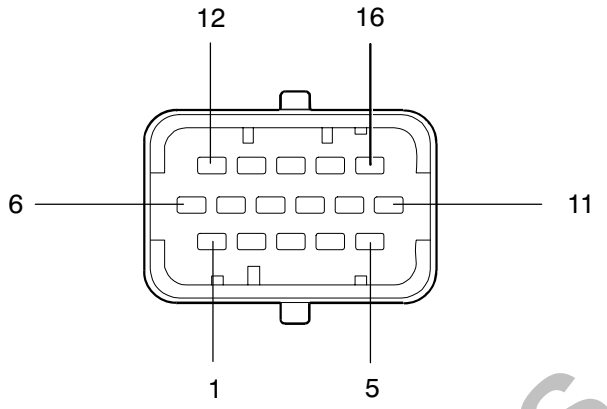
Injectors connector (A)

Figure 3



50350

PIN ECU	COLOUR CABLE	FUNCTION
1	-	-
2	-	-
3	MN	Cylinder injector 2
4	MV	Cylinder injector 3
5	VB	Cylinder injector 4
6	HR	Cylinder injector 2
7	-	Ground
8	-	Ground
9	MB	Cylinder injector 1
10	VN	Cylinder injector 6
11	VG	Cylinder injector 5
12	HN	Cylinder injector 3
13	HG	Cylinder injector 1
14	CN	Cylinder injector 4
15	CB	Cylinder injector 6
16	CL	Cylinder injector 5

Colours key

A	light blue
B	white
C	orange
G	yellow
H	grey
L	dark blue
M	dark brown
N	black
R	red
S	pink
V	green
W	light brown
Z	violet

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TIGHTENING TORQUE

PART				TORQUE	
				Nm	(kgm)
Cylinder head fastening screw	1st phase:	screws M12x1.75x70		50 ± 5	(5 ± 0.5)
		screws M12x1.75x140		40 ± 5	(4 ± 0.5)
		screws M12x1.75x180	▲	70 ± 5	(7 ± 0.5)
	2nd phase:			90°	
	3rd phase:	(only for screws 140 and 180 mm long)		90°	
Bed cap fastening screws	1st phase			50 ± 6	(5 ± 0.6)
	2nd phase		▲	80 ± 6	(8 ± 0.6)
	3rd phase			90°	
Connecting rod cap fastening screws		1st phase		30 ± 5	(3 ± 0.5)
		2nd phase	▲	50 ± 5	(5 ± 0.5)
		3rd phase		60° ± 5°	
Engine flywheel fastening screws		pre-tighten		30 ± 5	(3 ± 0.5)
		Angle	▲	60° ± 5°	
Injector fastening				60 ± 5	(6 ± 0.5)
Fuel filter				contact + 3/4 turn	
Injection pump gear cover fastening screw				25 ± 5	(2.5 ± 0.5)
Valve gear cover and case fastening screw				25 ± 5	(2.5 ± 0.5)
Container fastening screw				25 ± 5	(2.5 ± 0.5)
Intake manifold fastening screw				25 ± 5	(2.5 ± 0.5)
Fuel pump fastening screw				25 ± 5	(2.5 ± 0.5)
Exhaust manifold fastening screw				53 ± 5	(5.3 ± 0.5)
Tappet cover fastening nut				25 ± 5	(2.5 ± 0.5)
Rocker arm support fastening screw				48 ± 8	(4.8 ± 0.8)
Nut for rocker arm adjusting screw				25 ± 5	(2.5 ± 0.5)
Screw fastening the pulley on drive shaft			pre-tighten	50 ± 5	(5 ± 0.5)
			Angle	90°	
Distributing shaft shoulder plate fastening screw				25 ± 5	(2.5 ± 0.5)
Fan support fastening screw				25 ± 5	(2.5 ± 0.5)
Injection pump fastening screw				12 ± 5	(1.2 ± 0.5)
Fan pulley fastening screw				45 ± 5	(4.5 ± 0.5)
Turbocompressor fastening screw				25 ± 5	(2.5 ± 0.5)
Heat exchanger fastening screw				25 ± 5	(2.5 ± 0.5)
Oil pump and front cover fastening screw				25 ± 5	(2.5 ± 0.5)
Starter motor fastening screw				55 ± 5	(5.5 ± 0.5)
Alternator fastening screw				45 ± 5	(4.5 ± 0.5)
Water pump fastening screw				25 ± 5	(2.5 ± 0.5)
Oil filter				contact + 3/4 turn	
Belt stretcher fastening screw				45 ± 5	(4.5 ± 0.5)

▲ - Lubrication with oil

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Recovery software version 4.1_2

Associated with the recognition of meaningful or severe anomalies, the adoption of strategies is activated in the ECU that, in order to allow using the engine in full safety, limit some injection parameters within pre-established thresholds depending on case severity.

In currently used software applications, four safety levels are provided, that are characterised by vehicle performance reduction.

The table related to blink-codes includes power reduction values that for such purpose point out the performance limitations that are automatically adopted by the control unit depending on the anomaly being present.

In case of intermittent anomalies, namely recognised by the ECU and afterwards no more present, the performance reduction will be active till the engine stops.

Normal operation will be restored only upon the following start-up while the anomaly data will be "saved" in the failures memory.

Blink-Code	Warning light EDC	Anomaly description	Power reduction
VEHICLE			
1.2	OFF	Multi Switch	0
1.4	ON	Accelerator pedal signal	0
1.8	OFF	Diagnosis warning indicator	0
ENGINE			
2.1	ON	Refrigerating liquid temperature sensor signal	0
2.2	OFF	Supercharging air temperature sensor signal	0
2.3	OFF	Fuel temperature sensor signal	0
2.4	ON	Supercharging pressure sensor signal	0
2.5	OFF	Atmospheric pressure sensor signal	0
2.6	ON	Oil pressure sensor signal	0
2.7	ON	Oil temperature sensor signal	0
2.8	OFF	Heated filter control relay	0
3.7	ON	Battery voltage	0
3.8	OFF	Pre-post heating warning light	0
3.9	OFF	Pre-post heating resistance	0

Power reduction:

0 = No power reduction

1 = Slight power reduction - Performance comparable with equivalent but aspired engine

2 = Moderate power reduction - 50% torque

3 = High power reduction - Limited engine speed

4 = Engine stop

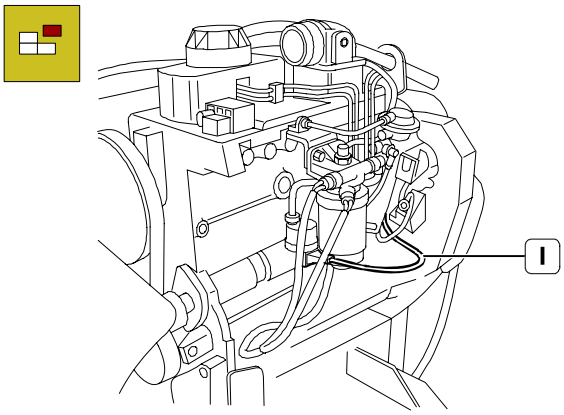
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ENGINE BENCH-OVERHAUL

Disassembling the engine

Figure 30



84252

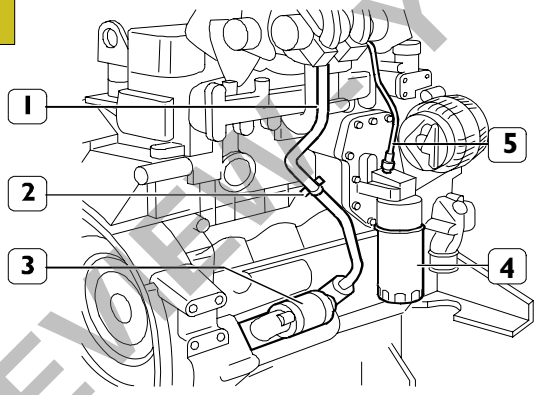
Drain the engine oil by taking the cap off the sump and the oil filling cap off the head cover.

Remove the fan unit from the fan pulley.

In order to be able to fit bracket 380000661 (which fastens the engine to the overhaul stand) to the crankcase, it is necessary to:

- ❑ remove electric wiring (1).

Figure 31



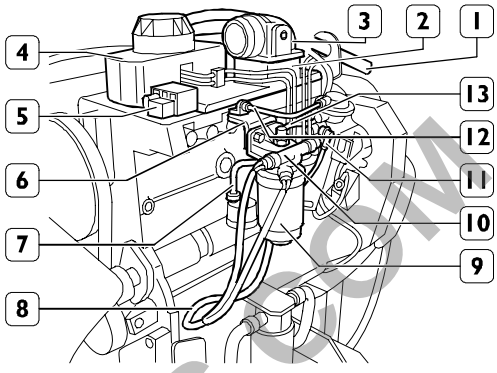
86463

In order to be able to fit bracket 380000661 to the crankcase on the right side, it is necessary to remove:

- ❑ the starter motor (3);
- ❑ the bracket (2) fastening the oil return pipe (1);
- ❑ the oil return piping (1) relative to turbine;
- ❑ take off turbine lubrication delivery pipe (5);
- ❑ remove oil filter (4) and heat exchanger unit.

Secure the engine to rotary stand 380000301.

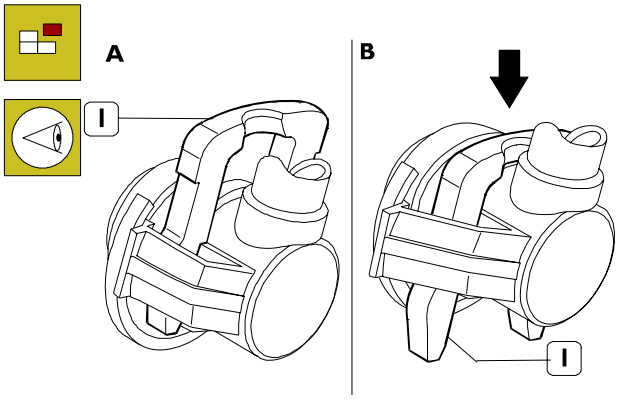
Figure 32



84254

- ❑ disconnect the engine oil vapour recovery pipe from blow-by (1);
- ❑ take off tappet covers (4);
- ❑ disconnect electric wiring (8);
- ❑ take off fuel filter (9);
- ❑ take off intake manifold (3);
- ❑ take off container (2);
- ❑ take off container control unit (5);
- ❑ disconnect the piping from L.D.A. system (13);
- ❑ disconnect quick-coupling pipes (7), (10), (11) and (13), by following the indications given in Figure 33;
- ❑ take off fuel filter support (6).

Figure 33



70126

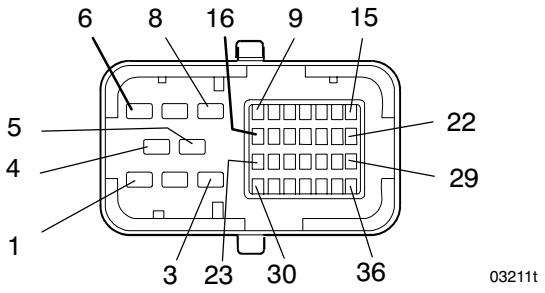
Act on fork (1) as shown in the figure (detail A), then remove the adapter. To avoid damaging the same, bring fork (1) back to the locking position (detail B) after the adapter has been removed.

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Sensors connector (C)

Figure 5



Colours key

A	light blue
B	white
C	orange
G	yellow
H	grey
L	dark blue
M	dark brown
N	black
R	red
S	pink
V	green
W	light brown
Z	violet

PIN ECU	COLOUR CABLE	FUNCTION
5	C	Pressure regulator ground
7	V	Pressure regulator control
9	MN	Engine oil pressure – temperature sensor supply
10	CR	Air pressure – temperature sensor supply
12	HN	Rail pressure sensor supply
17	BL	Fuel temperature sensor ground
18	CV	Cooling liquid temperature sensor ground
19	GV	Engine oil temperature – pressure sensor ground
20	BZ	Rail pressure sensor ground
21	GN	Air temperature sensor ground
23	R	Signal from distribution shaft sensor
24	B	Drive shaft sensor ground
25	R	Signal from drive shaft sensor
27	RV	Signal from rail pressure sensor
28	LN	Signal from air pressure sensor
29	BH	Signal from air temperature sensor
30	B	Distribution sensor ground
33	GR	Signal from engine oil pressure sensor
34	CN	Signal from fuel temperature sensor
35	NS	Signal from engine oil temperature sensor
36	BG	Signal from cooling liquid temperature sensor

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TIGHTENING TORQUE

Mechanic Injection Engine
F4GE0684F

PART			TORQUE Nm	TORQUE (kgm)
Cylinder head fastening screw	1st phase: screws M12x1.75x70		50 ± 5	(5 ± 0.5)
	screws M12x1.75x140		40 ± 5	(4 ± 0.5)
	screws M12x1.75x180	▲	70 ± 5	(7 ± 0.5)
	2nd phase:		90°	
	3rd phase: (only for screws 140 and 180 mm long)		90°	
Bed cap fastening screws	1st phase		50 ± 6	(5 ± 0.6)
	2nd phase	▲	80 ± 6	(8 ± 0.6)
	3rd phase		90° ± 5°	
Connecting rod cap fastening	1st phase		30 ± 5	(3 ± 0.5)
	2nd phase	▲	50 ± 5	(5 ± 0.5)
	3rd phase		60° ± 5°	
Engine flywheel fastening screws	pre-tighten		30 ± 5	(3 ± 0.5)
	Angle	▲	60° ± 5°	
Injector fastening			60 ± 5	(6 ± 0.5)
Sump oil drain plug			60 ± 5	(6 ± 0.5)
Fuel filter			contact + 3/4 turn	
Injection pump gear cover fastening screw			25 ± 5	(2.5 ± 0.5)
Valve gear cover and case fastening screw			25 ± 5	(2.5 ± 0.5)
Container fastening screw			25 ± 5	(2.5 ± 0.5)
Intake manifold fastening screw			25 ± 5	(2.5 ± 0.5)
Fuel pump fastening screw			25 ± 5	(2.5 ± 0.5)
Exhaust manifold fastening screw			53 ± 5	(5.3 ± 0.5)
Tappet cover fastening nut			25 ± 5	(2.5 ± 0.5)
Rocker arm support fastening screw			48 ± 8	(4.8 ± 0.8)
Nut for rocker arm adjusting screw			25 ± 5	(2.5 ± 0.5)
Screw fastening the pulley on drive shaft	pre-tighten		50 ± 5	(5 ± 0.5)
	Angle		90° ± 5°	
Distributing shaft shoulder plate fastening screw			25 ± 5	(2.5 ± 0.5)
Fan support fastening screw			25 ± 5	(2.5 ± 0.5)
Injection pump fastening screw			12 ± 5	(1.2 ± 0.5)
Fan pulley fastening screw			45 ± 5	(4.5 ± 0.5)
Turbocompressor fastening screw			25 ± 5	(2.5 ± 0.5)
Heat exchanger fastening screw			25 ± 5	(2.5 ± 0.5)
Oil pump and front cover fastening screw			25 ± 5	(2.5 ± 0.5)
Starter motor fastening screw			55 ± 5	(5.5 ± 0.5)
Alternator fastening screw			45 ± 5	(4.5 ± 0.5)
Water pump fastening screw			25 ± 5	(2.5 ± 0.5)
Oil filter			contact + 3/4 turn	
Belt stretcher fastening screw			45 ± 5	(4.5 ± 0.5)

▲ - Lubrication with oil

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Blink-Code	Warning light EDC	Anomaly description	Power reduction
INJECTORS			
5.1	ON	Injector solenoid valve for cylinder 1	0
5.2	ON	Injector solenoid valve for cylinder 2	0
5.3	ON	Injector solenoid valve for cylinder 3	0
5.4	ON	Injector solenoid valve for cylinder 4	0
5.5	ON	Injector solenoid valve for cylinder 5	0
5.6	ON	Injector solenoid valve for cylinder 6	0
5.7	ON	Power stage 1 (cylinders 1-2-3)	0
5.8	ON	Power stage 2 (cylinders 4-5-6	0
ENGINE REVOLUTIONS			
6.1	ON	Drive shaft sensor signal	2
6.2	ON	Distribution shaft sensor signal	2
6.3	ON	Engine speed signal plausibility	0
6.4	Blinking	Excessive engine revolutions	0
6.5	OFF	Starter relay	0
FUEL PRESSURE			
8.1	Blinking	Fuel pressure control-RAIL	3
8.2	Blinking	Fuel pressure signal	3
8.3	Blinking	Pressure regulator solenoid valve	3
8.4	Blinking	Double-stage overpressure valve intervention	3
8.5	Blinking	Max pressure error-RAIL	4
CONTROL UNIT			
9.4	ON	Main relè	0
9.6	ON	Turning-off procedure in control unit	0
9.7	ON	Sensors supply	0

Power reduction:

0 = No power reduction

1 = Slight power reduction - Performance comparable with equivalent but aspired engine

2 = Moderate power reduction - 50% torque

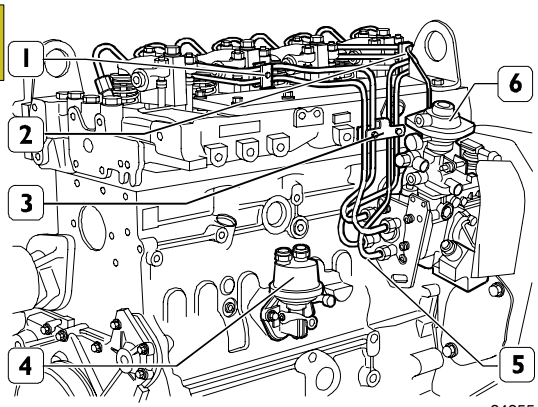
3 = High power reduction - Limited engine speed

4 = Engine stop

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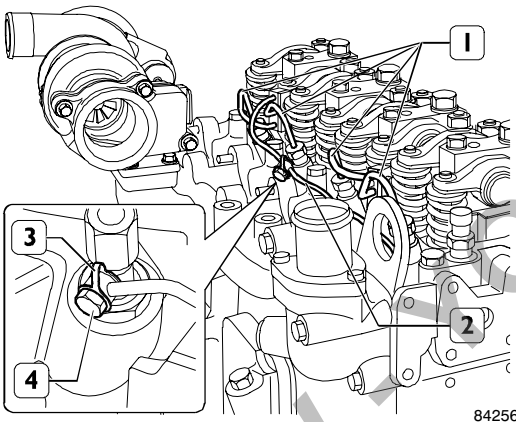
Figure 34



84255

- ❑ Remove injector (5) feed pipes (5) from injection pump (6); remove the rackets fastening the pipe unit (1), (2) and (3) on the cylinder head.
- ❑ Remove the priming pump (4).

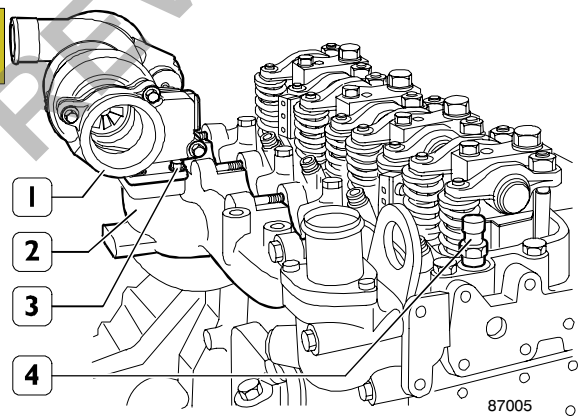
Figure 35



84256

- ❑ Remove the feed pipe unit from injectors (1).
- ❑ Remove fuel drain pipe (2) from injectors by removing the screw (4) and the seal (3).

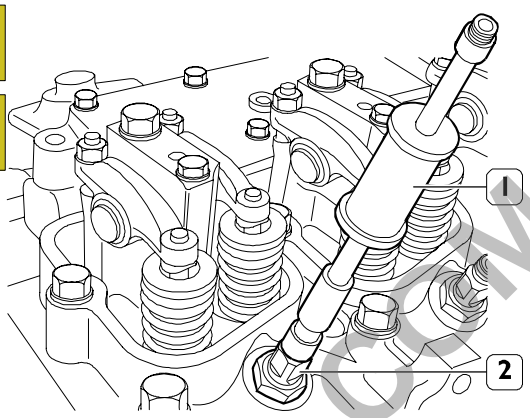
Figure 36



87005

- ❑ Remove the screws (3) and then remove the turbine (1).
- ❑ Remove the exhaust manifold (2).
- ❑ Remove water temperature sensor (4).

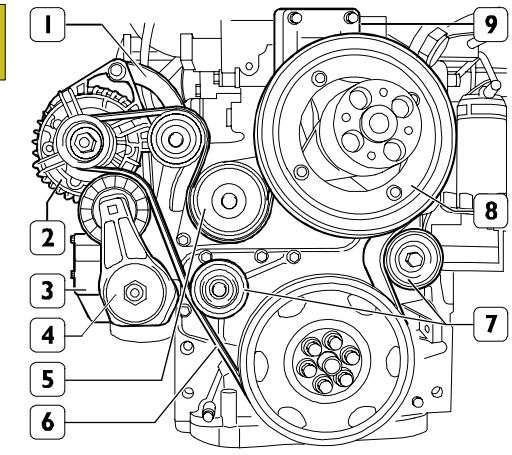
Figure 37



84082

Take out injectors (2) by means of tool (1) 380000671.

Figure 38



84258

- ❑ Remove the belt tightener (4).
- ❑ Remove the auxiliary component belt (6) operating the alternator fastening bracket (1).
- ❑ Remove the alternator (2), the water pump (5), the fan pulley (8) and the guide pulleys (7).
- ❑ Remove the pulley support (9).
- ❑ Remove the engine cooling system connection (3) from the cylinder block.

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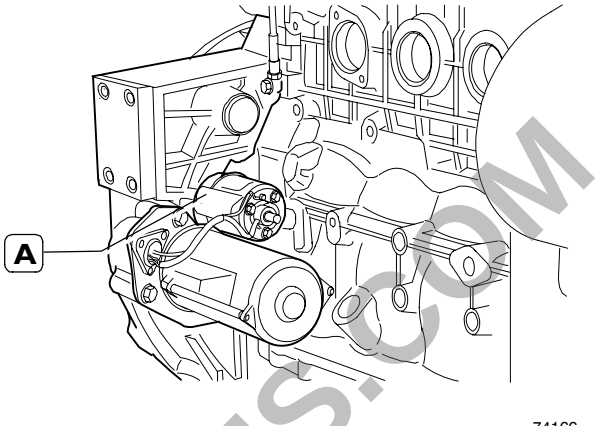
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Starting

Starting is usually driven through a starting block placed on vehicle dashboard and supplies a positive voltage to electronic control unit pin 20B.

The control unit itself in turn controls, through pin 37B, the starter supplying remote control switch.

Figure 11



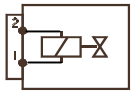
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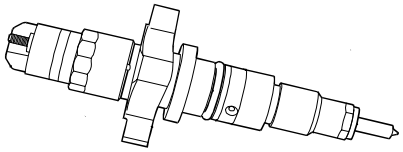
A – Starter supplying remote control switch;

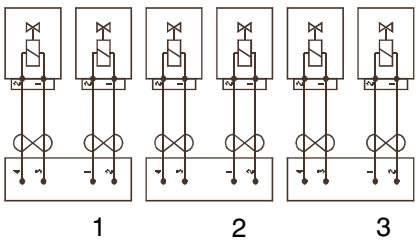
Electro-injectors - connectors

REFERENCE		DESCRIPTION	PIN CONTROL
CONNECTOR 1	1	Cylinder injector 2	3 A
	2	Cylinder injector 2	6 A
	3	Cylinder injector 1	13 A
	4	Cylinder injector 1	9 A
CONNECTOR 2	1	Cylinder injector 4	5 A
	2	Cylinder injector 4	14 A
	3	Cylinder injector 3	12 A
	4	Cylinder injector 3	4 A
CONNECTOR 3		Cylinder injector 6	10 A
		Cylinder injector 6	15 A
		Cylinder injector 5	16 A
		Cylinder injector 5	11 A

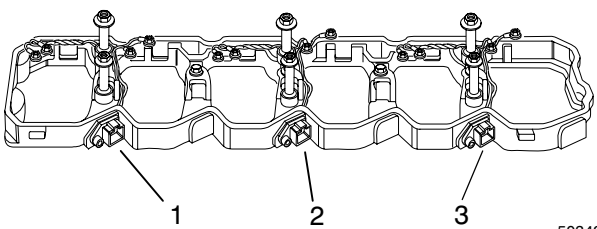
Figure 12







50343



50349

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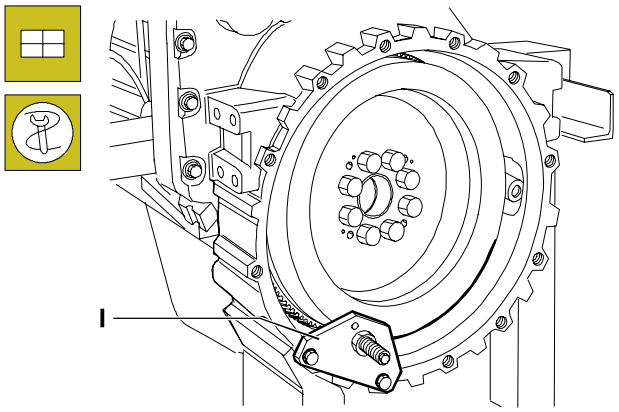
Engines Common Rail
F4HE0684J - F4AE0684K - F4AE0684L

PART		TORQUE	
		Nm	kgm
Cylinder barrel lubrication nozzle fixing screw M8		15 ± 3	1.5 ± 0.3
Engine shaft cap fixing screw M12	1st phase	50 ± 6	5 ± 0.6
	2st phase	80 ± 6	8 ± 0.6
	3st phase	90º ± 5º	
Stud bolts M6 for camshaft sensors		8 ± 2	0.8 ± 0.2
Stud bolts M8 for power supply pump		12 ± 2	1.2 ± 0.2
Rear gearcase fixing screw M12		77 ± 12	7.7 ± 1.2
Rear gearcase fixing screw M10		47 ± 5	4.7 ± 0.5
Rear gearcase fixing screw M8		24 ± 4	2.4 ± 0.4
Camshaft sensor fixing nut M6		10 ± 2	1 ± 0.2
Oil pump fixing screw M8	1st phase	8 ± 1	0.8 ± 0.1
	2st phase	24 ± 4	2.4 ± 0.4
Front cover fixing screw M8		24 ± 4	2.4 ± 0.4
Screw M8 for camshaft longitudinal check plate fixing		24 ± 4	2.4 ± 0.4
Camshaft gear fixing screw M8		36 ± 4	3.6 ± 0.4
Connecting rod cap fixing screw M11	1st phase	60 ± 5	6 ± 0.5
	2st phase	60º ± 5º	
Underblock plate fixing screw M10		43 ± 5	4.3 ± 0.4
Nut M18 for high pressure pump gear fixing		105 ± 5	10.5 ± 0.5
Fuel pump fixing nuts M8		24 ± 4	2.4 ± 0.4
½ inch plug on the cylinder head		24 ± 4	2.4 ± 0.4
½ inch plug on the cylinder head		36 ± 5	3.6 ± 0.5
½ inch plug on the cylinder head		12 ± 2	1.2 ± 0.2
Injector fixing screws M6	1st phase	8.5 ± 0.35	0.85 ± 0.035
	2st phase	75º ± 5º	
Union fixing nut for injector power supply		50 ± 5	5 ± 0.5
Pre-heating grid nut M6 on the suction manifold		8 ± 2	0.8 ± 0.2
Suction manifold fixing screw M8		24 ± 4	2.4 ± 0.4
Rear bracket fixing screw M12 for engine lifting		77 ± 12	7.7 ± 1.2
Common rail fixing M8 screws		24 ± 4	2.4 ± 0.4
High-pressure fuel pipe unions M14		20 ± 2	2 ± 0.2
Cylinder head fixing M12 screw (12x1.75x 130)	1st phase	35 ± 5	3.5 ± 0.5
Cylinder head fixing M12 screw (12x1.75x 150)	1st phase	55 ± 5	5.5 ± 0.5
	2st phase	90º ± 5º	
	3st phase	90º ± 5º	
Equalizer support fixing screw		36 ± 5	3.6 ± 0.5
Valve clearance adjustment nut		24 ± 4	2.4 ± 0.4
Power supply pipe fixing nuts M14 from common rail high pressure pump		20 ± 2	2 ± 0.2
High pressure pipe union fixing screw M8		24 ± 4	2.4 ± 0.4
Head bulkhead fixing screw M6 for harness		10 ± 2	1 ± 0.2
Electric harness support fixing screw M8 for injector power supply		24 ± 4	2.4 ± 0.4
Harness fixing nuts on individual injector		1.5 ± 0.25	0.15 ± 0.025
Fuel filter-holder bracket fixing screw M12		77 ± 8	7.7 ± 0.8
Fuel filter-holder fixing screw M8		24 ± 4	2.4 ± 0.4
Fuel filter		contact + ¾ turn	
Oil pressure adjustment valve fixing screw M22 on the oil filter support		80 ± 8	8 ± 0.8
Oil filter support and gasket radiator fixing screw M8		24 ± 4	2.4 ± 0.4
Oil filter		contact + ¾ turn	

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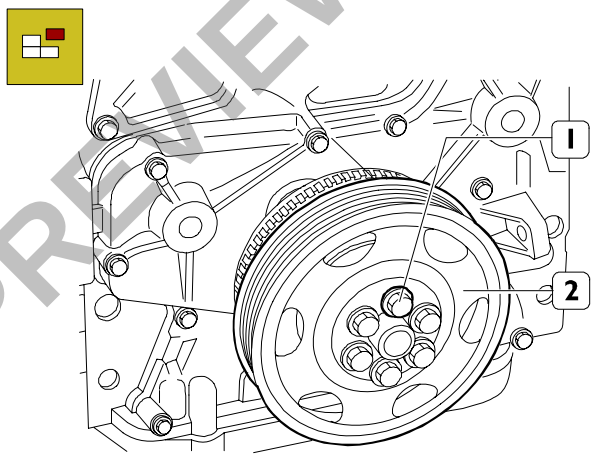
Figure 39



84068

Apply tool 380000144 (1) to the flywheel housing to stop flywheel rotation.

Figure 40

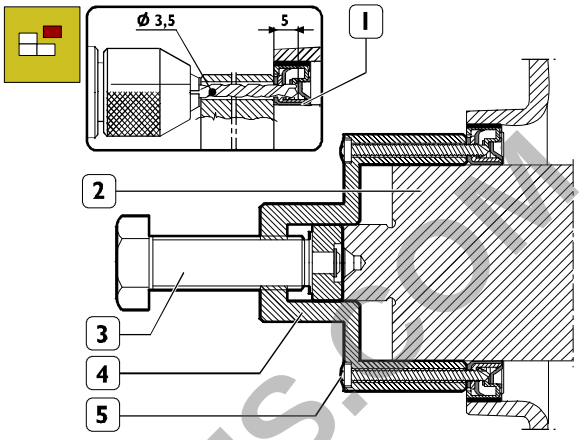


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Unscrew fastening screws (1) from pulley (2).

Disassembling front seal ring

Figure 41



78256

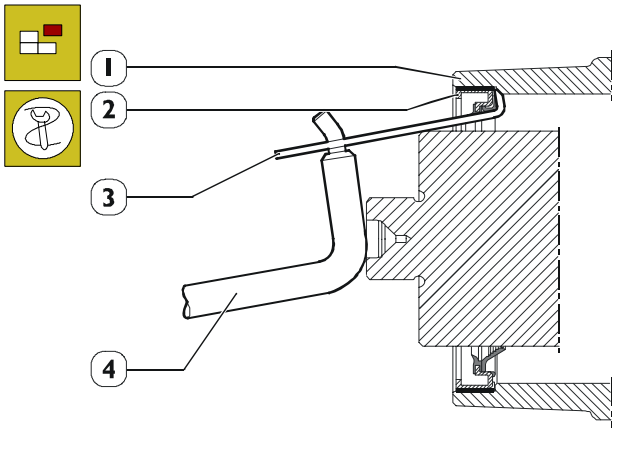
Apply tool 380000665 (4) on drive shaft front shank (2).

Drill inner seal ring (1), through tool 380000665 (4) guide holes, with an inset (∅ 3.5 mm) down to a depth of 5 mm.

Secure tool 380000665 (4) to ring (1) by screwing the 6 screws (5) provided.

Take off ring (1) by fastening screw (3).

Figure 42



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Apply the proper tension rod (3) of tool 380000669 to outer seal ring (2) as shown in the figure, then take the same off front cover (1) by means of lever (4).

Remove the front cover.

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ENGINES

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