

Product: Case 668T/M2 668T/E2 Engine Service Manual

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CASE Engines 668T/M2 and 668T/E2

Service Manual

Bur 6-47950NA



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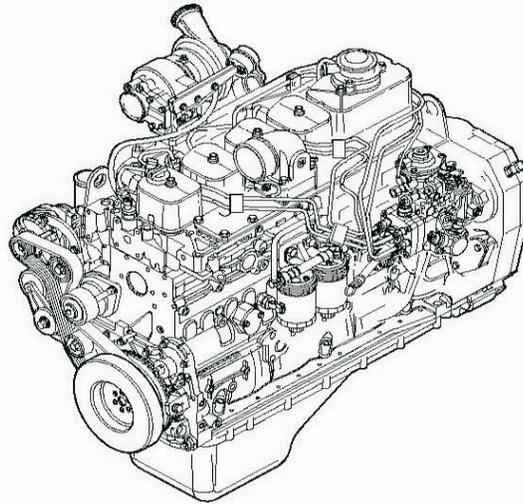
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REPAIR MANUAL FOR ENGINES

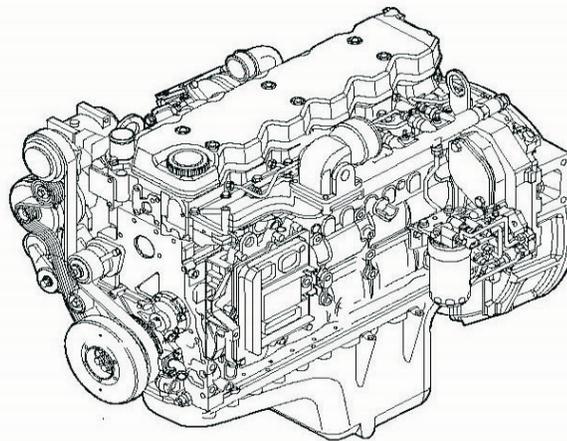
F4GE0684F - (668T/M2)

F4HE0684J - (668T/E2)

6-47950NA



F4GE0684F



F4HE0684J

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INTRODUCTION

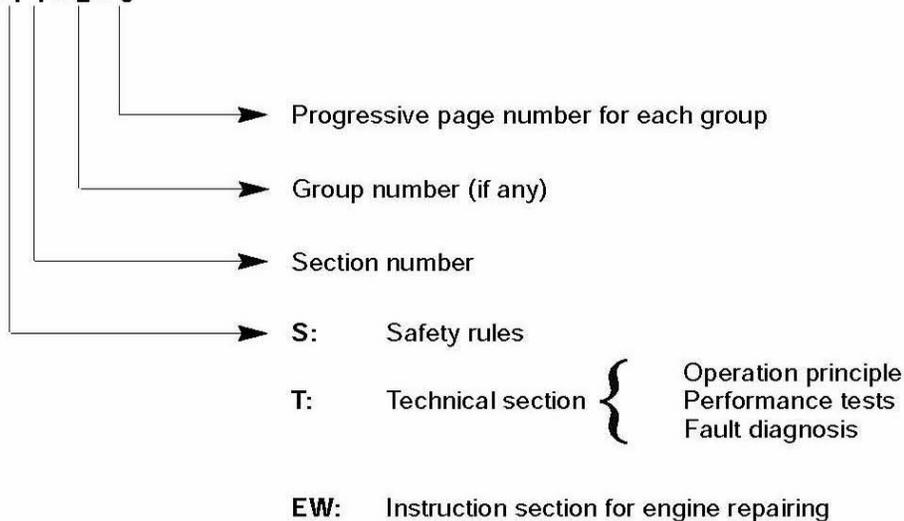
TO THE READER

- This manual was written for a skilled technician and contains all the technical information needed to repair this vehicle.
- Read this manual carefully for the information concerning repairing operations.

FURTHER REFERENCES**PAGE NUMBER**

- Every page carries a number on the top right corner. Every page contains the following information:

Example:: T 1 - 2 - 3

**SYMBOLS**

This manual contains safety warning symbols and indications referring to possible injuries or vehicle damages.



This symbol regards safety.

Use great care when you see this symbol because possible injuries to the personnel may occur. Strictly observe the precautions marked with this symbol.

The safety warning symbol is used also to draw attention on the weight of a component or an element. Make sure you are always using the right equipment and lifting techniques when handling heavy loads, in order to prevent injuries or damages.

ENGINES

F4GE0684F - F4HE0684J OVERHAUL



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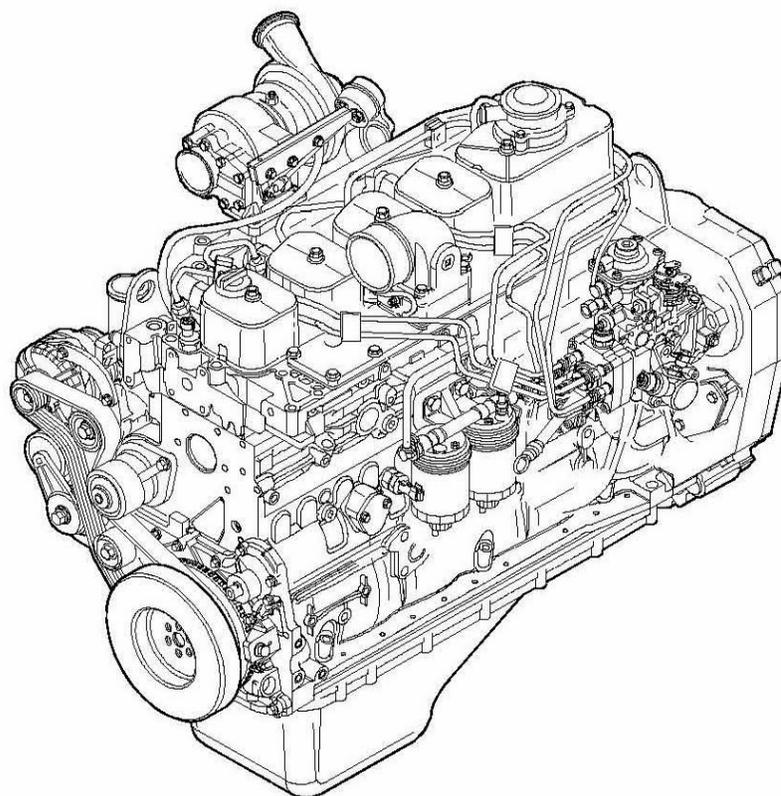
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ENGINE F4GE0684F - F4HE0684J OVERHAUL

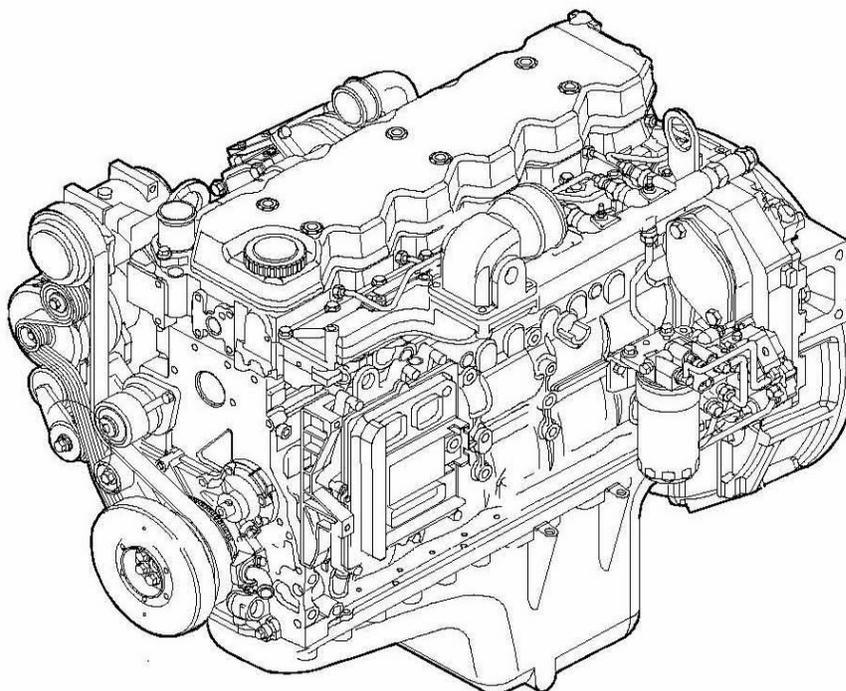
Figure 1



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ENGINE F4GE0684F

Figure 2

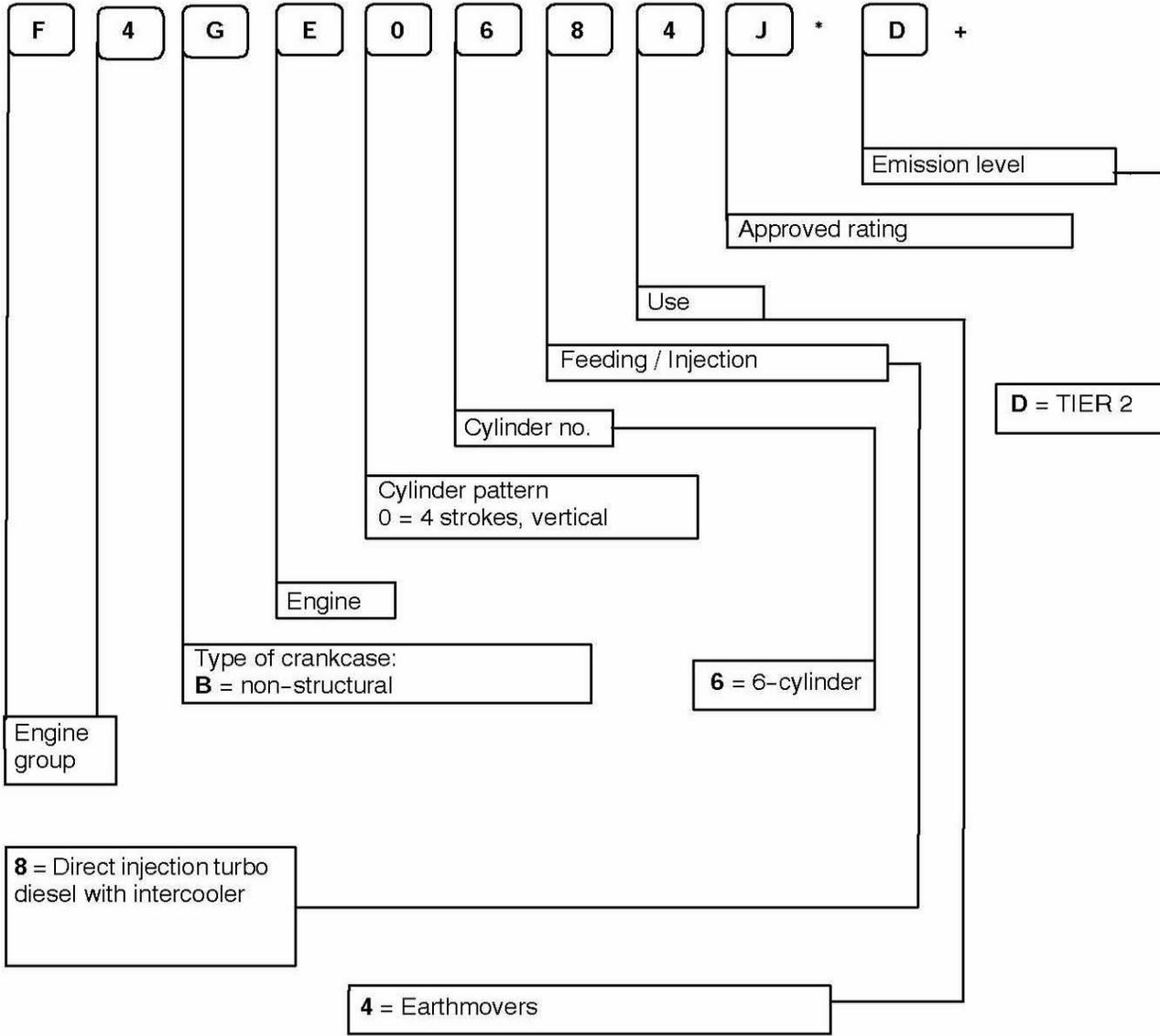


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ENGINE F4HE0684J

ENGINE F4GE0684F - F4HE0684J OVERHAUL

ENGINE CODING



X Y Y

X = 4 in-line, 2-valve injection pump
Y = Engine model
X = X= 1 4-valve Common Rail

Y Y Y Y Y Y

Manufacturing sequence number

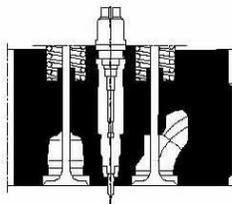
ENGINE F4GE0684F - F4HE0684J OVERHAUL

MAIN ENGINE FEATURES

A →	LW130.B	LW170.B
B →	F4GE0684F	F4HE0684J
C →	*D601	*D100
D →		
E →	6728 cm ³	
F →	110 kW 2000 rpm	145 kW 2000 rpm

G →

Direct injection



H →

In-line injection pump

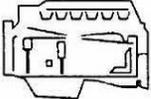
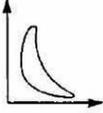
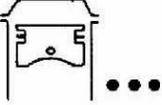
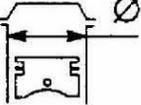
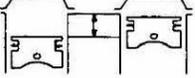
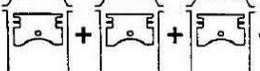
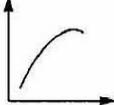
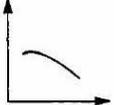
I →

T.A.A.
(Boosted by intercooler)

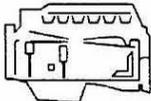
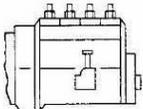
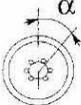
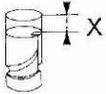
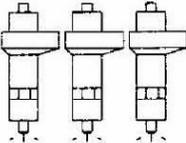
- A** Wheeled loaders
- B** Type of engine
- C** Engine model
- D** Number of cylinders
- E** Total displacement
- F** Max. power currently available
- G** Type of injection
- H** Injection system
- I** Air supply system

ENGINE F4GE0684F - F4HE0684J OVERHAUL

MAIN ENGINE FEATURES

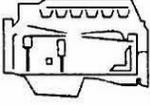
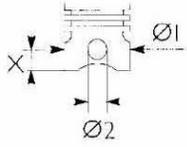
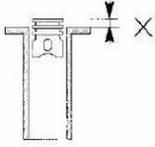
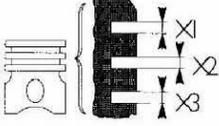
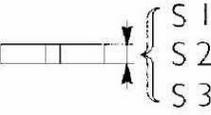
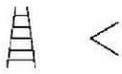
	Type	F4GE6484F	F4HE6484J	
		*D601	*D100	
	Cycle	4-stroke diesel engine		
	Feeding	Boosted by intercooler		
	Injection	Direct		
	Number of cylinders	In-line, 6-cylinder		
	Bore	mm	11042	
	Stroke	mm	132	
	Total displacement	cm ³	6728 cm ³	
	Compression ratio			
 	Max. rating	kW min ⁻¹	110 2000	145 2000
 	Max. torque	Nm (kgm) min ⁻¹	675 1400	850 1400
	No-load idle rpm	min ⁻¹	700	
	No-load peak rpm	min ⁻¹	-	
	BOOSTING Type of turbocompressor:	With intercooler HOLSET HX35W		
	LUBRICATION	Forced by means of gear pump, pressure relief valve, oil filter		
	Oil pressure with hot engine: at idle rpm at peak rpm	bar bar	1.2 3.8	

ENGINE F4GE0684F - F4HE0684J OVERHAUL

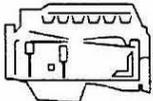
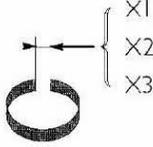
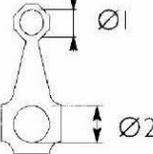
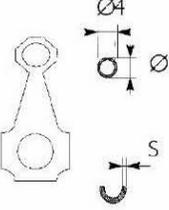
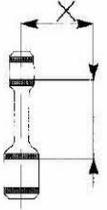
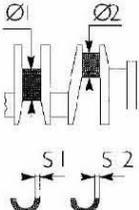
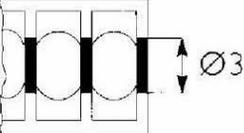
	Type	F4GE0684F	F4HE0684J
		*D601	*D100
COOLING	Water pump drive: Thermostat: start of opening: °C	By fluid	
		By means of belt	
		81 ± 2	
	REFUELLING		
	Full filling capacity 1°	litres	-
	Ambra Super Gold 15W40 10W30	kg	
	- engine sump	litres	-
	- engine sump + filter	kg	
		litres	
		kg	
	FEEDING Bosch-type injection	VE6/12F9000 L968	High pressure Common Rail
	Pump setting	0° ± 0°.5	
	Start of delivery	mm	1
	Type of nozzle	DSLA 145 P1174	Electro-injectors
	Injection sequence	1 - 5 - 3 - 6 - 2 - 4	
 	Injection pressure bar	245 bar	250 - 1450 bar

ENGINE F4GE0684F - F4HE0684J OVERHAUL

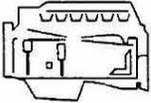
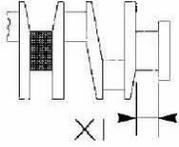
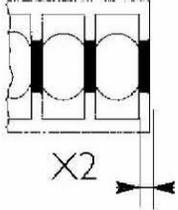
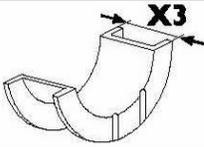
ASSEMBLING PLAY - SPECIFICATIONS

	Type	F 4GE0684F		F 4HE0684J	
		*D601		*D100	
CRANK GEAR COMPONENTS AND CYLINDER ASSEMBLY			mm		
	Cylinder liners  Ø1			104	
	Pistons: supplied with standard spares Measurement dimension X Outer diameter Ø1 Pin seat Ø2	X Ø1 Ø2	61 103.730 to 10.748 38.016 to 38.010		
	Piston - cylinder liners			-	
	Piston diameter  Ø1			0.5	
	Position of pistons from crankcase	X	-		
	Piston pin  Ø3			37.994 to 38.000	
	Piston pin - Pin seat			0.01 to 0.022	
	Type of piston X1* Piston ring slots X2 X3	X1* X2 X3	2.705 to 2.735 2.440 to 2.460 4.03 to 4.05		
	Piston rings S1 S2 S3	S1* S2 S3	2.560 to 2.605 2.350 to 2.380 3.977 to 3.990		
	Piston rings - Slots	1 2 3	0.100 to 0.175 0.010 to 0.11 0.040 to 0.083		
	Piston rings			0.5	

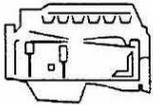
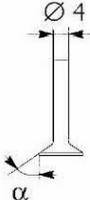
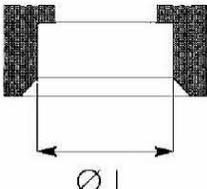
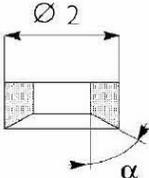
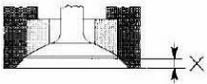
ENGINE F4GE0684F - F4HE0684J OVERHAUL

	Type	F4GE0684F	F4HE0684J
		*D601	*D100
CRANK GEAR COMPONENTS AND CYLINDER ASSEMBLY		mm	
	Piston ring end opening in cylinder liner:	X1	0.3 to 0.4
		X2	0.6 to 0.8
		X3	0.3 to 0.55
	Connecting rod small-end bushing seat	Ø1	41.2797 to 41.553
	Connecting rod bearing seat	Ø2	72.987 to 73.013
	Connecting rod small-end bushing diameter		
	Outer	Ø4	40.987 to 410.13
	Inner	Ø3	38.019 to 38.033
	Connecting rod small-end bushing – seat		0.266 to 0.566
	Piston pin – Bushing		0.019 to 0.039
	Measurement dimension	X	-
	Max. error on connecting rod axis parallelism	=	-
	Journals	Ø1	82.99 to 83.01
	Crankpins	Ø2	68.987 to 69.013
	Main half bearings	S1*	2.456 to 2.464
	Connecting rod half bearings	S2*	1.955 to 1.968
	* supplied with spares		
	Bed supports no.:		
	n. 1-5	Ø3	87.982 to 88.008
	n. 2-3-4		87.977 to 88.013

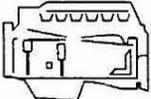
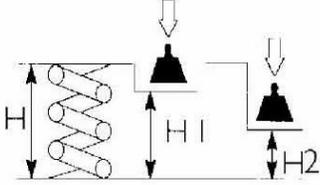
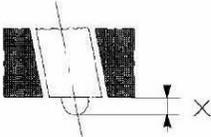
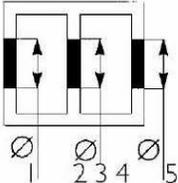
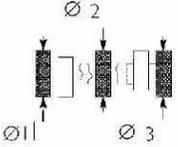
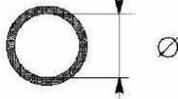
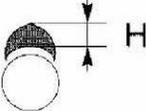
ENGINE F4GE0684F - F4HE0684J OVERHAUL

	Type	F4GE0684F	F4HE0684J
		*D6011	*D100
CRANK GEAR COMPONENTS AND CYLINDER ASSEMBLY		mm	
	Half bearings - journals: n. 1-7 n. 2-3-4-5-6	0.041 to 0.119 0.041 to 0.103	
	Half bearings - crankpins	0.033 to 0.041	
	Main half bearings Connecting rod half bearings	+ 0.250; + 0.500	
	Shoulder journal	X1	37.475 to 37.545
	Shoulder bed support	X2	25.98 to 26.48
	Shoulder half rings	X3	37.28 to 37.38
	Drive shaft shoulder		0.068 to 0.410

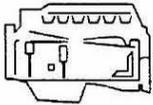
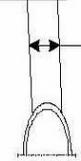
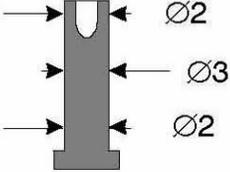
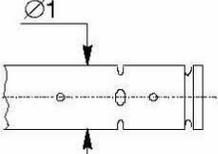
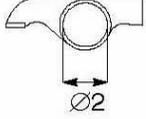
ENGINE F4GE0684F - F4HE0684J OVERHAUL

	Type	F4GE0684F		F4HE0684J	
		*D601		*D100	
VALVE GEAR – CYLINDER ASSEMBLY		mm			
	Valve guide seats on cylinder head	$\varnothing 1$	8.019 to 8.039	70.42 to 7.062	
	Valves:				
		 $\varnothing 4$ α	7.96 to 7.98 60°	6.970 to 6.999 60 ± 0.25°	
		 $\varnothing 4$ α	7.96 to 7.98 45°	6.970 to 6.999 45 ± 0.25°	
	Valve stem and respective guide		0.052 to 0.092	0.043 to 0.092	
	Seat on head for valve seat:				
		 $\varnothing 1$	46.987 to 47.013	34.837 to 34.863	
		 $\varnothing 1$	43.637 to 43.668	34.837 to 34.863	
	Valve seat outer diameter; inclination of valve seats on cylinder head:				
		 $\varnothing 2$ α	47.063 to 47.089 60°	34.917 to 34.931 60°	
		 $\varnothing 2$ α	43.713 to 43.739 45°	34.917 to 34.931 45°	
	Hollow				
		 X	0.356 to 1.102	0.59 to 1.11	
		 X	0.104 to 0.840	0.96 to 1.48	
	Between the valve seat and the head				
			0.050 to 0.102	0.054 to 0.094	
			0.050 to 0.102	0.054 to 0.094	
	Valve seats				-

ENGINE F4GE0684F - F4HE0684J OVERHAUL

	Type	F4GE0684F	F4HE0684J
		*D601	*D100
VALVE GEAR – CYLINDER ASSEMBLY		mm	
	Valve spring height: free spring H under a load of: 329 N (•) - 3398 N (■) H1 641 N (•) - 741 N (■) H2	63.5 49.02 (•) 38.20 (•)	47.75 35.33 (■) 25.2 (■)
	Injector protrusion X	not adjustable	
	Seats for distributing shaft bushings no. n. 1-7 Distributing shaft seats no. 2-3-4-5-6	-	
	Distributing shaft support pins: 1 ⇒ 7	∅	53.995 to 54.045
	Bushing inner diameter ∅	54.083 to 54.147	
	Bushings and seats in crankcase	-	
	Bushings and support pins	0.038 to 0.162	
	Eccentric working lift:		
		6.045	6.45
		7.239	7.582

ENGINE F4GE0684F - F4HE0684J OVERHAUL

	Type	F4GE0684F	F4HE0684J
		*D601	*D100
VALVE GEAR – CYLINDER ASSEMBLY		mm	
	Seat for tappet collar in the crankcase	Ø1	16.000 to 16.030
	Outer diameter of tappet collar:	Ø2	15.929 to 15.959
		Ø3	15.965 to 15.980
	Between the tappets and the seats	0.020 to 0.065	0.025 to 0.070
	Tappets	-	
	Rocker arm shaft	Ø1	18.963 to 18.975
	Rocker arms	Ø2	19.000 to 19.026
	Between the rocker arm and the shaft	0.025 to 0.063	0.024 to 0.377

ENGINE F4GE0684F - F4HE0684J OVERHAUL

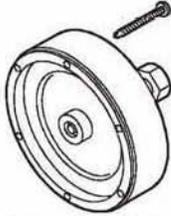
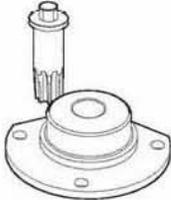
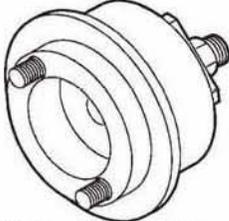
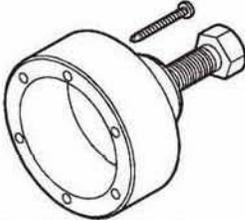
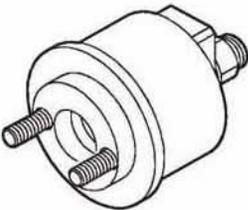
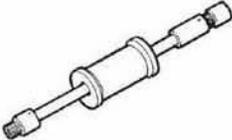
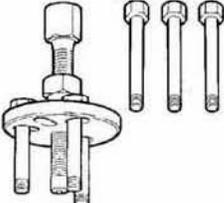
TIGHTENING TORQUE

PART	COPPIA	
	Nm	(kgm)
Cylinder head fastening screw	1 st 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)
	2 nd phase:	90°
	3 rd phase: (only for screws 140 and 180 mm long)	90°
Bed cap fastening screws	1 st phase	50 ± 6 (5 ± 0.6)
	2 nd phase ▲	80 ± 6 (8 ± 0.6)
	3 rd phase	90° ± 5°
Connecting rod cap fastening	1 st phase	30 ± 5 (3 ± 0.5)
	2 nd phase ▲	50 ± 5 (5 ± 0.5)
	3 rd 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

ENGINE F4GE0684F - F4HE0684J OVERHAUL

TOOLS

TOOL No.	DEFINITION	TOOL No.	DEFINITION
380000663	 <p>Crankshaft Rear Seal Puller</p>	380000988	 <p>Tool for Rotating the Engine Flywheel</p>
380000664	 <p>Crankshaft Rear Seal Installer</p>		
380000665	 <p>Crankshaft Front Seal Puller</p>		
380000666	 <p>Crankshaft Front Seal Installer</p>		
380000671	 <p>Injector Puller</p>		
380000979	 <p>Injector Pump Puller</p>		

ENGINE F4GE0684F - F4HE0684J OVERHAUL

GRAPHIC INDICATIONS AND SYMBOLS

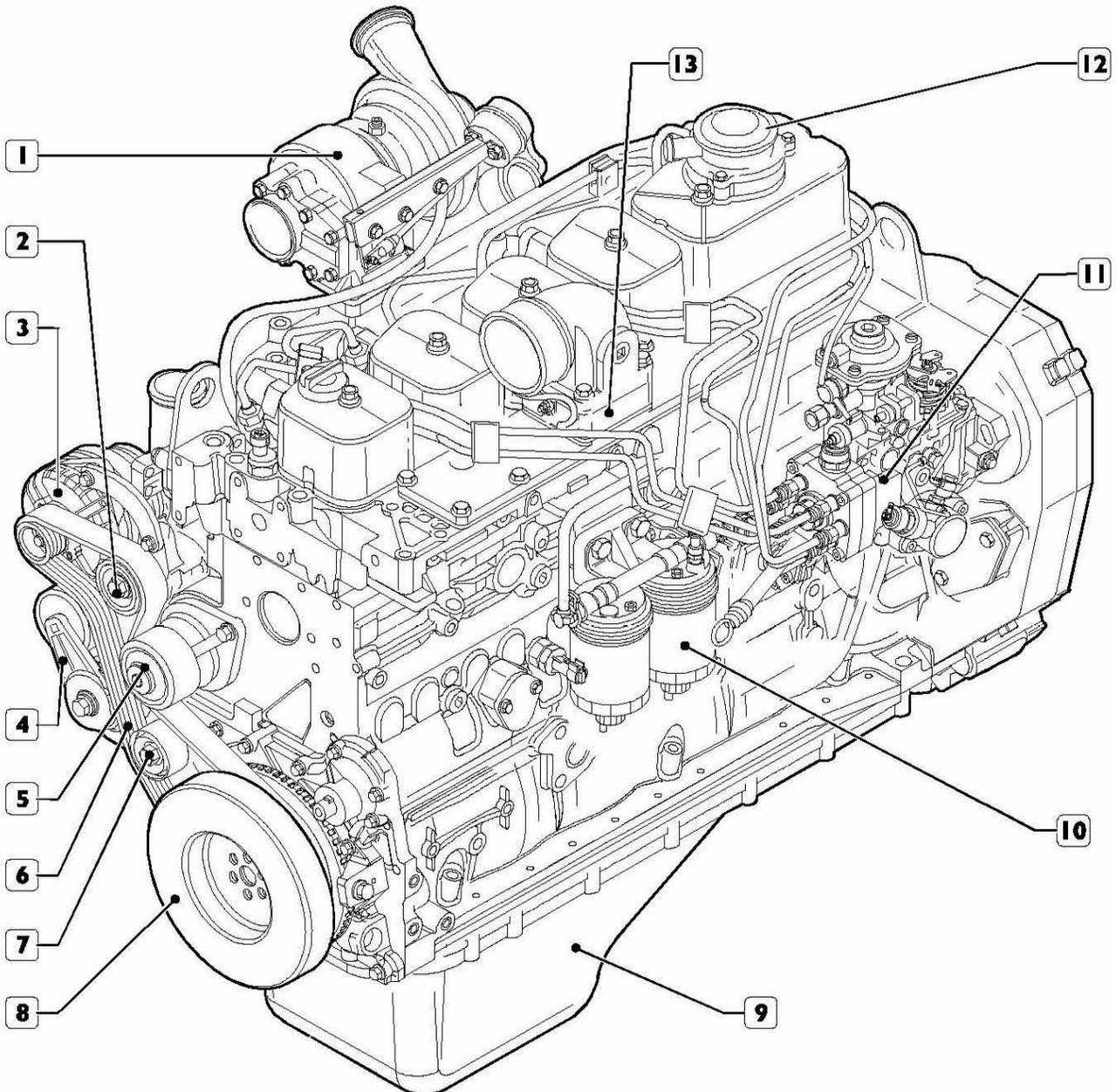
	Detachment Disconnect		Intake
	Reattachment Connect		Exhaust
	Removing Disassembling		Operation
	Mounting Assembling	ϱ	Compression ratio
	Torque-tighten		Tolerance Weight difference
	Torque-tighten + angular value		Dragging torque
	Countersink		Replacement Genuine spares
	Adjustment Setting		Rotation
	Warning Note		Angle Angular value
	Visual check Mounting position check		Preload
	Measurement Dimension to be measured Check		Revs number
	Equipment		Temperature
	Surface to be machined Machining finish		Pressure
	Interference Forced mounting	>	Increase Greater than Maximum
	Thickness Play	<	Decrease Smaller than Minimum
	Lubricate Moisten Grease		Selection Classes Increases
	Sealant		Temperature < 0 °C Cold Winter
	Air bleed		Temperature > 0 °C Hot Summer

ENGINE F4GE0684F - F4HE0684J OVERHAUL

GENERAL REMARKS

ENGINE F4GE0684F

Figure 3

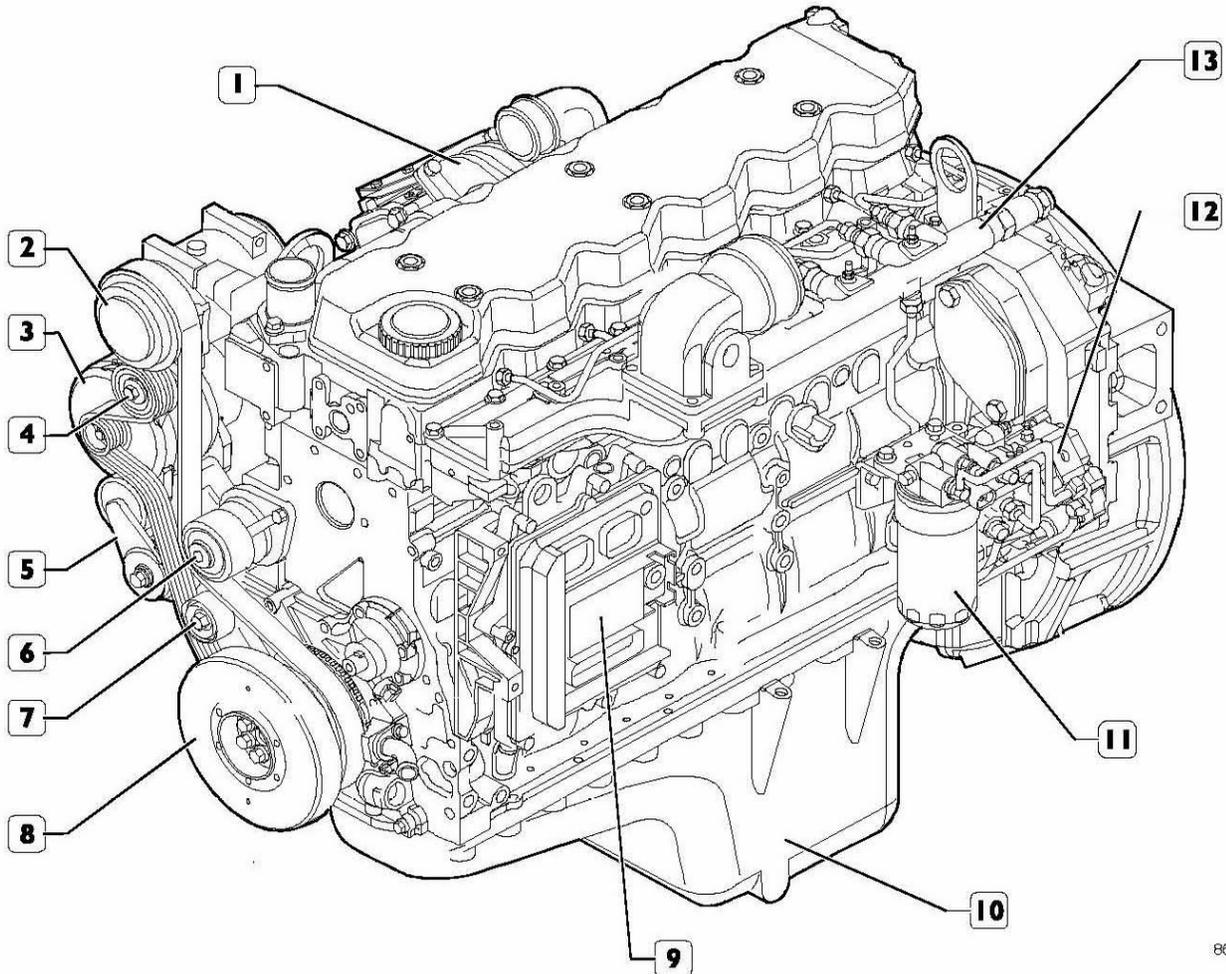


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1. Turbocompressor – 2. Fixed guide pulley – 3. Alternator – 4. Automatic belt stretcher – 5. Water pump – 6. Poly-V water pump and alternator drive belt – 7. Fixed guide pulley – 8. Damper flywheel – 9. Sump – 10. Diesel oil filters – 11. Rotary injection pump – 12. Blow-by – 13. Cold start air heater

MOTORE F4HE0684J

Figure 4



86486

1. Turboblower - 2. Conditioner compressor - 3. Alternator - 4. Fixed guide pulley -
 5. Automatic take-up unit - 6. Water pump - 7. Fixed guide pulley
 8. Damper flywheel - 9. Electronic control unit - 10. Oil sump - 11. Fuel oil filter - 12. High pressure
 pump with fuel pump - 13. Common rail

ENGINE F4GE0684F - F4HE0684J OVERHAUL

DESCRIPTION OF MAIN MECHANIC ENGINE COMPONENTS

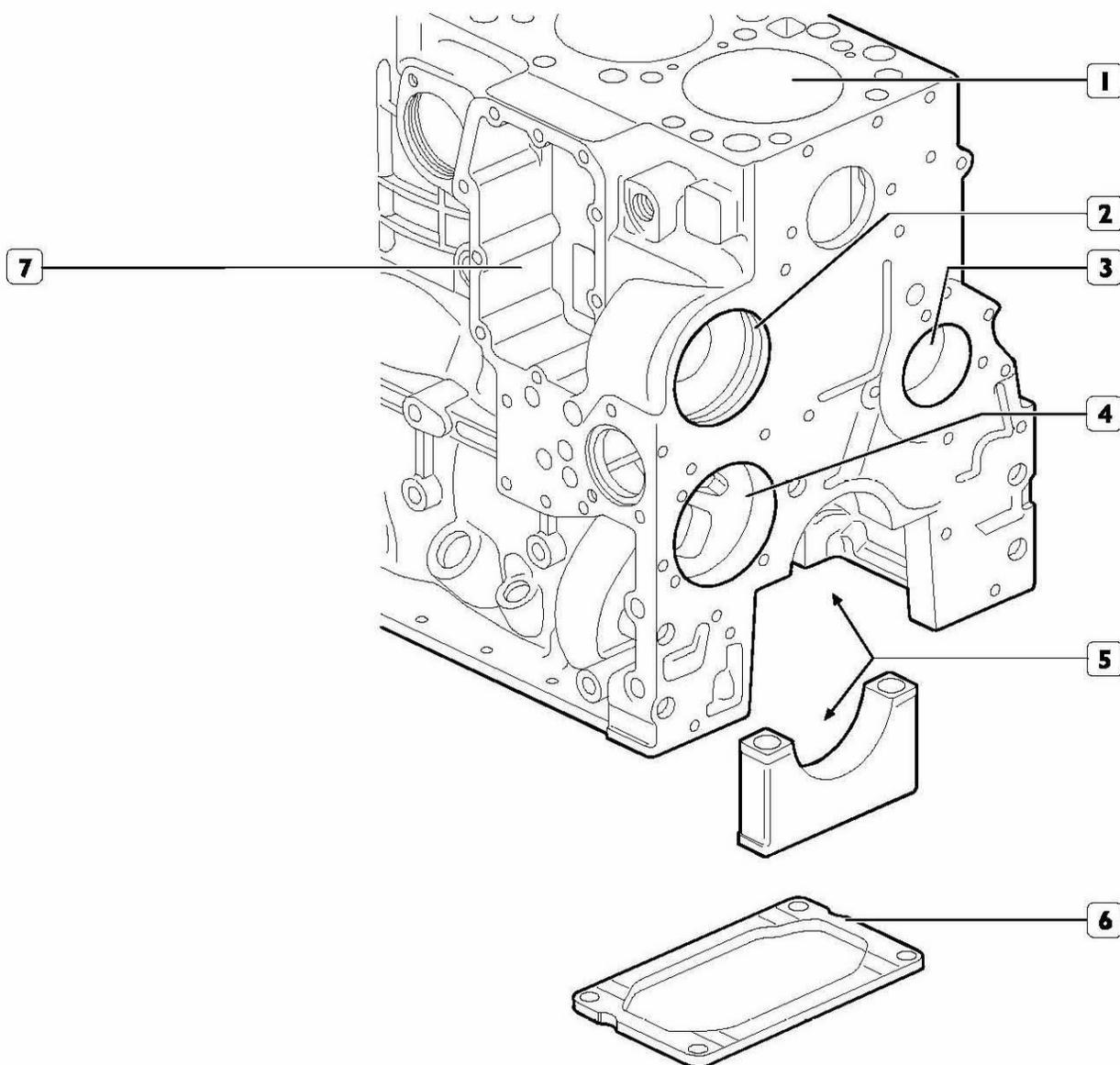
Crankcase

It consists of a cast-iron structure in which the following items are realized: cylinder liners (1); bed supports (5) and seats for: distributing shaft bushings (3), tappets, water/oil heat exchanger (7), water pump (2) and oil pump (4).

It also incorporates the coolant circulation chambers and the engine member lubricating circuit ducts.

Plate (6) is fitted to the lower part of the crankcase and ensures greater resistance to forces and stress.

Figure 5



Drive shaft

It is made of steel and rests on seven induction-hardened supports.

Inside the drive shaft are the lubricating oil ducts.

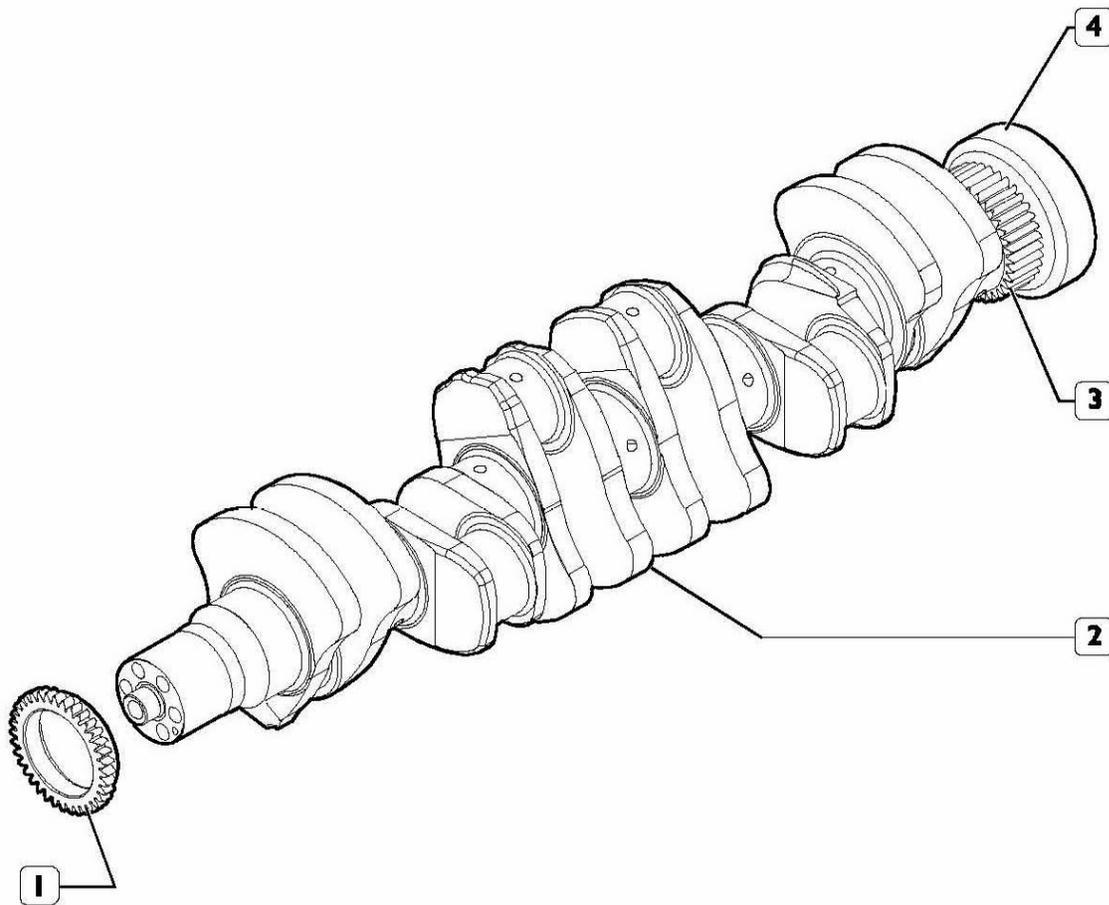
The following items are force-fitted on the front shank: oil pump drive gear, phonic wheel, damper flywheel and auxiliary component drive pulley.

The following items are force-fitted on the rear shank: distributing shaft drive gear and engine fly-wheel mounting hub.

The main half bearings are made of steel with anti-friction alloy coating.

The penultimate main half bearings are equipped with a shoulder to restrain the drive shaft end play. Parts (1) and (3) are mounted in an interfering manner on the rear shank and cannot be replaced.

Figure 6



1. Oil pump drive gear - 2. Drive shaft - 3. Valve gear drive gear -
4. Flywheel attachment hub

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Drive shaft seal rings

The front and rear seal rings are of the "box" type, with radial seal.

ENGINE F4GE0684F - F4HE0684J OVERHAUL

Connecting rods

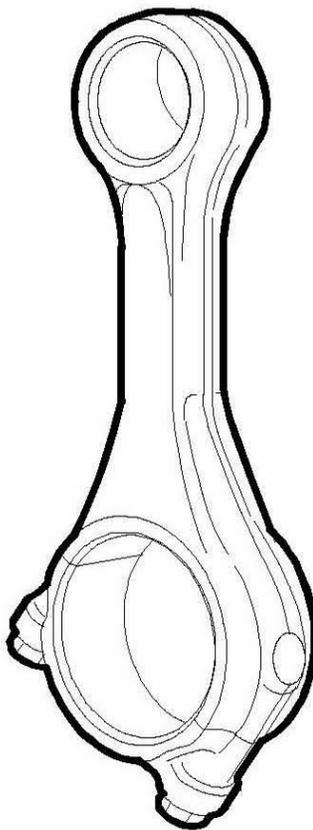
They are steel-stamped, of the oblique cut type, with separation of the cap obtained by an advanced technology (fracture split) instead of mechanic machining.

The connecting rod half bearings are made of steel, with anti-friction alloy coating.

Each connecting rod is marked:

- By a number (on the connecting rod body and cap) indicating its respective match and the cylinder in which it is mounted.
- By a letter (on the connecting rod body) indicating the weight class of the factory-assembled connecting rod.

Figure 7



Pistons

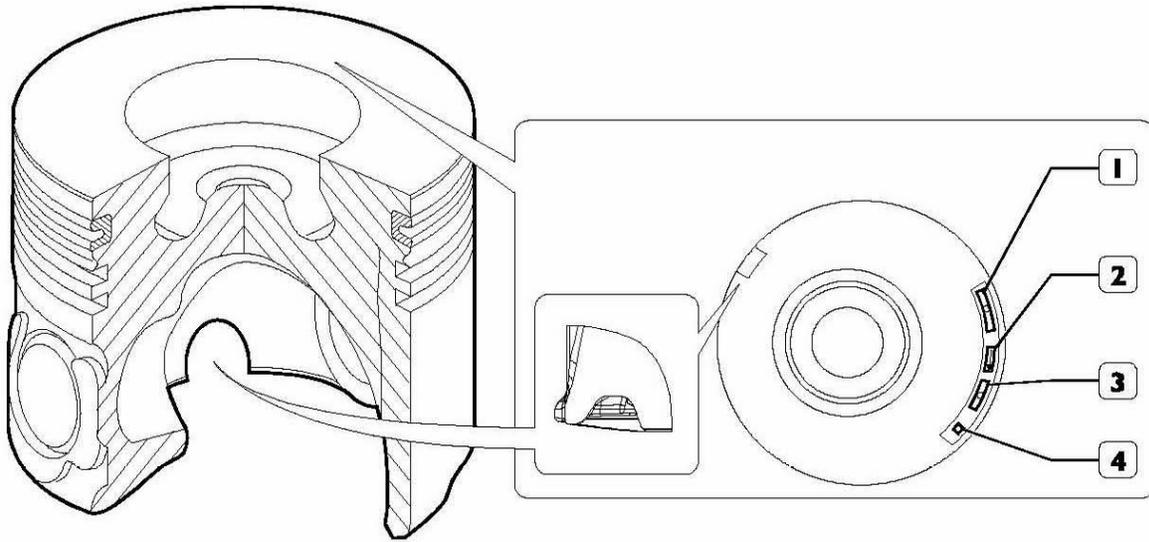
The combustion chamber is machined in the piston crown. The crown of the piston is cooled by the engine oil supplied by the sprayer.

There are three grooves that house the compression rings; the 1st of which is V shaped and is obtained using a cast iron insert.

The following references are engraved on the crown of the piston:

1. Spare part number and design change number.
2. Arrow indicating the assembly sign of the piston in the cylindrical liner; this must be facing towards the front side of the engine block.
3. Date of manufacture.
4. Stamp indicating testing of the 1st groove insert

Figure 8



ENGINE F4GE0684F - F4HE0684J OVERHAUL

Distributing shaft

The distributing shaft rests on seven supports in the crankcase.

The supports (front and rear) are equipped with steel bushings mounted in an interfering manner and coated with anti-friction material; two control eccen-

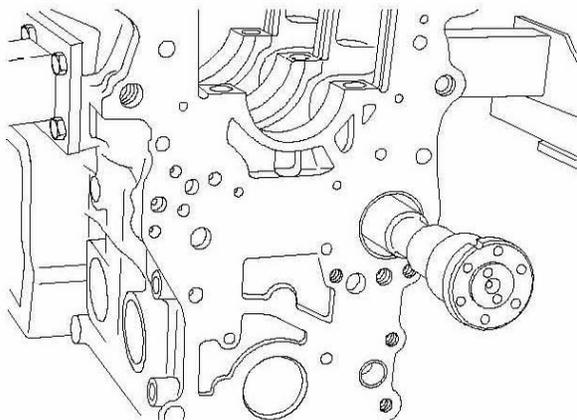
trics are provided for each cylinder.

A. Intake valve control

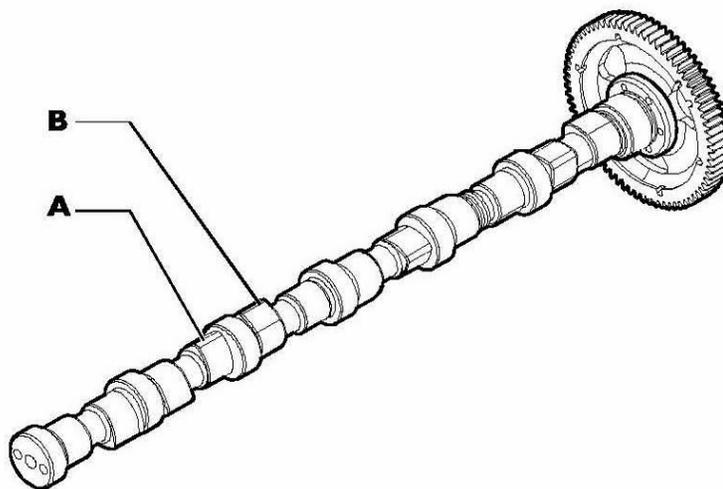
B. Exhaust valve control

The distributing shaft is controlled directly by the drive shaft by means of straight-tooth gears.

Figure 9



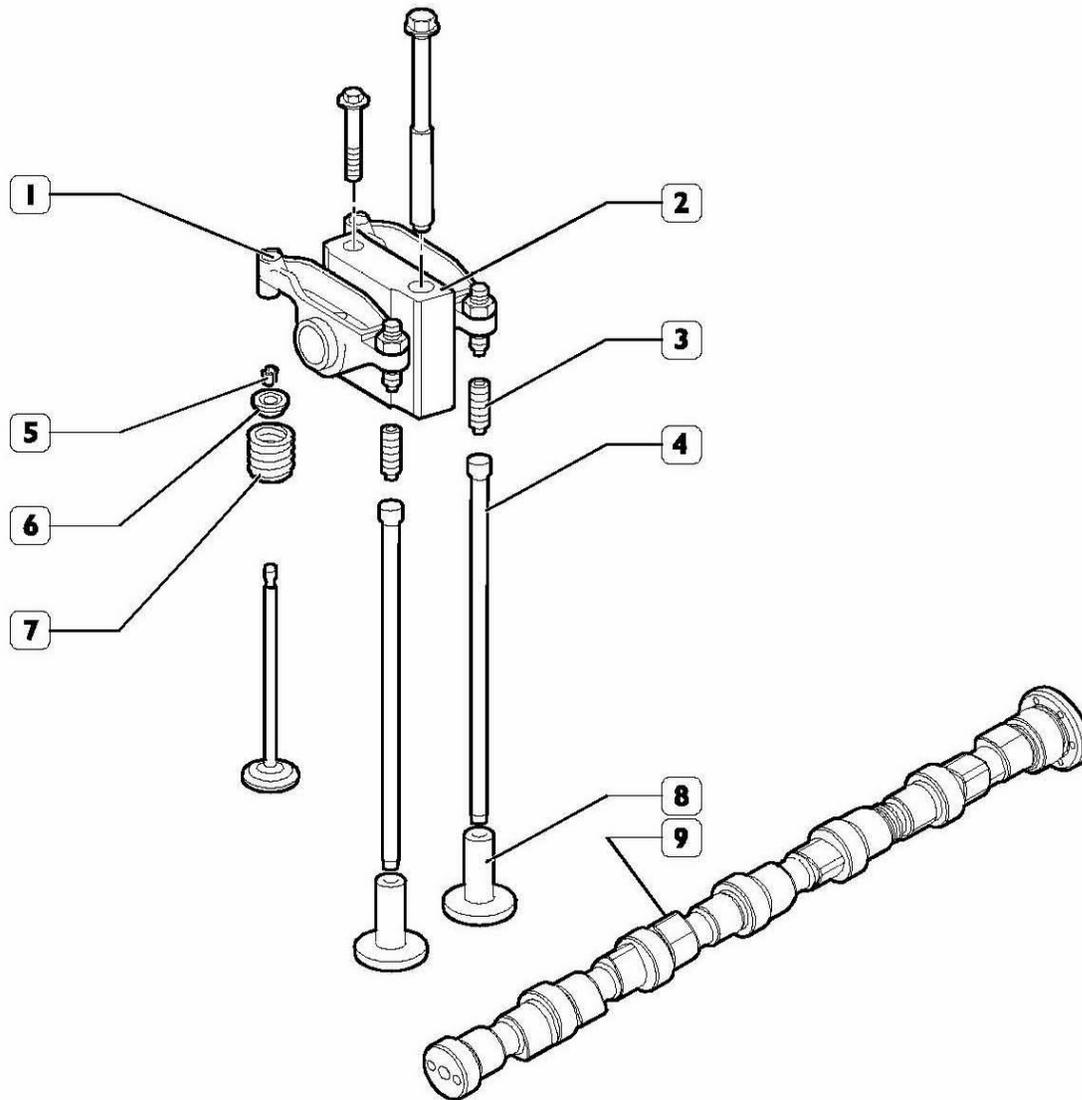
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Engine F4GE0684F valve control

Figure 10



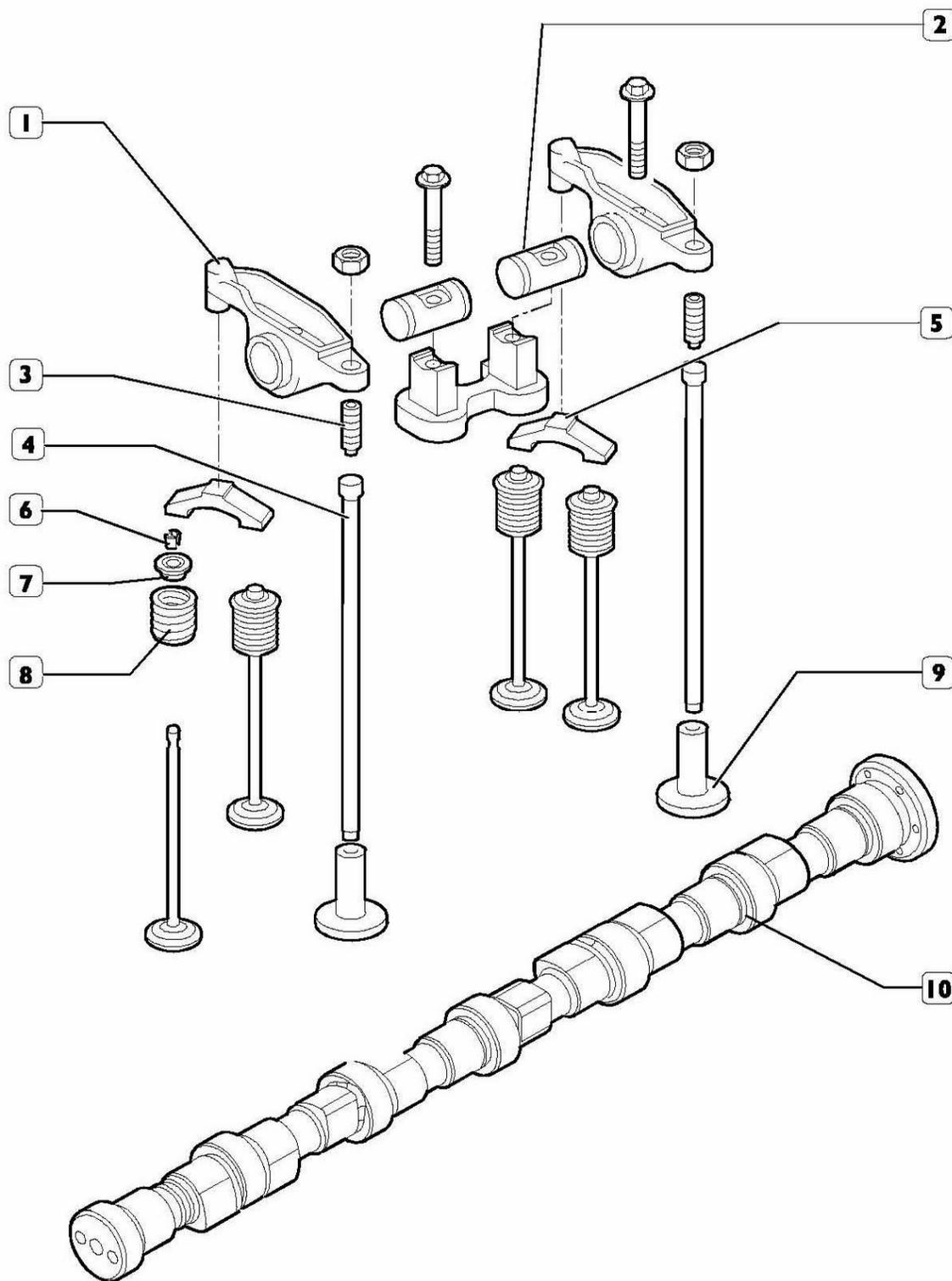
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1. Rocker arm – 2. Arbour support – 3. Adjusting screw – 4. Rod – 5. Lock cones – 6. Cup – 7. Spring –
8. Tappet – 9. Distributing shaft

ENGINE F4GE0684F - F4HE0684J OVERHAUL

Engine F4HE0684J valve control

Figure 11



1. Rocker arm - 2. Shaft - 3. Adjustment screw - 4. Rod - 5. Bridge - 6. Half-cones -
7. Retainer - 8. Spring - 9. Tappet - 10. Timing shaft

ENGINE F4GE0684F - F4HE0684J OVERHAUL

Engine F4GE0684F cylinder head

The seats of the following parts are obtained on the cast-iron cylinder head:

- inserted valve seats (4);
- injectors (6);
- thermostat (5);

Moreover, the following components are inserted on the heads:

- single-block exhaust manifold (1);
- intake manifold (2) with seat for cold start air heater (3).

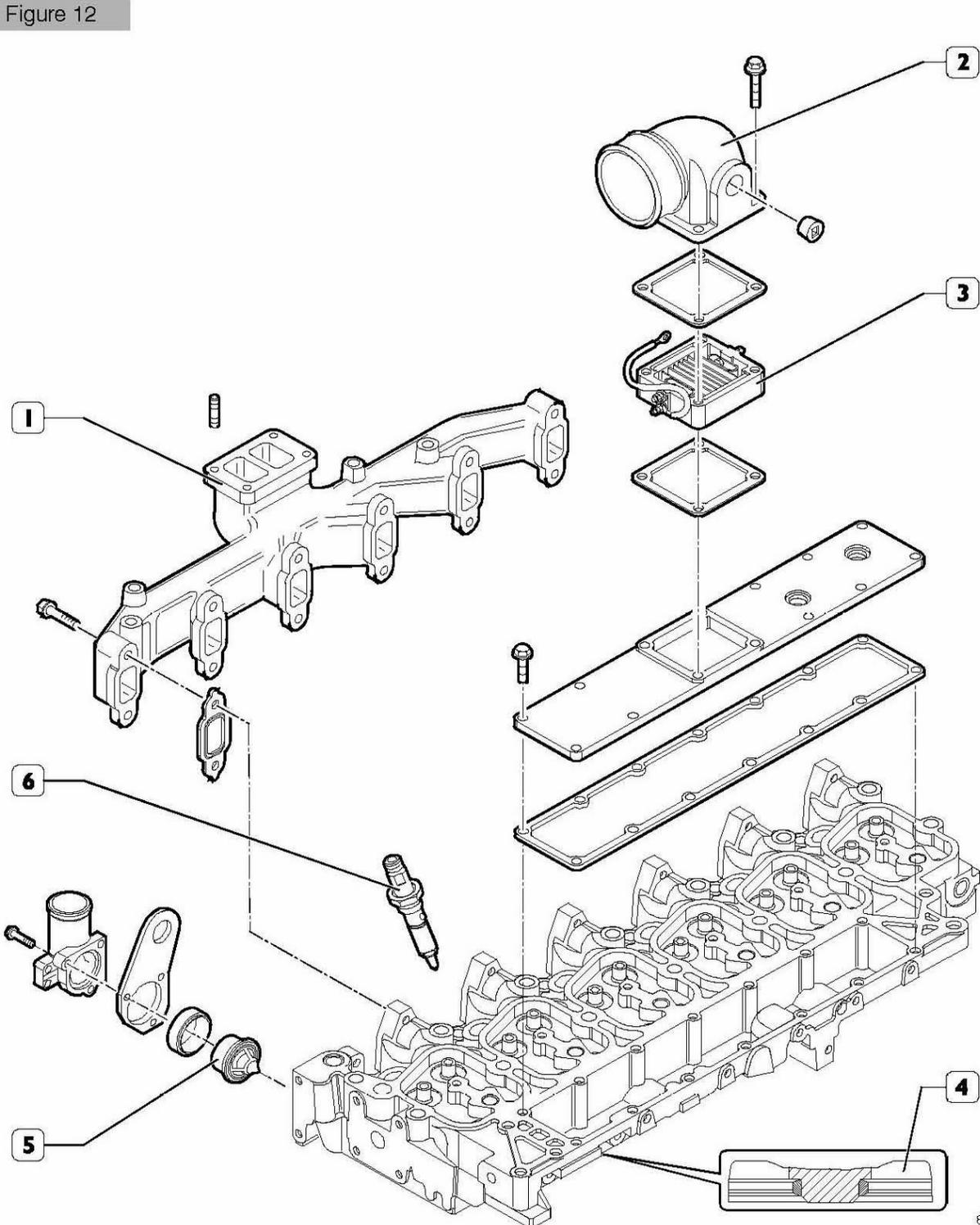


Figure 12

DETAIL OF CYLINDER HEAD WITH INSERTED VALVE SEATS

Engine F4GE0684F cylinder head

The seats of the following parts are obtained on the cast-iron cylinder head (8):

- inserted valve seats (10);
- injectors (2);
- thermostat (4);

Moreover, the following components are inserted on the heads:

- exhaust manifold (1) in two parts;
- intake manifold (5) with seat for cold start air heater (6);
- support (7) with injector harness (3).

Figure 13

