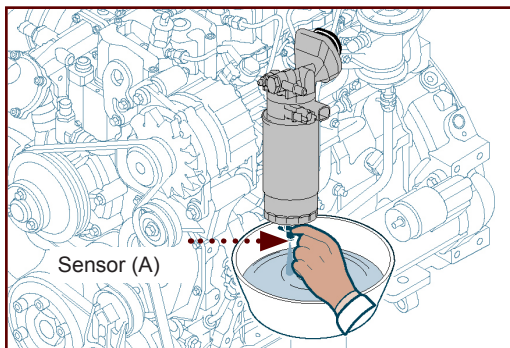
3- If the engine is not regularly used, it is advisable to start and take it to the working temperature (70÷80°C) at least once a month.

4- DO NOT use the engine at maximum performances before it has reached the working temperature (70÷80 °C).

5- When starting the engine for the first time, run it at no-load for a few minutes and make sure that the oil pressure value matches the one stated in the table. (See "Technical data )" - "Lubrication circuit")

6 - In the event that the ambient temperature is low during use, proceed as follow:

- ☐ preheat the engine adequately.
- ☐ when ambient temperatures are lower than -10°C, contact the manufacturer of the vehicle regarding the installation of devices which facilitate start-up and prevent ice forming in the engine oil vapour recovery



7 - Use oils and lubricants with suitable features (viscosity grade, specifications and operating temperature). (See "Recommended lubricants")

8 - If the "water in fuel" indicator lights up, proceed as follows:

- Turn off the engine and remove the ignition key.
- Let the engine cool down adequately to avoid being burnt.
- Prepare a container of appropriate capacity.
- Unscrew the water sensor (A) of the filter and let the fuel flow until it proves to be water-free.
- Screw the sensor (A) back.


**Important**

Be careful to ensure that the fuel in the filter does not drain completely out. If it does, remove it (see “Fuel filter replacement.”), fill it manually and then repeat the bleeding operation. Do not throw away any polluting material in the environment. Carry out their disposal in compliance with the relevant legislation in force.

9 - When an alarm signal (visual and/or acoustic) is triggered by the control panel this indicates that there is a malfunction of some kind.


**Caution - Precaution**

In the presence of anomalies, the electronic engine management system activates protective strategies and also the limitation of the engine performances if necessary.

In these conditions it is possible to check the ignition of the indicator light (MIL) for the engines R750EU5 or of the system indicator light (SYS) for the engines R750TE3-IE3, R750TE4-IE4-ISE4.

Do not continue to use the engine with the MIL indicator light on, instead contact an authorized VM Motori assistance centre.

Do not attempt to disconnect the MIL indicator light sensor in order to clear the signal. VM Motori does not assume any liability for economic damages or risks to personal safety. For more information, refer to the documentation provided by the manufacturer of the vehicle/device in which the engine is installed.

To solve the problem, proceed as indicated.

– Turn off the engine.

– Consult chapter “INFORMATION ABOUT FAILURES” for the action to be taken and details of how to deal with the causes that triggered the state of emergency.

– In case of doubts, never operate directly, but contact a VM authorised workshop.


**Important**

If the engine is not regularly used, it is advisable to start and take it to the working temperature (70÷80°C) at least once a month.

If the engine is installed for use in emergencies, for example in the case of generators, it must be started at least once per month.

## OPERATING THE ENGINE UNDER SPECIFIC CONDITIONS

The engine performance is affected by fuel temperature, the temperature and relative humidity of incoming air and altitude.

When using the engine at high altitudes and high air and fuel temperatures, the output is reduced.

For further information contact a VM MOTORI S.P.A. assistance centre.

## REGENERATION OF THE PARTICLE FILTER

The "Regeneration of the particle filter" is the burning operation of the particles that periodically accumulate in the filter.

### R750EU5



#### Important

**R750EU5 engines have an automatic particulate filter regeneration system that can only be activated while the vehicle is running. During this phase, the filter casing reaches temperatures of around 500°C.**



#### Caution - Precaution

**During the particulate filter regeneration phase, do not park the vehicle on surfaces containing flammable materials, which may burn on contact with the exhaust system.**

### R750IE4

In some applications, there may be an indicator light in the instrument panel of the vehicle which indicates the clogging of the particulate filter .

In the event of activation of this indicator light, for the regeneration of the particulate filter it is recommended to drive the vehicle at medium-high engine load, until the indicator light turns off.

For more information refer to the instruction book for use and maintenance of the vehicle or contact the customer service network.

In some applications a button may be available for manual regeneration of the particulate filter: to use this button refer to the instruction book for use and maintenance of the vehicle.



#### Important

**R750IE4 engines have an automatic particulate filter regeneration system that can only be activated while the vehicle is running. During this phase, the filter casing reaches temperatures of around 500°C.**



#### Caution - Precaution

**During the particulate filter regeneration phase, do not park the vehicle on surfaces containing flammable materials, which may burn on contact with the exhaust system.**

## REFUELLING

During refuelling, make sure the fuel does not contain any residue; in this case use specific filters.

– Avoid using fuel mixed with water or other substances which may damage the engine.

– The engine has been designed to be powered by standard fuels available on the European market (according to specifications EN 590). If it is to be powered by BIODIESEL fuels (according to specifications UNI EN 14214), it can be mixed, up to 5%, with fuel available on the European market (according to regulation EN 590).



### Caution - Precaution

**Do not use fuels with specifications other than those indicated.**

– For engines model R754EU5 - R756EU5 - R754TE4,IE4,ISE4, use fuel with a low sulphur content. The percentage sulphur must never exceed 10-50 ppm (parts per million).



### Caution - Precaution

**If the percentage sulphur contained in the fuel exceeds the value indicated, the antiparticulate filter will not work properly.**



### Danger - Warning

**All fuels are inflammable. Any fuel leaking or dropping on hot surfaces and electric components can cause fires. Do not smoke when refuelling or nearby any filling station.**

## ENGINE IGNITION AND TURNING OFF

The engine is not fitted with a control panel.

For information on the commands and control devices, please see the documentation provided by the manufacturer of the vehicle/ device in which the engine is installed.



### Important

**In the case of turbocharged engines, before switching the engine off it should be run at minimum idle speed for a few minutes in order to avoid damaging the turbocharger.**

## MAINTENANCE INFORMATION

### RECOMMENDATIONS FOR MAINTENANCE

**GB**

Keep the equipment as much efficient as possible and carry out the scheduled maintenance operations established by the manufacturer. A good maintenance will ensure the highest performance, a longer operating lifetime and a constant compliance with safety requirements.



#### **Caution - Precaution**

**Unless otherwise stated, all interventions should be carried out when the engine has been stopped, cooled down and the ignition key has been removed.**

**Those authorized to carry out these**

**interventions should follow all the precautions needed to guarantee the safety of the people involved, in compliance with the requirements laid down in the applicable legislation concerning safety at the workplace.**



#### **Important**

**For each maintenance operation, fill in the "Periodic maintenance operation record sheet" provided, so as to keep a trace of the operations performed and therefore establish the most suitable methods for future operations.**

### ENGINE MAINTENANCE

The maintenance operations are subdivided into:

- Maintenance during running-in (first 50 hours)
- Routine maintenance (after running-in)

The frequency stated in the "routine maintenance" table should be applied to engines which are used regularly.

Some lubricants or components lose their characteristics over time even if the engine is left idle for long periods; therefore, maintenance intervals should be established considering that these parts need to be replaced not only on the basis of their hours of operation but of ageing as well.

The approximate maximum time during which the chemical-physical characteristics of a few components or lubricants are maintained is stated below.

- 1 year – Lubricant oil
- 1 year - Fuel filter cartridge
- 2 years – Coolant

**MAINTENANCE DURING RUNNING-IN (FIRST 50 HOURS)**

**Important**

For each maintenance operation, fill in the “Periodic maintenance operation record sheet” provided, so as to keep a trace of the operations performed and therefore establish the most suitable methods for future operations.

**GB**

| Frequency (1)                                              | Component              | Type of intervention                                              | Intervention procedures                                       | Reference                                      |
|------------------------------------------------------------|------------------------|-------------------------------------------------------------------|---------------------------------------------------------------|------------------------------------------------|
| <b>Every 10 hours (Every day)</b>                          | Engine oil (2)         | Level control                                                     | Top up, if necessary                                          | See Engine oil level control                   |
|                                                            | Coolant (4)            | Level control                                                     | Top up, if necessary                                          | See Engine coolant level check                 |
|                                                            | Air filter             | Check it is clean                                                 | Clean with low pressure compressed air.                       |                                                |
|                                                            |                        | Check the clogging indicator that is installed on the filter body | Clean the filter or, if necessary, replace it with a new one. | See Cleaning and replacement of the air filter |
|                                                            | Coolant fluid radiator | Check it is clean                                                 | Clean with a soft brush                                       |                                                |
| <b>After the first 50 hours (at the end of running-in)</b> | Oil filter (3)         | Replacement                                                       |                                                               | See Oil filter cartridge replacement           |

(1) If an hour counter is not available, the frequency of the interventions should be calculated on the basis of a calendar day: one calendar day corresponds to 12 hours of operation.

(2) In hard working conditions, such as dusty environments and operation with extreme loads, change the oil of the engine and the oil filter every 150 working hours. If the engine has not worked for the specified time, it will be necessary to replace the oil and the filter all the same once a year.

(3) If the engine has not been in operation for the length of time indicated, the filter must still be changed at least once every 12 months.

(4) If the engine has not been in operation for the length of time indicated, the fluid must still be changed at least once every 24 months.

(5) If the engine has not been in operation for the length of time indicated, the belt must still be changed at least once every 24 months

**Periodic maintenance operation record sheet**

**Important**

For each maintenance operation, fill in the sheet, so as to keep a trace of the operations performed and therefore establish the most suitable methods for future operations.

**ROUTINE MAINTENANCE (AFTER RUNNING-IN)**

**Important**

For each maintenance operation, fill in the “Periodic maintenance operation record sheet” provided, so as to keep a trace of the operations performed and therefore establish the most suitable methods for future operations.

**GB**

| Frequency (1)              | Component                               | Type of intervention                                              | Intervention procedures                                       | Reference                                        |
|----------------------------|-----------------------------------------|-------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------|
| <b>Every 10 hours</b>      | Engine oil (2)                          | Level control                                                     | Top up, if necessary                                          | See “Engine oil level control”                   |
|                            | Coolant (4)                             | Level control                                                     | Top up, if necessary                                          | See “Engine coolant level check”                 |
|                            | Air filter                              | Check it is clean                                                 | Clean with low pressure compressed air.                       |                                                  |
|                            |                                         | Check the clogging indicator that is installed on the filter body | Clean the filter or, if necessary, replace it with a new one. | See “Cleaning and replacement of the air filter” |
|                            | Coolant fluid radiator                  | Check it is clean                                                 | Clean with a soft brush                                       |                                                  |
| <b>Every 300 hours (6)</b> | Engine oil (2) (6)                      | Replace                                                           |                                                               | See “Engine oil change”                          |
|                            | Oil filter                              | Replace the cartridge                                             |                                                               | See “Oil filter cartridge replacement”           |
|                            | Air filter                              | Replace the main cartridge                                        |                                                               | See “Cleaning and replacement of the air filter” |
|                            |                                         | Check if the safety cartridge is clean                            | Clean with low pressure compressed air.                       | See “Cleaning and replacement of the air filter” |
|                            | Fuel filter                             | Replace                                                           |                                                               | See “Fuel filter replacement.”                   |
|                            | Air intake circuit and intercooler pipe | Check it is clean<br>Check of pipe sealing                        |                                                               |                                                  |
|                            | Dust discharge circuit                  | Check it is clean                                                 |                                                               |                                                  |
|                            | Oil separation circuit                  | Check of pipe sealing                                             |                                                               |                                                  |
|                            | Vacuum circuit                          | Check of pipe sealing                                             |                                                               |                                                  |

| Frequency (1)    | Component                    | Type of intervention                                            | Intervention procedures         | Reference                           |
|------------------|------------------------------|-----------------------------------------------------------------|---------------------------------|-------------------------------------|
| Every 900 hours  | Drive belt (type Poly-V) (5) | Replace                                                         |                                 | See "Changing t belt (type Poly-V)" |
|                  | fuel tank                    | Clean the fuel tank and check the efficiency of the filler cap. |                                 |                                     |
|                  | Air filter                   | Replace the clogging indicator                                  |                                 |                                     |
| Every 1200 hours | Coolant (4)                  | Replace                                                         |                                 | See "Coolant replacement"           |
| Every 4000 hours | Antiparticulate filter       | Perform the regeneration                                        | Apply to an authorised workshop |                                     |
| Every 4000 hours | Engine                       | Performing partial overhaul                                     | Apply to an authorised workshop |                                     |
| Every 8000 hours | Engine                       | Performing general overhaul                                     | Apply to an authorised workshop |                                     |

(1) If an hour counter is not available, the frequency of the interventions should be calculated on the basis of a calendar day: one calendar day corresponds to 12 hours of operation.

(2) In hard working conditions, such as dusty environments and operation with extreme loads, change the oil of the engine and the oil filter every 150 working hours. If the engine has not worked for the specified time, it will be necessary to replace the oil and the filter all the same once a year.

The engine oil must in any case be changed, even before the time limit indicated in the scheduled

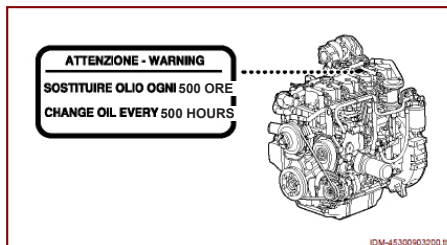
maintenance programme, if the MIL  indicator light comes on with the ECU error 252F - "Engine oil critical mass".

(3) If the engine has not been in operation for the length of time indicated, the filter must still be changed at least once every 12 months.

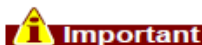
(4) If the engine has not been in operation for the length of time indicated, the fluid must still be changed at least once every 24 months.

(5) If the engine has not been in operation for the length of time indicated, the belt must still be changed at least once every 24 months

(6) In engine R756EU5 models with a high capacity oil sump, a special plate is applied on the cover of the engine valves to indicate that the engine oil and the oil filter must be changed every 500 hours instead of every 300.



#### Periodic maintenance operation record sheet



**For each maintenance operation, fill in the sheet, so as to keep a trace of the operations performed and therefore establish the most suitable methods for future operations.**

## PERIODIC MAINTENANCE OPERATION RECORD SHEET



## Important

**Important** For each maintenance operation, fill in the sheet, so as to keep a trace of the operations performed and therefore establish the most suitable methods for future operations.

[illegible]

1) Indicate the total number of working hours..

[illegible]

**GB**

1) Indicate the total number of working hours..

**GB**

| Date | Hours<br>(1) | Type of maintenance performed | Signature and stamp of<br>workshop |
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1) Indicate the total number of working hours..

[illegible]

**GB**

1) Indicate the total number of working hours..

**GB**

| Date | Hours<br>(1) | Type of maintenance performed | Signature and stamp of<br>workshop |
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1) Indicate the total number of working hours..

## MAINTENANCE WHEN THE ENGINE IS LEFT IDLE

If the vehicle/equipment to which the engine is fitted remains inactive, certain maintenance operations must be carried out to ensure the engine remains in full working order.

If the engine is not used for short periods of time, carry out the following interventions:

1- Make sure the electric contacts are working properly and, if necessary, protect them with an anti-oxidant spray.

– Check the charge of the battery and the liquid level.

– If necessary, carry out the scheduled maintenance work (See “Engine maintenance”).



### Important

**It is advisable to start the engine bringing it to the operating temperature (70÷80°C) at least once per month. The engine must be started once per month if it is installed for emergency purposes.**

**If the engine needs to be used in emergency conditions, refer to the specific regulations concerning compulsory start-up: if there are no specific regulations, you are advised to start up the engine once a month.**

**If the engine is left idle for prolonged periods, carry out the engine protective treatment to guarantee its efficiency for 6 months and to avoid continuous control and maintenance interventions. If the engine is not used for a further period of time, check the need to repeat the protective treatment for other 6 months. (Vedi “Engine storage”).**

## WASHING THE ENGINE

In order to avoid irreversibly damaging the electrical and electronic components of the engine, do not spray high pressure jets of water or jets of vapour in the direction of these components.

Pay particular attention to:

- ☐ cable connection points and engine wiring electrical connectors
- ☐ alternator, starter motor,
- ☐ injection pump and related fuel supply pump,
- ☐ electro-injectors,
- ☐ electrical sensors installed on the engine,
- ☐ electronic engine management control unit,
- ☐ engine suction air filter and related air flow meter,
- ☐ fuel filter,

– If you decide to wash the engine, adequately protect the above listed components before washing.

– When washing is complete, start the engine and leave it running for a few minutes until it is completely dry.

## MAINTENANCE IN CASE OF ENGINE INACTIVITY

**GB**

After a period of inactivity, it is necessary to carry out a few maintenance interventions before starting the engine again to ensure its maximum efficiency conditions.

– Check the charge of the battery and the liquid level.

– Make sure the electric contacts are intact and properly working.

– Carry out the operation diagnosis of the engine.

– Check the oil level, and, if necessary, top up or replace it according to the established intervals (See “Routine maintenance (after running-in)”)

– Replace the oil filter according to the established intervals (See “Routine maintenance (after running-in)”)

– Check the coolant level, and if necessary, top up or replace it according to the established intervals (See “Routine maintenance (after running-in)”)

– Replace the fuel filter according to the established intervals (See “Routine maintenance (after running-in)”)

– Replace the air filter according to the established intervals (See “Routine maintenance (after running-in)”)

– Tension again the transmission belt

– Check the tightening of the hydraulic unions (See “Control screw tightening and union sealing”)

– Check the rubber gaskets and relevant fixing clips to ensure they are undamaged.

– Use a cloth soaked in a degreasing product to remove the external protective treatment.

– Start the engine and run it at minimum speed for a few minutes (See “Engine ignition and turning off”)

– If no anomalies are detected, bring the engine to its operating temperature (70÷80°C).

– Turn off the engine and check again the engine oil and coolant level.

## CHECKS AND CONTROLS

The list indicates some of the maintenance, testing and control operations to be carried out on the engine during normal operation.

- Fuel supply circuit bleeding
- Control screw tightening and union sealing
- Engine oil level control
- Engine coolant level check
- Procedure for loosening or tensioning the belt
- Engine oil change

- Coolant replacement
- Oil filter cartridge replacement
- Fuel filter replacement.
- Cleaning the antiparticulate filter



### Important

**For each maintenance operation, fill in the “Periodic maintenance operation record sheet” provided, so as to keep a trace of the operations performed and therefore establish the most suitable methods for future operations.**

## CONTROL SCREW TIGHTENING AND UNION SEALING

Follow the procedure below.

- 1- Start the engine and run it at minimum speed for a few minutes.
- 2-Run the engine at normal speed until the operating temperature ( $70\div 80^{\circ}\text{C}$ ) is reached.
- 3- Turn off the engine and let it cool down.

4-Make sure the fixing screws of the main parts are tightened properly.

5- Check the union sealing on the fuel supply circuit.

6- Check the tightening of the clamps.

7- Check any fluid leaks.

## FUEL SUPPLY CIRCUIT BLEEDING

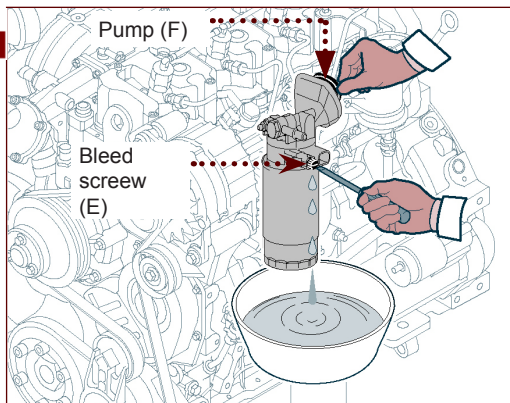


### Important

**This operation must be carried out each time the fuel cartridge is changed**

Follow the procedure below.

- 1- Turn off the engine and remove the ignition key.
- 2- Let the engine cool down adequately to avoid being burnt.



3- Prepare a container of appropriate capacity.

4- Loosen the screw (E).



### Caution - Precaution

**Do not loosen high-pressure pipe unions of the supply circuit (COMMON RAIL system).**

5- Operate the pump (F) manually to eliminate air from the circuit.

6- Check that a flow of clean fuel containing no air bubbles is coming out of the bleeder screw (E).



### Important

**Be careful to ensure that the fuel in the filter does not drain completely out. If it does, remove it (see "Fuel filter replacement."), fill it manually and then repeat the bleeding operation.**

7- Tighten the screw (E).

8- Wipe out the fuel residues before starting the engine.

## ENGINE OIL LEVEL CONTROL

Follow the procedure below.

1- Start the engine and bring it to the operating temperature (70÷80 °C).

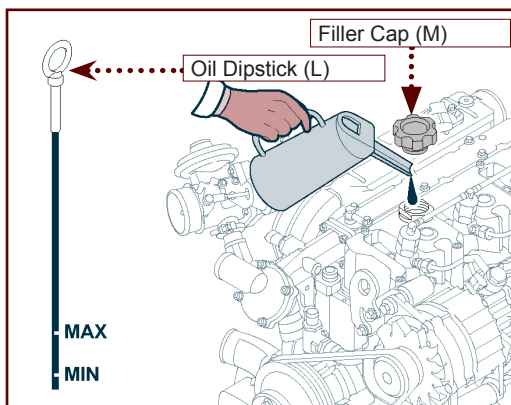
2- Turn off the engine and remove the ignition key.

3- Place the engine on a perfectly level surface.

4- Wait a few minutes so that all the oil will flow into the sump.

5- Remove the dipstick (L) and check the oil level.

6- Top up, if necessary, from plug (M). As for the oil quantity, see "Technical data".



### Important

**The oil level should be included between the minimum and maximum marks. Do not mix oils of different brands or with different features. (See "Recommended lubricants")**

## ENGINE COOLANT LEVEL CHECK

Follow the procedure below.

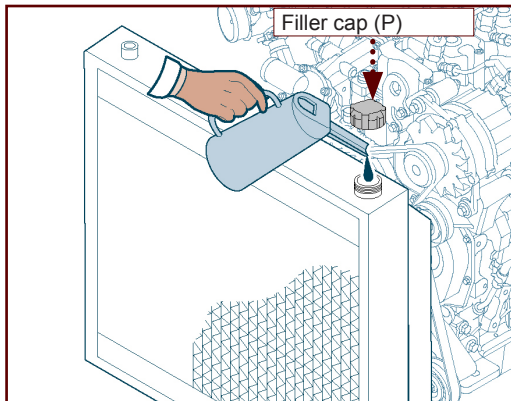
- 1- Start the engine and bring it to the operating temperature ( $70 \div 80$  °C).
- 2- Turn off the engine and remove the ignition key.
- 3- Let the engine cool down properly.
- 4- Unscrew the filling plug (P).



### Caution - Precaution

**Open the plug gently to drain the pressure.**

- 5- Top up, if necessary, from plug (P).  
As for the liquid quantity and type, see "Technical data".


**GB**


### Important

**The fluid level must be up to the base of the neck into which the radiator plug is screwed.**

**For further information, please consult the documentation provided by the manufacturer of the vehicle/device in which the engine is installed.**

## CLEANING AND REPLACEMENT OF THE AIR FILTER

The air filter is equipped with the indicator (A) that displays the relevant clogging level. Clean the filter as described when the indicator always keeps red coloured.

1- Unscrew the fastening screw (B) and disassemble the cyclone pre-separator filter (C).

2-Clean the filter with compressed air or with a water jet.

3-Remount filter (C) and fix it with the screw.

4- Open the fasteners (D) and disassemble the cover (E).

5- Remove the cartridge (F), and then clean it with an air jet directed to the exterior.

6- Check the wearing conditions of the cartridge and, if necessary, replace it.

7- Remove the cartridge (G), and then clean both the cartridge and the inside of the container with an air jet.



### Caution - Precaution

**When cleaning the container, pay attention so that no foreign body enters the intake duct.**

8- Re-assemble the cartridge (G).

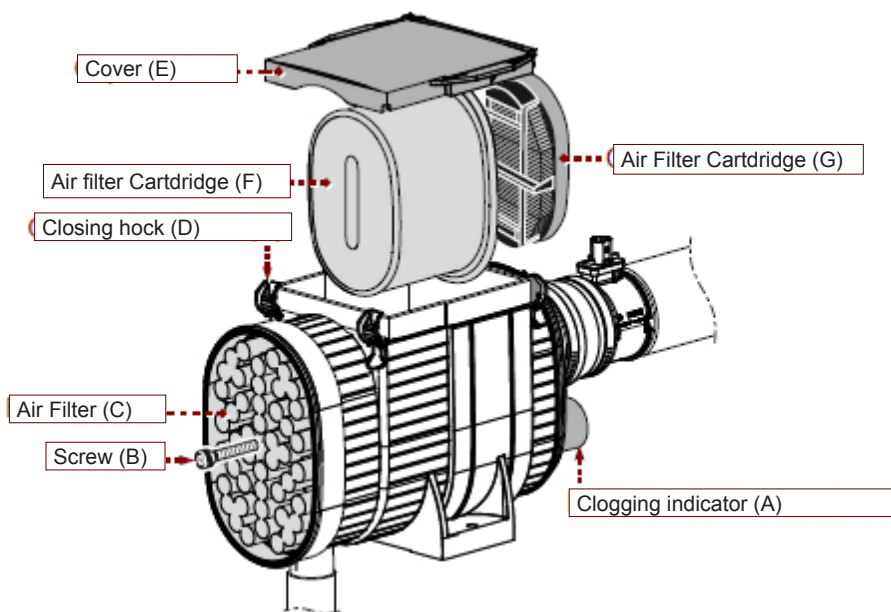


### Important

**After having replaced the main cartridge (F) two or three times, it is important to replace the safety cartridge (G), as well.**

9- Re-assemble the cartridge (F) and the cover (E).

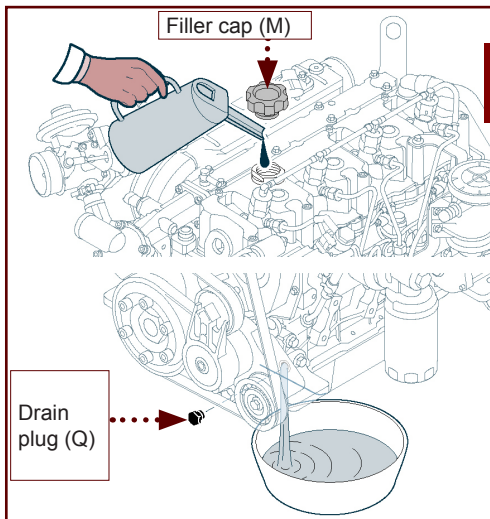
10-At the end of the operation, press the button of the indicator to reset its colour.



## ENGINE OIL CHANGE

Follow the procedure below.

- Start the engine and bring it to the operating temperature ( $70 \div 80$  °C)
- Turn off the engine and remove the ignition key.
- Let the engine cool down adequately to avoid being burnt.
- Prepare a container of appropriate capacity. (As for the oil quantity, see "Technical data".)
- Unscrew the load plug (M).
- Unscrew the exhaust plug (Q) and let all the oil flow into the container.
- Replace the gasket and screw plug (Q) back into place.


**GB**


### Important

**Lock the plug to a torque of 55 Nm.**

- Pour the new oil until it reaches the correct level on the dipstick. (See "Engine oil level control")
- Screw again the load plug (M).
- Start the engine and bring it to the operating temperature ( $70 \div 80$  °C). Check for any oil leaks.
- Turn off the engine and check the oil level. (See "Engine oil level control")

**ENGINE OIL DILUTION**

Reset the ECU parameters (carry out this operation after completing the engine oil change).

**Important**

In R750 EURO5 engines after each oil change the “Oil dilution calculation” function must be reset. The function is reset by the diagnosis tool available from authorised workshops or vehicle dealers. If the diagnosis tool is not available, the function can be reset using the following procedure:

1. Turn the ignition key to ON with the engine off
2. Press the accelerator pedal fully down (pedal from 0% to 100%)
3. Wait for 3 seconds before releasing the pedal.
4. Release the pedal, allow it to return to the initial position (0%) and wait a further 3 seconds before pressing it again.

Repeat the procedure described in points 2, 3 and 4, 5 times. In some applications the accelerator pedal procedure is not feasible: proceed using the manual accelerator potentiometer.

**VERIFICATION:** if the procedure has been done correctly, the engine oil low pressure light will flash three times for one second each, with a pause of 0.5 seconds. In some applications the verification is not feasible.

**Important**

Do not throw the oil in the environment but carry out its disposal in compliance with legislation in force in the country where it is used. Use the oils and lubricators recommended by the manufacturer. (See “Recommended lubricants”)

## COOLANT REPLACEMENT

Follow the procedure below.

- 1- Start the engine and run it at minimum speed for a few minutes. The cooling circuit reaches the operating pressure.
- 2- Turn off the engine and remove the ignition key.
- 3- Let the engine cool down adequately to avoid being burnt.
- 4- Prepare a container of appropriate capacity. As for the liquid quantity, see "Technical data".
- 5- Unscrew the load plug (P).



### Caution - Precaution

**Open the plug gently to drain the pressure.**

- 6- Open the cock (S).



### Important

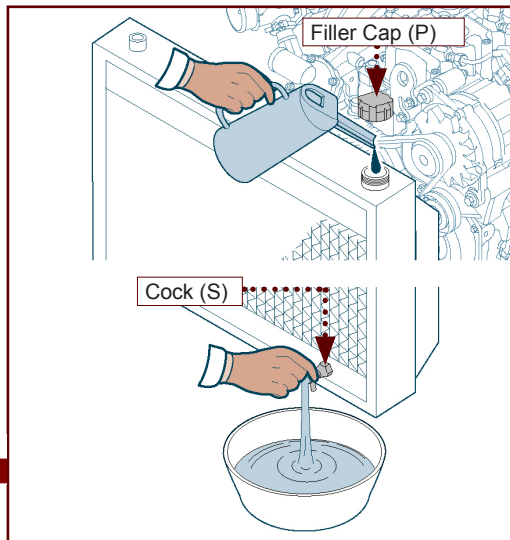
**If there is no coolant drainage tap, check to see if there is a drain plug. For further information, please consult the documentation provided by the manufacturer of the vehicle/device in which the engine is installed.**

- 7- Let the liquid flow into the container.
- 8- Close the cock (S).
- 9- Pour in the new liquid.



### Important

**The fluid level must be up to the base of the neck into which the radiator plug is screwed. If there is a coolant expansion tank, consult the documentation provided by the manufacturer of the vehicle/device in which the engine is installed. As for the liquid quantity and type, see "Technical data".**



- 10- Screw again the plug (P).

- 11- Turn the engine on and keep it running at idle speed for a few minutes to bring it up to working temperature (70÷80°C).



### Important

**If the fluid level decreases, top it up until it is constantly between the reference marks**

- 12- Turn off the engine and let it cool down properly.

- 13- Check the coolant level and, if necessary, carry out topping-up. (See "Engine coolant level check")



### Important

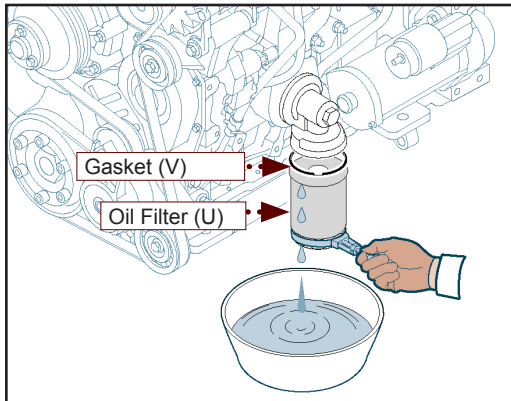
**Do not throw away any polluting material in the environment. Carry out their disposal in compliance with the relevant legislation in force.**

**GB**

## OIL FILTER CARTRIDGE REPLACEMENT

Follow the procedure below.

- 1- Turn off the engine and remove the ignition key.
- 2- Let the engine cool down adequately to avoid being burnt.
- 3- Prepare a container to collect any leak.
- 4- Unscrew filter (U) and replace it.
- 5- Check the conditions of gasket (V) and, if necessary, replace it.
- 6- Lubricate the seal of the new cartridge before assembling it.
- 7- Install the oil filter.



### Important

**Lock the screw to a torque of 25 Nm.**

- 8- Turn the engine on and keep it running at idle speed for a few minutes to bring it up to working temperature (70÷80°C).
- 9- Turn off the engine and remove the ignition key.
- 10- Wait a few minutes so that all the oil will flow into the sump.
- 11- Check that the oil in the tank is at the correct level, and top up if necessary. (See "Engine oil level control")
- 12- Check for any oil leaks



### Caution - Precaution

**If any oil leaks are found, stop the engine immediately and contact an authorised service centre.**



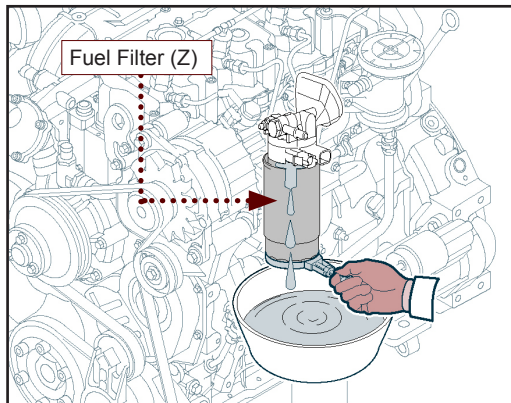
### Important

**Do not throw away any polluting material in the environment. Carry out their disposal in compliance with the relevant legislation in force.**

## FUEL FILTER REPLACEMENT

Follow the procedure below.

- 1- Turn off the engine and remove the ignition key.
- 2- Let the engine cool down adequately to avoid being burnt.
- 3- Prepare a container to collect any leak.
- 4- Disassemble filter(Z) and replace it.
- 5- Fill the new filter with fuel from the filter you have just removed.
- 6- Lubricate the gasket of the new filter before mounting it.
- 7- Refit the filter.
- 8- Bleed air from the fuel supply circuit.  
(See "Fuel supply circuit bleeding")
- 9- Turn the engine on and check for any fuel leaks.



### Caution - Precaution

**If any fuel leaks are found, stop the engine immediately and contact an authorised service centre.**



### Important

**Do not throw away any polluting material in the environment. Carry out their disposal in compliance with the relevant legislation in force.**

**GB**

**RECOMMENDED LUBRICANTS**

The lubricant recommended by VM MOTORI S.P.A. is: Q8 T 905 10W-40 for operating temperatures from - 20°C to +50°C.

–Viscosity grade: SAE 10W-40

–Specifications: ACEA E6

**Important**

**It is advisable not to mix oils with different characteristics.**

Oils of different brands can be used provided that they have the following features:

**GB**

## INFORMATION ABOUT FAILURES

### TROUBLESHOOTING

The information below are provided to facilitate the identification and solution of possible anomalies and failures which may occur during operation. Some of these problems can be solved by the user, while others require specific technical skills or abilities, therefore they should be exclusively dealt with by qualified technicians with extensive experience in the specific sector of intervention.



#### **Caution - Precaution**

**Activation of a visual and/or acoustic signal indicates some form of malfunction. In this case, turn the engine off immediately and consult the documentation supplied by the manufacturer of the vehicle/device in which the engine is installed.**

**GB**

| Problem                                                                  | Cause                                                                    | Remedy                                                  |
|--------------------------------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------|
| During the ignition phase the control board and the engine do not start. | Flat battery                                                             | Recharge or replace battery                             |
|                                                                          | Blown fuse                                                               | Replace fuse                                            |
|                                                                          | The electric cables are disconnected or they do not guarantee continuity | Check the electric connections                          |
|                                                                          | Failure of engine revolution sensor                                      | Replace the sensor                                      |
|                                                                          |                                                                          | Apply to an authorised workshop                         |
| The engine does not start                                                | Presence of air in the fuel supply circuit                               | Carry out bleeding (See "Fuel supply circuit bleeding") |
|                                                                          | Dirty or faulty injectors                                                | Replace the injectors                                   |
|                                                                          |                                                                          | Apply to an authorised workshop                         |
|                                                                          | faulty fuel pressure regulation valve                                    | Replace the valve                                       |
|                                                                          |                                                                          | Apply to an authorised workshop                         |
|                                                                          | Failure of the start control                                             | Replace the start control                               |
|                                                                          |                                                                          | Apply to an authorised workshop                         |
| The starter motor runs idle                                              | water and/or impurities in the fuel                                      | Apply to an authorised workshop                         |
|                                                                          | Clogged fuel filter                                                      | Replace filter (See "Fuel filter replacement.")         |
|                                                                          |                                                                          | Check the starter motor                                 |
| The starter motor runs idle                                              | Electromagnet failure                                                    | Apply to an authorised workshop                         |

**GB**

| Problem                                       | Cause                                                                    | Remedy                                                  |
|-----------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------|
| The starter motor is not running              | Flat battery                                                             | Recharge or replace battery                             |
|                                               | Interrupted electric connection                                          | Check the electric connections                          |
|                                               | Worn brushes                                                             | Replace the worn brushes                                |
|                                               |                                                                          | Apply to an authorised workshop                         |
| The engine stops after ignition               | Presence of air in the fuel supply circuit                               | Carry out bleeding (See "Fuel supply circuit bleeding") |
|                                               | Clogged fuel filter                                                      | Replace filter (See "Fuel filter replacement.")         |
|                                               | Injection pump malfunction                                               | Apply to an authorised workshop                         |
|                                               | faulty fuel pressure regulation valve                                    | Replace the valve                                       |
|                                               |                                                                          | Apply to an authorised workshop                         |
|                                               | Presence of air in the fuel supply circuit                               | Carry out bleeding (See "Fuel supply circuit bleeding") |
|                                               | water and/or impurities in the fuel                                      | Apply to an authorised workshop                         |
| The engine does not reach the operating speed | The electric cables are disconnected or they do not guarantee continuity | Check the electric connections                          |
|                                               | Clogged fuel filter                                                      | Replace filter (See "Fuel filter replacement.")         |
|                                               | Presence of air in the fuel supply circuit                               | Carry out bleeding (See "Fuel supply circuit bleeding") |
|                                               | Injection pump malfunction                                               | Apply to an authorised workshop                         |
|                                               | Dirty or faulty injectors                                                | Replace the injectors                                   |
|                                               |                                                                          | Apply to an authorised workshop                         |
|                                               | water and/or impurities in the fuel                                      | Apply to an authorised workshop                         |
|                                               | clogged air filter                                                       | Clean or replace the filter                             |
|                                               | Insufficient combustion air flow                                         | Apply to an authorised workshop                         |
|                                               | Engine overheating                                                       | Apply to an authorised workshop                         |
| Emission of black smoke from the exhaust pipe | Dirty or faulty injectors                                                | Reduce the load                                         |
|                                               |                                                                          | Replace the injectors                                   |
|                                               | Faulty turbocharging turbine                                             | Apply to an authorised workshop                         |
|                                               |                                                                          | Replace the turbine                                     |
|                                               |                                                                          | Apply to an authorised workshop                         |

| Problem                                                                                             | Cause                                       | Remedy                                                                 |
|-----------------------------------------------------------------------------------------------------|---------------------------------------------|------------------------------------------------------------------------|
| Light emission of white smoke from the exhaust pipe                                                 | oil level too high                          | Adjust the oil level                                                   |
|                                                                                                     | Worn segments                               | Check compression                                                      |
|                                                                                                     |                                             | Apply to an authorised workshop                                        |
|                                                                                                     | Worn valve guideways                        | Check wear                                                             |
|                                                                                                     |                                             | Apply to an authorised workshop                                        |
| Abundant emission of white smoke from the exhaust pipe                                              | Burnt gasket head                           | Apply to an authorised workshop                                        |
|                                                                                                     | Water pump malfunction                      | Replace the pump                                                       |
|                                                                                                     |                                             | Apply to an authorised workshop                                        |
|                                                                                                     |                                             | Replace the belt (See "Changing the belt (type Poly-V)")               |
|                                                                                                     | Thermostat valve malfunction                | Replace the valve                                                      |
|                                                                                                     |                                             | Apply to an authorised workshop                                        |
|                                                                                                     | Coolant too low                             | Top up, if necessary (See "Engine coolant level check")                |
| The pressure gauge shows a too low engine oil pressure and the corresponding warning light comes on | Failure of pressure gauge                   | Check or replace the pressure gaug                                     |
|                                                                                                     |                                             | Apply to an authorised workshop                                        |
|                                                                                                     | Oil level too low                           | Adjust the oil level (See "Engine oil level control")                  |
|                                                                                                     | Oil pump failure                            | Check or replace the pump                                              |
|                                                                                                     |                                             | Apply to an authorised workshop                                        |
|                                                                                                     | Faulty sensor                               | Check and, if appropriate, replace the sensor.                         |
|                                                                                                     |                                             | Apply to an authorised workshop                                        |
|                                                                                                     | engine oil filter blocked                   | Replace the engine oil filter (See "Oil filter cartridge replacement") |
| The coolant temperature warning light comes on                                                      | Coolant too low                             | Adjust the engine coolant level (See "Engine coolant level check")     |
|                                                                                                     | Stucked overpressure valve of the load plug | Replace the plug                                                       |
|                                                                                                     | Water pump malfunction                      | Replace the pump                                                       |
|                                                                                                     |                                             | Apply to an authorised workshop                                        |
|                                                                                                     | Thermostat valve malfunction                | Replace the valve                                                      |
|                                                                                                     |                                             | Apply to an authorised workshop                                        |
|                                                                                                     |                                             |                                                                        |
|                                                                                                     |                                             |                                                                        |
|                                                                                                     |                                             |                                                                        |

**GB**

| Problem                                                                                                                             | Cause                                                         | Remedy                                                                                                                               |
|-------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| The coolant temperature warning light comes on                                                                                      | Broken or worn belt                                           | Replace the belt (See “Changing the belt (type Poly-V)”)                                                                             |
| Output reduction                                                                                                                    | Clogged fuel filter                                           | Replace filter (See “Fuel filter replacement.”)                                                                                      |
|                                                                                                                                     | Presence of air in the fuel supply circuit                    | Carry out bleeding (See “Fuel supply circuit bleeding”)                                                                              |
|                                                                                                                                     | Injection pump malfunction                                    | Replace the pump                                                                                                                     |
|                                                                                                                                     |                                                               | Apply to an authorised workshop                                                                                                      |
|                                                                                                                                     | Dirty or faulty injectors                                     | Replace the injectors                                                                                                                |
|                                                                                                                                     |                                                               | Apply to an authorised workshop                                                                                                      |
|                                                                                                                                     | clogged air filter                                            | Clean or replace the filter                                                                                                          |
|                                                                                                                                     | Engine overheating                                            | Apply to an authorised workshop                                                                                                      |
| Insufficient combustion air flow                                                                                                    | Apply to an authorised workshop                               |                                                                                                                                      |
| The battery warning light comes on                                                                                                  | The alternating current generator does not charge the battery | Check and, if appropriate, replace the alternating current generator                                                                 |
|                                                                                                                                     |                                                               | Apply to an authorised workshop                                                                                                      |
| The oil pressure warning light comes on                                                                                             | Engine oil pressure too low                                   | Turn off the engine. Apply to an authorised workshop                                                                                 |
| The warning light which detects water in fuel comes on                                                                              | Presence of water in the fuel filter                          | (See chapter “OPERATING INFORMATION”, paragraph “Recommendations for use point no.9)                                                 |
| The warning light of the engine MIL/ SYS (*) turns on.                                                                              | Engine malfunction                                            | Apply to an authorised workshop                                                                                                      |
| The particulate filter indicator light turns on  | Particulate filter is clogged                                 | The particulate filter regeneration is necessary (see chapter ““OPERATING INFORMATION””, paragraph “Particulate Filter Regeneration” |

(\*) The luminous warning light MIL (amber colour) turns on to signal the malfunction of the engine due to the surpassing of emission thresholds.

The luminous warning light SYS (red colour) turns on to signal the malfunction of the engine without the surpassing of particle emission thresholds.

**INFORMATION ABOUT COMPONENT REPLACEMENT****RECOMMENDATIONS FOR PART REPLACEMENT**

Before carrying out any replacement, activate all safety devices and evaluate the need to inform the personnel working on the engine or nearby. In particular, place proper signs in the nearby areas and keep away all devices which, once activated, may represent a source of unexpected danger and risk for people's safety and health. When necessary, replace the worn components, and use original spare parts only. The manufacturer cannot be held responsible for damages to people or components resulting from the use of

non original spare parts and from repairs carried out without the authorisation of the manufacturer.

When requesting spare parts, always contact your nearest VM MOTORI S.P.A. spare parts centre (See "documentation enclosed": Spare parts and service centre address booklet), indicating the engine serial number. (See "Manufacturer and engine identification")

**GB**

## CHANGING THE BELT (TYPE POLY-V) WITH AUTOMATIC BELT TENSIONER

Follow the procedure below.

- 1- Turn off the engine and remove the ignition key.
- 2- Let the engine cool down adequately to avoid being burnt.
- 3- Rotate the automatic belt tensioner (A) in counter clockwise direction to loosen the belt (B), and then remove it from the pulley (C).



### Caution - Precaution

**Do not throw away any replaced part in the environment. Carry out their disposal in compliance with the relevant legislation in force.**

- 4- Remove the belt (D) and replace it.



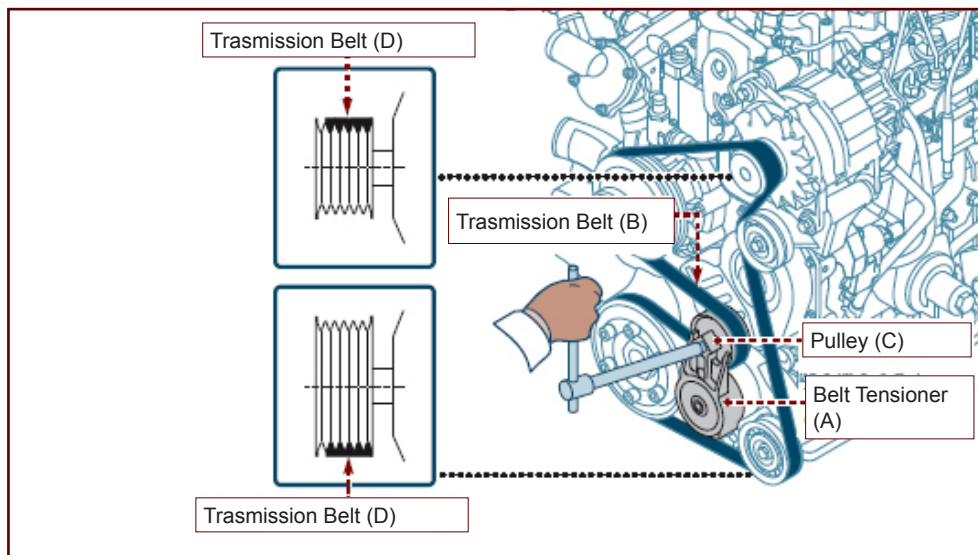
### Important

**Before tightening the belt, make sure that it is correctly positioned in the pulley seats.**



### Important

**Before restarting the engine, make sure there are no tools or other material left near the moving parts.**



**CHANGING THE BELT (TYPE POLY-V) WITH AUTOMATIC BELT TENSIONER**
**GB**

**Important**

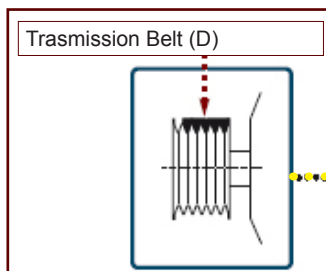
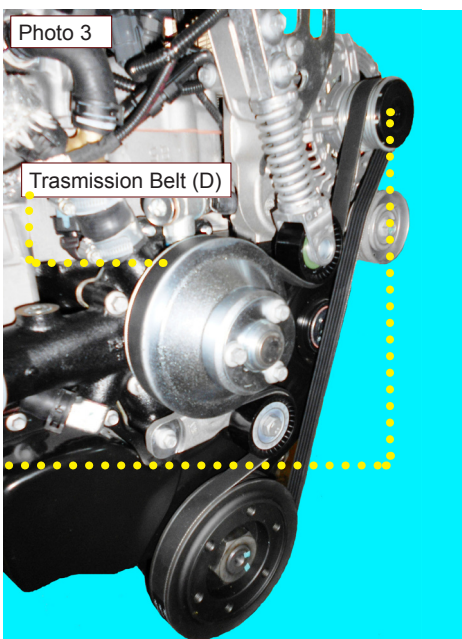
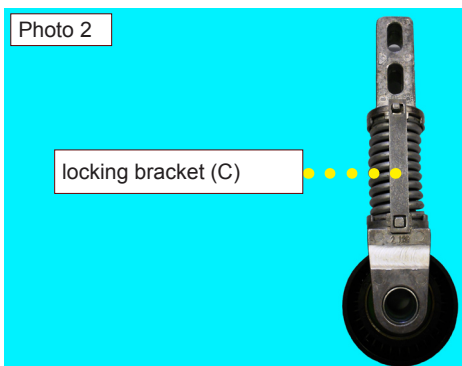
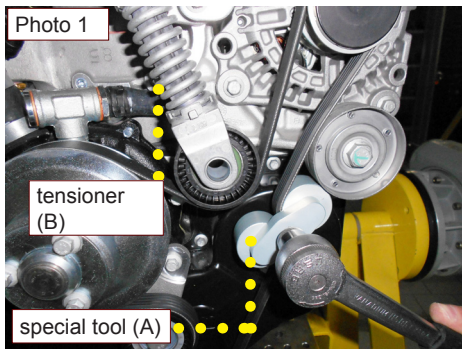
**Special equipment must be used to replace the belt with linear turnbuckle. This operation must be performed by an authorised repair shop.**

Follow the procedure below.

- 1- Turn off the engine and remove the ignition key.
- 2- Let the engine cool down adequately to avoid being burnt.
- 3 - Rotate the special tool (A) in any anti-clockwise direction so that the turnbuckle (B) becomes compressed (Photo 1).
- 4 - Insert the locking clamp (C) as shown in photo 2.
- 5 - Remove the belt (D).
- 6 - Install the new belt and position it as shown in photo 3.
- 7 - Rotate the special tool (A) in an anti-clockwise direction so that the turnbuckle (B) becomes compressed, and remove the locking clamp.


**Important**

**Before tightening the belt, make sure that it is correctly positioned in the pulley seats.**





## ENGINE DISPOSAL

**GB**

This operation should be carried out by experienced operators, in compliance with the legislation in force concerning safety at the workplace. Do not throw away non biodegradable products and non ferrous components (rubber, PVC, resins, etc.).

While decommissioning the engine, divide all the components depending on their chemical composition and dispose of them accordingly.