



gensets and
genset engines

section 3

8001 SERIES

WORKSHOP MANUAL

8061Si06
8061Si07
8061SRi26
8061SRI27

Publication No L32022008
Date 10 - 1998

IVECO aifo

The data contained in this publication may not have been updated following modifications carried out by the manufacturer, at any time, for technical or commercial reasons and also to conform to the requirements of the law in the various countries.

This publication supplies features and data together with the suitable methods for repair operations to be carried out on each single components of the gensets and genset engines. Following the supplied instructions and using the inherent specific fixtures, a correct repair procedure will be obtained in due time, protecting the operators from all possible accidents. Before starting any repair, be sure that all accident prevention devices are available and efficient.

Therefore check and wear what indicated by the safety provision protective glasses, helmet, gloves, safety shoes.

Before use, check all work, lifting and transport equipment.

8001 SERIES

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TIMING

Valve Timing :

- Intake

opens : before T.D.C.....12°

closes : after B.D.C.....31°

- Exhaust

opens : before B.D.C.....50°

closes : after .D.C.....16°

Clearance between valves and rockers for

timing checks.....0,45 mm

Operating clearance between valves and rockers,

cold engine:

intake and exhaust.....0,30 mm

FUEL SYSTEM

In line injection pump type Bosch VE6

Fixed injection pump delivery start advance...8° ± 0,5°

Fuel injectors setting.....250 + 3 bar

Firing order1 - 5 - 3 - 6 - 2 - 4

LUBRICATION

Minimum oil pressure:

- at full throttle.....2 kg/cm²

- when idling.....0,7 kg/cm²

STARTING

By starter motor

**** ELECTRIC SYSTEM FOR :**

- GENSET ENGINE 8061SI 06 A.550

- GENSET ENGINE 8061SI 06 A.580

- GENSET G.E. 8061SI 06 A.955

- GENSET ENGINE 8061SI 07 A.550

- GENSET ENGINE 8061SI 07 A.580

- GENSET G.E. 8061SI 07 A.955

- Voltage.....12 V

- Self - regulated alternator.....14 V, 45 A

- Starting motor power.....3 KW

- Battery (optional).....1X180 Ah

**** ELECTRIC SYSTEM FOR :**

- GENSET 8061SI 06 A.956

- GENSET 8061SI 07 A.956

- Voltage.....24 V

- Self - regulated alternator.....28 V, 30 A

- Starting motor power.....4 KW

- Battery (optional).....2X120 Ah

TIMING

Valve Timing :

- Intake

opens : before T.D.C.....12°

closes : after B.D.C.....31°

- Exhaust

opens : before B.D.C.....50°

closes : after .D.C.....16°

Clearance between valves and rockers for
timing checks.....0,45 mm

Operating clearance between valves and rockers,

cold engine:

intake and exhaust.....0,30 mm

FUEL SYSTEM

In line injection pump type Bosch VE6

Fixed injection pump delivery start advance...3° ± 0,5°

Fuel injectors setting.....250 + 3 bar

Firing order1 - 5 - 3 - 6 - 2 - 4

LUBRICATION

Minimum oil pressure:

- at full throttle.....2 kg/cm²

- when idling.....0,7 kg/cm²

STARTING

By starter motor

**** ELECTRIC SYSTEM FOR :**

- GENSET ENGINE 8061SRI 26 A.550

- GENSET ENGINE 8061SRI 26 A.580

- GENSET G.E. 8061SRI 26 A.955

- GENSET ENGINE 8061SRI 27 A.550

- GENSET ENGINE 8061SRI 27 A.580

- GENSET G.E. 8061SRI 27 A.955

- Voltage.....12 V

- Self - regulated alternator.....14 V, 45 A

- Starting motor power.....3 KW

- Battery (optional).....1X180 Ah

**** ELECTRIC SYSTEM FOR :**

- GENSET 8061SRI 26 A.956

- GENSET 8061SRI 27 A.956

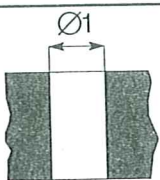
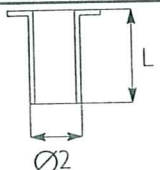
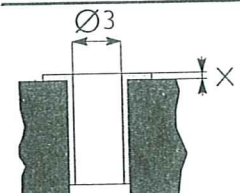
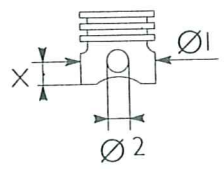
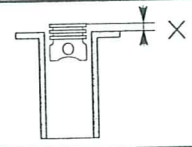
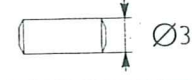
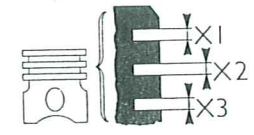
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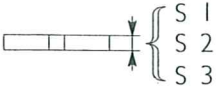
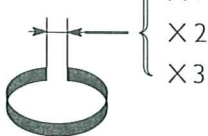
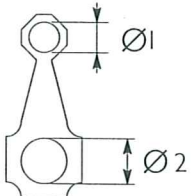
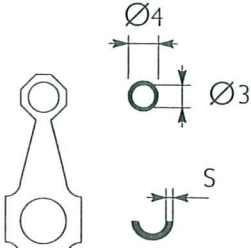
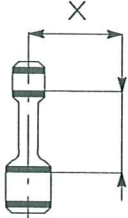
- Self - regulated alternator.....28 V, 30 A

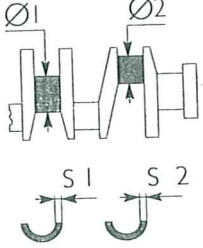
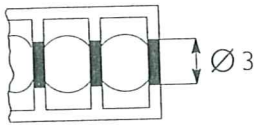
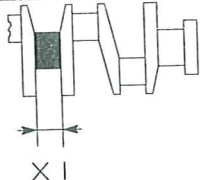
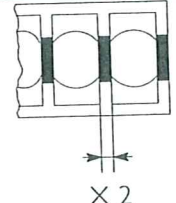
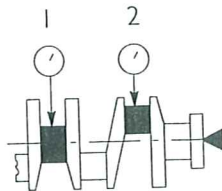
- Starting motor power.....4 KW

- Battery (optional).....2X120 Ah

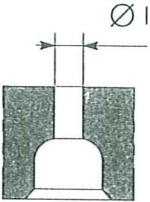
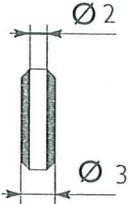
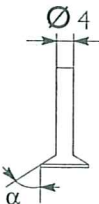
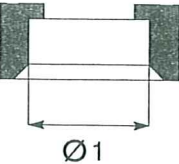
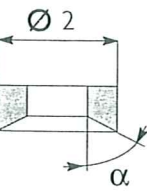
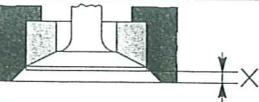
DATA ON ASSEMBLY CLEARANCES

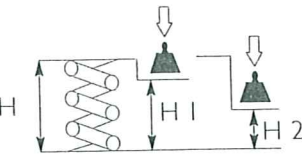
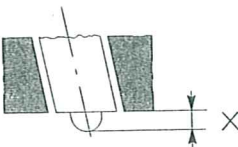
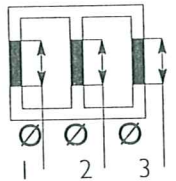
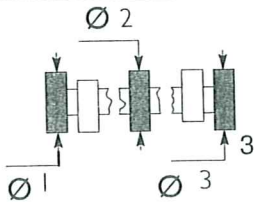
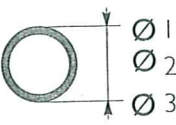
CYLINDER BLOCK AND CRANK MECHANISM COMPONENTS			mm
	Bores for cylinder liners Ø 1		106,85 ÷ 106,90
	Cylinder liners: outside diameter Ø 2 length L		106,94 ÷ 106,97 198,00 ÷ 198,50
	Cylinder liners–crankcase bores		0,04 ÷ 0,12
	Outside diameter Ø 2		0,2
	Cylinder liners inside diameter Ø 3 protrusion X		104,000 ÷ 104,024
	Pistons: measurement height X outside diameter Ø 1 housing for gudgeon pin Ø 2		12 103,870 ÷ 103,852 38,000 ÷ 38,006
	Piston–cylinder liner		0,130 ÷ 0,172
	Piston diameter Ø 1		0,4 – 0,8
	Piston protrusion X		0,64 ÷ 0,97
	Gudgeon pin Ø 3		37,984 ÷ 37,990
	Gudgeon pin – pin housing		0,010 ÷ 0,022
	Piston ring grooves X 1 * X 2 X 3		3,20 ÷ 3,23 2,55 ÷ 2,57 4,03 ÷ 4,05
* measured on 101 mm diameter			

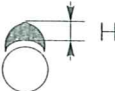
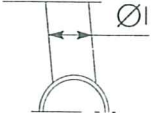
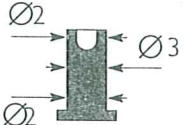
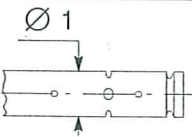
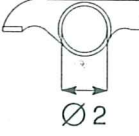
				mm
	S 1 *			3,095 ÷ 3,075
	Piston rings	S 2		2,490 ÷ 2,0478
		S 3		3,990 ÷ 3,975
	* measured on 101 mm diameter			
	1			0,105 ÷ 0,155
	Piston ring – grooves	2		0,060 ÷ 0,092
		3		0,040 ÷ 0,075
	Piston rings			0,4 – 0,8
	Piston ring end gap in cylinder liner:			
		X 1		0,30 ÷ 0,55
		X 2		0,60 ÷ 0,85
		X 3		0,30 ÷ 0,60
	Small end bush housing	Ø 1		41,846 ÷ 41,884
	Big end bearing housing	Ø 2		67,407 ÷ 67,422
	Small end bush diameter			
	outside	Ø 4		41,979 ÷ 42,017
	inside	Ø 3		38,004 ÷ 38,014
	Big end bearing shell (S=thickness)	S		1,805 ÷ 1,815
	Small end bush – housing			0,095 ÷ 0,171
	Gudgeon pin – bush			0,014 ÷ 0,031
	Big end bearing shells			0,254 – 0,508
	Measurement dimension	X		125
	Maximum out-of-parallel error on connecting rod axes	—		0,07

				mm
	Main journals	Ø 1		79,791 ÷ 79,810
	Crankpins	Ø 2		63,725 ÷ 63,744
	Main bearing shells (S=thickness)	S 1		2,169 ÷ 2,178
	Big end bearing shells (S=thickness)	S 2		1,805 ÷ 1,815
	Main bearing housings	Ø 3		84,200 ÷ 84,230
	Bearing shells – main journals			0,034 ÷ 0,101
	Bearing shells – crankpins			0,033 ÷ 0,087
	Main bearing shells Big end bearing shells			0,254 – 0,508
	Main journal, thrust bearing	X 1		32,0 ÷ 32,1
	Main bearing housing, thrust bearing	X 2		25,010 ÷ 25,060
	Thrust washer halves	X 3		3,378 ÷ 3,429
	Crankshaft end float			0,082 ÷ 0,334
	Thrust washer halves			0,254 – 0,508 – 0,762 – 1,016
	Alignment	1		≤ 0,10
	Ovality	2		± 0,25
	Taper	1 – 2		0,008
				0,012

CYLINDER HEAD. VALVE GEAR

mm			
	Valve guide housings in the cylinder head	Ø 1	13.950 ÷ 13.983
	Valve guide	Ø 2 Ø 3	8.023 ÷ 8.043 13.993 ÷ 14.016
	Valve guides and seatings in the head		0.010 ÷ 0.066
	Valve guides		+ 0.2
	Valves :	 Ø 4 α  Ø 4 α	7.985 ÷ 8.000 60° 30' ± 7' 7.985 ÷ 8.00 45° 30' ± 7'
	Valve stem and its guide		0.023 ÷ 0.058
	Housing in head for valve seat	 Ø 1  Ø 1	— 39.000 ÷ 39.025
	Outside diameter of valve seat; angle of valve seat in cylinder head	 Ø 2 α  Ø 2 α	— 60° ± 5' 39.136 ÷ 39.161 45° ± 5'
	Recessing of valves	X	0.7 ÷ 1
	Between valve seat and head		0.111 ÷ 0.161

			mm
	Valve spring height		
	Free height	H	44.6
	Under a load of 270 ± 14 N	H1	34
	528 ± 26 N	H2	23.8
	Injector protrusion	X	0.7 ÷ 1.5
	Camshaft bearing housing in crankcase	Ø 1 Ø 2 Ø 3 Ø 4	55.280 ÷ 55.305 54.780 ÷ 54.805 54.280 ÷ 54.305 53.780 ÷ 53.805
	Camshaft bearing journals	Ø 5 Ø 6 Ø 7 Ø 8	51.470 ÷ 51.500 50.970 ÷ 51.000 50.470 ÷ 50.500 49.970 ÷ 50.000
	Outside diameter of camshaft bushes	front Ø 1 front intermediate Ø 2 rear intermediate Ø 3 rear Ø 4	55.375 ÷ 55.430 54.875 ÷ 54.930 54.375 ÷ 54.430 53.875 ÷ 53.930
	Inside diameter of bushes	front Ø 1 front intermediate Ø 2 rear intermediate Ø 3 rear Ø 4	51.580 ÷ 51.630 51.080 ÷ 51.130 50.580 ÷ 50.630 50.080 ÷ 50.130
	Bushes and housings in crankcase		0.07 ÷ 0.15
	Bushes and bearing journals		0.08 ÷ 0.16

			mm
	Effective cam lift		
		H	5.97
		H	6.25
	Tappet cup housing in crankcase	Ø 1	15.000 ÷ 15.018
	Outside diameter of tappet cup	Ø 2	14.740 ÷ 14.780
		Ø 3	14.950 ÷ 14.970
	Between tappets and housings		0.030 ÷ 0.068
	Tappets		0.1 – 0.2 – 0.3
	Rocker shaft	Ø 1	17.982 ÷ 18.000
	Rockers	Ø 2	18.016 ÷ 18.034
	Between rockers and shaft		0.016 ÷ 0.052

" MOTOMETER " VALUES

	T.D.C. pressure *	bar	≥ 26
	Min. permissible T.D.C. pressure *	bar	≤ 19
	Engine motoring over speed	rpm	≈ 260

(*) Starter-driven engine with oil temperature at 40° – 50° C and injection pump at shut-off.

TIGHTENING TORQUE

DESCRIPTION		TORQUE	
		Nm (kgm)	
Cylinder head capscrew	stage 1: pretightening	▲ 70	(7)
	stage 2: pretightening	▲ 70	(7)
	stage 3: angle	180°	
Capscrew, main bearing caps	prtightening angle	▲ 40	(4)
		60°	
Capscrew, connecting rod caps	pretightening angle	▲ 80	(8)
		90°	
Flywheel fixing screw	pretightening angle	▲ 40	(4)
		60°	
Nut for injector fixing stud	pretightening endtightening	9,9	(1)
		22,5	(2,3)
Oil sump fixing screw		16,5	(1,7)
Oil sump drain plug		95	(9,5)
Heater seat plug		125	(12,5)
Capscrew, rh and lh rear bracket		80	(8)
Capscrew, engine block rear cover		22,5	(2,3)
Capscrew, rear cover		22,5	(2,3)
Capscrew, timing cover and housing		22,5	(2,3)
Nut for timing cover and housing stud		22,5	(2,3)
Pipe union, piston cooling oil nozzle		45	(4,5)
Capscrew, intake manifold		22,5	(2,3)
Capscrew, intake manifold and hook		50	(5)
Capscrew, exhaust manifold		22,5	(2,3)
Nut, cylinder upper cover		13,5	(1,4)
Capscrew, rocker mounting		22,5	(2,3)
Nut, rocker adjustment screw		13,5	(1,4)
Nut, flywheel hub		295	(29,5)
Capscrew, drive pulley		50	(5)
Capscrew, intermediate pin with flange		50	(5)
Capscrew, camshaft thrust place		32,5	(3,3)
Capscrew, gear mounting		22,5	(2,3)
Capscrew, injection pump		22,5	(2,3)
Capscrew, injection pump		50	(5)
Capscrew, injection pump		50	(5)
Capscrew, turbocharger		50	(5)
Capscrew, gas exhaust pipe from turbocharger		16,5	(1,7)
Capscrew, oil pump to front cover		22,5	(2,3)
Capscrew, retaining plate for oil pressure adjustment valve		22,5	(2,3)
Capscrew, heat exchanger		50	(5)
Capscrew, water pump		50	(5)
Capscrew, fan hub		115	(11,5)
Capscrew, belt tightener		50	(5)

TOOLS

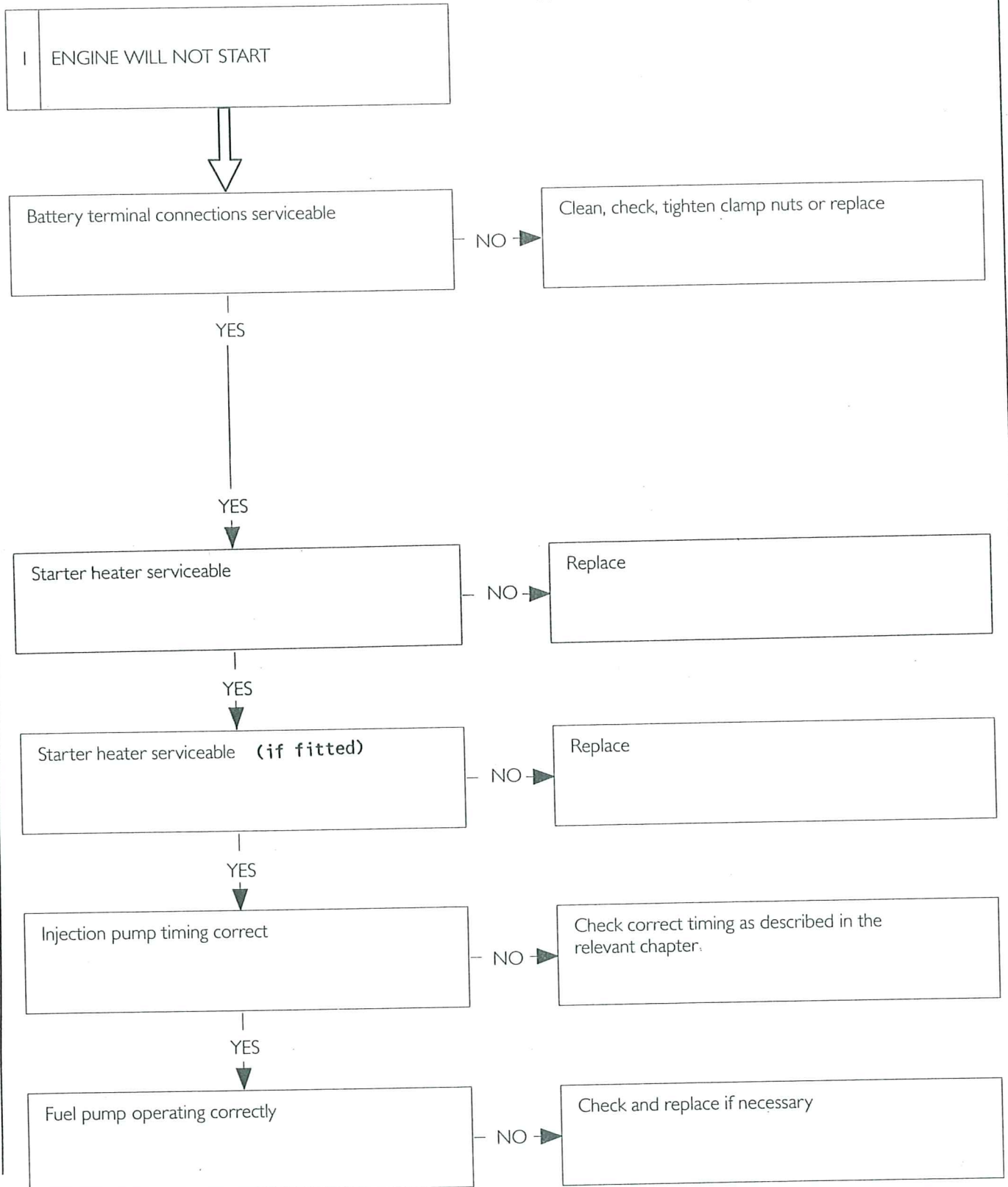
TOOL NUMBER	DESCRIPTION
99305049	Equipment for checking spring loading
99305121	Hot air unit
99322230	Swivelling telescopic stand
99340033	Damper flywheel extractor
99340205	Impact extractor
99341003	Single action bridge
99341016	Pair of brackets with holes
99342135	Pin for extracting injectors (to be used with 99340205)
99342145	Extractor for injector holder case
99348001	Extractor with locking device
99348004	Universal extractor, internal, 5 to 70 mm
99350108	Wrench for valve gear clearance adjustment screw
99360183	Tongs for fitting engine piston rings
99360288	Drift for removing valve guides
99360293	Drift for refitting valve guides (use with 9936028)
99360322	Tool for rotating engine flywheel
99360314	Tool for removing cartridge filters
99360352	Tool for locking engine flywheel
99360268	Tool for removing and refitting engine valves
99360365	Installing tool for fitting crankshaft rear seal (use with 99370005)
99305019	Box with set of tools for recutting valve seatings
99360467	Adapter for checking cylinder compression (to be used with 99395682)
99360500	Crankshaft lifting tool
99360508	Ring for lifting cylinder block
99360595	Hoisting beam for removing and refitting engine
99360605	Ring clamp for inserting standard and oversize pistons into the cylinders
99361033	Brackets for securing engine to swivelling stand 99322230
99365063	Tool for refitting injector holder cases
99370005	Handle for interchangeable drifts 99370006 Handle for interchangeable drifts
99370349	Installing tool for fitting crankshaft front seal (use with 99370006)
99390310	Reaming tool for valve guide
99390425	Tap for threading injector holder cases to be extracted
99394017	Reamer for reconditioning lower part of injector holder case (use with 99394019)
99394018	Cutter for reconditioning injector seating housing (use with 99394019)
99394019	Pilot bush
99395216	Pair of gauges for angle tightening with 1/2" and 3/4" square attachment
99395363	Tee square assembly for checking connecting rod distortion
99395682	Diesel engine cylinder compression tester
99395687	Bore micrometer (50 – 175 mm)
99395850	Torque wrench for checking belt tension

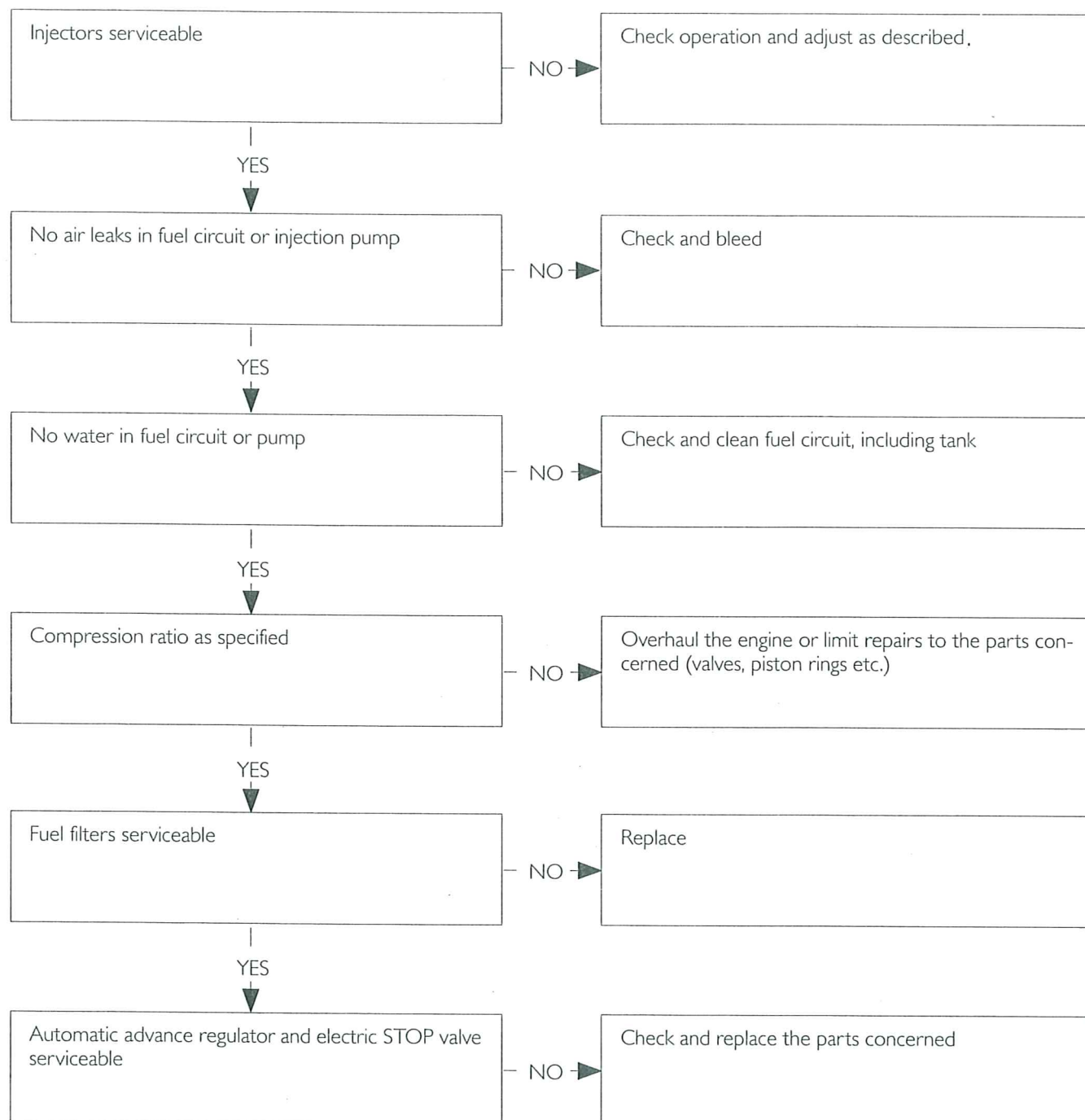
FAULT DIAGNOSIS

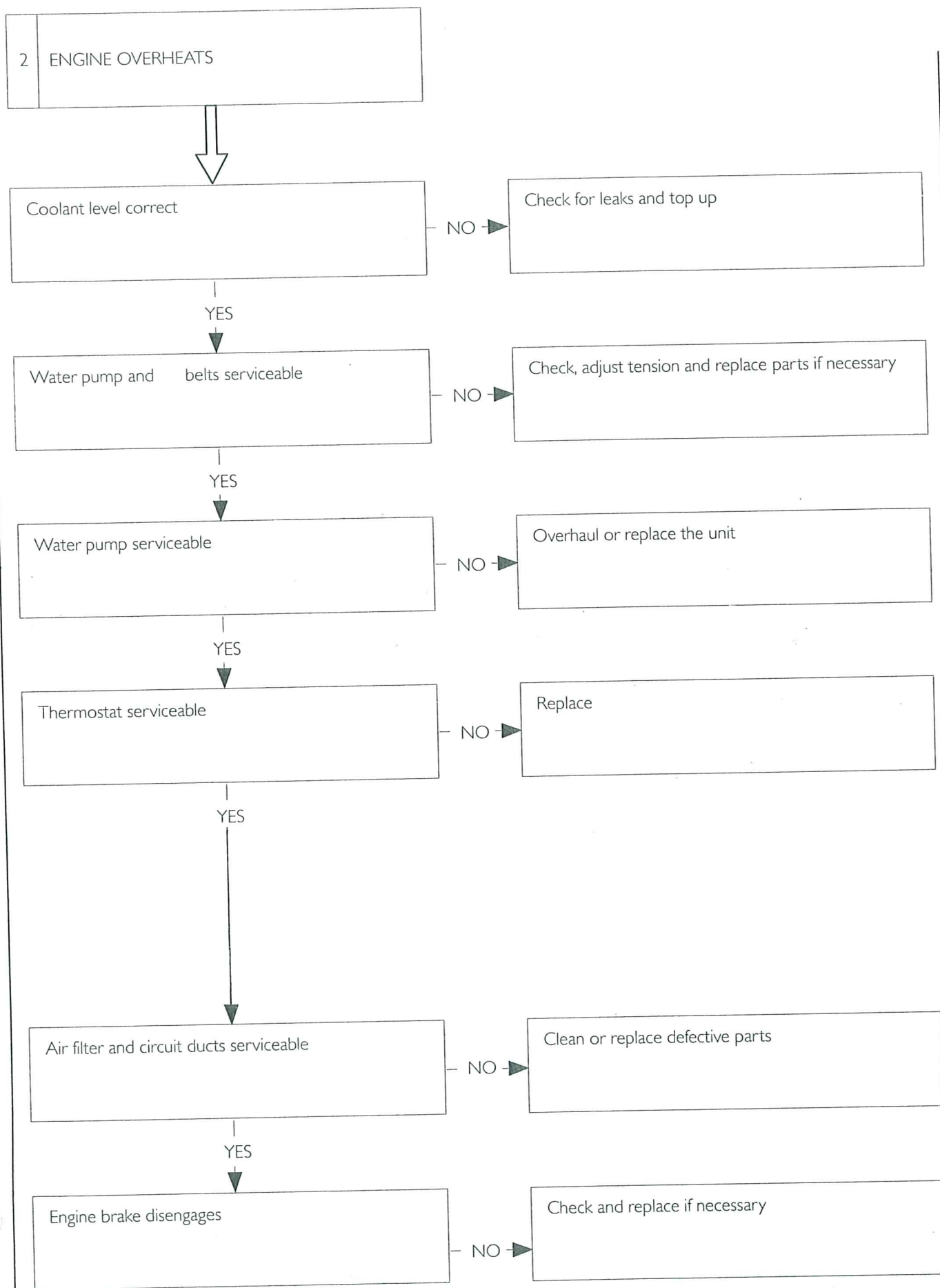
Main engine operating faults :

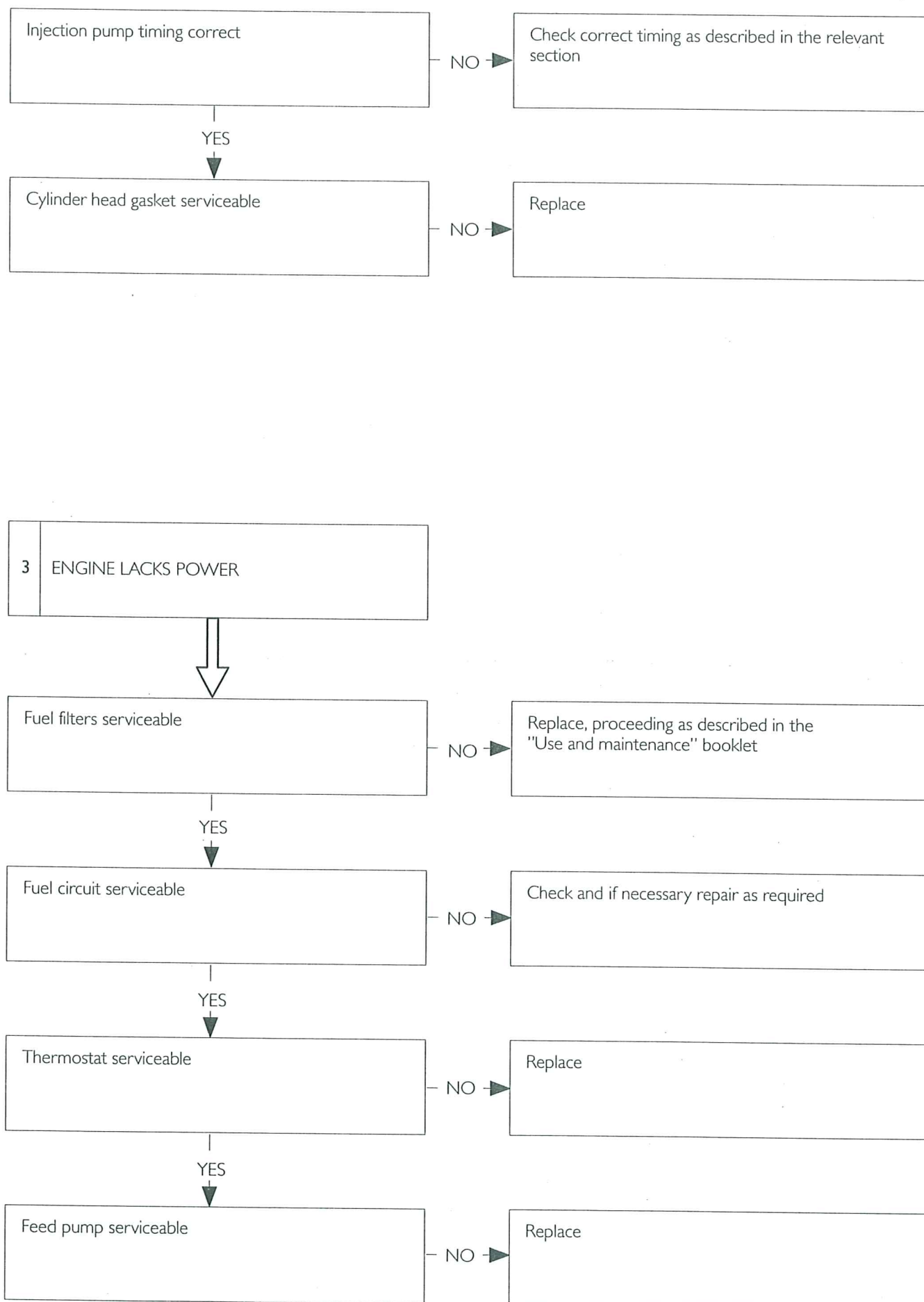
- 1 – Engine will not start
- 2 – Engine overheats
- 3 – Engine lacks power
- 4 – Engine emits black or dark grey smoke
- 5 – Engine emits grey (whitish) smoke

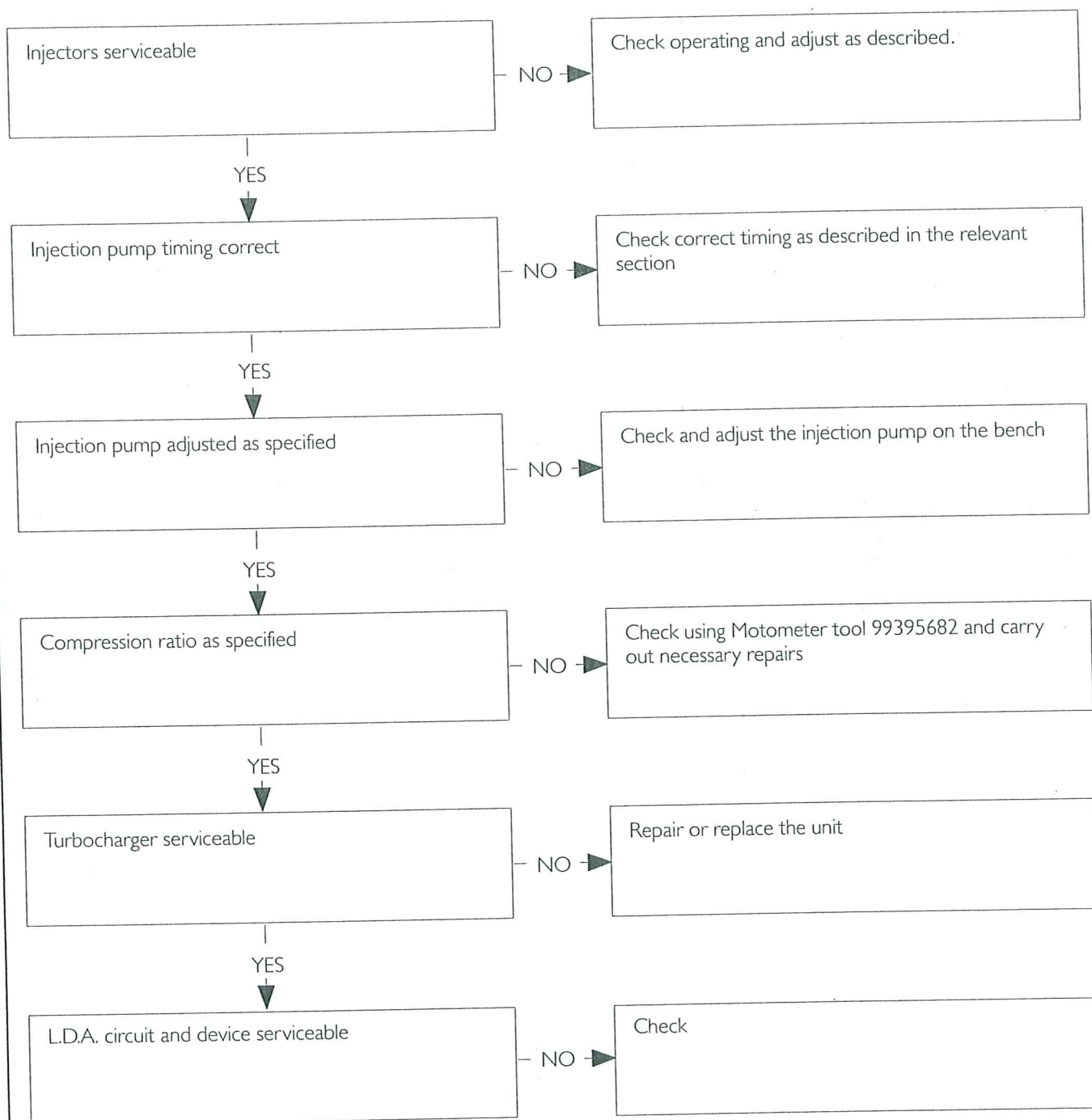
- 6 – Engine emits blue smoke
- 7 – Abnormal knocking from the engine
- 8 – Engine stops
- 9 – Engine exceeds maximum rpm
- 10 – Oil pressure too high or too low
- 11 – Excessive fuel consumption

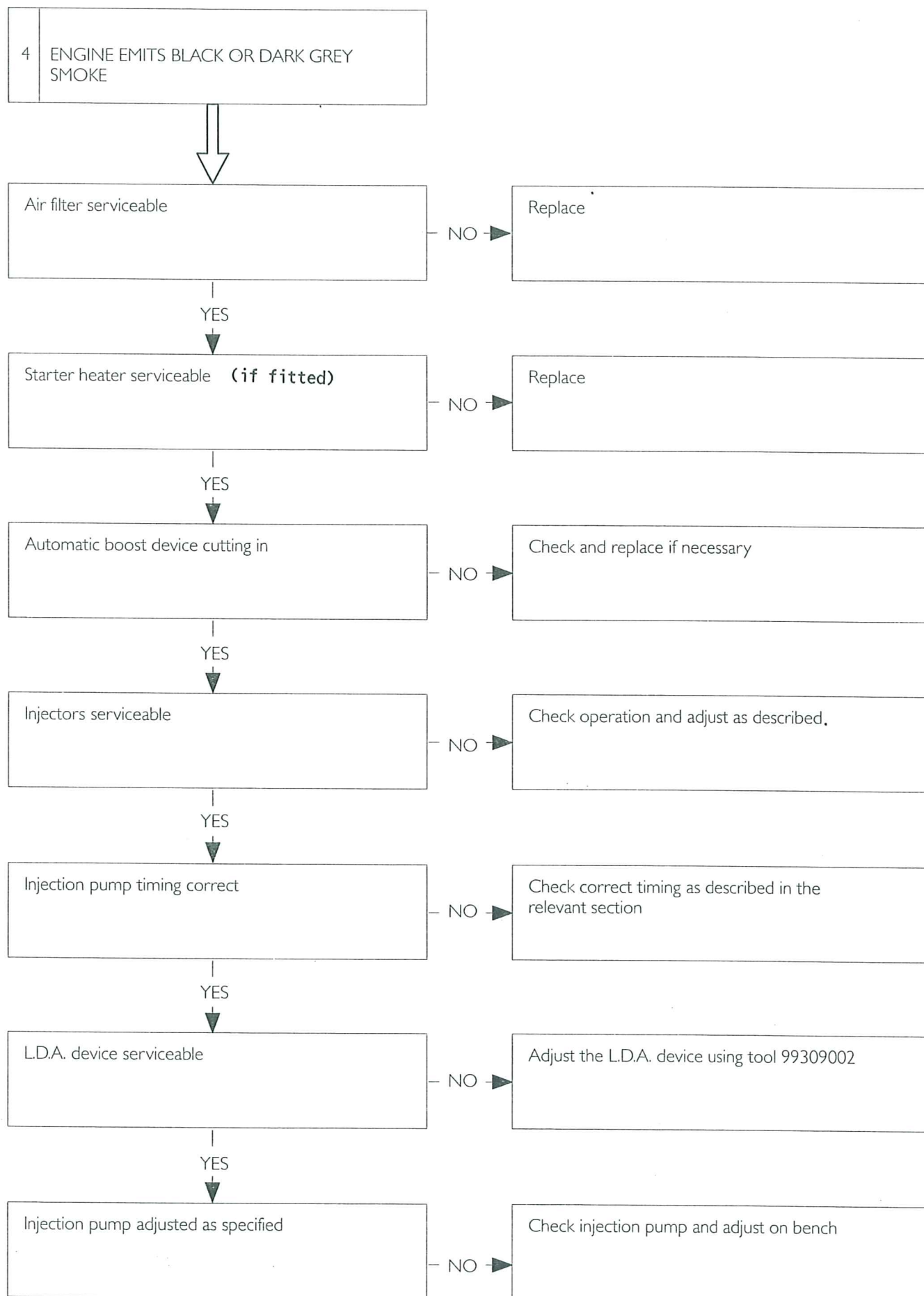


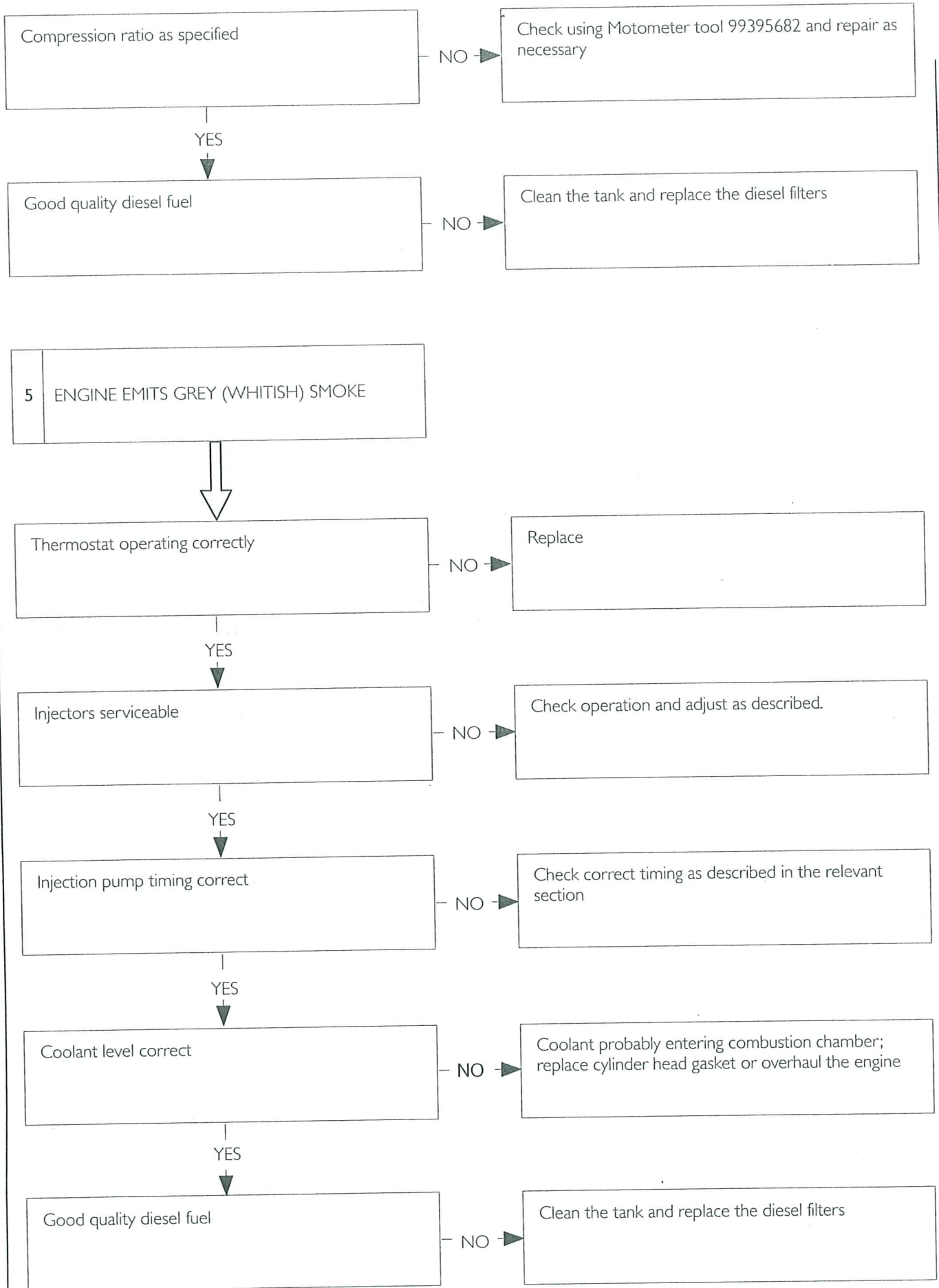












6 ENGINE EMITS BLUE SMOKE



Excessive oil consumption

YES →

Check oil breather, cylinder compressions.
If necessary, overhaul the cylinder head or engine

7 ABNORMAL KNOCKING FROM THE ENGINE



Knocking coming from crankshaft

YES →

Check main journals for clearance and ovality, tightness of main bearing cap bolts and flywheel bolts, oil pressure. Replace parts or overhaul the engine.

NO



Knocking coming from connecting rods

YES →

Check crankpins for clearance and ovality, tightness of connecting rod cap bolts, connecting rods for distortion. Replace parts or overhaul the engine.

NO



Knocking coming from pistons

YES →

Check clearance between pistons and cylinder liners, piston rings for breaks, gudgeon pin to piston boss clearances. Replace parts or overhaul the engine.

NO



Knocking coming from cylinder head

YES →

Check operating clearance between rocker arms and valves, injection pump timing, valve timing. Adjust.

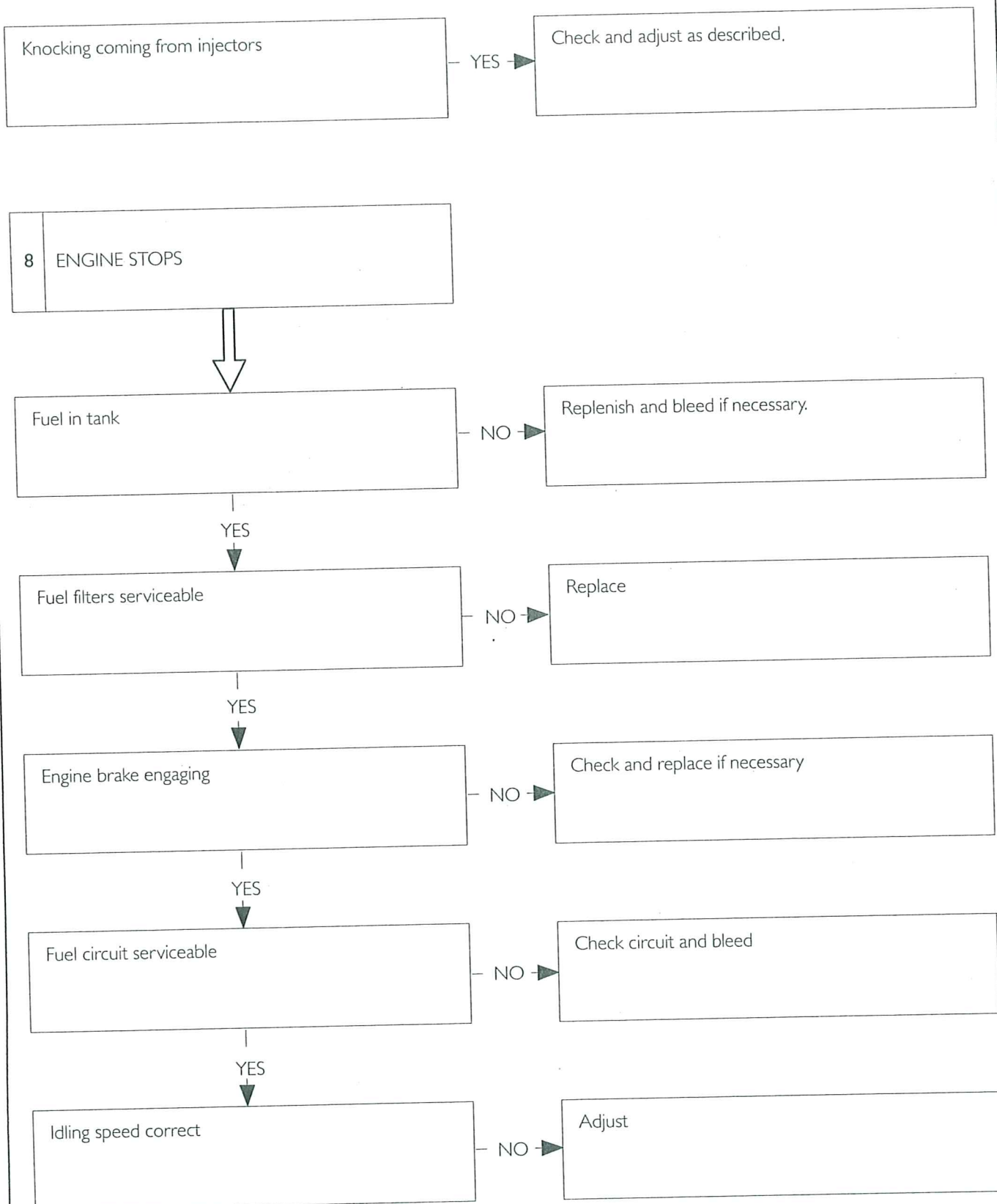
NO

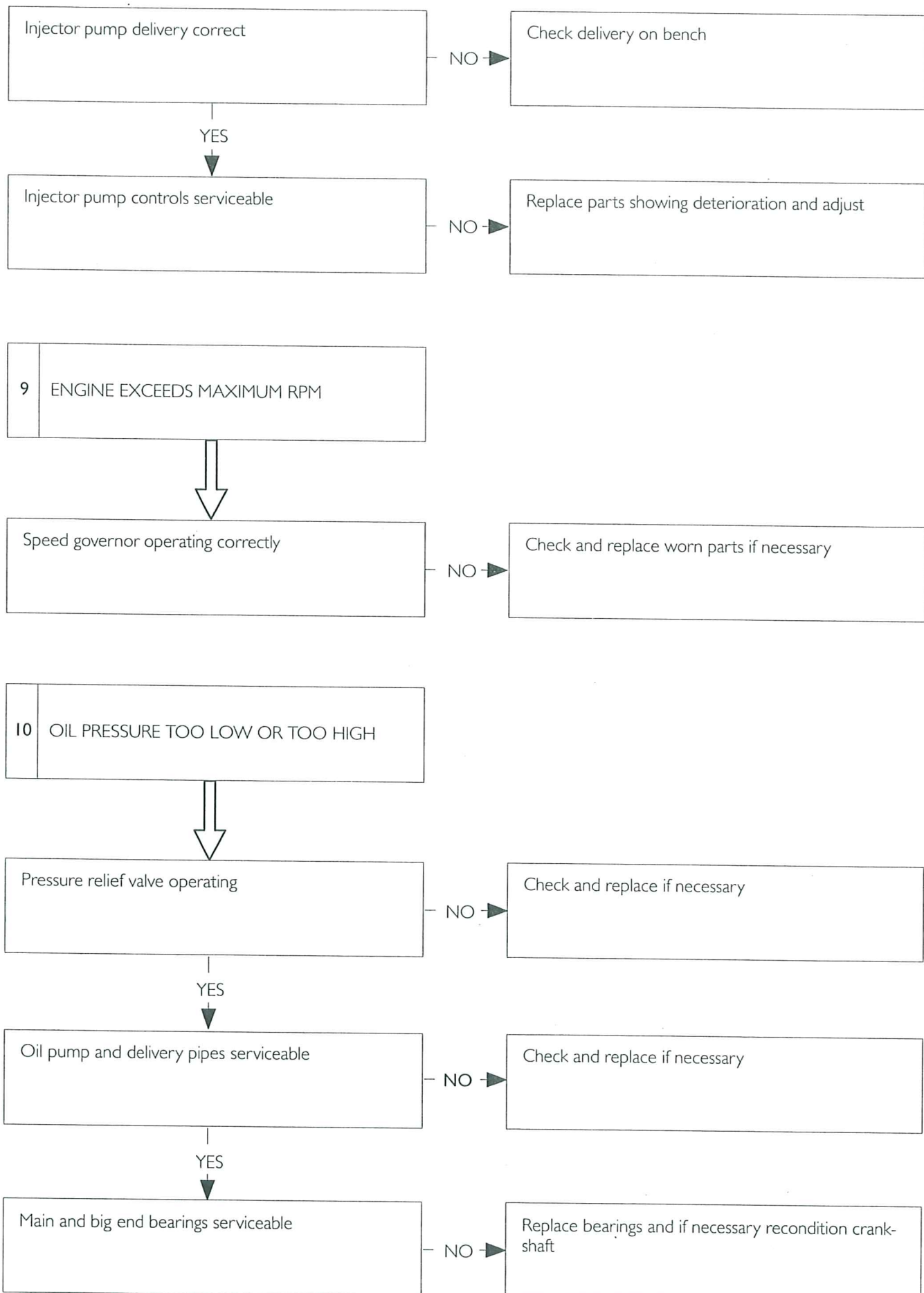


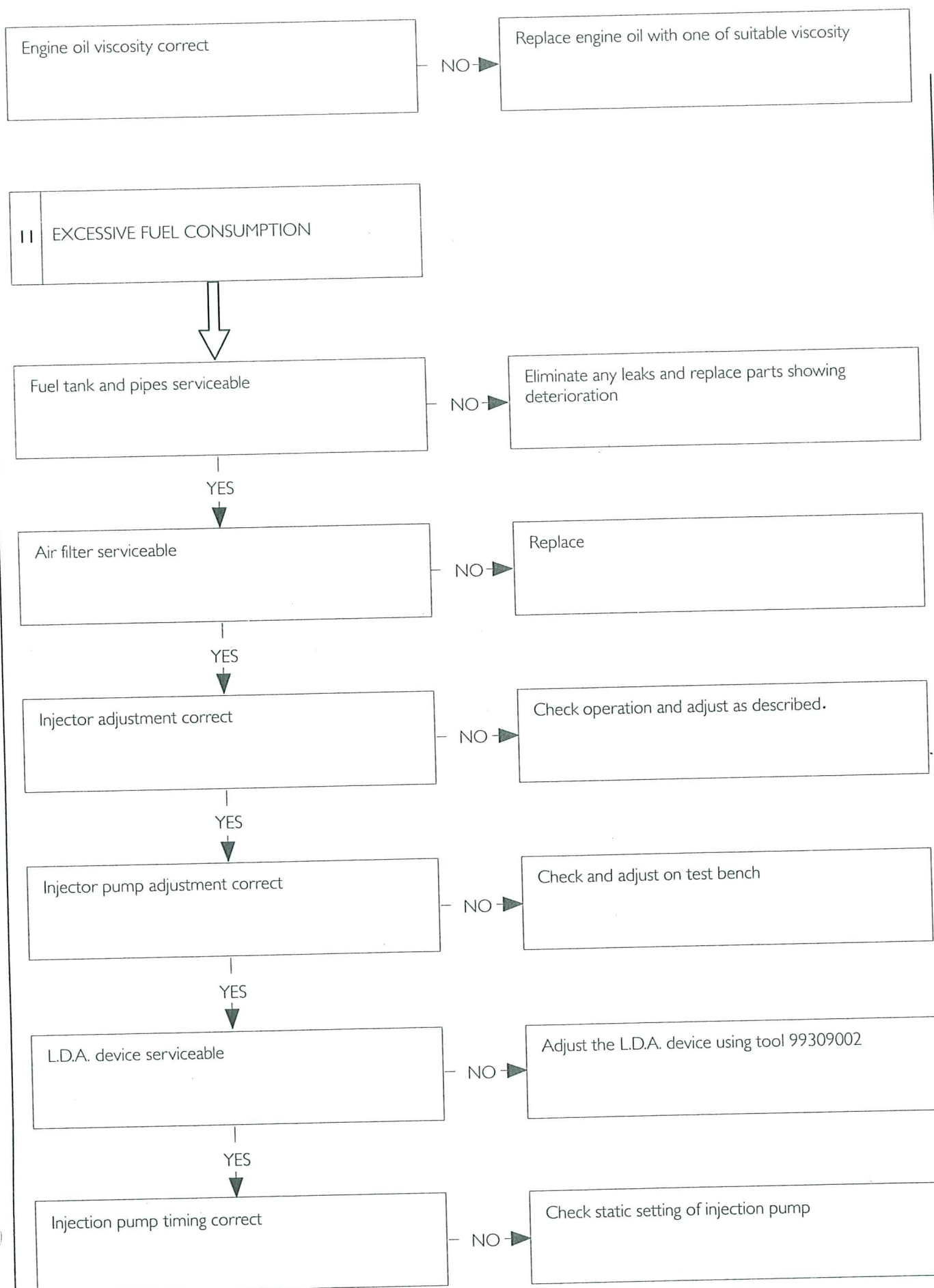
Knocking coming from timing gears

YES →

Check gears and replace if necessary







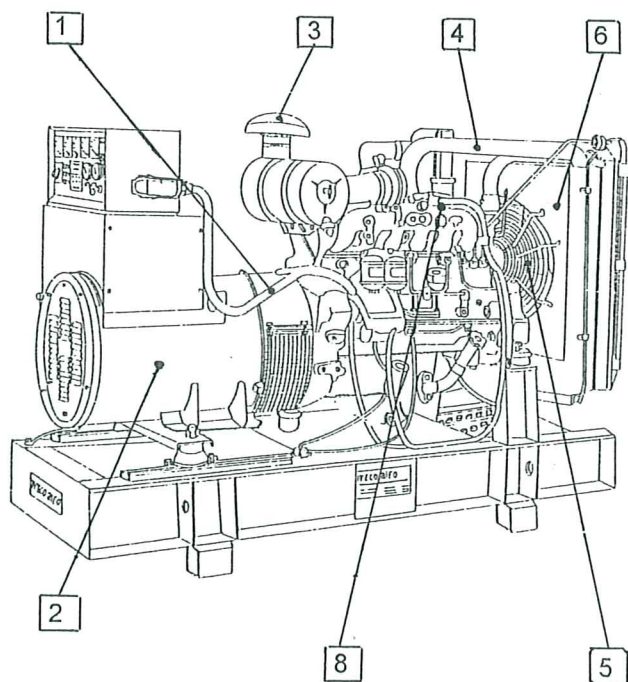
ENGINE BENCH DISASSEMBLY

DISMANTLING OF THE GENSET

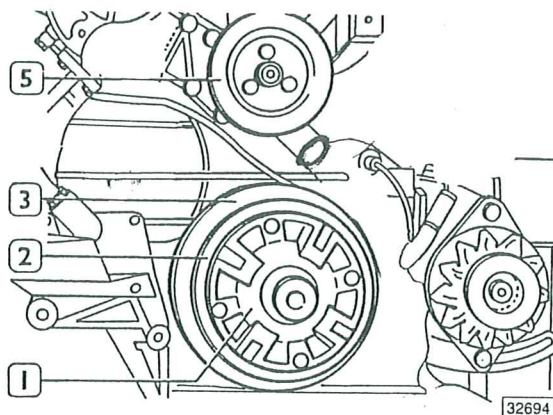
Remove all the external components of the genset:

Radiator
Guards
Air cleaner
Electric machine
Pipes for air/water
Electric wiring
Injection pump
Flywheel housing
Heat exchangers
Oil/fuel filters
Intake and exhaust manifolds
Fan
Turbocharger

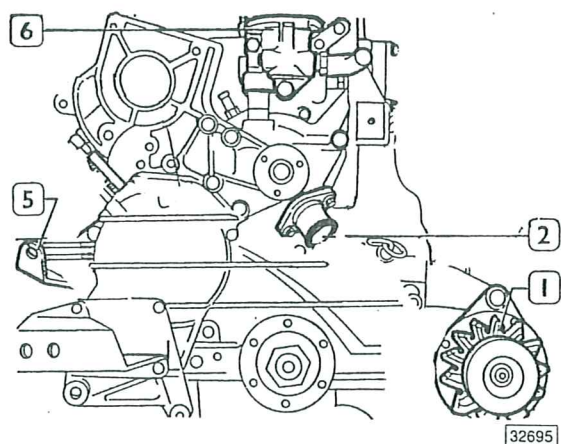
in order to fit the engine to the swivelling stand and to perform the overhaul.



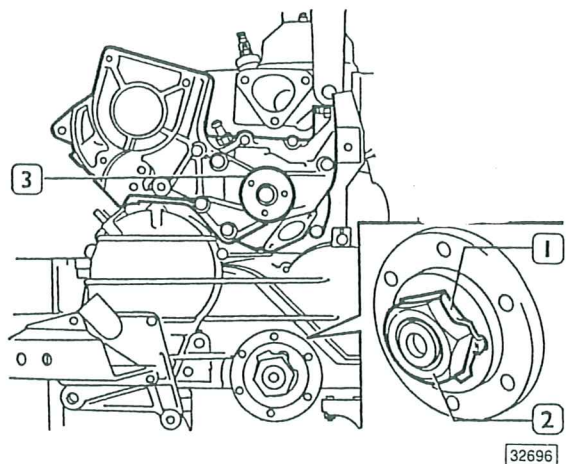
- ☐ Electric wiring (1)
- ☐ Electric machine (2)
- ☐ Air cleaner (3)
- ☐ Pipe for radiator (4)
- ☐ Guard for fan and alternator (5)
- ☐ Radiator (6)
- ☐ Engine (8)



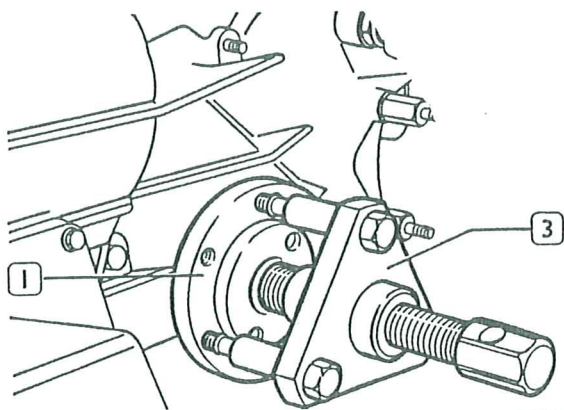
Take off the fan mounting (1), remove the crankshaft pulley (2) and the damper flywheel (3), and the water pump drive pulley (5).



Remove the alternator (1) and its bracket, remove the pipe (2) running from the water pump to the radiator. Detach the compressor lubricating oil delivery and return pipes (3, 4). Remove the thermostat (6).

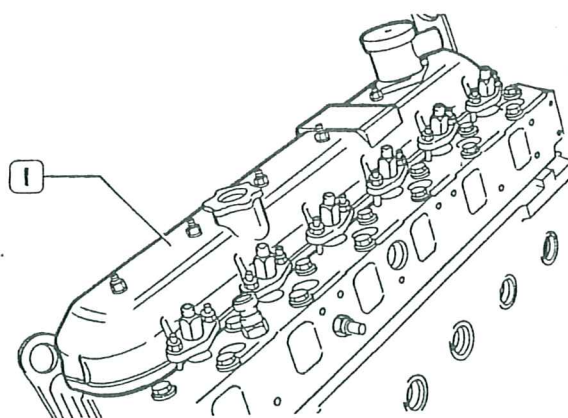


Remove the water pump (3). Straighten the locking plate (1) on the hub and unscrew the nut (2).



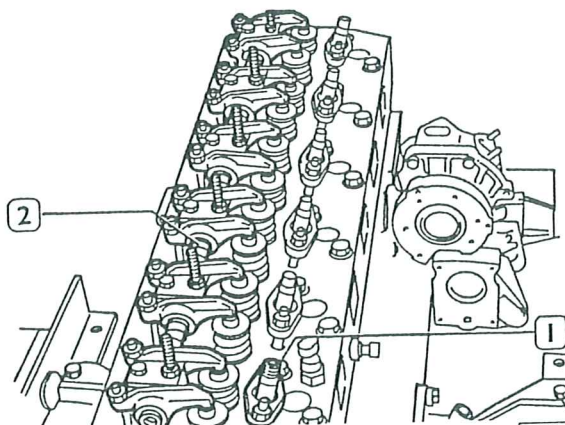
32697

Remove the hub (1) for the damper flywheel using tool 99340033 (3)



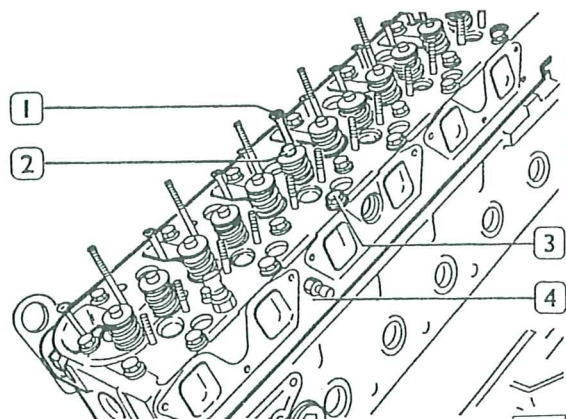
32700

Remove the rocker cover (1).



32701

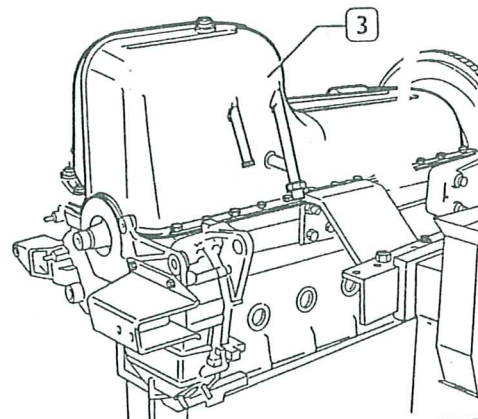
Remove the injectors (1) and the rocker shaft assembly.



32702

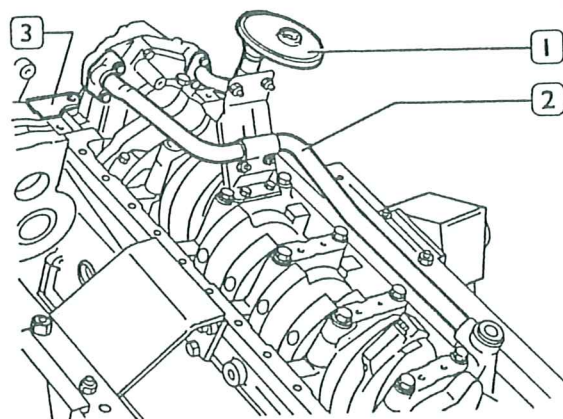
Recover the pushrods (1) and the caps (2) from the valve stems.

Unscrew the bolts (3) securing the cylinder head (4) and remove the head, recovering the gasket.



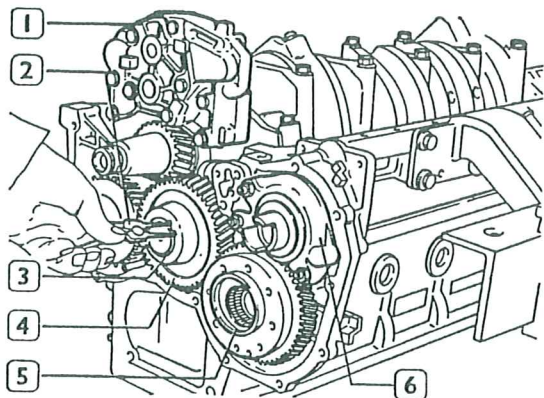
32703

Rotate the engine 180°, remove the sump (3).



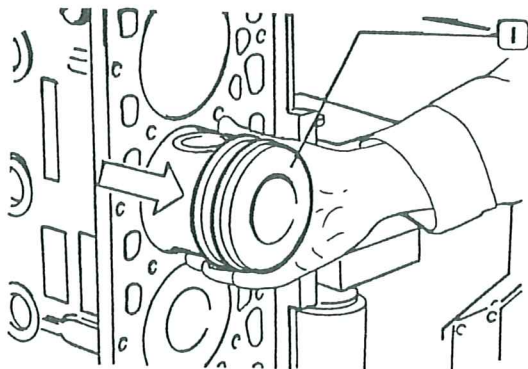
32704

Remove the oil suction (1) and delivery (2) pipes and the timing gear cover (3).



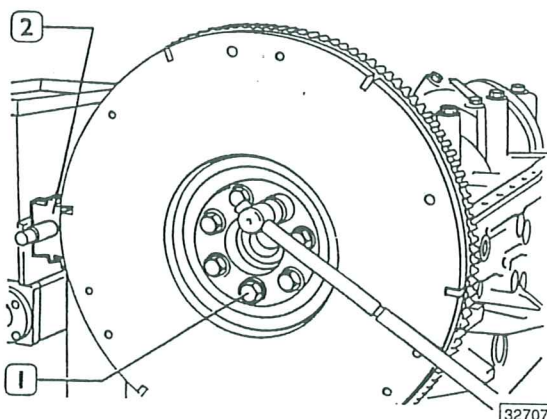
32705

Using round nosed pliers (2), remove the circlip (3) and withdraw the idler gear (4). Remove the oil pump (1). Remove the power steering pump drive shaft support (6). Remove the injection pump drive gear (5).



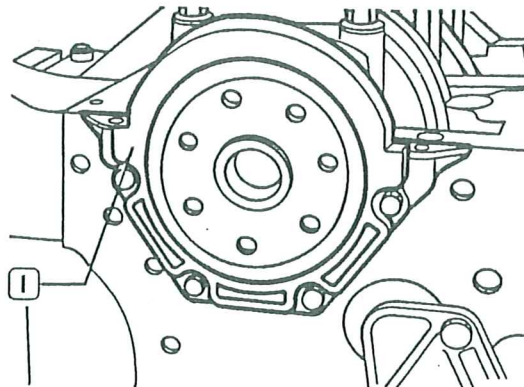
32706

Remove the big end caps, recover the bearing shells and then withdraw the piston-connecting rod assemblies (1) from the top of the crankcase.



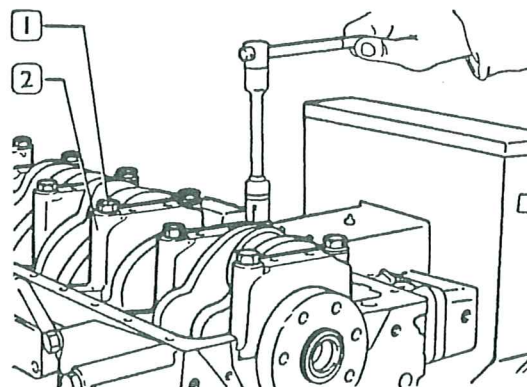
32707

Unscrew the flywheel attachment bolts (1), remove the tool 99360352 (2) and remove the flywheel.



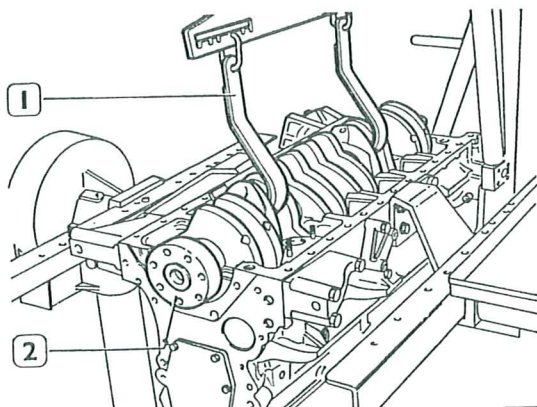
32708

Remove the rear cover (1) complete with seal.



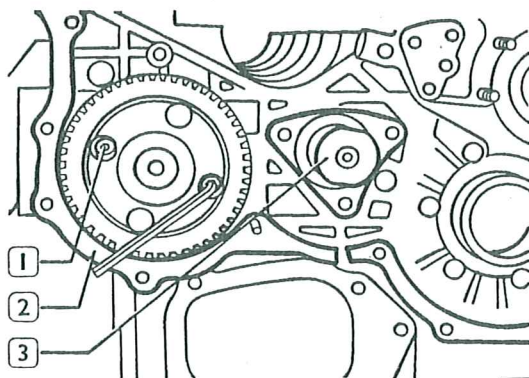
32709

Unscrew the bolts (1) for the main bearing caps (2) and remove the caps.



32710

Lift and dismount the crankshaft (2) by means of tool 99360500 (1); keep the main bearing shells and the shoulder semi-rings of the crankcase.



32711

Loosen the locking screws (1) of the collar plate and pull out the camshaft. Pull the valve lifters out of their seats and dismount the oil spring nozzles. Remove the bracket (3) of the transmission gear wheel and the control housing (2).

Clean carefully all dismantled parts and check their integrity after dismantling of the engine.

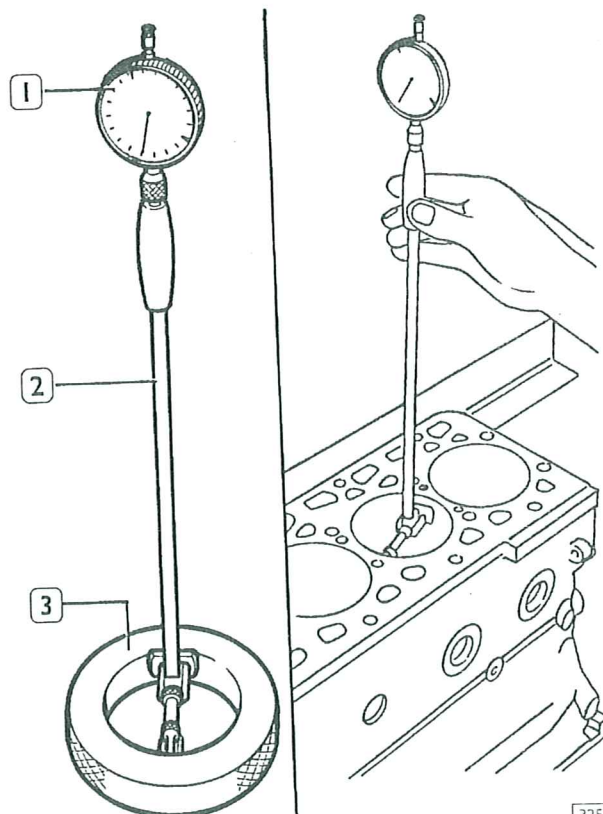
On the following pages instructions for the main checks and measurements are given which have to be carried out to determine whether the parts can be used again for mounting.

REPAIRS

CYLINDER BLOCK

CONTROLS AND MEASUREMENT

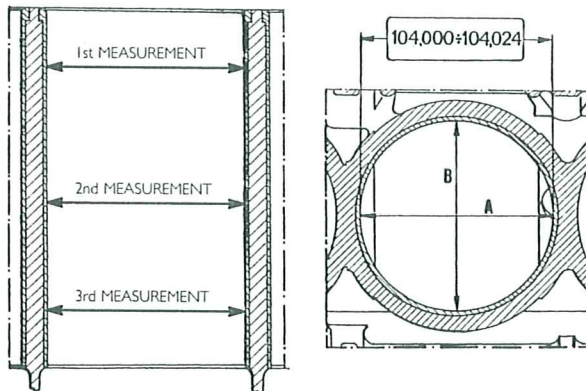
Because of its ductility the cylinder liner must never be measured inside when dismantled; the inner diameter must be measured at completely mounted liner.



32579

In order to determine the value of the out-of-round, of the conical form and of the wear the inner diameter of the liners is checked by means of gauge 99395687 (2) provided with centimeter indicating caliper (1) that has been previously calibrated at a ring gauge (3) with a diameter of 104 mm.

If a ring gauge with a diameter of 104 mm is not available, use a slide gauge.

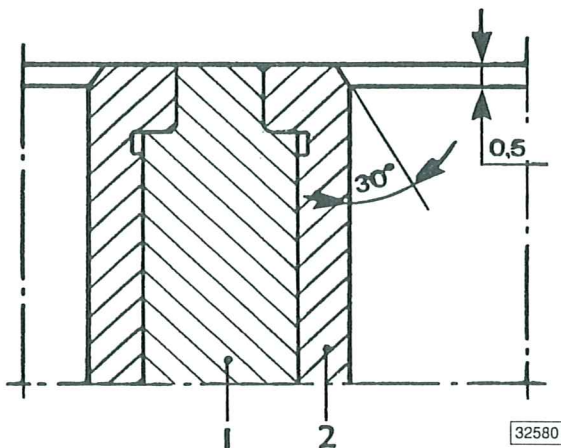


20581

PLAN FOR CHECKING CYLINDER LINER DIAMETER

The measurements must be carried out for each individual cylinder at three different levels in the liner and in two planes at right angles to each other, one parallel to the lengthwise axis (A) and the other at right angles to it (B). Maximum wear is generally found in this plane (B) and in line with the first measurement. If ovality or taper or wear of any kind is found, it may be eliminated at overhaul by grinding the liners if the wear or scoring is light, or by reboring and then grinding if there is deep scoring or marked ovality.

Where reconditioning is carried out, all liners must be finished to the same oversize (0.4 – 0.8 mm).

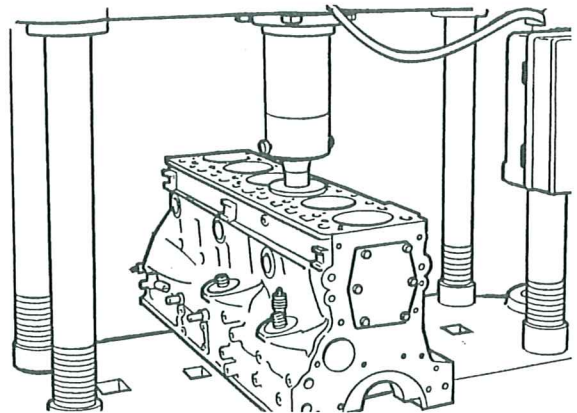


32580

PLAN OF CHAMFER TO BE APPLIED TO CYLINDER LINERS AFTER RECONDITIONING

1. Crankcase 2. Cylinder liner

REPLACING CYLINDER LINERS



32712

Removal and installation of the cylinder block liners is carried out using a hydraulic press and the appropriate adaptor plate.

To install the cylinder liners in the cylinder block by using a press, the following steps have to be carried out:

- ☐ Measure to ensure cylinder liner outer diameter is 106.970 – 106.940 mm and the cylinder block bore diameter is 106.850 – 106.900 mm;
- ☐ Insert cylinder liner into the cylinder block and test, after pressing—in 70 – 90 mm the load must be not less than 5000 N and not more than 23.000 N;
- ☐ Continue pressing in and test, 30 mm before finishing, the load must be between 10.000 and 40.000 N;
- ☐ When pressing in is completed, wait 5" with a load of 50.000 or more to ensure liner is fully home; Strike blow with a hammer to ensure the liner is flush with the cylinder block;

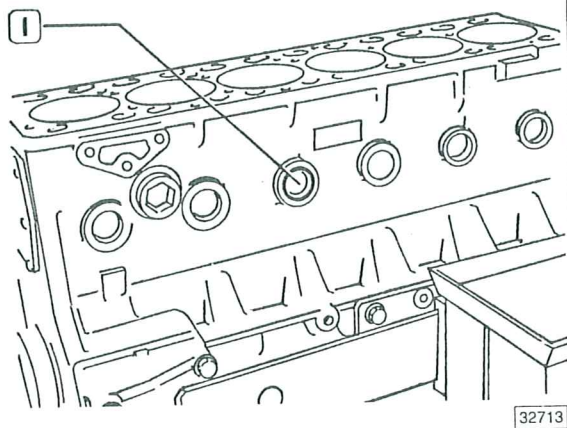
If the fitting load is not within the specific figures, extract the liner and install a new one in its place.

After they have been fitted, cylinder liners must be reamed and ground.

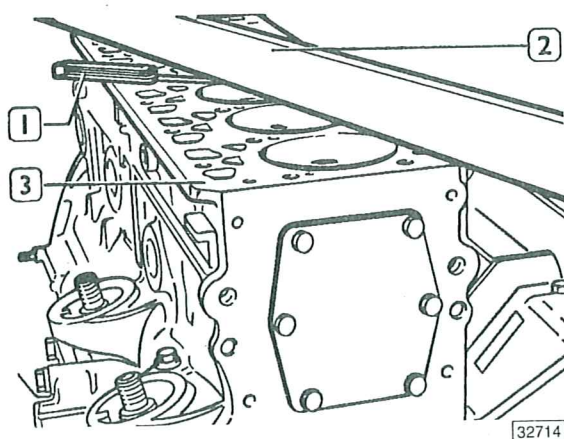
(NOTE: 10.000 N = 1 Tonne)

Cylinder liners are supplied with an inner diameter slightly below nominal diameter to allow for any deformation which occurs during fitting to be corrected.

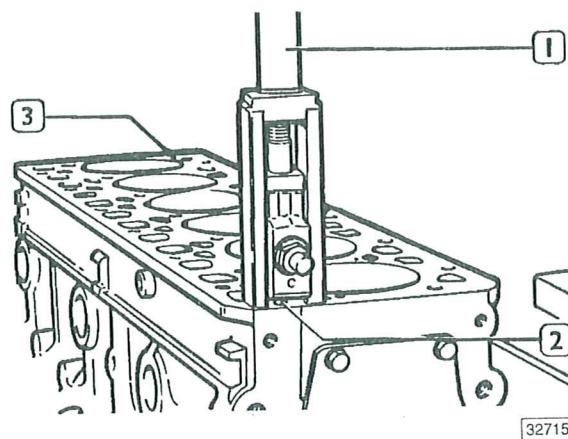
Replacement cylinder liners are also supplied with the outside diameter 0.2 mm oversize.



Check the condition of the machining plugs (1) in the cylinder block; if they are rusted or there is the least suspicion of leakage, replace them.



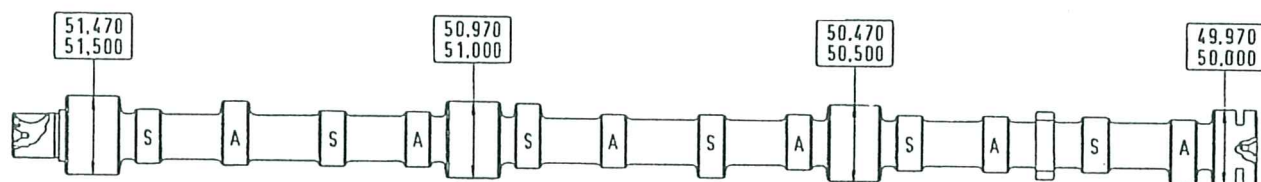
Check that the cylinder head mating surface (3) are flat using a calibrate rule (2) and a feeler gauge (1). Grind any rough spots removing as little material as possible after removing the locating dowels. After grinding the cylinder head surface, restore the protrusion of the cylinder liner border support base to 0.64 – 0.97 mm



Using the tool (1), remove the locating dowel (2) from the mating surface (3) of the cylinder.

Extract the locating dowel only if the mating surface requires skimming.

CAMSHAFT

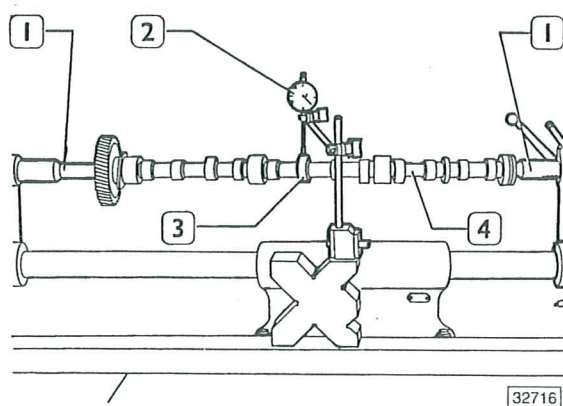


MAIN DATA FOR THE CAMSHAFT

The surfaces of the shaft bearing journals and those of the cams must be absolutely smooth;

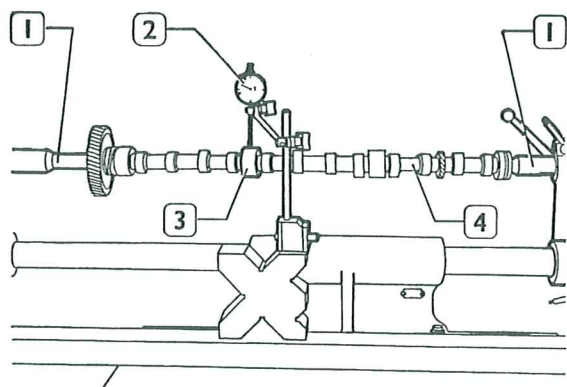
if they show traces of seizing and scoring, the shaft and associated bushes must be replaced.

CHECKING CAM LIFT AND JOURNAL ALIGNMENT



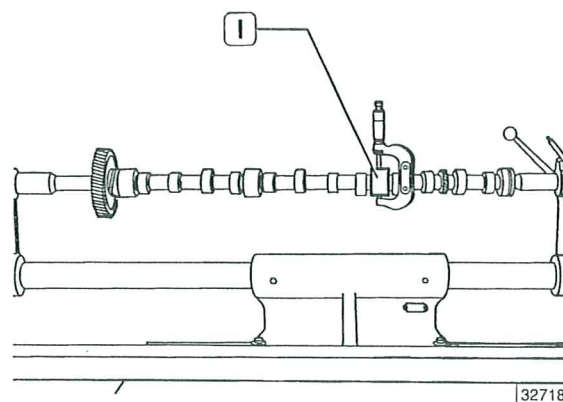
Arrange the camshaft (4) between the centres (1) and using the hundredths dial gauge (2) check the lift of the cams (3) which should be:

- ☐ 5.97 mm for the inlet cam
- ☐ 6.25 mm for the exhaust cam



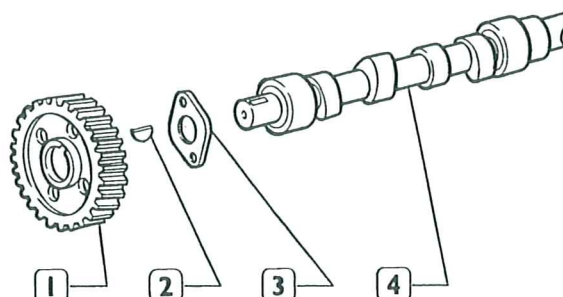
Still with the camshaft (4) arranged between centres (1), check the alignment of the support journals (3) using the hundredths dial gauge; this must not be more than 0.020 mm. If a larger misalignment is found, replace the shaft.

FIGURE 54



To check the assembly clearance, measure the inside diameters of the bushes (fig. 57) and the diameter of the journals (1, fig. 54) of the camshaft; the difference will give you the actual clearance. If clearances of more than 0.160 mm are found, replace the bushes and the shaft too, if necessary.

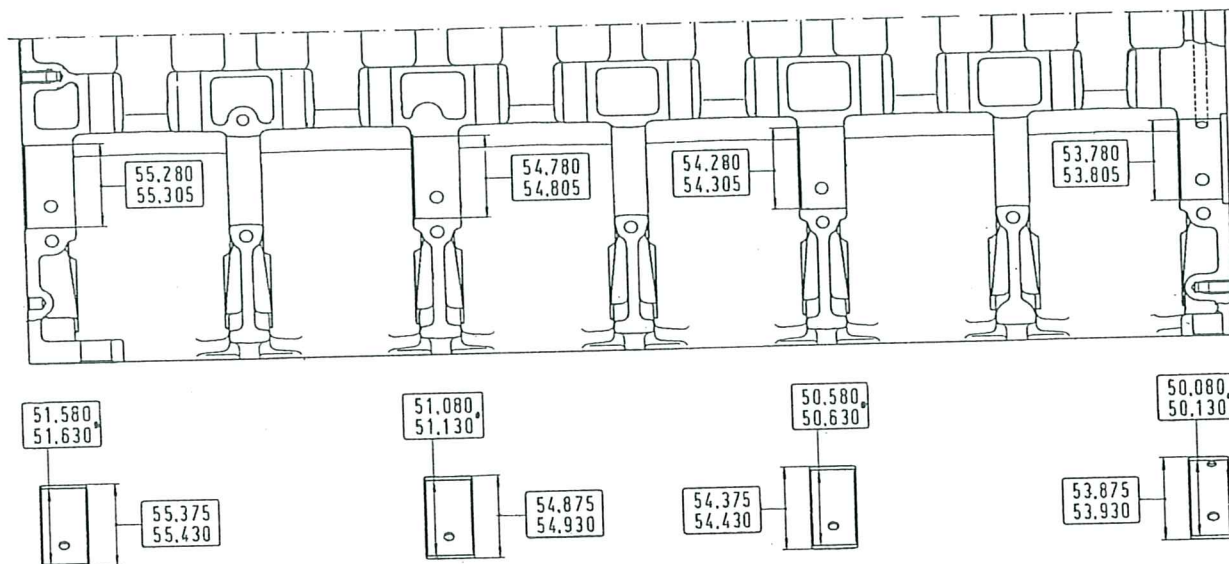
REPLACING THE CAMSHAFT GEAR



Check that the teeth of the camshaft gear (1) are not excessively damaged or worn; if they are, replace it. When fitting the new gear, it should be heated in an oven for 10' at a temperature of 180° and then shrunk onto the shaft, having first fitted the plate (3) and key (2) to the shaft.

BUSHES

The surfaces of the bushes must not show any signs of seizing or scoring; if they do, replace them.



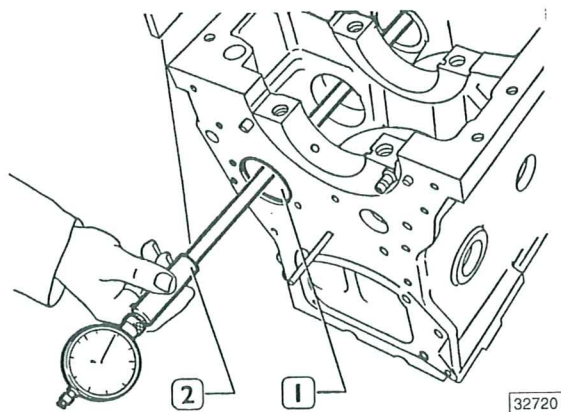
1403

MAIN DATA FOR CAMSHAFT BUSHES AND THEIR HOUSINGS IN THE CRANKCASE

- Dimension to be obtained after the bushes have been installed

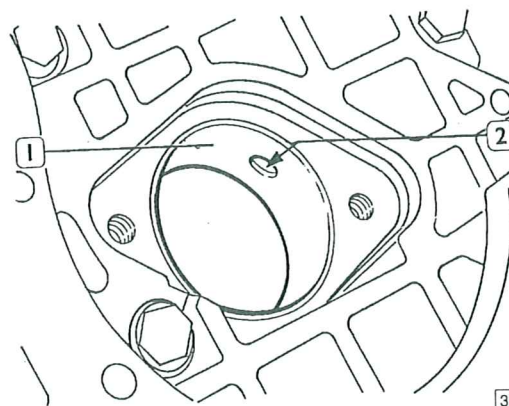
REPLACING THE BUSHES

FIGURE 57



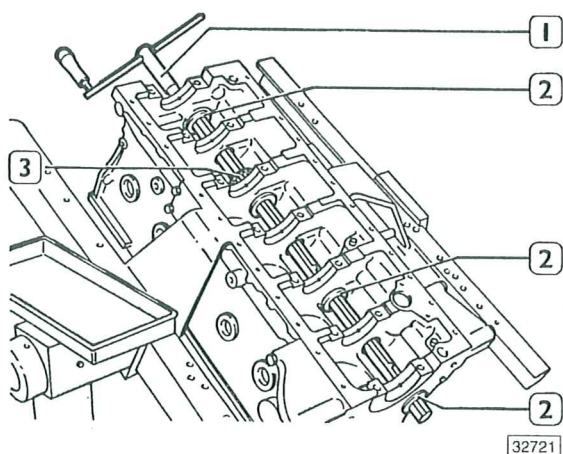
32720

Before replacing the bushes (1), measure the bush diameters using a bore micrometer (2).
To remove and refit the camshaft bushes, use a suitable drift.



32587

When fitting the bushes (1), make sure that the holes (2) are lined up with the oil feed holes in the crankcase.

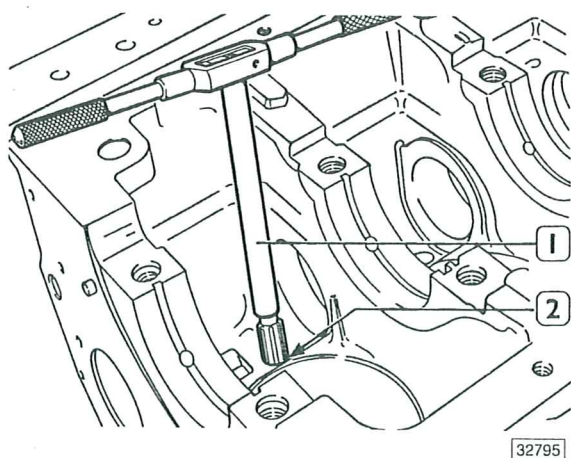


After fitting, ream the camshaft bushes using the arbor (1) fitted with the pilot bushes (2) and cutter (3) so that the specified values are obtained.

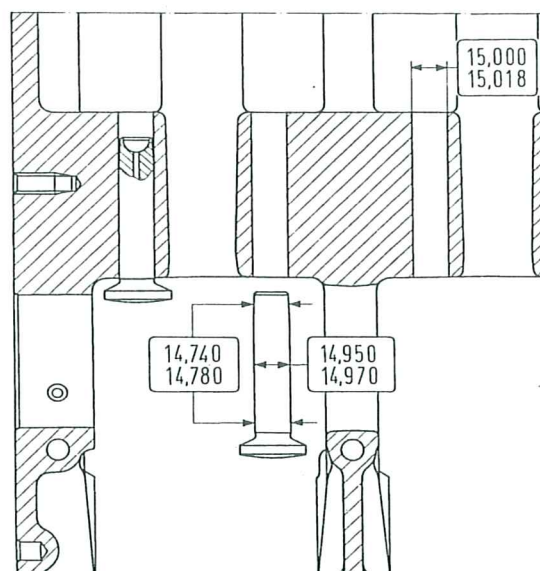
TAPPETS

Replacement tappets are supplied in standard size and 0.10, 0.20 and 0.30 mm oversizes.

REPLACING TAPPETS

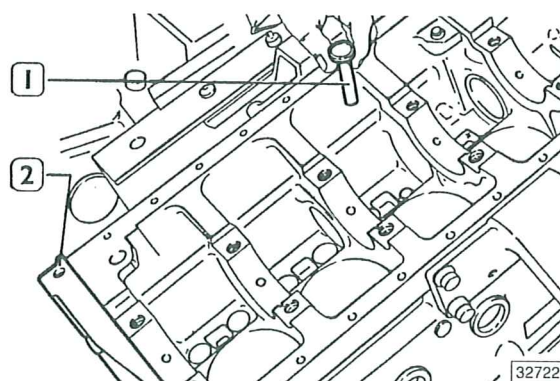


Replacing the tappets because of excessive play in the housings involves fitting oversize tappets and reaming out the seatings using an appropriate reamer (1).

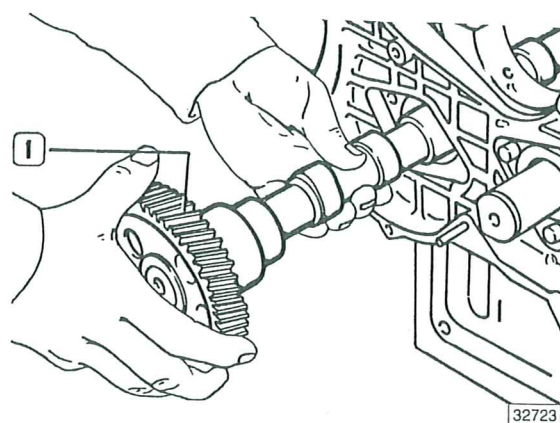


MAIN DATA FOR TAPPETS AND THEIR HOUSINGS IN THE CRANKCASE

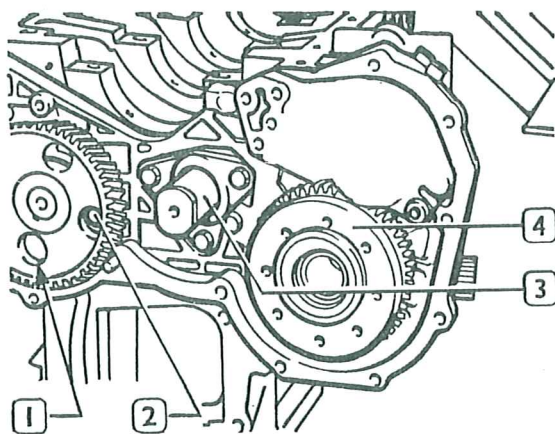
Fitting tappets, camshaft



Secure the timing gear casing (2) to the crankcase, first fitting the gasket, and tighten the screws to a torque of 25 Nm using a torque wrench. Lubricate the tappets (1) and fit into their housings in the crankcase.



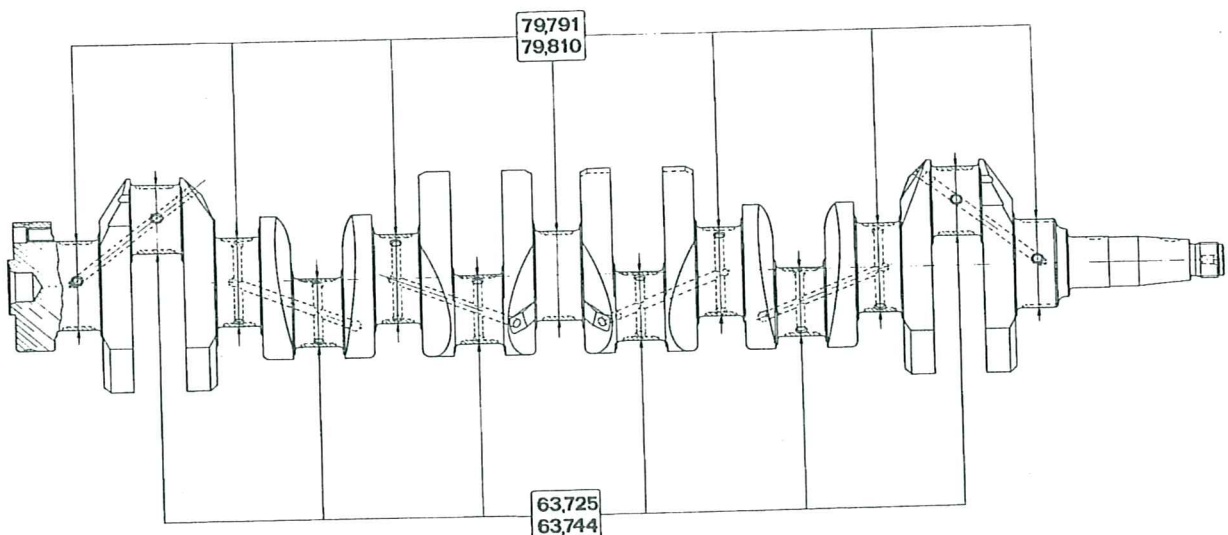
Lubricate the camshaft bearings and insert the shaft (1) into the crankcase.



32724

Through the holes (1) in the camshaft gear, tighten the screws (2) securing the camshaft retainer plate to the crankcase.
Fit the idler gear pin (3), the injection pump gear (4)

CRANKSHAFT



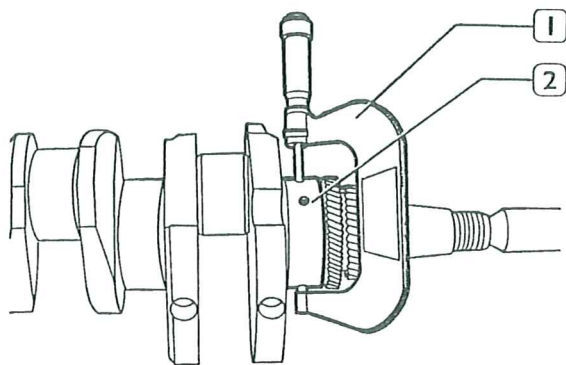
20400

MAIN DATA FOR THE CRANKSHAFT MAIN BEARING JOURNALS AND CRANKPINS

MEASURING THE MAIN BEARINGS JOURNALS AND CRANKPINS

Before regrounding the journals, measure the main journals (2) with a micrometer (1) and establish on the basis of the scale of bearing undersizes (7) the diameter to which the journals must be reground.

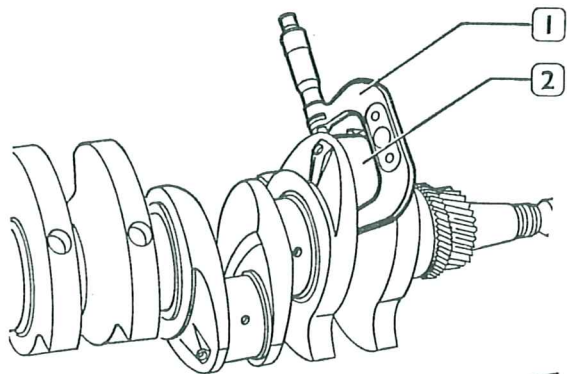
The classes of undersize are :
0.254, 0.508 mm



32725

MEASURING THE MAIN BEARING JOURNALS

Main bearing journals and crankpins are always all reground to the same undersize class so as not to impair crankshaft balance.



32726

MEASURING THE CRANKPINS

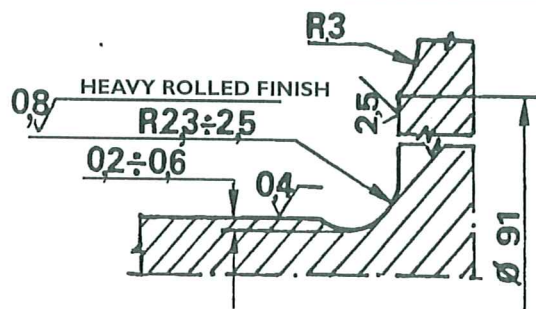
During the grinding operation, take great care to comply with the values for the main journal and crankpin blend radii given in the following figures.

Regrinding carried out on main journals or crankpins must be indicated by appropriate markings stamped on the side of crank web no. 1.

For undersize crankpins : the letter M

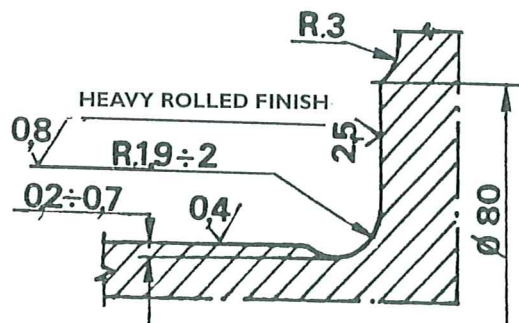
For undersize main journals : the letter B

For undersize crankpins and main journals : the letters MB.



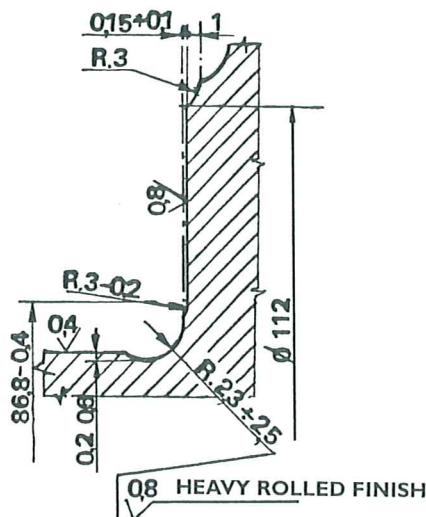
21177

DETAIL OF MAIN JOURNAL BLEND RADII



21178

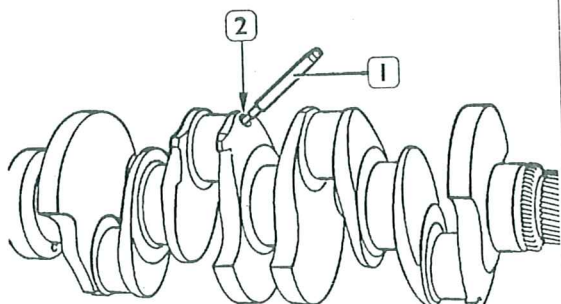
DETAIL OF CRANKPIN BLEND RADII



21176

DETAIL OF THRUST BEARING MAIN JOURNAL BLEND RADII

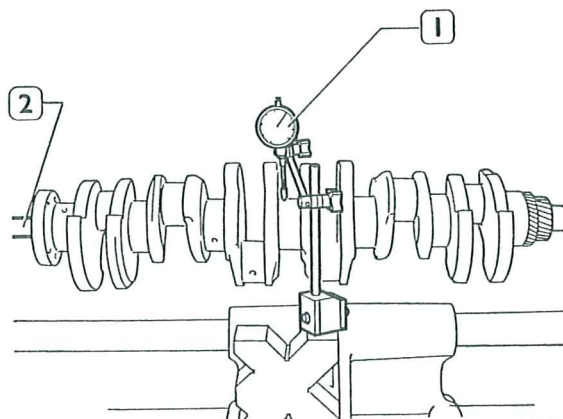
REMOVING/FITTING OILWAY PLUGS



32597

Check that the lubrication circuit plugs (2) do not show any leaks at an internal pressure of 15 bars; if they do, replace using a suitable drift (1).

CHECKING MAIN JOURNAL ALIGNMENT

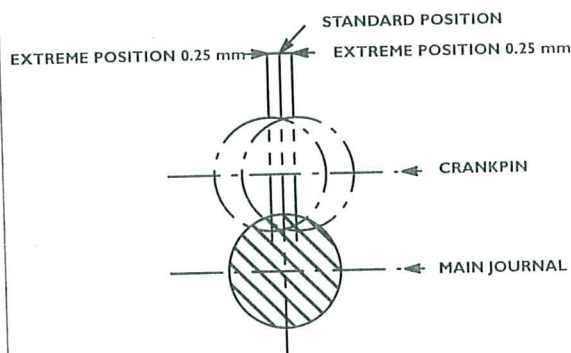


32727

This check must be carried out after regrinding, if any, of the crankshaft journals by positioning the crankshaft between centres (2) and using a hundredths dial gauge (1) for the check.

Main journal alignment : maximum tolerance

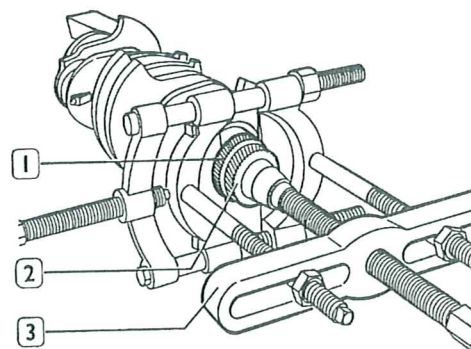
- > 0.10 mm (total reading on the dial gauge).



2219

- Alignment of the crankpins with the main journals: the centreline of each pair of crankpins and the centreline of the main journals must be in the same plane : the maximum tolerance permitted at right angles to this plane is ± 0.25 mm
- For the distance between the axis of rotation of the shaft and the outer surface of the crankpins, the maximum tolerance permitted is ± 0.10 mm

REPLACING CAMSHAFT AND OIL PUMP DRIVE GEARS



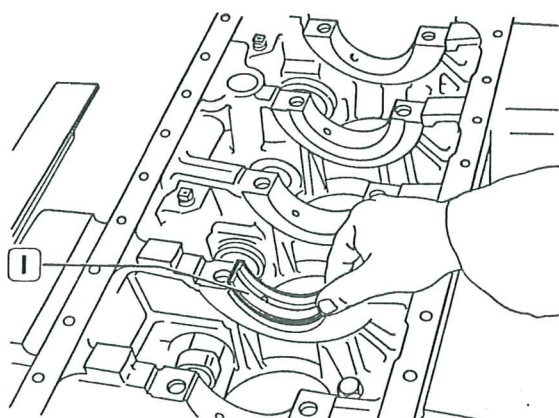
32599

Check that the teeth of the gears (1, 2) are not damaged or worn; if they are, remove them using a suitable extractor (3). When fitting new gears (1, 2), they must be heated in an oven for 10' to a temperature of 180° and shrunk on to the crankshaft, having first fitted the key.

MOUNTING MAIN BEARING

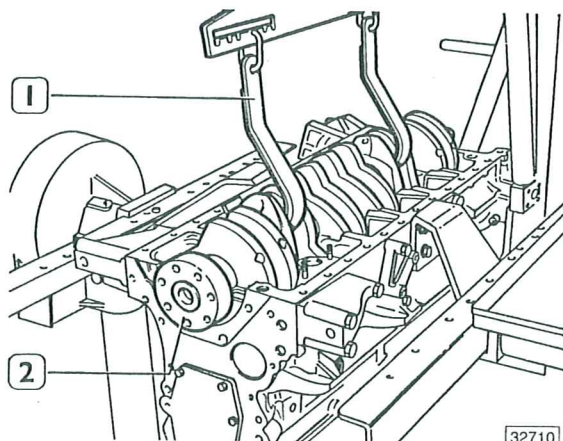
Replacement main bearings are supplied in inside diameter undersizes.

Do not carry out fitting operations on the bearings.



32728

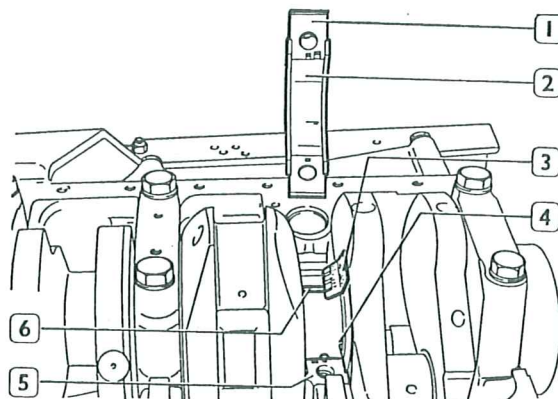
Position the bearing shells (1) in the main bearing housings in the crankcase.



32710

Lift the crankshaft (2) using tool 99360500 (1) and carefully place it on the bearing shells in the housings.

MEASURING MAIN BEARING ASSEMBLY CLEARANCES



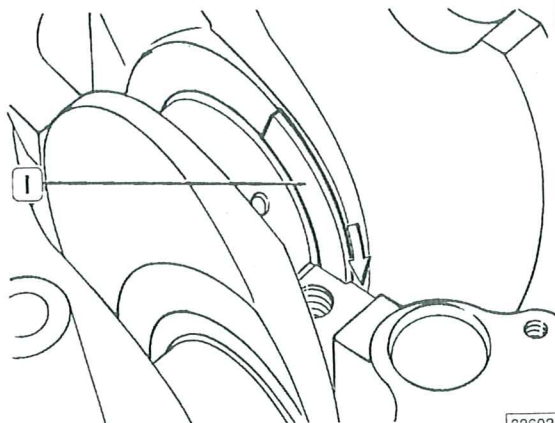
32730

The clearance between the crankshaft journals and the relevant bearings is checked by the plastigage method, proceeding as follows :

- ☐ thoroughly clean the parts and remove all traces of oil
- ☐ arrange a strip of plastigage (6) on the main journals (4), parallel with the lengthwise axis
- ☐ fit the caps (1) together with the bearing shell to the relevant housings
- ☐ fit the cap securing bolts and tighten them to the prescribed torque using a torque wrench; the bolts must be lubricated with oil beforehand
- ☐ remove the caps from the housings and determine the clearance between the bearing shells and the crankshaft main journals by comparing the width of the plastigage at the point of greatest flattening with the scale divisions given on the package (3) containing the plastigage

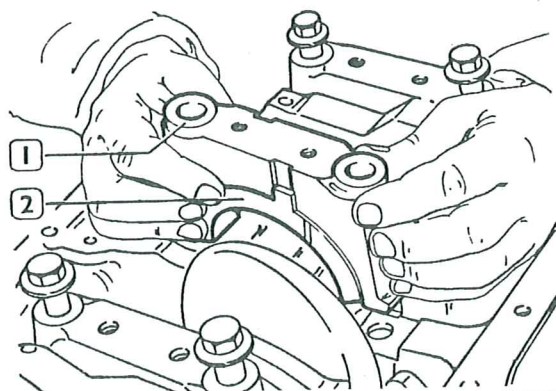
Checking crankshaft end float

The normal assembly clearance is 0.082 – 0.334 mm. If a larger end float is found, replace the thrust washer halves with new ones of standard thickness or if necessary an oversize of 0.127, 0.254, 0.508 mm.



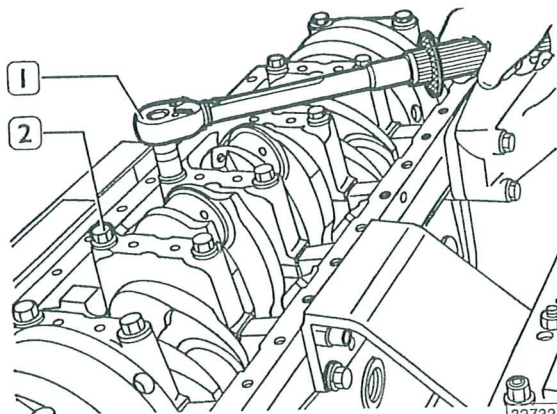
32603

Position the thrust washer halves (1) on the 6th housing with the surface covered with anti-friction alloy towards the facing on the crankshaft.



32731

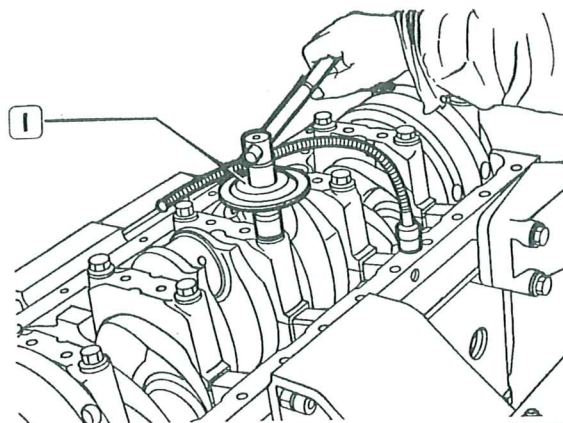
Fit the main bearing caps with bearing shells; before fitting the cap (1), position the halves of the thrust washer (2) with the surface covered with anti-friction alloy towards the facing on the crankshaft.



32732

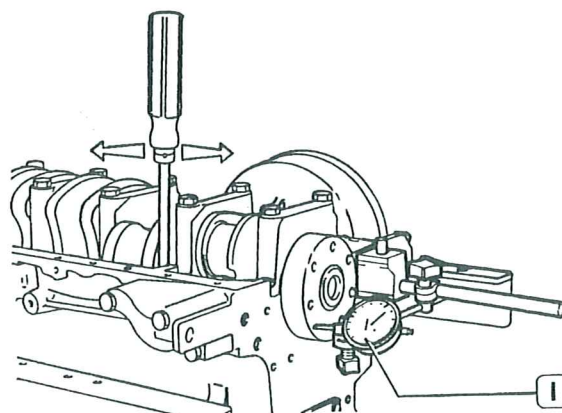
Using a torque wrench (1), tighten the securing bolts (2) to a torque of 80 Nm.

The bolts must be lubricated.



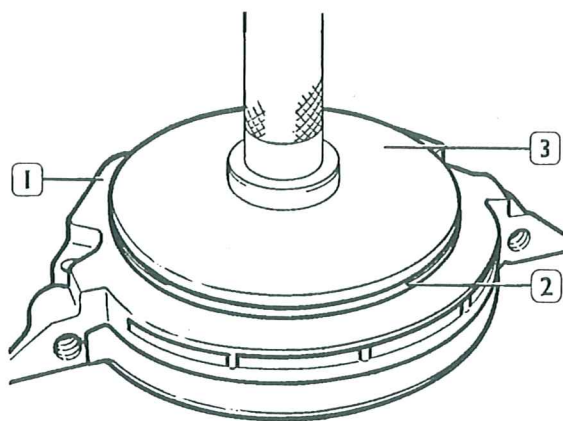
32779

Further tighten the screws by 90°, using tool 99395216 (1).



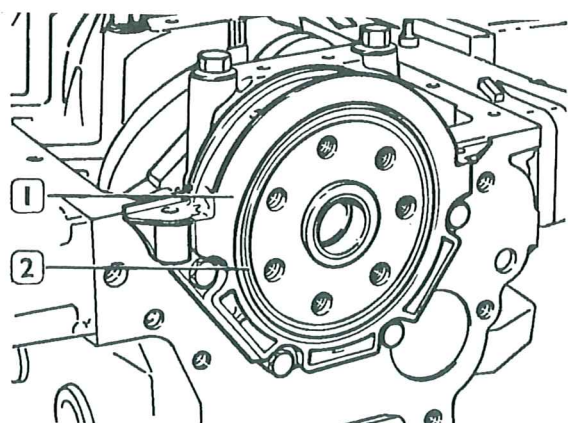
32733

Fit the dial gauge (1) with magnetic base and check end float.

CRANKSHAFT REAR COVER

32608

The oil seal (2) is fitted to the cover (1) using the appropriate installing tool (3).



32734

Fit the rear cover (1) to the crankcase, having first fitted the gasket.

FLYWHEEL

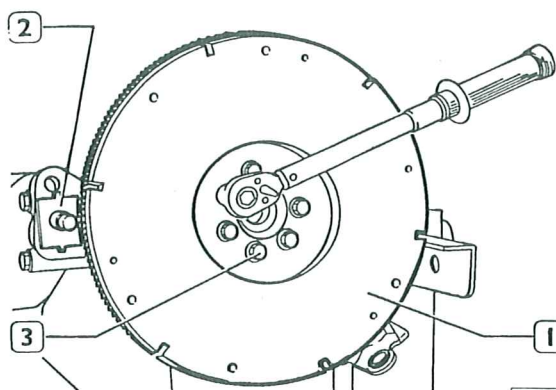
Check the surface on which the clutch plate bears; if it is scored, skimming will be required.

REPLACING THE FLYWHEEL RING GEAR

If the teeth of the gear fitted to the flywheel are badly damaged, replace the ring gear. Before fitting, the gear must be heated to a temperature of 80°C.

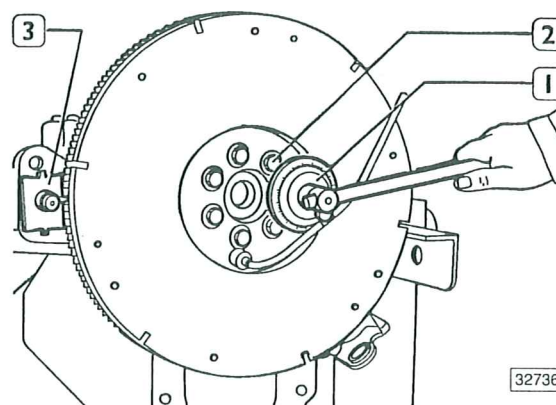
Fitting the flywheel

The bolts may be re-used provided that the $\varnothing$ of the thread is not less than 11.5 mm.



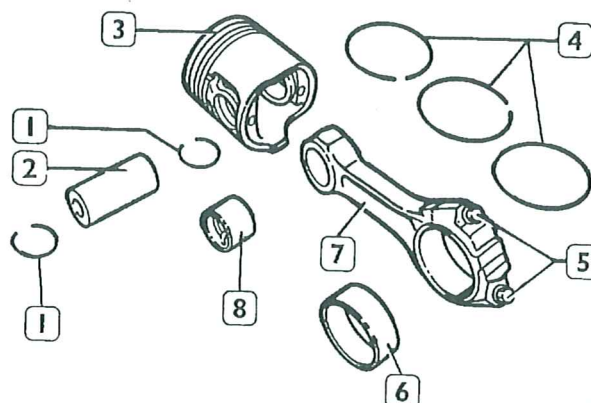
32735

Fit the flywheel (1), fit tool 99360352 (2) and, using a torque wrench, tighten the bolts (3) previously coated with LOCTITE HVX 576 to a torque of 40 Nm.



32736

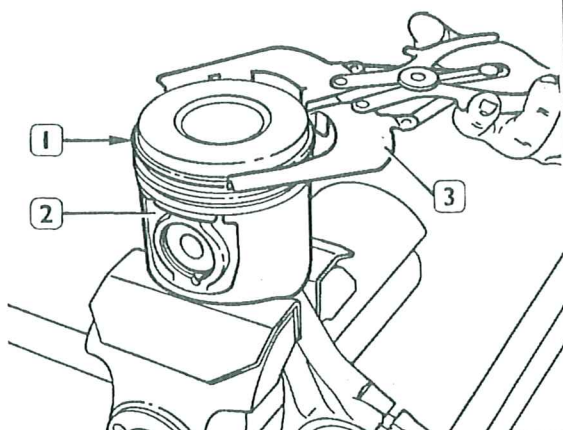
Fit tool 99395216 (1) and further tighten the screws (2) by 60°. Remove the flywheel locking tool (3).

CONNECTING ROD/PISTON ASSEMBLY

32612

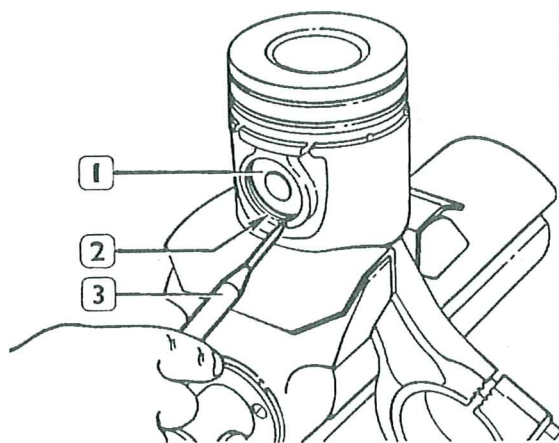
COMPONENT PARTS OF THE CONNECTING ROD/PISTON ASSEMBLY

1. Retaining clips 2. Gudgeon pin 3. Piston 4. Piston rings
5. Bolt 6. Bearing shells 7. Connecting rod 8. Bush



32613

Remove the piston rings (1) from the piston (2) using tongs 99360183 (3).



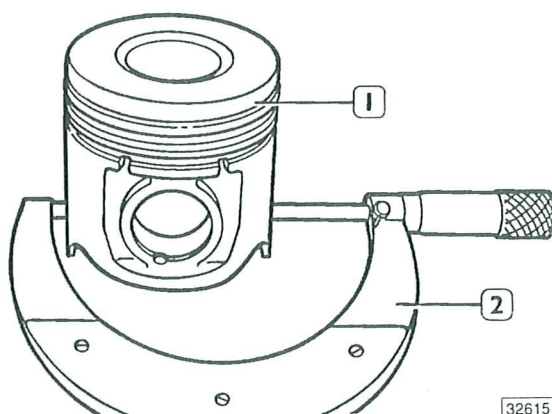
32614

The gudgeon pin (1) retaining clips (2) are removed using a scribe (3) as shown in the figure.

PISTON

Replacement pistons are supplied in standard size or 0.4, 0.8 mm oversizes.

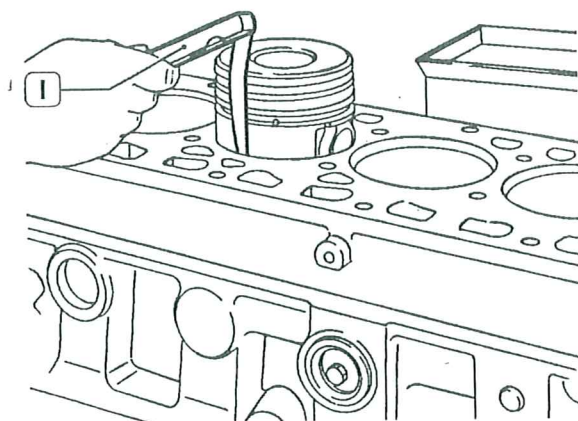
Measuring the piston diameter



32615

The diameter of the piston (1) is measured using a micrometer (2) to determine the assembly clearance.

The diameter must be measured 12 mm from the base of the skirt.

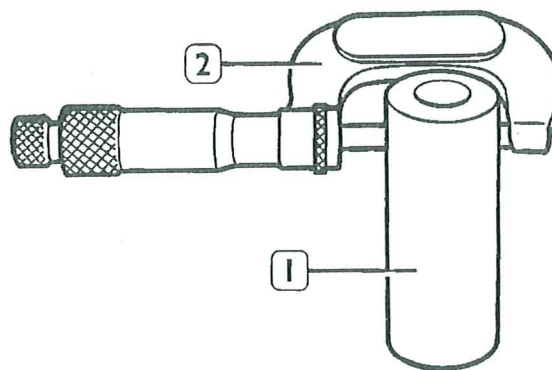


32616

The clearance between the piston and cylinder liner can also be measured using a feeler gauge (1).

GUDGEON PIN

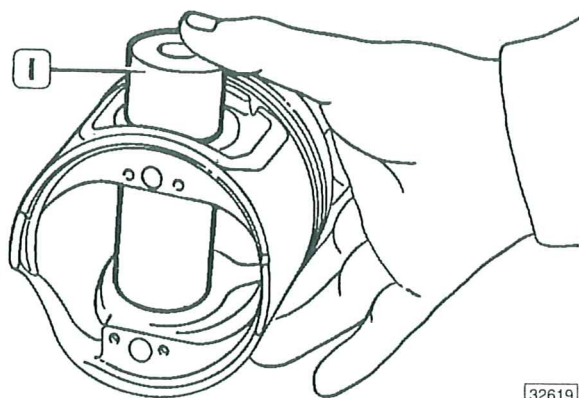
The pins are fitted with clearance both in the small end and in the piston.



32618

The diameter of the pin (1) is measured using a micrometer (2).

Conditions for a correct gudgeon pin to piston fit

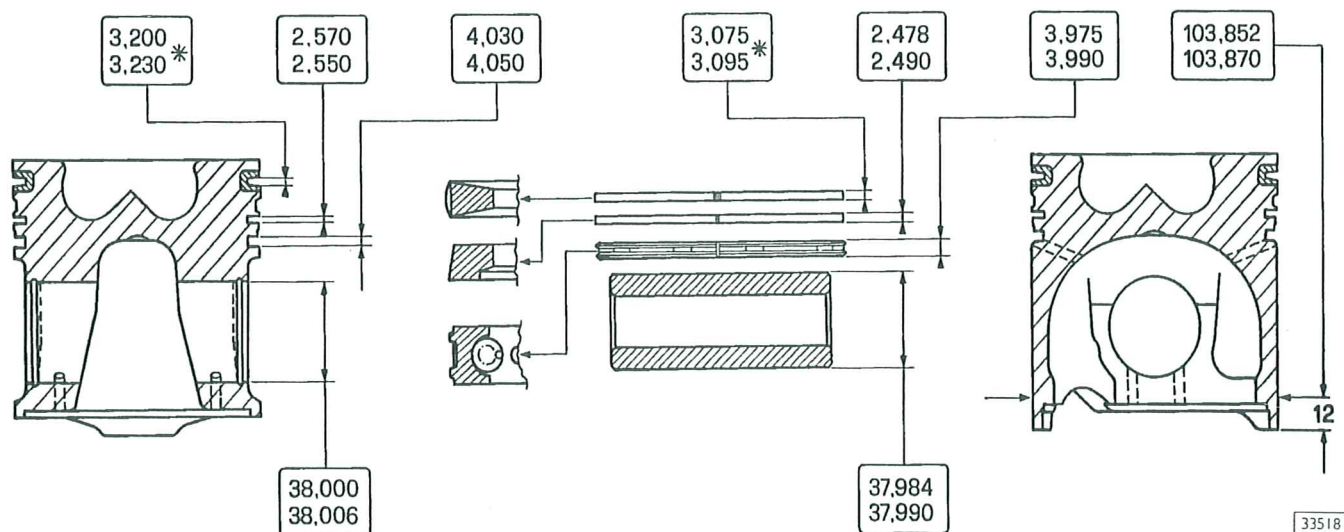


32619

When fitting new pins, check the correct fit with the housing in the piston by carrying out the following check:

- ☐ lubricate the pin and its housing in the piston bosses with engine oil
- ☐ holding the pin in a vertical position, insert it into the bosses in the piston
- ☐ it should be possible to insert the pin simply by pressing on it
- ☐ the pin should not drop out of the bosses by itself.

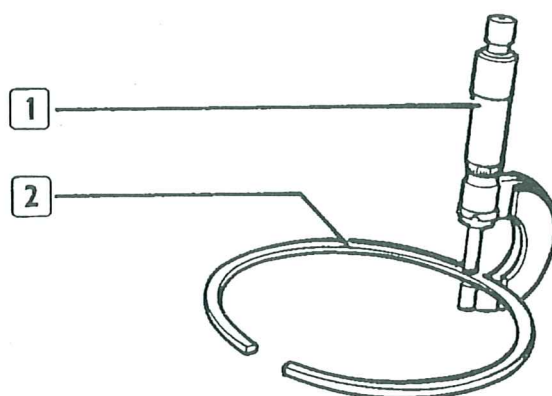
PISTON



33518

PISTON RINGS

Replacement piston rings are supplied in standard size and 0.4, 0.8 mm oversize.

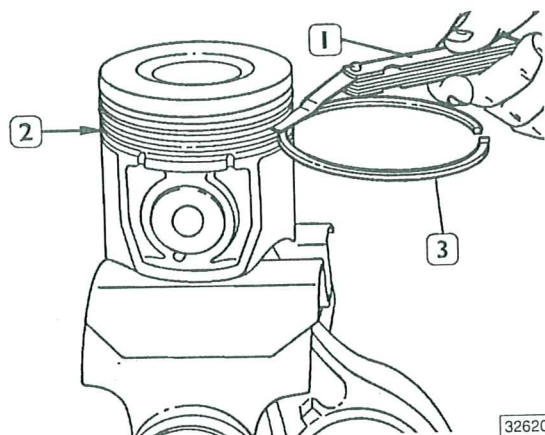


16552

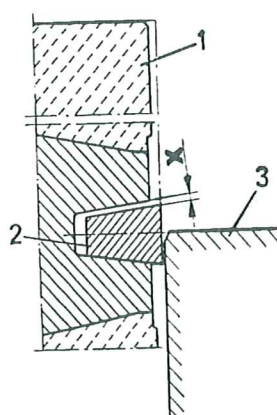
Check the thickness of the piston ring (2) using a micrometer (1).

MAIN DATA FOR THE PISTON, PISTON RINGS AND GUDGEON PIN

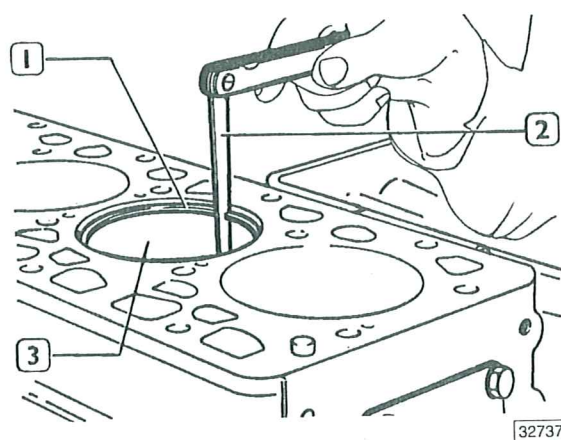
* The dimension is measured on a $\varnothing 101$ mm.



Check the clearance between the piston rings (3) and the grooves on the piston (2) using a feeler gauge (1).



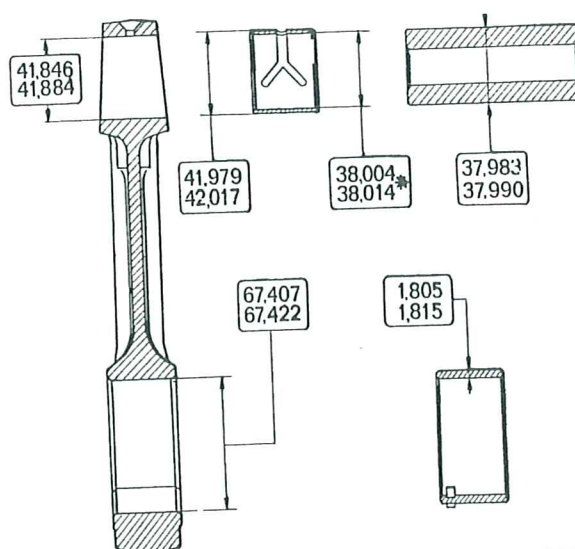
The compression ring (2) in the first slot is wedge shaped. The clearance between the compression ring and the groove is measured by positioning the piston (1) with the relevant ring in the cylinder liner (3) in such a way that the compression ring half projects from the cylinder liner.



The clearance between the ends of the piston rings (1) inserted into the cylinder liner (3) is measured using a feeler gauge (2).

If the gap between the ends is found to be less or more than the specified value, replace the piston rings.

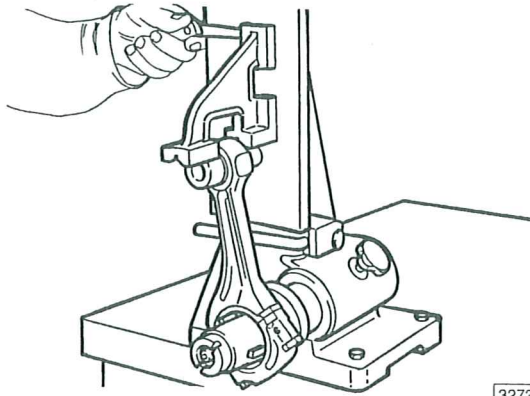
CONNECTING RODS



MAIN DATA FOR THE CONNECTING ROD, BUSH, GUDGEON PIN AND BEARING SHELLS

* Dimension to be obtained after installing the bush.

Checking connecting rods for distortion

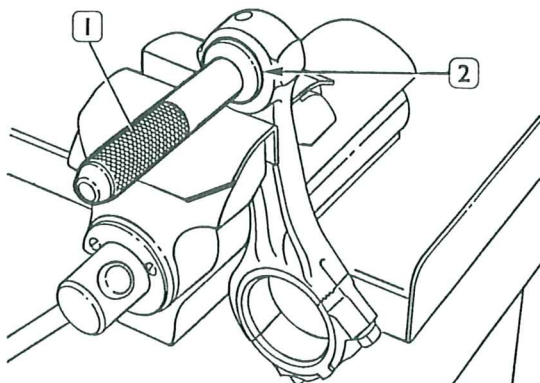


32738

Check that the connecting rod axes are parallel. The tolerance permitted is 0.07 mm measured at 125 mm from the lengthwise axis of the rod.

Each connecting rod is marked on the body and cap with a number corresponding to that of the cylinder to which it is fitted. In case of replacement, it is therefore necessary to number the new connecting rod with the same number as the one replaced.

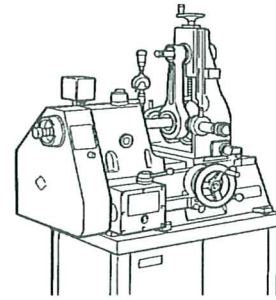
BUSHES



32625

The bush (2) is removed and refitted using the appropriate drift (1).

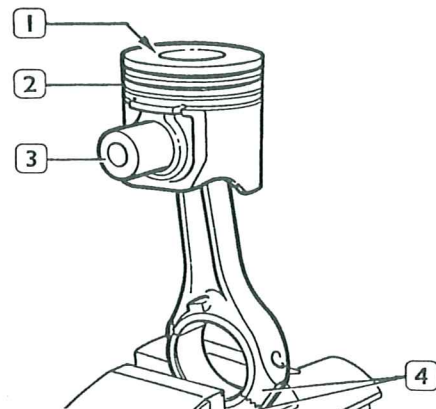
After installing the bush in the connecting rod small end, remove the part which protrudes at the side and then ream the bush to the specified diameter.



Reaming the small end bush using reaming machine 99301044.

ASSEMBLING THE CONNECTING ROD/PISTON ASSEMBLY

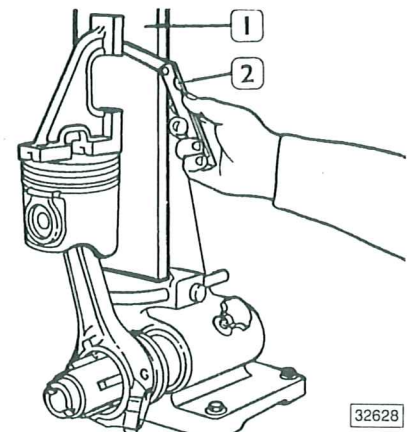
Assembling connecting rod to piston



32627

The piston (2) must be fitted so that the words TAP-PET SIDE (1) on the crown are on the opposite side to the number (4) engraved on the connecting rod. Insert the gudgeon pin (3) and fit the retainer snap rings.

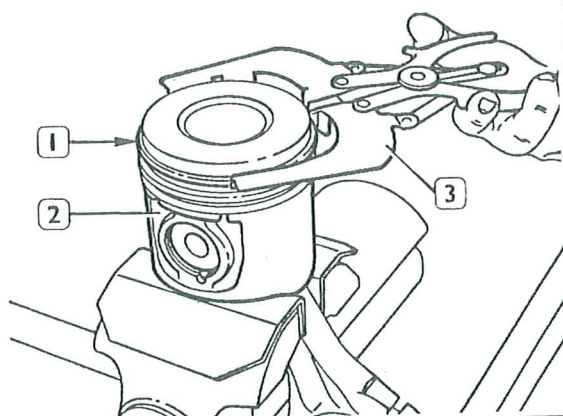
Checking connecting rod/piston for distortion



32628

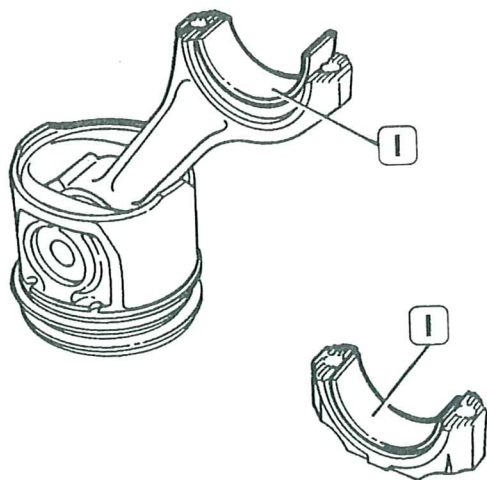
Check the connecting rod-piston assembly for distortion using fixture 99395363 (1) and a feeler gauge (2). The plane of the piston crown must be exactly at right angles to the plane of the fixture 99395363.

Fitting piston rings



32613

The piston rings (1) are fitted to the pistons (2) using tongs 99360183 (3). The rings must be fitted with the word TOP facing upwards, and also the ring gaps must be located so that they are 120° apart from each other.

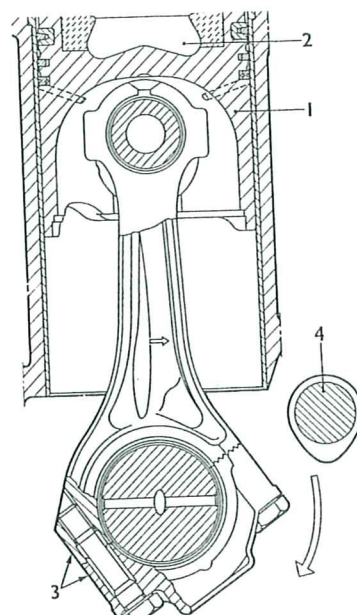


32630

Fit the bearing shells (1) to the connecting rod and to the cap.

Do not carry out any fitting operations on the bearing shells.

The connecting rod bolts may be reused provided that the Ø of the thread measured between 19 and 35 mm from the beginning of the screw is not less than 10.5 mm.

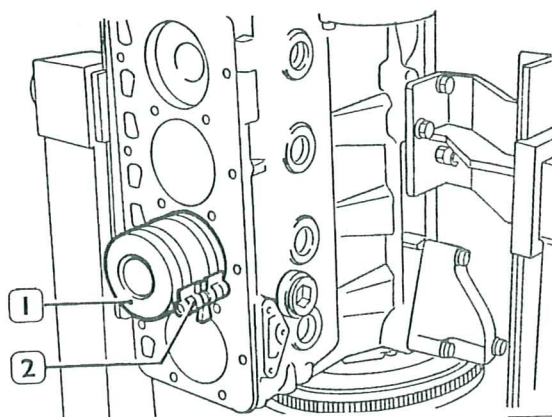


32631

PLAN FOR ASSEMBLING THE CONNECTING ROD TO THE PISTON FOR FITTING THE ASSEMBLY INTO THE CYLINDER

1. Piston 2. Combustion chamber 3. Area stamped with the number of the cylinder to which the connecting rod belongs 4. Camshaft

The arrow indicates the direction of rotation of the engine viewed from the camshaft drive end.



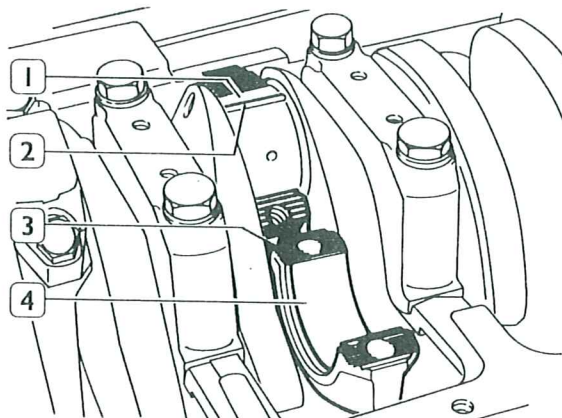
32632

The connecting rod/piston assembly (1) is fitted into the cylinder liner using ring clamp 99360605 (2). Lubricate the parts concerned before fitting.

When fitting the connecting rod/piston assemblies into the liners, check that:

- ☐ the connecting rod number corresponds to the number of its cylinder
- ☐ the words TAPPET SIDE stamped on the crown are facing the camshaft
- ☐ the numbers on the connecting rods are facing away from the camshaft side
- ☐ the piston ring gaps are staggered 120° from each other.

MEASURING CRANKPIN ASSEMBLY CLEARANCE



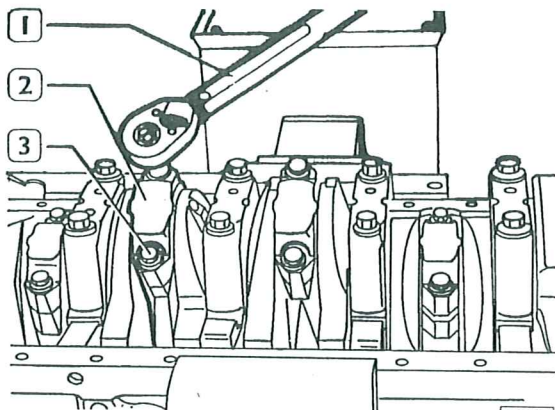
32633

To measure the clearance, carry out the following operations :

- ☐ thoroughly clean the parts and remove all traces of oil
- ☐ position a strip of plastigage (2) on the crankshaft journals (1)
- ☐ fit the connecting rod cap (3) and tighten the bolts to the prescribed torque; the bolts must be lubricated
- ☐ remove the cap (3) and determine the clearance by comparing the width of the plastigage (2) at the point of greatest flattening with the scale divisions given on the package (3) containing the plastigage.

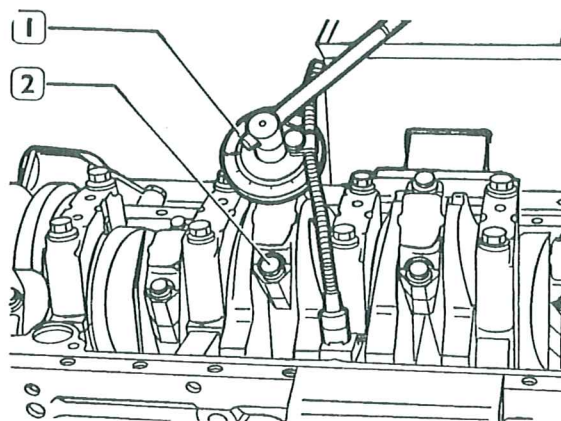
Lubricate the parts concerned before final assembly. Before re-using the connecting rod cap securing bolts, check that the diameter of the thread measured at 19 – 35 mm from the beginning of the screw is not less than 10.5 mm; if it is, replace the bolt.

Fitting connecting rod caps



32739

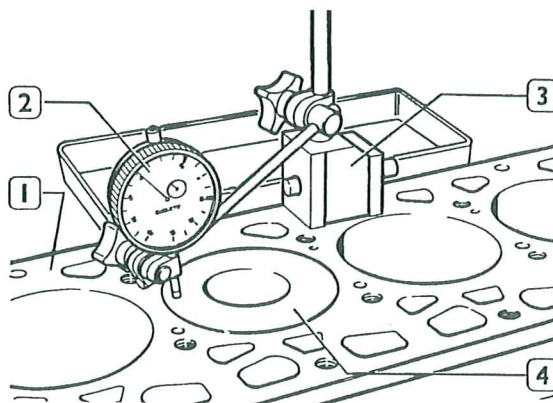
Fit the connecting rod caps (2) and, using a torque wrench (1), tighten the bolts (3) to a torque of 40 Nm; the bolts must be lubricated beforehand.



32740

Fit tool 99395216 (1) to the dial wrench and tighten the bolts (2) further by 60°.

Check that the connecting rods can be moved axially on the crankpins.



32741

When fitting is complete, check the position of the pistons (4) at TDC with respect to the cylinder block face using a dial gauge (2) with magnetic base (3).

The top lands of the pistons must project 0.64 – 0.97 mm above the face of the cylinder block (1).

TIMING GEARS

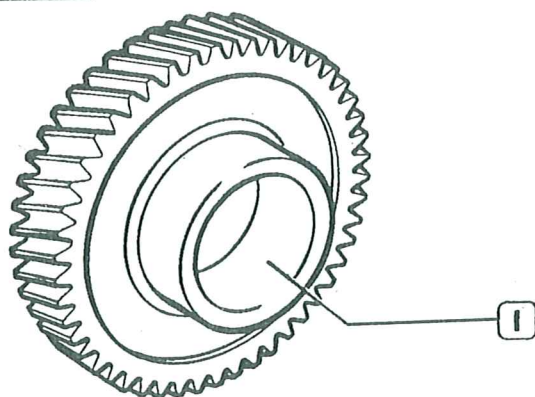
CHECKING AND REPLACING THE IDLER GEAR

Check the idler gear for damage and excessive tooth wear, replacing it if necessary.

TIMING CONTROL

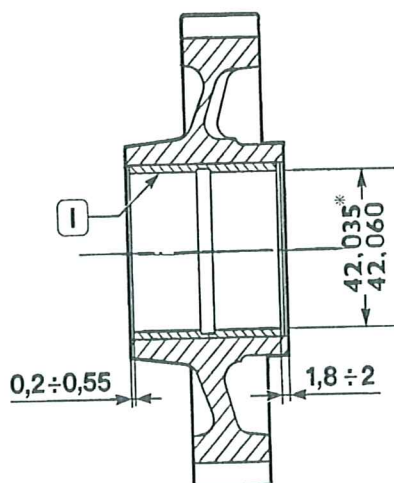
REPLACING THE IDLER
GEAR BUSH

Figure 114



32637

Check the contact surfaces of the bush (I) for scoring or signs of seizing; if these are found, replace the bush using a suitable drift.

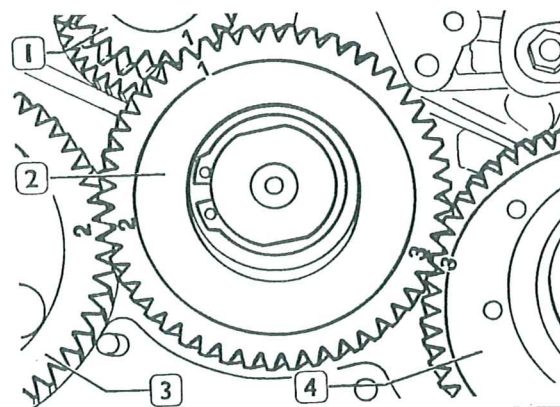


32638

After fitting the bush (I), it must be reamed to the diameter shown in the figure (*).

The timing check is carried out as follows:

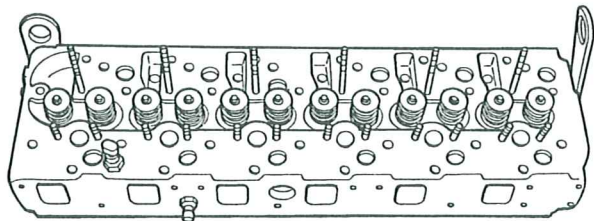
- provisionally set the play between the valves and rockers at 0,30 mm and check with a graduated sector that the advance and retard angles for intake and exhaust correspond to those indicated in the page 1 for engine 8061Si...; and page 2 for engine 8061SRi....



32742

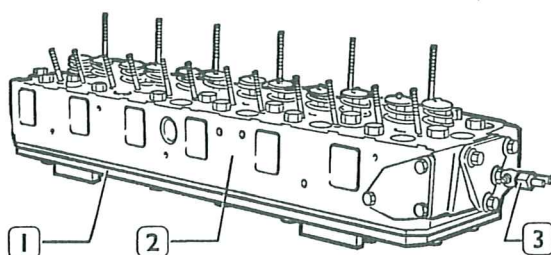
Install the idler gear (2), locating it so that the numbers 1, 2 and 3 marked on it line up with the same numbers engraved on the crankshaft gear (1), the camshaft gear (3) and the injection pump gear (4).

CYLINDER HEAD



32743

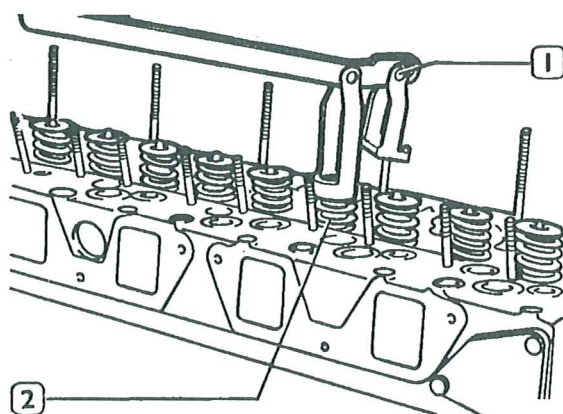
Hydraulic leak test



32744

Before dismantling the cylinder head, carry out the hydraulic leak test using the appropriate equipment (1, 3). By means of the coupling (3), pump in water heated to approx. 90°, to a pressure of 4 – 5 bars. Under these conditions, no leaks should be found, and if they are, the cylinder head (2) should be replaced.

DISMANTLING THE VALVES

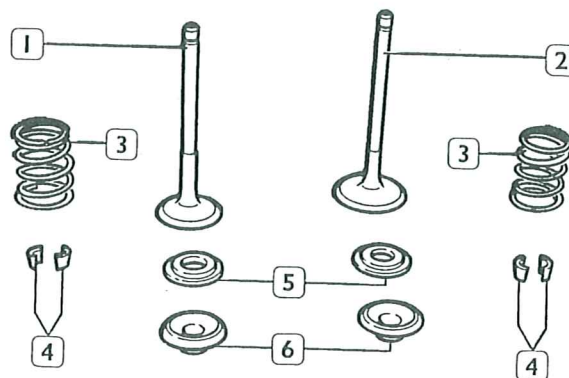


32745

Rest the cylinder head on the workbench and, using tool 99360357 (1), apply pressure to the upper spring cup

(6, fig. 121) so that the valve collets (4) can be extracted and the valve released; take off the upper cup (6), the spring (3) and the lower cup (5). Repeat the operation on all the valves. Turn the cylinder head upside down and withdraw the valves.

FIGURE 121

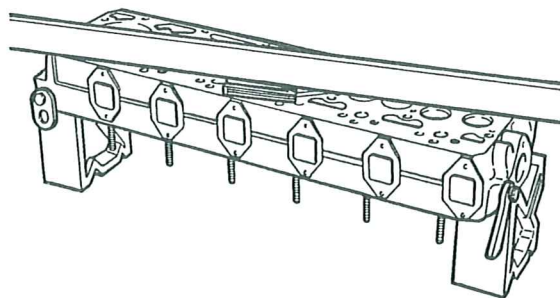


32643

COMPONENT PARTS OF THE VALVE ASSEMBLY

1.Exhaust valve 2.Inlet valve 3.Spring 4.Collets
5.Lower cups 6.Upper cups

Checking the mating surface of the head with the cylinder block



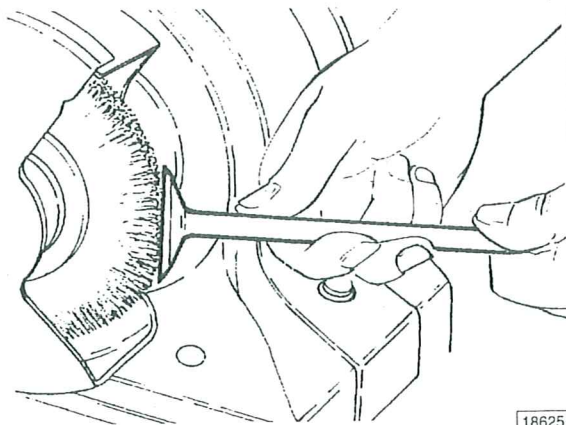
32746

The mating surface of the head with the cylinder block is checked using a straight edge and a feeler gauge. If values of more than 0.15 mm are found over the whole length of the surface, true up the head on a suitable surface grinder; removing as little material as possible.

After this operation, the recessing of the valves and protrusion of the injectors should be checked.

VALVES

Removal of deposits and inspection of valves

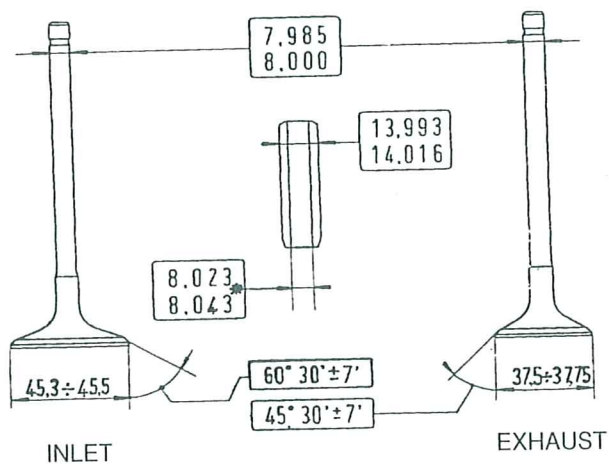


18625

Remove carbon deposits from the valves using a suitable wire brush.

Check the valves for signs of seizing or cracking and also, using a micrometer, check that the diameter of the valve stem is within the specified limits (see fig. 124). If not, replace the valves.

FIGURE 124



2039

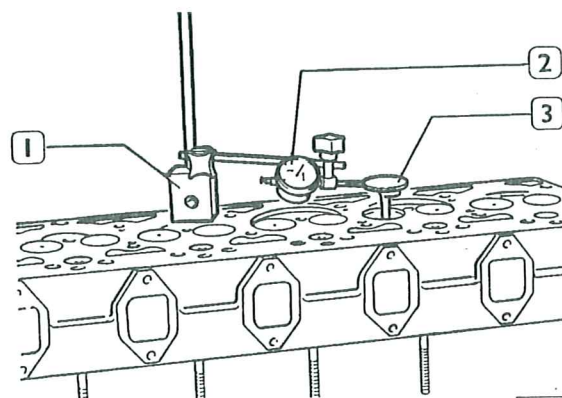
MAIN DATA FOR VALVES AND VALVE GUIDES

* Dimension to be obtained after installing the valve guides.

Refacing the valves

If necessary, reface the seatings on the valves using grinding machine 99301014, setting an angle of $45^{\circ} 30' \pm 7'$ for exhaust valves and $60^{\circ} 30' \pm 7'$ for inlet valves, removing as little material as possible.

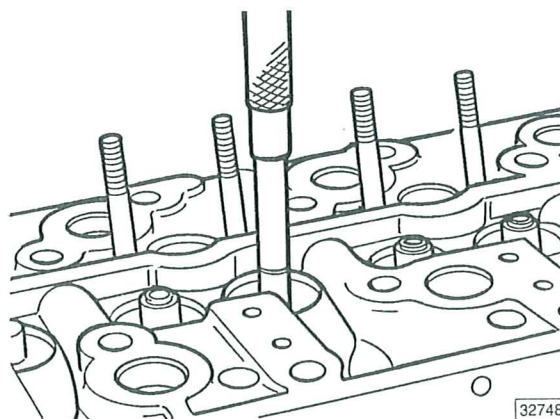
Checking the play between a valve stem and its valve guide



32747

Using a dial gauge (2) with magnetic base (1), check the play between the valve stem (3) and its guide. If excessive play is found, replace the valve and, if necessary, the valve guide.

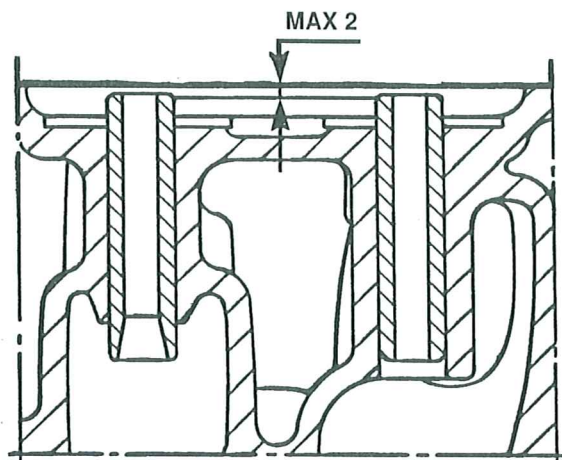
VALVE GUIDES



32748

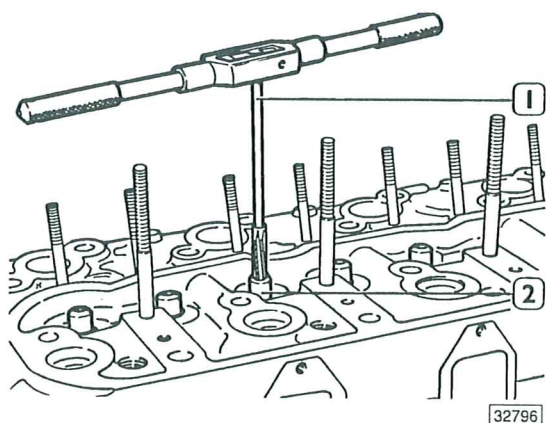
The valve guides are removed and fitted using drifts 99360288 and 99360293.

Replacement valve guides are also supplied with the outside diameter 0.2 mm oversize.



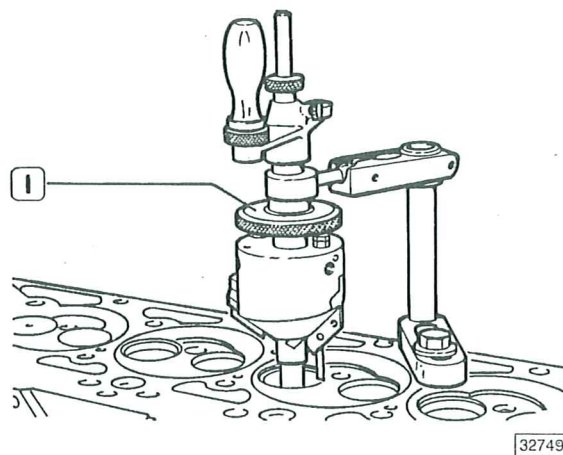
VALUES FOR INSTALLING VALVE GUIDES

Reaming the internal surfaces of valve guides



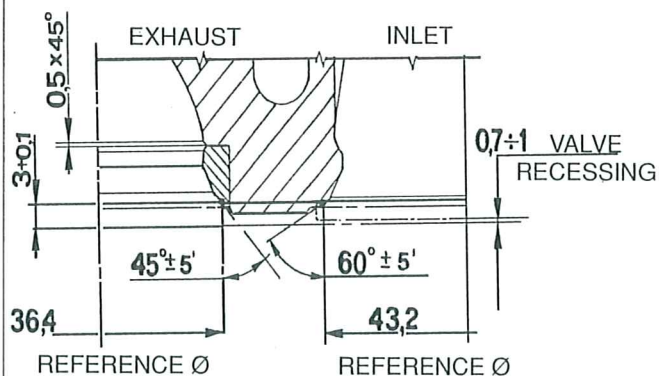
After installing the valve guides, ream the hole in the valve guide (2) using reaming tool 99390310 (1).

Recutting the valve seats



Using the Hunger tool 99360419 (1), recut the valve seats in the cylinder head so as to obtain perfect sealing.

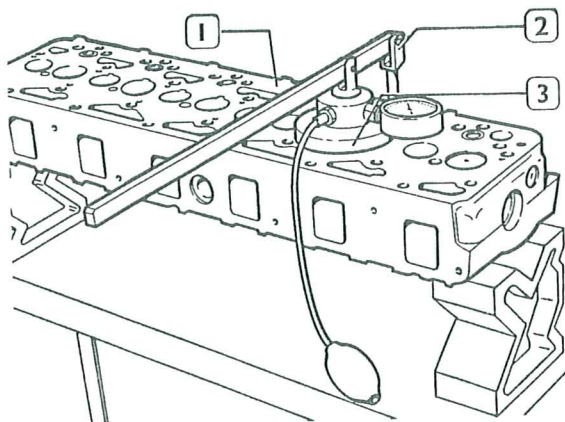
The valve seats in the cylinder head are recut whenever the valves or valve guides are reconditioned or replaced.



MAIN DATA ON THE INLET AND EXHAUST VALVE SEATINGS

When assembling after the recutting operations, check that the recessing of the inlet and exhaust valves with respect to the cylinder head face is 0.7 – 1 mm.

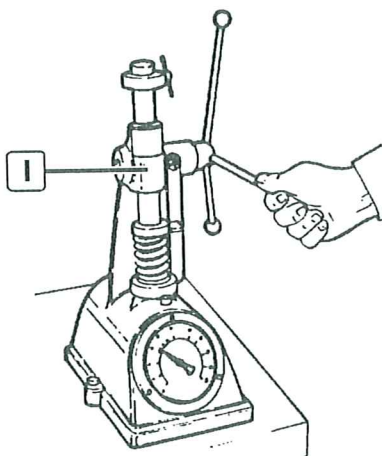
Valve leakage test



32750

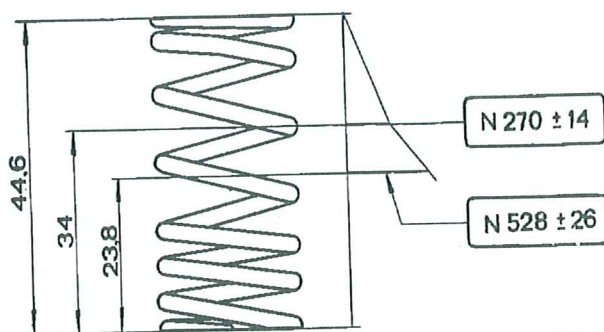
The leakage test on the valves in the cylinder head (1) is carried out using the appropriate equipment (2 and 3).

VALVE SPRINGS



16587

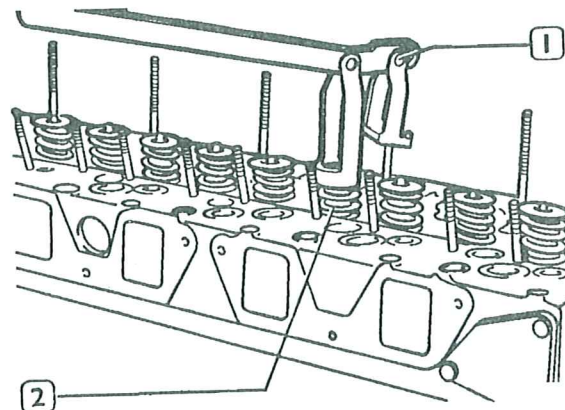
Before fitting, the characteristics of the valve springs must be checked using tool 99305049, and the data on load and elastic deformation compared with those given for new springs in the following figure.



20398

MAIN DATA FOR CHECKING THE VALVE SPRINGS

Refitting the valves

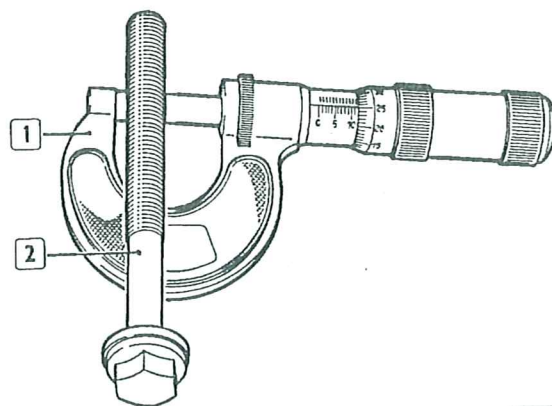


32745

To fit, reverse the order of the operations carried out for removal as described.

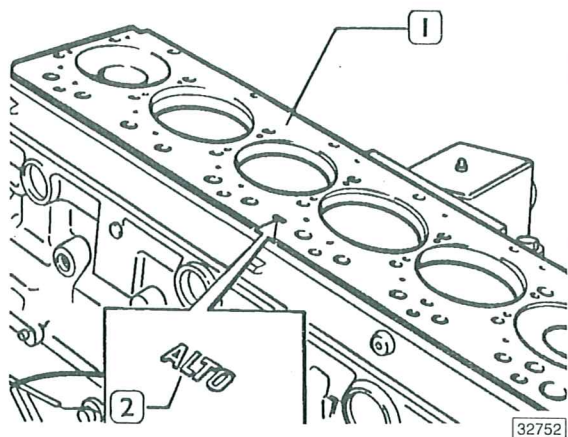
Lubricate the valve stems with engine oil.

Fitting the cylinder head



18929

Before re-using the cylinder head bolts (2), with a micrometer (1) measure that the thread diameter of the bolts is not less than 11.5 mm at any point; if it is, replace them.

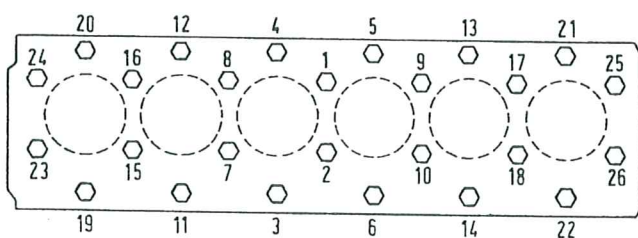


32752

To fit and tighten down the cylinder head, follow the instructions given below :

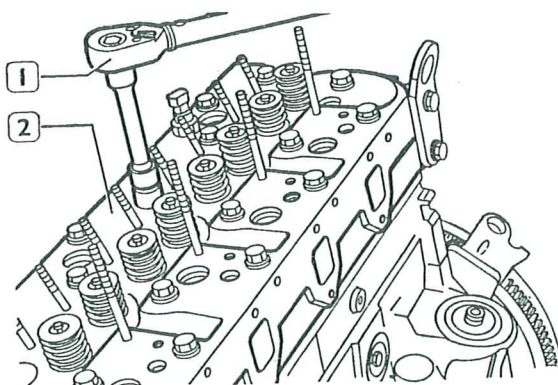
- arrange the gasket (1) on the crankcase with the word ALTO [TOP] (2) facing the operator

FIGURE 137



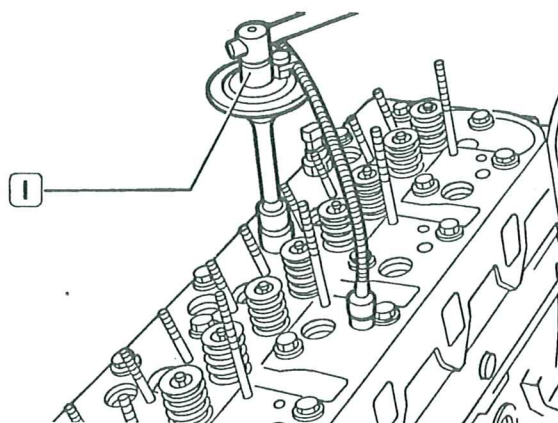
6935

PLAN SHOWING CYLINDER HEAD BOLT TIGHTENING SEQUENCE



32753

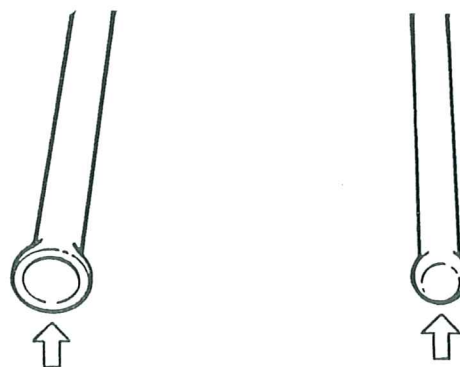
- fit the cylinder head (2), insert the bolts (3) after lubricating them and tighten them as follows in the sequence shown in figure 137.
- stage 1 : using a torque wrench (I), tighten to the preliminary torque of 70 Nm
- stage 2 : retighten to the torque of 70 Nm



32754

- stage 3 : fit tool 99395216 (I) to the angle gauge wrench and tighten by an angle of 180°

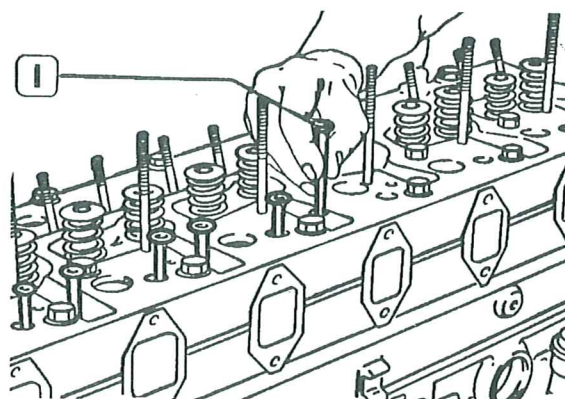
PUSH RODS



32655

The valve pushrods must be free from distortion; the cup seatings for the adjustment screws and the ball ends locating in the tappets must not show any signs of seizing or wear; if they do, replace the rods.

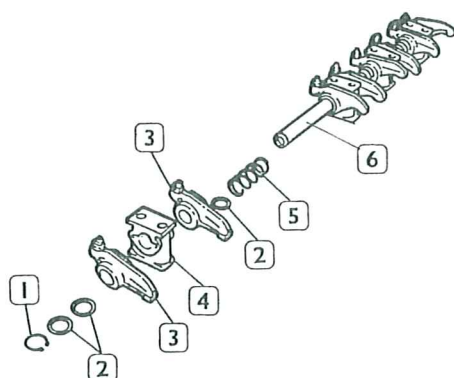
Pushrods for inlet and exhaust valves are identical and therefore interchangeable.



32755

Fit the pushrods (I) into their seatings.

PUSH RODS

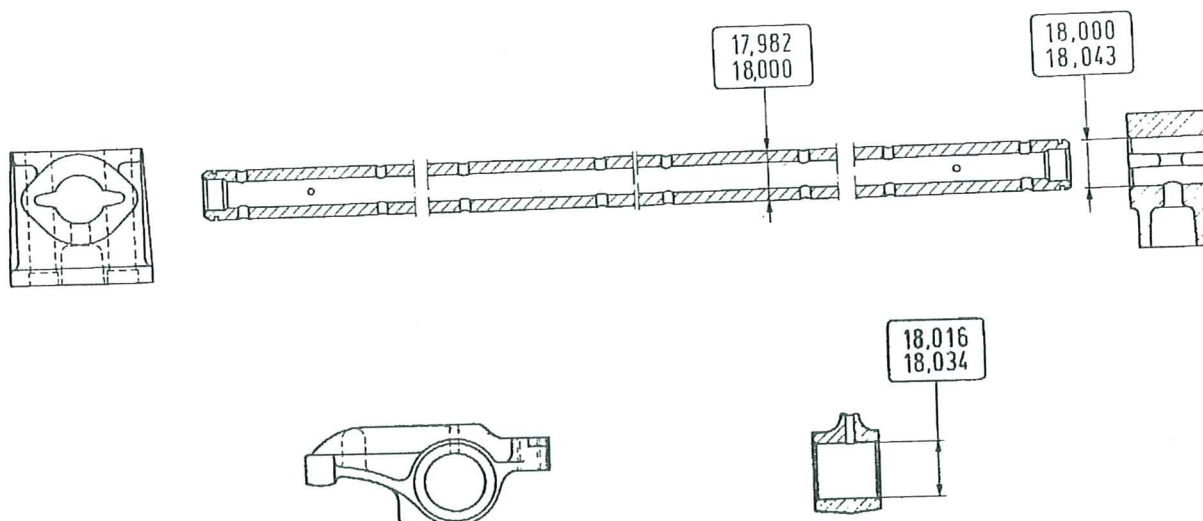


32658

COMPONENT PARTS OF THE ROCKER SHAFT

1. Circlip 2. Adjustment shims 3. Rockers
4. Pedestal for shaft 5. Spring 6. Shaft

ROCKER SHAFT



32657

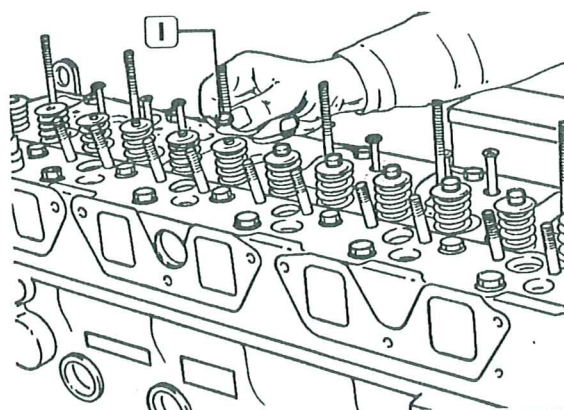
MAIN DATA FOR ROCKER SHAFT PEDESTALS, ROCKER SHAFT AND ROCKERS

Check that the contact surfaces are free from scoring or signs of seizing; if not, replace the parts showing deterioration.

Check the clearance between the valve gear rockers and the rocker shaft and between the pedestals and rocker shaft, which should be 0.016–0.052 and 0–0.061 mm respectively; replace any parts giving rise to clearances larger than those specified.

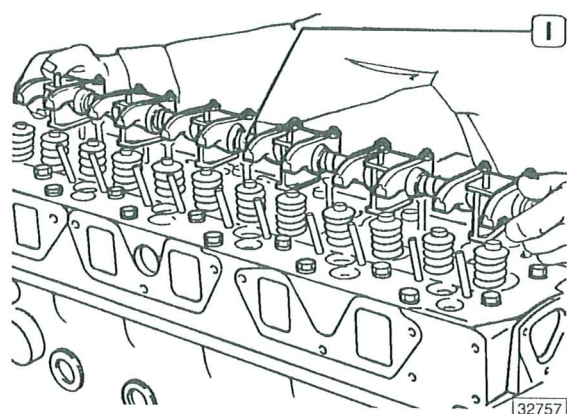
Check that the plugs fitted to the ends of the shaft provide a perfect seal.

Fitting the rocker shaft and adjusting the operating clearance between the valves and rockers

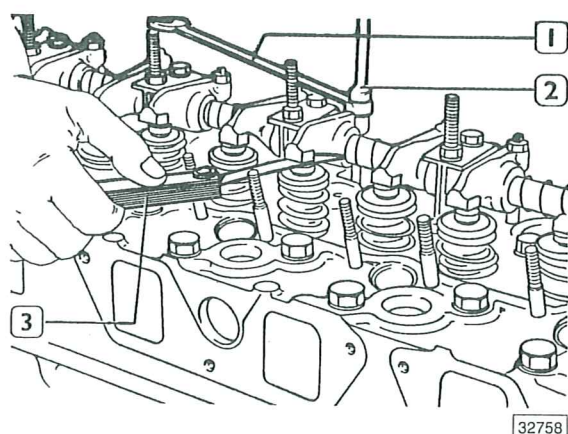


32756

Fit the caps (1) onto the valve stems.



Fit the rocker shaft assembly (1).
Adjust the operating clearance between the valves and rockers as described below.



The clearance between the rockers and valves is adjusted using wrench 99350108 (2), a bi-hexagon wrench (1) and a feeler gauge (3). The operating clearance is 0.25 ± 0.05 mm for both inlet and exhaust; subsequent adjustments are carried out when a value outside the range 0.15 – 0.45 mm is found. Move the cylinder on which the clearance is to be adjusted to the firing position; the valves of this cylinder are closed while those of the symmetrical cylinder are rocking. Symmetrical cylinders are 1 and 6, 2 and 5 and 3 and 4.

To speed up adjustment of the rocker to valve operating clearances, proceed as follows :
rotate the crankshaft until the valves of no. 1 cylinder are rocking and adjust the valves marked with an asterisk as shown in the table :

cylinder no.	1	2	3	4	5	6
inlet	—	—	*	—	*	*
exhaust	—	*	—	*	—	*

rotate the crankshaft until the valves of no. 6 cylinder are rocking and adjust the valves marked with an asterisk as shown in the table :

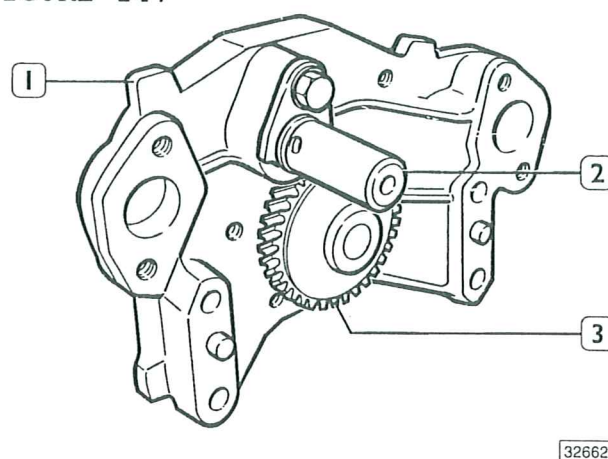
cylinder no.	1	2	3	4	5	6
inlet	*	*	—	*	—	—
exhaust	*	—	*	—	*	—

LUBRICATION

Engine lubrication is obtained by means of a gear type pump (fig. 147) fitted to the lower part of the crankcase in line with the front main bearing; it is driven by the crankshaft gear.

OIL PUMP

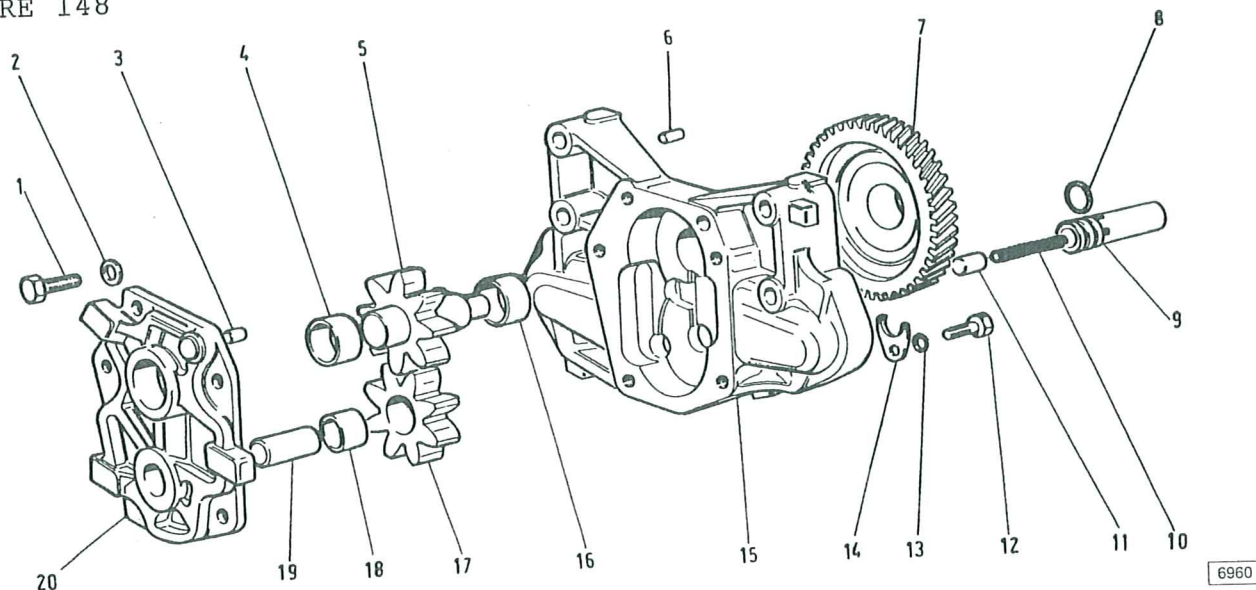
FIGURE 147



OIL PUMP ASSEMBLY

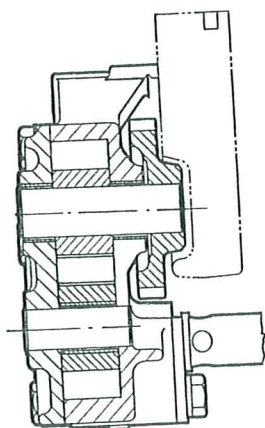
1.Pump body 2.Relief valve 3.Driven gear

FIGURE 148



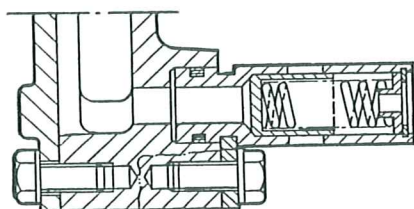
COMPONENT PARTS OF THE OIL PUMP ASSEMBLY

- 1.Screw 2.Washer 3.Locating dowel 4.Bush 5.Oil pump gear 6.Locating dowel 7.Driven gear operating the oil pump
 8.Seal 9.Valve body 10.Spring 11.Valve 12.Screw 13.Washer 14.Attachment plate 15.Oil pump body 16.Bush
 17.Oil pump gear 18.Bush 19.Spindle 20.Oil pump cover



SECTIONAL VIEW OF OIL PUMP

32663



SECTIONAL VIEW OF OIL PRESSURE RELIEF VALVE

32664

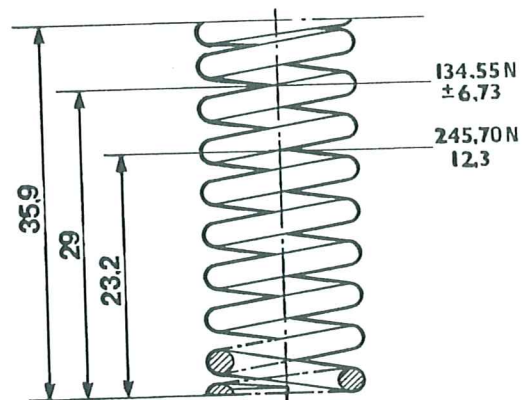
Checks

Check that the gears (5, 17 fig. 148) and gear wheel (7) show no signs of wear or seizing; if they do, replace the complete pump.

Check that the valve (11, fig. 148) slides freely in its housing and shows no signs of seizing or scoring; also check the setting data for the relief spring (10) compared with those given in figure 151.

Valve starts to open : 6 bars; valve finishes opening : 11 bars

FIGURE 151

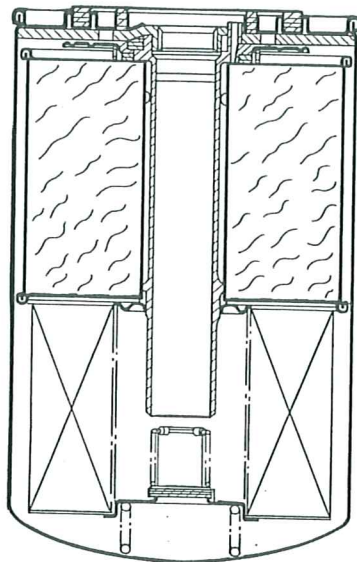


MAIN DATA FOR CHECKING THE RELIEF VALVE SPRING

32665

OIL FILTER

Two double filtration filters are fitted to the engine. Opening pressure for the filter valve : 2.5 ± 0.2 bars.



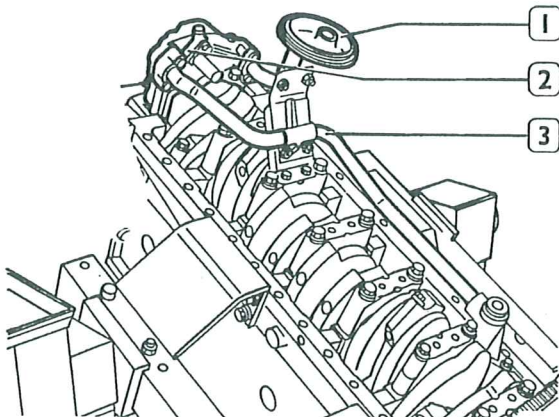
32666

SECTIONAL VIEW OF THE OIL FILTER

When fitting the filters, observe the following instructions :

- oil the seals
- screw the filters up until the seals contact the seating bases
- tighten further for another 3/4 of a turn

Fitting the oil pump



32759

Fit the oil pump (2), the suction (1) and delivery (3) pipes.

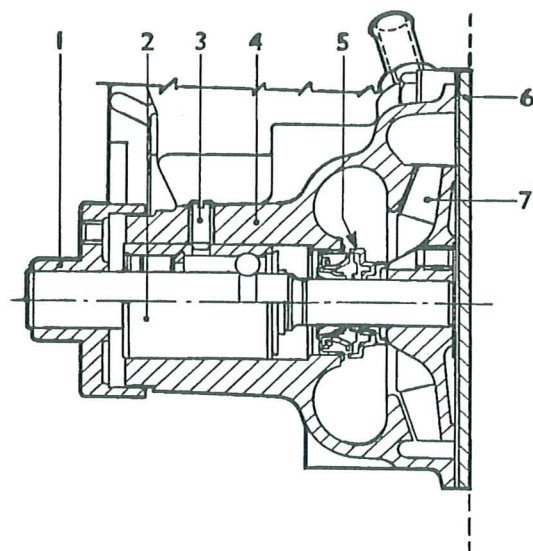
COOLING WATER PUMP

The water pump is of the centrifugal impeller type. The pump bearing is integral with the rotor spindle.

Water sealing between the pump body (4, fig. 154) and the spindle (2) is obtained by means of a seal (5).

The screw (3, fig. 154) retaining the bearing must be locked in its housing using LOCTITE 242 sealant.

FIGURE 154



32668

SECTIONAL VIEW OF WATER PUMP

1. Hub 2. Spindle with bearing 3. Screw 4. Pump body
5. Seal 6. Cover 7. Rotor

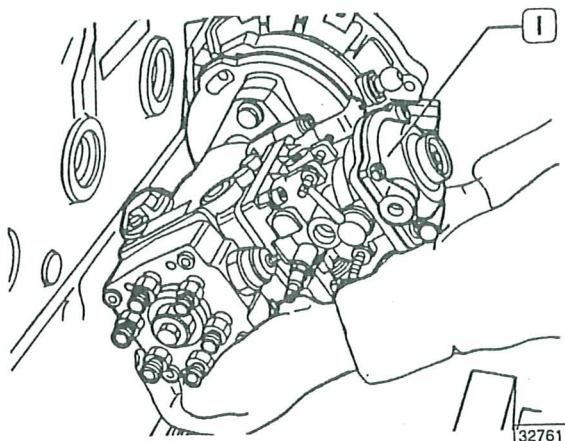
Check that the pump body has no cracks or water leaks; if it has, replace the water pump complete.

MOUNTING OF THE INJECTION PUMP AND TIMING

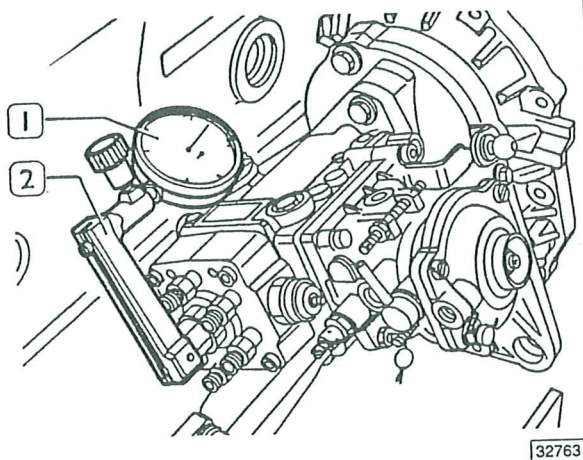
(FOR ENGINES WITH ROTARY INJECTION PUMP)

Fit the injection pump, proceeding as follows :

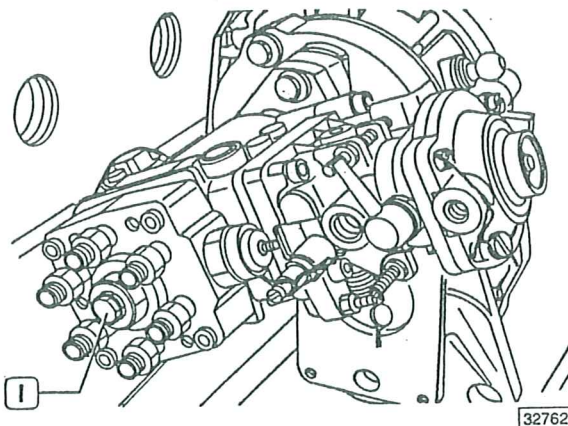
- ☐ check that the timing gears are set correctly



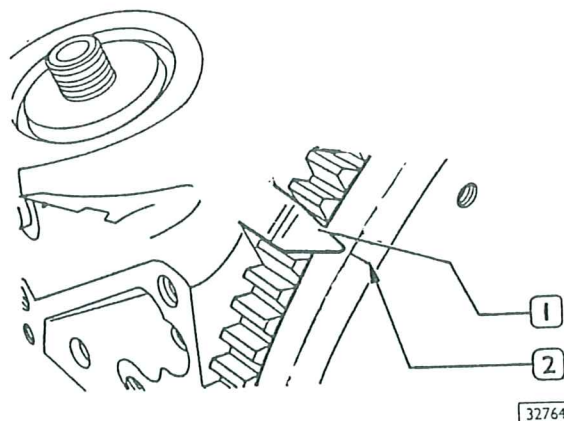
- ☐ install the injection pump (1), lining up the double recess inside the drive coupling with the double dog in the sleeve
- ☐ screw up the screws without tightening them fully



- ☐ screw on tool 99395099 (2) complete with the hundredths dial gauge (1) with the stylus in contact with the crown of the control piston
- ☐ apply 3 mm preload to the dial gauge
- ☐ turn the engine backwards until the control piston on the pump reaches BDC as indicated by the dial gauge
- ☐ zero the dial gauge



- ☐ remove the plug (1) on the pump closure screw



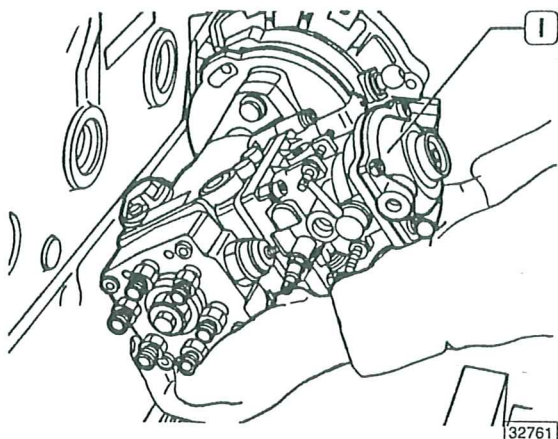
- ☐ turn the engine forwards and bring the $8^\circ \pm 30'$ mark (2) engraved on the flywheel, indicating injection advance, into line with the reference pointer (1)
- ☐ under these conditions, the control piston of the pump should have travelled 1 mm, the value being read off from the dial gauge
If this is not the case, rotate the pump body in its slotted hole until the specified value is obtained
- ☐ fully tighten the pump securing screws
- ☐ remove tool 99395099 and screw the plug back into the closure screw.

MOUNTING OF THE INJECTION PUMP AND TIMING

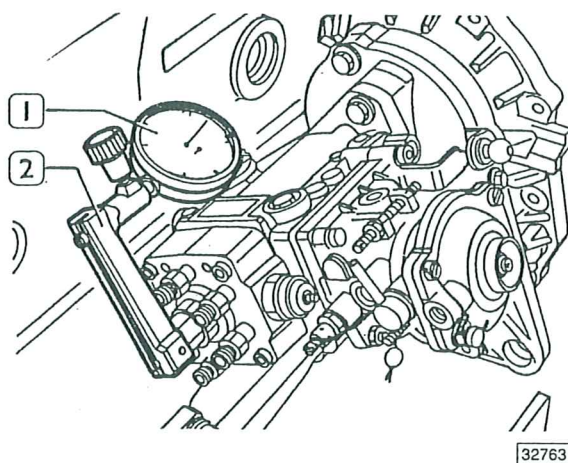
(FOR ENGINES WITH ROTARY INJECTION PUMP)

Fit the injection pump, proceeding as follows :

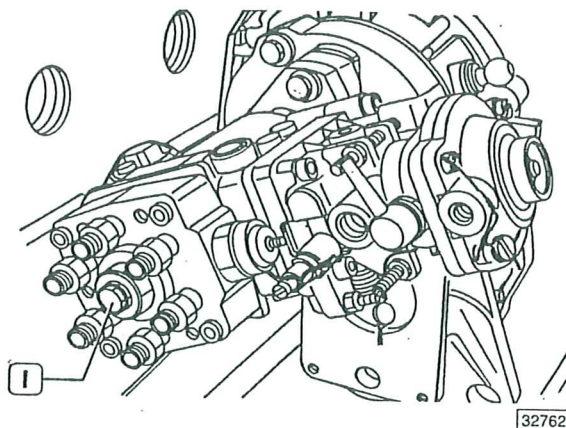
- ☐ check that the timing gears are set correctly



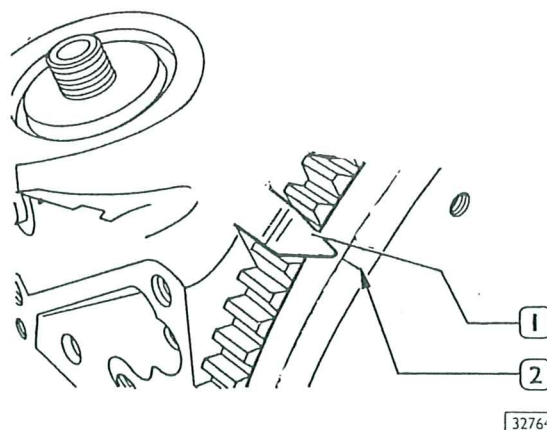
- ☐ install the injection pump (1), lining up the double recess inside the drive coupling with the double dog in the sleeve
- ☐ screw up the screws without tightening them fully



- ☐ screw on tool 99395099 (2) complete with the hundredths dial gauge (1) with the stylus in contact with the crown of the control piston
- ☐ apply 3 mm preload to the dial gauge
- ☐ turn the engine backwards until the control piston on the pump reaches BDC as indicated by the dial gauge
- ☐ zero the dial gauge



- ☐ remove the plug (I) on the pump closure screw

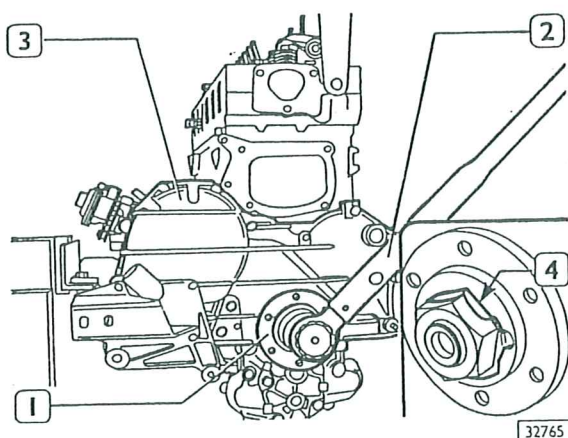


- ☐ turn the engine forwards and bring the $3^\circ \pm 30'$ mark (2) engraved on the flywheel, indicating injection advance, into line with the reference pointer (1)
- ☐ under these conditions, the control piston of the pump should have travelled 1 mm, the value being read off from the dial gauge. If this is not the case, rotate the pump body in its slotted hole until the specified value is obtained
- ☐ fully tighten the pump securing screws
- ☐ remove tool 99395099 and screw the plug back into the closure screw.

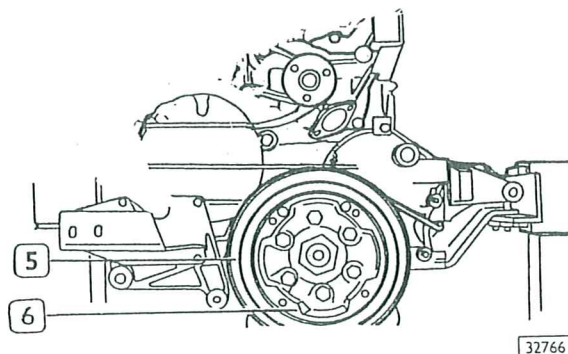
OVERHAUL OF THE ELECTRIC MACHINE

About the operations of dismantling, overhaul, re-fitting of the components of the electric machine, please refer to the specific manual supplied with each genset.

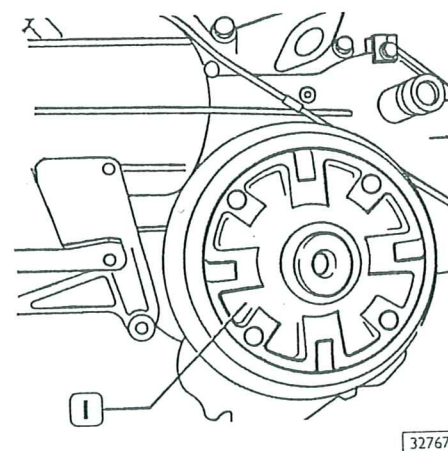
REASSEMBLING THE ENGINE



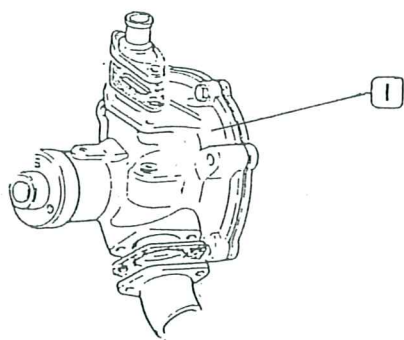
Fit the timing gear cover (3). Fit tool 99360352 to the flywheel to prevent it from rotating.
Fit the hub (1) with locking plate; tighten the nut with a torque wrench (2) to a torque of 300 Nm and bend over the locking plate (4).



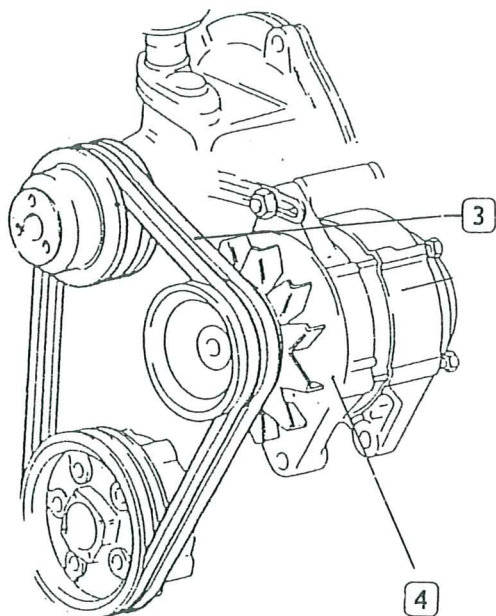
Fit the water pump, the thermostat unit, damper flywheel (5), pulley (6)



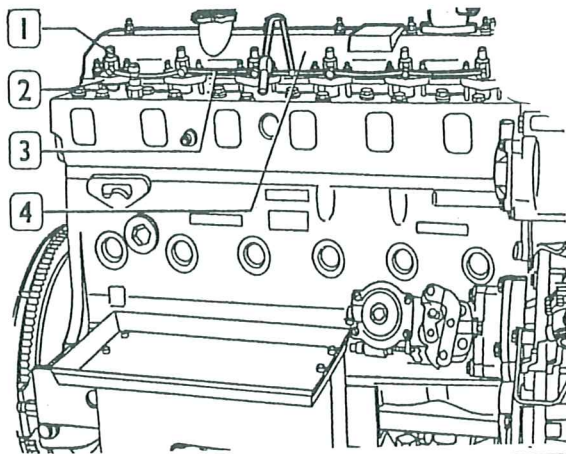
Fit the fan mounting (1)



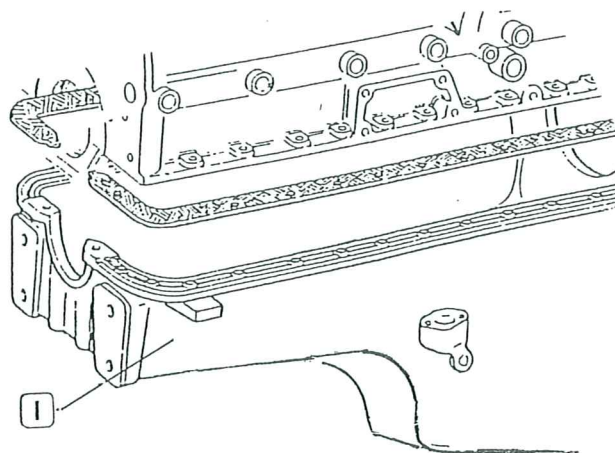
Fit the belts tensioner; water pump pulley.(1) the pipe from the water pump to the radiator.



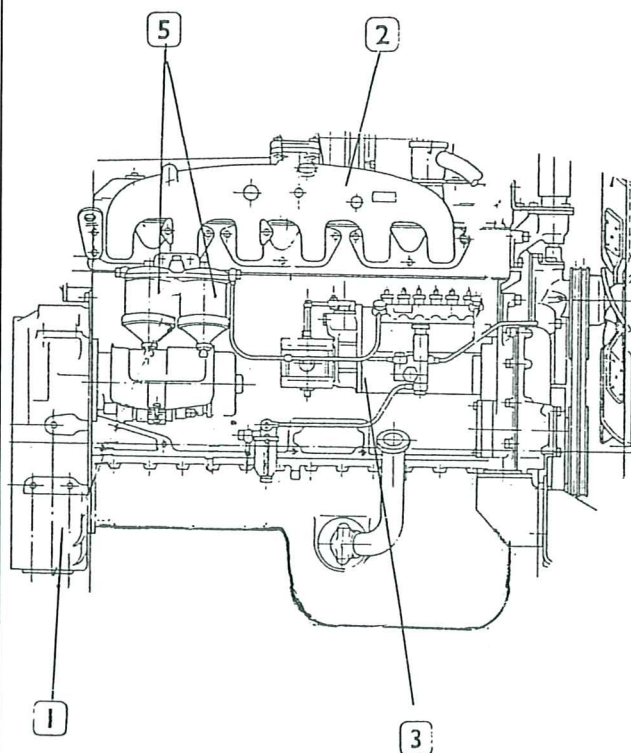
Fit the belts (3) and the alternator (4)



Fit the injectors (1), securing them with the brackets (2), fit the fuel return pipe (3) and the rocker cover (4) with gasket.

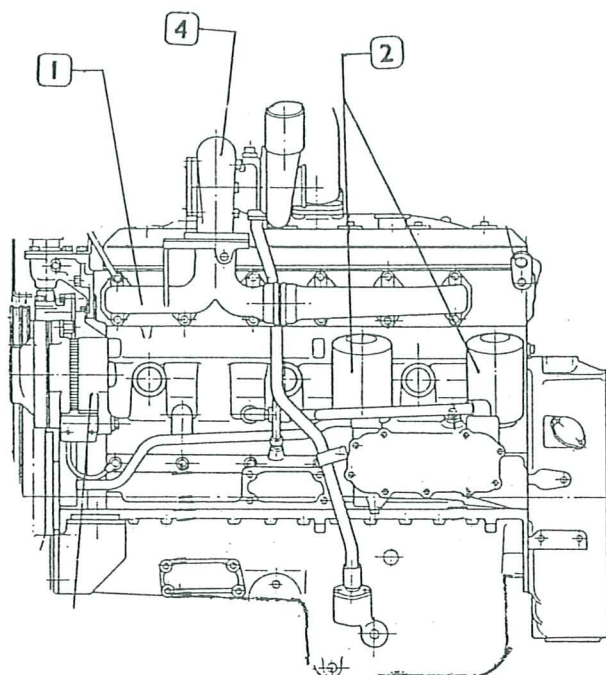


Turn the engine through 180°, position the gaskets, coat with sealant at the joints; fit the sump (1), the fan duct support and the bracket for the heat exchanger cooling pipes.



For engines with in-line injection pump:
Fit the flywheel cover(1),the inlet manifold (2),the injection pump(3), with the fuel filter(5),injectors lines;

For engines with rotary injection pump:
Fit the flywheel cover(1),the inlet manifold (2),the injection pump(3), with the fuel filter(5),injectors lines; the actuator.

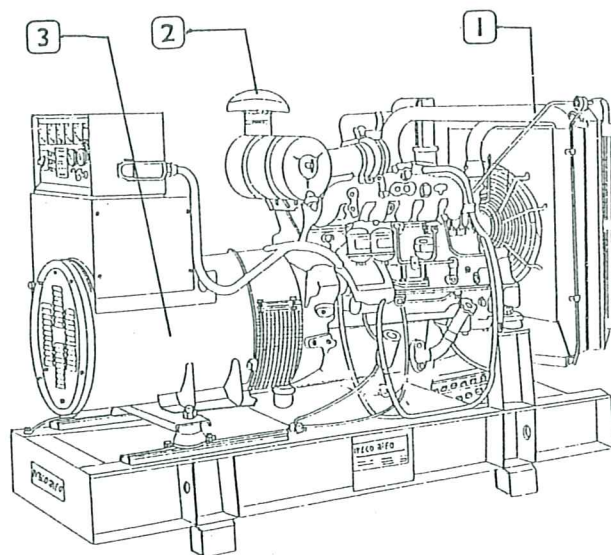


Fit the heat exchanger (1) and the two connecting pipes; the oil filters(2); the turbocharger(4), the oil delivery and return pipes

ASSEMBLING OF THE ALTERNATOR WITH THE ENGINE

For the alternator fitting carry out the following operations:

- Place the flex-plate of the alternator on the flywheel centering.
- Block the fixing screws of the alternator bell to the engine.
- Block the fixing screws of the flex-plate to the flywheel.



Fit radiator with the relevant connection pipes(1), and guard for fan and alternator; air cleaner(2); electric machine (3); electric wiring.

Complete all these operations assembling the relevant lines.

Refill the engine oil sump according to the indicated quantities.

10

11

12

13

