SERVICE MANUAL

VM Motori
R 753 IE4
Tier 4B (final) and Stage IV
Engine

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General specification

Engine specifications	
Cycle	Four stroke diesel
Total displacement	**2.228 L (2.354 US qt)**
Number of cylinders	3
Bore and stroke	94 x 107
Compression ratio	17.5 : 1
Intake	Turbocharged and inter-cooled circuit
Cooling	Liquid cooled
Water pump control	Belt driven
Cooler	Water / Oil
Crankshaft rotation	Counter-clockwise
Firing order	1 - 3 - 2
Timing	Pushrods and rocker arms With hydraulic tappets and camshaft Gear cascade control and camshaft fitted on the crankcase
Minimum idling speed (RPM)	**800 - 1000 RPM**
Maximum operating speed (RPM)	**3000 RPM**
Rated operating speed	**2600 RPM**
Rated power	**48.5 kW (65 Hp) @ 2600 RPM**
Maximum torque	**220 N·m (162 lb ft) @ 1800 RPM**
Injection	Common rail direct injection
Fuel supply	Gear pump
Injector supply	High pressure injection pump
Circuit fuel supply	Rotor pump
Type of lubrication	Forced lubrication
Oil change including filter	**6.3 L (6.7 US qt)**
Oil pressure at minimum speed	**2.5 bar (36.2 psi)**
Total capacity of cooling circuit (excluding radiator and relevant pipes)	**3.6 L (3.8 US qt)**
Expansion tank cap pressure setting	**1.1 bar (16.0 psi)**
Coolant	50/50 mix
Coolant maximum temperature alarm	**105 °C (221 °F)**
Nominal voltage	**12 V**
Alternating current generator (nominal voltage)	**14 V**
Alternating current generator (nominal current)	**75 A**
Starter motor output	**2 kW (3 Hp)**

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Engine - Troubleshooting

Problem	Possible Cause	Correction
Engine will not start	An engine no start is defined as an engine that will crank but will not start. The most likely causes of this failure are issues related to the battery, fuel system or low engine compression.	1. Faulty battery, voltage too low 2. Insufficient fuel level 3. Contaminated fuel (water or air) 4. Clogged fuel filter 5. Faulty fuel injectors 6. Faulty glow plugs (if equipped) 7. Faulty fuel lift pump (if equipped) 8. Faulty high pressure pump, (if equipped) 9. Faulty mechanical pump, (if equipped) 10. Low engine compression 11. Engine timing incorrect
The engine starts then stalls	This symptom is usually caused by fuel leakage or a clogged fuel filter.	Visually inspect the fuel system for external leakage. If leakage is found, repair as necessary. Check fuel system pressure for adequate pressure. If fuel pressure is lower than expected, repair as necessary.
Engine will not crank	An engine no-crank condition is defined as an engine that will not crank. Possible failures include a dead or weak battery, an open battery disconnect switch (if equipped) or a starting system failure.	1. Check battery voltage. Charge or replace the battery as necessary. 2. Verify the status of the battery disconnect switch (if equipped). The switch must be closed. 3. Check the starting system for possible failures. Check the starter relay and battery voltage at the starter. Perform a voltage drop test between the battery and the engine starter to check the starter wiring. Repair as necessary.
The engine is difficult to start	The cause of an engine hard start condition is similar to those of an engine no start condition. Failures can include inadequate fuel pressure, air supply, engine compression, faulty glow plugs or incorrect injection timing during start up.	1. Faulty battery, voltage too low. 2. Insufficient fuel level 3. Contaminated fuel (water or air) 4. Clogged fuel filter 5. Faulty fuel injectors 6. Faulty glow plugs (if equipped) 7. Faulty fuel lift pump (if equipped) 8. Faulty high pressure pump 9. Restricted air induction system 10. Low engine compression 11. Engine timing incorrect
Engine has a slow cranking condition	A slow engine crank condition can be caused by a weak battery, worn starter internal engine resistance. Extremely cold operating temperatures can also be a factor in a slow engine crank condition.	1. Load test the battery. Charge or replace the battery as necessary. 2. Perform a voltage drop test on the starting circuit. There should be a drop less than **0.5 V** on both the positive and negative circuits. If the drop is greater than **0.5 V**, repair as necessary. 3. Bench test the starter. If the starter operates slower than expected, replace the starter.

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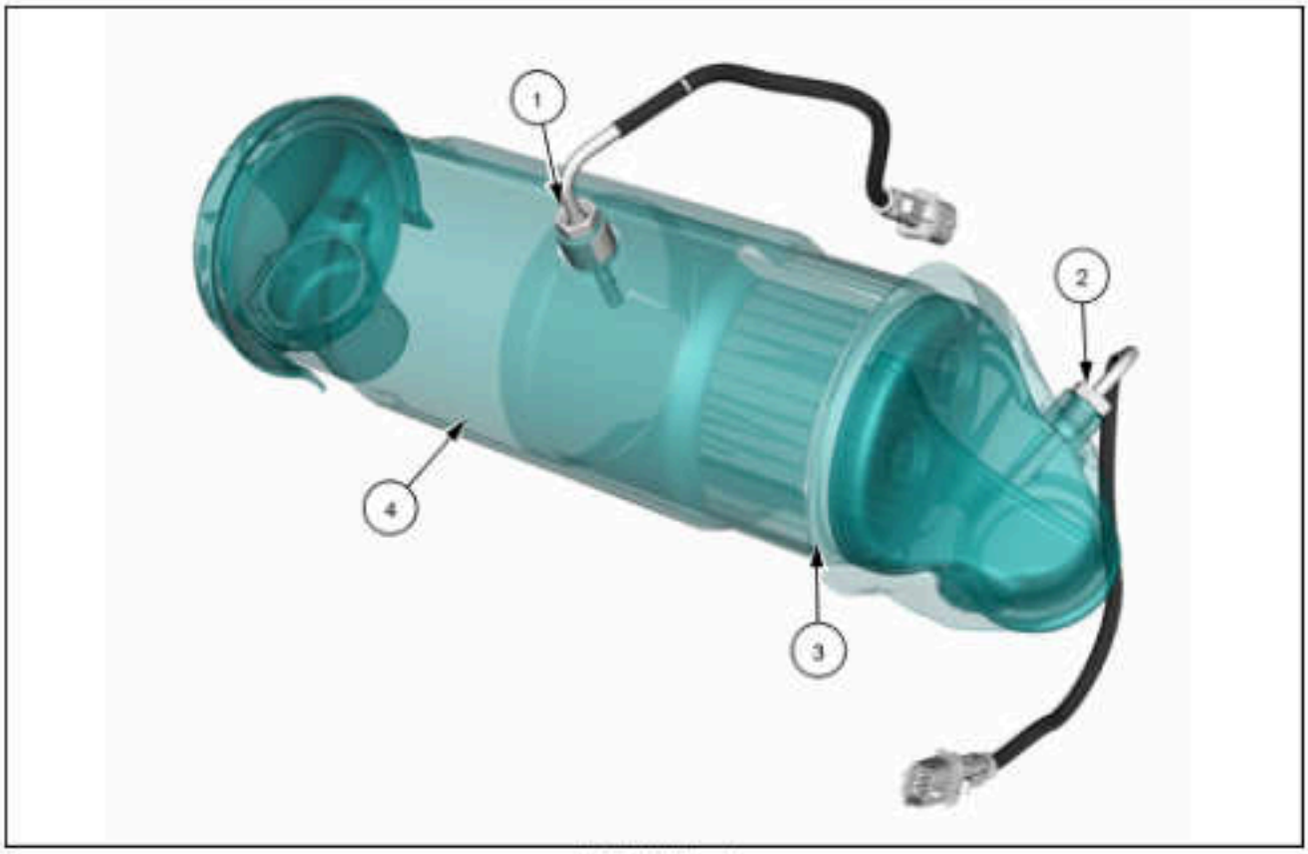
Engine cooling system - Filling

NOTICE: *Before starting the test check that the thermostat applied operate correctly (lift, opening temperature).*

1. All valves operating in the cooling circuit and those in the heating circuit connected to the engine must be opened.
2. Use a flow meter in the filling pipe to adjust the filling flow rate to **8.0 - 10.0 L/min** (**2.1 - 2.6 US gpm**).
3. After adjusting the filling flow rate, filling starts with the engine at a standstill, and ends when water spills over the filling pipe union.

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Particulate Matter (PM) catalyst - Dynamic description



(1) Particulate Matter (PM) catalyst inlet temperature sensor	**(3)** Diesel Oxidation Catalyst (DOC)
(2) Diesel Oxidation Catalyst (DOC) inlet temperature sensor	**(4)** Particulate Matter (PM) catalyst

The PM-Catalyst operates on the principle of continuous passive regeneration of soot with Nitrogen dioxide (NO2). The Nitric oxide (NO) to NO2 conversion occurs over the DOC at temperatures between **220.0 - 450.0 °C** (**428.0 - 842.0 °F**). In passive regeneration the soot oxidation temperature is lowered to a level allowing for auto-regeneration during regular vehicle operation. The engine management system will be tuned (throttle valve closure, rail pressure adjustment, boost pressure adjustment etc.) in order to ensure that the temperatures are sufficiently high to sustain continuous passive regeneration. A minimum NO_x to PM ratio of 30:1, or greater will be necessary for acceptable passive regeneration. Higher NO_x/PM ratios result in higher NO2 concentrations and better filter regeneration.

See **Exhaust Gas Recirculation (EGR) exhaust treatment - Overview (10.501)** for emission standards.

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