Engine instructions manual

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VM p/n - 42432056G Ed. 1 / 04 - 2015

GENERAL INDEX

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GENERAL INFORMATION

INTRODUCTION

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

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.

If engines designed and built by VM MOTORI 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 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 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 association 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.

ICIM

ISO 14001 - Cert. n° 0043A

ICIM

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 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 employees are committed to the achievement of quality and environmental policy goals.

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

VM MOTORI 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.

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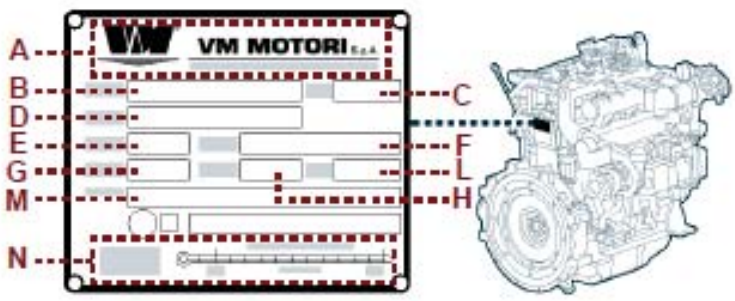
MANUFACTURER AND ENGINE IDENTIFICATION

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



A) Manufacturer identification

B) Serial number

C) Weight

D) Type

E) Family

F) Model

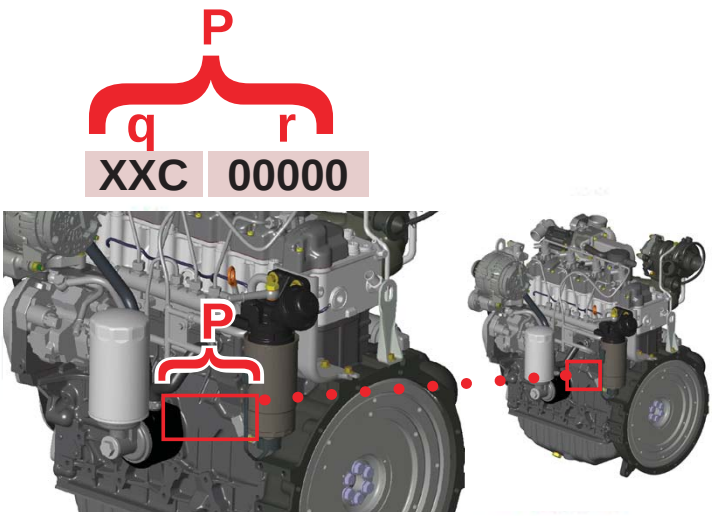
G) Version

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
45D	R754TE4
34D	R754IE4
39D	R754ISE4
60D	R754EU6
61D	R756EU6

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, 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

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TECHNICAL INFORMATION

ENGINE GENERAL DESCRIPTION

Engines of series R750 EU6 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 VI** anti-pollution directives. **Model 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 R754EU6, R756EU6, R754TE4-IE4-ISE4")**.

MAIN COMPONENTS R754EU6 - R754TE4 - IE4 - ISE4

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 (not installed on R754TE4-ISE4 engine models).

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

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

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

W) After Treatment System (ATS): it is composed of a DPF filter + DOC oxydation catlyst (w1) and SCR catalytic converter (w2). The SCR catalytic converter is provided only for R750EU6 engine models. See paragraph "After Treatment Exhaust Gas System" in order to know the working principles.

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.

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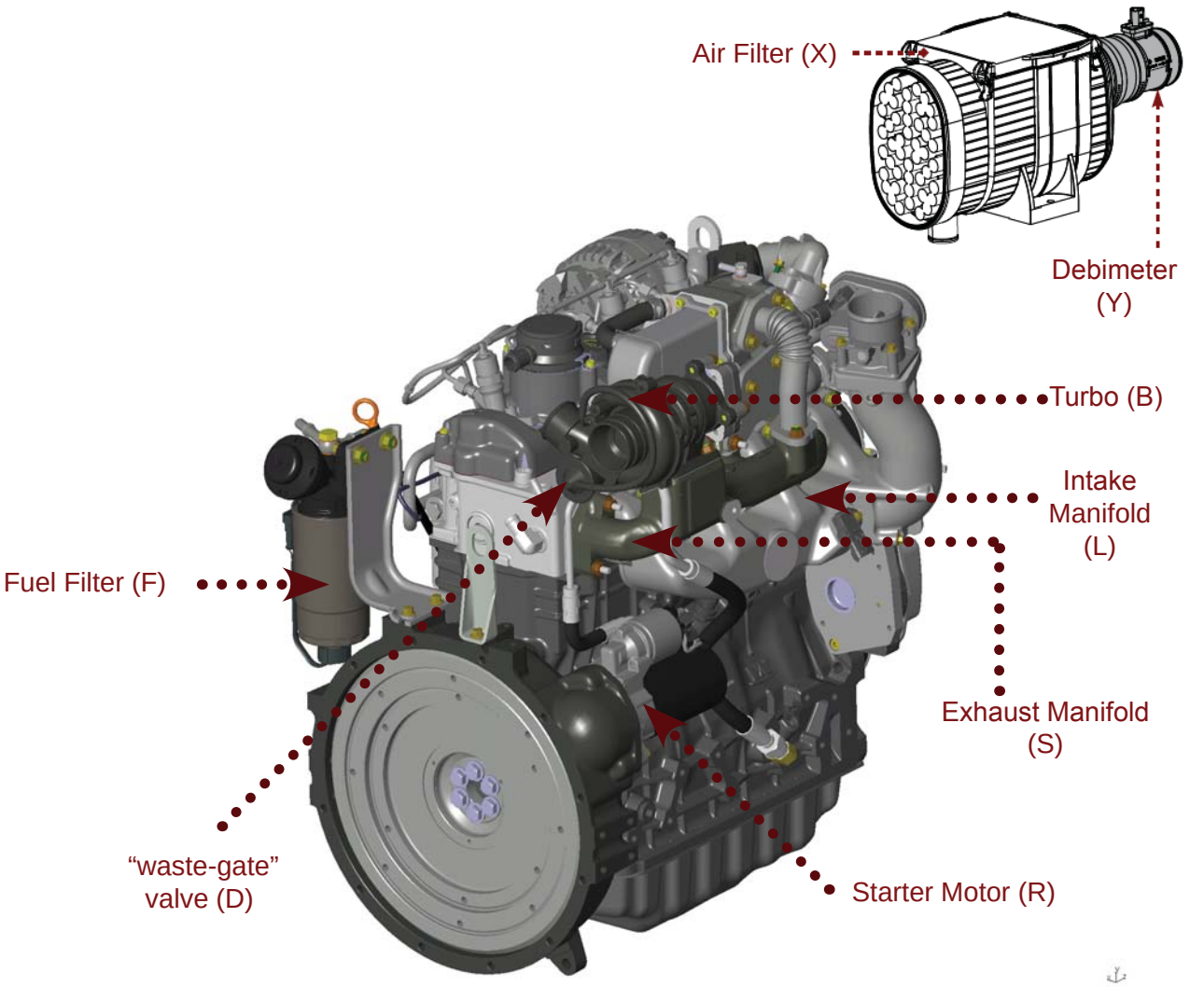
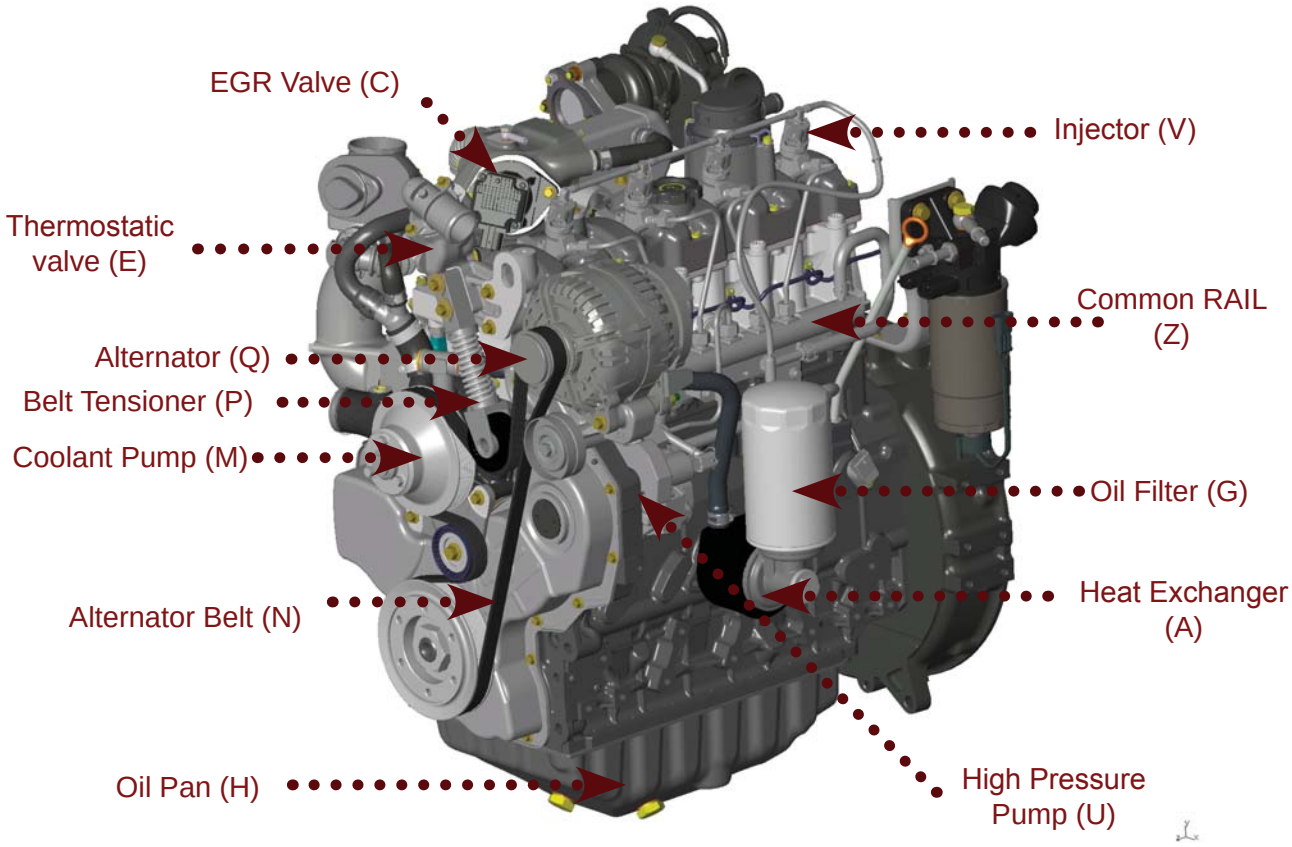

Air Filter (X)
Debimeter (Y)
Turbo (B)
Intake Manifold (L)
Fuel Filter (F)
Exhaust Manifold (S)
"waste-gate" valve (D)
Starter Motor (R)


EGR Valve (C)
Injector (V)
Thermostatic valve (E)
Common RAIL (Z)
Alternator (Q)
Belt Tensioner (P)
Coolant Pump (M)
Oil Filter (G)
Heat Exchanger (A)
Alternator Belt (N)
Oil Pan (H)
High Pressure Pump (U)

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MAIN COMPONENTS R756EU6

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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 (not installed on R754TE4-ISE4 engine models).

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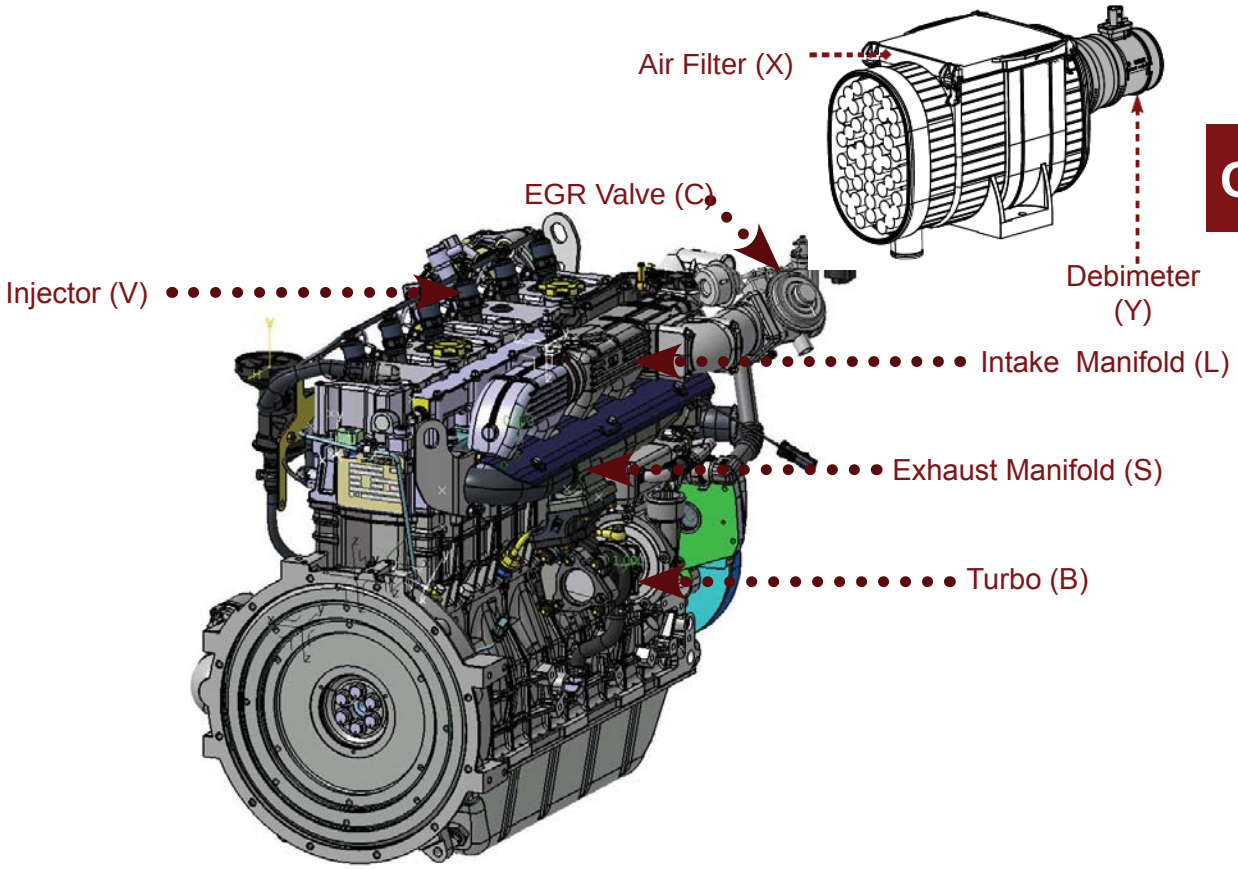
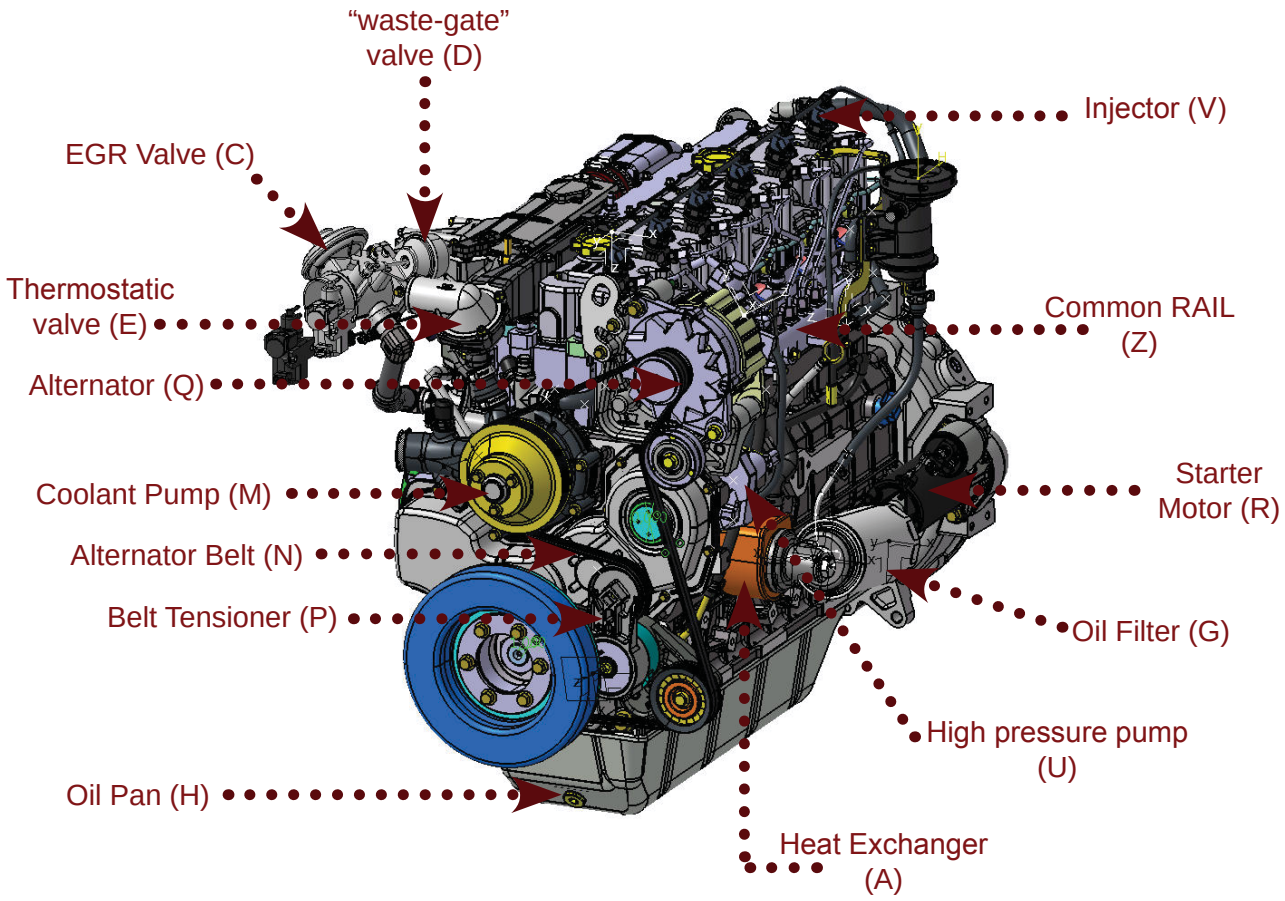

Air Filter (X)
EGR Valve (C)
Injector (V)
Debimeter (Y)
Intake Manifold (L)
Exhaust Manifold (S)
Turbo (B)


“waste-gate” valve (D)
Injector (V)
EGR Valve (C)
Thermostatic valve (E)
Common RAIL (Z)
Alternator (Q)
Coolant Pump (M)
Starter Motor (R)
Alternator Belt (N)
Belt Tensioner (P)
Oil Filter (G)
High pressure pump (U)
Oil Pan (H)
Heat Exchanger (A)

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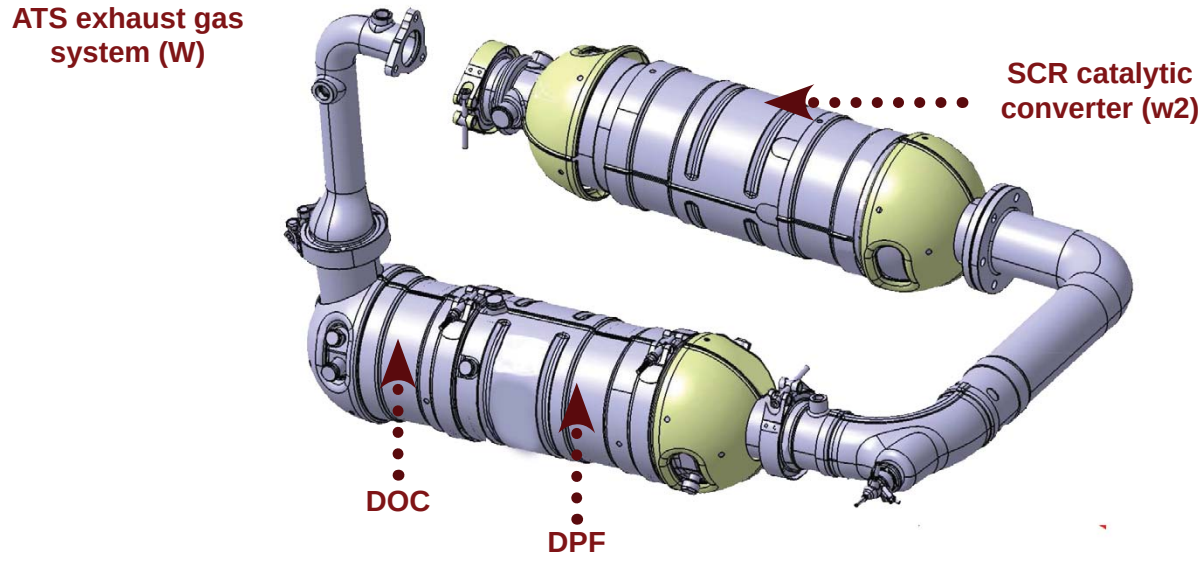
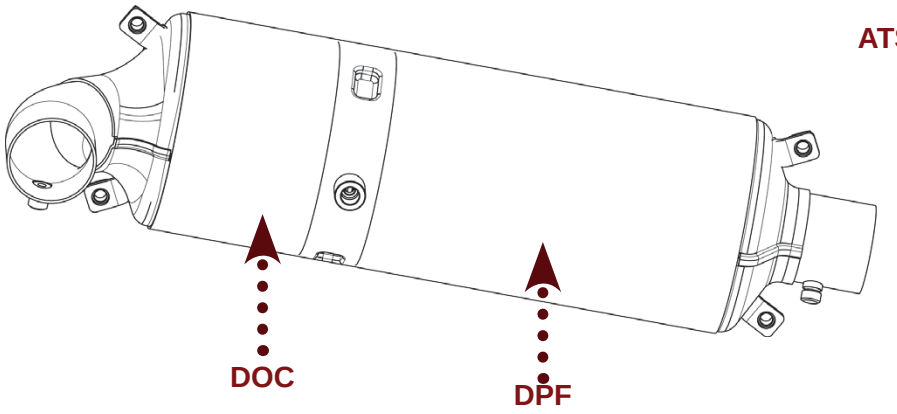
R750EU6



Diesel Oxidation Catalyst (DOC) and a Diesel Particulate Filter (DPF)

(w1)

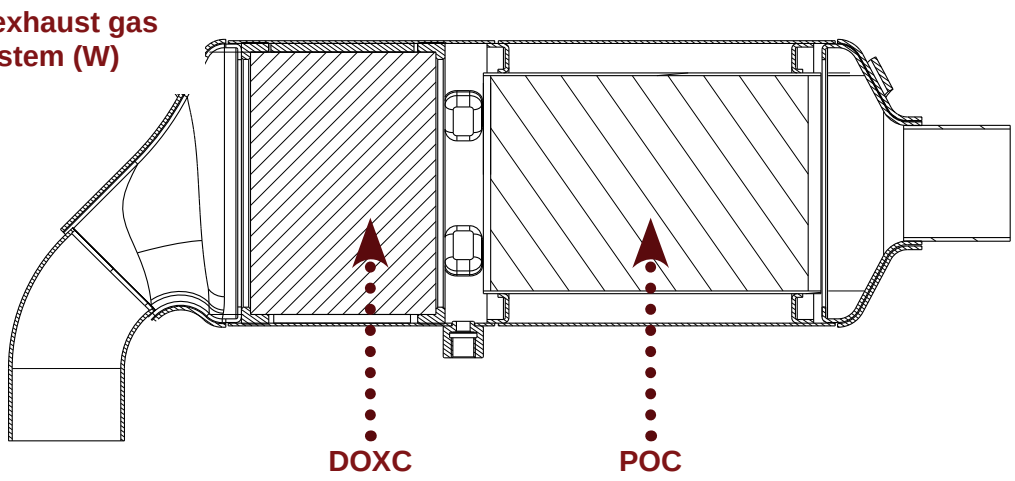
R754IE4



Diesel Oxidation Catalyst (DOC) and a Diesel Particulate Filter (DPF)

(w1)

R754TE4 / ISE4



DOXC catalyst + POC filter

(w1)

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AFTER TREATMENT EXHAUST GAS SYSTEM (ATS) - R750EU6 ENGINE MODELS

AFTERTREATMENT DEVICES

The ATS consists of a Diesel Oxidation Catalyst (DOC), a Diesel Particulate Filter (DPF), and a Selective Catalyst Reduction (SCR) system.

These components burn off collected particulate matter in a process called “regeneration” and reduce nitrous oxides (NOx).

The key to successful regeneration is high exhaust temperature for a period of time. Without adequate temperatures for regeneration, the DPF filter will continue to trap particulate and eventually plug. In order to avoid DPF plugging, VM Motori uses an actively-regenerated Aftertreatment System.

The exhaust from a diesel engine produces levels of nitrous oxide (NOx) that must be reduced. To meet emission standards, a Selective Catalyst Reduction (SCR) system has been added to the current ATS.

The SCR system consists of a Dosing Control Unit (DCU box), a tank for Diesel Exhaust Fluid (DEF), a DEF injector, and an SCR catalyst.

DEF is pumped through the unit DCU box to the DEF injector.

The DEF injector sprays DEF into upstream SCR module to produce a chemical reaction. This chemical reaction converts nitrous oxides (NOx) present in the exhaust stream into water vapor and nitrogen.

INFORMATION ON THE DIESEL EXHAUST FLUID (DEF)

The Selective Catalytic Reduction (SCR Catalyst) aftertreatment system requires Diesel Exhaust Fluid (DEF) to maintain exhaust emissions at levels compliant with emissions standards.

Diesel Exhaust Fluid (DEF) is a simple, non-toxic and pre-mixed fluid composed of an Aqueous Urea Solution.

Diesel Exhaust Fluid (DEF) is manufactured to strict quality standards to ensure proper emissions control. Only DEF that meets ISO 22241 specifications can be used.

IMPORTANT:

It is forbidden the use of solutions with different specifications.

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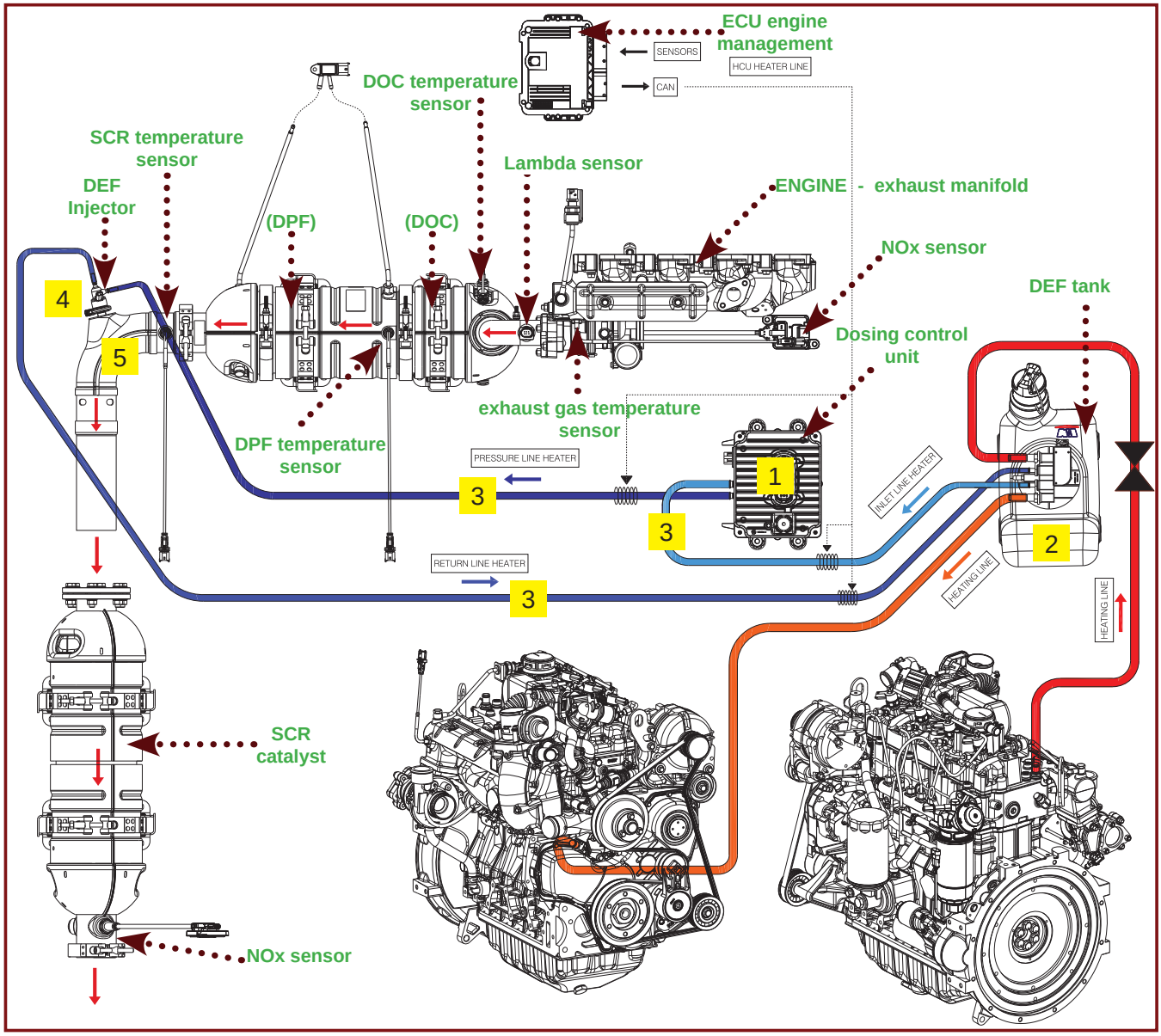

engine coolant inlet
engine coolant outlet
DEF from tank to Dosing Control Unit
DEF from Dosing Control Unit to Injector
DEF return line to the tank

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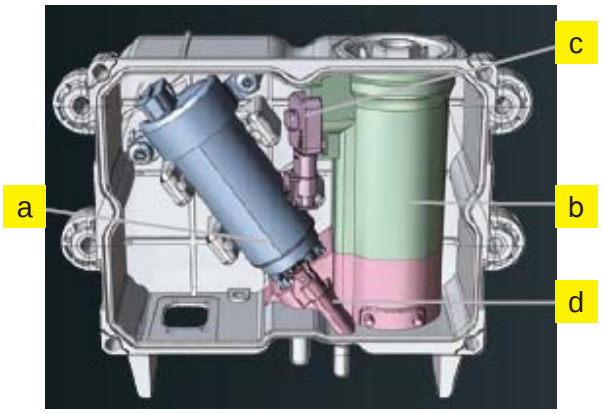
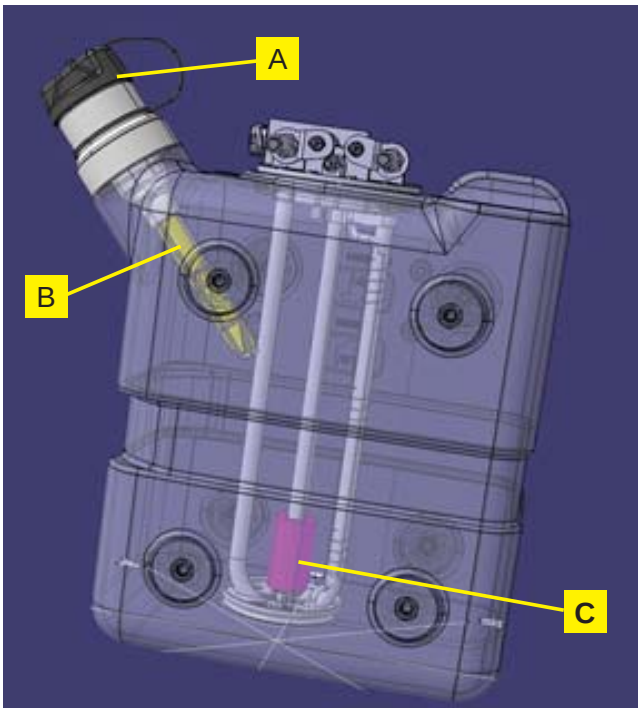
DEF FLUID DELIVERY SYSTEM - MAIN COMPONENTS

1 - **Dosing Control Unit (DCU box):** this device supplies the fluid DEF to the injector (3). The fluid amount is regulated by the electronic engine system management. The Unit could be installed on the tank containing the DEF fluid. It is composed of:
- pump (a)
- filter (b)
- pressure transducer (c)
- pump/filter heater (d)
- control unit



2 - **DEF tank:** it contains the DEF fluid. It is composed of:
- filling cap (blue colour usually) (A)
- internal filter (B)
- DEF level sensor (C)
- DEF temperature sensor



3 - **DEF fluid supply lines:**
the lines are composed of three tubes electrically heated.
The heating pipes is managed by DCU box.
The fluid supply lines are approved by VM Motori.

4 - **Injector:** it sprays the DEF fluid to the SCR catalytic converter through the use of mixing device.

5 - **Mixing device:** it enables optimal flow distribution of the gaseous ammonia across the SCR catalyst, minimizing urea deposits.

Representation:
DEF injection / UREA distribution

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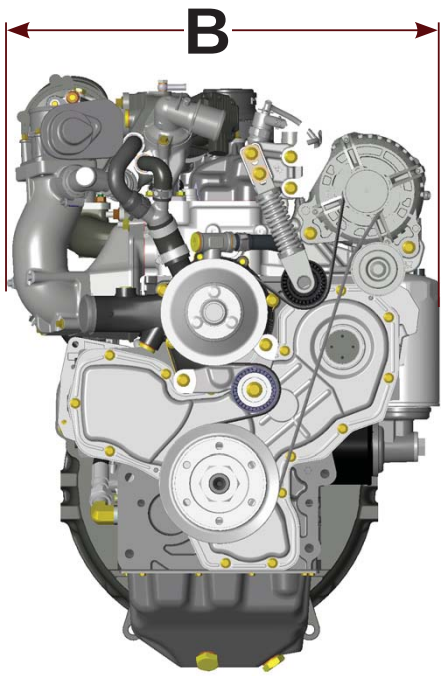
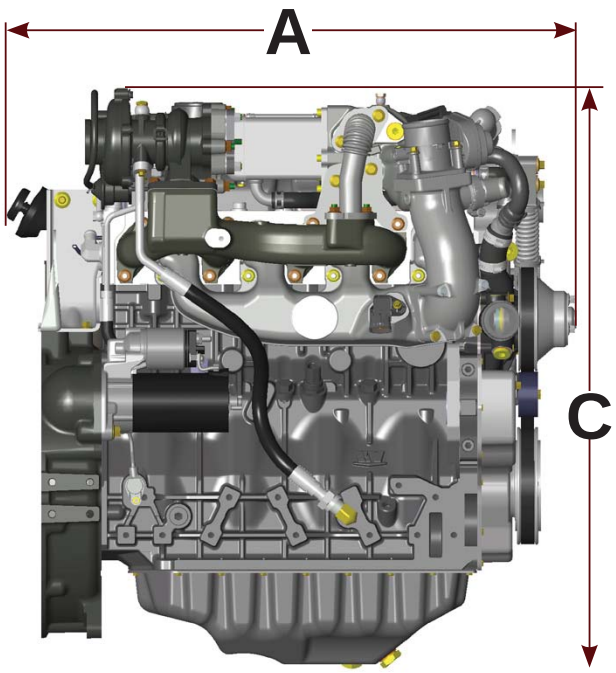
TECHNICAL DATA

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





TECHNICAL DATA (R754 EU6)

	Unit of measurement	R754EU6
Dimensions		
A	mm	705
B	mm	559
C	mm	753

	Unit of measurement	R754EU6		
General data				
Cycle		Four stroke diesel		
Total displacement	Liters	2,970		
Number of cylinders	nr.	4		
Bore and stroke	mm	94x107		
Compression ratio		17.5 ± 0.5 : 1	17.5 ± 0.5 : 1	17.5 ± 0.5 : 1
Intake		Turbocharged and inter-cooled circuit - (Dry) air filter		
Cooling		Water circuit		

	Unit of measure-ment	R754EU6
Cooler		water/oil
Crankshaft rotation	Anticlockwise (observing the engine from the handwhe el side)	
Combustion sequence	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	
Dry shipping weight of engine	kg	260
Maximum permanent lengthwise inclination (with handwheel up)	degrees	30°
Maximum permanent lengthwise inclination (with handwheel down)	degrees	35°
Maximum permanent crosswise inclination	degrees	30°
Power and torque		
Maximum operating speed	rpm	3000
Maximum power	kW (CV) @ rpm	84 (112) @ 3000
Maximum torque	Nm (kgm) @ rpm	420 (42.8) @ 1100
Consumption at maximum power		
Specific fuel consumption	g/kWh	
Specific oil consumption	g/kWh	
Fuel supply circuit		
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 7%**, with fuel available on the European market (according to regulation **DIN EN 590**). **IMPORTANT** **Do not use fuels with specifications other than those indicated.**	

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	Unit of measure-ment	R754EU6
Lubrication circuit		
Type of lubrication		Forced lubrication
Circuit fuel supply		Rotor pump
Oil change including filter (standard sump)	liters (kg)	9.8 L (8.7 Kg) **(model R754EU6.05A - 13L / 11.5Kg)**
Oil quantity at minimum level (standard sump)	liters (kg)	
Oil quantity at maximum level (standard sump)	liters (kg)	
Oil pressure at minimum speed (with started engine)	bar	
Oil cooling		Oil/water cooler
Cooling circuit		
Total capacity of cooling circuit (excluding radiator and relevant pipes)	liters	
Setting pressure of the expansion tank plug	bar	1.1
Coolant		50% demineralised or distilled water and 50% protective radiator fluid with monoethylene glycol and organic inhibitor formulation complying with ASTM D 3306 type 1 Standards (Recommended fluid PARAFLU UP)
Coolant maximum temperature alarm	°C	107
Exhaust Circuit		
DEF fluid		Aqueous Urea Solution (AUS32) conform to ISO 22241 specifications **IMPORTANT** **Do not use solutions with specifications other than those indicated.** **During the refilling is essential to avoid contamination of the liquid with other substances and / or the accidental entry of foreign substances in the tank**
DEF fluid tank capacity	liters	14 liters including reserve

	Unit of measure-ment		R754EU6	
Electric system				
Nominal voltage	V	12		
Alternating current generator (nominal voltage)	V	14		
Alternating current generator (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 new air filter	mbar	40		

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

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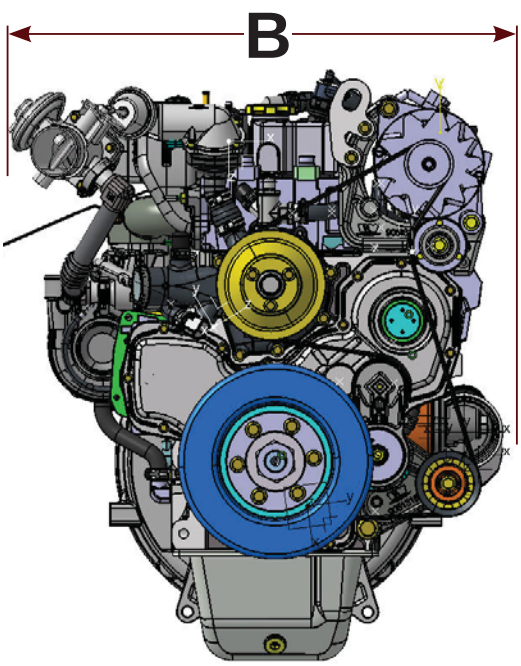

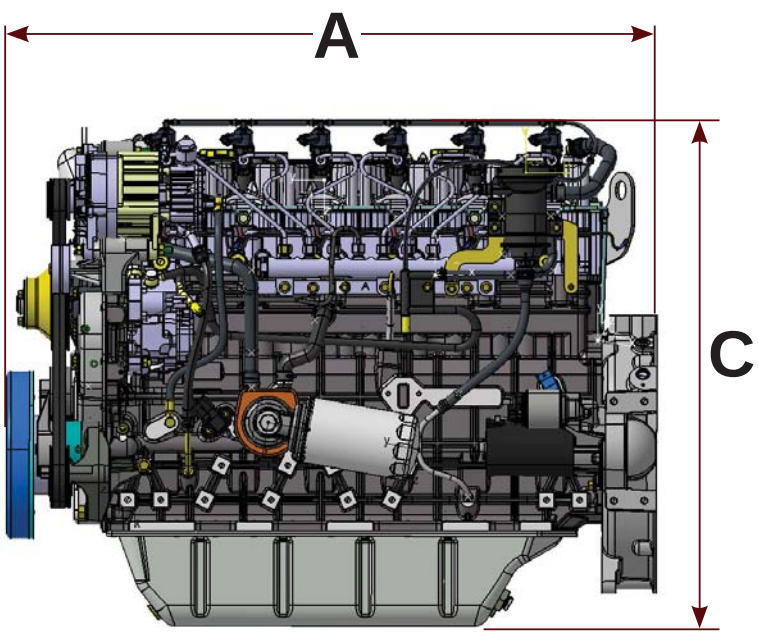

TECHNICAL DATA (R756 EU6)

	Unit of measurement	R756EU6
Dimensions		
A	mm	943
B	mm	617
C	mm	723

	Unit of measurement	R756EU6
General data		
Cycle		Four stroke diesel
Total displacement	Liters	4,455
Number of cylinders	nr.	6
Bore and stroke	mm	94x107
Compression ratio		17.5 ± 0.5 : 1
Intake		Turbocharged and inter-cooled circuit - (Dry) air filter
Cooling		Water circuit

	Unit of measure-ment	R756EU6
Cooler		water/oil
Crankshaft rotation	Anticlockwise (observing the engine from the handwhe el side)	
Combustion sequence	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 +/-150
Dry shipping weight of engine	kg	335
Maximum permanent lengthwise inclination (with handwheel up)	degrees	30°
Maximum permanent lengthwise inclination (with handwheel down)	degrees	35°
Maximum permanent crosswise inclination	degrees	30°
Power and torque		
Maximum operating speed	rpm	3000
Maximum power	kW (CV) @ rpm	120 (163.2) @ 3000
Maximum torque	Nm (kgm) @ rpm	500 Nm @ 1400
Consumption at maximum power		
Specific fuel consumption	g/kWh	
Specific oil consumption	g/kWh	
Fuel supply circuit		
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 7%**, with fuel available on the European market (according to regulation **DIN EN 590**). **IMPORTANT** **Do not use fuels with specifications other than those indicated.**	

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	Unit of measure-ment	R756EU6
Lubrication circuit		
Type of lubrication		Forced lubrication
Circuit fuel supply		Rotor pump
Oil change including filter (standard sump)	liters (kg)	13,8 (12) ÷ 18.9 (16,5) The oil quantity at maximum level (12 ÷ 16,5 kg) depends on the capacity of the oil sump with which the engine is equipped. **R756EU6.01A** **Customer SCHMIDT version 01A: 16,5 KG**
Oil quantity at minimum level (standard sump)	liters (kg)	
Oil quantity at maximum level (standard sump)	liters (kg)	
Oil pressure at minimum speed (with started engine)	bar	
Oil cooling		Oil/water cooler
Cooling circuit		
Total capacity of cooling circuit (excluding radiator and relevant pipes)	liters	
Setting pressure of the expansion tank plug	bar	1.1
Coolant		50% demineralised or distilled water and 50% protective radiator fluid with monoethylene glycol and organic inhibitor formulation complying with ASTM D 3306 type 1 Standards (Recommended fluid PARAFLU UP)
Coolant maximum temperature alarm	°C	107
Exhaust Circuit		
DEF fluid		Aqueous Urea Solution (AUS32) conform to ISO 22241 specifications **IMPORTANT** **Do not use solutions with specifications other than those indicated.** **During the refilling is essential to avoid contamination of the liquid with other substances and / or the accidental entry of foreign substances in the tank**
DEF fluid tank capacity	liters	14 liters including reserve

	Unit of measure-ment		R756EU6	
Electric system				
Nominal voltage	V	12		
Alternating current generator (nominal voltage)	V	14		
Alternating current generator (nominal current)	A	105		
Starter motor output	kW	2.5		
Recommended battery capacity	Ah	140		
Battery breakaway current	A	950		
Suction circuit				
Maximum depression allowed with new air filter	mbar	40		

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TECHNICAL DATA (R754 TE4-R754 IE4 - R754ISE4)

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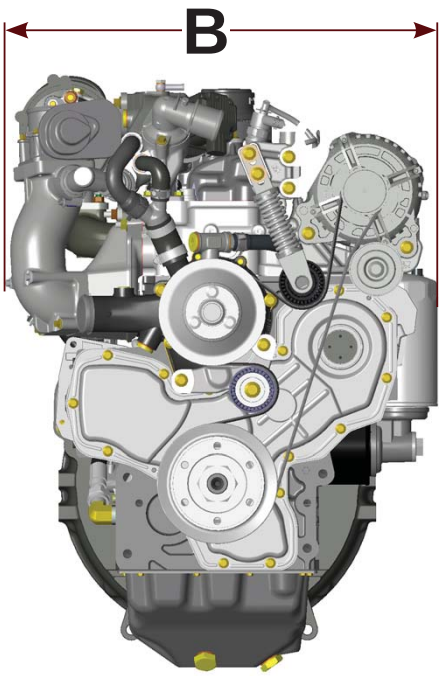

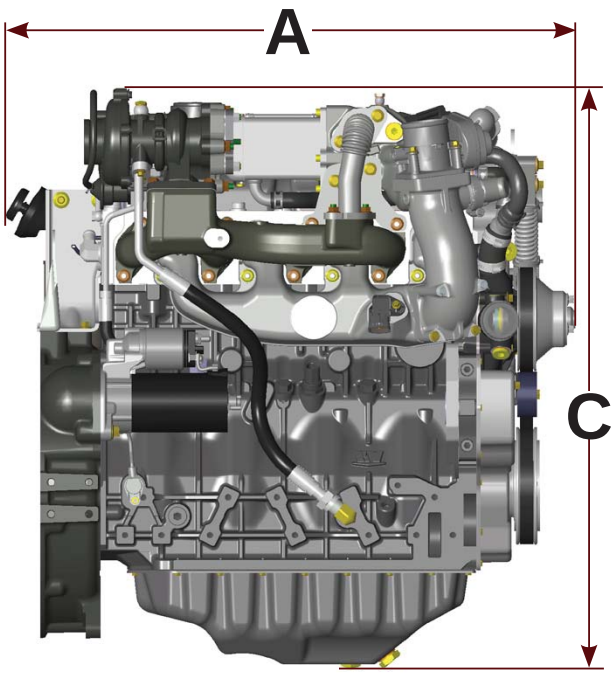

	Unit of measurement	R754TE4	R754IE4	R754ISE4
Dimensions				
A	mm	704	704	704
B	mm	554	554	554
C	mm	766	766	766

	Unit of measurement	R754TE4	R754IE4	R754ISE4
General data				
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 measure-ment	R754TE4	R754IE4	R754ISE4
Cooler		water/oil		
Crankshaft rotation	Anticlockwise (observing the engine from the handwhe el 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°
Power and torque				
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
Consumption at maximum power				
Specific fuel consumption	g/kWh		222.5	217.7
Specific oil consumption	g/kWh		0,2	0.2
Fuel supply circuit				
Type of injection	Common Rail direct injection with high pressune 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 7%, with fuel available on the European market (according to regulation DIN EN 590). **IMPORTANT** **Do not use fuels with specifications other than those indicated.**			

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	Unit of measure-ment	R754TE4	R754IE4	R754ISE4
Lubrication circuit				
Type of lubrication		Forced lubrication		
Circuit fuel supply		Rotor pump		
Oil change including filter (standard sump)	liters (kg)	9.8 L (8.7 Kg) **model R754IE4.05A - 13L (11.5Kg)**		
Oil quantity at minimum level (standard sump)	liters (kg)			
Oil quantity at maximum level (standard sump)	liters (kg)			
Oil pressure at minimum speed (with started engine)	bar			
Oil cooling		Oil/water cooler		
Cooling circuit				
Total capacity of cooling circuit (excluding radiator and relevant pipes)	liters			
Setting pressure of the expansion tank plug	bar	1,1		
Coolant		50% demineralised or distilled water and 50% protective radiator fluid with monoethylene glycol and organic inhibitor formulation complying with ASTM D 3306 type 1 Standards (Recommended fluid PARAFLU UP)		
Coolant maximum temperature alarm	°C	107		
Electric system				
Nominal voltage	V	12		
Alternating current generator (nominal voltage)	V	14		
Alternating current generator (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 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 requirements 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.

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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.

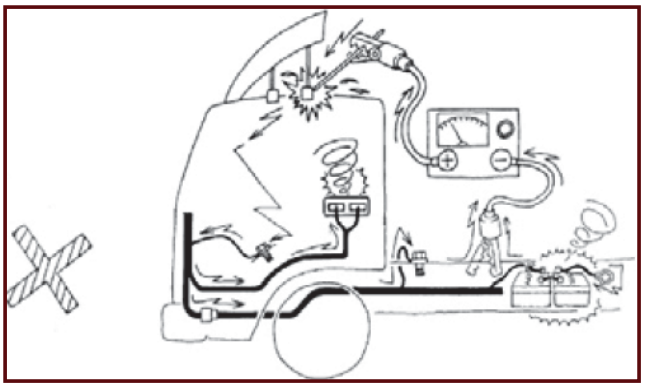
–Do not use boosters or quick starters to start the engine.

–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 movingpart.

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.

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PACKAGING AND TRANSPORT

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

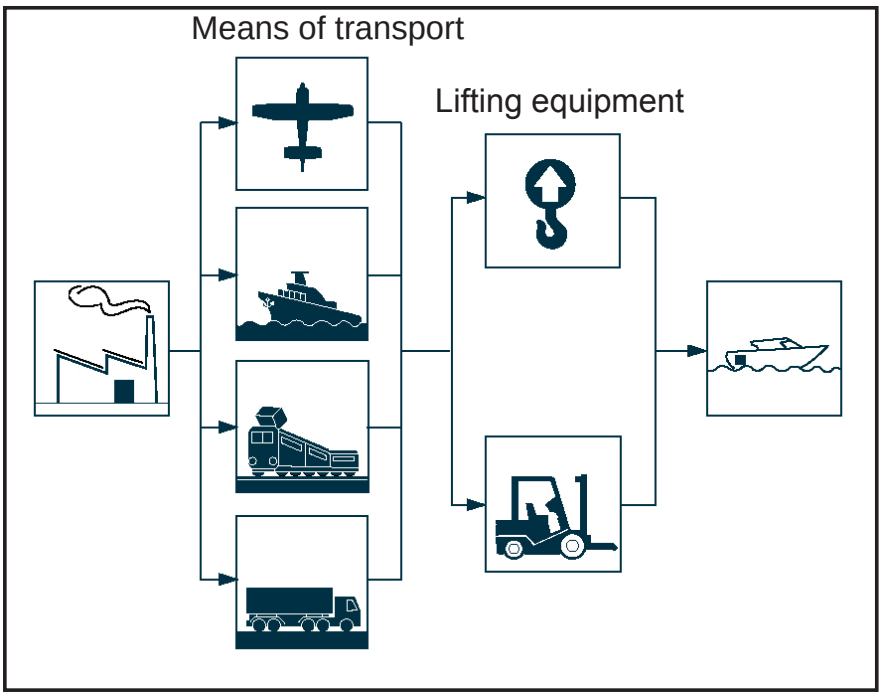
–By road

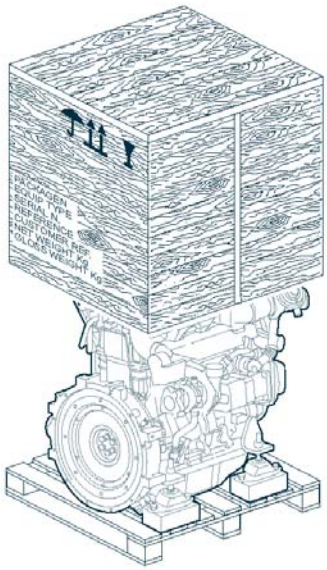
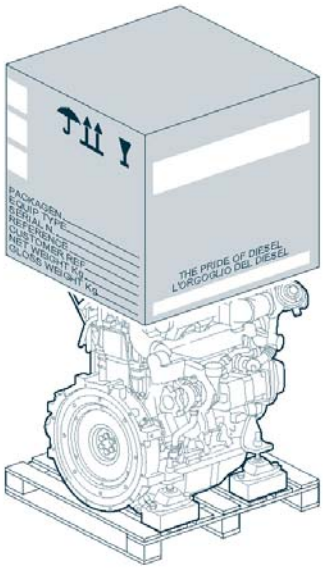
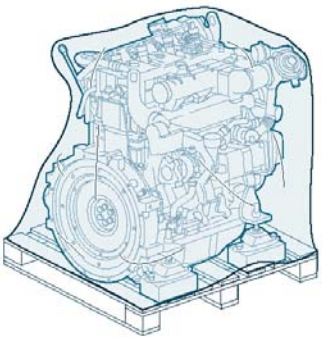
–By railway

–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
		

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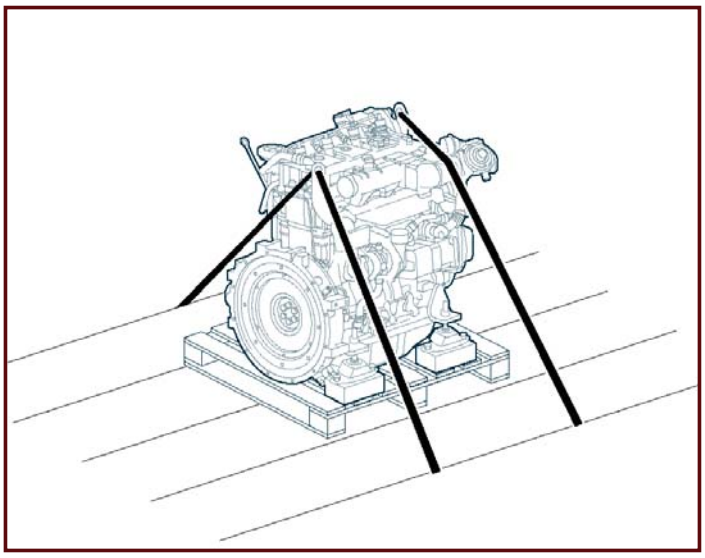
In order to guarantee the perfect conservation of all engine components, an “overseas” packaging should be used in case of maritime transport.

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.



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.

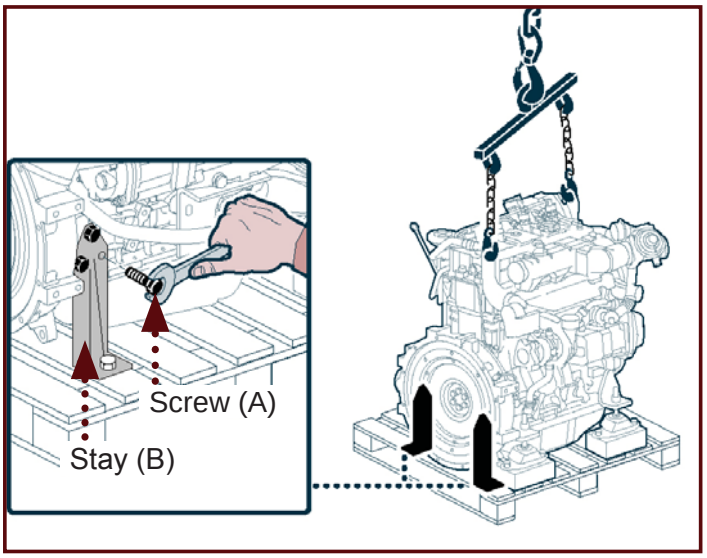
2-While unpacking, make sure the components are intact and their quantity is correct.

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.

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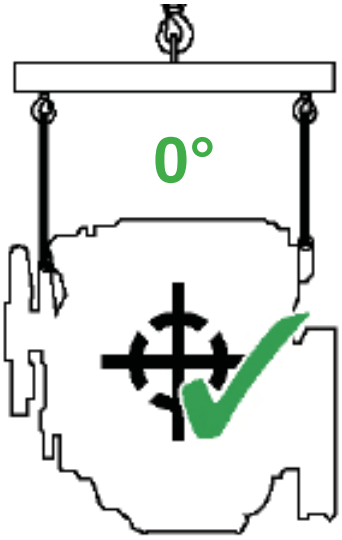
HANDLING AND LIFTING

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

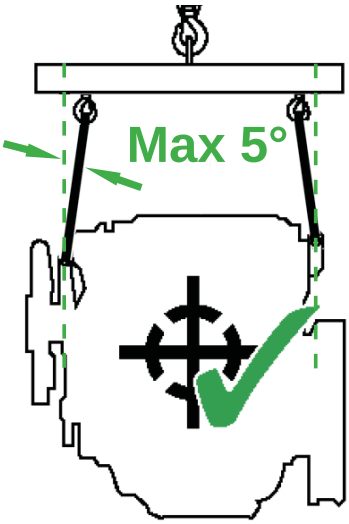


Important

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

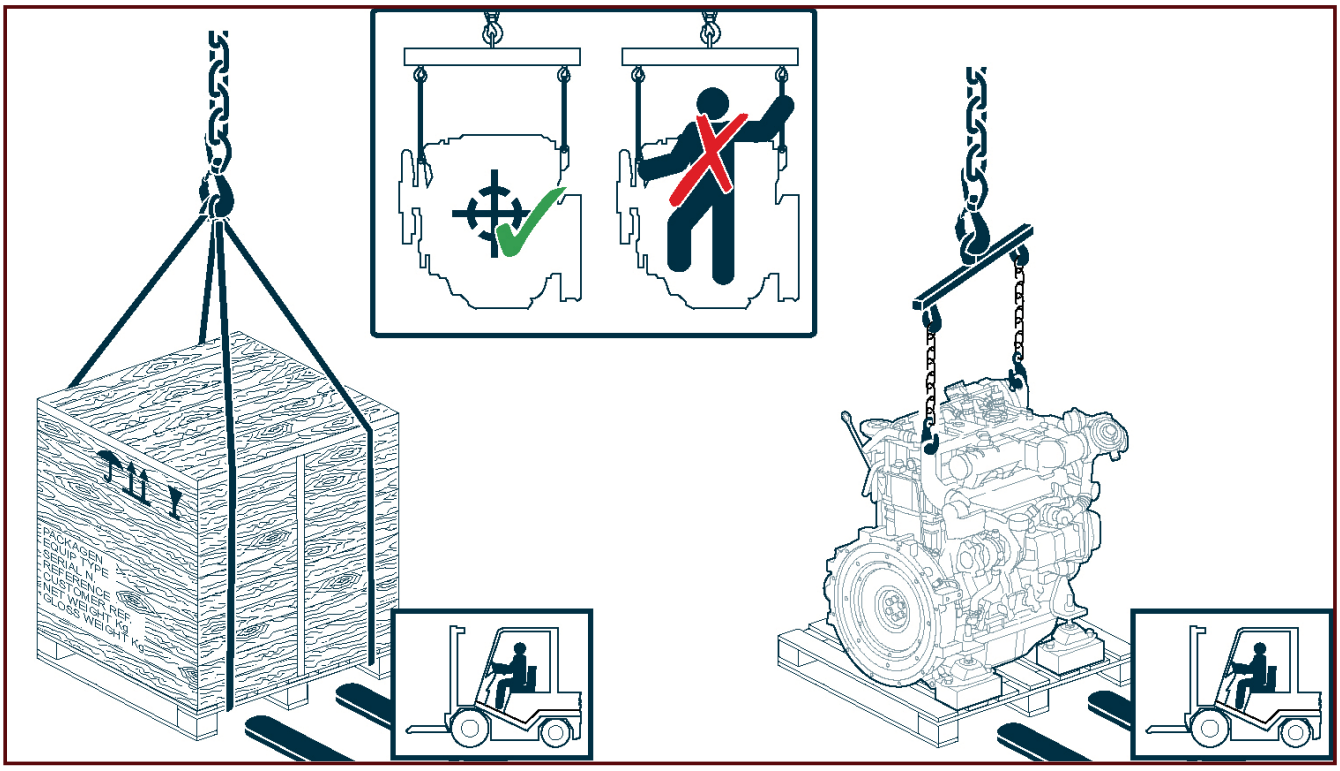
–Hook the lifting device to the fixing points as shown in the figure.

–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.



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ENGINE STORAGE

VM Motori supplies the engine with a protection treatment which is valid for 12 months from the delivery date from the factory.

If the engine is still not being used 12 months after VM Motori delivery date, 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% protective radiator fluid with monoethylene glycol and organic inhibitor formulation complying with ASTM D 3306 type 1 Standards (Recommended fluid PARAFLU UP).

• Start up the engine and run it until it reaches the right temperature for water-cooled engines (about 70°- 80°C).

• 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.

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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 7%;

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).

• 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.

• 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.

Further information are available in the website: www.vmmotori.it, in the “Contacts – Request Info” section.

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OPERATING INFORMATION

RECOMMENDATIONS FOR USE AND OPERATION

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.

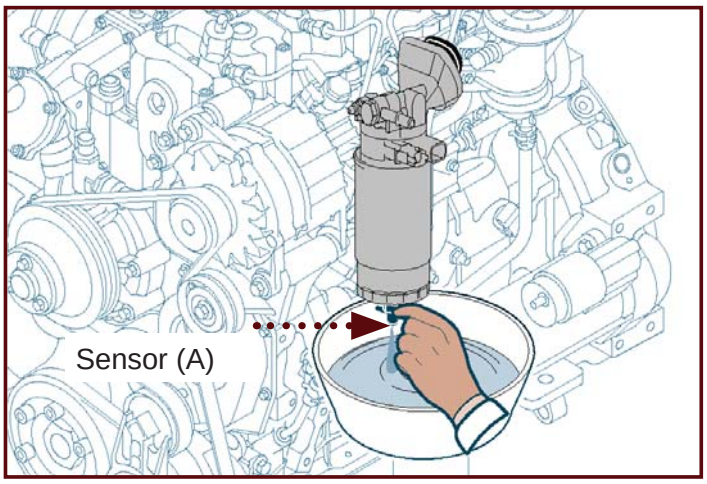
4- DO NOT use the engine at maximum performances before it has reached the working temperature (70÷80 °C).

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.

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.

Important

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.

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.

10 - It is possible that the DWS lamp turn on. This lamp is related to SCR urea system. In case of DWS lamp illumination, please operate as follows:

- check the DEF fluid level as per DEF gauge. If the level is low, it is necessary to performe the refilling (REFER TO PARAGRAPH "**DIESEL EXHAUST FLUID "DEF" REFILLING, STORAGE AND HANDLING**".

- after DEF refilling or in case of DEF fluid correct (no low level as per DEF gauge), if the DWS lamp does not turn off, it is necessary to refer to an authorized center.

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.

Do not attempt to disconnect the MIL indicator light sensor and/or DWS indicator light sensors 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.

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REGENERATION OF THE PARTICLE FILTER (DPF / POC) - R750EU6 - R754IE4,TE4 ,ISE4

Illumination of the Malfunction Indicator Lamp (MIL) Lamp  indicates a failure of an emissions control device. The MIL may illuminate along with other Aftertreatment system warning lamps. Call for service to repair the fault.

Illumination of the Diesel Particulate Filter (DPF) Regeneration Lamp  indicates that a regeneration is required: the operator is suggested to drive the vehicle at medium/high engine RPMs (or at medium/high loads) to allow the regeneration process.

Important

The driver MUST stay with the vehicle throughout the regeneration process.

Otherwise it is possible to perform the DPF regeneration through the “Regeneration Request Switch”. This procedure is called “PARKED REGENERATION”. In order to know the location of this switch it is necessary to refer to the documentation of vehicle manufacturer.

Important

Not all vehicles may be equipped with a Regeneration Request Switch due to application or user specification. The Switch installation is at the discretion of the vehicle manufacturer

Performing a Parked Regeneration

Perform the Parked Regeneration as follows:

Caution - Precaution

To avoid injury from inhaling engine exhaust, always operate the engine in a well-ventilated area. Engine exhaust is toxic.

During parked regeneration the exhaust gases will be extremely HOT and could cause a fire if directed at combustible materials. The vehicle must be parked outside.

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.

Important

The procedure will take approximately 20 to 30 minutes (depending on engine type and the amount of soot accumulated in the DPF filter)

NOTE: the engine coolant temperature MUST exceed 65°C.

1) Keep engine at slow idle

2) Put transmission in neutral

3) Set park brake

4) Hold DPF Switch to the ON position for 3 seconds and then release. The engine speed will increase to 2000 RPM. The regeneration will take 20-30 minutes. The regeneration is complete when the engine returns to low idle.

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REQUIREMENTS TO ENSURE THE CORRECT OPERATION OF NOx CONTROL SYSTEM (R750EU6 ENGINE MODELS)

In the engines equipped with SCR system a driver warning and a two levels driver inducement system have to be implemented, so that the users will not continue to operate the vehicle without correcting the concern.

The inducement system comprises a driver warning inducement lamp (DWS)  and a two levels of torque reduction:

- first level: torque reduction of 25% and a disablement of the vehicle,
- second level: limitation of the vehicle speed to a max. of 20 km/h (“creep mode”), if a defect is not repaired in a timely manner **(*)**.

The malfunctions may be:

1. DEF fluid low level
2. Identification of incorrect DEF fluid
3. Monitoring system tampering
4. DEF fluid dosing interruption
5. EGR valve blocked
6. Incorrect AdBlue consumption
7. DEF fluid freeze

(*) for those vehicles not equipped with speed sensor the limitation will be 60% of rated engine RPMs and 50% of torque reduction.

DRIVER WARNING SYSTEM ACTIVATION (DWS LAMP)

- Inform the operator that a condition has occurred which compromises the vehicle emission control system.

- Visual (DWS Lamp) and possibly audible alarms on the dashboard

- Designed such that it cannot be defeated, ignored, or disabled without correcting the concern.

- Activation of the warning system is linked to the status of the corresponding Diagnostic Trouble Code (DTC). If one of the malfunctions listed in table is detected and the corresponding DTC has got the status active the inducement warning lamp is turned ON.

GB

Table: NOx control driver warning and inducement system activation

Malfunctions	**WARNING** **activation of DWS warning lamp** **DWS LAMP STATUS STEADY**	**LEVEL 1** **Counter for activation of stage 1 (derating)** **DWS LAMP STATUS FLASHING**	**LEVEL 2** **Counter for activation of stage 2 (creep mode)** **DWS LAMP STATUS FLASHING**
Low reagent level	(DEF level < 9 %)	none	AdBlue level = 0 %
Reagent quality		After 10 hrs from activation of steady DWS lamp	After 20 hrs from activation of steady DWS lamp
Reagent dosing interruption		After 10 hrs from activation of steady DWS lamp	After 20 hrs from activation of steady DWS lamp
Reagent consumption		After 10 hrs from activation of steady DWS lamp	After 20 hrs from activation of steady DWS lamp
Impeded EGR valve		After 36 hrs from activation of steady DWS lamp	After 100 hrs from activation of steady DWS lamp
Tampering of monitoring system		After 10 hrs from activation of steady DWS lamp	After 100 hrs from activation of steady DWS lamp

Inducement level	name	lamp DWS status	Engine torque derate	Engine RPMs derate	Vehicle speed limitation (max. 20km/h)
Warning	DWS lamp activation	continuous/ steady	no	no	no
1	Derate Mode	flashing	yes (-25%)	no	no
2	Creep Mode	flashing	yes (-50%)	**(***)**	**(*)**
(*) : only if the vehicle is equipped with the vehicle speed sensor					
(***) : reduction by 60% of rated engine RPMs for vehicle equipped without vehicle speed sensor.					

DEF FLUID LEVEL INDICATOR

Refer to the documentation of vehicle manufacturer.

Concerning the reagent (DEF) refilling refer to section " DIESEL EXHAUST FUILD (DEF) REFILLING, STORAGE AND HANDLING"

Important

A low DEF fluid level could turn the DWS lamp on.
First check the DEF fluid level.

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 assistance centre.

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 7 %, 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 R750EU6 - 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.

GB

DIESEL EXHAUST FLUID “DEF” REFILLING, STORAGE AND HANDLING

On the vehicle chassis there is installed a DEF fluid tank.

The DEF fuild is an Aqueous Urea Solution “AUS32” that meets ISO standards 22241.

Important

Use only fluid DEF certified in accordance with ISO 22241 specifications in order to avoid irreversible damage to the engine components.

The diesel exhaust fluid DEF is heated through the engine coolant heat when the DEF fluid temperature is less than - 5°C (23°F).

STORAGE

Regaridng the DEF storage refer to technical specifications and recommendations of DEF fluid manufacturer.

HANDLING

Important

It is important that you do not contaminate the DEF.

Regarding the DEF handling refer to safety data sheet of DEF fluid manufacturer.

DEF is nontoxic, nonhazardous and nonflammable.

DEF is corrosive to certain sensitive metals. DEF tanks and dispensing equipment will be made of an appropriate plastic.

• Only specific and appropriate tanks must be used to storage the DEF liquid.
• Only use specific DEF equipment, recommended by the DEF supplier
• Do not use the same pump for DEF and fuel, oil or coolant
• Do not use paper/ cloth to clean inside of DEF container or DEF tanks
• Before DEF refilling make sure that the area around the DEF refilling cap is perfectly clean to avoid any contamination of the DEF fluid.

Important

It is recommended do not use other solution if not DEF fluid provided by its authorized distributors.

It is recommended to avoid introducing into the DEF tank solutions uncontrolled. In case of erroneous or inadvertent introduction of fluids not suitable, avoid starting the engine and contact an authorized service center.
Otherwise, the result will be an irreparable damage to the DEF injection system.

AVAILABILITY

DEF fluid is usually available at all major truck stops and petrol stations.

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.

GB

MAINTENANCE INFORMATION

RECOMMENDATIONS FOR MAINTENANCE

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.

Caution - Precaution

For turbocharged engines it is rigorously necessary to respect:
- scheduled intervals maintenance
- indications for the replacement of the lube oil, oil filter and air filter
- maintenance coupon requirements.

Engine oil does not meet the specifications or a contaminated oil causes irreversible damage to the turbocharger. VM Motori does not accept any responsibility regarding the neglecting of the observation of the rules mentioned above.

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

GB

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.

Frequency (1)	Component	Type of intervention	Intervention procedures	Reference
Every 10 hours (Every day)	Engine oil (2) (6)	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	
After the first 50 hours (at the end of running-in)	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.

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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.**

Frequency (1)	Component	Type of intervention	Intervention procedures	Reference
Every 10 hours	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	
Details at Hako Manual and Hako-System-Maintenance	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 (3)	Replace		See "Fuel filter replacement."
	Air intake circuit and intercooler pipe	Check it is clean Check of pipe sealing		
	Dust discharge circuit	Check it is clean		
	Oil separation circuit	Check of pipe sealing		
	Vacuum circuit	Check of pipe sealing		

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Frequency (1)	Component	Type of intervention	Intervention procedures	Reference
Every 1000 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 1000 hours	DCU box internal filter	Replace		See DCU box filter replacement
Every 3000 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.

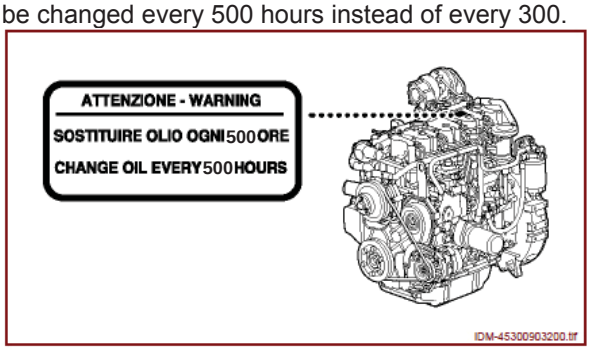
The engine oil must in any case be changed, even before the time limit indicated in the scheduled maintenance programme, if the MIL  indicator light comes on with the ECU error 252F - “Engine oil critical mass”.

(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 **R754EU6.05A / R754IE4.05A / R756EU6.01A** 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.



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.

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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.**

Date	Hours (1)	Type of maintenance performed	Signature and stamp of workshop

1) Indicate the total number of working hours..

Date	Hours (1)	Type of maintenance performed	Signature and stamp of workshop

1) Indicate the total number of working hours..

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Date	Hours (1)	Type of maintenance performed	Signature and stamp of workshop

1) Indicate the total number of working hours..

Date	Hours (1)	Type of maintenance performed	Signature and stamp of workshop

1) Indicate the total number of working hours..

GB

Date	Hours (1)	Type of maintenance performed	Signature and stamp of workshop

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.

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MAINTENANCE IN CASE OF ENGINE INACTIVITY

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÷80°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.

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ENGINE OIL LEVEL CONTROL

Follow the procedure below.

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

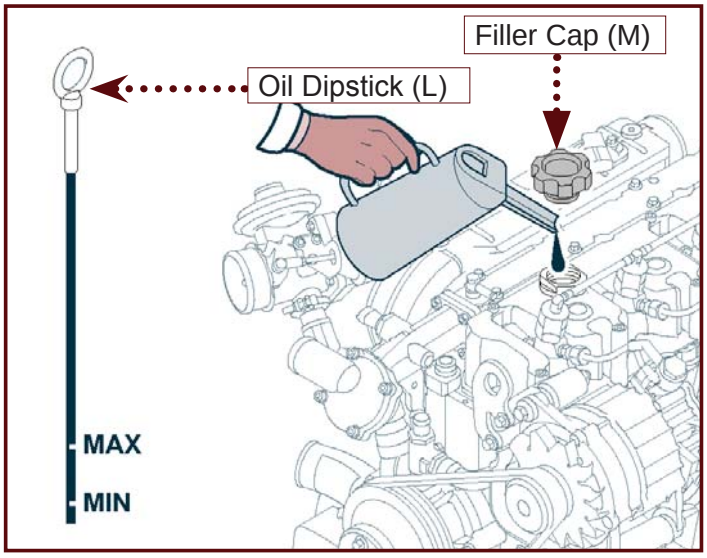
2- Turn off the engine and remove the ignition key.

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

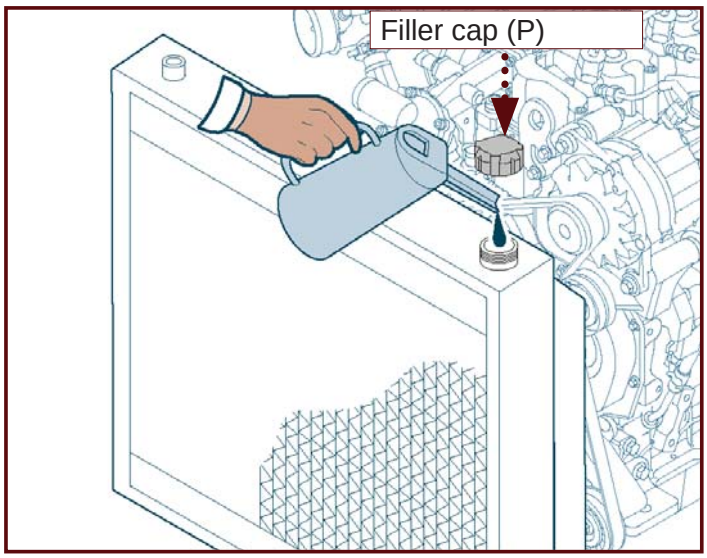
Follow the procedure below.

1- Start the engine and bring it to the operating temperature (70÷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 ”.

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.

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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.

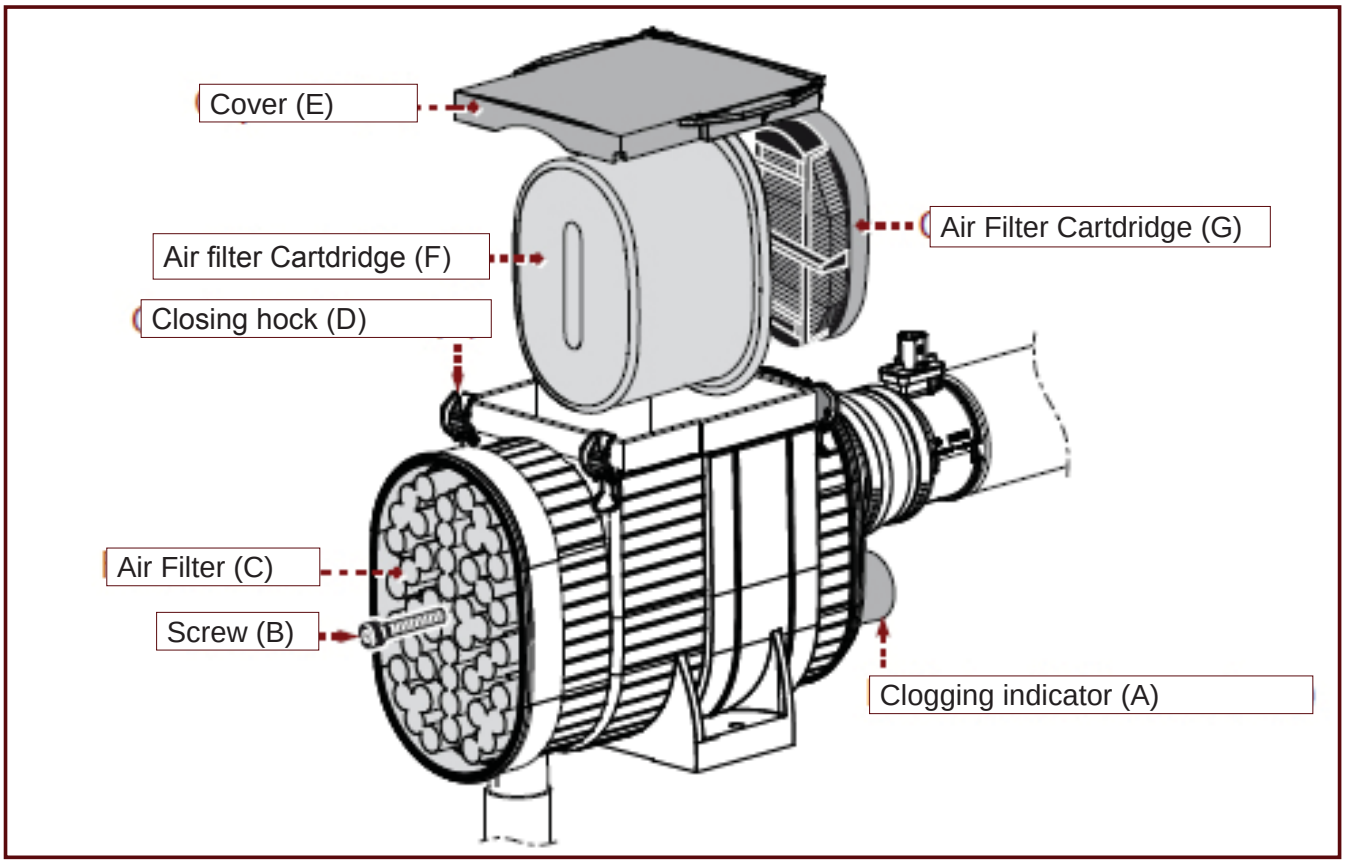
8- Re-assemble the cartridge (G).

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).

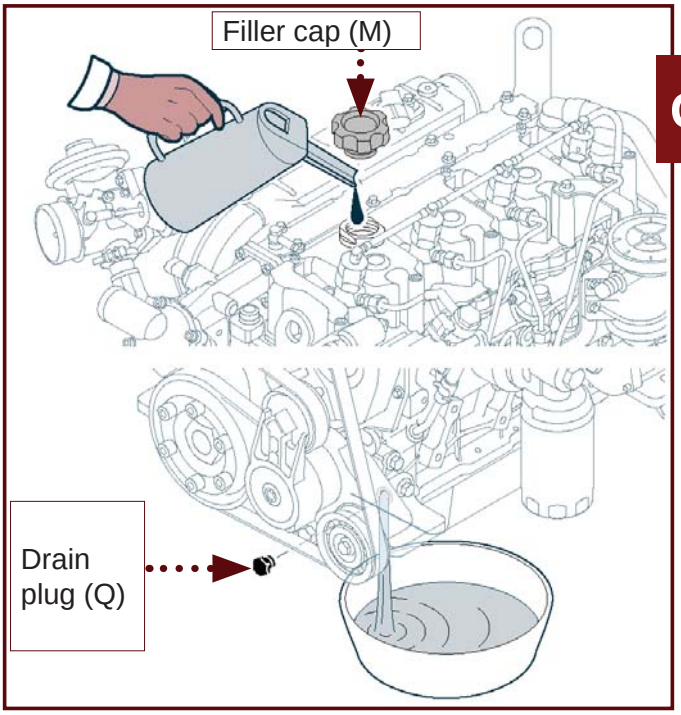
10-At the end of the operation, press the button of the indicator to reset its colour.



ENGINE OIL CHANGE

Follow the procedure below.

- Start the engine and bring it to the operating temperature (70÷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.



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÷80 °C). Check for any oil leaks.
- Turn off the engine and check the oil level. (See “Engine oil level control”)

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ENGINE OIL DILUTION

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

Important

In R750EU6 - R750 IE4/TE4/ISE4, 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:

Important

In some applications the verification is not feasible.

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.

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.

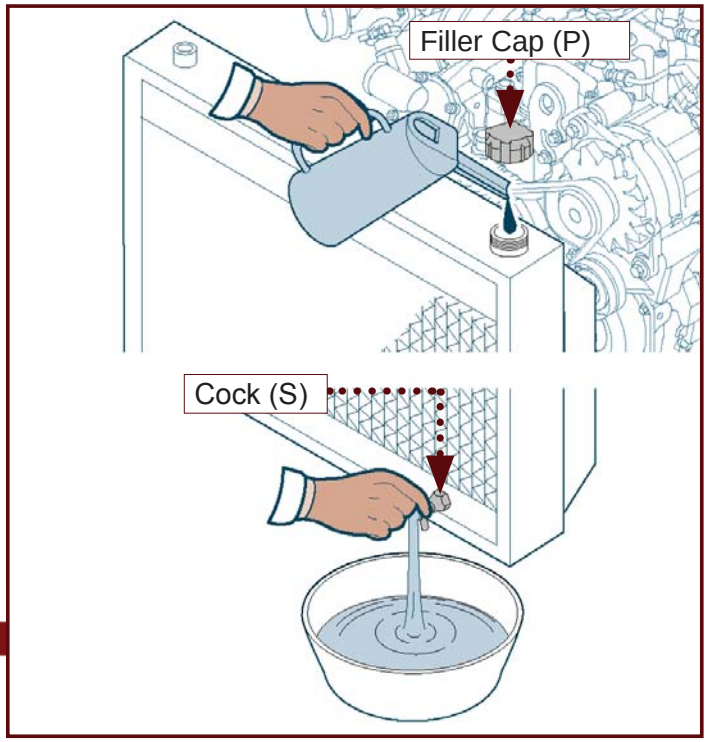
7- Let the liquid flow into the container.

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.

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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.

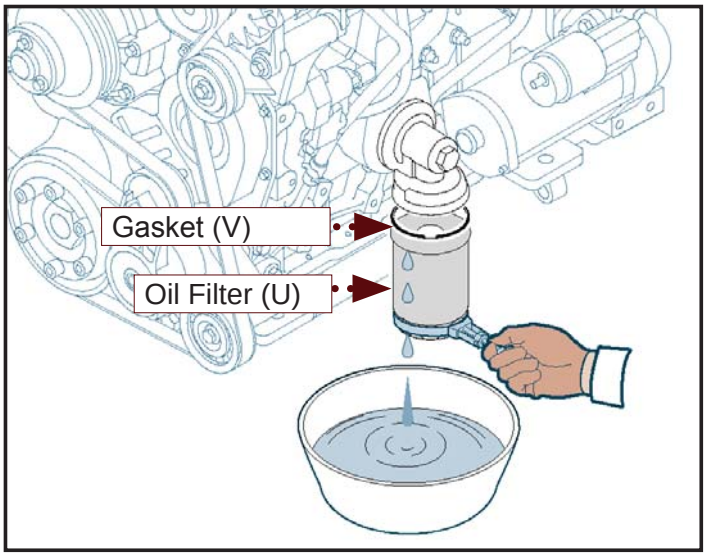
3- Prepare a container to collect any leak.

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.

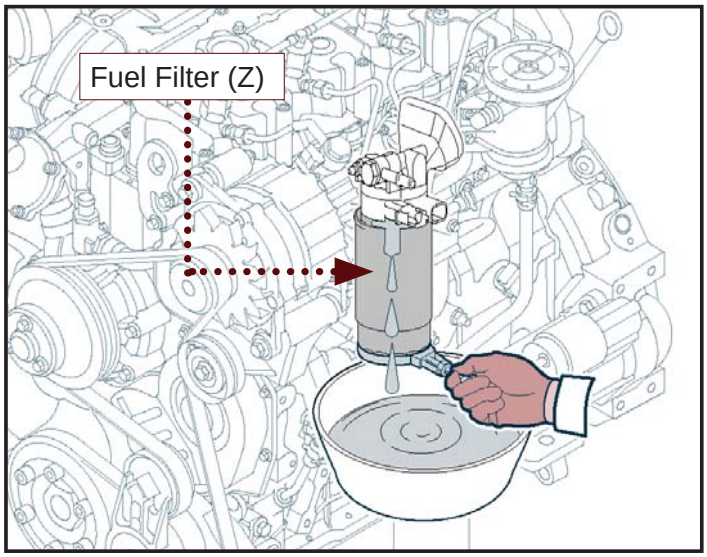
5- Fill the new filter with fuel from the filter you have just removed.

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.

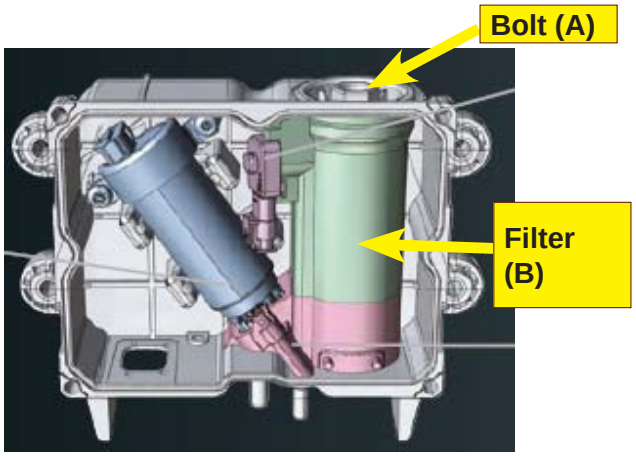
DCU BOX INTERNAL FILTER REPLACEMENT

1 - slacken the bolt A

2 - remove the filter cartridge Band replace it witha new one

3 - install the new filter cartridge inside the DCU box unit

4 - tighten the bolt A



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FUEL SUPPLY CIRCUIT BLEEDING

Important

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

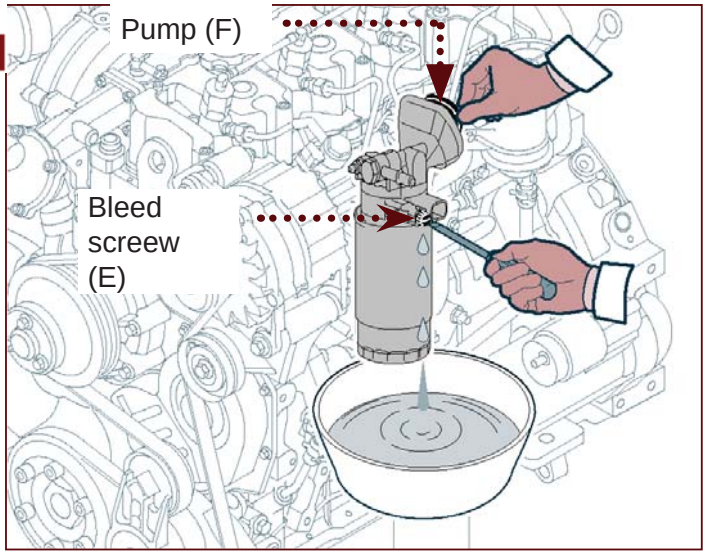
Follow the procedure below.

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.

RECOMMENDED LUBRICANTS

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

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

–Viscosity grade: SAE 10W-40

–Specifications: ACEA E6

Important

It is advisable not to mix oils with differentcharacteristics.

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.

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
	water and/or impurities in the fuel	Apply to an authorised workshop
	Clogged fuel filter	Replace filter (See “Fuel filter replacement.”)
The starter motor runs idle	Electromagnet failure	Check the starter motor
		Apply to an authorised workshop

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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 electric cables are disconnected or they do not guarantee continuity	Check the electric connections
The engine does not reach the operating speed	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
	Overload	Reduce the load
	problems related to SCR system	See chapter “OPERATING INFORMATION”, paragraph “**Driver warning system activation DWS Lamp** ”
Emission of black smoke from the exhaust pipe	Dirty or faulty injectors	Replace the injectors
		Apply to an authorised workshop
	Faulty turbocharging turbine	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

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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
	problems related to SCR system	See chapter “OPERATING INFORMATION”, paragraph **“Driver warning system activation DWS Lamp”**
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 particular filter indicator light turns on 	Particulate filter is clogged	The particulate filter regeneration is necessary (see chapter ““OPERATING INFORMATION””, paragraph “Particulate Filter Regeneration”
The Warning inducement lamp (DWS)  turns on	the causes could be different	See chapter “OPERATING INFORMATION”, paragraph **“Driver warning system activation DWS Lamp”**

(*) 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 spare parts centre (See "documentation enclosed": Spare parts and service centre address booklet), indicating the engine serial number. (See"Manufacturer and engine identification")

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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.

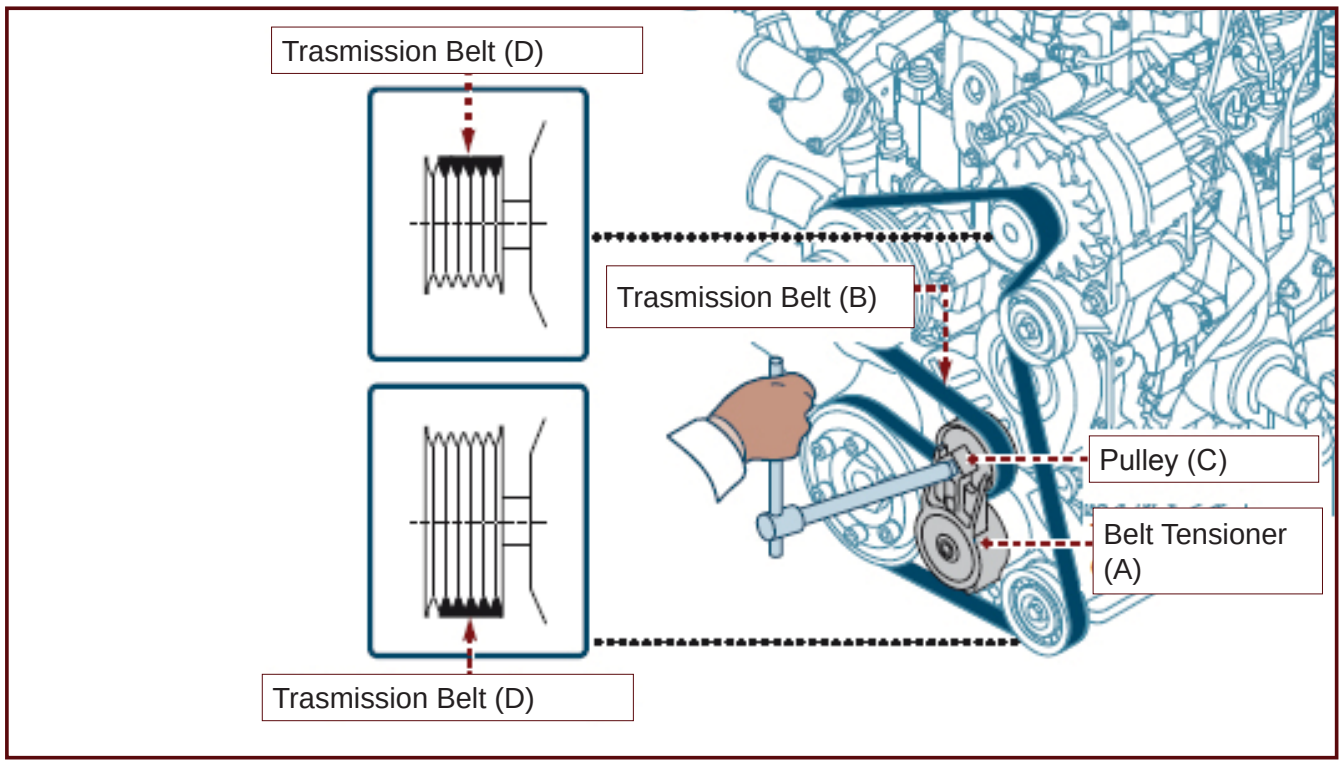
4- Remove the belt (D) and replace it.

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

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.

Photo 1

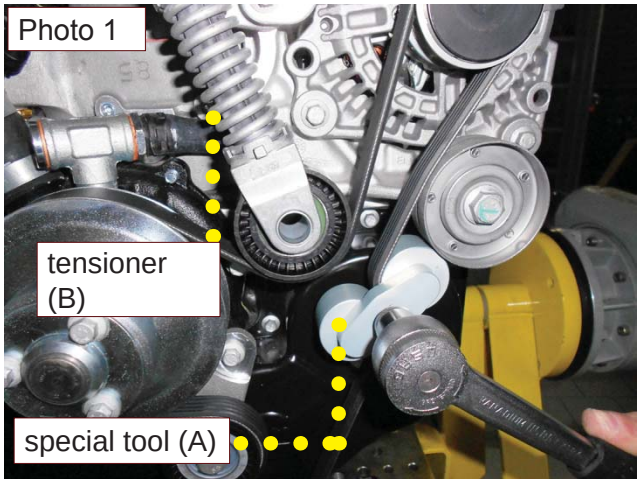


Photo 2

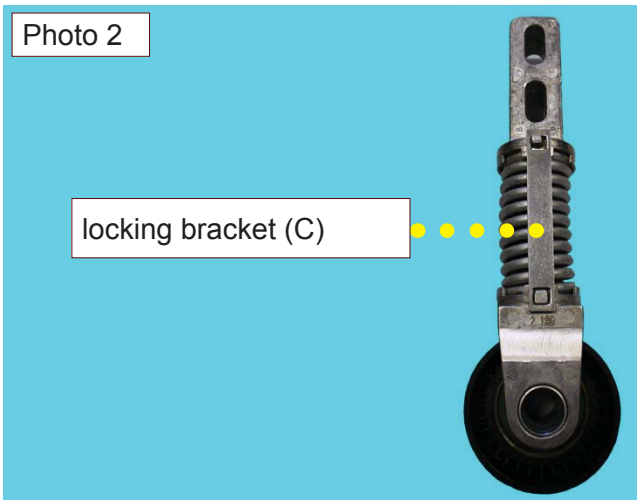
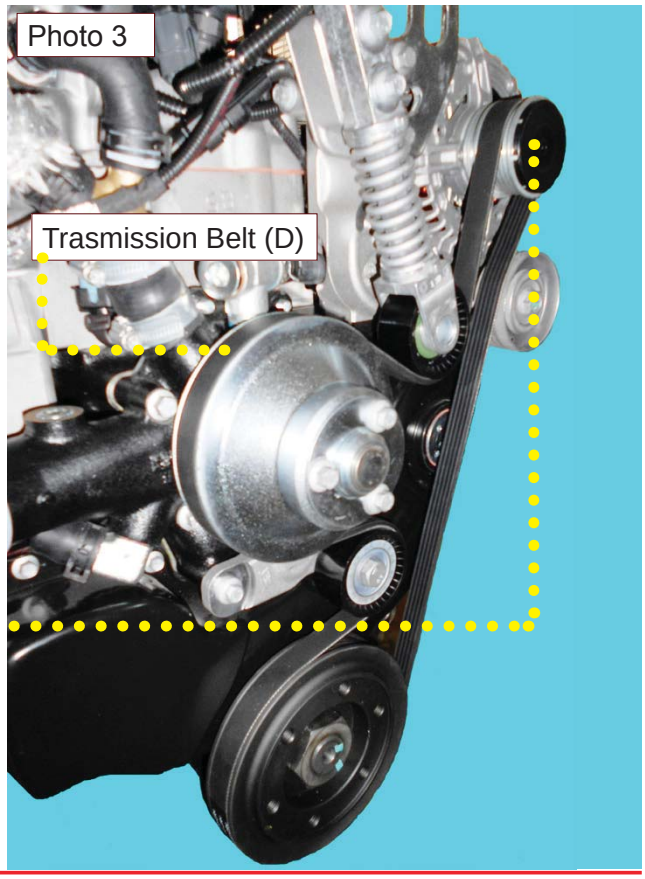
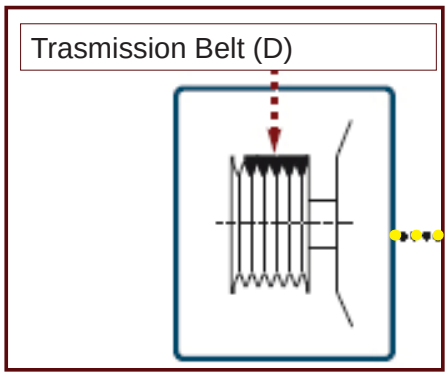


Photo 3





ENGINE DISPOSAL

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.