CASE CONSTRUCTION

SERVICE MANUAL

ENGINES NEF

Tier 3
F4CE9484, F4CE9684, F4DE9484, F4DE9684, F4DE9687, F4GE9484, F4GE9684, F4HE9484, F4HE9684

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Torque

F4DE9484, F4HE9484, F4DE9684, F4DE9687, F4HE9684

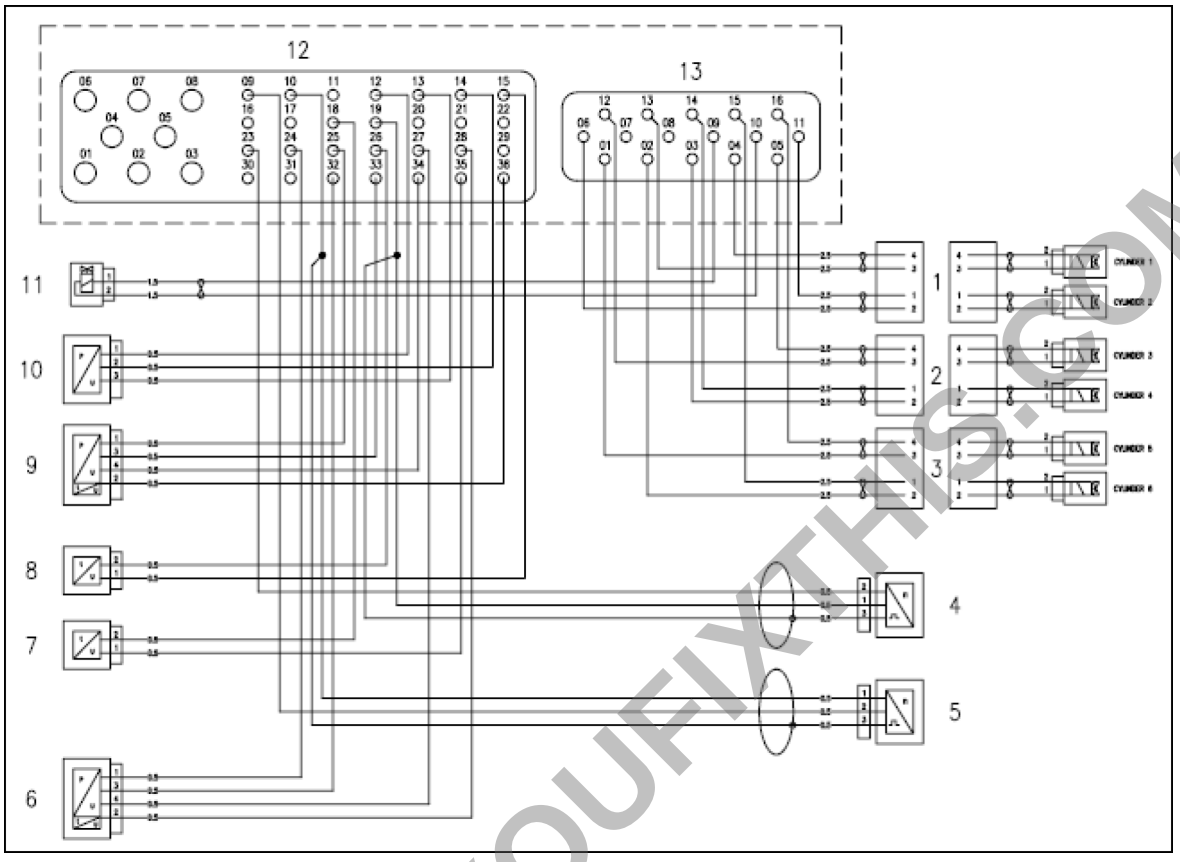
Component	Size	Specification
Cylinder Head and Components		
Plug	¼"	**10 - 14 Nm (7.4 - 10.3 lb ft)**
	½"	**20 - 28 Nm (14.8 - 20.7 lb ft)**
	¾"	**31 - 41 Nm (22.9 - 30.2 lb ft)**
Grid Heater	M6 Nut	**6 - 10 Nm (4.4 - 7.4 lb ft)**
Intake Manifold	M8 Screw	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Engine Lifting Bracket		
Rear	M12	**65 - 89 Nm (47.9 - 65.6 lb ft)**
Front	M8	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Cylinder Head	**M12x1.75x130 mm**	
First Phase		**30 - 40 Nm (22.1 - 29.5 lb ft)**
Second Phase		**85 - 95 °**
Third Phase		**85 - 95 °**
Cylinder Head	**M12x1.75x150 mm**	
First Phase		**50 - 60 Nm (36.9 - 44.3 lb ft)**
Second Phase		**85 - 95 °**
Third Phase		**85 - 95 °**
Rocker Bracket		**31 - 41 Nm (22.9 - 30.2 lb ft)**
Rocker Arm Jam Nuts		**20 - 28 Nm (14.8 - 20.7 lb ft)**
Exhaust Manifold		**48 - 58 Nm (35.4 - 42.8 lb ft)**
Valve Cover	M8 Nut	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Turbocharger		
6 Cylinder	M8 Screw	**6 - 8 Nm (4.4 - 5.9 lb ft)**
	M8 Nut	**37 - 49 Nm (27.3 - 36.1 lb ft)**
4 Cylinder	M8 Screw	**6 - 8 Nm (4.4 - 5.9 lb ft)**
	M8 Nut	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Front Case		
Front Cover	M8 Screw	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Rear Case		
Gear Case	M12 Screw	**65 - 89 Nm (47.9 - 65.6 lb ft)**
	M10 Screw	**42 - 52 Nm (31.0 - 38.4 lb ft)**
	M8 Screw	**20 - 28 Nm (14.8 - 20.7 lb ft)**
Flywheel Housing	M10	**75 - 95 Nm (55.3 - 70.1 lb ft)**
	M12	**44 - 54 Nm (32.5 - 39.8 lb ft)**
Cylinder Block and Crankshaft Components		

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Wiring harness - Electrical schema

F4HE9484, F4HE9684



ELECSCHEMH 1

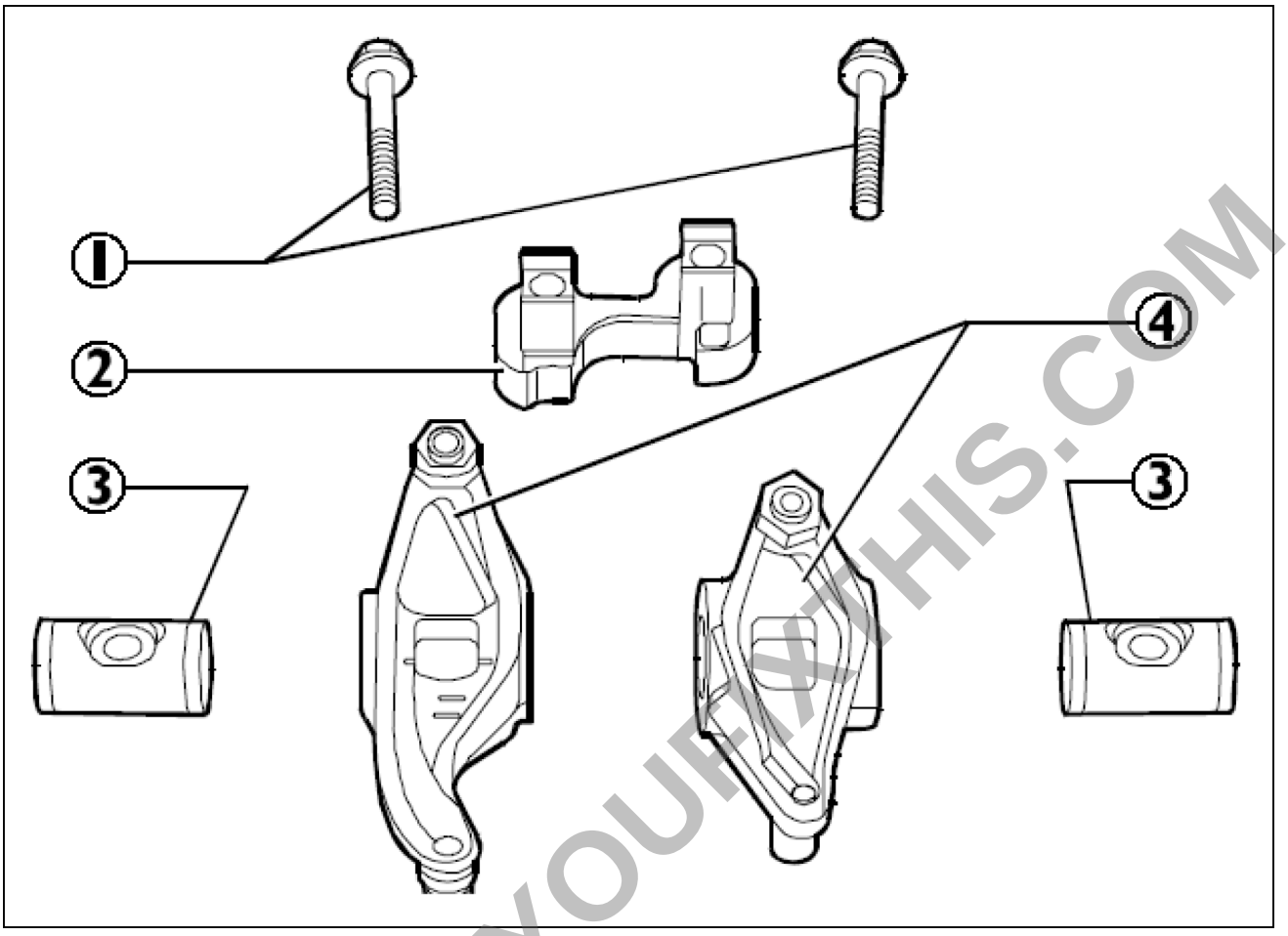
(1) Injectors for cylinders 1 and 2
(2) Injectors for cylinders 3 and 4
(3) Injectors for cylinders 5 and 6
(4) Engine RPM sensor
(5) Timing sensor
(6) Engine oil pressure/temperature sensor
(7) Fuel temperature sensor
(8) Coolant temperature sensor
(9) Air pressure/temperature sensor
(10) Fuel pressure sensor
(11) Pressure regulator
(12) Connector C to the EDC control unit (sensors)
(13) Connector A to the EDC control unit (injectors)

Injectors Connector (A)	
ECU PIN	**FUNCTION**
1	Cylinder 5 injector
2	Cylinder 6 injector
3	Cylinder 4 injector
4	Cylinder 1 injector
5	Cylinder 3 injector
6	Cylinder 2 injector
7	-
8	-
9	Pressure Regulator
10	Pressure Regulator
11	Cylinder 2 injector
12	Cylinder 3 injector
13	Cylinder 1 injector
14	Cylinder 4 injector

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Rocker Assembly Components



ROCKERCOMPONENT 2

(1) Screws - (2) Bracket - (3) Shafts - (4) Rockers.

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FUEL AND INJECTION SYSTEM - Plumbing schema

F4DE9484, F4HE9484, F4DE9684, F4DE9687, F4HE9684

The fuel system is a Common Rail injection system with a CP3 high pressure pump.

The pressure regulator, placed upstream of the high pressure pump, adjusts the fuel flow that is necessary on the low pressure system. Afterwards, the high pressure pump takes care of supplying the rail properly. This arrangement, by pressurizing the necessary fuel only, improves the energetic efficiency and limits fuel heating in the system.

Function of the pressure relief valve **(2)**, assembled on the high pressure pump, is keeping the pressure, at the pressure regulator inlet, constant at **5 bar** (**73 psi**). Based on the efficiency the fuel filter.

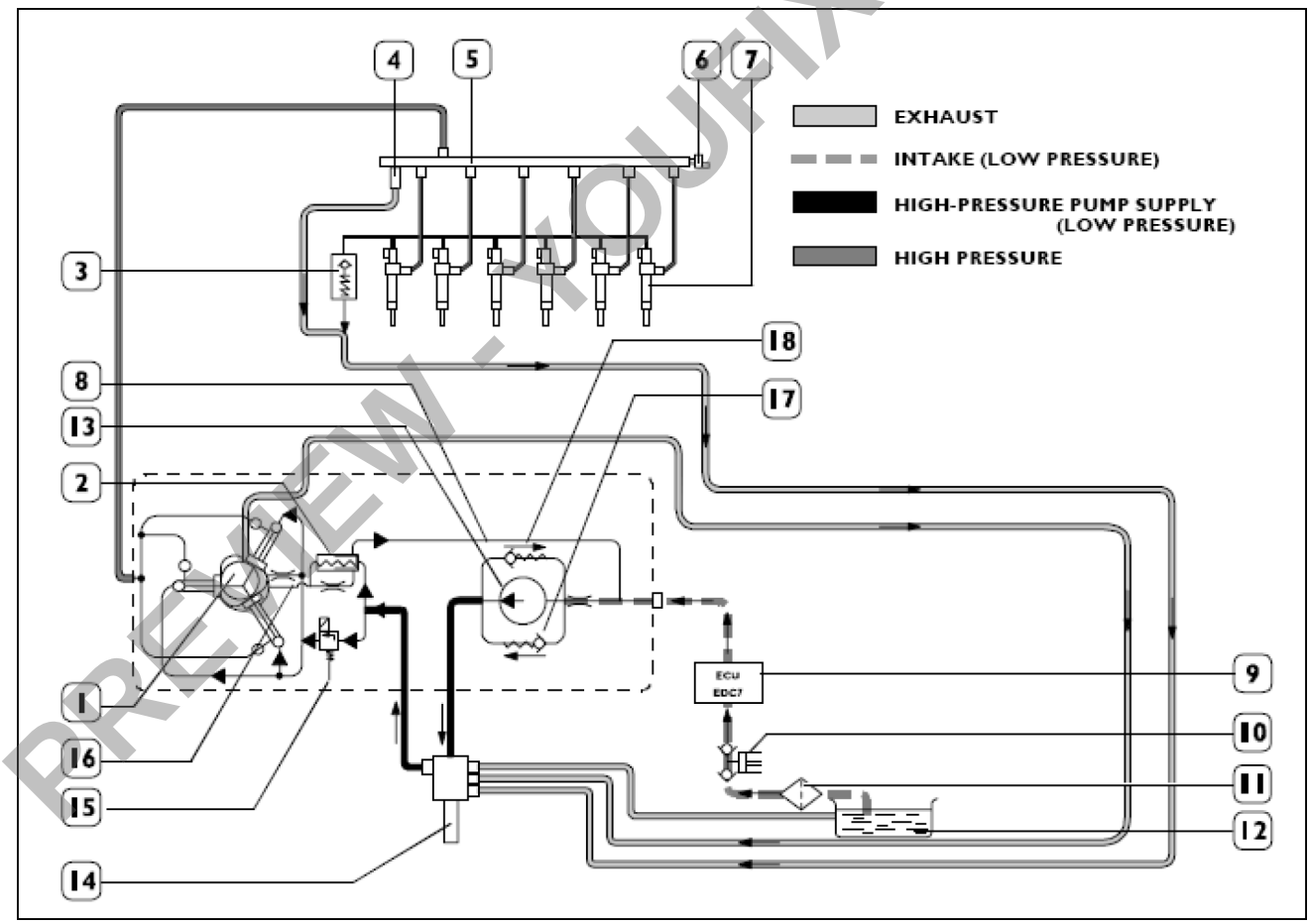
The pressure relief valve **(2)** increases fuel flow in the high pressure pump cooling circuit, through inlet and drain piping **(16)** from piping **(8)**.

The pressure relief valve housed on the cylinder head, assembled on injector return **(3)**, limits the fuel return flow from injectors at a pressure of **1.3 - 2 bar** (**19 - 29 psi**).

Two bypass valves are placed in parallel with the mechanical supply pump.

The bypass valve **(18)** allows fuel to flow from the mechanical pump outlet to it's inlet, when the fuel filter inlet pressure exceeds the allowed threshold value.

The bypass valve **(17)** allows filling the supply system through the manual priming pump **(10)**.



FUELSYSTEMSCHEM 1

(1) High-Pressure pump - (2) pressure relief valve on high pressure pump, 5 bar (72.5 psi) - (3) Pressure relief valve assembled on fuel return from injectors, 1.3 - 2 bar (18.9 - 29.0 psi) - (4) Rail overpressure valve - (5) Common rail - (6) Pressure sensor - (7) Injector - (8) Return spring - (9) Control unit heat exchanger - (10) Mechanical priming pump - (11) Pre-Filter - (12) Fuel tank - (13) Mechanical supply pump - (14) Fuel filter - (15) Pressure regulator - (16) High pressure pump cooling pipe - (17) By-pass valve - (18) By-pass valve.

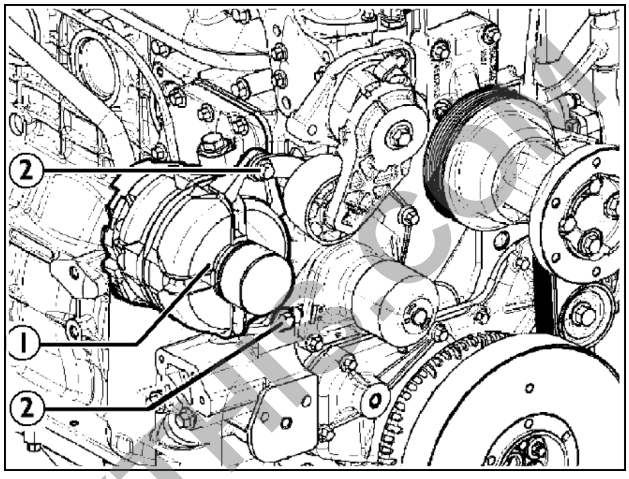
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Alternator - Remove

F4DE9484, F4HE9484, F4DE9684, F4DE9687, F4HE9684

Prior operation:
Fan and drive Belt - Remove (B.50.A)

1. Remove the cables from the back of the alternator **(1)**.
2. Remove the retaining bolts **(2)** securing the alternator **(1)** to the support.
3. Remove the alternator **(1)**.



ALTERNATOR 1

Next operation:
Alternator - Install (A.30.A)

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Clearance Data

Cylinder Block and Crankshaft Components

Cylinder Barrels	**104.000 - 104.024 mm (4.094 - 4.095 in)**
Oversize	**0.4 mm (0.016 in)**
Pistons	**103.714 - 103.732 mm (4.083 - 4.084 in) / 103.759 - 103.777 mm (4.085 - 4.086 in) (*)**
Skirt Height	**55.9 mm (2.201 in) / 49.5 mm (1.949 in) (*)**
Pin housing	**38.010 - 38.016 mm (1.496 - 1.497 in)**
Piston (oversize)	**0.4 mm (0.016 in)**
Protrusion	**0.28 - 0.52 mm (0.011 - 0.020 in)**
Pin	**37.994 - 38.000 mm (1.496 - 1.496 in)**
Piston Pin - Pin Housing	**0.01 - 0.022 mm (0.0004 - 0.001 in)**
Piston ring landings	
Combustion	**2.705 - 2.735 mm (0.106 - 0.108 in)**
Intermediate	**2.440 - 2.460 mm (0.096 - 0.097 in) / 2.420 - 2.440 mm (0.095 - 0.096 in) (*)**
Oil Control	**4.030 - 4.050 mm (0.159 - 0.159 in)**
Piston Rings	
Combustion	**2.560 - 2.605 mm (0.101 - 0.103 in)**
Intermediate	**2.350 - 2.380 mm (0.093 - 0.094 in)**
Oil Control	**3.970 - 3.990 mm (0.156 - 0.157 in)**
Piston Ring and Ring Landing Clearance	
Combustion	**0.100 - 0.175 mm (0.004 - 0.007 in)**
Intermediate	**0.060 - 0.110 mm (0.002 - 0.004 in) / 0.040 - 0.090 mm (0.002 - 0.004 in) (*)**
Oil Control	**0.040 - 0.080 mm (0.002 - 0.003 in)**
Piston Ring End Gap	
Combustion	**0.30 - 0.40 mm (0.012 - 0.016 in)**
Intermediate	**0.60 - 0.80 mm (0.024 - 0.031 in)**
Oil Control	**0.30 - 0.55 mm (0.012 - 0.022 in)**
Connecting Rod	
Small end housing	**40.987 - 41.013 mm (1.614 - 1.615 in)**
Big end housing	**72.987 - 73.013 mm (2.874 - 2.875 in)**
Small end bushing Inside Diameter	**38.019 - 38.033 mm (1.497 - 1.497 in)**
Big end bearing shell thickness	**1.955 - 1.968 mm (0.077 - 0.077 in)**
Piston Pin and Bushing Clearance	**0.019 - 0.039 mm (0.001 - 0.002 in)**
Oversize Big end bearing Shells	**0.250 mm (0.010 in) ; 0.500 mm (0.020 in)**
Crankshaft	
Main Journals	**82.99 - 83.01 mm (3.267 - 3.268 in)**
Crankpins	**68.987 - 69.013 mm (2.716 - 2.717 in)**
Main Bearing Shell Thickness	**2.456 - 2.464 mm (0.097 - 0.098 in)**
Big end Bearing Shell Thickness	**1.955 - 1.968 mm (0.077 - 0.078 in)**
Main Bearing Bore	
No. 1,5 / 1,7	**87.982 - 88.008 mm (3.464 - 3.465 in)**
No. 2,3,4 / 2,3,4,5,6	**87.977 - 88.013 mm (3.464 - 3.465 in)**
Bearing Shell and Journal Clearance	
No. 1,5 / 1,7	**0.041 - 0.119 mm (0.002 - 0.005 in)**
No. 2,3,4 / 2,3,4,5,6	**0.041 - 0.103 mm (0.002 - 0.004 in)**
Bearing Shell and Crankpin Clearance	**0.033 - 0.041 mm (0.001 - 0.002 in)**

(*) Valid for engines: F4HE9684P, F4HE9684A, F4HE9687P, F4HE9687A

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ENGINE - Service limits Maintenance Planning

F4DE9484, F4HE9484, F4DE9684, F4DE9687, F4HE9684

To ensure optimized working conditions, in the following pages we are providing instructions for the overhaul control interventions, checks and setting operations that must be performed on the engine at due planned dates.
The frequency of the maintenance operations is just an indication since the use of the engine is the main characteristic to determine and evaluate replacements and checks.
It is not only allowed but recommended that the staff in charge of the maintenance should also carry out the necessary maintenance and controlling operations even if not being included in the ones listed here below but that may be suggested by common sense and by the specific conditions in which the engine is run.

Regular maintenance and inspection planning

Checks and periodical inspections	Frequency (hours)
Visual check of engine	Daily
Inspection presence of water in fuel filter or pre-filter	Daily
Inspection blow-by filter elements	-
Inspection of belt wear status	-
Inspection and setting of tappet clearance	4000
EDC	When anomaly occurs
Replacement of engine's oil and filter	500
Replacement of pre-filter	1000
Replacement of fuel filter	500
Replacement of blow-by filter	500
Replacement of belt	1500

NOTICE: *The frequency of the maintenance operations is just an indication since the use of the engine is the main characteristic to determine and evaluate replacement and checks.*
The maintenance operations are valid only if the setter fully complies with all the installation prescriptions provided by Iveco Motors.
Furthermore, the users assembled by the setter shall always be in conformance to couple, power and number of turns based on which the engine has been designed.

Daily Maintenance Checks

It is a good habit to execute, before engine start, a series of simple checks that might represent a valid warranty to avoid inconveniences, even serious, during engine running. Such checks are usually up to the operators and to the vehicle's drivers.

- Fluid levels and checks of any eventual leakage from the fuel, cooling and lubricating circuits.
- Notify the maintenance if any inconvenience is detected or if any filling is necessary.

After engine start and while engine is running, proceed with the following checks and controls:

- check presence of any eventual leakage from the fuel, cooling and lubricating circuits.
- Verify absence of noise or unusual rattle during engine working.
- Verify, using vehicle devices, the prescribed pressure, temperature and other parameters.
- Visual check of fumes (color of exhaust emissions)
- Visual check of cooling liquid level, in the expansion tank.

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Bearing Shell and Crankpin Clearance	**0.033 - 0.041 mm (0.001 - 0.002 in)**

(*) Valid for engines: F4DE9684A.

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Fuel system inspection

The check must be executed both when the engine is off and when it is running.
The check operation consists in examining the fuel pipelines running from the tank to the pre-filter (if provided in the specific equipment), to the filter, to the high pressure pump and to the rail diffuser and from this last one to the head.
Special attention must be paid to the connections on the high pressure pipelines.

⚠ WARNING ⚠

Diesel fuel escaping under pressure can penetrate the skin causing serious injury. Do not use your hand to check for leaks. Use a piece of cardboard or paper to search for leaks. Wear protective gloves and eye protection.If any fluid is injected into the skin, obtain medical attention immeadiately or gangrene may result. Failure to comply could result in serious injury or death.

B071

Cooling system inspection

The check must be executed both when the engine is off and when it is running.
Check the pipelines from the engine to the radiator, from the expansion tank and vice-versa. Find out any blow-by, verify the status of the pipes specially close to the holding strips.
Verify that the radiator is clean, the correct working of the fan flywheels, the presence of any leakage from the connectors, from the manifold and from the radiating unit.

⚠ DANGER ⚠

Hot coolant can spray out if radiator cap is removed. To remove radiator cap: Wear face protection, let system cool, turn to first notch, then wait until all pressure is released. Scalding can result from fast removal of radiator cap. Check and service engine cooling system according to maintenance instructions.

SB023

The density of the cooling liquid must be checked any how every year before winter season and be replaced in any case every two years.

NOTE: *In case of new filling, proceed bleeding the system, through the bleeds on the engine.*
If bleeding of the system is not carried out, serious inconvenience might be caused to the engine due to the presence of air pockets in the engine's head.

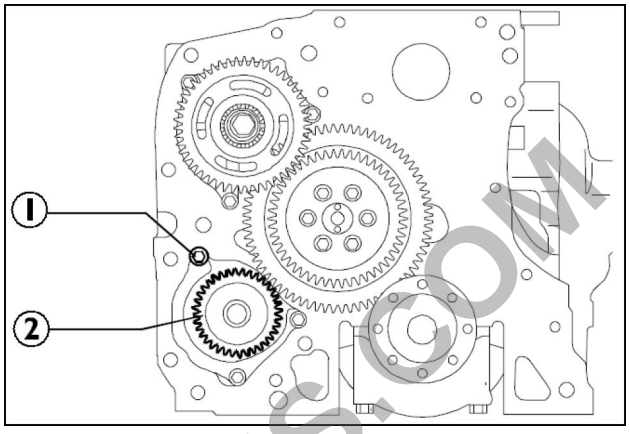
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Auxiliary drive - Install

F4CE9484, F4CE9684

1. Fit the power take-off gear **(2)** (where equipped) into the specially provided housing and fasten the screws **(1)**.



AUXDRIVEC 1

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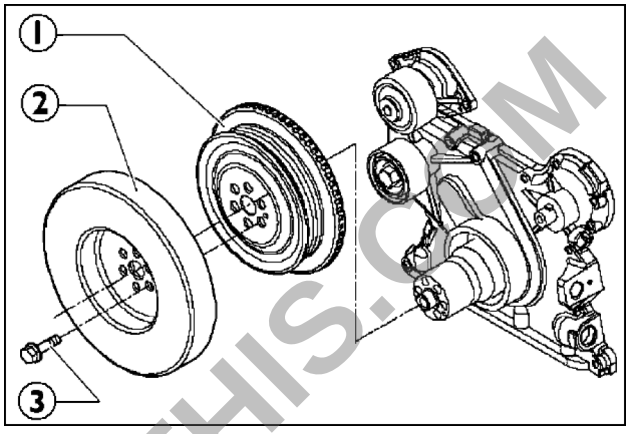
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Vibration damper - Install

F4HE9484, F4HE9684

Prior operation:
Vibration damper - Remove (B.10.A)

1. Attach the vibration damper **(2)** and the pulley **(1)** to the crankshaft, and torque the mounting bolts **(3)** to **61 - 75 Nm** (**45 - 55 lb ft**).



VIBDAMPENERH 1

Next operation:
Fan and drive Belt - Install (B.50.A)

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Sensing system Position sensor - Remove

F4DE9484, F4HE9484, F4DE9684, F4DE9687, F4HE9684

1. Remove the mounting nut and slide the timing sensor out of the timing gear housing.

Next operation:
Sensing system Position sensor - Install (B.10.A)

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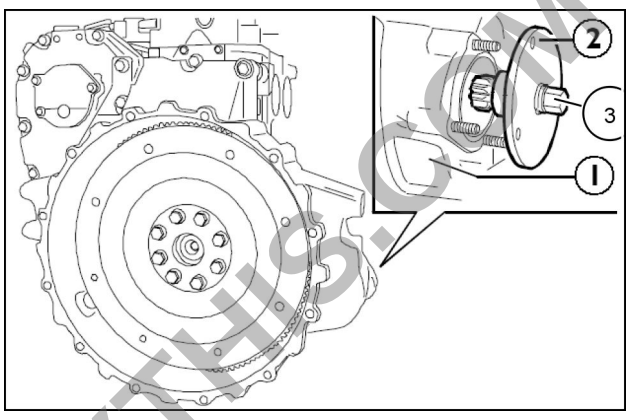
Fuel injection pump Rotary injection pump - Disassemble

F4GE9484, F4GE9684

Prior operation:
Fuel injection pump Rotary injection pump - Remove (B.20.A)

NOTE: *This procedure assumes that all the fuel pipes have been removed, the electrical connections have been disconnected, and the accelerator cable shall also be disconnected.*

1. Remove the starter from the flywheel housing **(1)** and use tools **380000988 (2)** and **380000732 (3)** to rotate the flywheel.

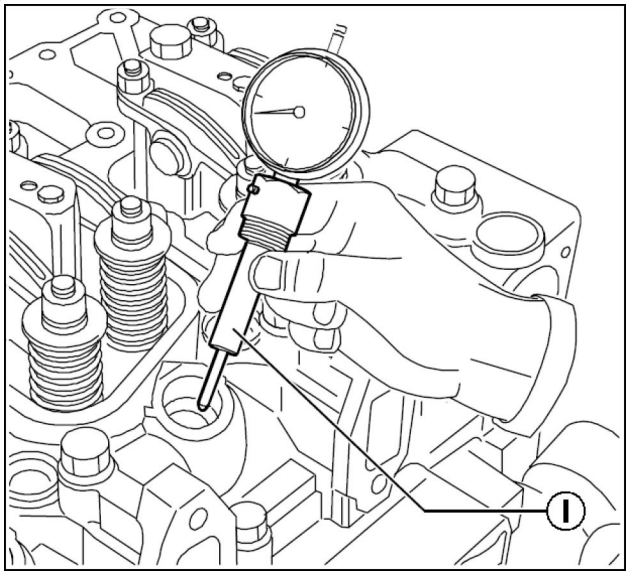


FLYWHEELROTATEG 1

NOTE: *In the case of pump replacement, the spare part shall be supplied preset. If the pump is to be disassembled and reassembled later on without being repaired, it will be necessary to preset the pump while it is still assembled to the engine and disassembled afterwards.*

Finding TDC with the false injector

2. Remove the rocker cover of the first cylinder.
3. Remove the injector and place the tool **(1)** to set the number one cylinder to the TDC (top dead center) position at the end of the compression phase. Pre-load the gauge.
4. This condition is obtained by rotating the engine shaft properly until you find the maximum value on the gauge and then checking that the intake and exhaust valves are both closed.
5. Once TDC is obtained, lock the flywheel by means of tool **380000988**.



TDCTOOLING 2

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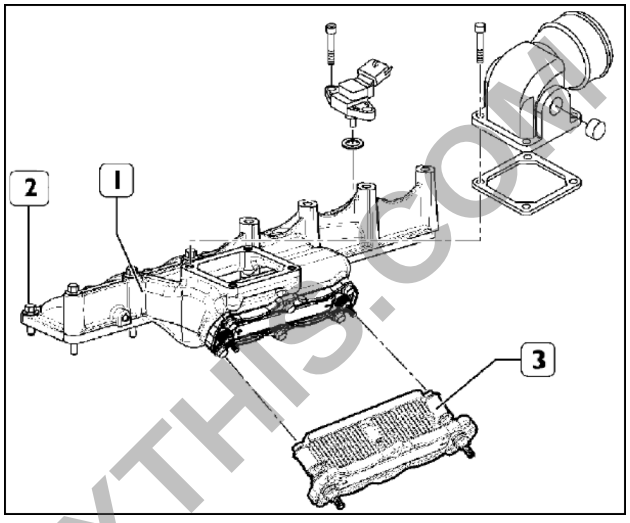
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Air intake manifold - Install

F4HE9484, F4HE9684

Prior operation:
Air intake manifold - Remove (B.30.A)

1. Apply **LOCTITE 5999**to the mounting surface of the air intake heater **(3)** on the intake manifold **(1)**.
2. Install the heater **(3)** and tighten bolts.
3. Assemble the manifold and fasten it to the cylinder head using screws **(2)**.



INTAKEF4HE 1

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Water pump - Install 18
Water pump - Remove 17

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