

RENAULT

Workshop Repair Manual

ENGINES (petrol) 4 cylinders - Cast-Iron

Types	Vehicles
E5F	Clio
E6J	Extra Clio Renault 19
E7F	Clio Renault 19
E7J	Extra Clio Renault 19 Mégane

Cancels and replaces Part No. 77 11 091 458

77 11 193 633

APRIL 1997

Edition anglaise

"The repair methods given by the manufacturer in this document are based on the technical specifications current when it was prepared.

The methods may be modified as a result of changes introduced by the manufacturer in the production of the various component units and accessories from which his vehicles are constructed."

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ENGINE AND PERIPHERALS

Foreword

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USE OF THE MANUAL

In this manual you will find three major chapters:

- **specifications,**
- **removal of engine,**
- **reassembly of engine.**

To repair a component on the vehicle refer to the Workshop Repair Manual and Technical Notes.

UNITS OF MEASUREMENT

- All the dimensions are expressed in millimetres, mm (unless otherwise indicated).

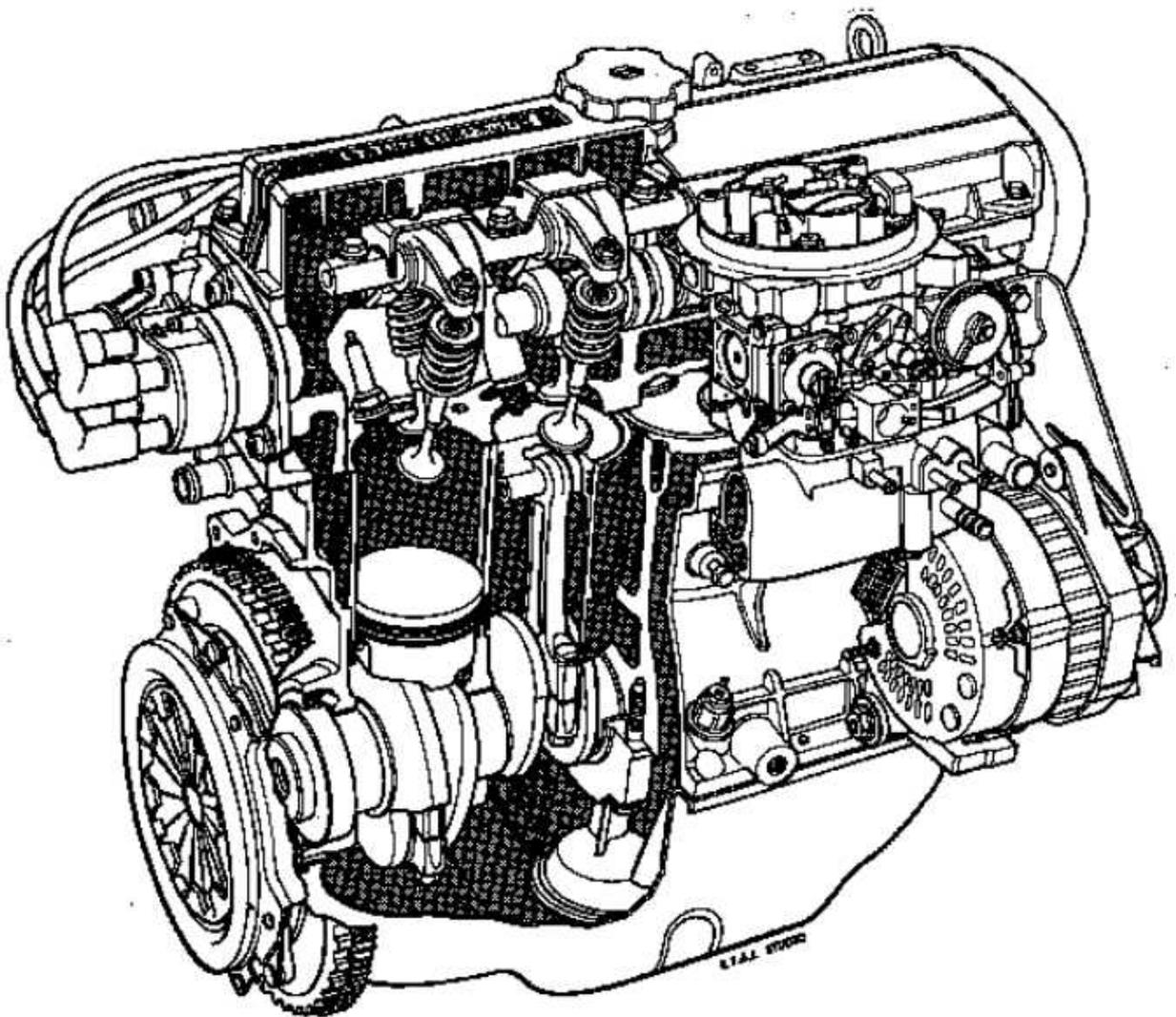
The tightening torques:

- in decaNewton metres daN.m
(reminder: **1 daN.m = 1.02 m.kg**).
The tightening torques without tolerances must be kept within $\pm 10\%$.
- in degrees, the tightening torques without tolerances must be kept within $\pm 3\%$.

The pressures are in **bars**.

ENGINE AND PERIPHERALS
Section View

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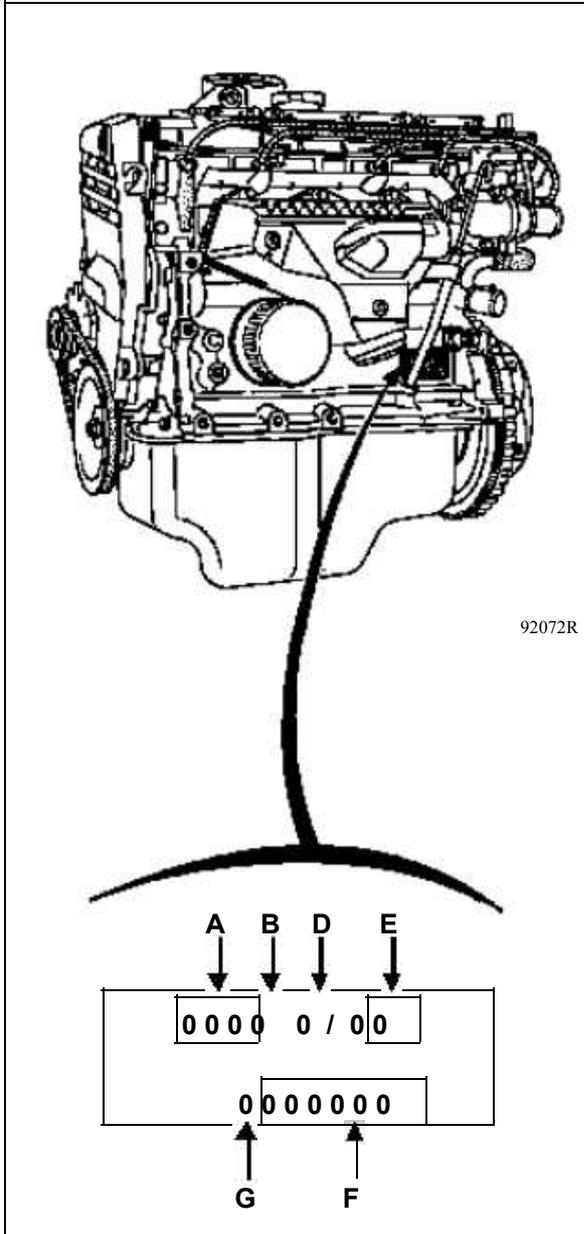
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ENGINE AND PERIPHERALS

Engine identification

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The engine is identified by a plate riveted onto the cylinder block.



It shows:

- A: The engine type
- B: The homologation letter
- D: The identity of RENAULT SA
- E: The engine suffix
- G: The assembled engine factory reference
- F: The engine fabrication number

ENGINE AND PERIPHERALS

Engine identification

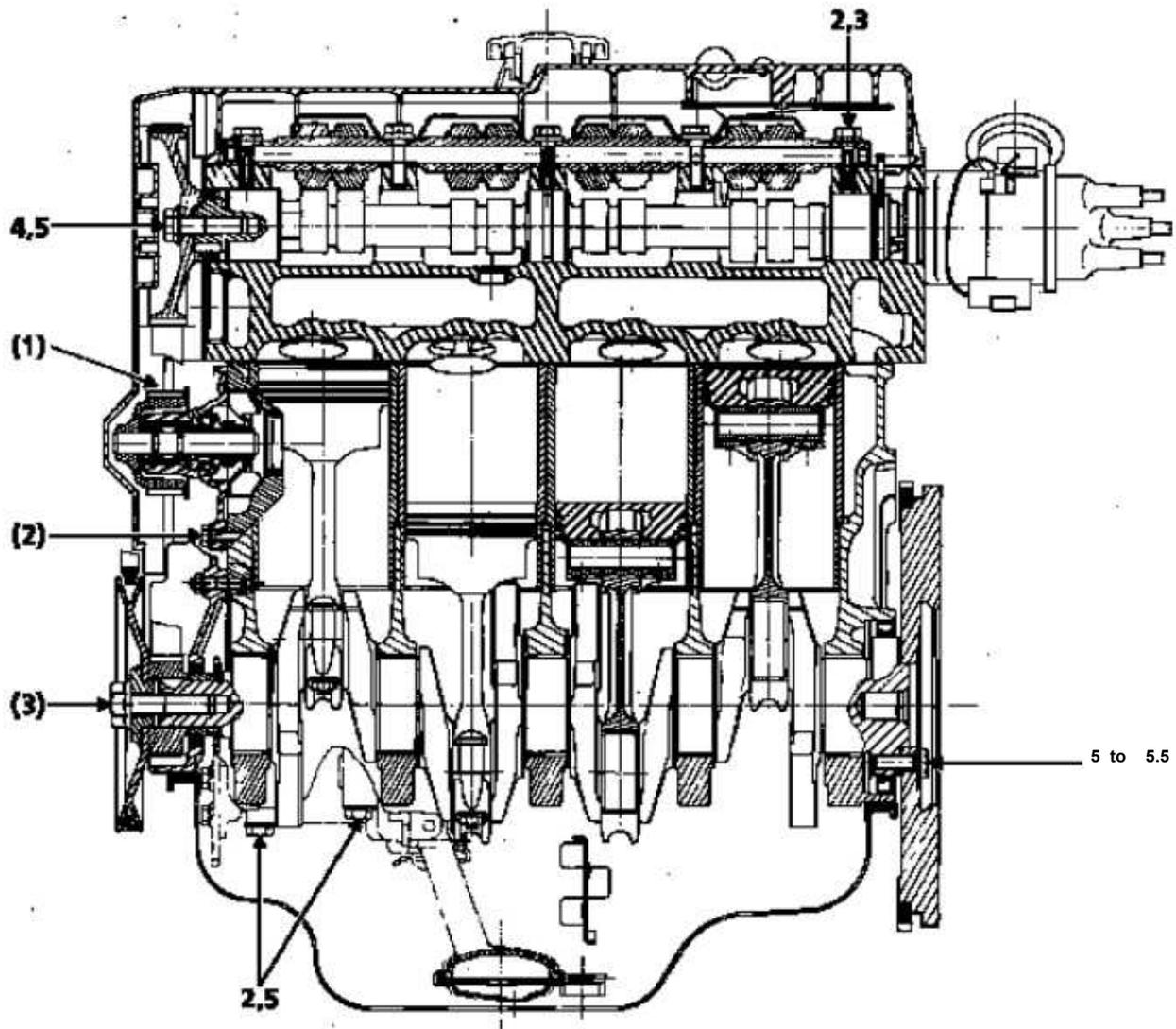
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Engine	Suffix	Vehicle	Compression ratio	Bore (mm)	Stroke (mm)	Capacity (cm ³)
E5F	710	B/C/S 572	9.25/1			
	716	B 57N				
E7F	700	B/C/S 57A 3/5 57F/L	9.25/1	75.8	64.9	1171
	704	B/C/S 57A	9.25/1			
	706	B/C/S 57R	8.8/1			
	708	B/C/S 57A 3/5 57G/R	9.5/1			
	730	B/C/L 53W	9.25/1			
	750	B/C 57S 3/5 57J	9.5/1			
E6J	700	B/C/L/S537	9.5/1			
	701	B/C/L 537	9.5/1			
	706	B/L 536	9.5/1			
	712	B/C 57B	9.5/1			
	713	B/C 573	9.5/1			
	718	B 57P	8.8/1			
	734	F 40A	9.5/1			
	738	F 40Y	8.8/1			
760	5 57B	9.5/1				
E7J	601	B/C 57B	9.5/1	75.8	77	1390
	624	B A0T				
	700	B/C/L 53A				
	706	B/C/L 53A				
	710	B/C 57B				
	711	B/C 57B				
	716	B/C 57B				
	718	B/C 57T				
	719	B/C 57T				
	720	F 40V				
	724	F 40U				
	726	F 40U				
	728	F 40D				
	742	B/C/L 535				
	745	B/C/L 53A				
	754	B/C 57Y				
	756	B/C 57J				
	757	B/C 57J				
	764	B/J/L A0E				
770	F 40S					
771	F 40S					
773	F 40U					



ENGINE AND PERIPHERALS

Section and tightening torques (in daN.m and/or°)

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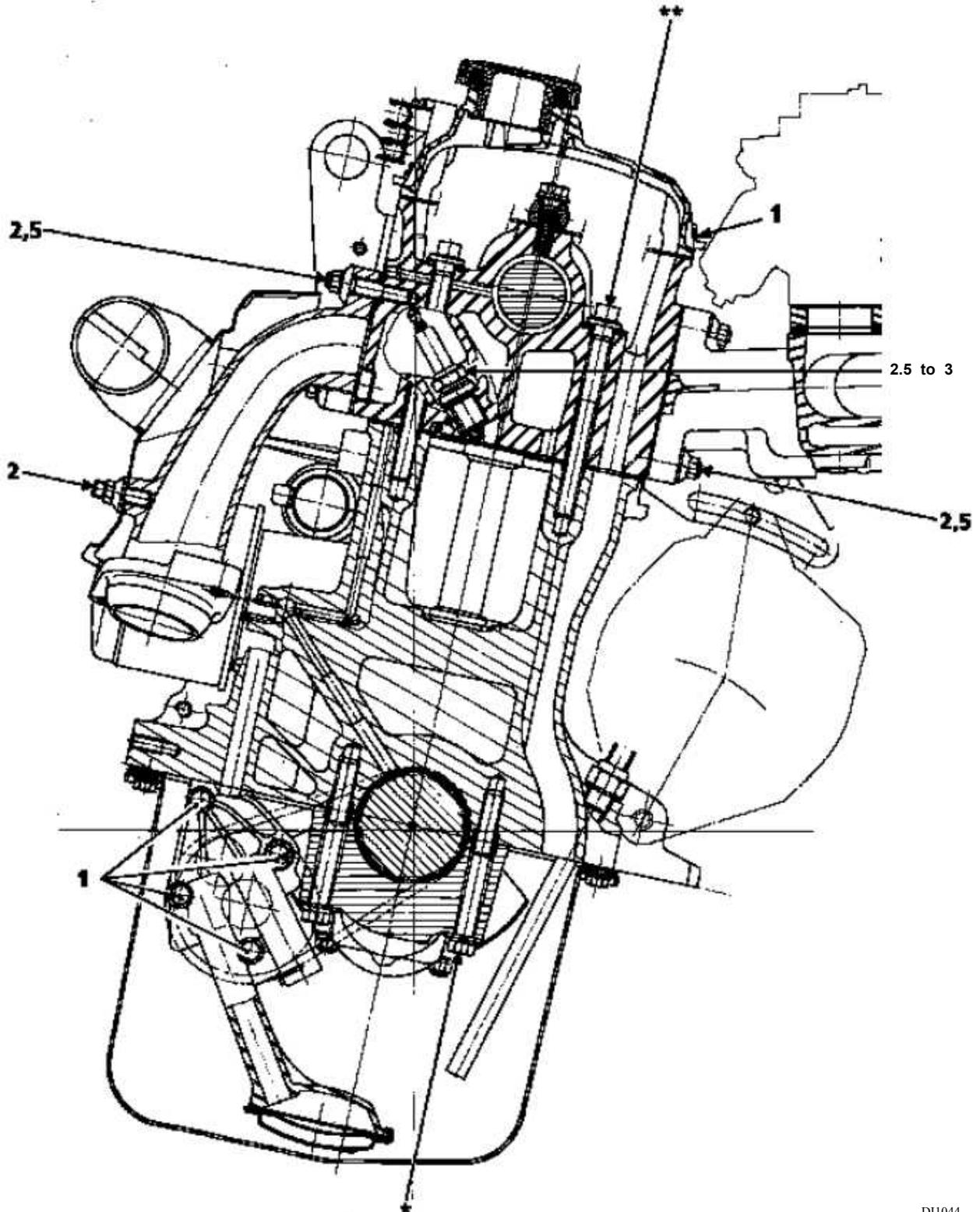
- (1) Timing tension wheel nut: tighten to **5 daN.m**
- (2) **M6** bolt and nut: tighten to **1 daN.m**
M8 bolt: tighten to **2.2 daN.m**
- (3) Pre-tighten to **2 daN.m**, then angle tighten by **68° ± 6°**



ENGINE AND PERIPHERALS

Section and tightening torques(in daN.m and/or °)

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* Pre-tighten the bolts to **2.5 daN.m**, then angle tighten by $43^\circ \pm 6^\circ$

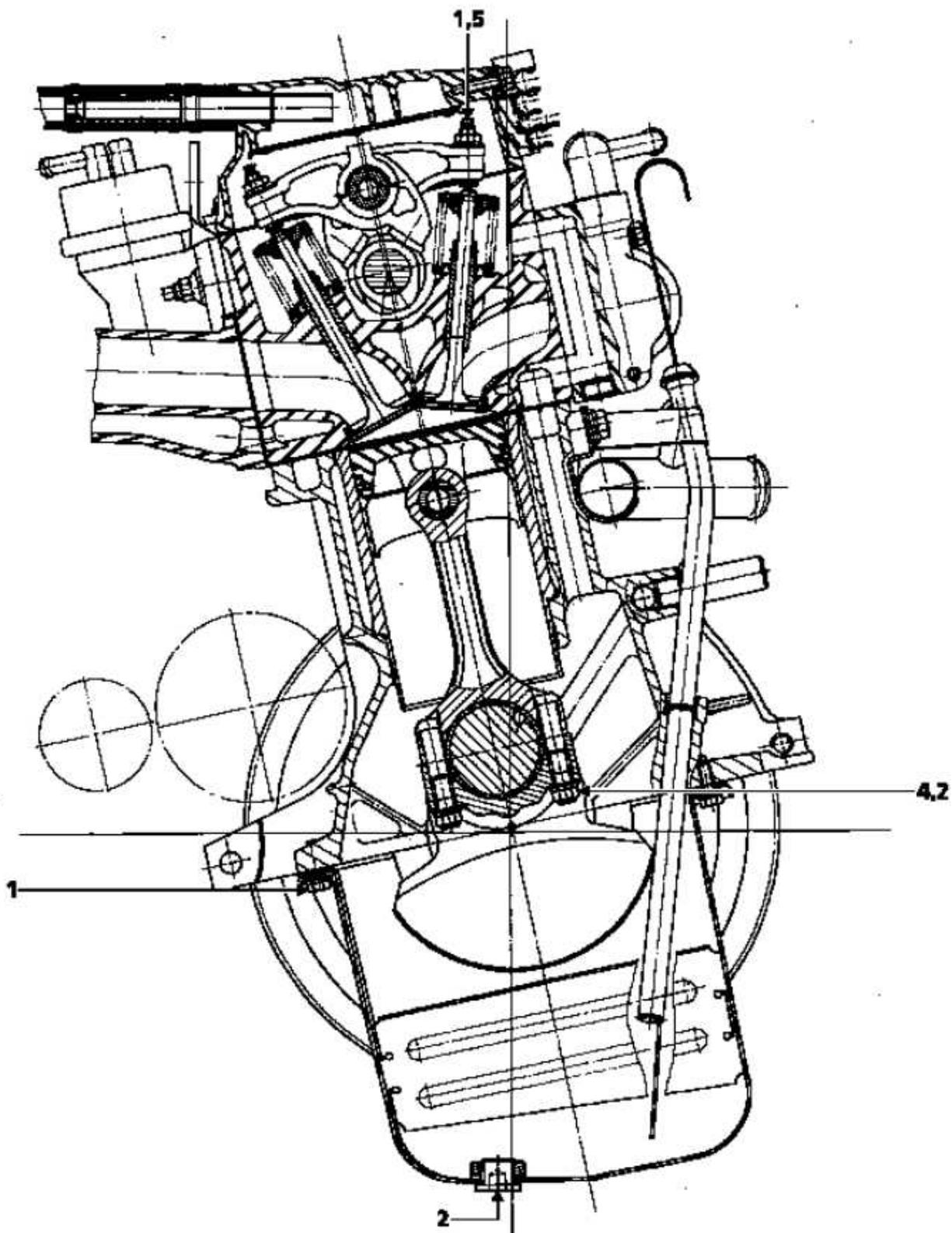
** See cylinder head tightening



ENGINE AND PERIPHERALS

Section and tightening torques(in daN.m and/or °)

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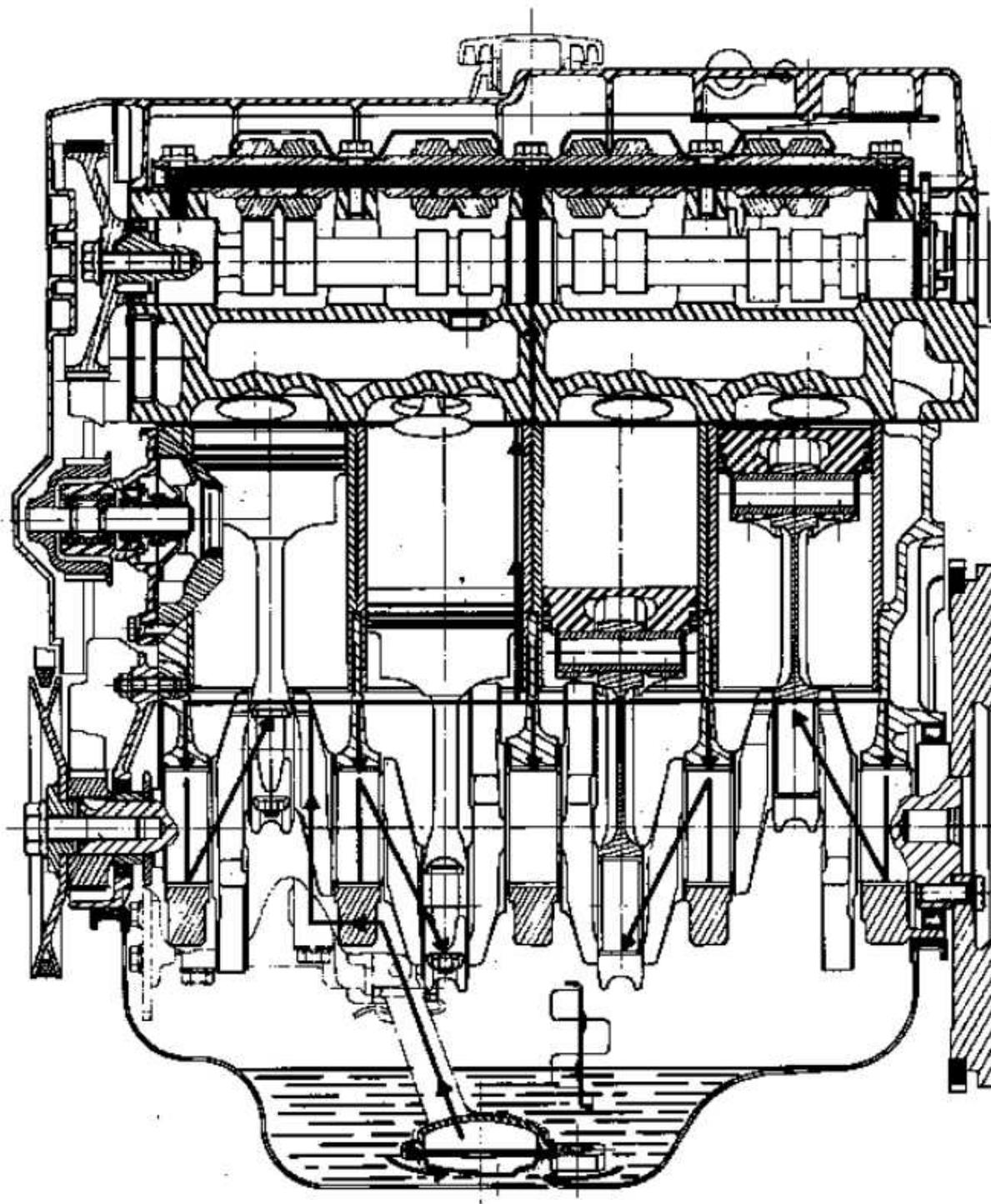


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ENGINE AND PERIPHERALS

Lubrication circuit diagram

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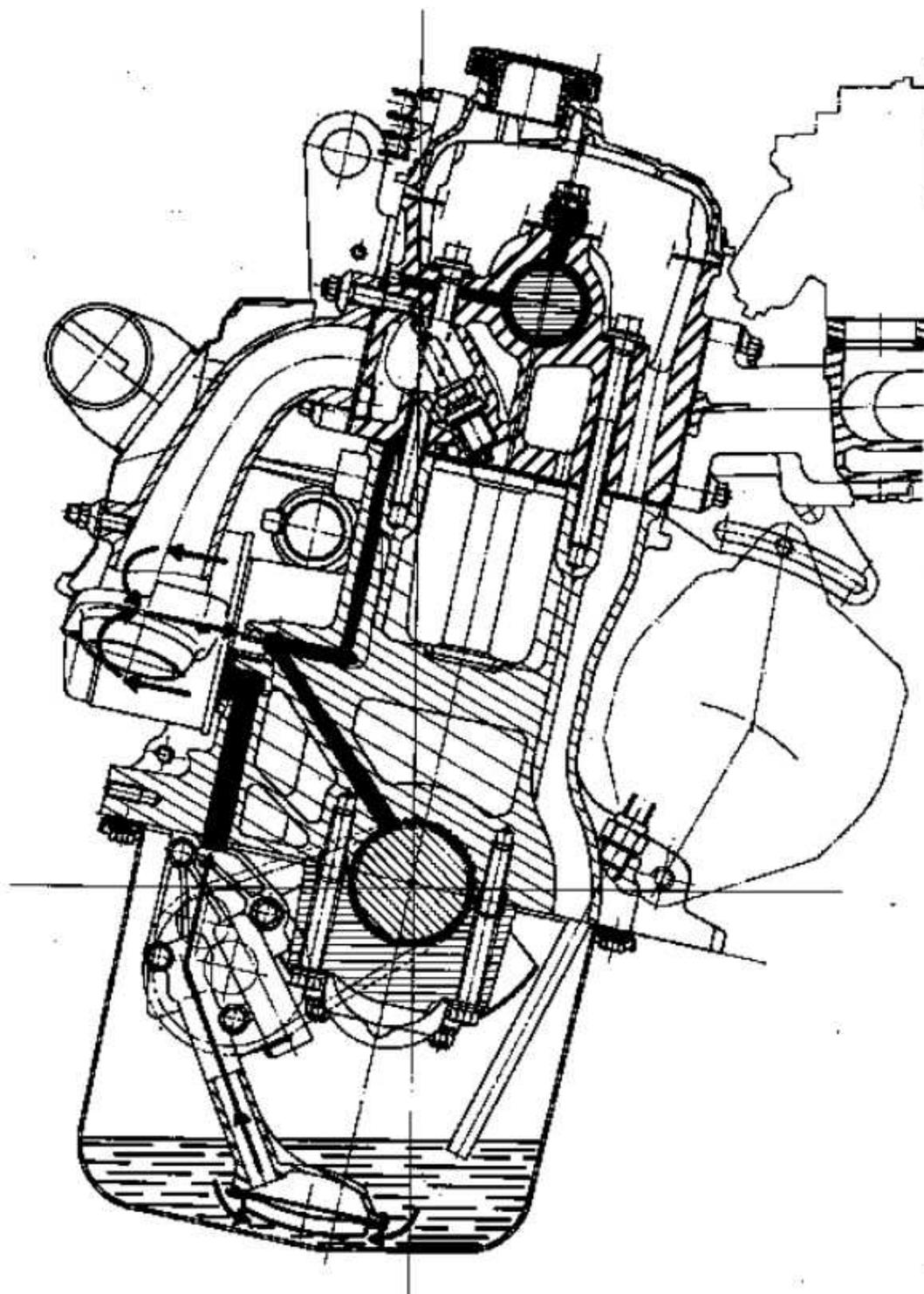


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ENGINE AND PERIPHERALS

Lubrication circuit diagram

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92130

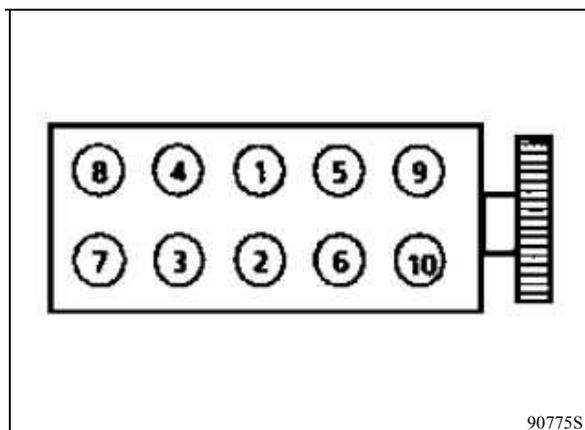
ENGINE AND PERIPHERALS Specifications

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CYLINDER HEAD

All the cylinder head bolts must be replaced systematically after removal.

Lubricate the threads and under all the bolt heads with engine oil.



METHOD OF TIGHTENING CYLINDER HEAD

Preseating the gasket

Initial tightening to **2 daN.m** followed by **angular tightening of $97^\circ \pm 2^\circ$** in the recommended order :

- tightening of **bolts 1-2**,
- tightening of **bolts 3-4-5-6**,
- tightening of **bolts 7-8-9-10**.

Seating of the gasket

Wait **3 minutes** for the seal to settle.

Tightening

- Slacken **bolts 1-2**.
Re-tighten **bolts 1-2 to 2 daN.m**, then angle tighten to $97^\circ \pm 2^\circ$.
- Slacken **bolts 3-4-5-6**.
Re-tighten **bolts 3-4-5-6 to 2 daN.m**, then angle tighten to $97^\circ \pm 2^\circ$.
- Slacken **bolts 7-8-9-10**.
Re-tighten **bolts 7-8-9-10 to 2 daN.m**, then angle tighten to $97^\circ \pm 2^\circ$.

No retightening of cylinder head.

Cylinder head gasket

Thickness of cylinder head gasket (mm): **1.3 ± 0.06**
(value for a compressed gasket)

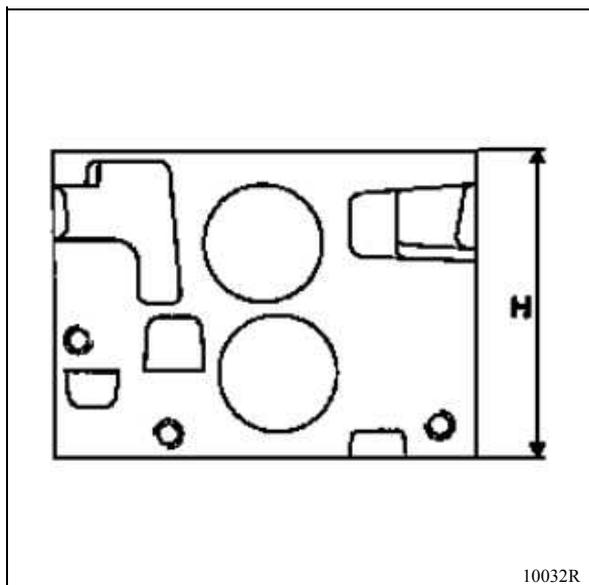
ENGINE AND PERIPHERALS Specifications

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VALVE CLEARANCES (in mm)

- Inlet	0.10
- Exhaust	0.25

Height of cylinder head



H = 113 ± 0.05 mm

Maximum deformation of gasket face: 0.05 mm.

No regrinding is permitted.

Cylinder volume with valves and spark plugs: 26.25 ± 0,6 cm³

Spark plug tightening torque: 2.5 to 3 daN.m

VALVES

Diameter of the stem (mm) : **7**

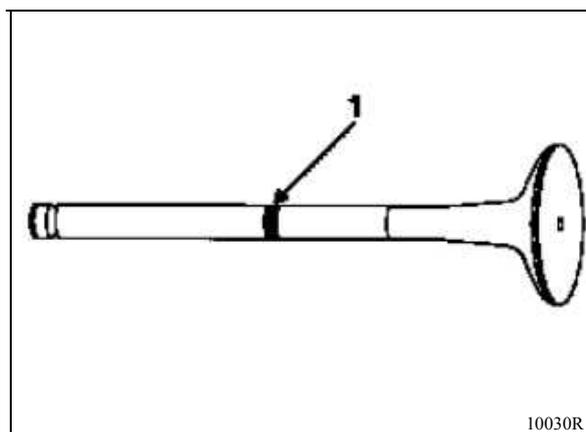
Port angle

- Inlet	120°
- Exhaust	90°

Head diameter (mm)

- Inlet	37.5 ± 0,1
- Exhaust	33.5 ± 0,1

WARNING: When valves are replaced, it is essential to refit (new) valves with the same part number (1) as the previous ones, in order to prevent any damage to the valve and seat.



The same part number can cover several markings, and in this case the valves are fully interchangeable.

Simply check that the new valves with a different marking do indeed correspond to the same part number.

ENGINE AND PERIPHERALS Specifications

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VALVE SEAT

Seat angle α

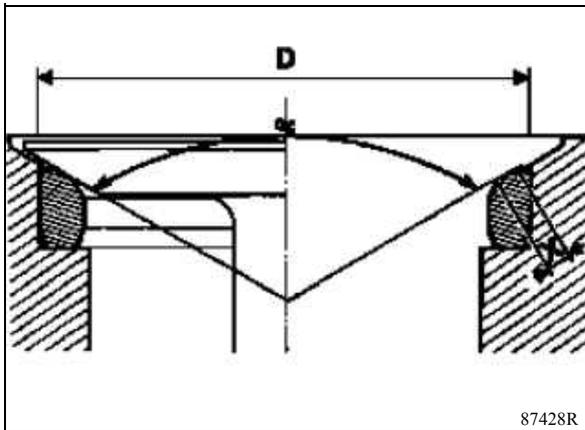
- Inlet 120°
- Exhaust 90°

Width of the seats (mm) X

- Inlet 1.7 ± 0,1
- Exhaust 1.7 ± 0,1

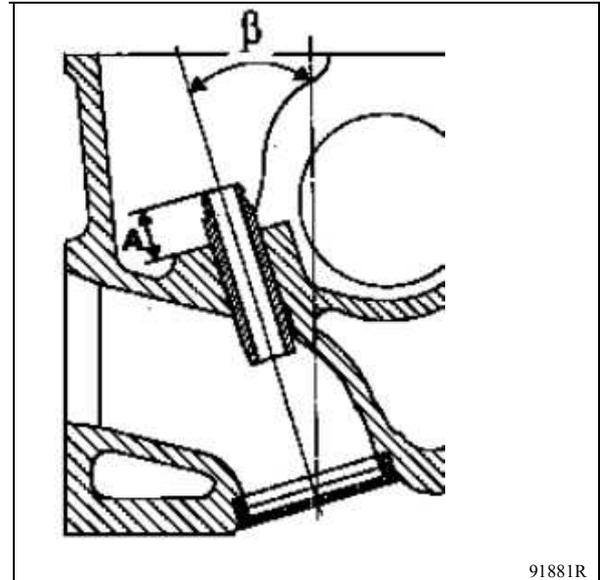
Outside diameter (mm) D

- Inlet 38.5
- Exhaust 34.5



Position of the guide in relation to the bottom of the valve spring (without lower cup) (mm) :

- Inlet: A = 12.34
- Exhaust: E = 12.34



VALVE GUIDES

Inside diameter (mm)

- Normal 7

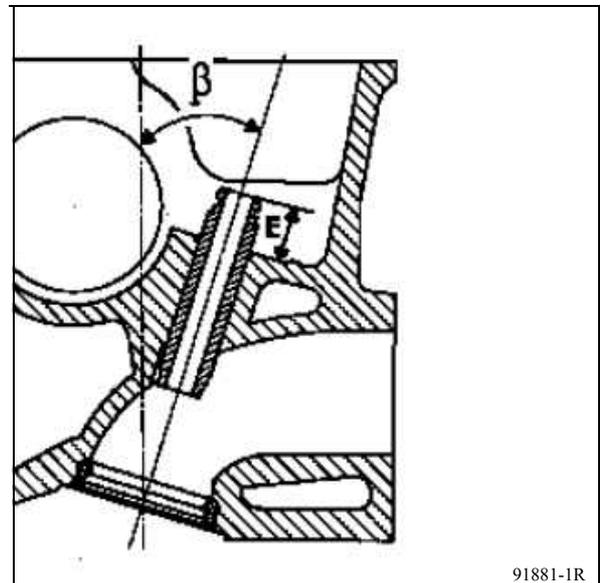
Outside diameter in the cylinder head (mm)

- Normal 12

The inlet and exhaust guides are fitted with valve stem seals. They must be replaced whenever the valves are removed.

Inclination of the guides:

- Inlet $\beta = 17^\circ$
- Exhaust $\beta = 17^\circ$



ENGINE AND PERIPHERALS Specifications

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VALVE SPRINGS

	1st fitting (black)	2nd fitting (orange)
Free length (mm)	46.64	44.93
Length under load (mm)		
- 27 daN.m	37	37
- 53.6 daN.m	27.5	-
- 65 daN.m	-	27.6
Length of spring (mm)	23.63	26.01
Wire diameter (mm)	3.8	4
Inside diameter (mm)	21.5	21.5

NOTE : The Parts Department only supplies 2nd fitting springs.

CAMSHAFT

End play (mm) : **0.06 to 0.15**

Number of bearings: **5**

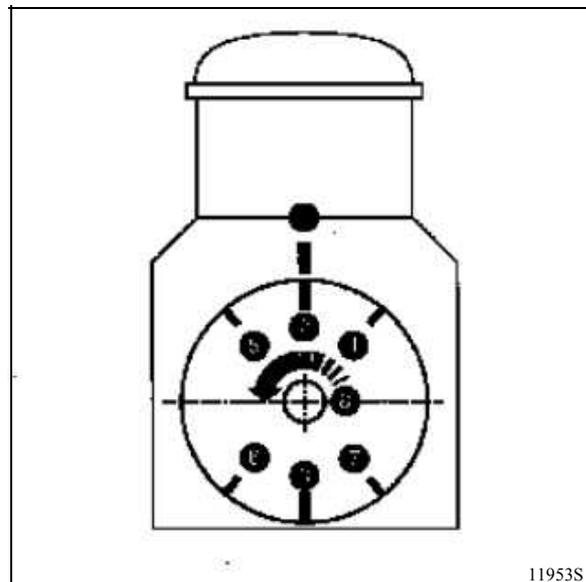
ENGINE AND PERIPHERALS Specifications

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Timing diagram: (cannot be checked)

	E5F 710 - 716 E7F 700 - 704 - 706 - 730 E7J 624 - 718 - 719 - 720	E6J 700 - 701 - 706 - 712 - 713 - 718 - 734 738 - 760 E7J 601 - 700 - 706 - 710 - 711 - 716 - 724 726 - 728 - 742 - 745 754 - 756 - 757 - 764 770 - 771 - 773	E7F 708 - 750
Inlet Opening Retard (IOR) *	- 2	- 6	- 4
Inlet Closing Retard (ICR)	39	43	30
Exhaust Opening Advance (EOA)	48	44	40
Exhaust Closing Advance (ECA) **	- 7	- 3	- 6

- * Since the Inlet Opening Retard is negative,
the opening of the valve is located after TDC.
- ** Since the Exhaust Closing Advance is negative,
the closing of the valve is located before TDC.



- 1 - Fixed mark TDC cylinder block
- 2 - Mobile mark flywheel TDC
- 3 - Mobile mark flywheel BDC
- 4 - Inlet Opening Retard (IOR)
- 5 - Exhaust Closing Advance (ECA)
- 6 - Inlet Closing Retard (ICR)
- 7 - Exhaust Opening Advance (EOA)
- 8 - Engine rotation direction (flywheel end)

ENGINE AND PERIPHERALS

Specifications

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PISTONS

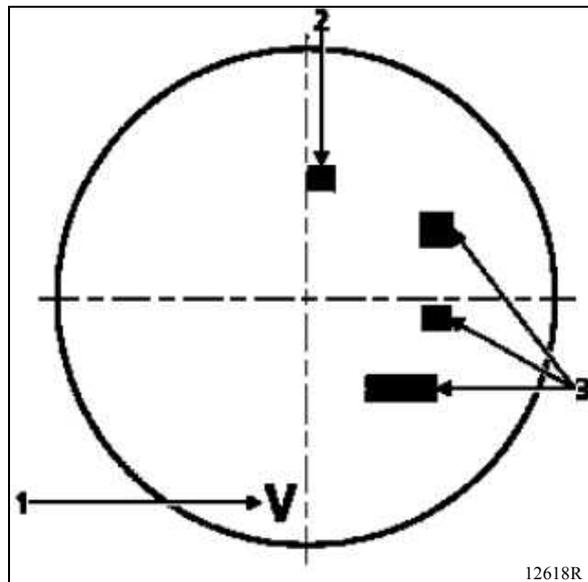
The gudgeon pin is press fitted in the connecting rod and fully floating in the piston.
Direction of mounting: arrow pointing towards flywheel end.

Gudgeon pins (mm)

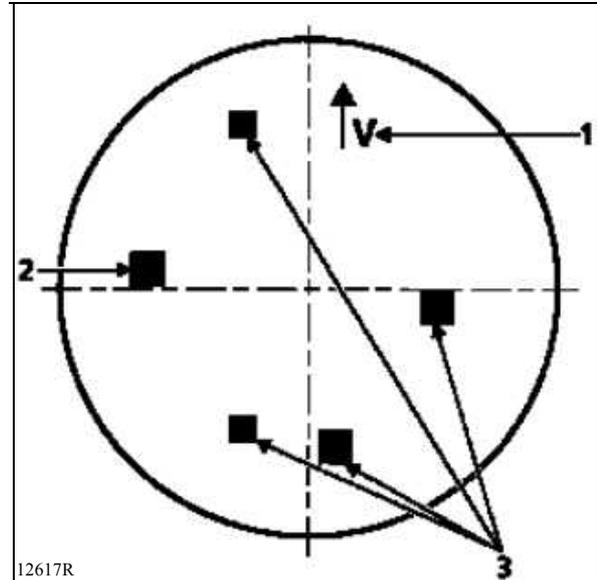
Length	60
Outside diameter	19
Inside diameter	11

Piston marking

SMP piston



Raised metal piston



Direction of piston: arrow (1) pointing towards the flywheel end.

The piston class is at (2) (piston class A - B - C).

The marks (3) are intended for the supplier only.

MARKING OF THE PISTON DIAMETER IN RELATION TO THE CYLINDER DIAMETER

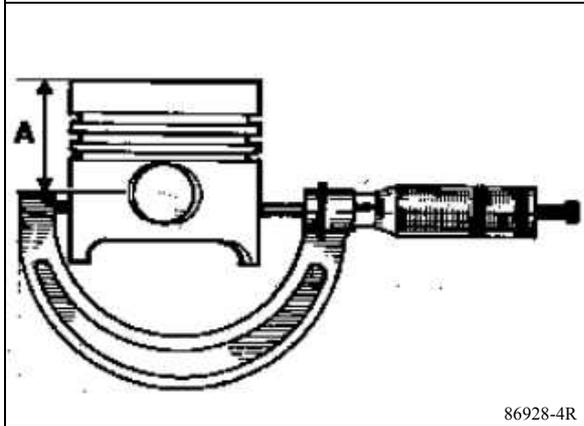
Piston mark	Piston diameter (mm)	Cylinder diameter (mm)
A	75.765 - 75.775 (exclusive)	75.8 to 75.81 (exclusive)
B	75.775 - 75.785 (incl.) (excl.)	75.81 to 75.82 (incl.) (excl.)
C	75.785 - 75.795 (inclusive)	75.82 to 75.83 (inclusive)

ENGINE AND PERIPHERALS Specifications

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Measurement of piston diameter

The diameter must be measured at dimension A = 46 mm.



Rings (thickness in mm)

Upper piston ring	1.5
Taper compression piston ring	1.75
Scraper ring	3

CONNECTING RODS (mm)

Side clearance of the big end (mm)	0.310 to 0.572
------------------------------------	----------------

WARNING: Do not use a scriber tool for the marking, in order to avoid starting any cracks in the connecting rods.

Use an indelible pencil instead.

CYLINDER LINERS

The cylinder liners are the wet type.

They have an O-ring at the base (J).

Height of liners (mm) $H_2 = 130$

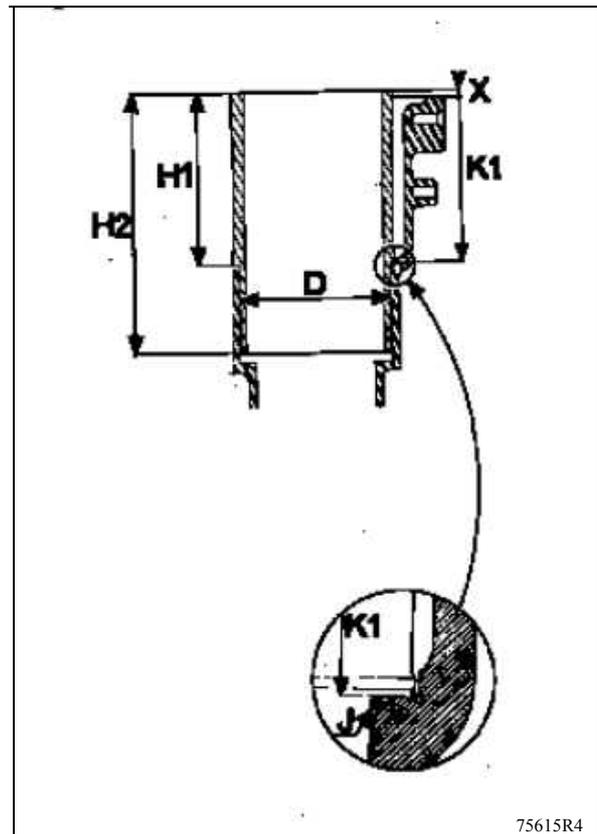
Inside diameter (mm) $75.8 \begin{matrix} +0.03 \\ 0 \end{matrix}$

Centring diameter (mm) $D = 80.6$

Protrusion of liners without seal (mm) $X = 0.02 \text{ to } 0.09$

Height of liners (mm) $H_1 = 91.5 \begin{matrix} +0.035 \\ +0.005 \end{matrix}$

Cylinder block depth (mm) $K_1 = 91.5 \begin{matrix} -0.015 \\ -0.055 \end{matrix}$



ENGINE AND PERIPHERALS Specifications

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CRANKSHAFT

Number of bearings 5

Roll hardened journals (mm):

- nominal diameter 54.795 ± 0.01
- repair diameter 54.550 ± 0.005

Roll hardened crankpins (mm) :

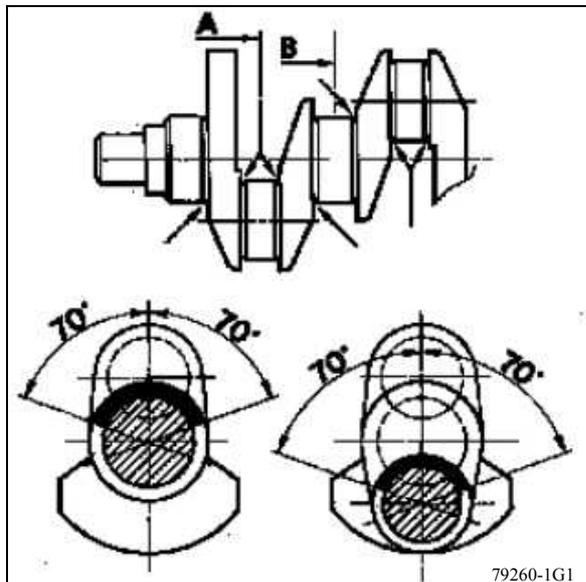
- nominal diameter 43.98 $\begin{matrix} 0 \\ - 0.02 \end{matrix}$
- repair diameter 43.73 $\begin{matrix} 0 \\ - 0.02 \end{matrix}$

End float 0.045 - 0.852 worn
0.045 - 0.252 unworn

There are shims of various thicknesses.

If grinding is carried out, the roll hardening must remain intact over an angle of 140° in the areas shown by the arrows.

These areas are defined on sections (A) and (B) taken as an example.



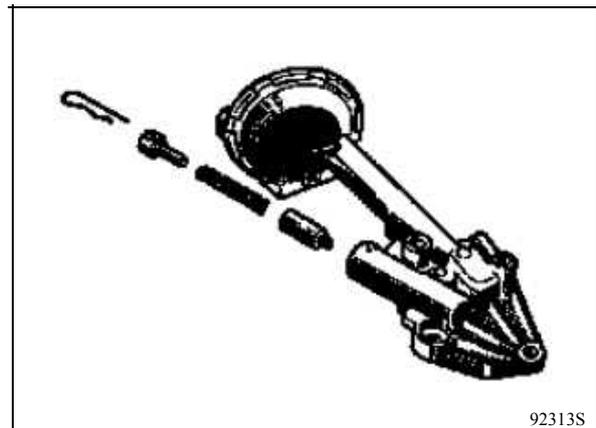
OIL PUMP

Minimum oil pressure at 80 °C :

- Idle speed 1 bar
- 4000 rpm 3 bars

The pump is of the gear pump type.

Remove the cover and the valve of the oil pump.

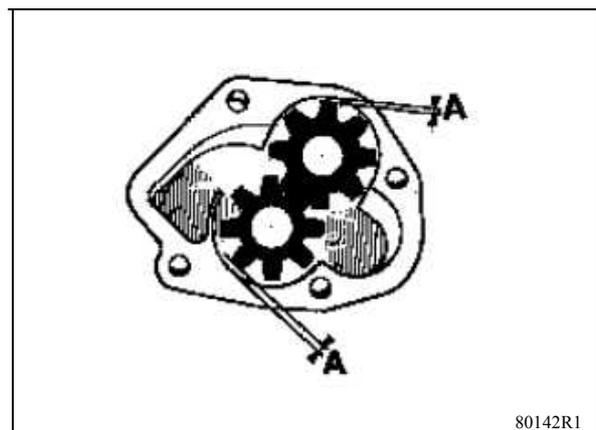


Checking the oil pump

Check the clearances:

Clearance A (in mm) :

- minimum 0.110
- maximum 0.249

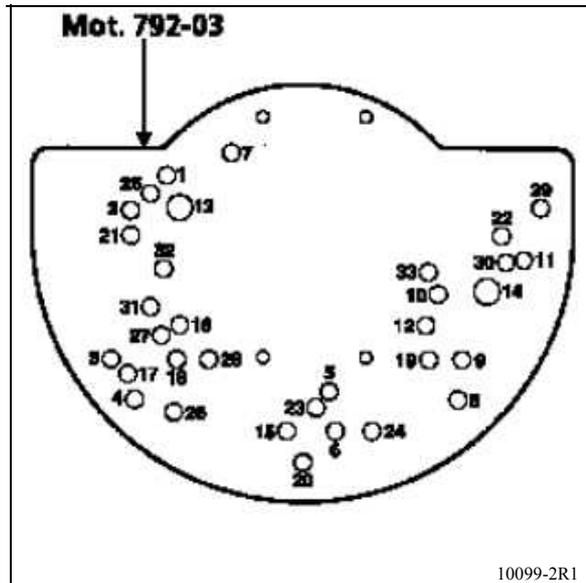
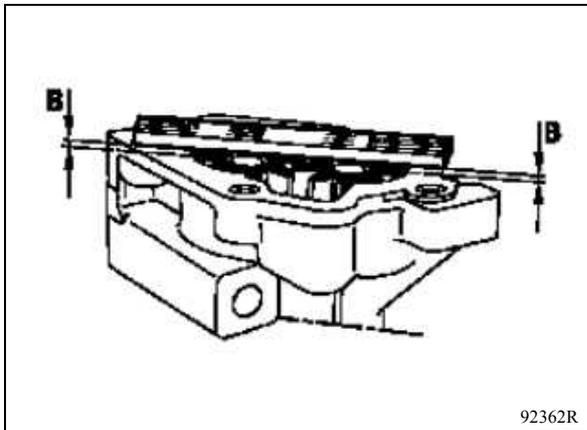


ENGINE AND PERIPHERALS Specifications

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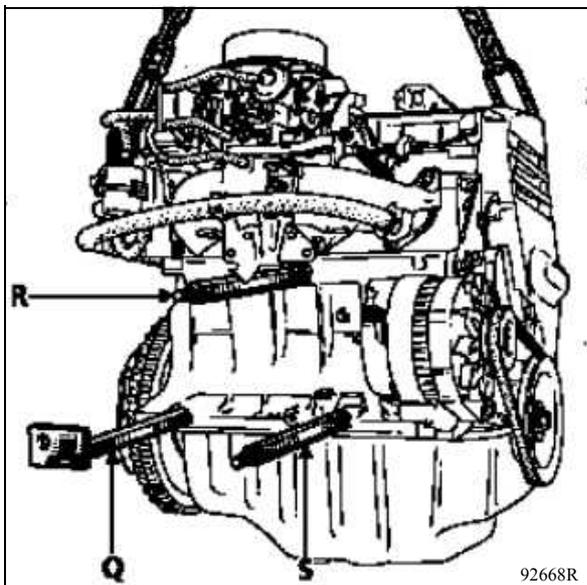
Clearance B (in mm):

- minimum 0.020
- maximum 0.086



Securing engine on mounting Mot. 792-03

Rods Mot. 1132 (Q ; S ; R) are secured to the cylinder block so that they fit into the holes (12 ; 27 ; 7) in the plate.



ENGINE AND PERIPHERALS Specifications

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CONSUMABLES

Type	Quantity	Component concerned	Parts Dept. Nos. (SODICAM)
Loctite FRENETANCH (Locking and sealing resin)	1 to 2 drops	Mounting bolts: flywheel, torque converter starter plate	77 01 394 070
Loctite FRENBLOC (Locking and sealing resin)	Coat	Crankshaft bearing (if the flywheel mounting bolts have no locking plate)	77 01 394 071
Loctite AUTOFORM	Coat	Flywheel bearing face on crankshaft	77 01 400 309
RHODORSEAL 5661	Coat	Sump, bearing cap, crankshaft bearing	77 01 404 452
Loctite 518	Bead	Water pump, crankshaft cover	77 01 421 162
Décapjoint	Coat	Cleaning of aluminium cylinder head gasket face	77 01 405 952

PRECAUTIONS

WASHING OF ENGINE

Protect the timing and alternator belts to avoid splashing of water and washing products on to them.

Do not allow water to penetrate the air inlet pipes.

FITTING OF THREAD INSERTS

The threaded holes in all the engine components may be repaired using thread inserts.

PARTS TO BE RENEWED WHEN THEY HAVE BEEN REMOVED

All seals and gaskets.

Flywheel bolts.

Valve guides.

Cylinder head bolts.

Crankshaft bearing bolts.

ENGINE AND PERIPHERALS

Standard exchange

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PREPARATION OF USED ENGINE FOR RETURN

The engine should be cleaned and drained (oil and water).

Leave on the used engine or put into the box used for returning it:

- the dipstick and its guide,
- the flywheel or the starter plate,
- the clutch disc and mechanism,
- the fuel pump,
- the water pump,
- the crankshaft pulley,
- the cylinder head cover,
- the spark plugs,
- the belt tensioner,
- the pressure switch and temperature switch,
- the timing cover,
- the oil filter.

Do not forget to remove:

- all the flexible coolant pipes,
- the belt or belts (except timing belt).

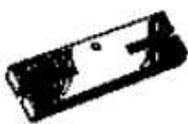
The used engine must be fixed on to the wooden base in the same way as the reconditioned engine:

- plastic plugs and caps in place,
- cardboard cover all around it.

ENGINE AND PERIPHERALS

Special tooling required

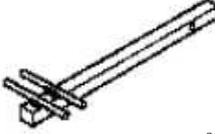
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Figurine	Method Reference	Part Number	Description
 69306-1S1	Rou. 15-01	00 01 331 601	Protector, inside diameter 16 mm
 83812S	Mot. 251-01	00 00 025 101	Dial gauge support. Used with Mot. 252-01
 83812S1	Mot. 252-01	00 00 025 201	Pressure plate for measuring cylinder liner protrusion. Used with Mot. 251-01 .
 68666S	Mot. 330-01	00 00 033 001	Cylinder head support.
 10052S	Mot. 574-22	00 00 057 422	Tool for replacing gudgeon pins (kit)
	Mot. 574-24	00 00 057 424	Tool for fitting gudgeon pins (pin with shoulder), used in conjunction with kit Mot. 574-22 .
 99614S	Mot. 582-01	00 00 058 201	Flywheel locking tool.
 77666S1	Mot. 588	00 00 058 800	Cylinder liner retaining flange
 77889S1	Mot. 591-02	00 00 059 102	Magnetised flexible tool for angular wrench for tightening cylinder head.

ENGINE AND PERIPHERALS

Special tooling required

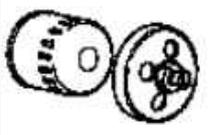
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Figurine	Method Reference	Part Number	Description
 78181S	Mot. 591-04	00 00 059 104	Angular wrench for tightening cylinder head (1/2" drive)
 10250	Elé. 1382	00 00 138 200	Spark plug wrench kit, limited tightening torque
 82919S1	Mot. 792-03 Mot. 1132	00 00 079 203 00 00 113 200	Engine mounting plate for Desvil stand. Set of 3 threaded rods for mounting engine on the Mot. 792-03 .
 80359S1	Mot. 799-01	00 00 079 901	Pinion immobiliser for notched timing belt.
 97628S	Mot. 1127-01	00 00 112 701	Tool for fitting camshaft seal
 80357S	Mot. 1128-01	00 00 112 801	Tool for fitting crankshaft seal, timing side
 68658S	Mot. 1129-01	00 00 112 901	Tool for fitting crankshaft seal, flywheel side
 92645-1S1	Mot. 1135-01	00 00 113 501	Timing belt tensioning tool

ENGINE AND PERIPHERALS

Special tooling required

10

Figurine	Method reference	Part Number	Description
 96508S1	Mot. 1273	00 00 127 300	Tool for checking belt tension
 97160-IS1	Mot. 1330	00 00 133 000	Oil filter cap, 66 mm diameter
 98503S	Mot. 1335	00 00 133 500	Pliers for removing valve stem seals

ENGINE AND PERIPHERALS

Essential equipment

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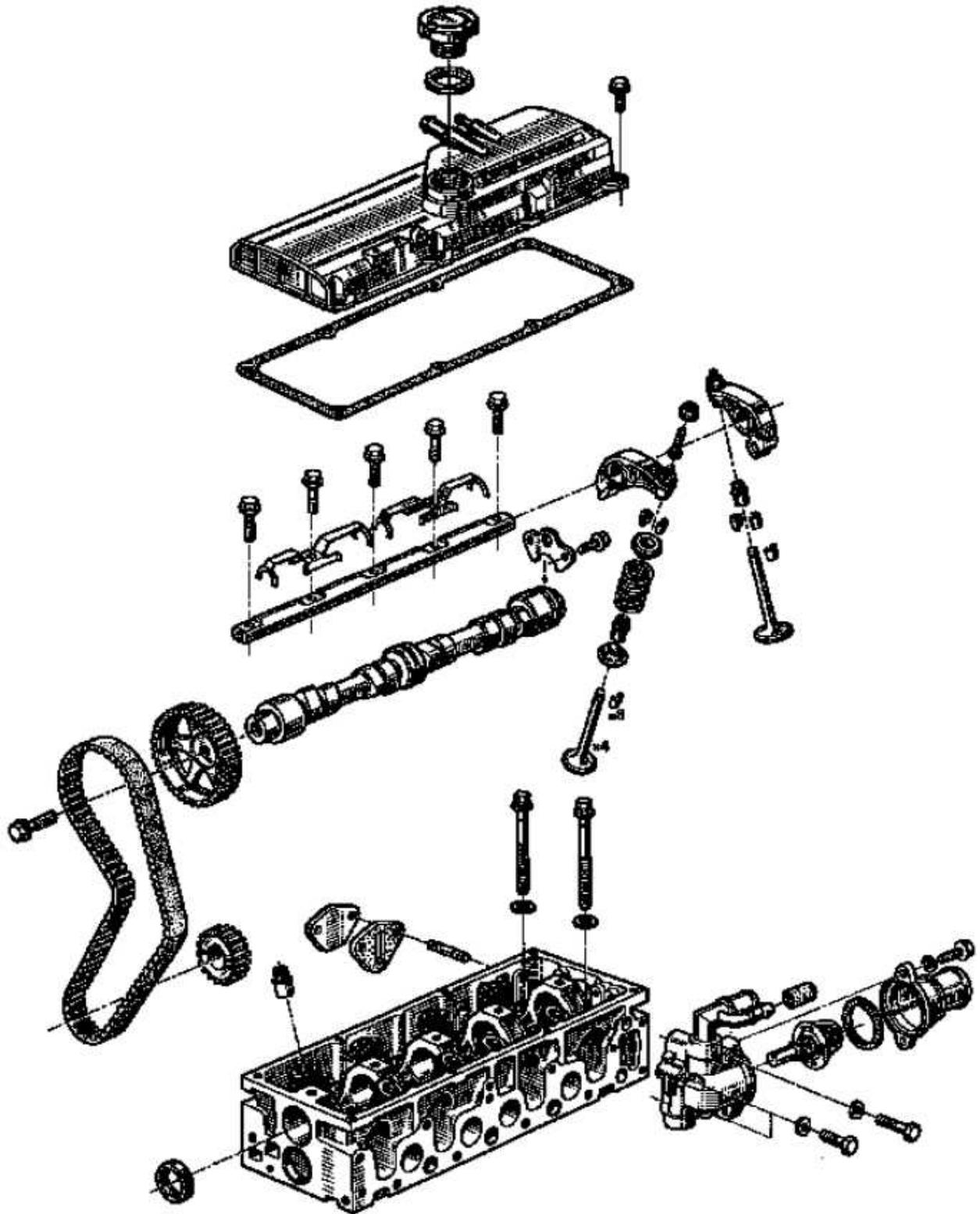
Description	
 83391S	Piston ring clamp (universal).
	Box of cutters for regrinding valve seats. (Example : CERGYSDIS C108 NEWAY).
	Valve lifter.
	12 mm Torx socket.

ENGINE AND PERIPHERALS

Engine repair

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EXPLODED VIEW OF CYLINDER HEAD



PRO10.1

ENGINE AND PERIPHERALS

Engine repair

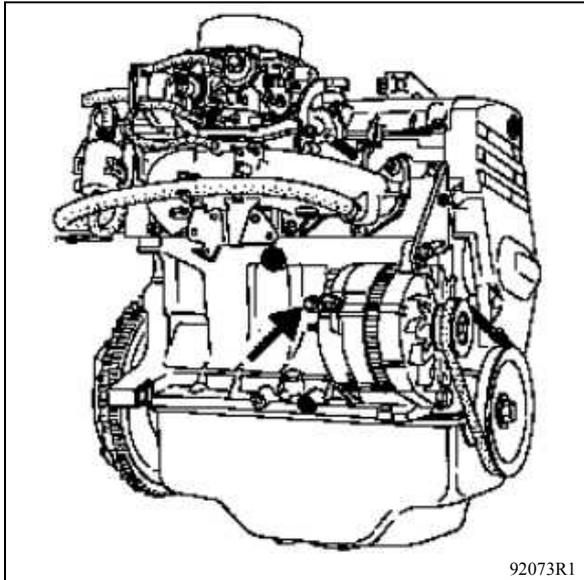
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ENGINE REMOVAL

Fix the engine onto support **Mot. 792-03** with the **Mot. 1132** rods.

Drain:

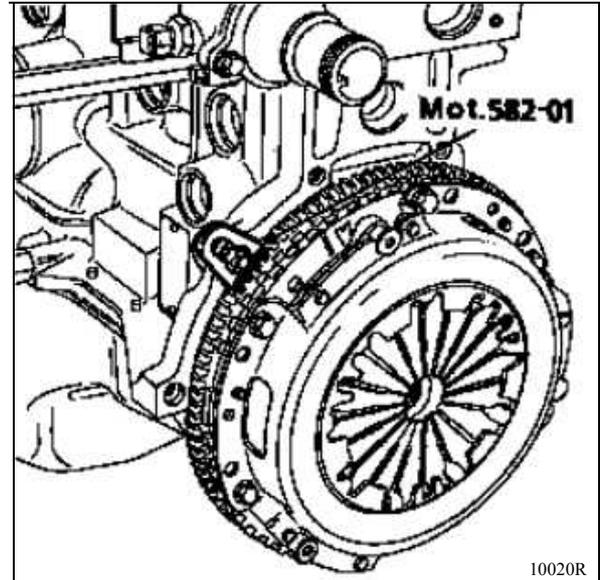
- the engine oil,
- the cylinder block coolant (if the engine has a drain plug).



Refit the drain plugs.

Remove:

- the engine wiring loom,
- the alternator and its belt,
- the crankshaft pulley; in order to do this, immobilise it with tool **Mot. 582-01**.



- the timing cover.

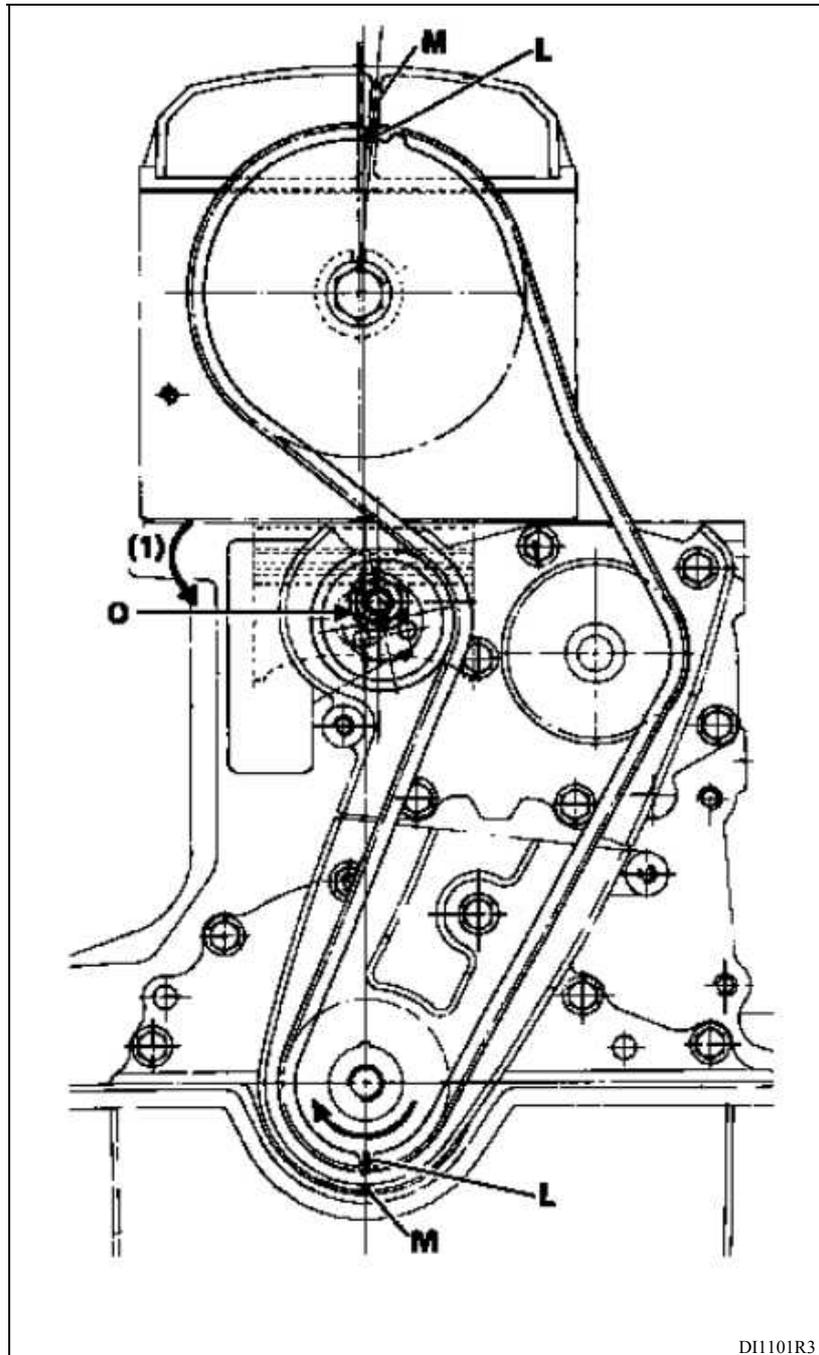
ENGINE AND PERIPHERALS

Engine repair

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Set the engine to setting point, lining up the marks (L) on the camshaft and crankshaft sprockets with the fixed marks (M).

Slacken the nut (O) and release the tension wheel. then remove the belt.



(1) Direction of tensioning of the tension wheel.

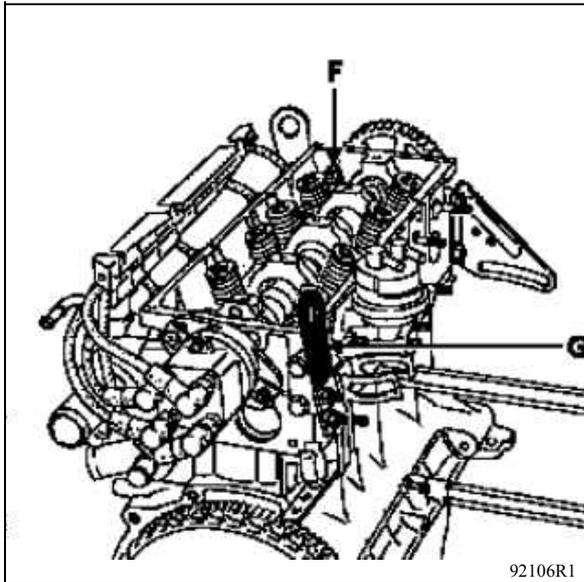
ENGINE AND PERIPHERALS

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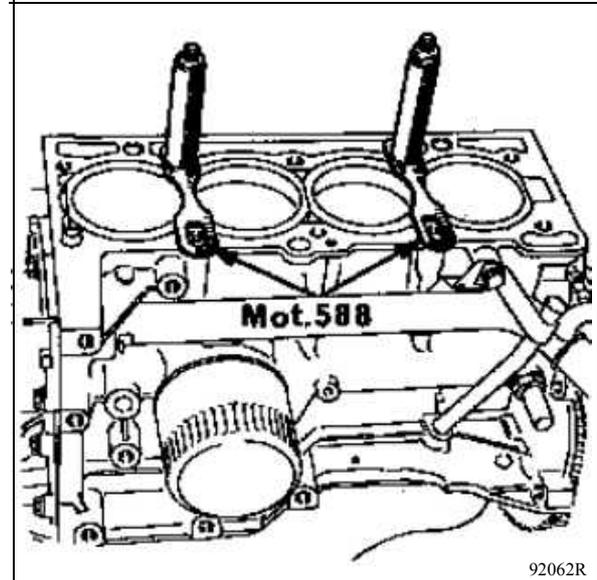
Remove:

- the cylinder head cover,
- the inlet manifold,
- the hot air scoop,
- the exhaust manifold,
- the cylinder head bolts except for bolt (F) which will only be slackened (use a Torx socket 12) in order to pivot the cylinder head about this bolt by tapping it at (G) using a wooden block,



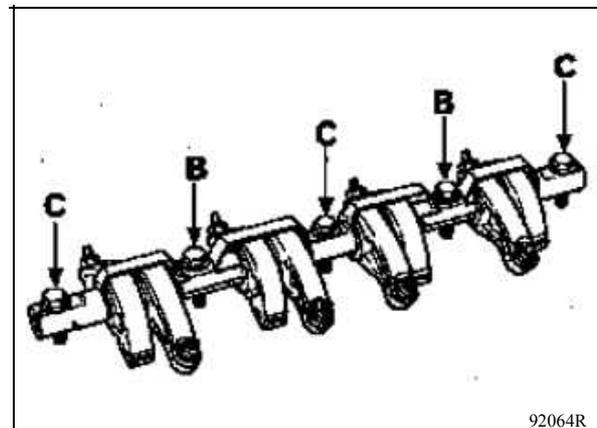
- the cylinder head.

Retain the liners using tool **Mot. 588**.



Remove:

- the rocker shaft, noting the bolt positions:
 - the 2 bolts (B) are solid,
 - the 3 bolts (C) are hollow (oil passage).

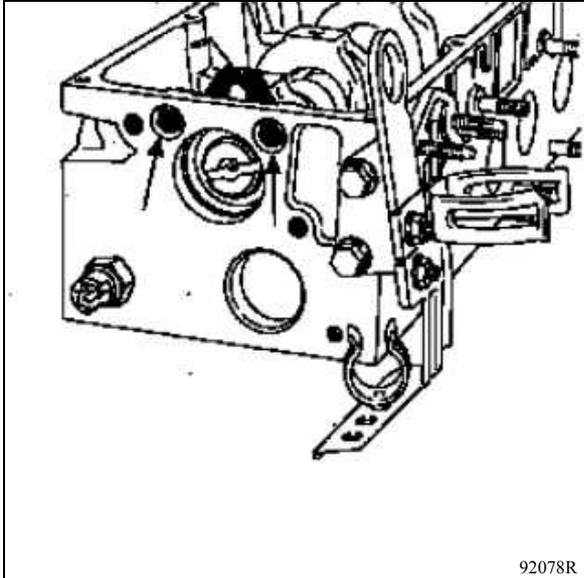


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- the camshaft seal,
- the camshaft flange,



- the camshaft,
- the fuel pump (if fitted),
- the distributor with the ignition wiring loom,
- the thermostat housing,
- the spark plugs,
- the camshaft sprocket, after immobilising it with **Mot. 799-01**.

Compress the valve springs (e.g. with **FACOM** tool **U43L**).

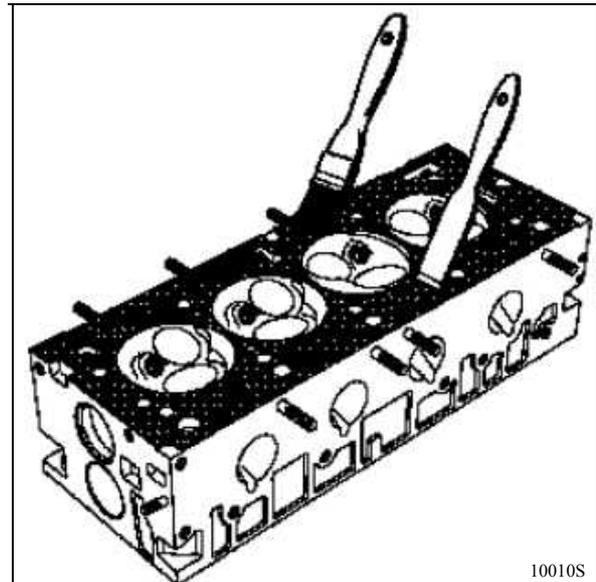
Remove the collets, the upper cups, the springs, the valves, the valve seals using the pliers **Mot. 1335** and the lower cups.

Cleaning

It is very important not to scratch the sealing faces of aluminium parts.

Use the product Decapjoint to dissolve any part of the seal which remains.

Apply the product to the part to be cleaned; wait about ten minutes, then remove it by means of a wooden spatula.



The wearing of gloves is recommended during this operation.

Do not allow any product to drip on to paintwork.

We would like to stress that the utmost care should be taken in carrying out this operation to prevent foreign bodies from penetrating the pipes feeding oil under pressure to the camshafts (pipes located both in the cylinder block and in the cylinder head) and in the oil return pipe.

Failure to follow this instruction would in fact risk blocking the nozzles of the valve rockers and quickly causing damage to the rocker cams and fingers.

ENGINE AND PERIPHERALS

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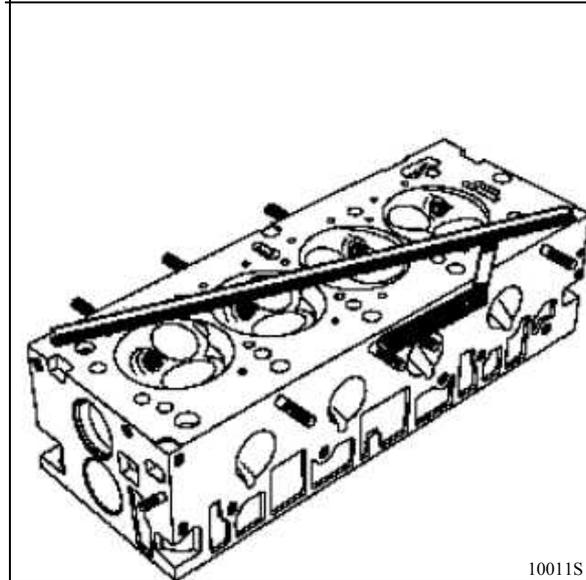
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CHECKING THE GASKET FACE

Using a rule and a set of shims check whether there is any deformation of the sealing face.

Maximum deformation: **0.05 mm**

No regrinding of the cylinder head is permitted.



ENGINE AND PERIPHERALS

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REGRINDING OF THE VALVE SEATS

Inlet

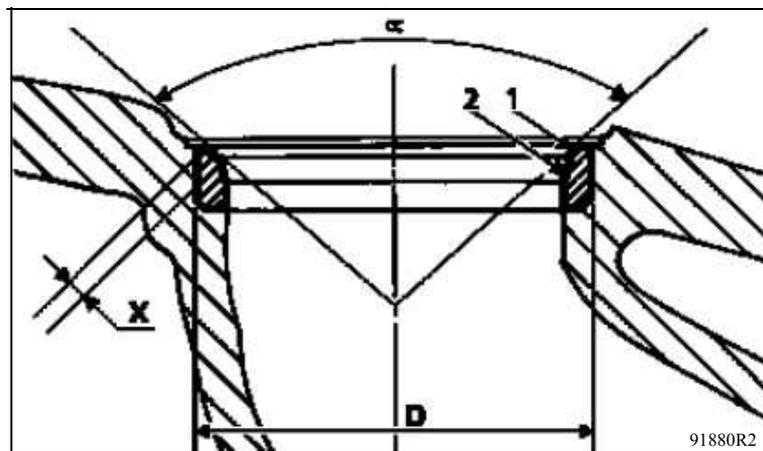
- seat width (mm) : $X = 1.7 \pm 0.1$
- angle : $\alpha = 120^\circ$

The seat (1) is re-cut using **cutter 208, angle 31°**.
Reduce the width of this seat at (2) with cutter n°
212 angle 75° until width (X) is obtained.

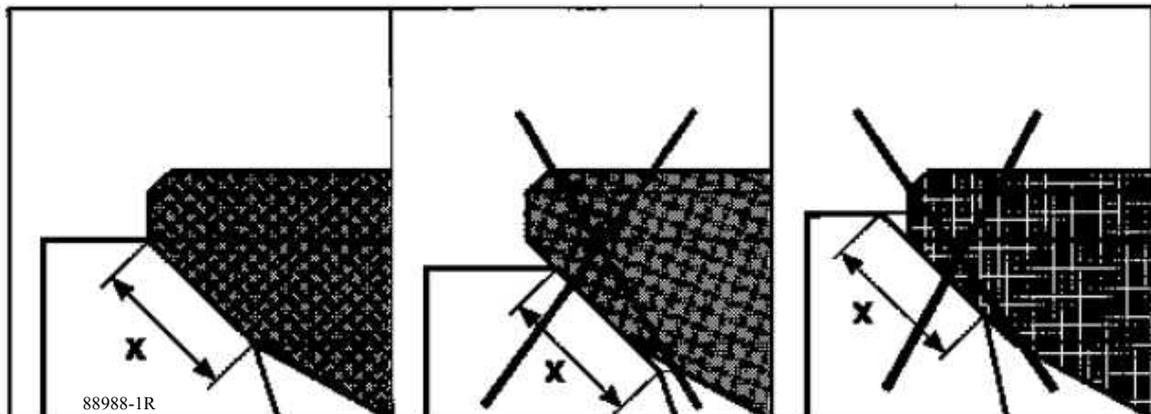
Exhaust

- seat width (mm) : $X = 1.7 \pm 0.1$
- angle : $\alpha = 90^\circ$

The seat (1) is re-cut using **cutter 204, angle 46°**.
Reduce the width of this seat at (2) with cutter n°
273 angle 60° until width (X) is obtained.



NOTE: Observe the position of the valve on its seat.



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REFITTING THE CYLINDER HEAD

Lubricate all the parts.

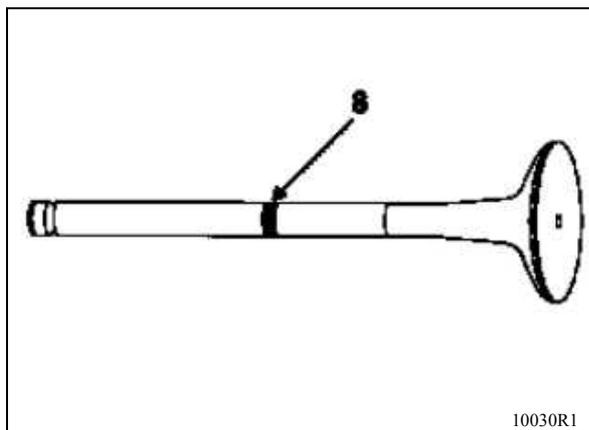
Fit the valve spring seating washers (1).

Fit the seals (2) on the valve guides (3) using an 11 mm tubular socket wrench.

WARNING: When valves are being replaced, it is essential to refit (new) valves having the same marking (8) as the previous ones, in order to prevent any damage to the valve and seat.

The same part number can cover several markings, and in this case the valves are fully interchangeable.

Simply check that any new valves with a marking different from the previous ones do indeed correspond to the same part number.

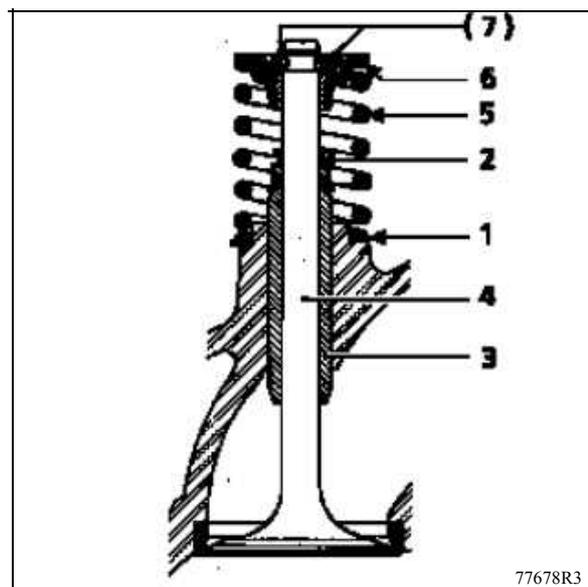


Refit in the following order:

- the new valves (4),
- the springs (5) (identical for the inlet and exhaust),
- the cups (6).

Compress the springs.

Fit the collets (7) (identical for the inlet and exhaust valves).



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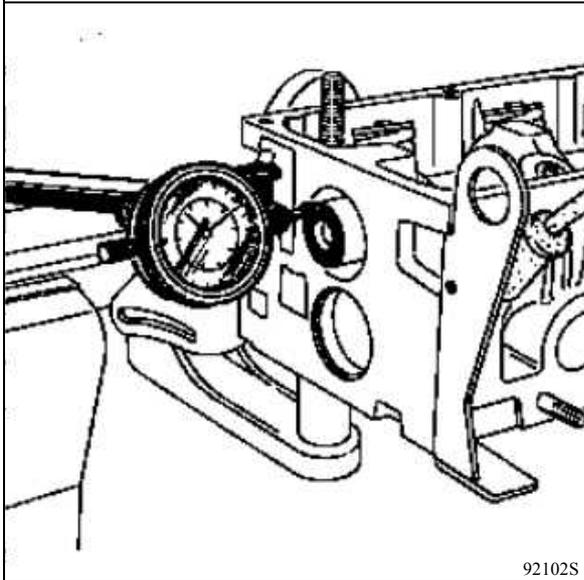
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Lubricate the camshaft.

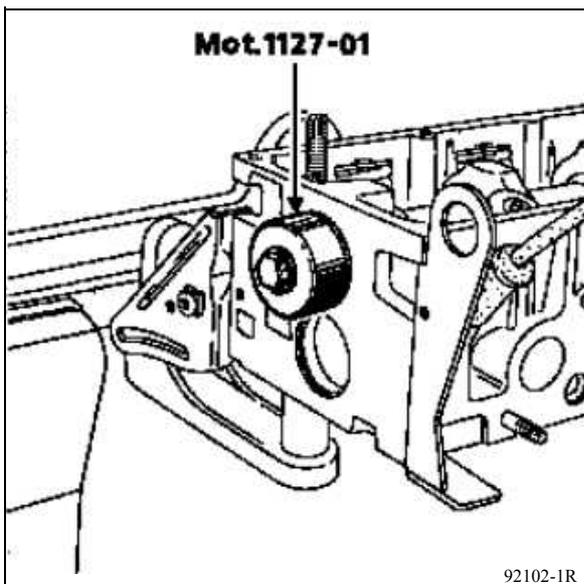
Refit the camshaft and its flange.

Check:

- the end play which should be between **0.06 and 0.015 mm**; if this is not the case, the flange or the camshaft are to blame,

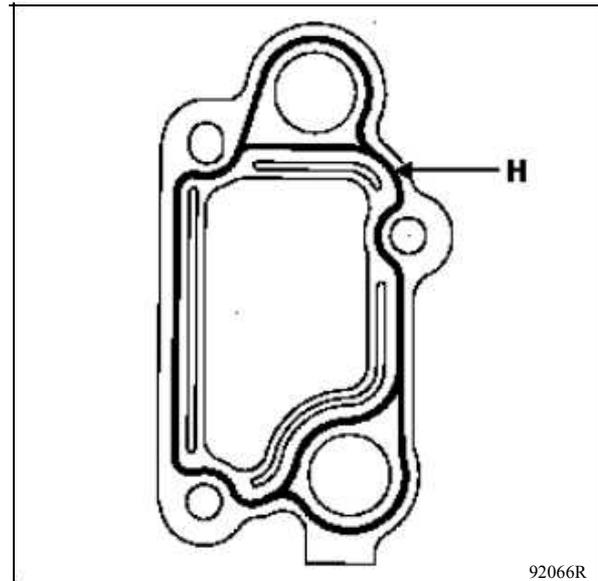


- the seal, using mounting bush **Mot. 1127-01**; this tool is designed to obtain an offset seat for the seal,



- the distributor with the wiring loom,
- the fuel pump (if fitted) with new seals,
- the thermostat support, making it tight with **Loctite 518**.

The bead (H) should be **0.6 to 1 mm wide** and should be applied as shown in the diagram below,



- the camshaft sprocket, immobilising it with tool **Mot. 799-01**, and tighten the bolt to a torque value of **4.5 daN.m** (lubricate the thread and underneath the bolt head).

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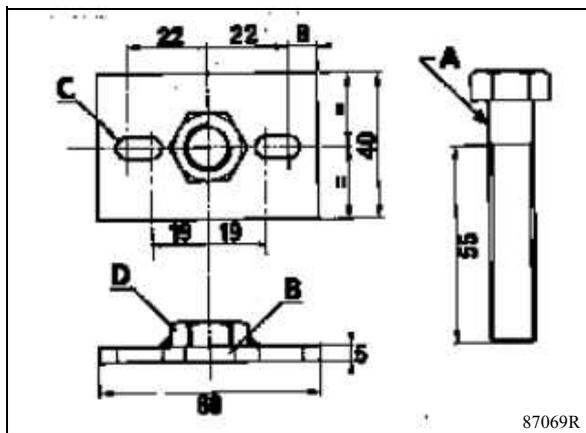
Engine repair

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Remove:

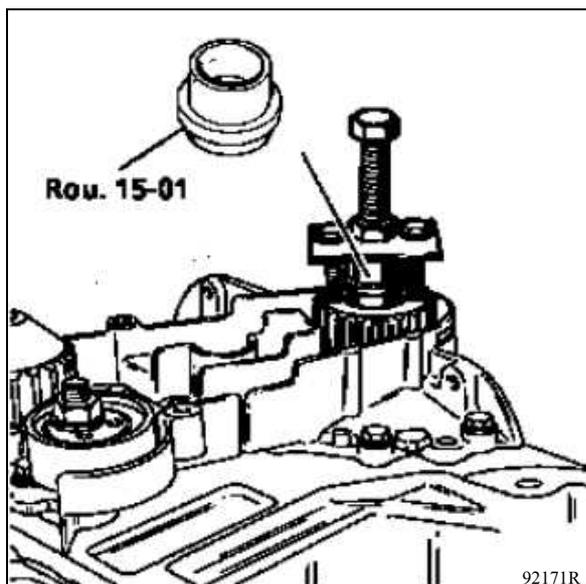
- the coolant pipe and the dipstick guide (these pipes are made water-tight by means of O-rings which must be replaced after each removal operation),
- the clutch mechanism and disc,
- the flywheel, immobilising it with the aid of tool **Mot. 582-01**,
- the sump,
- the crankshaft sprocket.

If necessary, use the locally manufactured tool with the shaft protector end protector **Rou. 15-01**.



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- A 12 mm diameter, 1.75 mm thread pitch
- B 1 hole, 13 mm diameter
- C 2 holes, 6.5 mm diameter
- D 12 mm diameter nut, 1.75 mm thread pitch, welded



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NOTE :

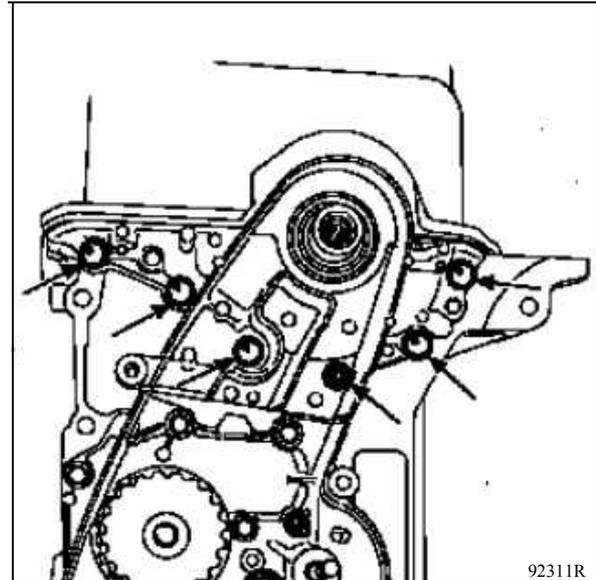
The crankshaft sprocket can be fitted in one of two ways:

- sprocket with keyway mounted on the crankshaft
- sprocket with keyway integral with it.

The two fittings are not interchangeable.

Remove:

- the crankshaft cover plate,



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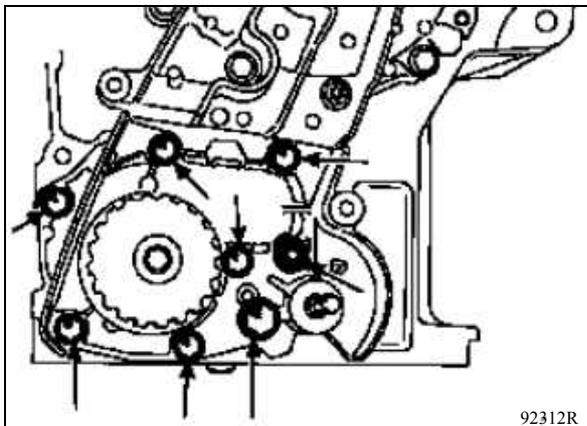
- the pulley,

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- the water pump,



- the three bolts mounting the oil pump sprocket on the hub, and remove the sprocket and chain assembly,
- the oil pump.

Carry out the marking of the big end shells with reference to their bodies.

WARNING: Do not use a scribe tool for the marking, in order to avoid starting any cracks in the connecting rods .
Use an indelible pencil instead.

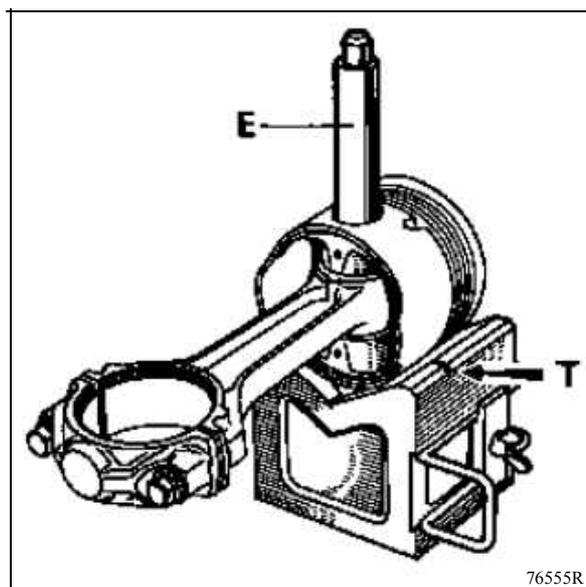
Remove:

- the big end shells and the bearings,
- the liner clamps (**Mot. 588**),
- the "liners - pistons - connecting rods" assemblies,
- the bearing shells with their bearings (mark them),
- the crankshaft (recover the side clearance shims),
- the crankshaft bearings in the cylinder block.

EXTRACTING THE GUDGEON PINS

Place the piston on the "V" of the support with the pin lined up with the clearance hole (two marks (T) showing the centre of the hole assist this alignment).

Use the extraction mandrel (E) to remove the gudgeon pin on the press.



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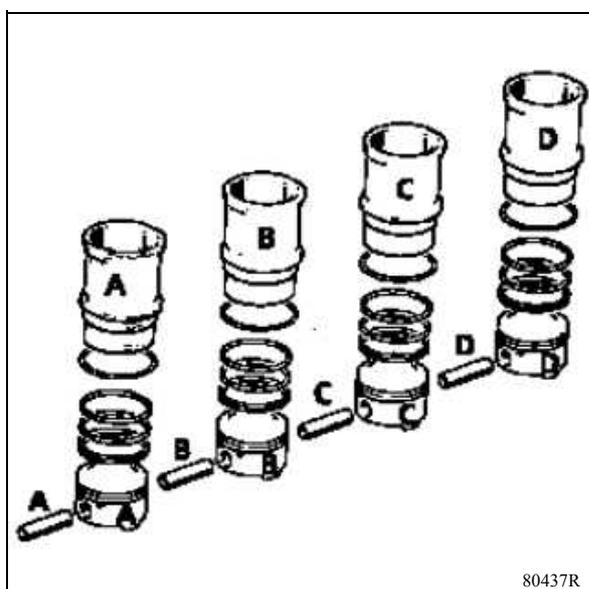
ENGINE REFITTING

Clean the cylinder block, particularly the liner supporting surface inside it.

Preparation of the "pistons-liners" assembly

The parts supplied in the set are matched.

Mark all the parts from A to D in order to retain the matching.



Dissolve the rustproofing film completely.

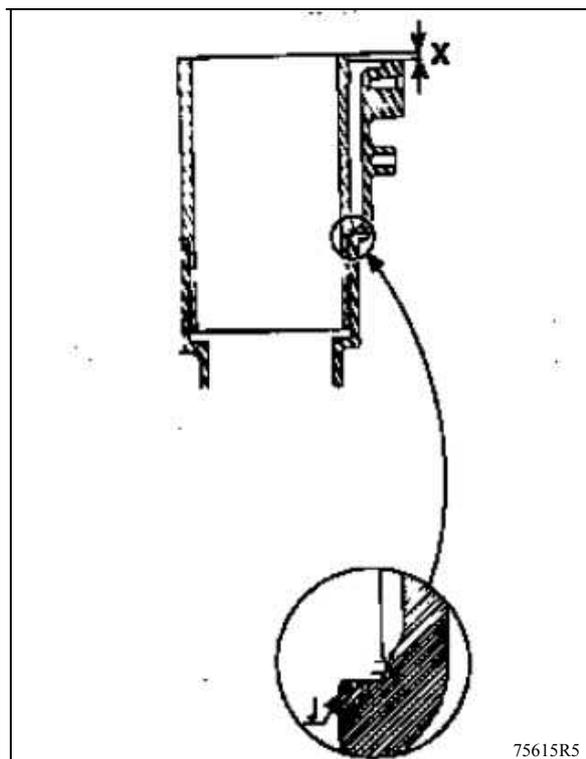
Never scratch the parts.

CYLINDER LINER PROTRUSION

These engines are equipped with liner base O-rings.

The O-rings are only provided for sealing purposes.

The liner rests directly on the cylinder block and their protrusion (X) depends on their manufacturing dimensions.



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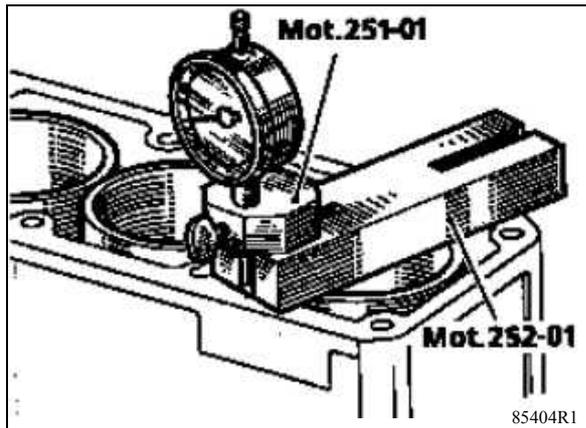
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The amount of protrusion (X) must be checked as follows:

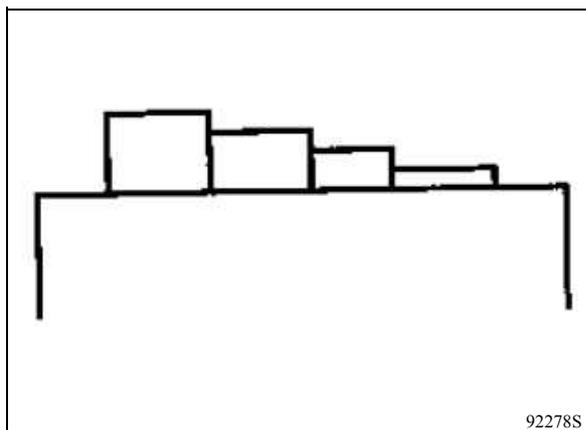
- place the cylinder liner, **without** its O-ring (J), in the cylinder block,
- check the protrusion with tools **Mot. 251-01** and **Mot. 252-01**.

The protrusion (X) should be between **0.02** and **0.09 mm**.



Position the liners so that:

- the difference in protrusion between two adjacent liners does not exceed **0.05 mm** (within the tolerance),
- the amount of protrusion reduces from cylinder No.1 to cylinder No.4 or vice-versa.



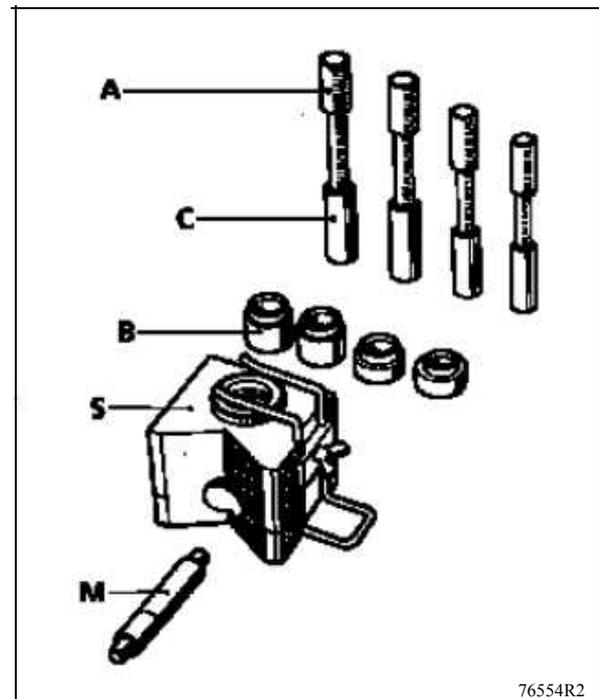
When the correct protrusion has been obtained, re-form assemblies **A, B, C and D**, then number the liners, the pistons and the gudgeon pins from **1 to 4** (No.1 on the flywheel side) in order to match up with the corresponding connecting rod.

If the protrusion is incorrect, check with a set of new liners in order to find out whether the fault lies in the cylinder block or in the liners; otherwise, check the theoretical dimensions (see "Specifications" section).

FITTING THE GUDGEON PINS

The gudgeon pins are press fitted on the connecting rods and are fully floating in the pistons. Use tool **Mot. 574-2** supplied in a kit containing:

- a piston support base (S),
- an extraction mandrel (M),
- piston support rings (B),
- mounting pins (A) with their centring devices (C).



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PREPARATION OF THE CONNECTING RODS

Visually check:

- the condition of the connecting rod (twisting - straightness),
- the bearing surface between the shells and the connecting rod bodies (if necessary, remove any burrs with a grinding wheel to obtain a correct bearing surface).

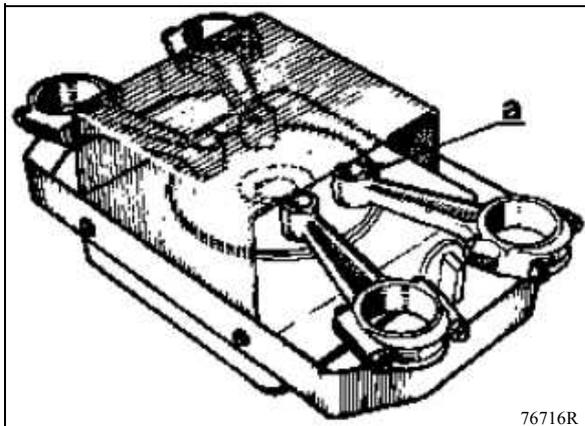
Use a **1500 W** heating plate.

Put the little ends on the heating plate.

Ensure that the whole surface of the little end is in contact with the plate.

Put a piece of self-pickling tin solder with a melting point of about **250°** onto each little end at (a) to act as a temperature check.

Heat the little end until the piece of self-pickling solder melts.



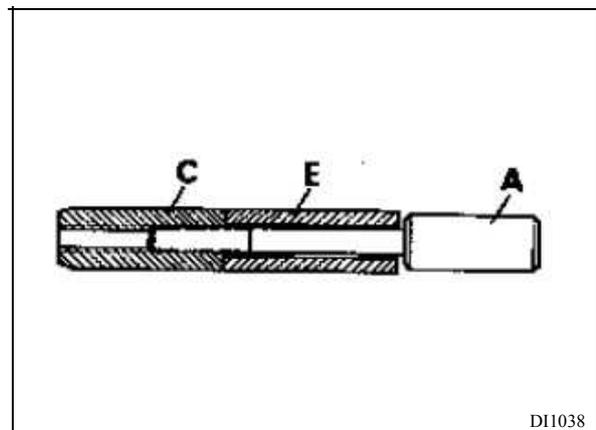
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PREPARATION OF THE GUDGEON PINS

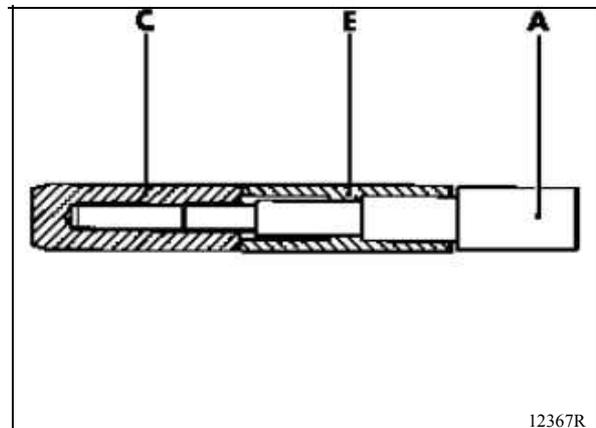
Check that the gudgeon pins are able to slide freely in the corresponding new pistons.

Use centring device **C13** and mounting tools **A13** or **A13-01** for the shouldered gudgeon pins.

Mount the gudgeon pin (E) on the mounting tool (A), tighten the centring device (C) **until contact is made, then slacken by a quarter turn.**



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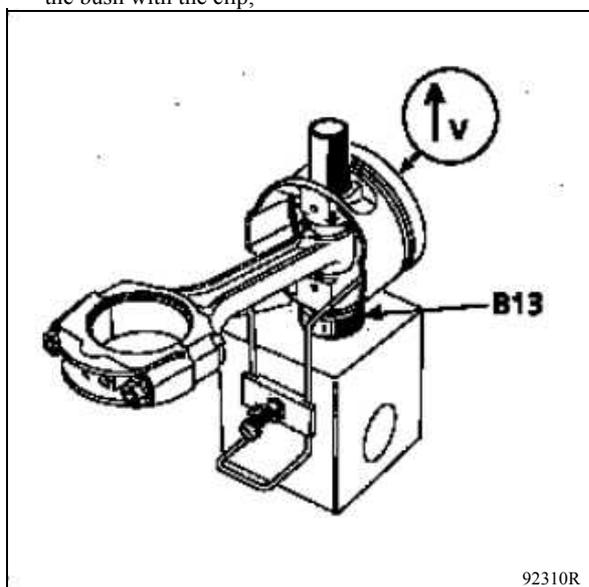
ASSEMBLING THE CONNECTING RODS AND PISTONS

The pistons are marked with an arrow stamped onto their heads indicating the **flywheel end**.

The connecting rods have no particular mounting direction, but nevertheless the **bearing stop lugs should be positioned on the same side**.

Follow the instructions below when assembling the piston and the connecting rod:

- place the bush **B13** on the support and fix the piston (with the arrow pointing upwards) onto the bush with the clip,



- lubricate the centring device and the gudgeon pin with engine oil,
- push the gudgeon pin into the mounting to check that it slides freely, and re-centre the piston if necessary,

The following operations must be carried out quickly in order to reduce the heat loss to a minimum.

When the piece of solder reaches its melting point (turns into a droplet):

- wipe off the droplet of solder,
- engage the centring guide in the piston,
- fit the connecting rod into the piston,
- quickly push in the gudgeon pin until the guide reaches the bottom of the support base.

Check that the gudgeon pin remains within the piston diameter for any connecting rod position in the piston.

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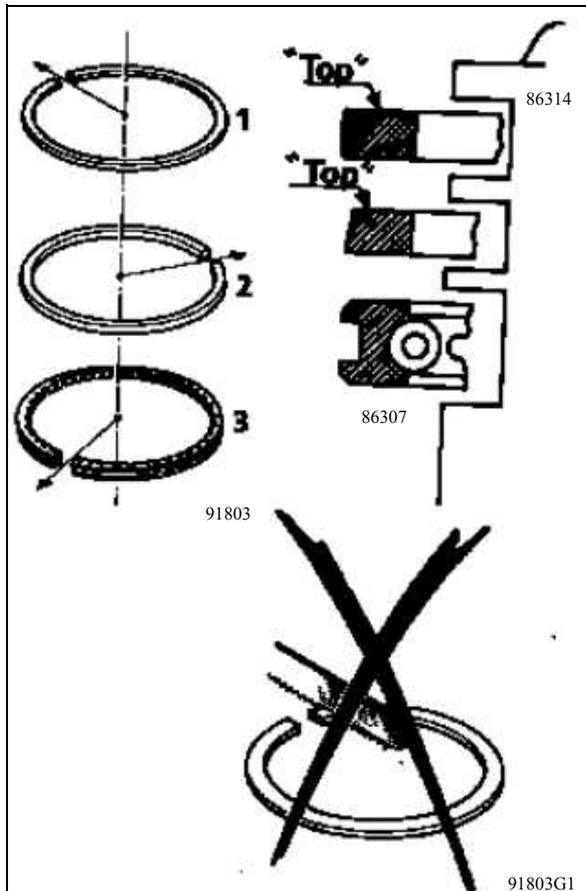
FITTING THE PISTON RINGS

Mount on the piston:

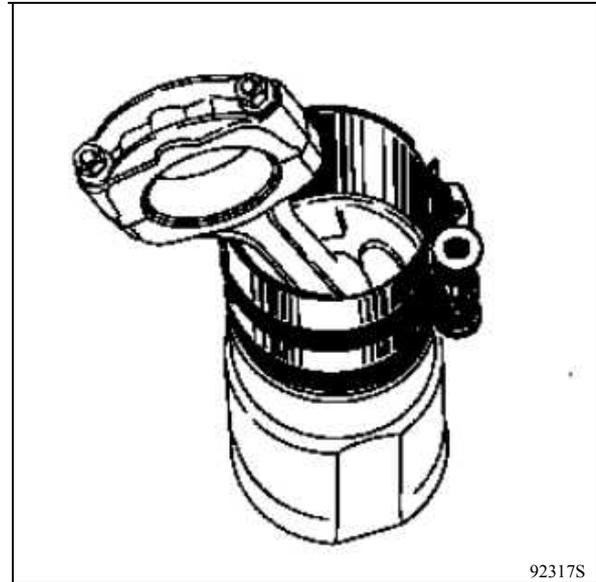
- the scraper ring (3),
- the taper compression piston ring (2), with the "Top" mark facing upwards,
- the upper piston ring (1), with the "Top" mark facing upwards.

Once the seating of all the piston rings has been adjusted, never alter this seating.

Oil and bed in the piston rings, seating the scraper ring onto a solid part of the groove.

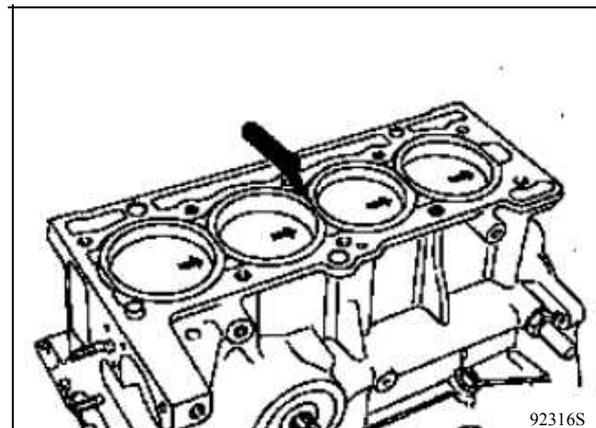


Fit the "connecting rods - pistons - piston rings" assemblies into the liners using the piston ring compressor.



Before fitting the "liners - pistons - connecting rods" assemblies into the cylinder block, do not forget to fit the O-ring on each liner, ensuring that it is not twisted.

Fit the assembly into the cylinder block in the pre-established order, checking that a **0.1 mm** shim will pass freely between the liners.

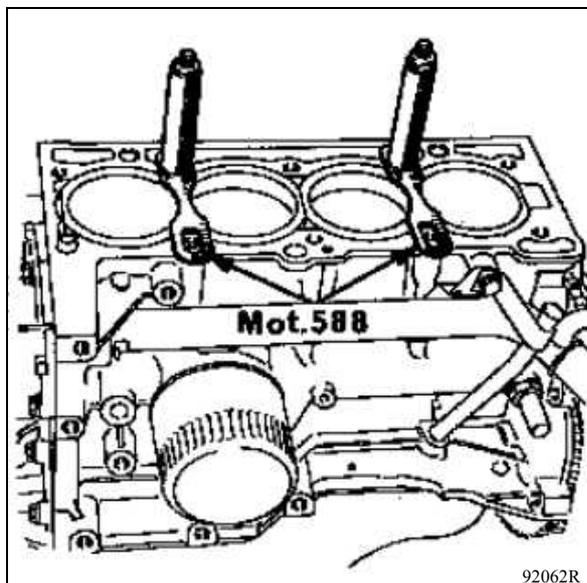


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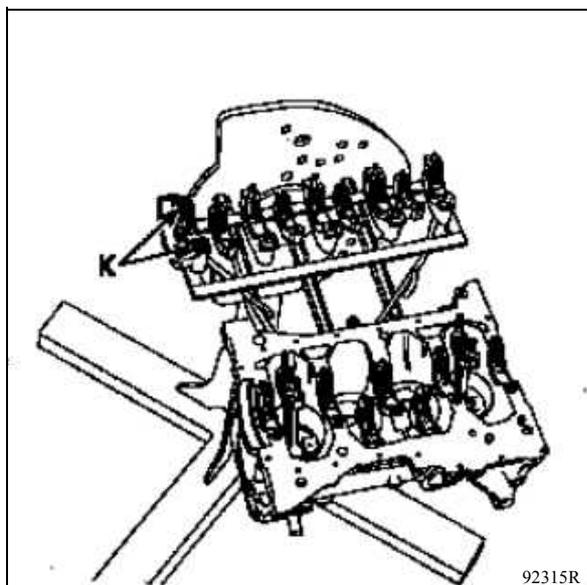
Immobilise the liners using tool **Mot. 588**.



MOUNTING THE BEARING SHELLS

The connecting rod bearing shells are identical.

The crankshaft bearing shells are grooved on the cylinder block side.



The upper shell of bearing **No. 5** is a special one and is also grooved.

Fit the crankshaft and the end float shims.

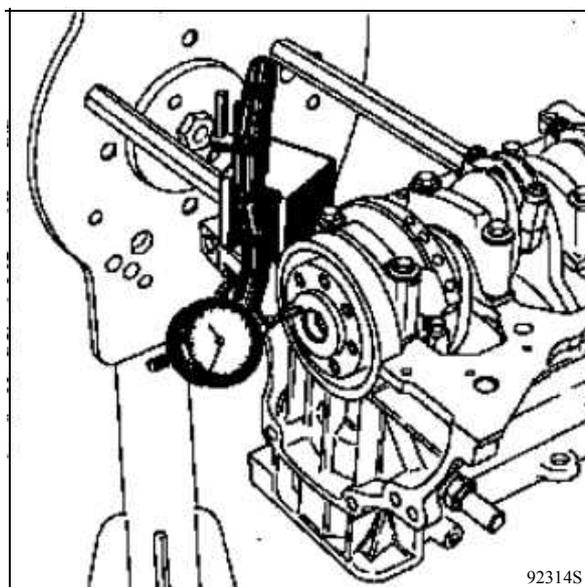
Lubricate the crankpins and the main bearing journals with engine oil.

Refit the crankshaft bearing shells.

Apply a thin layer of **RHODORSEAL 5661** on bearing **N° 1** zone (K) and tighten the bolts to **2.5 daN.m**, then angle tighten to **43° ± 6°**.

Check the end float of the crankshaft, which should be between:

- **0.045 and 0.852 mm** with wear,
- **0.045 and 0.252 mm** without wear.



Shims of the following thicknesses (**mm**) are available from the Parts Department: **2.80; 2.85; 2.90; 2.95**.

Refit the connecting rod shells and tighten the nuts to a torque value of **4.2 daN.m**.

Check:

- the end float of the connecting rods,
- that the assembly is able to rotate properly.

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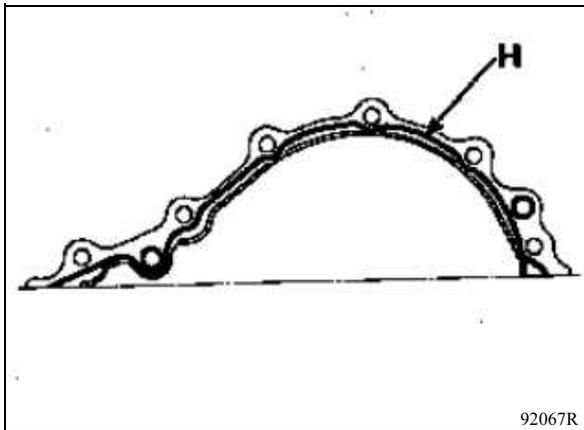
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Fit:

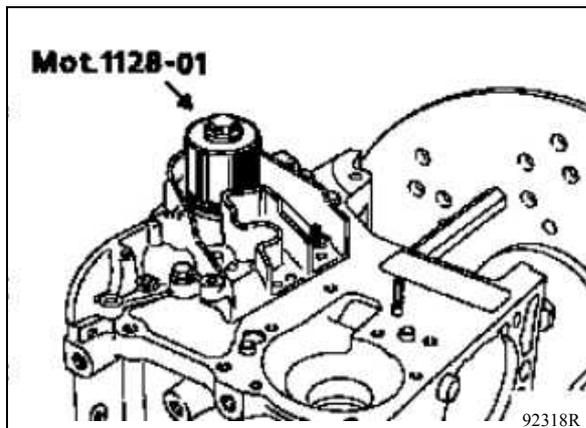
- the oil pump, checking that the centring dowls are present, and tighten to a torque value of **2.5 daN.m**,
- the two sprockets and chain of the oil pump, and tighten the three bolts mounting the sprocket to the hub to **1 daN.m**,
- the crankshaft end cover, sealing it with **Loctite 518**.

The bead (H) should be **0.6 to 1 mm** wide and should be applied as shown in the diagram below.

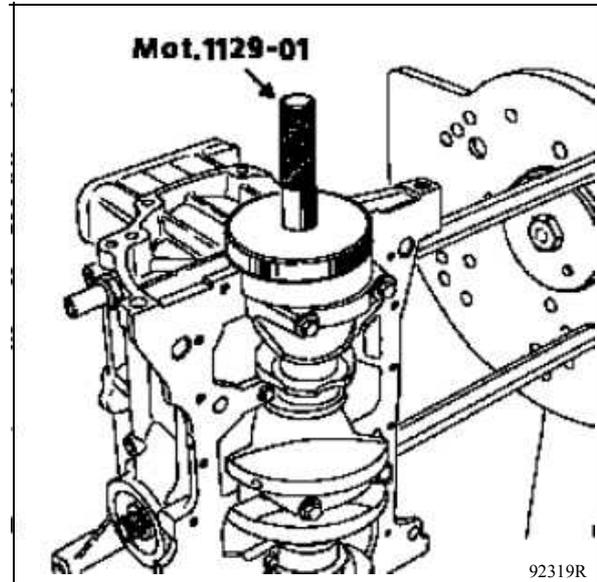


- the crankshaft end seal, using tool **Mot. 1128-01**; lubricate the lip and the outside diameter of the seal.

Turn over the spacer if the old seal has marked the bearing surface.



- the crankshaft seal (bearing No.1), using tool **Mot. 1129-01**; this tool is designed to ensure an offset seal bearing surface. Lubricate the lip and the outside of the seal.



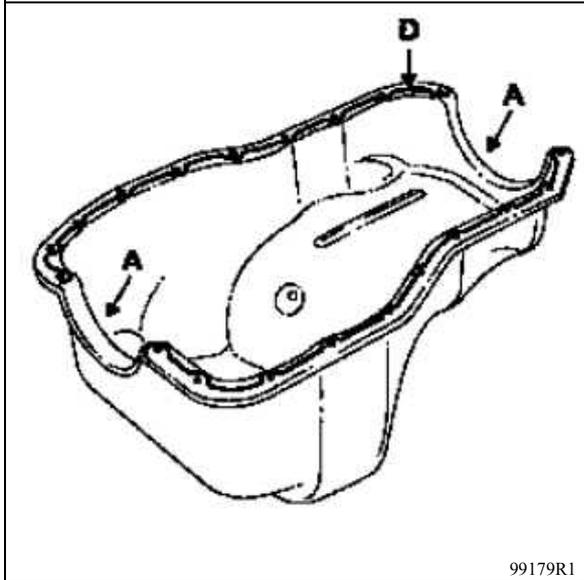
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Refit the sump and tighten to a torque value of **1 daN.m**.

NOTE : A tight seal for the sump can only be obtained using the special seal supplied by the after-sales service, except for engine **E7J 764** in which a tight seal is achieved by using **RHODOR-SEAL 5661**. Bead (D) should be **3 mm** wide.



Do not forget to replace the two "half-moon" seals at (A) with new ones.

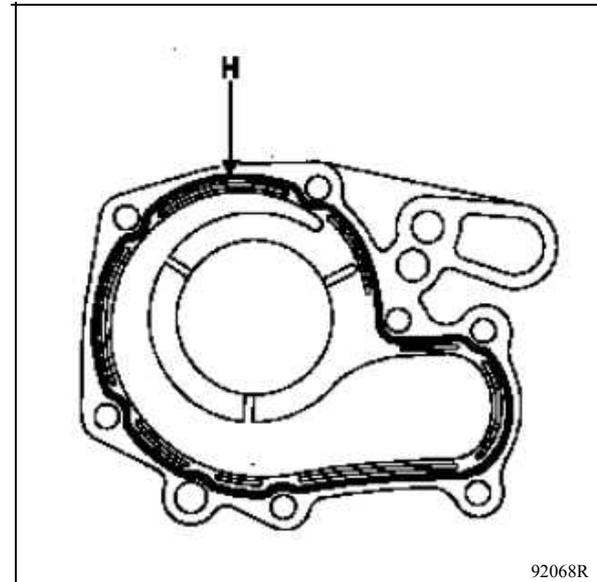
Coat the flywheel bearing surface on the crankshaft with **AUTOFORM Loctite**.

Fit the flywheel or the converter plate and immobilise it with the toothed segment **Mot. 582-01**.

Apply a drop of **FRENETANCH Loctite** to the bolts and tighten them to **5 - 5.5 daN.m**.

Centre the clutch disc and secure the mechanism.

Refit the water pump, sealing it with **Loctite 518**. The bead (H) should be **0.6 to 1 mm** wide and should be applied as shown in the diagram below.



REFITTING THE CYLINDER HEAD

Remove the liner tool **Mot. 588**.

Clean the gasket surfaces of the cylinder block and the cylinder head.

Refit the cylinder head centring dowel.

The new cylinder head gasket.

The cylinder head (lubricate the threads and underneath the bolt heads).

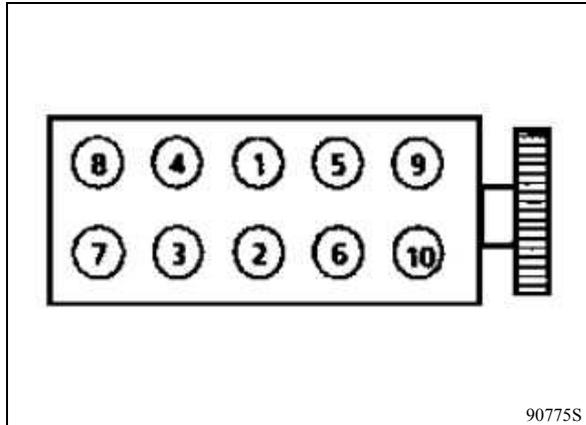
All the cylinder head bolts must be replaced systematically after any removal.

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Method of tightening the cylinder head



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Preseating of the gasket:

Initial tightening to **2 daN**, followed by angular tightening to $97^\circ \pm 2^\circ$ in the recommended order:

- tighten bolts 1-2,
- tighten bolts 3-4-5-6,
- tighten bolts 7-8-9-10.

Seating of the gasket:

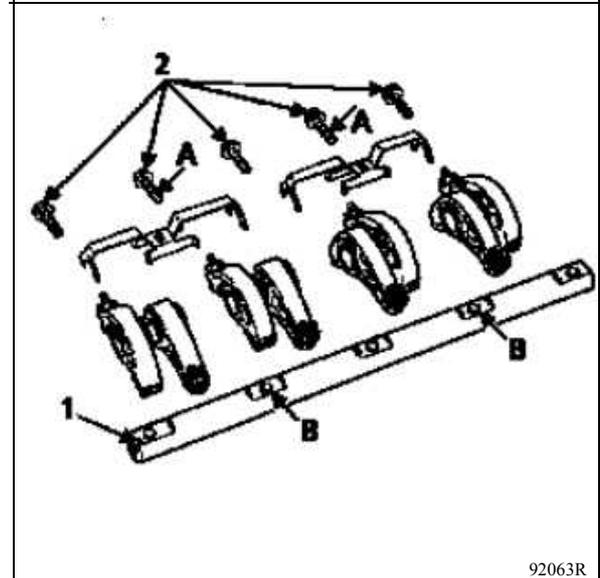
Wait **3 minutes** (settling time).

Tightening:

- Slacken bolts 1-2.
Retighten bolts 1-2 to **2 daN.m**, then angle tighten to $97^\circ \pm 2^\circ$.
- Slacken bolts 3-4-5-6.
Retighten bolts 3-4-5-6 to **2 daN.m**, then angle tighten to $97^\circ \pm 2^\circ$.
- Slacken bolts 7-8-9-10.
Retighten bolts 7-8-9-10 to **2 daN.m**, then angle tighten to $97^\circ \pm 2^\circ$.

There is no cylinder head retightening operation.

Refit the rocker shaft, positioning the mark (1) on the timing side and the bolts (A) at (B).



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NOTE : There are two sizes of bolts (A) : **M8×100** and **M8×125**.

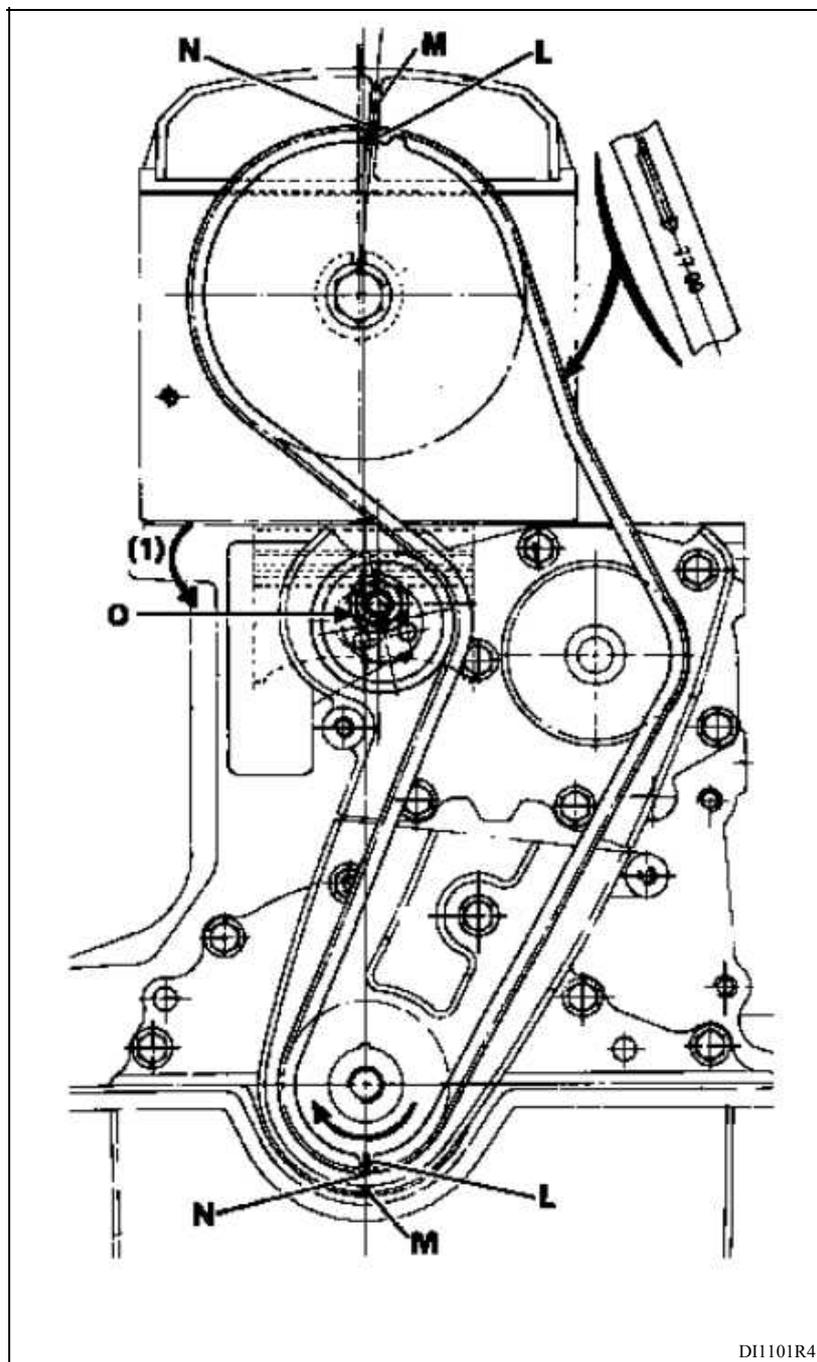
Refit:

- the rocker shaft mounting bolts (2), tightening them to a torque of **2.3 daN.m** and not forgetting to lubricate the threads and underneath the bolt heads with engine oil,
- the cylinder head cover without tightening it in order to facilitate the setting of the timing,
- the crankshaft sprocket.

ENGINE AND PERIPHERALS

Engine repair

Setting the timing



(1) Direction of tensioning of the tension wheel.

ENGINE AND PERIPHERALS

Engine repair

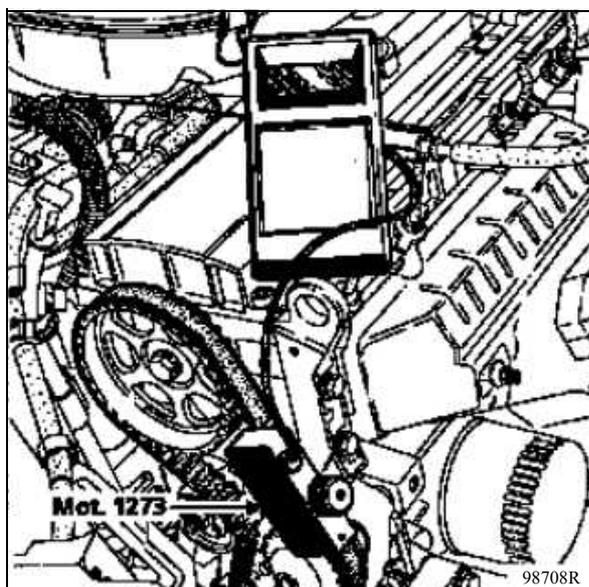
10

There is an arrow painted on the back of the belt showing the direction of rotation and two marks for the setting.

Line up the marks (N) on the belt with those on the sprockets (L) and the housings (M).

Respect the direction of mounting of the belt and begin to position it on the crankshaft sprocket.

Fit the sensor of **Mot. 1273**.



Turn the knurled wheel of the sensor until it releases (three "clicks").

Tension the belt using tool **Mot. 1135-01** until the display of the **Mot. 1273** shows the recommended fitting value.

Belt tension (in SEEM units)

Fitting value: 30 U.S.

Lock the tension wheel, carry out a check and adjust the value.

Rotate the crankshaft at least **three turns**.

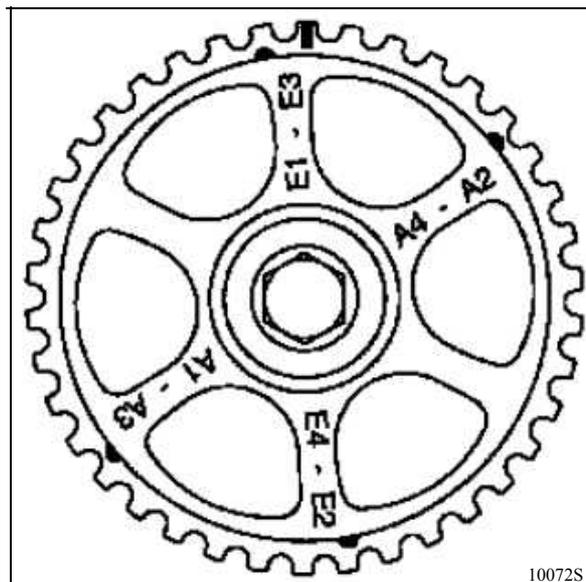
Check that the tension value is within the fitting tension tolerance ($\pm 10\%$), and if not readjust it.

NOTE : Never refit a belt which has been removed.

Tighten nut (O) of the tension wheel to **5 daN.m**.

It is essential to tighten the tension wheel nut to a torque value of 5 daN.m to prevent any risk of working loose which might damage the engine.

WARNING: Certain camshaft sprockets have five marks, but only the rectangular mark on the face of a tooth shows the TDC. The other marks are used for adjusting the valve rockers.



Only the camshaft sprockets with marks will be available in future from the Parts Department.

ENGINE AND PERIPHERALS

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SETTING THE VALVE ROCKER CLEARANCES

Setting values (cold) (in mm):

- inlet **0.10**
- exhaust **0.25**

Engine fitted with a CAMSHAFT SPROCKET WITH NO MARKS

"Tilt" method

Set the valves of the cylinder concerned to the end-of-exhaust / start-of- inlet position	Set the clearance of the valve rockers of the cylinder concerned
1	4
3	2
4	1
2	3

Fully open exhaust valve method

Leave the exhaust valve of cylinder **n° 1** fully open and set the clearance of the inlet valve of cylinder **n° 3** and the clearance of the exhaust valve of cylinder **n° 4**.

Proceed similarly for the other cylinders, following the order shown in the table.

Exhaust valve to be left fully open



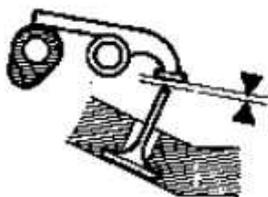
- 1**

- 3**

- 4**

- 2**

Inlet valve to be set



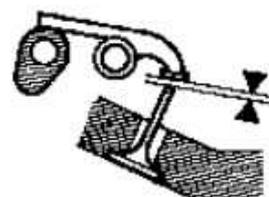
- 3**

- 4**

- 2**

- 1**

Exhaust valve to be set



- 4**

- 2**

- 1**

- 3**

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ENGINE AND PERIPHERALS

Engine repair

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Engine fitted with a CAMSHAFT SPROCKET WITH MARKS

Set the engine to TDC with ignition in cylinder No.1.

Turn the crankshaft clockwise (seen from the timing side) as far as the first mark.

SET: exhaust 1
exhaust 3

move on to the second mark:

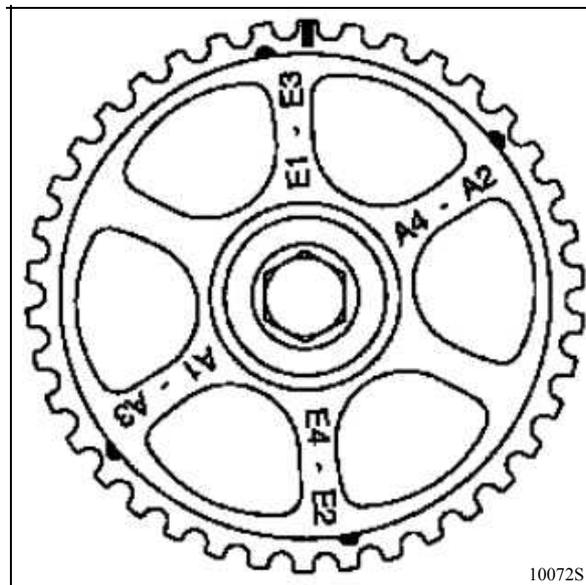
SET: inlet 1
inlet 3

third mark:

SET: exhaust 2
exhaust 4

fourth mark:

SET: inlet 2
inlet 4



ENGINE AND PERIPHERALS

Engine repair

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Refit:

- the cylinder head cover fitted with a new gasket,
- the coolant pipe and the dipstick guide tube with new seals,
- the timing cover,
- the crankshaft pulley tightening the bolt to **2 daN.m**, then angle tighten to **68° ± 6°**,
- the inlet and exhaust manifolds, tightening the nuts to **2.5 daN.m**,
- the accessories belt or belts.

Tensioning process

Engine cold (ambient temperature).

Fit the new belt.

Position the sensor of the **Mot. 1273**.

Turn the knurled wheel of the sensor until it releases (three "clicks").

Tension the belt until the fitting value recommended on the next page is shown on the display of the **Mot. 1273**.

Lock the tension wheel, carry out a check and adjust the value.

Rotate the crankshaft **three turns**.

Check that the tension value is within the fitting tension tolerance, and if not readjust it.

NOTE : Never refit a belt which has been removed.

ENGINE AND PERIPHERALS

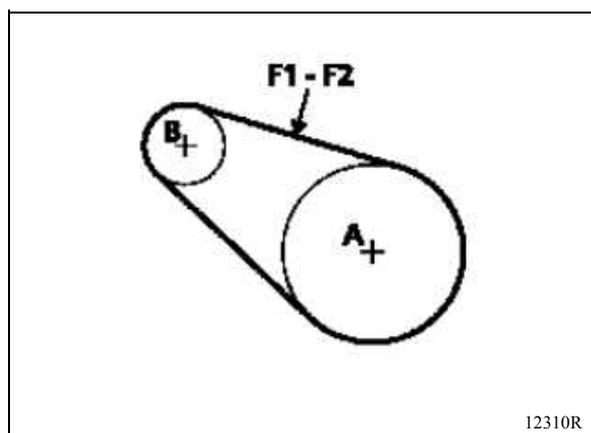
Engine repair

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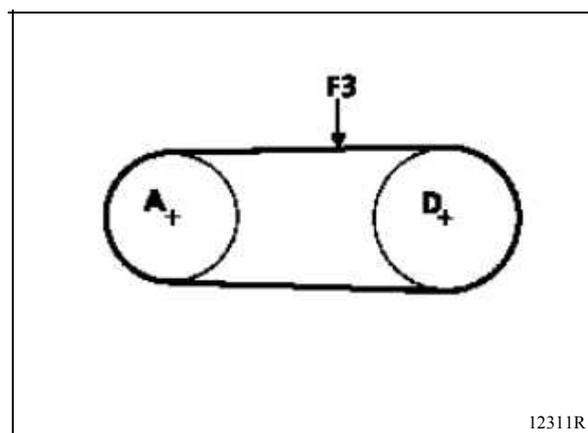
Tension (US = SEEM Units)	Alternator belt		Power assisted steering belt			Air conditioning belt			Air conditioning and power assisted steering belt		
	Vee F1	Grooved 3 teeth F2	Grooved 3 teeth			Vee F5	Grooved 4 teeth		Grooved 4 teeth		Grooved 5 teeth
			F3 (E7J 764)	F3	F4		F6	F7	F8	F9	F8
Fitting	83 ± 7	84 ± 6	84 ± 6	84 ± 5	84 ± 4	90	102 ± 6	103 ± 4	106	10 ± 7	110
Minimum operating	70	52	52	46	47	72	55	77	59	75	59

- A Crankshaft
- B Alternator
- C Air conditioning compressor
- D Power assisted steering pump
- E Pulley
- T Tension wheel
- Tension checking point

Alternator



Power assisted steering

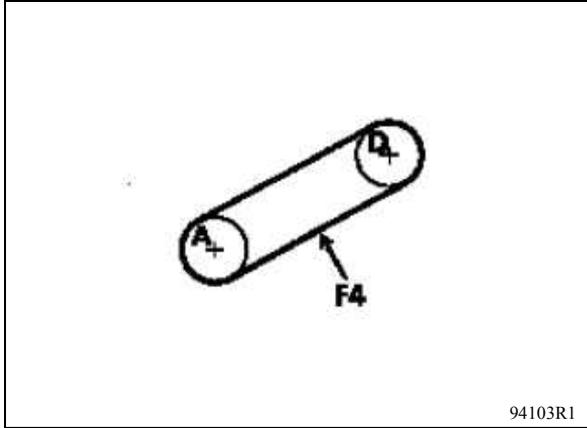


ENGINE AND PERIPHERALS

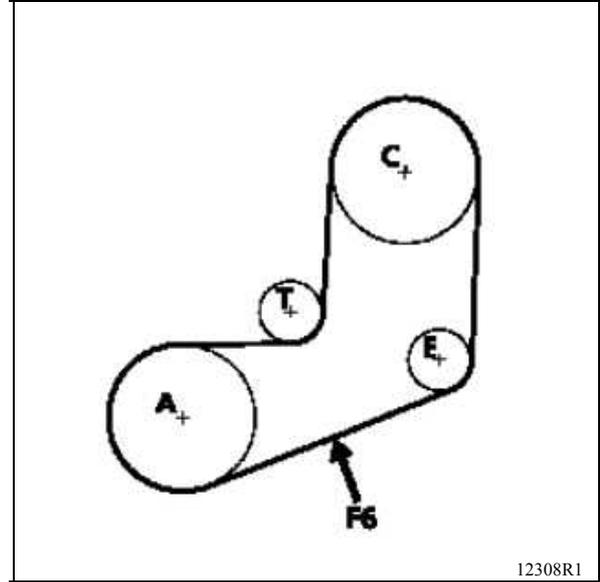
Engine repair

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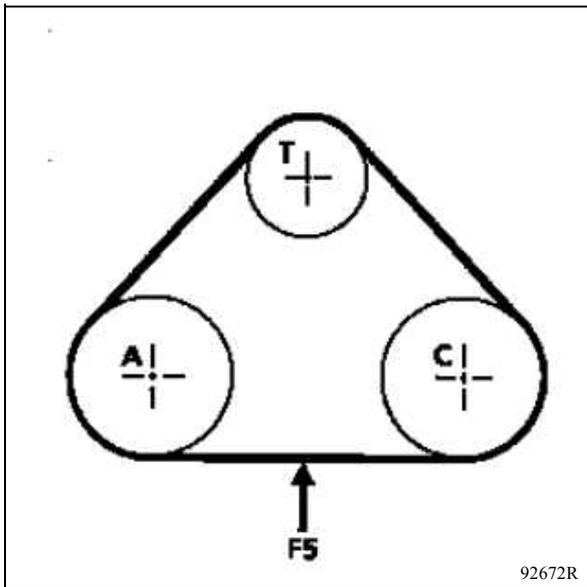
Power assisted steering



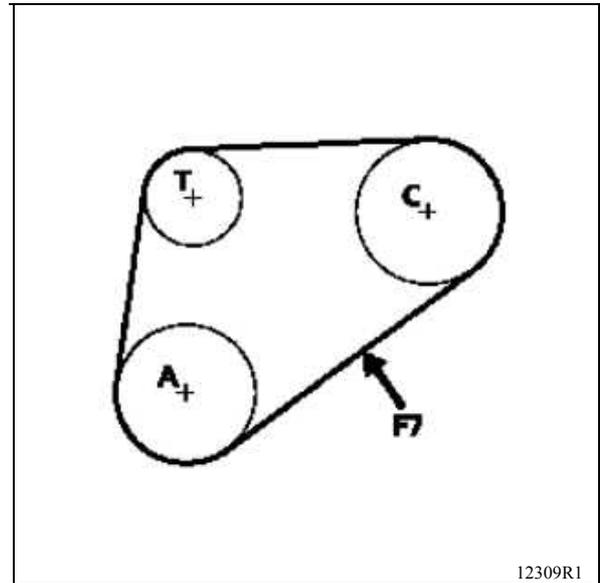
Air conditioning



Air conditioning



Air conditioning

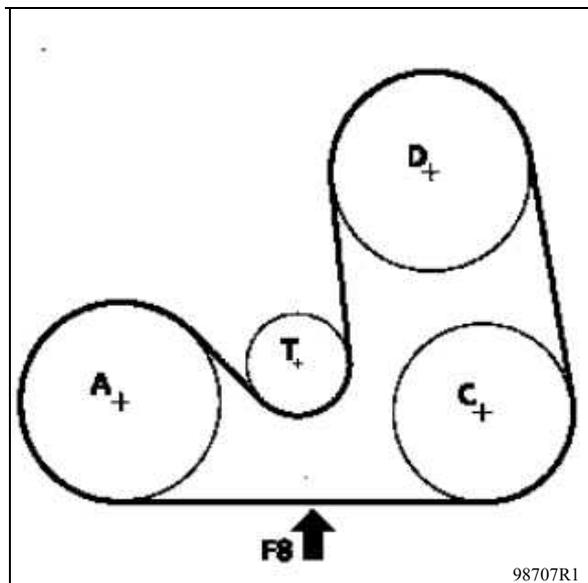


ENGINE AND PERIPHERALS

Engine repair

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Air conditioning and Power assisted steering



Power assisted steering and Air conditioning

