

RENAULT

Workshop Repair Manual

ENGINE (petrol)

4 cylinders - K4M

Engine fitted to :

- MEGANE : XA0B K4M 700
 K4M 701

 XA04 K4M 700
 K4M 701
- LAGUNA : X561 K4M 720

 X568 K4M 720

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USING THE MANUAL

This manual contains two major sections:

- **specifications,**
- **engine repair.**

For the repair of a component on the vehicle, refer to the Workshop Repair Manual or Technical Note for the vehicle.

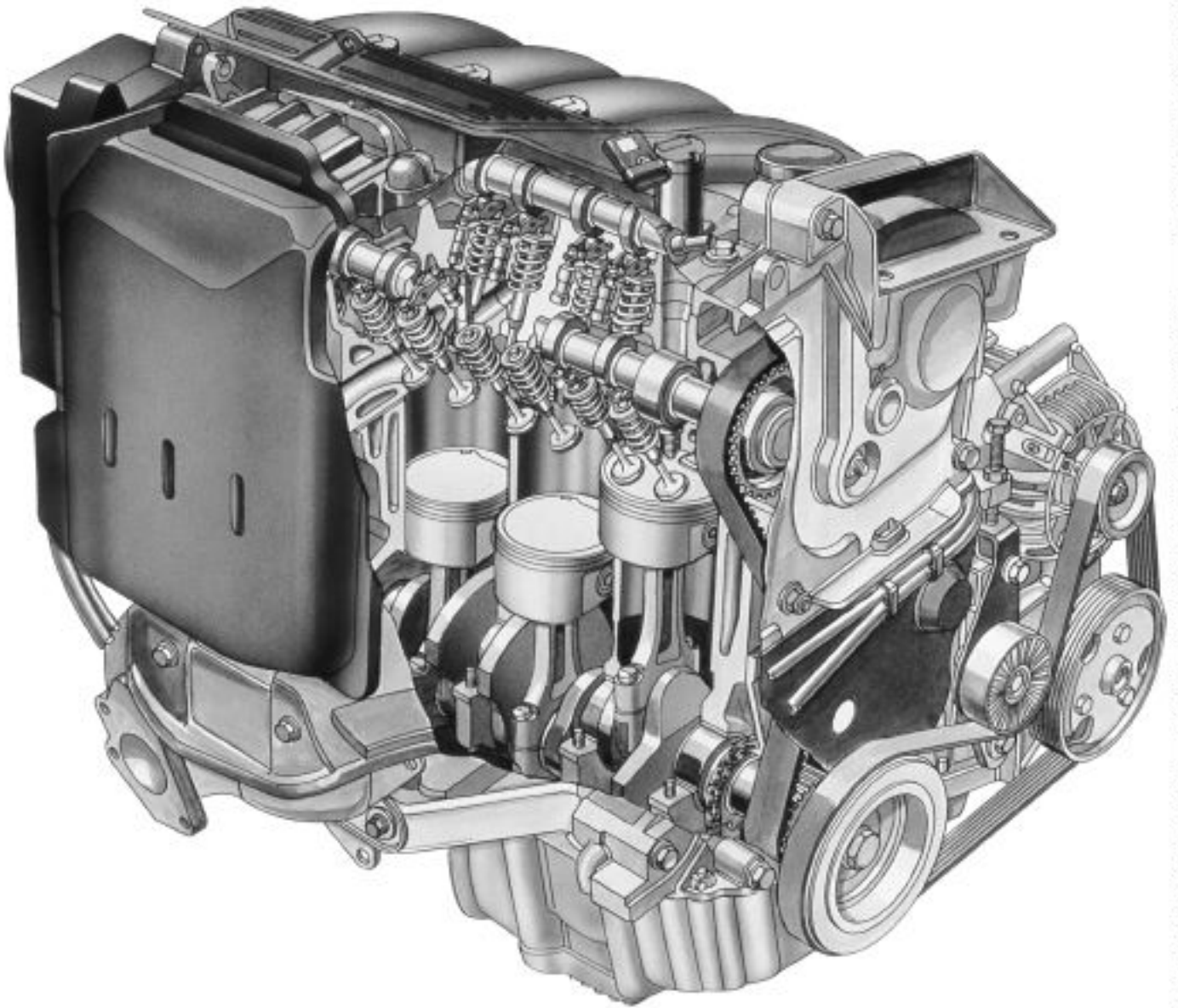
UNITS OF MEASUREMENT

- All dimensions are expressed in **mm** (unless stated otherwise).
- Tightening torques are given in decaNewton-meters **daN.m**
(reminder: **1 daN.m = 1.02 m.kg**).
- Pressures are given in **bar**
(reminder: **1 bar = 100 000 Pa**).

TOLERANCES

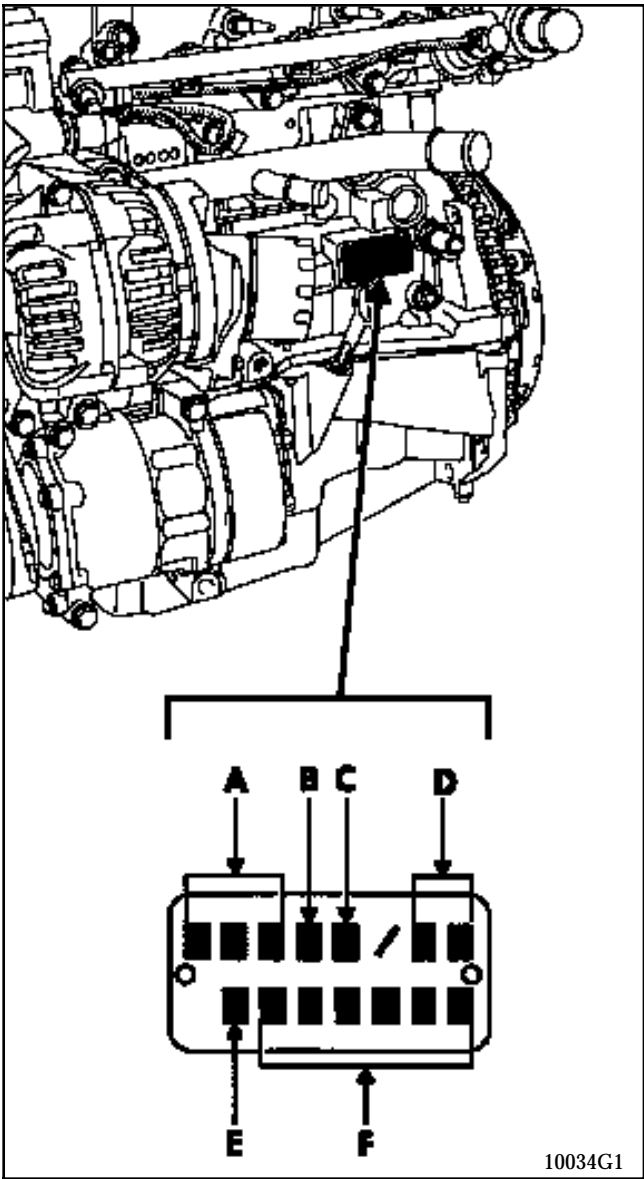
Tightening torques where no tolerance is specified should be observed to :

- in **Degrees** ($\pm 3^\circ$).
- in **daN.m** ($\pm 10 \%$).



IDENTIFICATION OF THE ENGINE

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



This shows:

- A : the engine type
- B : the engine approval number
- C : the identification of **Renault**
- D : the engine suffix
- E : the factory where the engine was made
- F : the engine fabrication number

Engine	Suffix	Capacity (cm ³)	Bore (mm)	Stroke (mm)	Ratio
K4M	700 701 720	1598	79.5	80.5	10/1

ENGINE AND PERIPHERALS
Tightening torques (in daN.m or in degrees)



10

Top of engine:

Description	Tightening torque
Air filter unit mounting bolt	0.9
Inlet air distributor bolt (see tightening order)	0.9
Lower inlet distributor	2
Throttle body bolt ***	1.3
Oil decanter bolt (see tightening order) ***	1.3
Camshaft bearing block bolt	(see tightening order)
Cylinder head coolant pipe outlet bolt	1
Camshaft pulley nut	3 and apply an angle of 84°
Cylinder head bolt	*
Cylinder head suspended mounting nut and bolt	4.1
Spark plugs	2.1
Coil bolt***	1.3
Power assisted steering pump bolt	2.1
Alternator bolt	2.1
Air conditioning compressor bolt	2.1
Multifunction mounting bolt	**
Exhaust manifold nut	1.8

* See tightening procedure on page 10-6.
** See tightening table on page 10-72.
*** **IMPORTANT:** Self tapping bolts which **MUST** be tightened to the correct torque using a torque wrench.



Bottom of engine:

Description	Tightening torque
Sump bolt (see tightening order)	0.8 and final tightening to 1.4
Crankshaft pulley bolt	2 and apply an angle of $135^{\circ} \pm 15^{\circ}$
Crankshaft closure plate (see tightening order)	1.1
Flywheel bolt	5 to 5.5
Clutch bolt	1.8
Oil pump bolt	2.2 to 2.7
Big end nut	4.3
Crankshaft bearing cap bolt	2.5 and apply an angle of $47^{\circ} \pm 5^{\circ}$
Water pump bolt (see tightening order) :	-
M6	1.1
M8	2.2
Timing pulley bolt	4.5
Timing tension wheel nut	2.7

CYLINDER HEAD

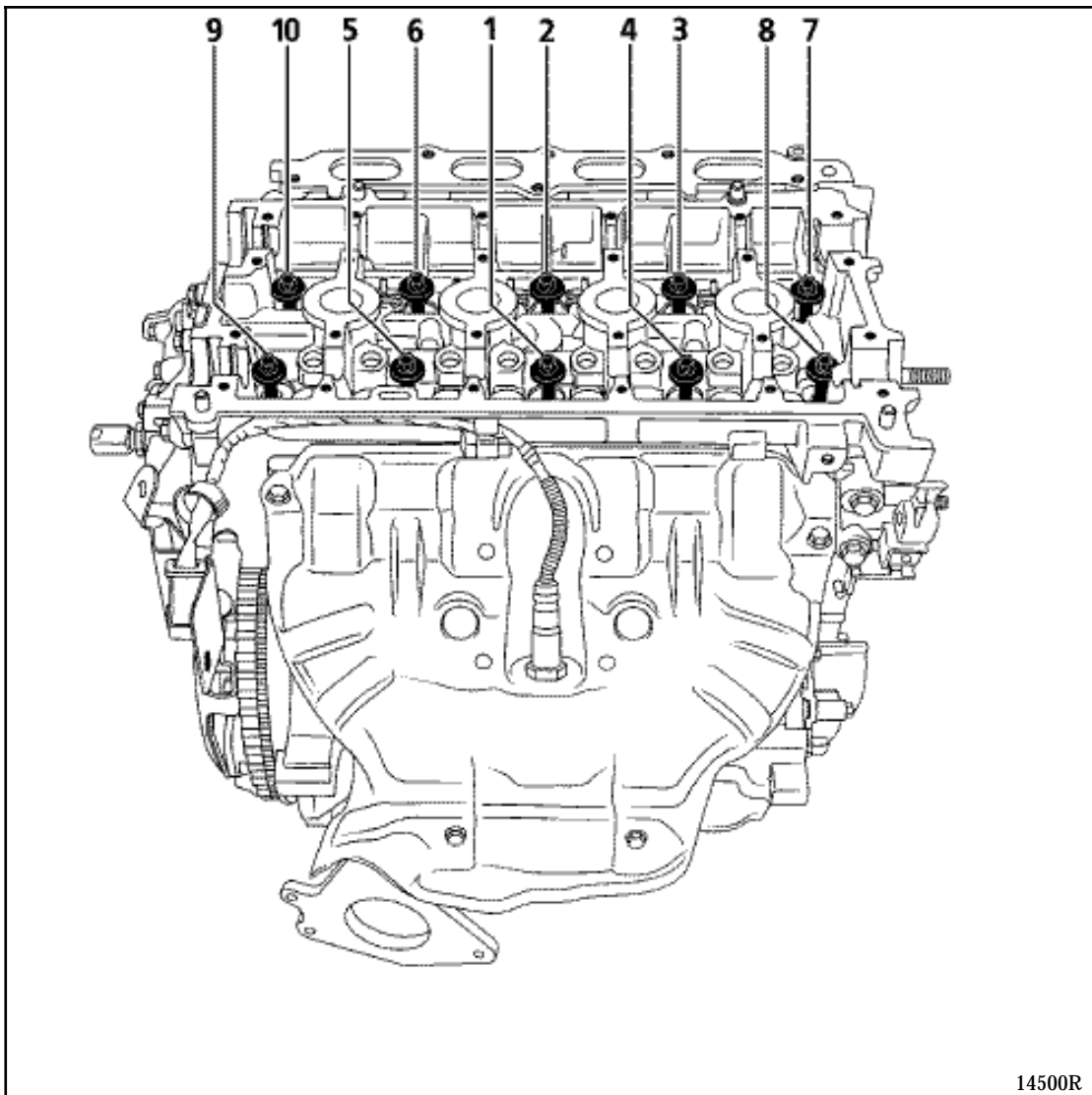
The bolts may be re-used if the length under the head does not exceed 117.7 mm (otherwise replace all the bolts).

Method for tightening the cylinder head

REMINDER: use a syringe to remove any oil from the cylinder head mounting holes to ensure the bolts are correctly tightened.

Do not lubricate new bolts. If the old bolts are re-used, they must be lubricated with engine oil however.

Tighten all the bolts to **2 daN.m** in the order recommended below.



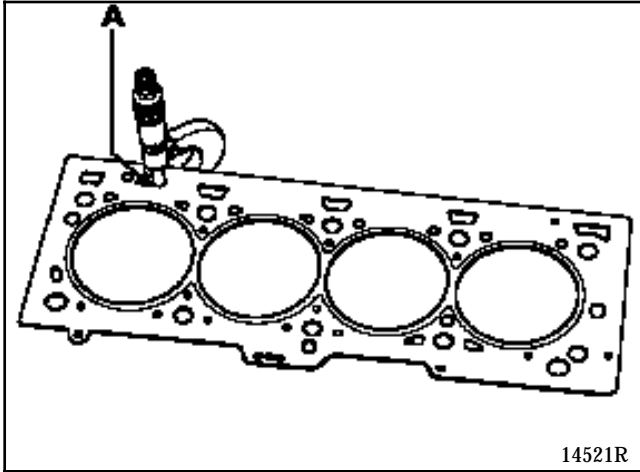
Check that all the bolts are correctly tightened to **2 daN.m**, then angle tighten (bolt by bolt) by **240° ± 6°**.

There is no cylinder head bolt retightening operation after this procedure has been applied.

Thickness of the cylinder head gasket

The thickness of the cylinder head gasket is measured at (A) :

- new gasket thickness: **0.96 ± 0.06 mm,**
- compressed gasket thickness: **0.93 ± 0.06 mm.**

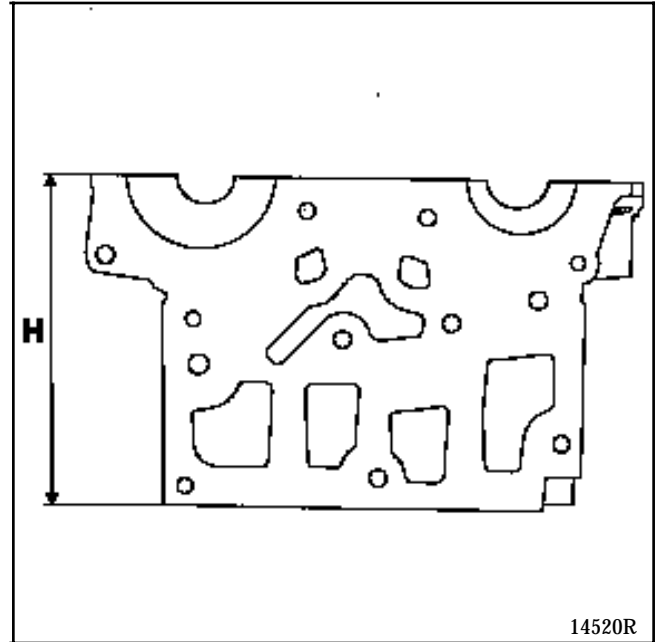


Firing order

1 - 3 - 4 - 2.

Cylinder head height

H = 137 mm.



Gasket face bow: **0.05 mm.**

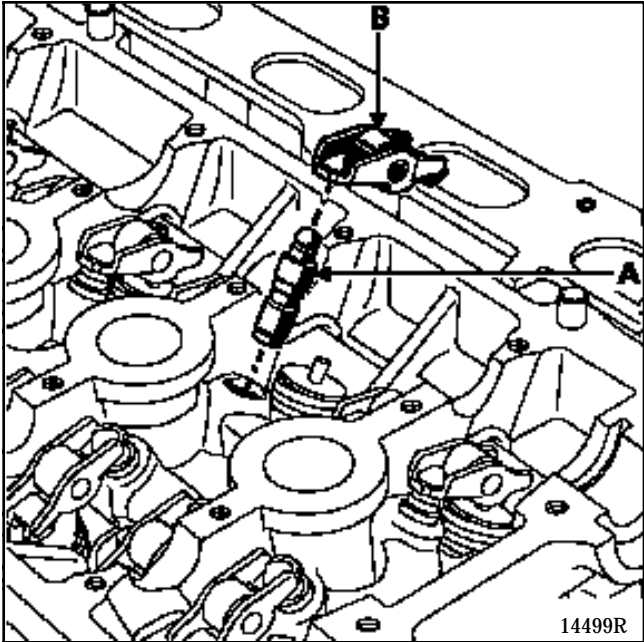
Regrinding is not permitted.

Check the cylinder head for any cracks.

Tightening torque for spark plugs: **2.1 daN.m.**

Hydraulic tappets

This engine is fitted with hydraulic stops (A) and roller rockers (B).



VALVES

Valve lift (in mm)

Inlet: 9.221
Exhaust: 8.075

Stem diameter (in mm)

Inlet: 5.484 ± 0.01
Exhaust: 5.473 ± 0.01

Head diameter (in mm)

Inlet: 32.7 ± 0.12
Exhaust: 27.96 ± 0.12

Port angle

Inlet and exhaust : 90° 15'

Valve length (in mm)

Inlet: 109.32
Exhaust: 107.64

VALVE SEATS

Seat angle α

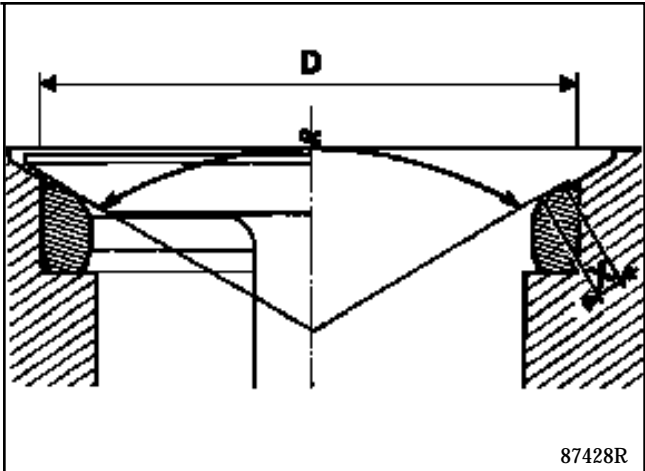
Inlet and exhaust : 89°

Port width X (in mm)

Inlet: 1.3 ^{+1.4}₀
Exhaust: 1.4 ^{+1.3}₀

External diameter D (in mm)

Inlet: 33.542 ± 0.006
Exhaust: 28.792 ± 0.006



VALVE GUIDES

Length (in mm)

Inlet and exhaust: 40.5 ± 0.15

External diameter of the guide (in mm)

Inlet and exhaust: $11 \begin{smallmatrix} + 0.05 \\ + 0.068 \end{smallmatrix}$

Internal diameter of the guide (in mm)

Inlet and exhaust

Non machined : $5 + 0.075$

Machined* : $5.5 + 0.018$

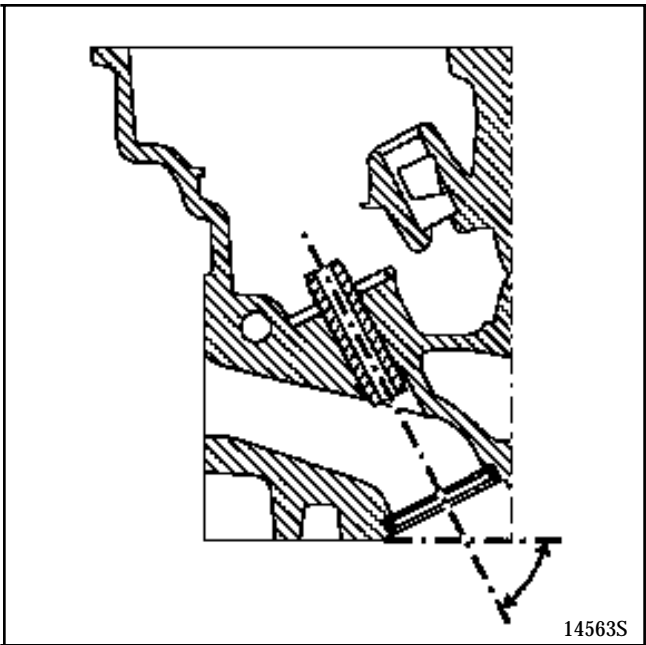
* The dimension is measured with the guide fitted into the cylinder head.

The inlet and exhaust guides have valve stem seals which also serve as a lower stop washer for the valve spring.

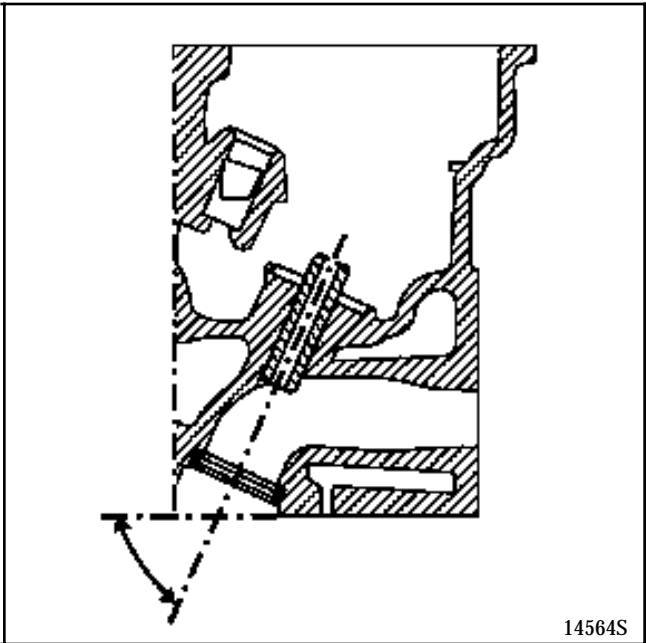
NOTE : do not lubricate the valve stem seals before fitting them.

Inlet and exhaust guide angle (in degrees)

Inlet: $63^{\circ} 30'$

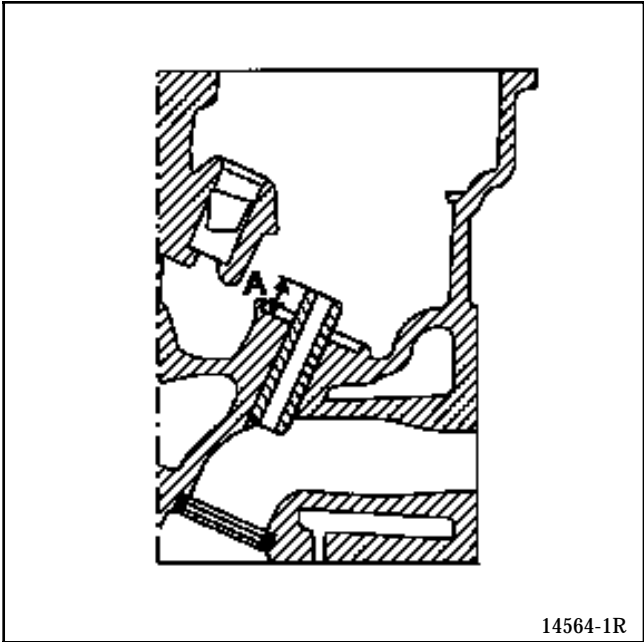


Exhaust: 66°



Position of the inlet and exhaust guides (in mm)

Inlet and exhaust: $A = 11 \pm 0.15$



Valve spring (in mm)

Free length: 41.30

Length under load:

19 daN	34.50
59 daN	24.50

Length of spring (coils touching): 23.20

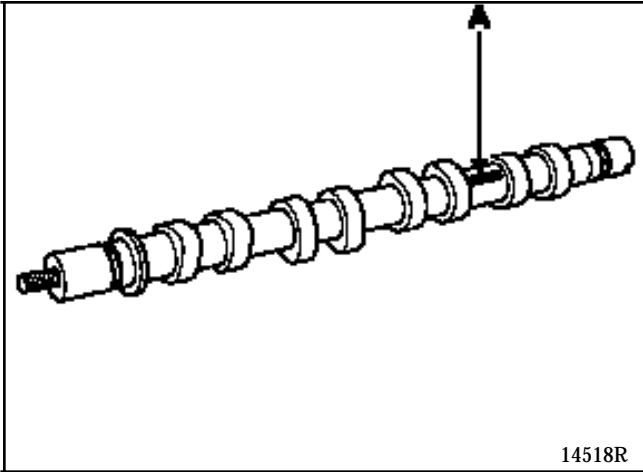
Internal diameter: 18.80

External diameter: 27

Oval type wire section.

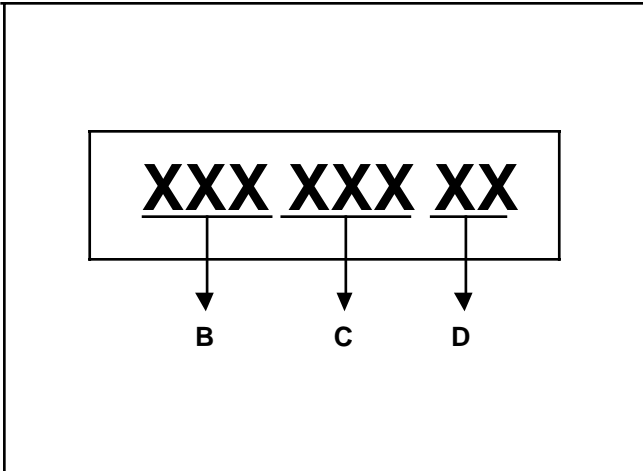
CAMSHAFTS

The camshafts are identified by a marking (A).



Detail of the marking:

- marks B and C are for the supplier only,
- mark D is used to identify the camshafts:
 - AM = Inlet
 - EM = Exhaust



End play (in mm)

Between **0.08** and **0.178**.

Number of bearings: **6**

Diameter of cylinder head camshaft bearings (in mm)

Flywheel end	
1	25 $\begin{smallmatrix} + 0.061 \\ + 0.04 \end{smallmatrix}$
2	
3	
4	
5	
6	28 $\begin{smallmatrix} + 0.061 \\ + 0.04 \end{smallmatrix}$
Timing end	

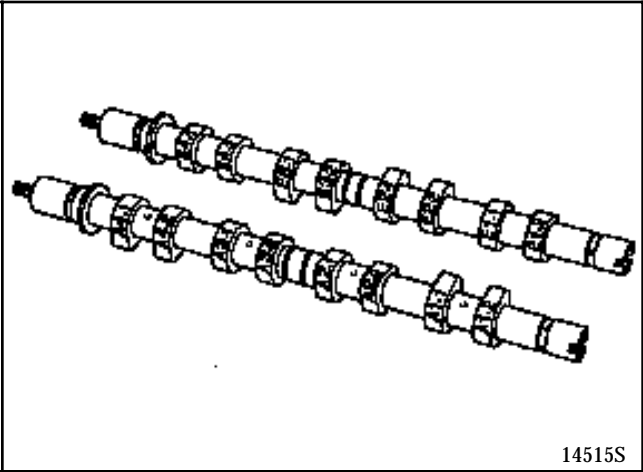
Diameter of camshaft bearings (in mm)

Flywheel end	
1	25 - 0.021
2	
3	
4	
5	
6	28 - 0.021
Timing end	

Timing diagram (cannot be checked)

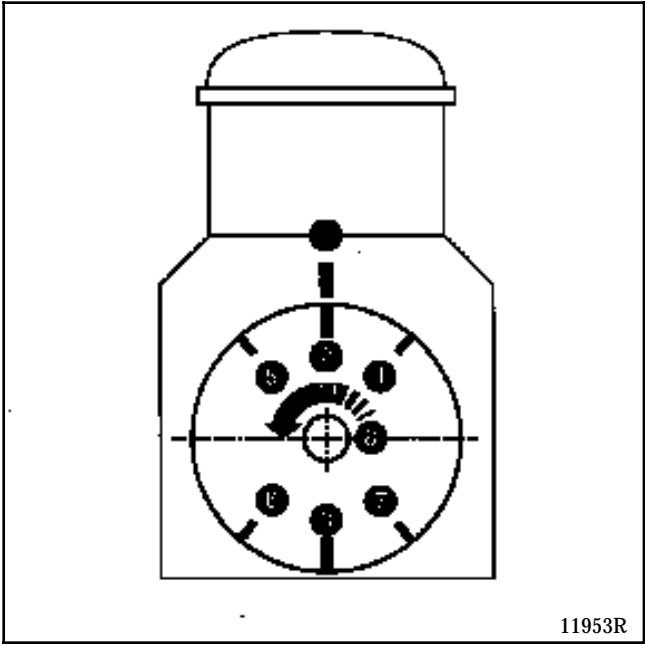
	Inlet camshaft		Exhaust camshaft	
	Cam 1	Cam 2	Cam 1	Cam 2
Inlet open retard*	- 1	- 5	-	-
Inlet close retard	18	22	-	-
Exhaust open advance	-	-	18	14
Exhaust close advance**	-	-	- 8	- 4

- * Inlet open retard is negative, so the valves are opened after TDC.
- ** Exhaust close advance is negative so the valves close before TDC.



A 4 - 1 = Inlet for cylinder 4 and cam n° 1.

E 4 - 1 = Exhaust for cylinder 4 and cam n° 1.



- 1 Cylinder block fixed TDC mark
- 2 Flywheel moving TDC mark
- 3 Flywheel moving BDC mark
- 4 Inlet open retard (**ROA**)
- 5 Exhaust close advance (**AFE**)
- 6 Inlet close retard (**RFA**)
- 7 Exhaust open advance (**AOE**)

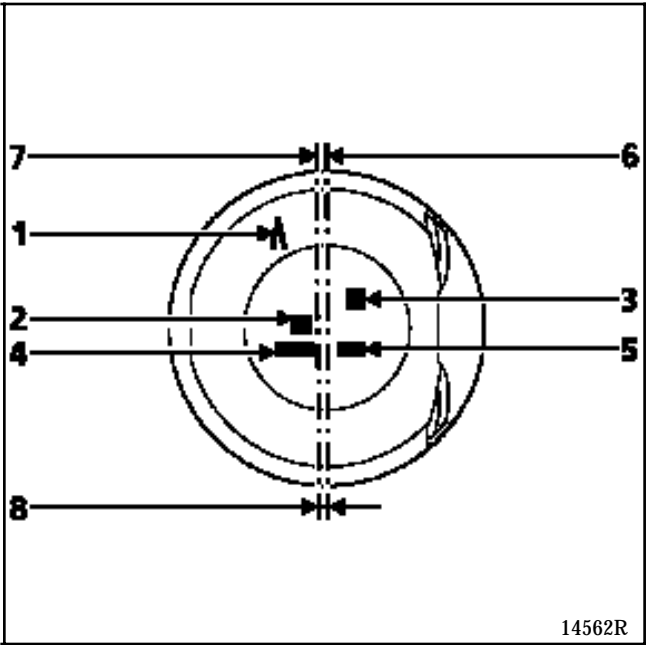
PISTONS

SMP piston

The gudgeon pin is fitted using tools **A13**, **C13** and **B10**.

The gudgeon pin is press fitted in the connecting rod and is fully floating in the piston.

Piston marking



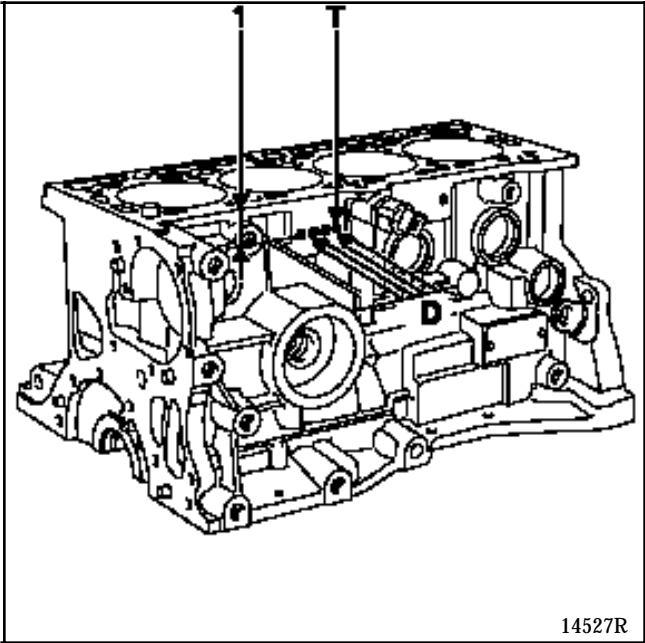
- 1 Piston direction Δ , flywheel end
- 2 Supplier's marking
- 3 Piston class (**A-B-C**)
- 4 Supplier's marking
- 5 Supplier's marking
- 6 Piston axis of symmetry
- 7 Axis of gudgeon pin hole
- 8 Offset between axis of gudgeon pin hole (7) and piston axis of symmetry (6) is **0.9 mm**

Piston diameter in relation to cylinder block diameter

Piston reference	Piston diameter (mm)	Cylinder diameter (mm)
A	79.470 inclusive to 79.480 exclusive	79.500 inclusive to 79.510 exclusive
B	79.480 inclusive to 79.490 exclusive	79.510 inclusive to 79.520 exclusive
C	79.490 inclusive to 79.500 inclusive	79.520 inclusive to 79.530 inclusive

Cylinder block barrel class

IMPORTANT: the pairing of diameters between the pistons and barrels in the cylinder block must be observed. Using the position of the "T" holes in relation to the cylinder block gasket face allows identification, in the nominal diameter, of the tolerance class of the barrels and, consequently, the diameter of the corresponding pistons (see table of pairings below).

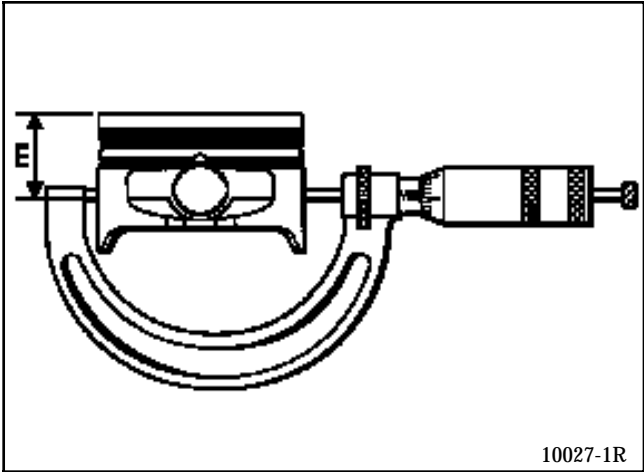


- NOTE :** the marking includes:
- 1 : gives the diameter class reference A, B or C,
 - D : gives the position of the class for each cylinder.

Position of holes T	Class reference
1 = 17 mm	A
2 = 27 mm	B
3 = 37 mm	C

Measuring the piston diameter

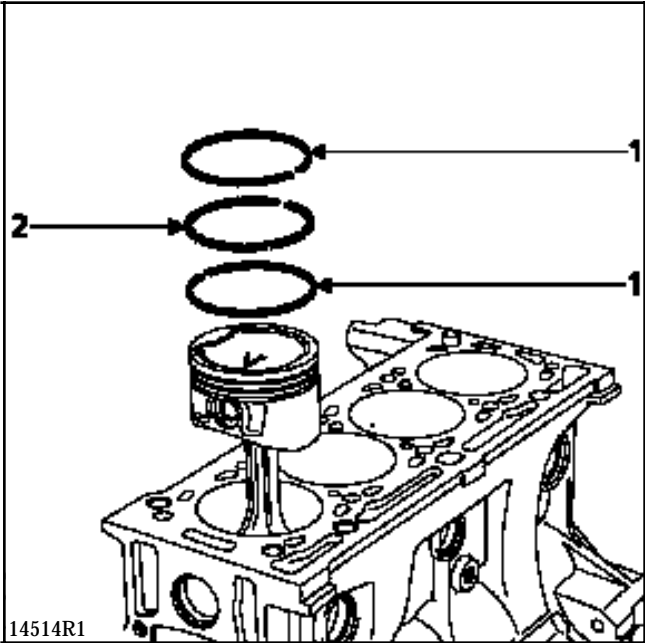
The diameter should be measured at : $E = 42 \pm 0.01$ mm.



PISTON RINGS

Three piston rings (thickness in mm)

- Upper piston ring: 1.2
- Sealing: 1.5
- Scraper in three parts: 2.5
 - two steel rails (1),
 - one spring ring (2).



Play at cut

Piston ring	Play at cut (in mm)
Upper	0.225 ± 0.075
Sealing	0.5 ± 0.1
Scraper	0.9 ± 0.5

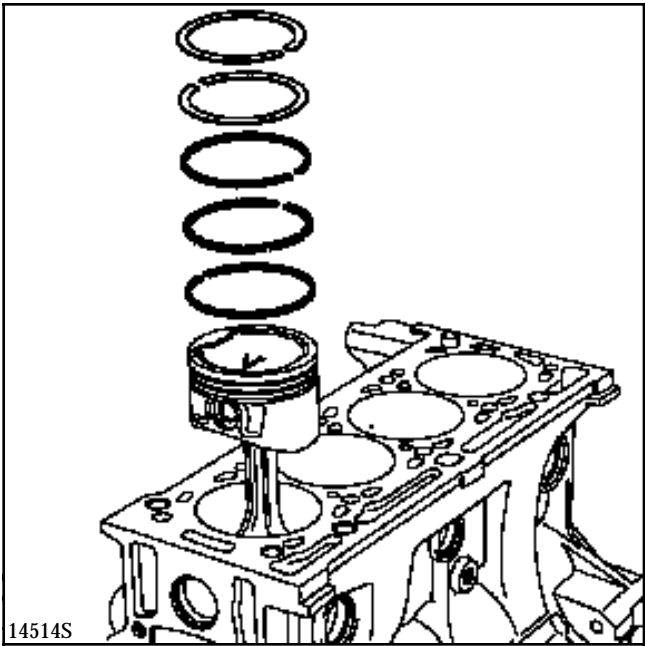
Gudgeon pin (in mm)

- Length: 61.7 to 62
- External diameter: 19.986 to 19.991
- Internal diameter: 11.6 (maximum)

Fitting the piston rings

The piston rings, which are set in the factory, must move freely in their grooves.

Ensure they are fitted in the correct direction.



CONNECTING RODS

Big end side clearance (in mm) **0.31 to 0.604**

Distance between big and little ends (in mm) **128 ± 0.035**

Big end diameter (in mm) **48.5 ± 0.25**

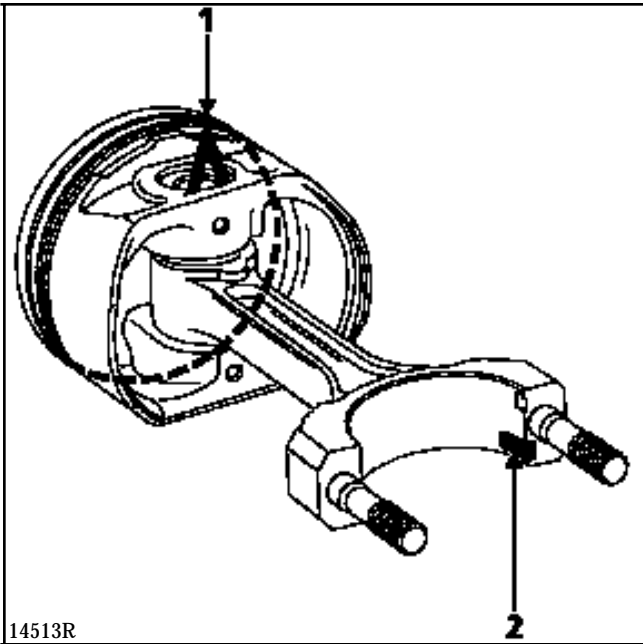
Little end diameter (in mm) **19.945 to 19.958**

IMPORTANT: never use a punch for marking the big end caps in relation to their bodies, to avoid starting any cracking in the connecting rod. Use an indelible pencil.

The maximum permitted weight difference for the same engine is **6 grammes**.

Fitting direction for the connecting rod in relation to the piston

Ensure the Δ (1) on the piston crown is at the top and the bearing shell stop lug (2) for the big end is at the bottom (as shown on the diagram below).



CRANKSHAFT

Number of bearings: 5

Main bearing journals:
- nominal diameter (in mm) see table below.

Crankpins:
- nominal diameter (in mm) : 43.97 ± 0.01

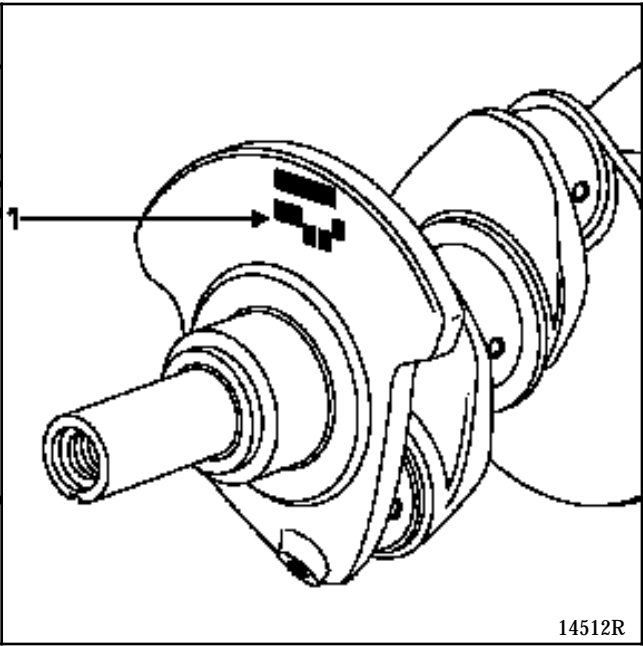
Crankshaft side clearance (in mm) :
- without side shim wear: 0.045 to 0.252
- with side shim wear: 0.852

The side shims are fitted to bearing n° 3.

Determining the crankshaft bearing shell class
(original fitting)

Marking on crankshaft (example)

Reference for crankshaft main bearing journal
diameter (1).



Detail of the marking (1)

Journal number					Diameter class
1*	2	3	4	5	
B	B	C	C	B	
					A = D1
					B = D2
					C = D3

* Flywheel end

Table of different journal diameter classes

Class marking on crankshaft	Journal diameter (in mm)
A = D1	47.990 inclusive to 47.997 exclusive
B = D2	47.997 inclusive to 48.003 exclusive
C = D3	48.003 inclusive to 48.010 inclusive

CYLINDER BLOCK

The diameters of the cylinder block bearings (5) are marked (drilled) on it (6) above the oil filter.

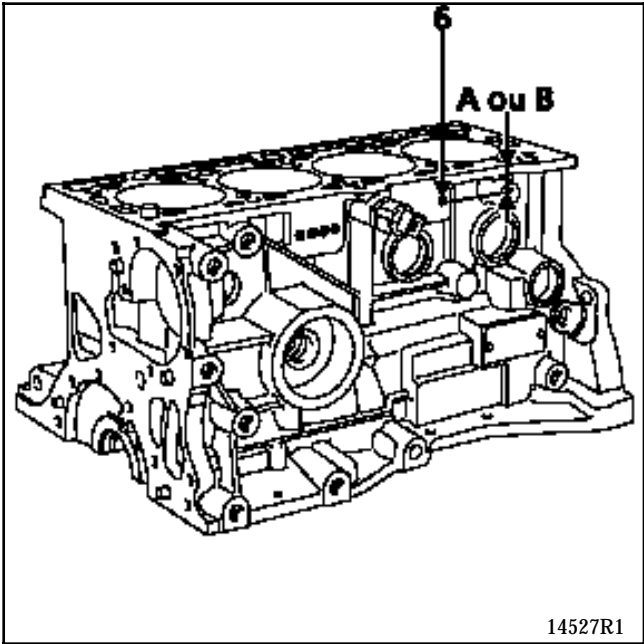
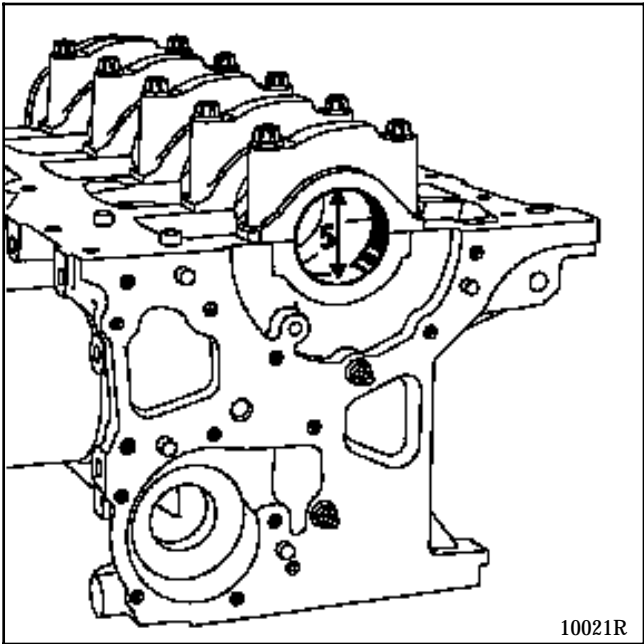


Table of cylinder block bearing diameters

Position of holes (6)	Class reference	Cylinder block bearing diameter (in mm)
A = 17 mm	1 or blue	51.936 inclusive to 51.942 exclusive
B = 27 mm	2 or red	51.942 inclusive to 51.949 inclusive

NOTE : the marking includes:
- A - B : gives the class diameter 1 or 2.

Pairing of crankshaft bearing shells

Journal diameter class			
	D1	D2	D3
1*	C1 = yellow 1.949 to 1.955	C2 = blue 1.946 to 1.952	C3 = black 1.943 to 1.949
2*	C4 = red 1.953 to 1.959	C1 = yellow 1.949 to 1.955	C2 = blue 1.946 to 1.952
Bearing shell thickness and class			

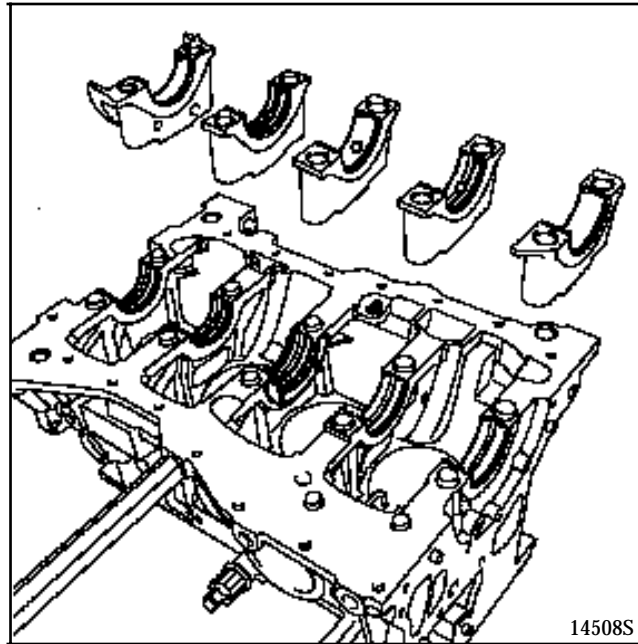
* Class of diameters for cylinder block crankshaft bearings.

NOTE : the Parts Department only supplies class C2 (blue).

CRANKSHAFT BEARING SHELLS

Fitting direction:

- on the **cylinder block**, fit the shells with the groove to all bearings,
- on the **bearing caps**, fit the shells with the groove to bearing caps 2 - 4 and the **non-grooved** shells to bearing caps 1 - 3 - 5.



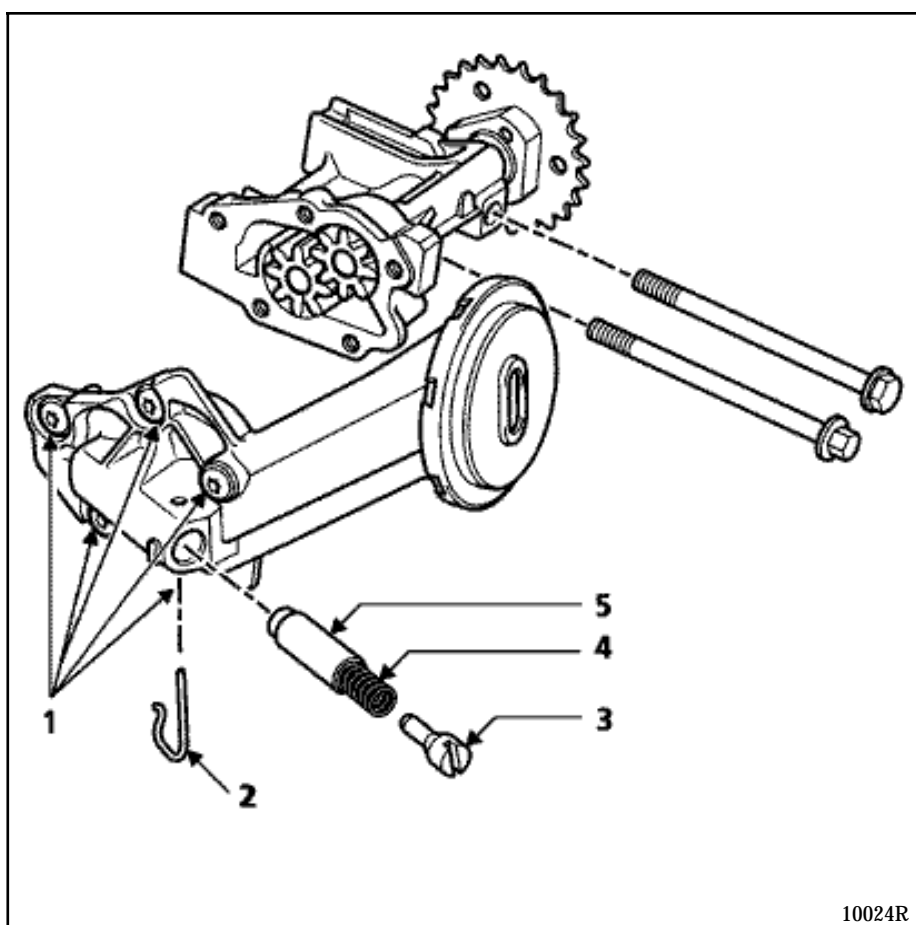
OIL PUMP

The pump is of the **geared** type.

Removal

Remove the five bolts (1), take off the cover and remove:

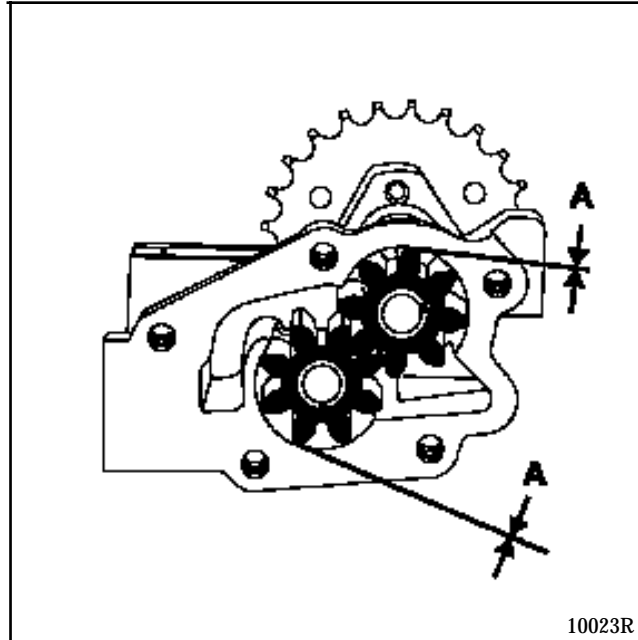
- the clip (2),
- the stop (3),
- the spring (4),
- the valve (5).



Checking the oil pump clearances

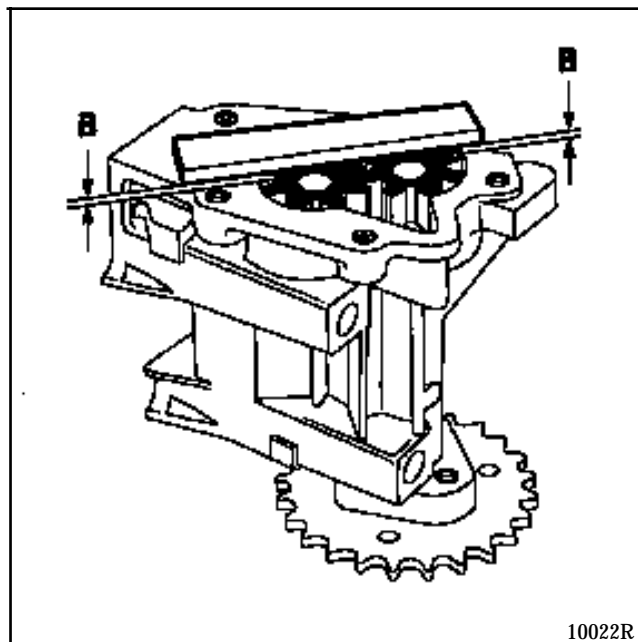
- Clearance A (in mm)

- Minimum : 0.110
- Maximum : 0.249



- Clearance B (in mm)

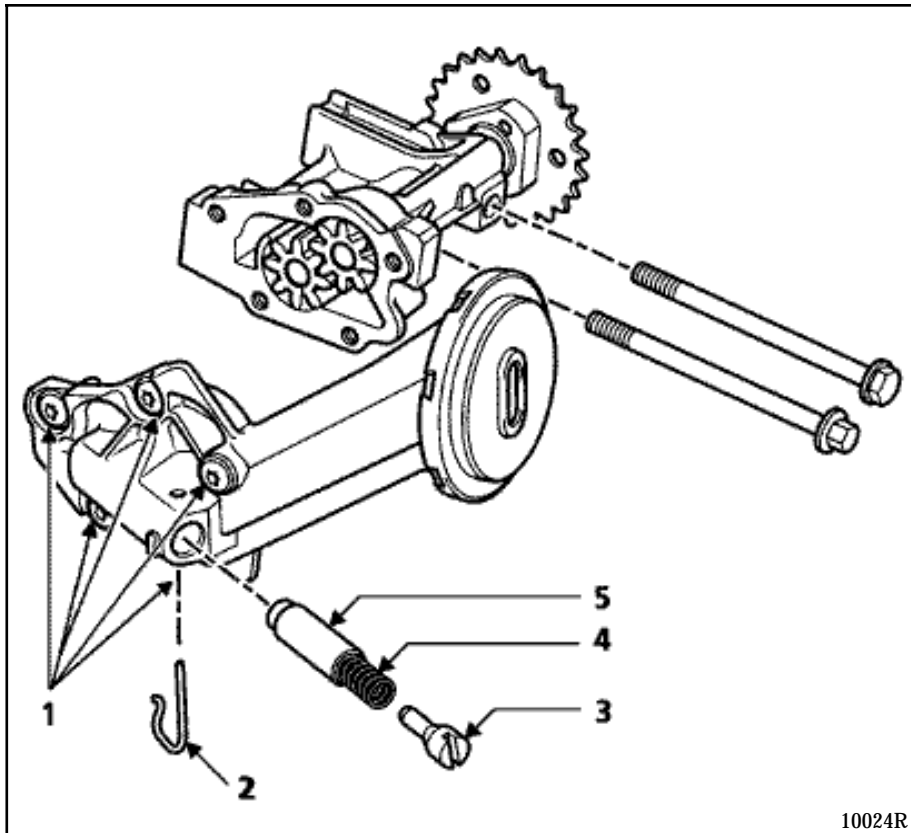
- Minimum : 0.020
- Maximum : 0.086



Refitting

Refit:

- the valve (5),
- the spring (4),
- the stop (3),
- the clip (2) **aligning it as shown in the diagram below,**
- the pump cover (bolts 1).



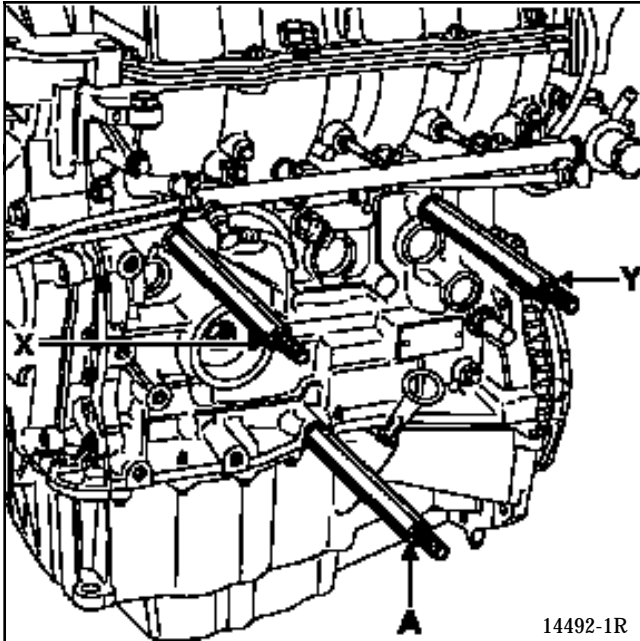
ENGINE AND PERIPHERALS

Specifications

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Mounting the engine on support tool Mot. 792-03 and rod Mot. 1378.

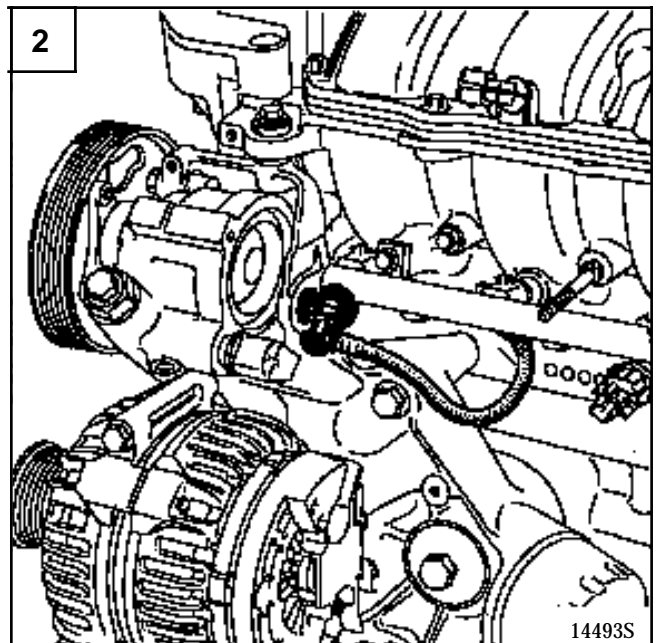
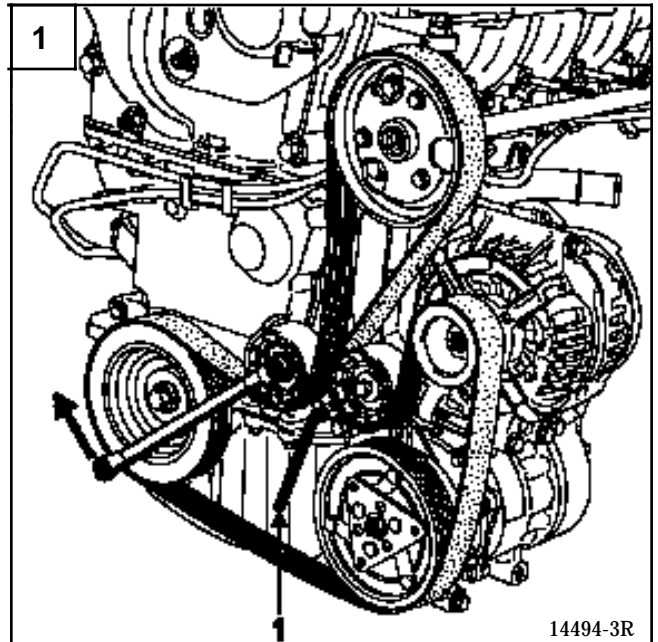
Rods (A), (X) and (Y) Mot. 1378 are secured to the cylinder block so that they fit into the holes (20, 32, 33) on the plate.

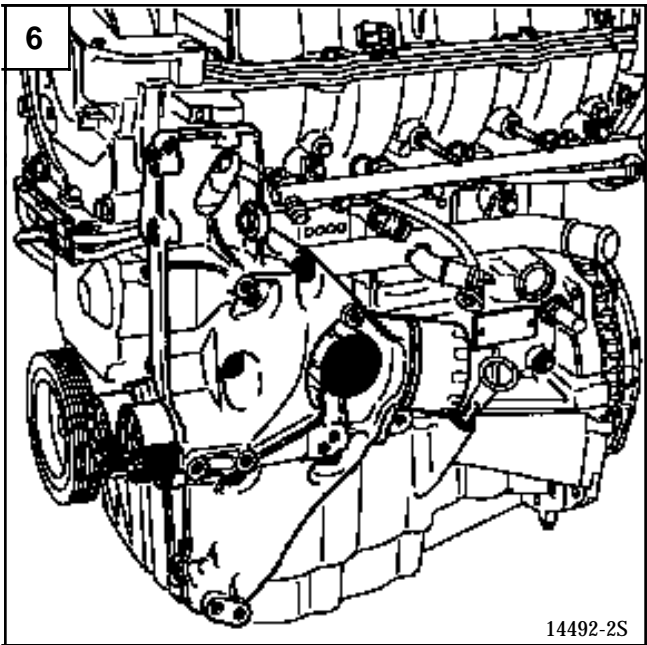
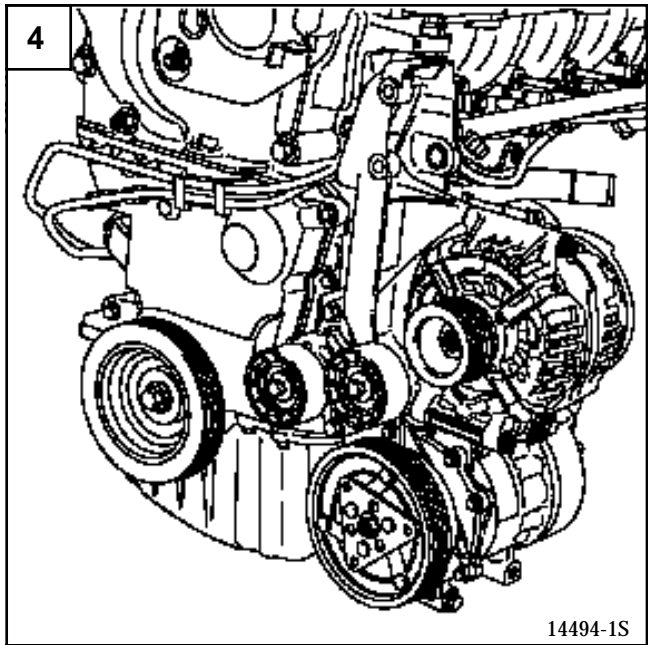
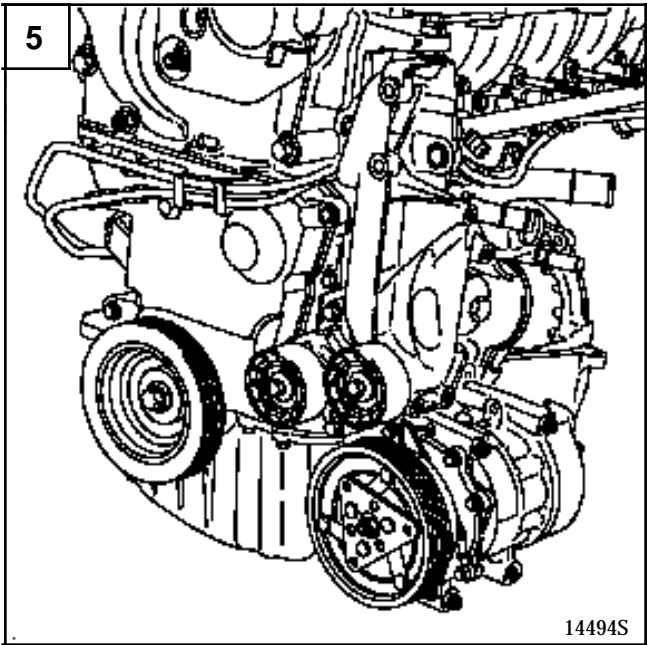
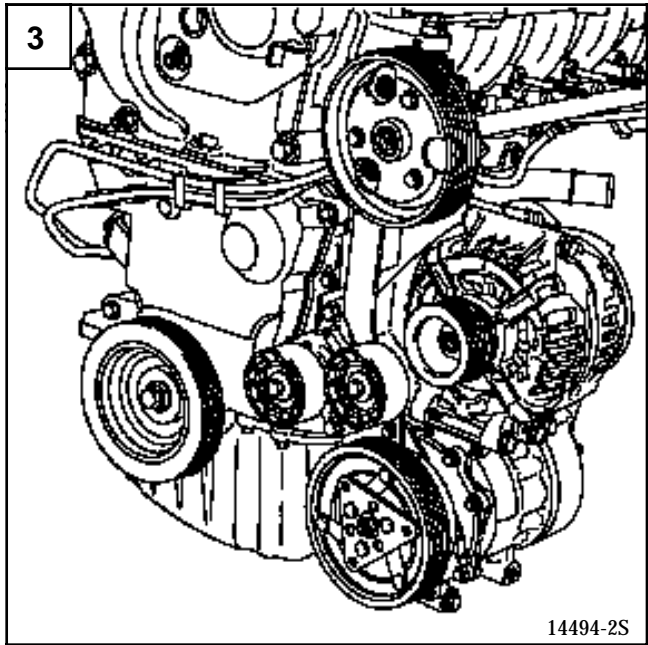


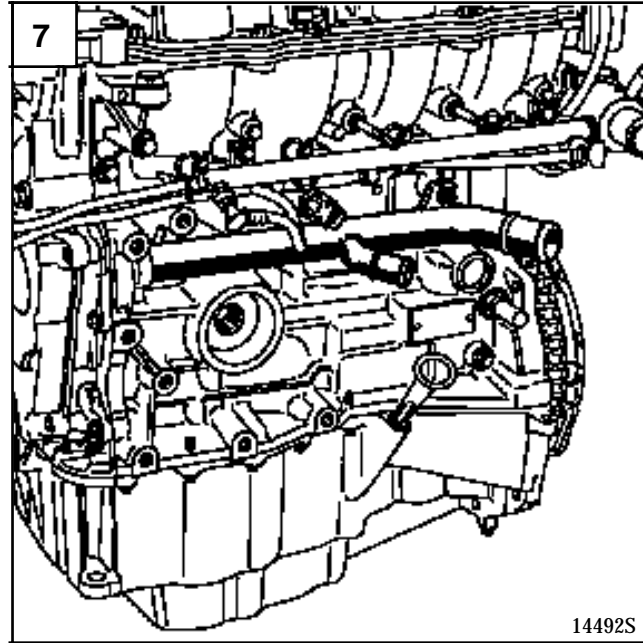
The engine wiring harness must be removed and the engine oil drained before the rods are fitted to the engine.

Remove the various components (diagrams 1 to 7).

Tilt the wrench to the left to slacken the belt. Lock the tension wheel using a 6 mm allen key (1).







CONSUMABLES

Type	Quantity	Component concerned	Part No.
SOLVENT S 56	-	Cleaning parts	77 01 421 513
DECAJJOINT	Coat	Cleaning gasket surfaces	77 01 405 952
RHODORSEAL 5661	Coat	Crankshaft bearing cap	77 01 404 452
Loctite 518	Coat	Crankshaft nose cover, water pump	77 01 421 162
Loctite FRENETANCH	1 to 2 drops	Water pump bolts	77 01 394 070

PRECAUTIONS

WASHING THE ENGINE

Protect the timing belt and alternator belt from splashes of water and cleaning products.

Do not permit water to enter the air inlet pipes.

FITTING OFFSET THREADS

The threaded holes of all parts in the engine may be repaired using offset threads, **except those for the cylinder head cover.**

PARTS TO BE RENEWED WHEN THEY ARE REMOVED

- All seals and gaskets.
- Flywheel bolts.
- Valve guides.
- Crankshaft bearing bolts.
- Camshaft pulley nuts.
- Bearing cap nuts.
- Belts.
- Timing belt tension wheel.
- Timing belt pulley.

PREPARATION OF THE USED ENGINE FOR RETURN

The engine must be cleaned and drained (oil and coolant).

Leave on the used engine or include in the return packaging:

- dipstick,
- flywheel or drive plate,
- clutch mechanism and disc,
- water pump,
- crankshaft pulley,
- cylinder head cover,
- plugs,
- belt tension wheel,
- pressure switch and temperature switch,
- timing cover.

Do not forget:

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

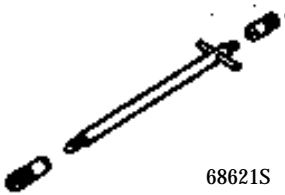







The used engine must be returned mounted on the base under the same conditions as the renovated engine:

- plastic plugs and covers in place,
- cardboard cover over everything.

ENGINE AND PERIPHERALS

Special tooling required

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Diagram	Methods reference	Part No.	Description
 68621S	Mot. 104	00 01 309 900	Tool for centring cylinder head gasket
 69716S1	Mot. 445	00 00 044 500	Oil filter wrench
 76641-1S1	Mot. 574-22	00 00 057 422	Tooling for replacing gudgeon pins.. Boxed kit.
 76554-1S1	Mot. 574-24	00 00 057 424	Addition to kit Mot. 574-22.
 99614S	Mot. 582-01	00 00 058 201	Flywheel locking tool
 76666S	Mot. 588	00 00 058 800	Cylinder liner retaining tool
 77889S1	Mot. 591-02	00 00 059 102	Magnetised flexible extension for angular wrench for tightening cylinder head
 78181S	Mot. 591-04	00 00 059 104	Angular wrench for tightening cylinder head with 12.7 mm square drive and index.

ENGINE AND PERIPHERALS
Special tooling required

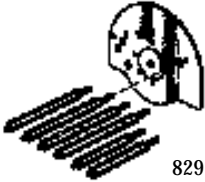






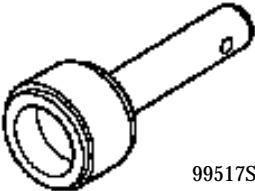






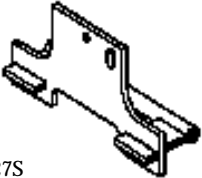

Diagram	Methods reference	Part No.	Description
 82919S	Mot. 792-03	00 00 079 203	Engine support plate
 80359S	Mot. 799-01	00 00 079 901	Locking tool for notched timing belt sprockets
 96898S	Mot. 1129-01	00 00 112 901	Tool for fitting crankshaft seal (flywheel end)
 97160-1S1	Mot. 1329	00 00 132 900	Cover for removing oil filter
 98503S	Mot. 1335	00 00 133 500	Pliers for removing valve stem seals
 10041S1	Mot. 1368	00 00 136 800	Tool for tightening pulley bolt
 84900S1	Mot. 1378	00 00 137 800	Pins marked X and Y, addition to Mot. 792-03 engine support on Desvil stand.
 99517S	Mot. 1385	00 00 138 500	Tool for fitting crankshaft seal (timing end)

Diagram	Methods reference	Part No.	Description
 14926S	Mot. 1487	00 00 148 700	Tool for refitting inlet camshaft plug
 14926S	Mot. 1488	00 00 148 800	Tool for refitting exhaust camshaft plug
 14924S	Mot. 1489	00 00 148 900	TDC pin
 14922S	Mot. 1490	00 00 149 000	Tool for locking camshaft pulleys
 14925S	Mot. 1491	00 00 149 100	Tool for fitting camshaft seals
 14923S	Mot. 1495	00 00 149 500	Socket for removing and refitting oxygen sensor
 14927S	Mot. 1496	00 00 149 600	Tool for setting camshafts.

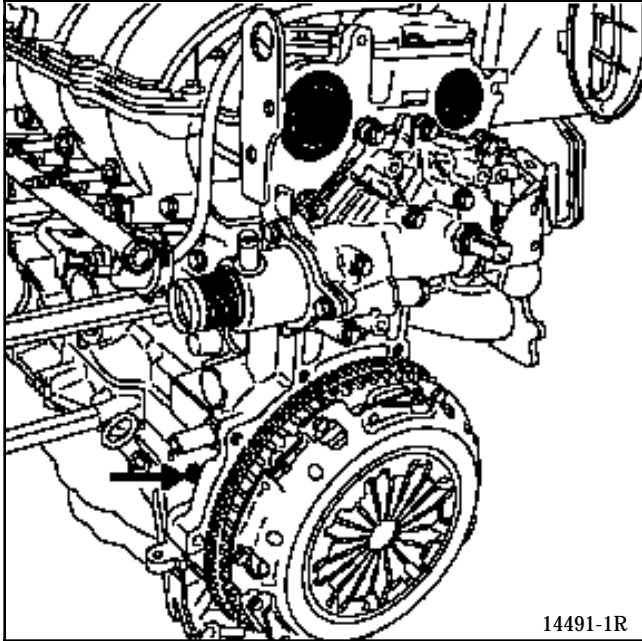
Description	
	Ring for fitting piston with piston rings into cylinder liner
	22 mm long socket standard 1/2" drive (12.7 mm square drive) for removing oil pressure testing gauge
	Valve lifter
	Male Torx sockets 30/40 standard 1/2" drive (12.7 mm square drive).
	Female Torx sockets 12/14 standard 1/2" drive (12.7 mm square drive).
	Angular tightening tool: <ul style="list-style-type: none">- from STAHL WILLE reference 540 100 03 for example,- from FACOM reference DM 360 for example.

Engine repair

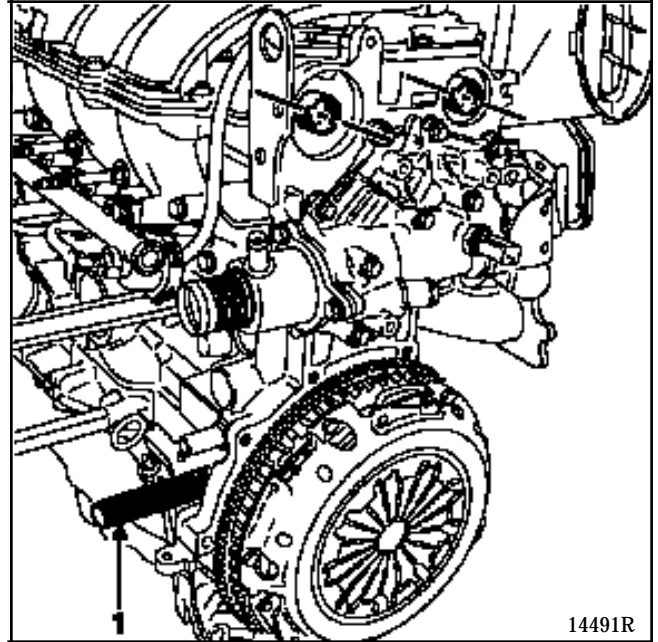
Engine removal

Remove:

- the adjusters at the end of the camshafts,
- the TDC pin plug.



Screw in the TDC pin (1).

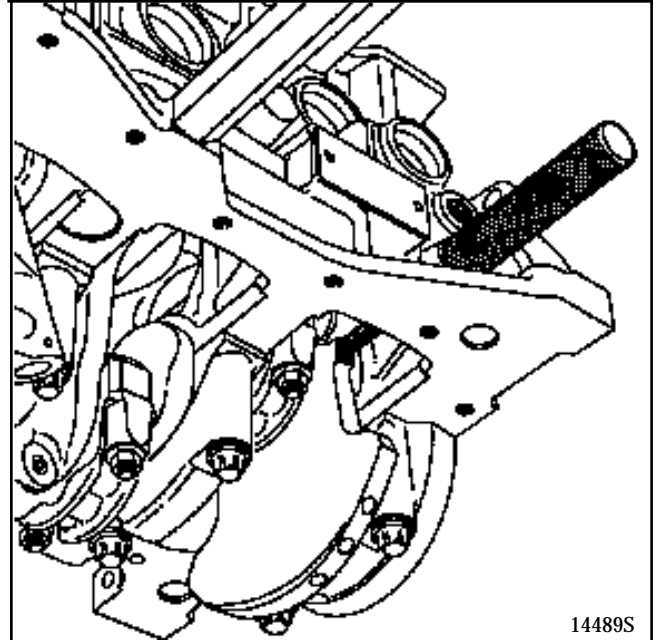


Turn the engine clockwise (timing end) until the crankshaft touches the TDC pin.

Positioning the timing at the setting point

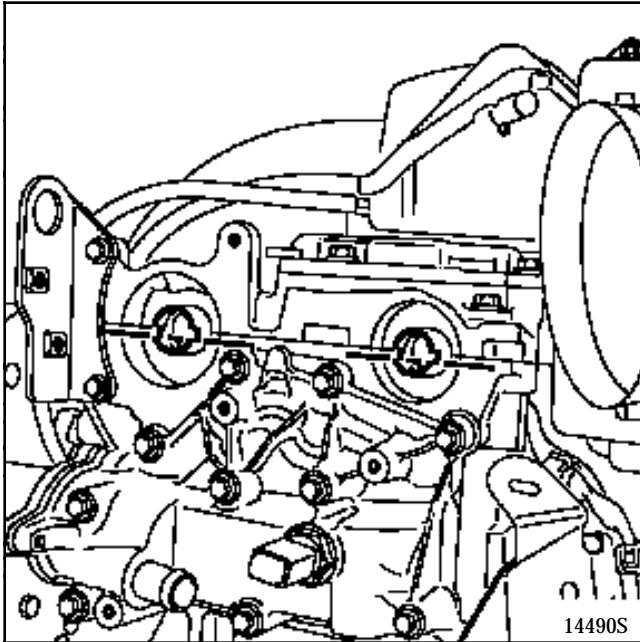
Method

Position the camshaft grooves downwards as shown on the diagram below.

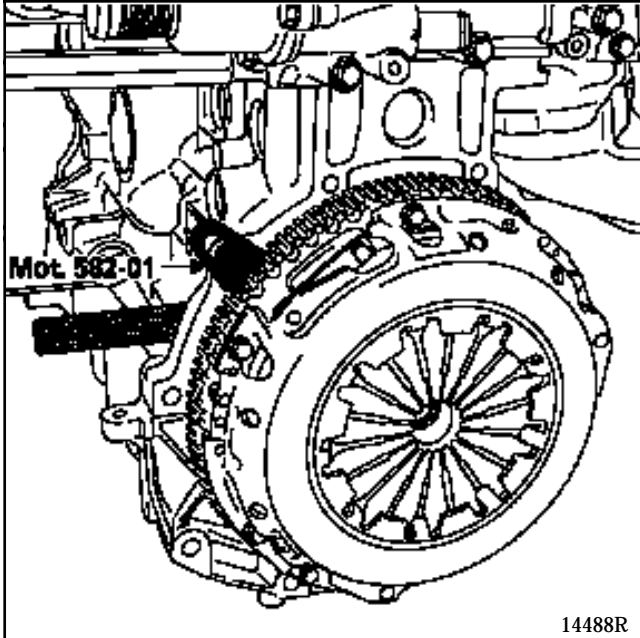


Engine repair

The camshaft grooves should be horizontal and out of line towards the bottom as shown in the diagram below.

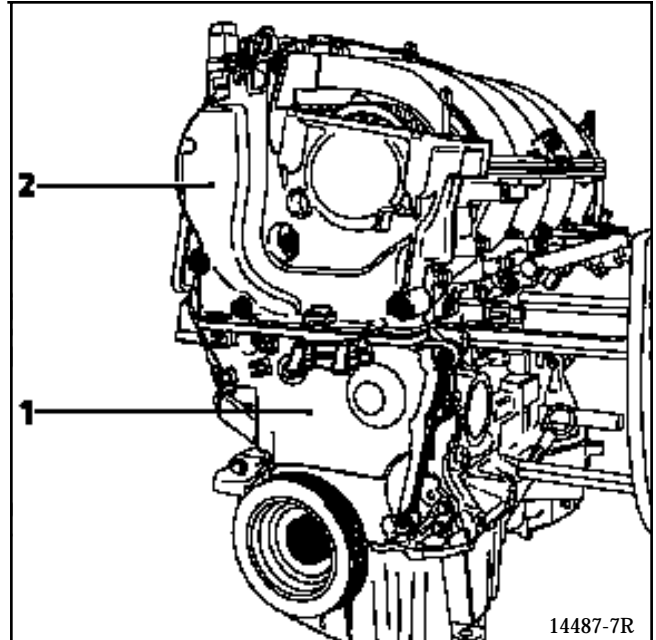


Fit the flywheel locking tool (Mot. 582-01).

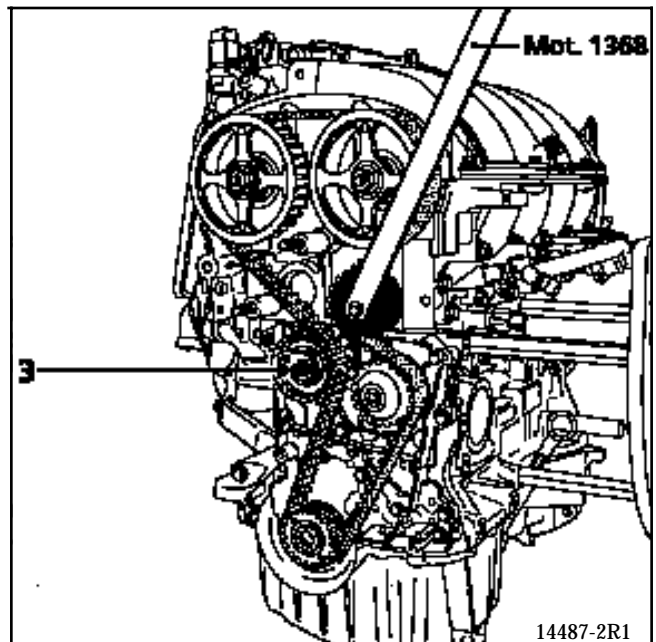


Remove:

- the accessories crankshaft pulley,
- the intermediate timing cover (1),
- the upper timing cover (2),



Slacken nut (3) on the tension wheel.

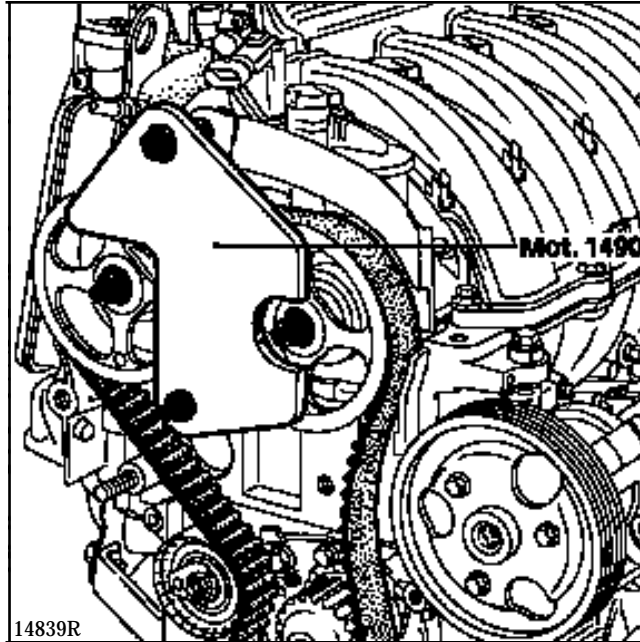


Remove the tension wheel using tool Mot. 1368.

Engine repair

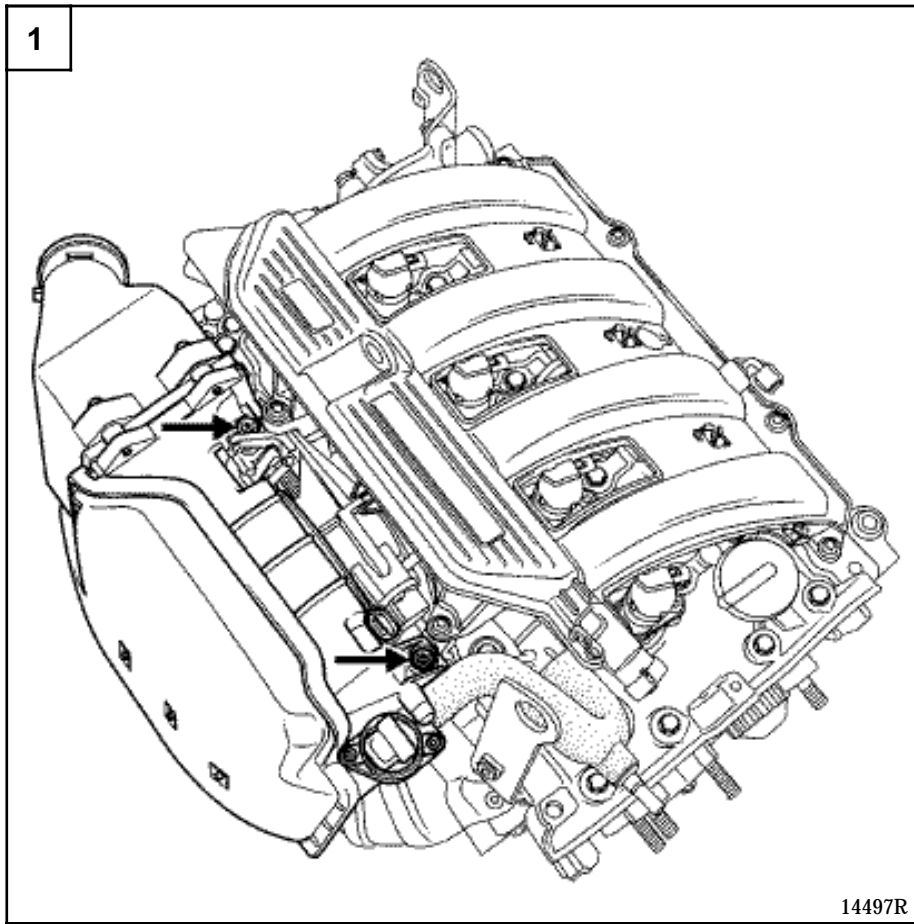
Remove:

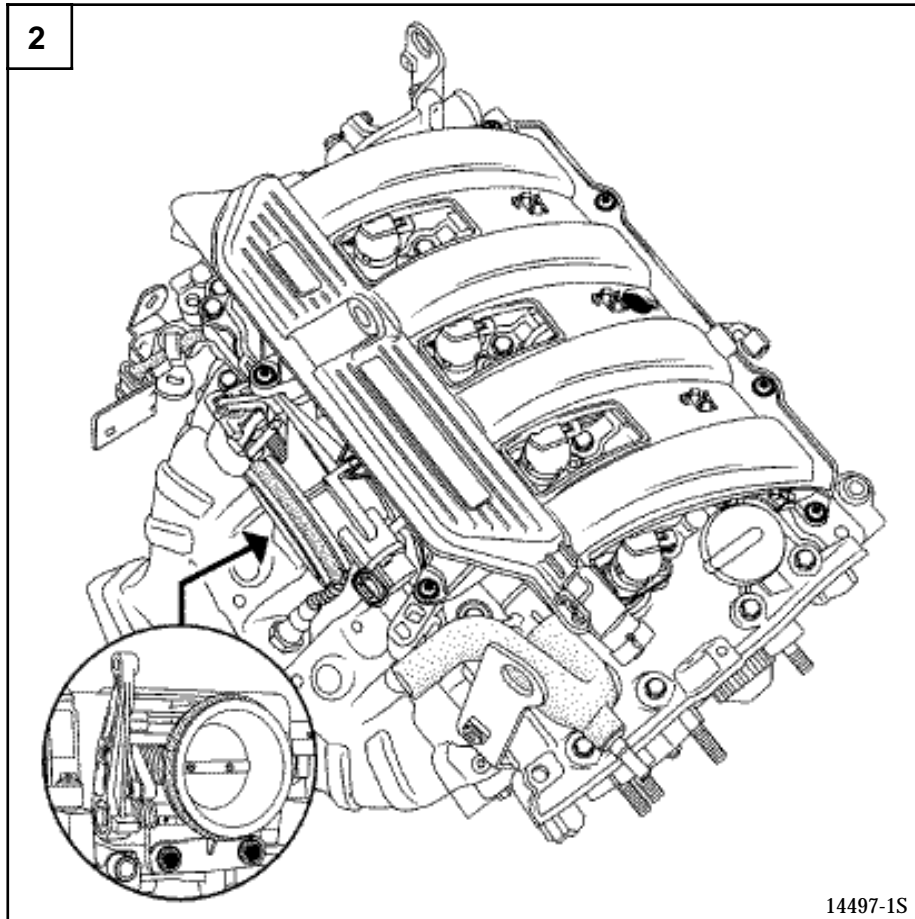
- the timing belt,
- the camshaft pulleys using tool **Mot. 1490**,



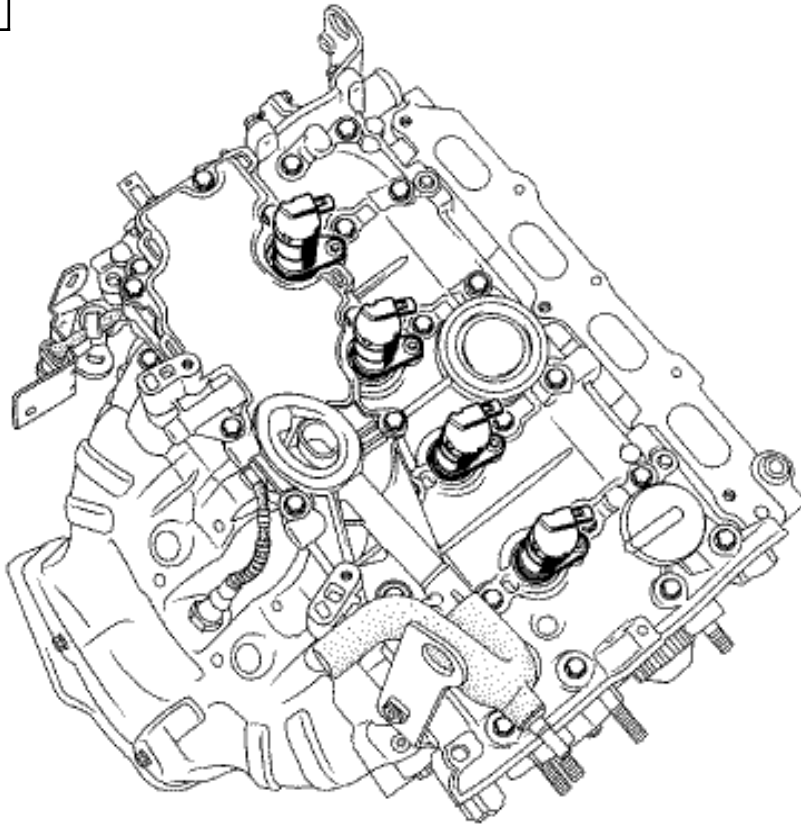
Engine repair

- the various components in diagrams 1 to 12.



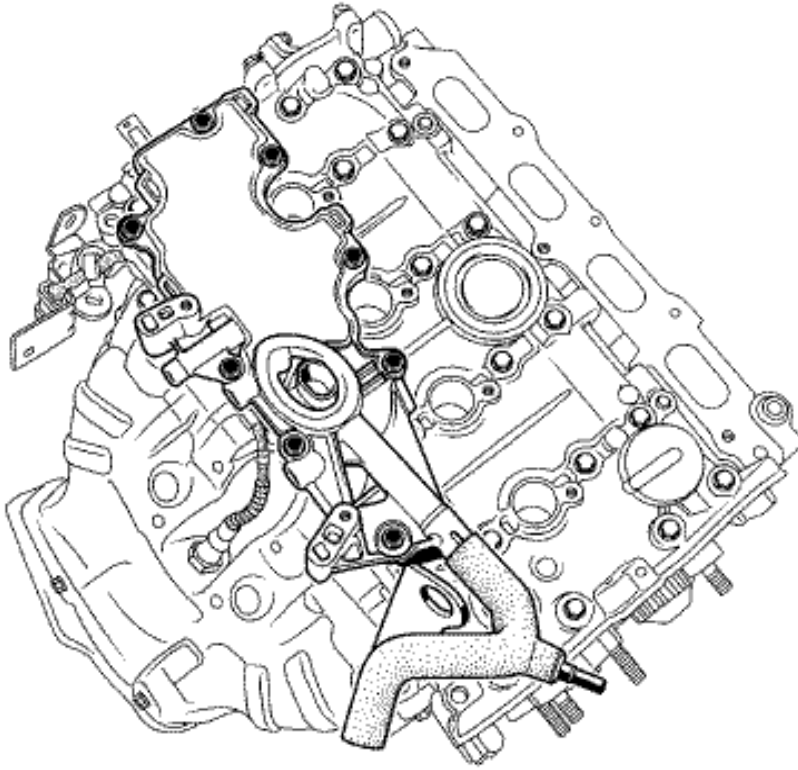


3



14497-2S

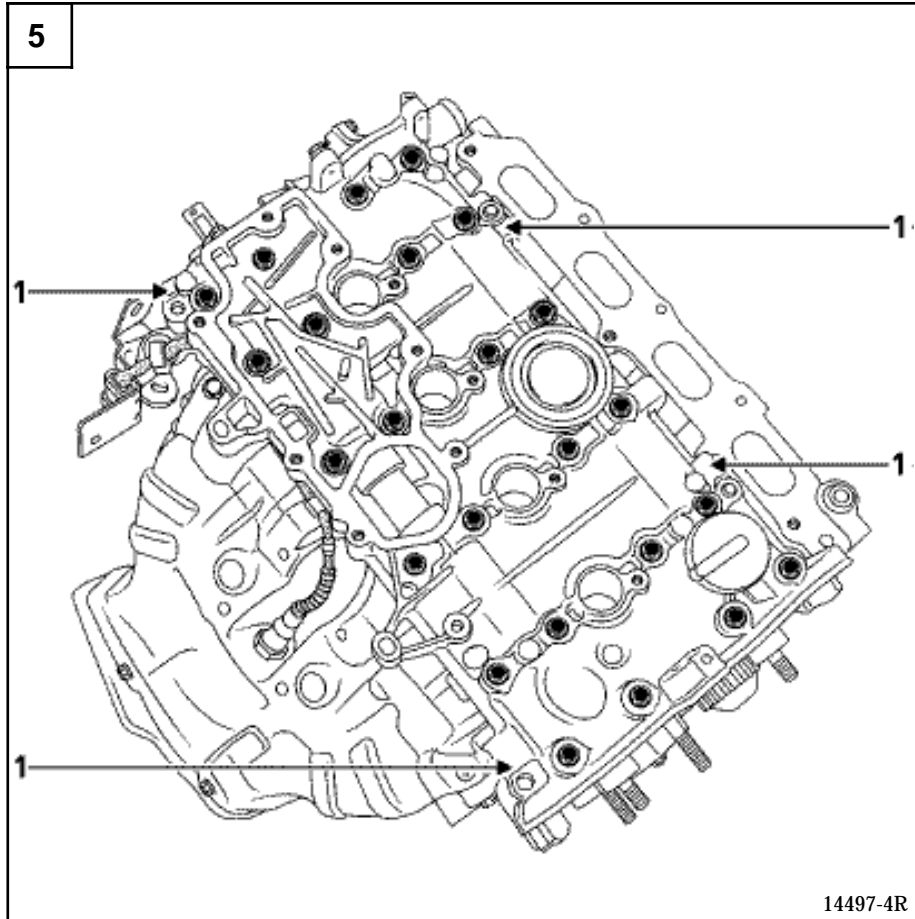
4



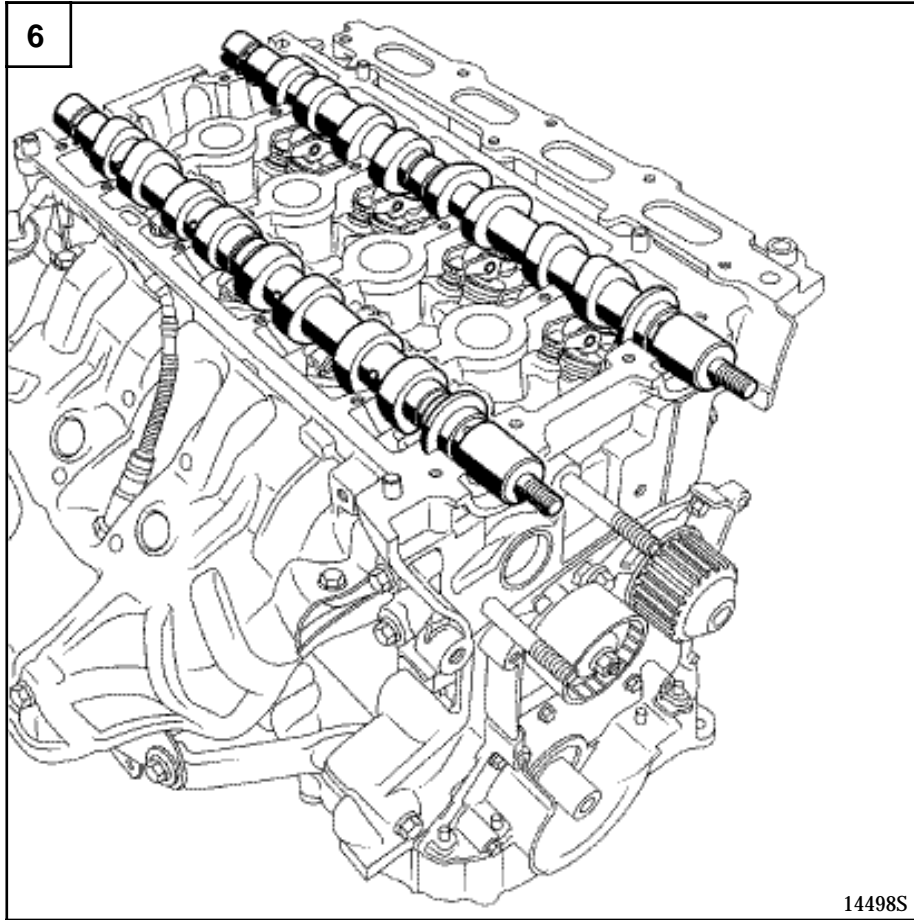
14497-3S

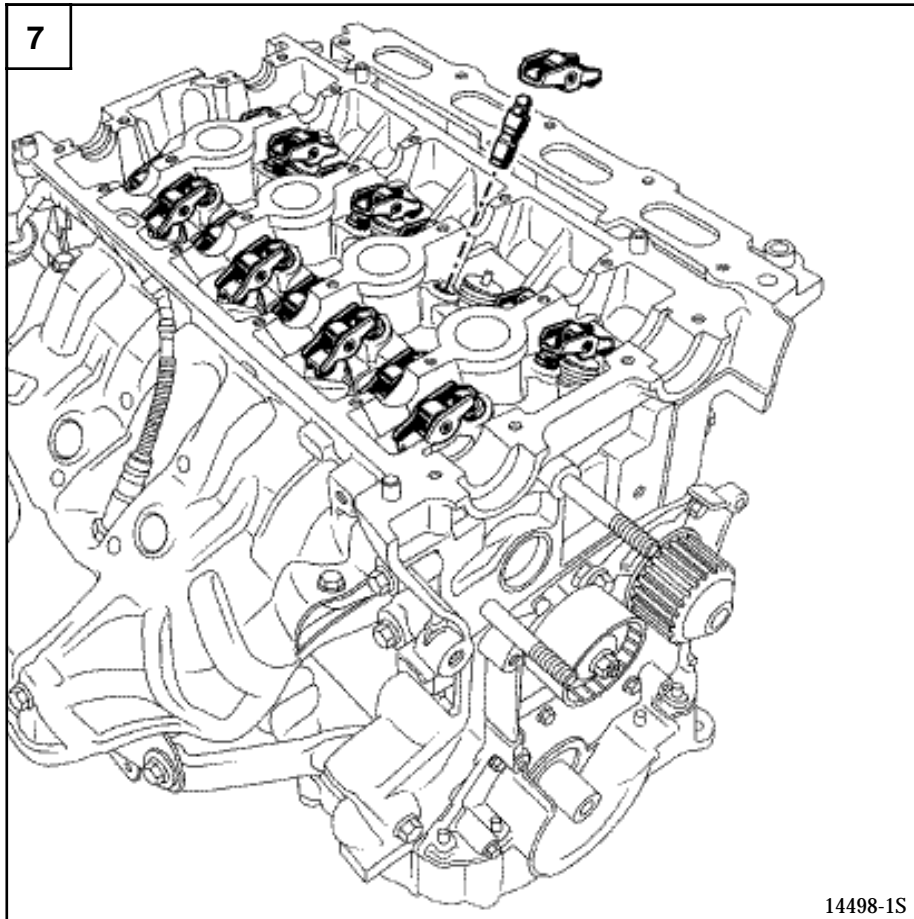
Engine repair

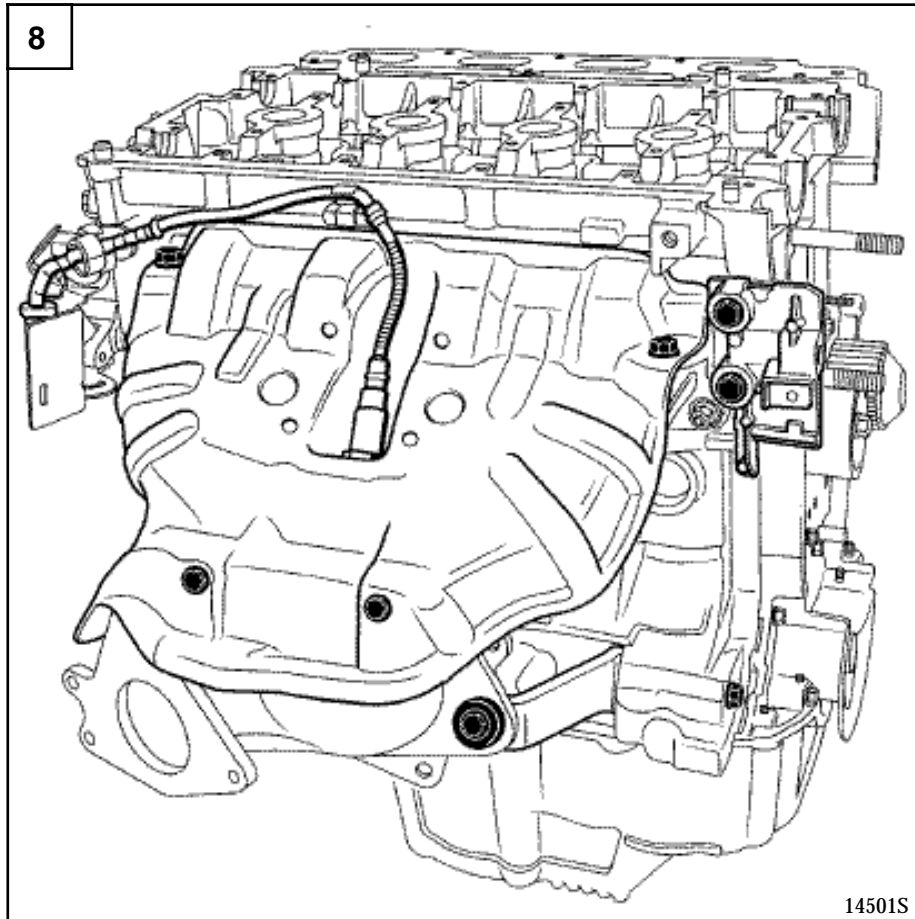
Remove the cylinder head cover bolts, then use a copper hammer to tap on lugs (1) and remove the cylinder head cover vertically.

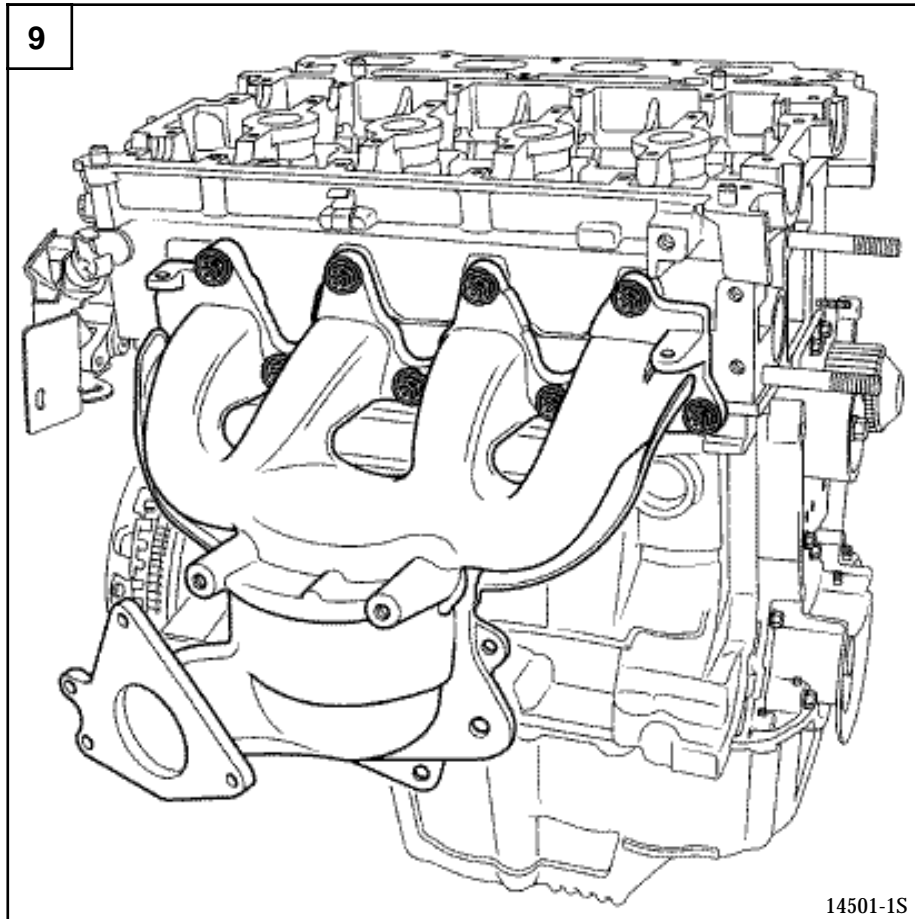


Engine repair





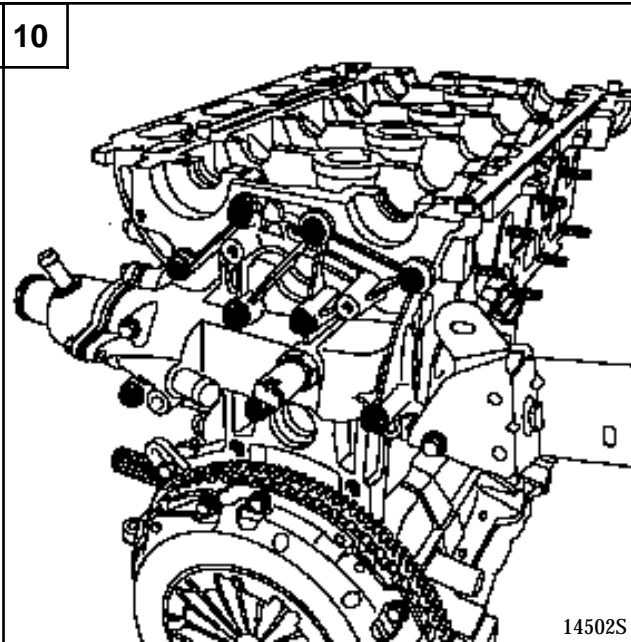




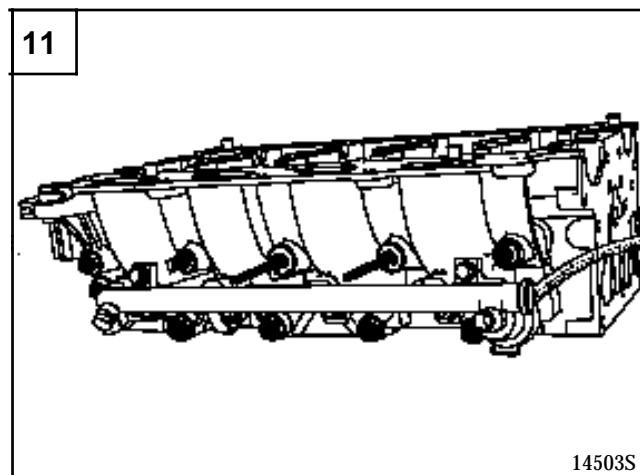
Engine repair

Remove:

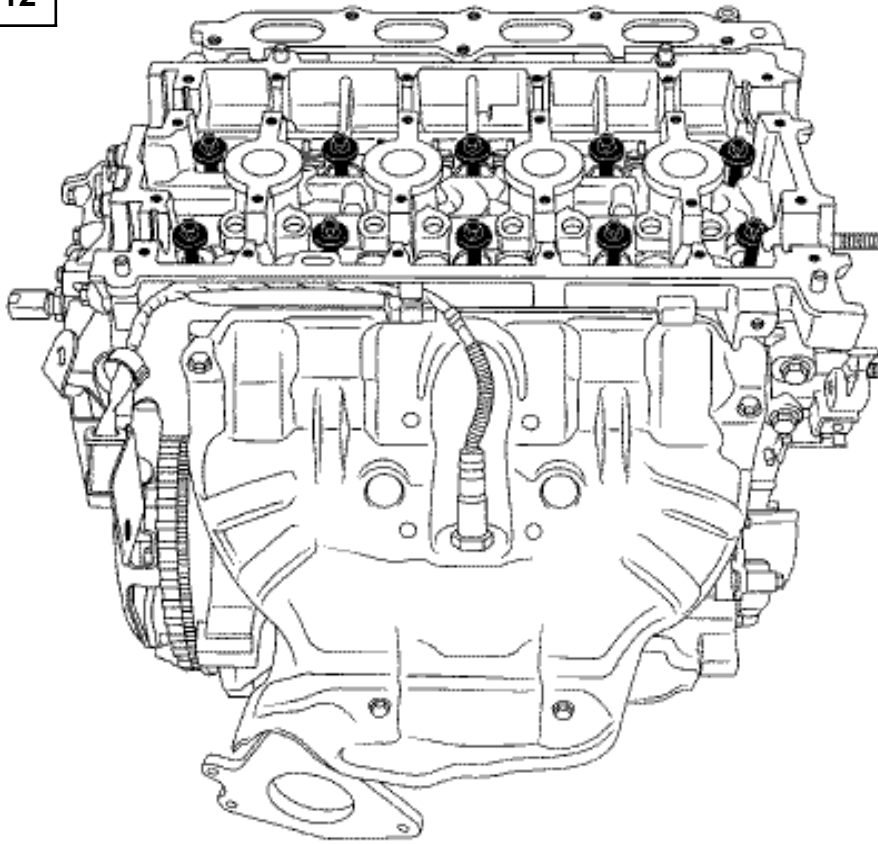
- the coolant housing at the end of the cylinder head,



- the lower inlet distributor.



12



14500S

Compress the valve springs using a valve lifter.

Remove:

- the keys,
- the upper cups,
- the springs,
- the valves,
- the valve guide seals using pliers **Mot. 1335**.

CLEANING

It is very important to avoid scratching the gasket faces of parts in aluminium.

Use **Décapjoint** to dissolve any gasket remaining on the surface.

Apply the product to the area to be cleaned, wait for approximately ten minutes then remove it using a wooden spatula.

Gloves should be worn during the operation.

Do not allow the product to come into contact with paintwork.

This operation must be carried out with extreme care to avoid any foreign bodies entering the oilways bringing oil under pressure to the hydraulic tappets, camshafts (oilways are located both in the cylinder block and the cylinder head) and the oil return pipe.

If this precaution is not observed, the various oilways may become blocked, causing rapid damage to the engine.

CHECKING THE GASKET FACE

Use a set of shims to check for gasket face bow.

Maximum deformation **0.05 mm**

The cylinder head may not be reground.

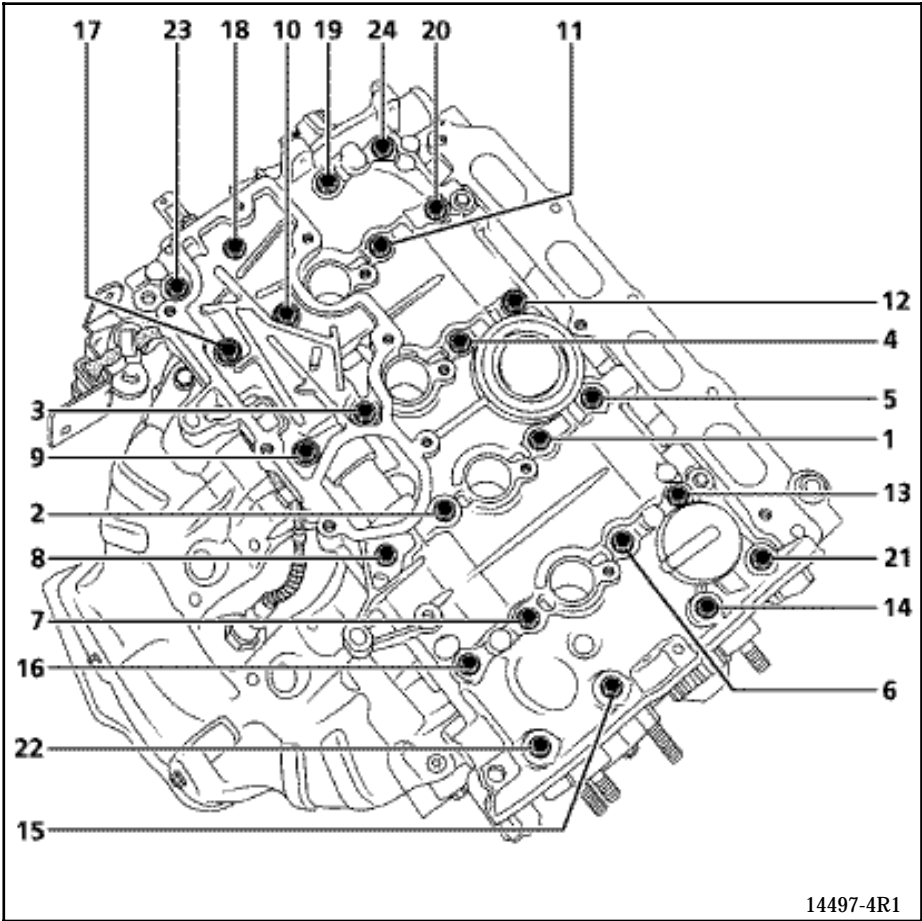
Check the cylinder head for any cracking.

Checking the camshaft end play

- Refit:
- the camshafts in the correct position (refer to camshaft identification in the "Specifications" section),
 - the cylinder head cover, tightening it to the correct torque.

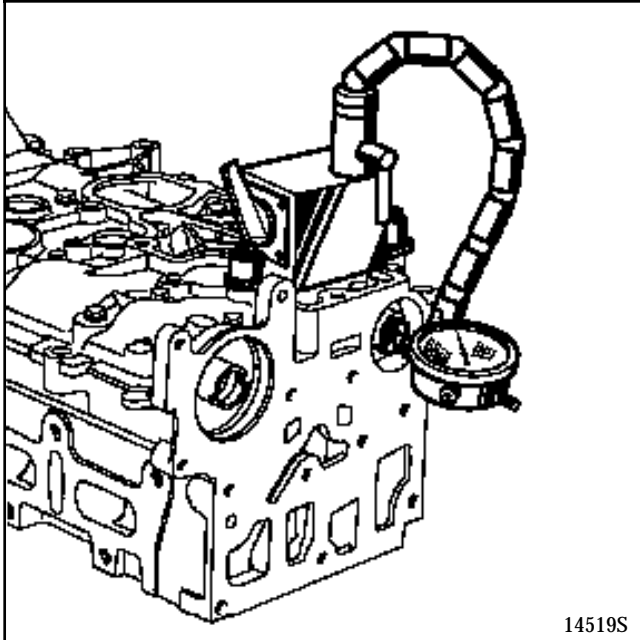
Tightening method

Fitting	Bolt tightening order	Bolt slackening order	Tightening torque (in daN.m)
Operation n° 1	22-23-20-13	-	0.8
Operation n° 2	1 to 12 14 to 19 21 and 24	-	1.2
Operation n° 3	-	22-23-20-13	-
Operation n° 4	22-23-20-13	-	1.2



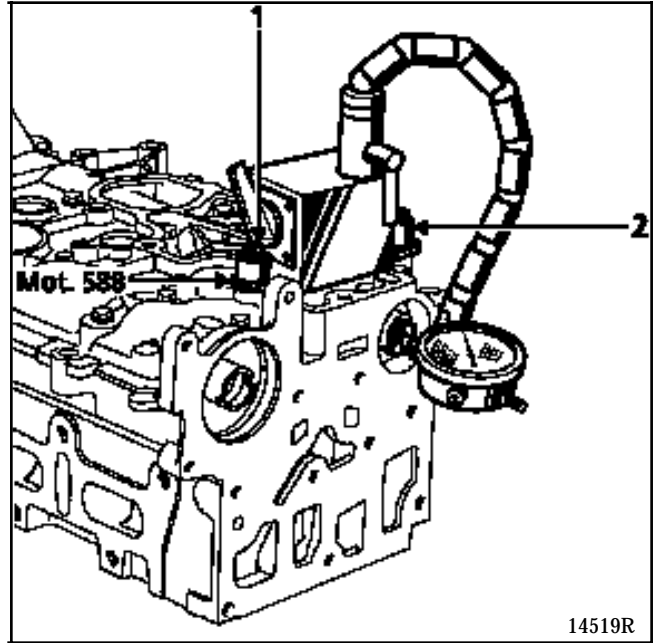
Engine repair

Check the end play which should be between **0.08** and **1.78 mm**.



NOTE : to fit the magnetic base onto the cylinder head, use tool **Mot. 588** and secure it using the oil decanter mounting bolts (1) and the spacers (2) which have the following dimensions:

- external diameter **18 mm**,
- diameter of hole for bolt (1) **9 mm**,
- height **15 mm**.



Remove the cylinder head cover and the camshafts again.

Engine repair

REFITTING THE CYLINDER HEAD

Fit the new valves, gently lapping them in on their respective seats. Thoroughly clean and mark all the parts then proceed with the refitting operations.

Lubricate the inside of the valve guide.

Fit the new valves.

Fit:

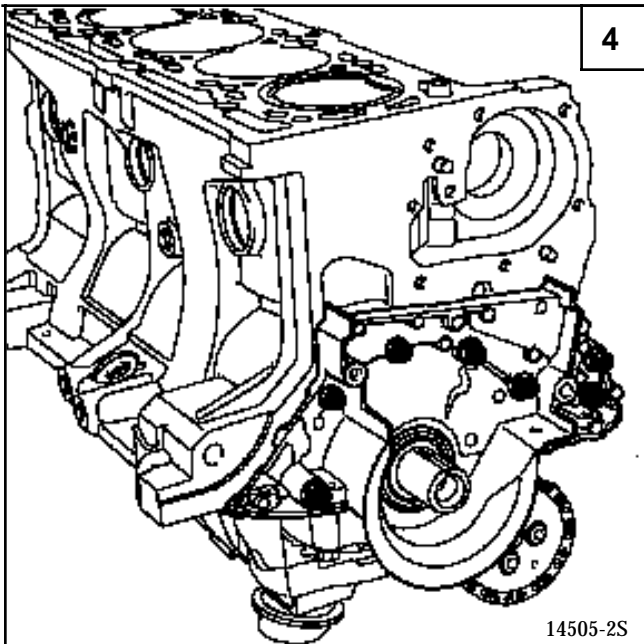
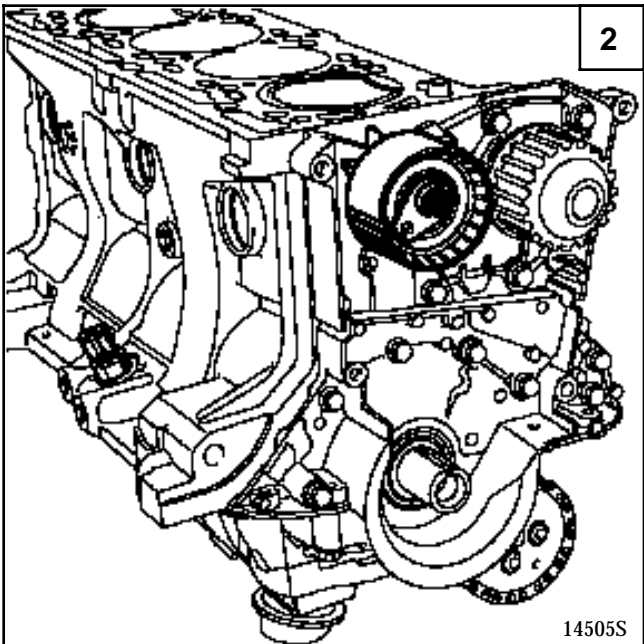
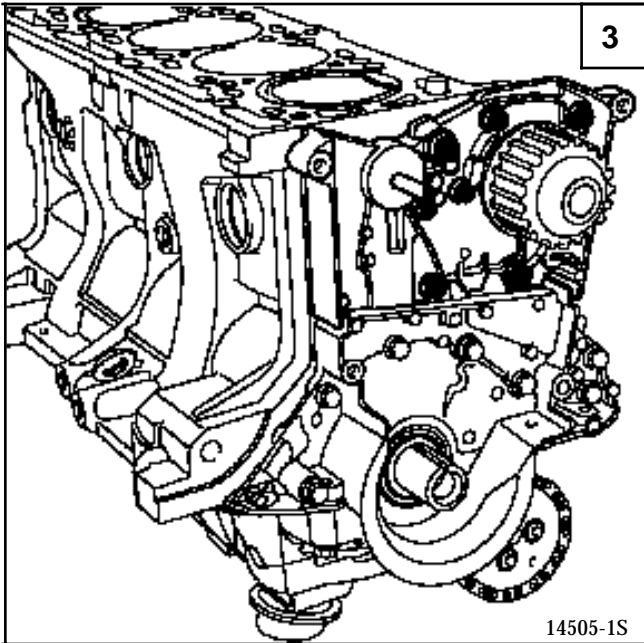
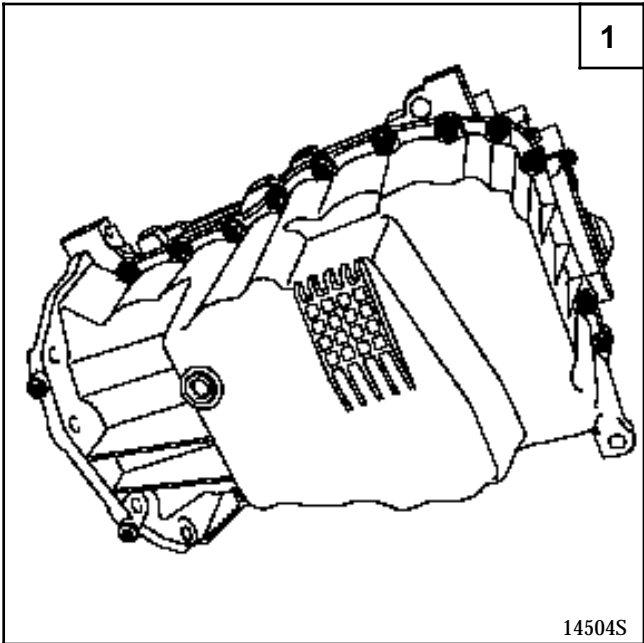
- the seals in turn (non-lubricated) to the valve guides using a pipe wrench,
- the springs,
- the upper cups.

Compress the springs.

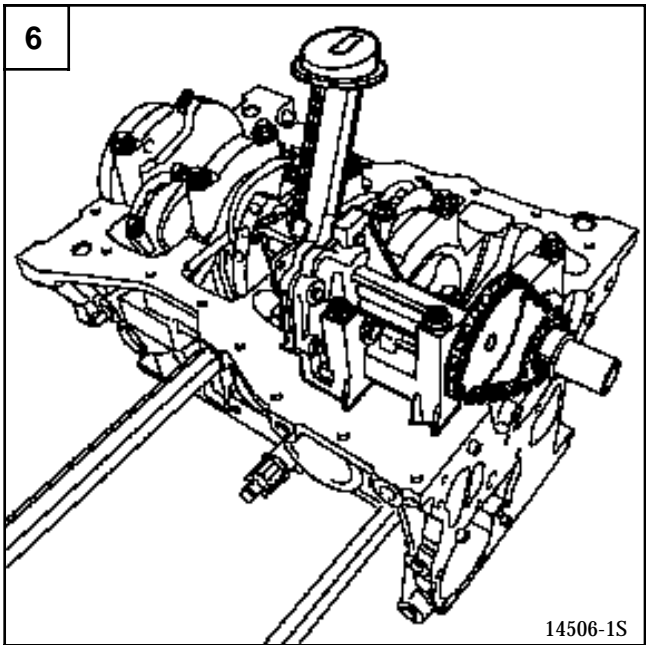
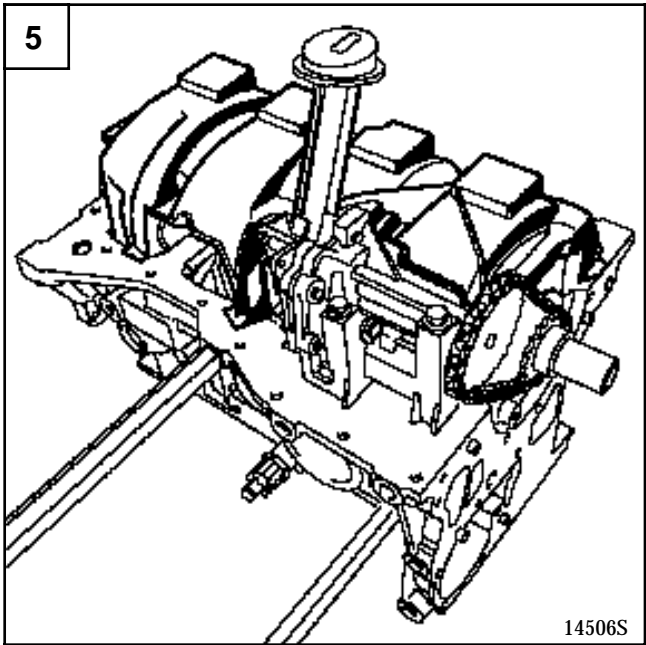
Fit the keys.

Engine repair

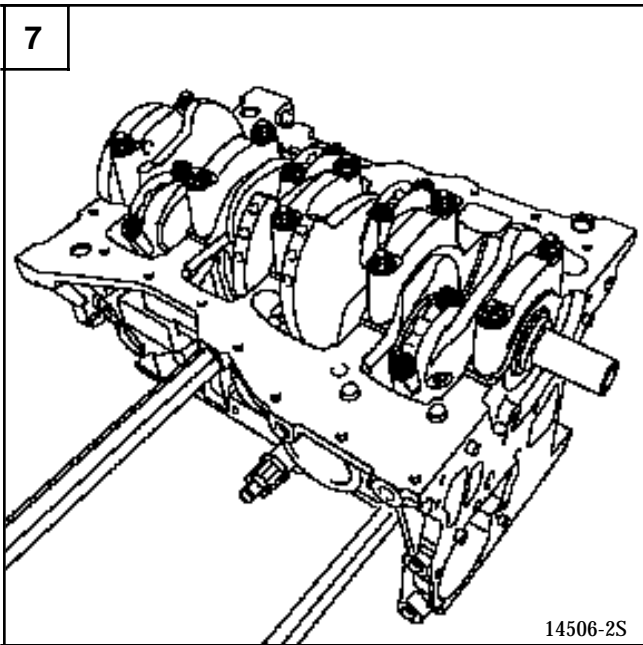
Remove the various components in diagrams 1 to 8.



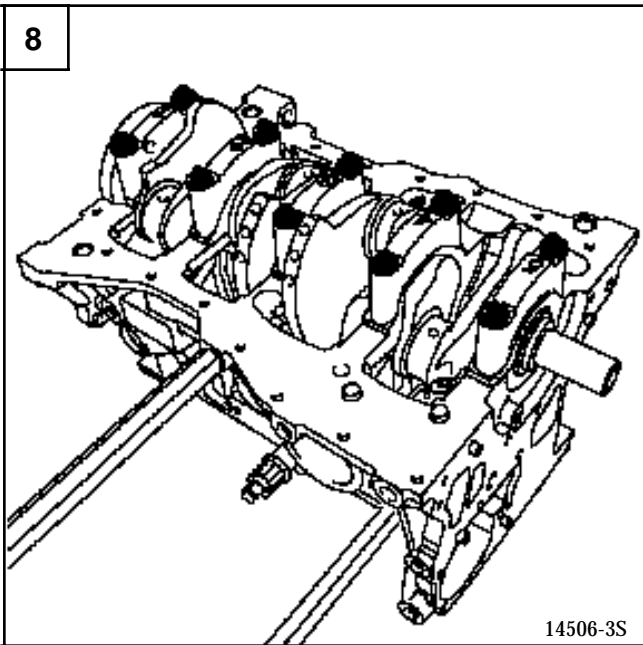
Engine repair



IMPORTANT: never use a punch for marking the big end caps in relation to their bodies, to avoid starting any cracking in the connecting rod. Use an indelible pencil.



The crankshaft bearing caps (the bearing caps are numbered from 1 to 5).



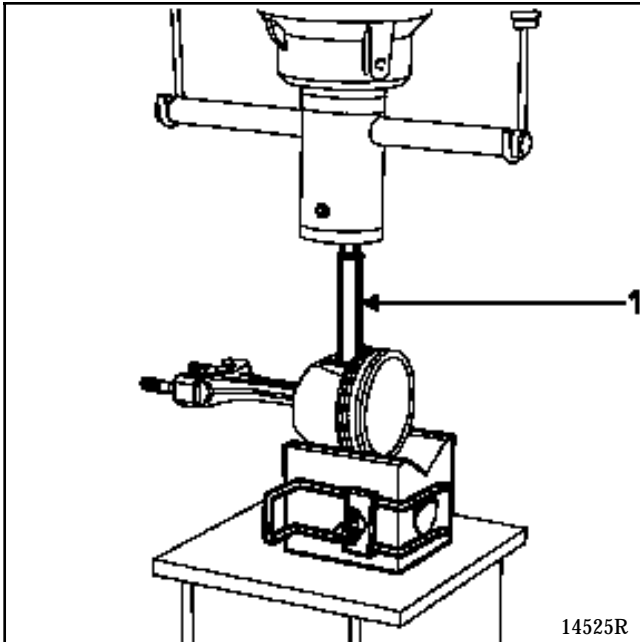
Engine repair

It is vital to note the position of the crankshaft bearing shells as the class may differ for each bearing.

Removing the gudgeon pins

Place the piston in the V of the support, with the gudgeon pin aligned with the release hole.

Using the extraction mandrel (1), remove the pin from the piston on the press.

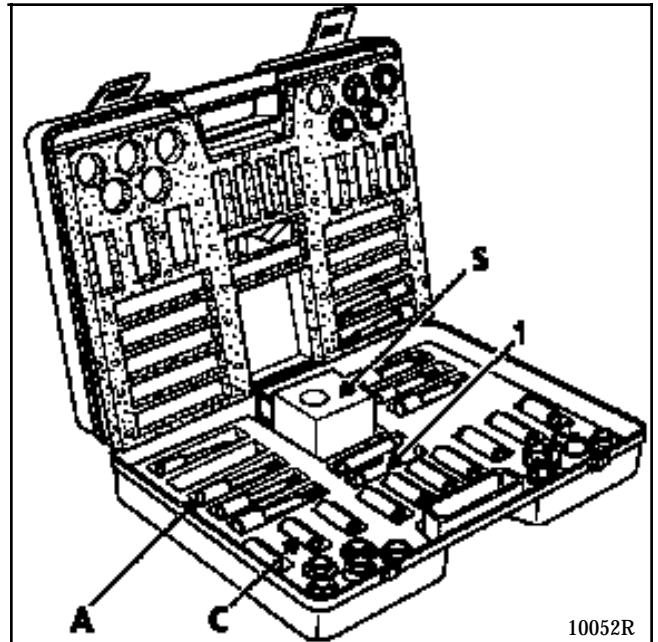
**Refitting the engine**

Clean the cylinder block.

Fitting the gudgeon pins

The gudgeon pins are press fitted in the connecting rods and are fully floating in the pistons. Use tool **Mot. 574-22** supplied in a kit containing:

- a piston support base (S),
- an extraction mandrel (1),
- fitting pins (A) with centring devices (C).



Engine repair

PREPARATION OF THE CONNECTING RODS

Visually check:

- the condition of the connecting rods (twisting - squareness),
- the contact of the bearing caps on the body of the connecting rods (if necessary use a stone to remove any burring, to ensure a correct seat).

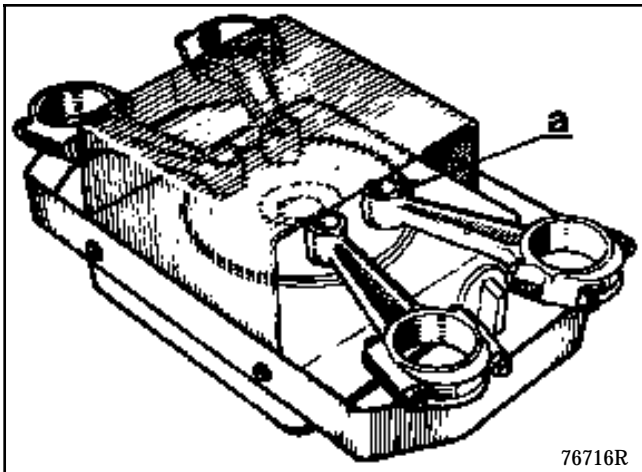
Use a **1 500 W** heating plate.

Place the little ends on the heating plate.

Check that the complete surface of the little end is in contact with the plate.

On each little end, place a small piece of solder at (A) as a temperature guide, as it fuses at approximately **250 °C**.

Heat the little end until the solder melts.

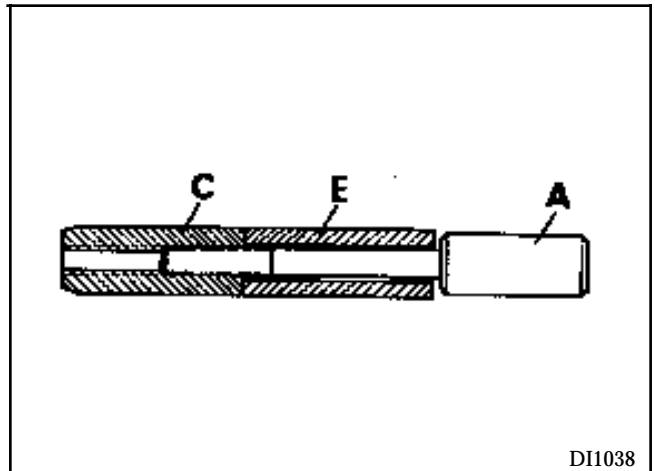


PREPARATION OF THE GUDGEON PINS

Check that the gudgeon pins slide freely in their corresponding new piston.

Use the centring device **C13** and the fitting pin **A13** or **Mot. 574-24**.

Fit the gudgeon pin (E) to the fitting pin (A), screw in the centring device (C) **until it makes contact then slacken it by a quarter turn**.



Engine repair

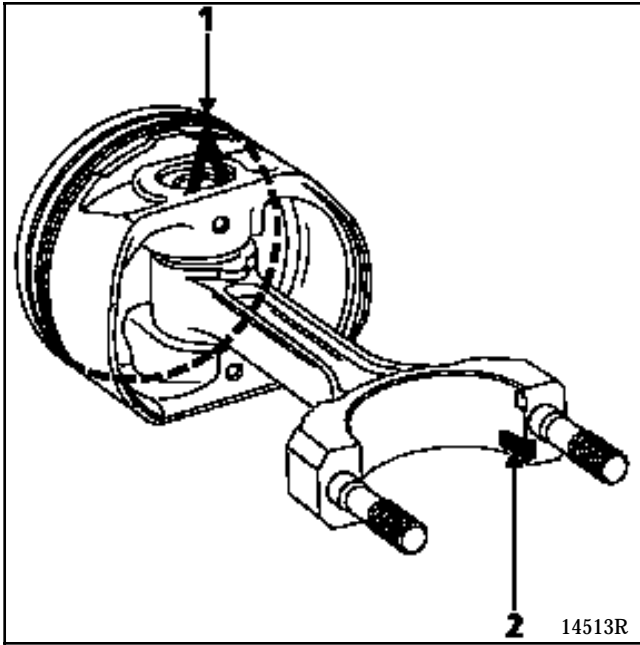
ASSEMBLING THE "CONNECTING ROD - PISTONS"

The pistons are marked by a Δ on their crown indicating the **flywheel end**.

Positioning the pistons in relation to the connecting rods

Ensure the Δ (1) on the piston crown is at the top.

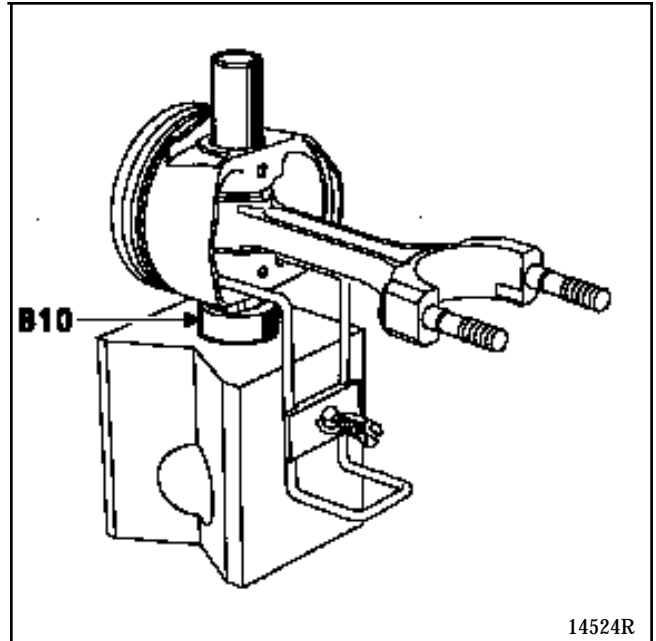
Ensure the connecting rod bearing shell stop lug (2) is at the bottom.



To assemble the piston and connecting rod, follow the instructions below:

Place ring **B10** on the base and place the piston on the ring, securing it using the pin.

Check that the gudgeon pin hole is aligned with the hole in ring **B10**.



Lubricate the centring device and the gudgeon pin using engine oil.

Press the gudgeon pin in to check that it slides freely and, if necessary, recentre the piston.

Engine repair

The following operations should be carried out quickly to avoid heat loss as far as possible.

When the piece of solder has reached the point of fusion (transformation into a droplet) :

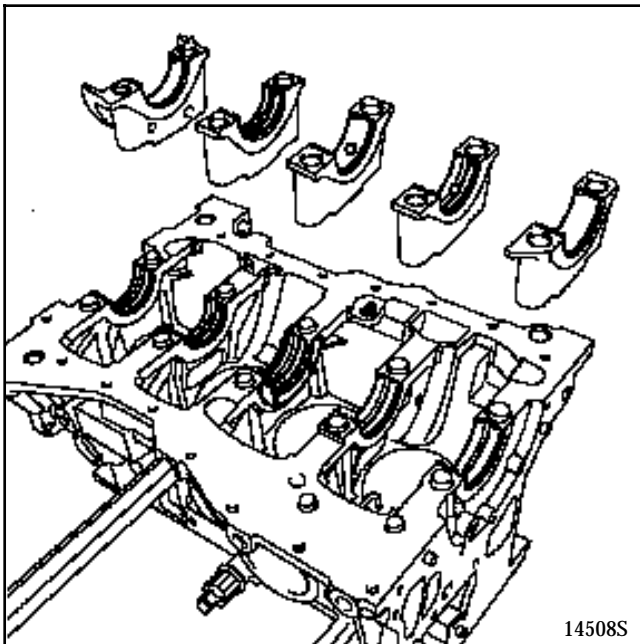
- wipe off the drop of solder,
- fit the centring guide into the piston,
- fit the connecting rod into the piston,
- press the gudgeon pin in as quickly as possible until the guide touches the bottom of the support base.

Check that the gudgeon pin remains inside the diameter of the piston for all positions of the connecting rod in the piston.

Crankshaft

Fit:

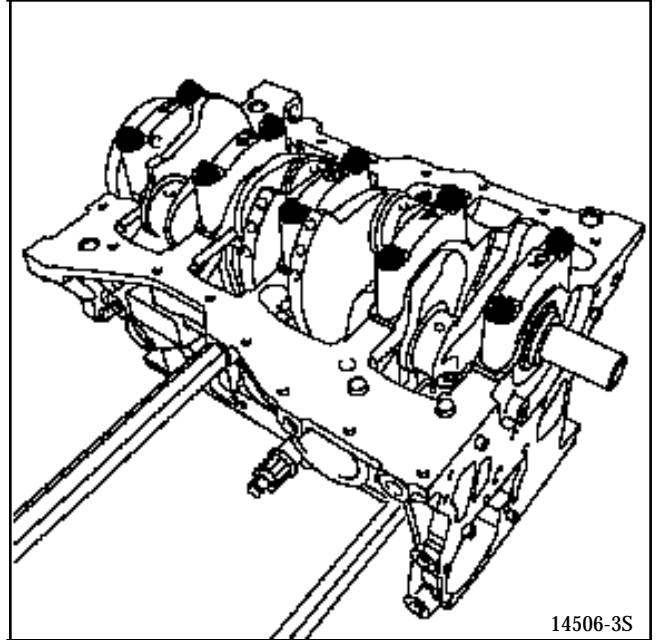
- the **non-grooved** bearing shells on bearing caps **1 - 3 - 5**,
- the grooved bearing shells on the bearings for the cylinder block and on bearing caps **2 - 4**,
- the crankshaft side shims on bearing **3** (grooves at crankshaft end),



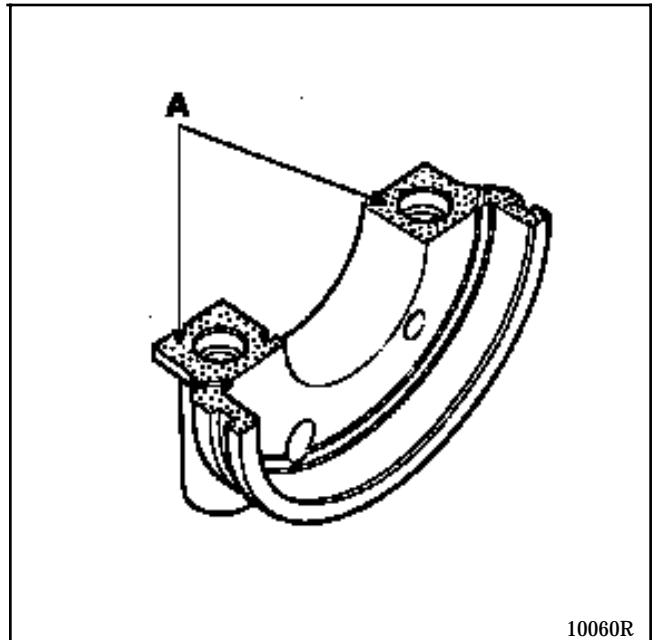
- the crankshaft.

Lubricate the journals using engine oil.

Refit the crankshaft bearing caps (these are numbered **1** to **5**) and initially tighten the bolts to **2.5 daN.m** then angle tighten by $47^\circ \pm 5^\circ$.

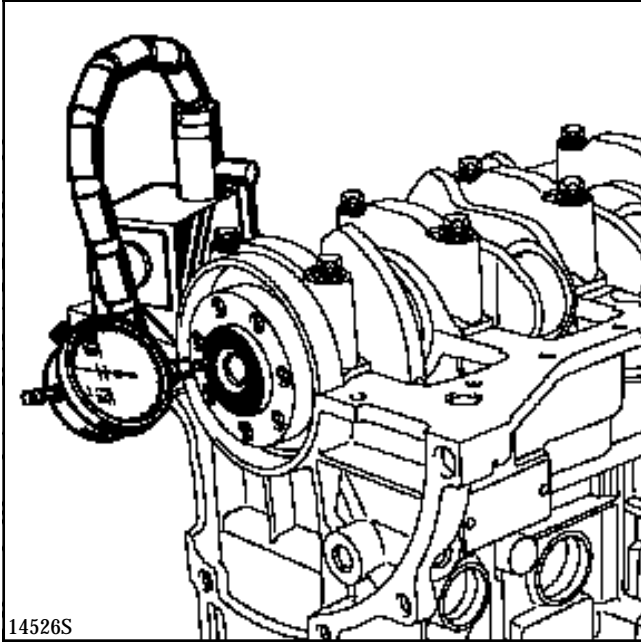


NOTE : remember to apply a fine layer of **RHODORSEAL 5661** to bearing n° **1** in zone (A).



Engine repair

Check the side clearance for the crankshaft which should be between **0.045** and **0.252 mm** without wear and **0.045** and **0.852 mm** with wear.



Check the crankshaft turns freely.

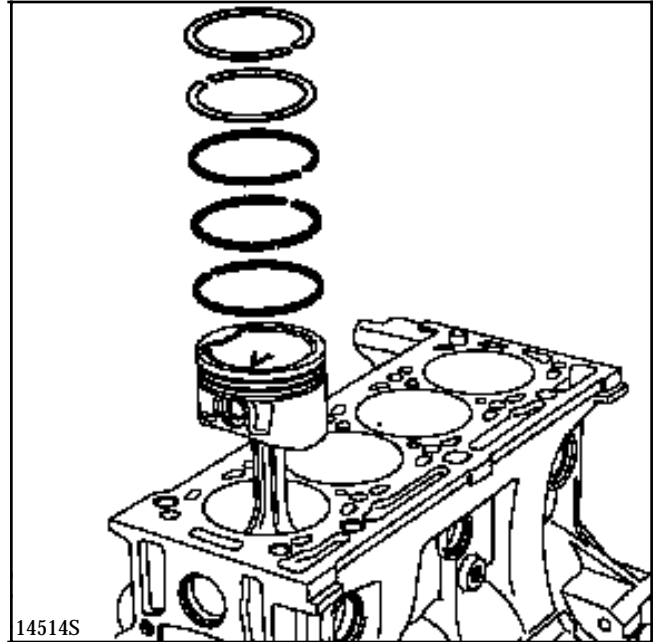
FITTING THE PISTON RINGS

The piston rings, which are set in the factory, must move freely in their grooves.

Ensure the rings are fitted in the correct manner, **TOP** should be at the top.

Aligning the piston rings on the piston

Ensure the piston rings are positioned as shown on the diagram below.



Engine repair

REFITTING

Lubricate the pistons.

Fit the piston and connecting rod assemblies into the cylinder block using the ring (example : **FACOM 750 TB**), ensuring the direction is correct (**Λ towards the flywheel**).

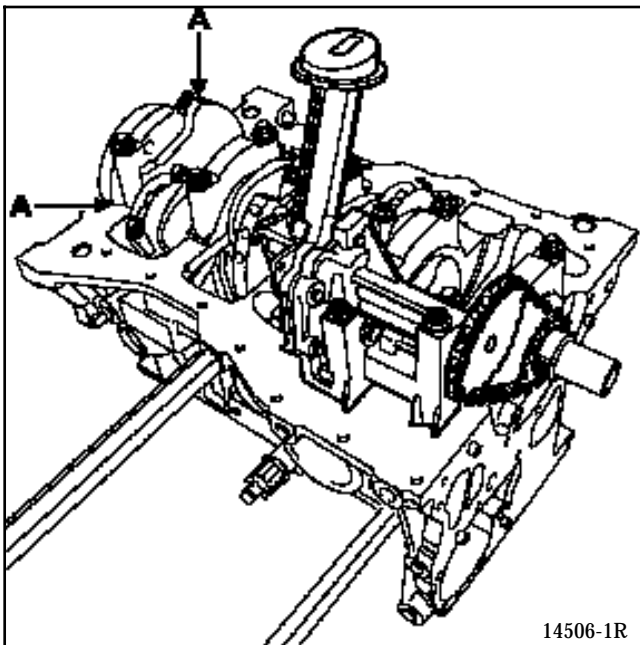
Fit the connecting rod onto the lubricated crankshaft crankpins.

Fit the big end caps.

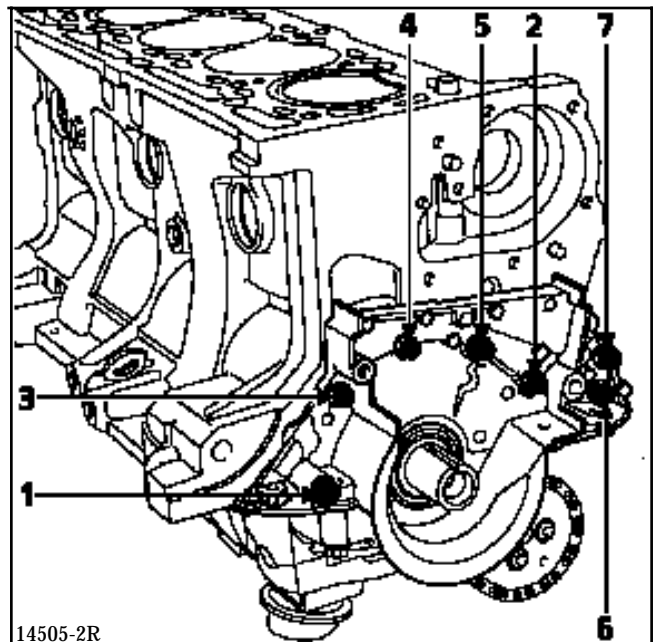
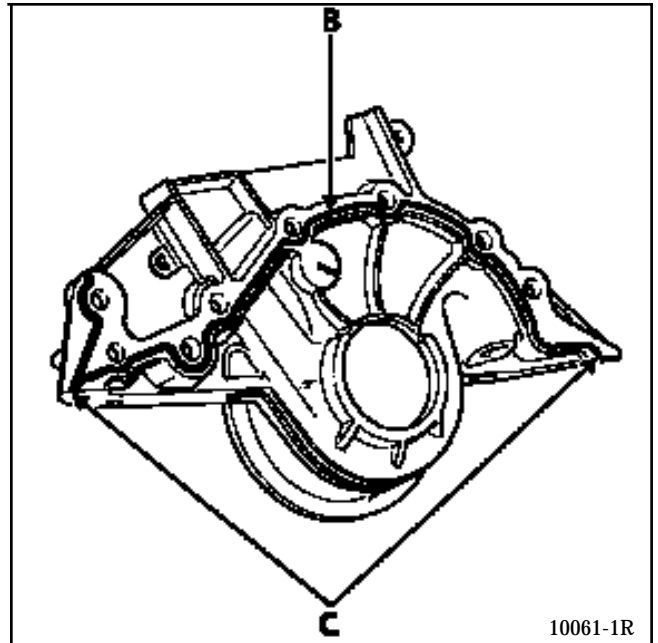
Tighten the new nuts for the big end caps to a torque of **4.3 daN.m**.

Refit :

- the oil pump chain,
- the oil pump and torque tighten it to **2.2 to 2.7 daN.m**,



- the crankshaft closure plate, sealed using **Loctite 518**. Bead (B) should be **0.6 to 1 mm** wide and should be applied as shown in the diagram below, tightening to a torque of **1.1 daN.m** in the recommended order.



Apply a drop of **RHODORSEAL 5661** at (A) (each side of bearing N° 1), and where the crankshaft closure plate meets the cylinder block at (C)

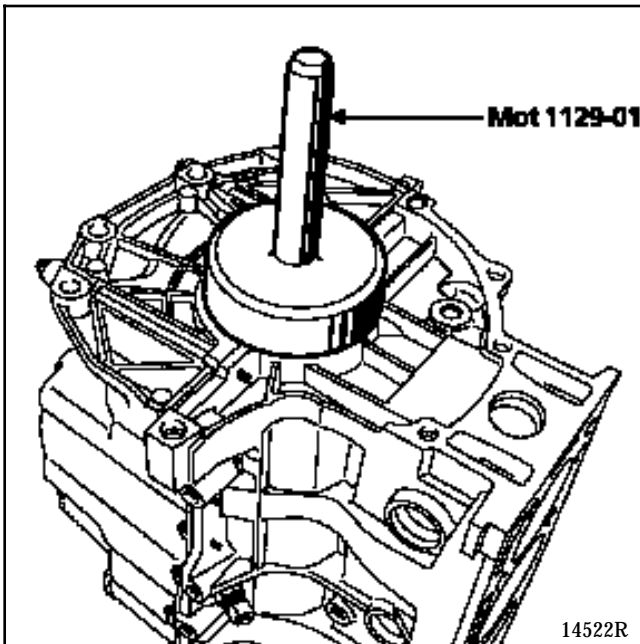
Engine repair

Refit :

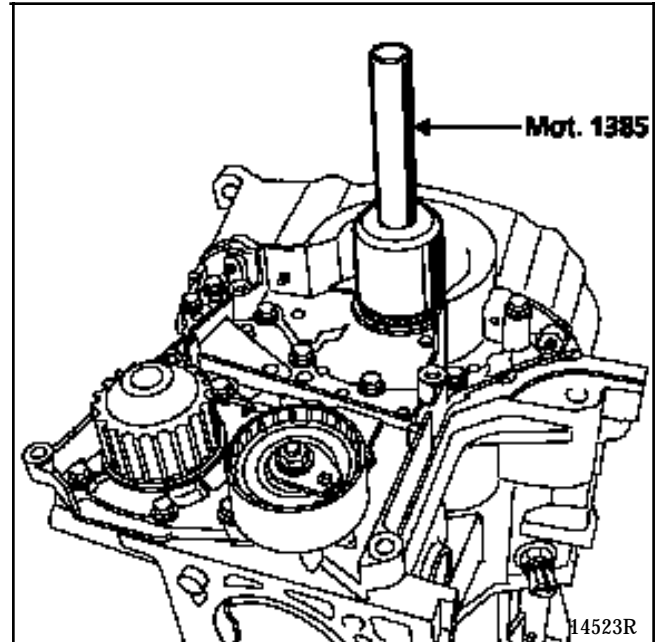
- the anti-emulsion plate,
- the sump with a new gasket, pre-tightening it to **0.8 daN.m** then finally tighten (in a "snail" pattern) to **1.4 daN.m**. The alignment of the cylinder block and the sump must be observed **on the flywheel side** to avoid deforming the clutch housing when assembling with the gearbox.

Fitting the crankshaft seals

- Flywheel end, use tool **Mot 1129-01**.



- Timing end, use tool **Mot. 1385**.

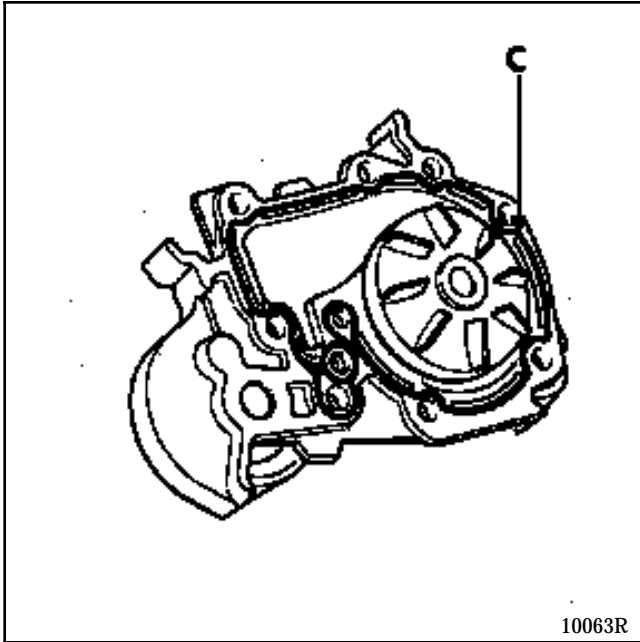


Refit :

- the flywheel, tightening the new bolts to a torque of **5.5 daN.m** (tighten in star pattern),
- the clutch, tightening to a torque of **1.8 daN.m**.

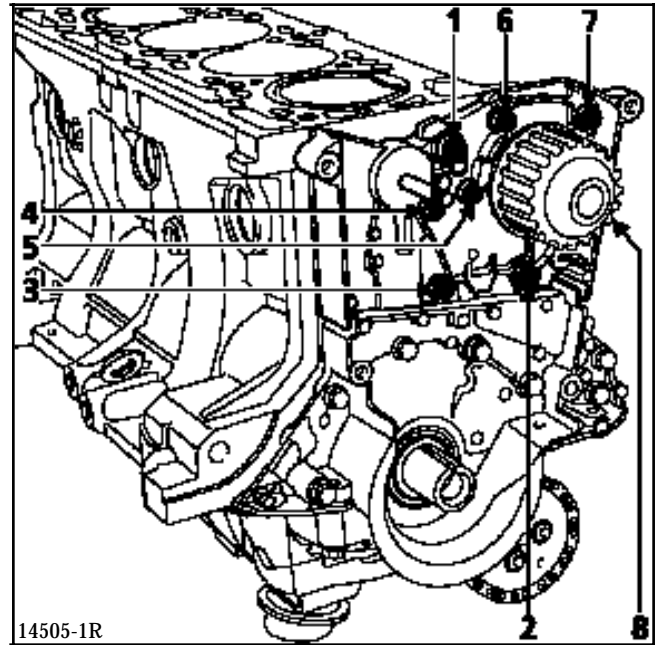
Engine repair

Refit the water pump, sealing it using **Loctite 518**. Bead (C) should be **0.6 to 1 mm** wide and should be applied as shown in the diagram below.



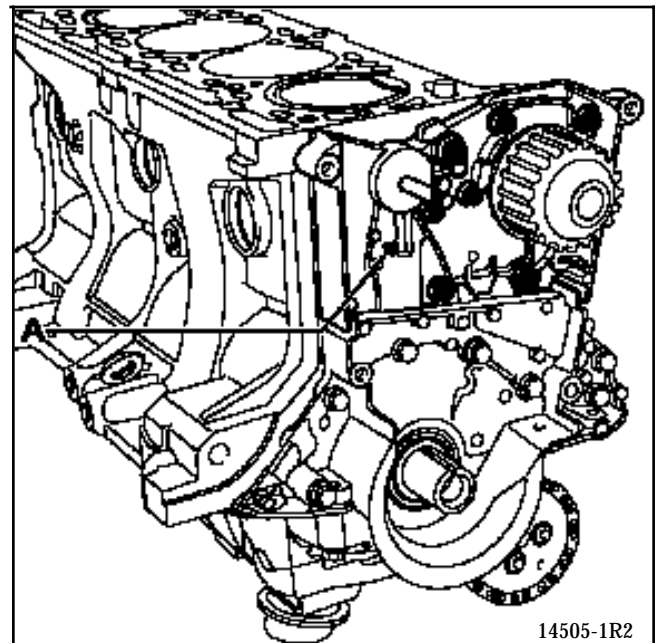
Pretighten the **M6** and **M8** bolts to **0.8 daN.m** then tighten the **M6** bolts to **1.1 daN.m** and the **M8** bolts to **2.2 daN.m** in the recommended order.

NOTE : apply 1 or 2 drops of **Loctite FRENETANCH** to bolts **1** and **4** on the water pump.



Refit :

- the timing tension wheel, correctly positioning the pulley lug in the groove (A),



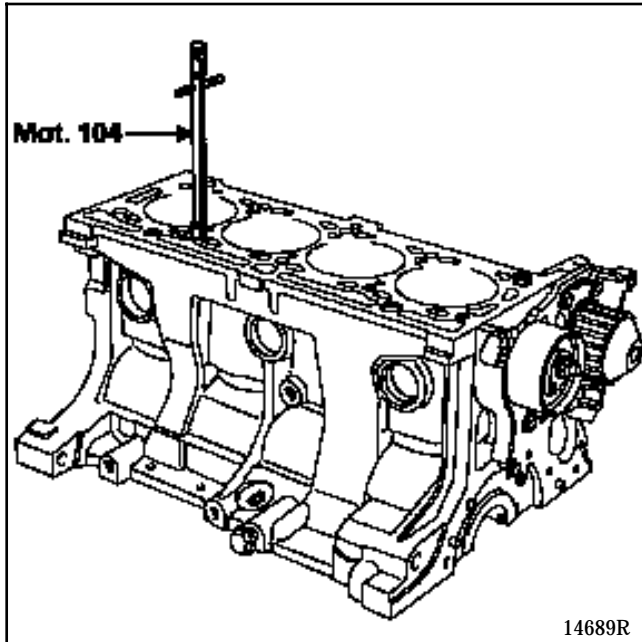
- the oil level sensor.

Engine repair

REFITTING THE CYLINDER HEAD

Position the pistons half way.

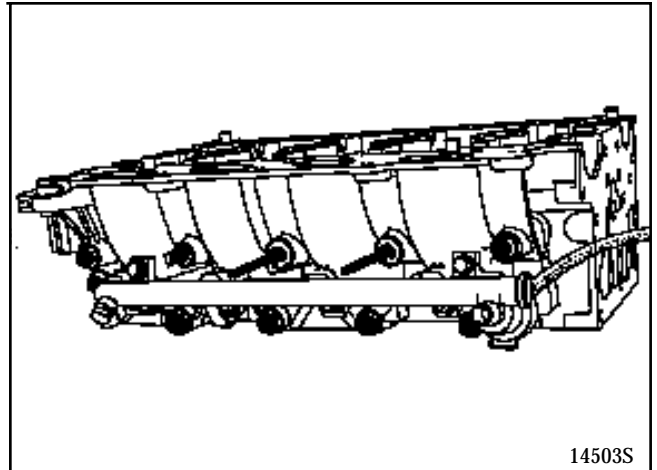
Fit tool **Mot. 104** to the cylinder block.



Fit the cylinder head gasket then the cylinder head.

Check the bolts then tighten the cylinder head (refer to the "Cylinder head specifications" section).

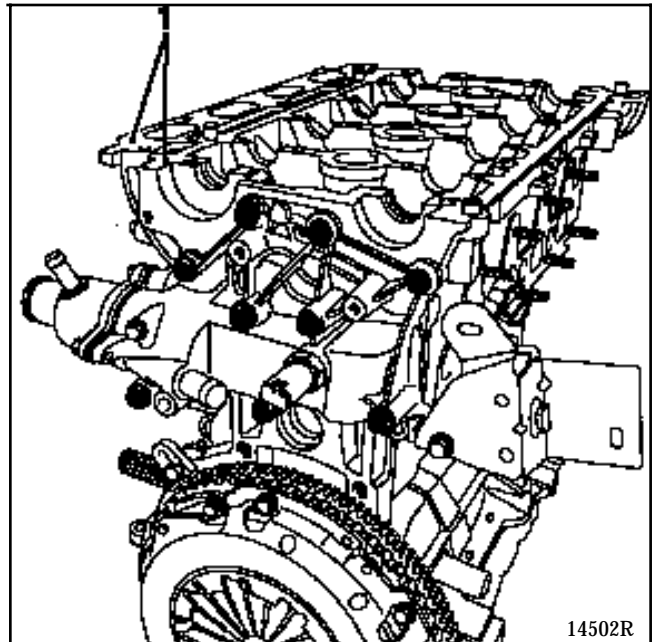
Refit the lower inlet distributor, tightening it to a torque of **2 daN.m**.

**NOTE :**

Check:

- the alignment between the lower inlet distributor and the cylinder head (timing end),
- the alignment between the upper faces (1) of the lower inlet distributor and the cylinder head.

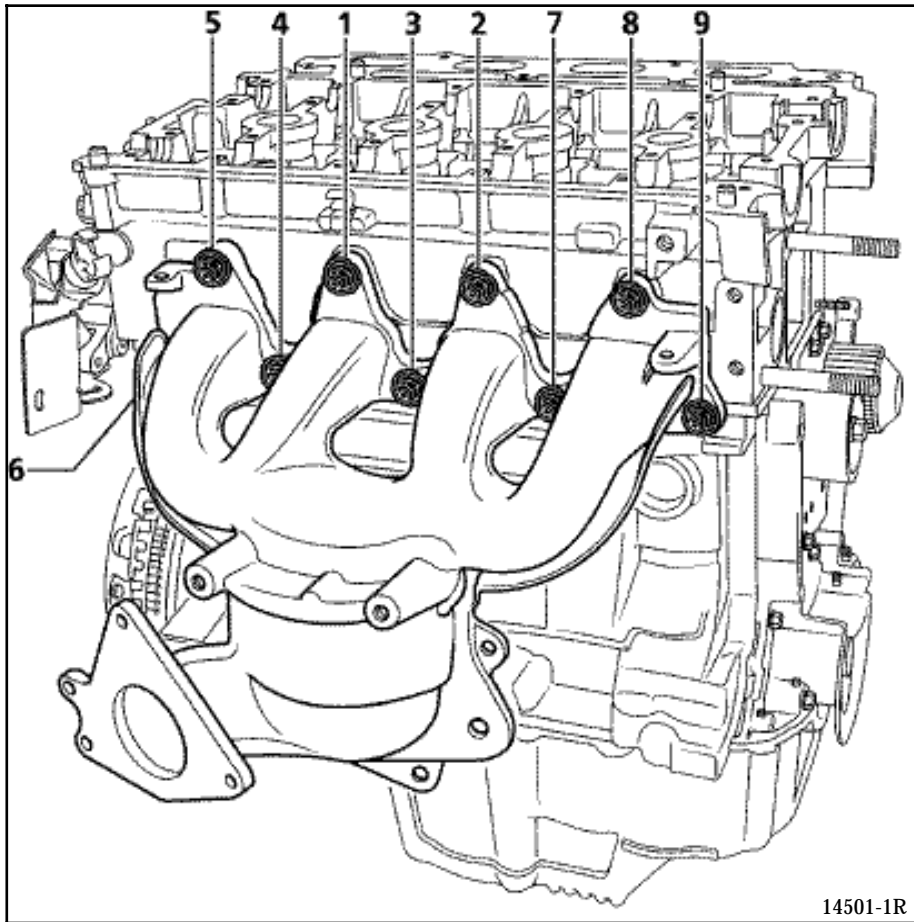
Refit the coolant housing with a new seal and torque tighten it to **1 daN.m**.



Engine repair

Refit :

- the exhaust manifold, torque tightening it to **1.8 daN.m** in the recommended order,

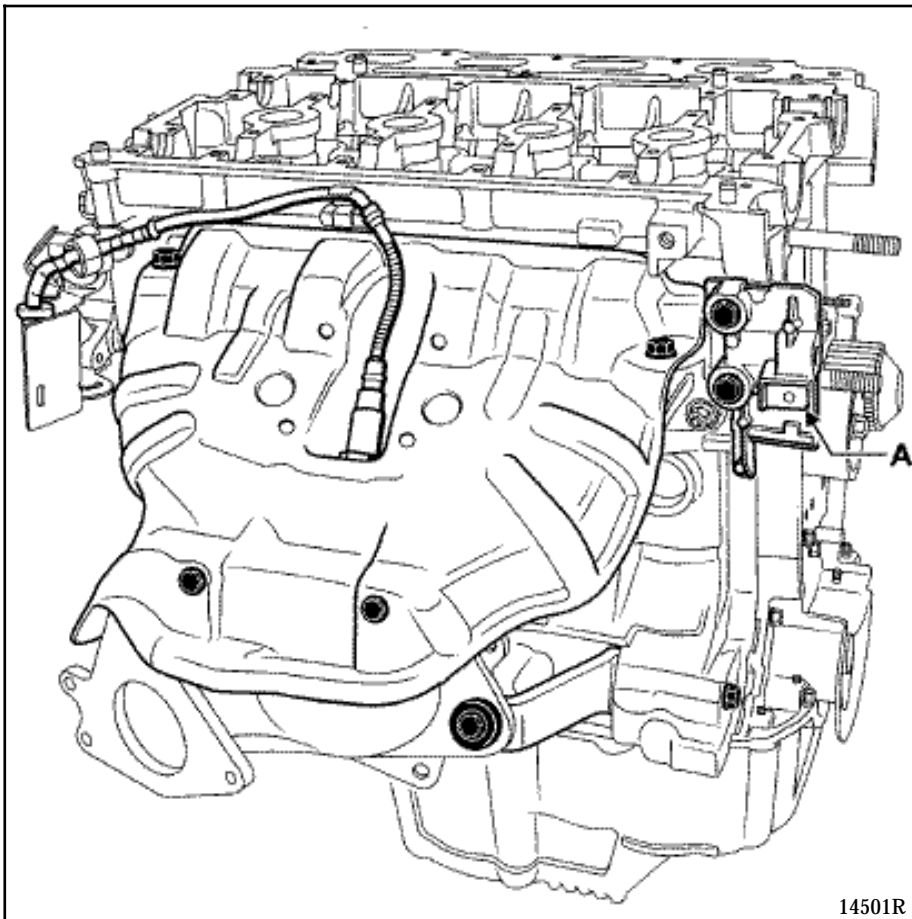


Engine repair

- the upper exhaust heat shield, torque tightening it to **1 daN.m**,
- the oxygen sensor, torque tightening it to **4.5 daN.m**.

NOTE : check that the exhaust heat shield is correctly positioned between the oxygen sensor and the manifold (this prevents the chimney effect which would destroy the oxygen sensor connections).

- the strut between the exhaust manifold and the cylinder block,
- the spacer (A).

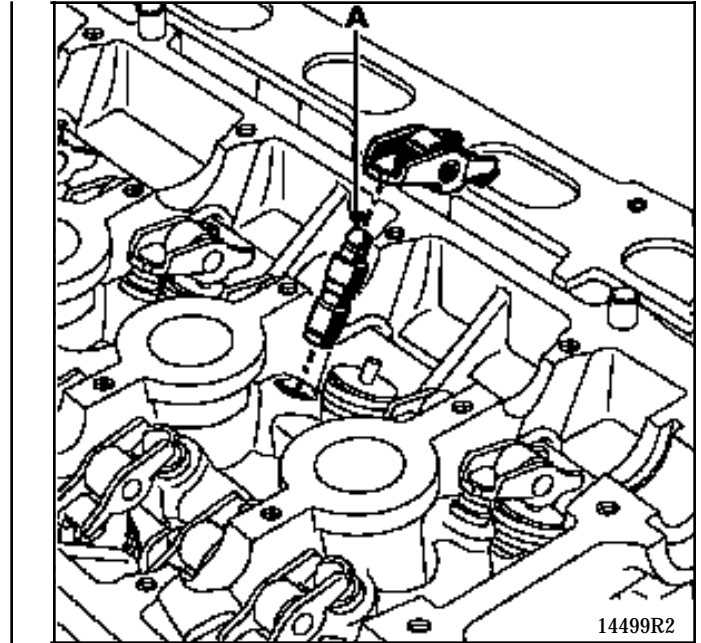


Engine repair

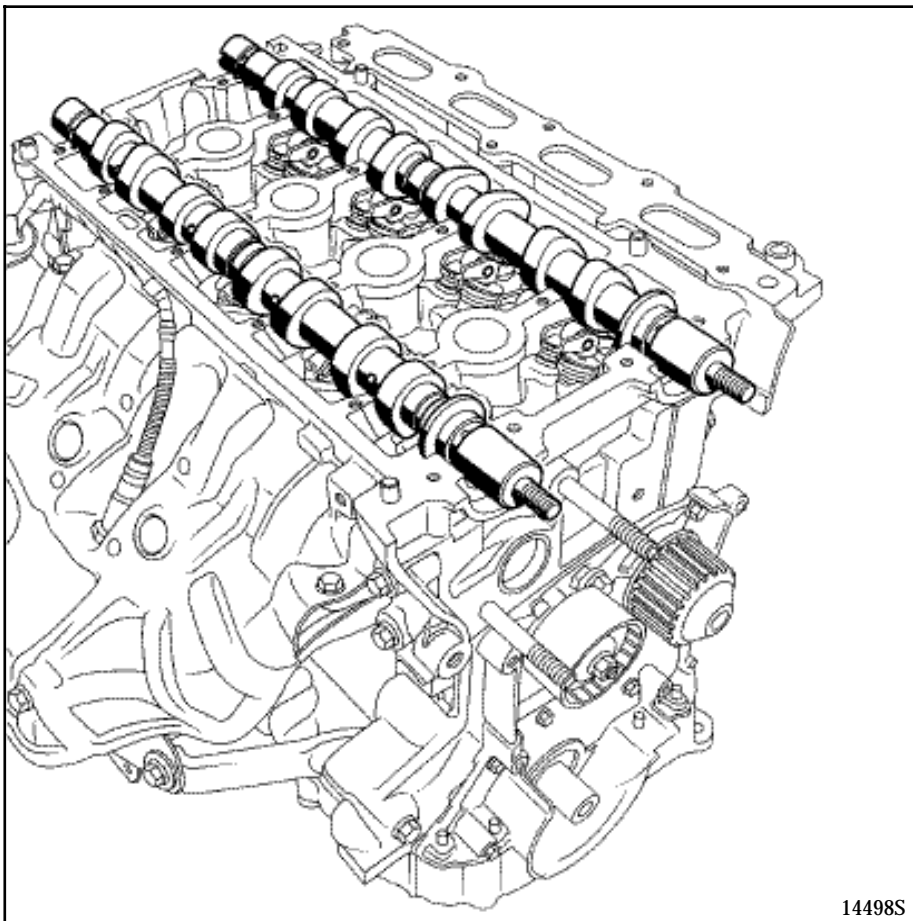
After a certain time, the hydraulic tappets will drain and must be reprimed.

To check if they need to be reprimed, press on the top of the stop at (A) using a thumb. If the stop piston goes down, immerse it in a container of diesel.

Refit the hydraulic tappets and valve rockers.



14499R2



14498S

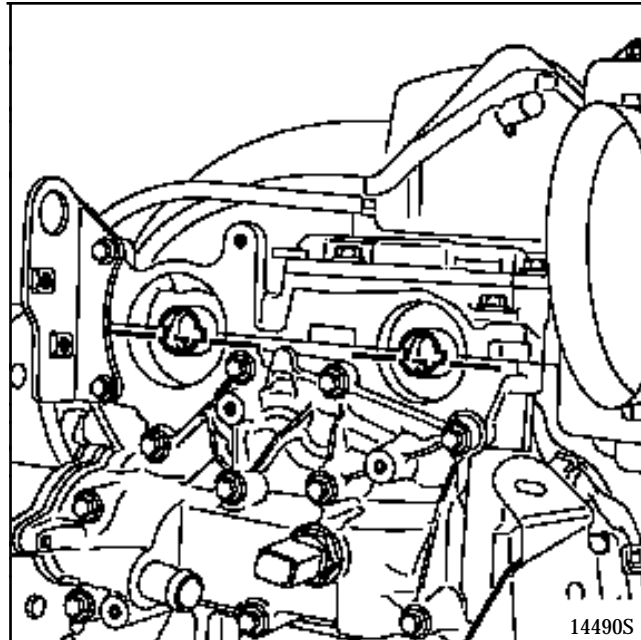
Lubricate the camshaft bearings.

Take care not to allow oil to come into contact with the cylinder head cover gasket face.

Refit the camshafts, positioning them correctly (see "**Identification of the camshafts**" in the "**Specifications**" section).

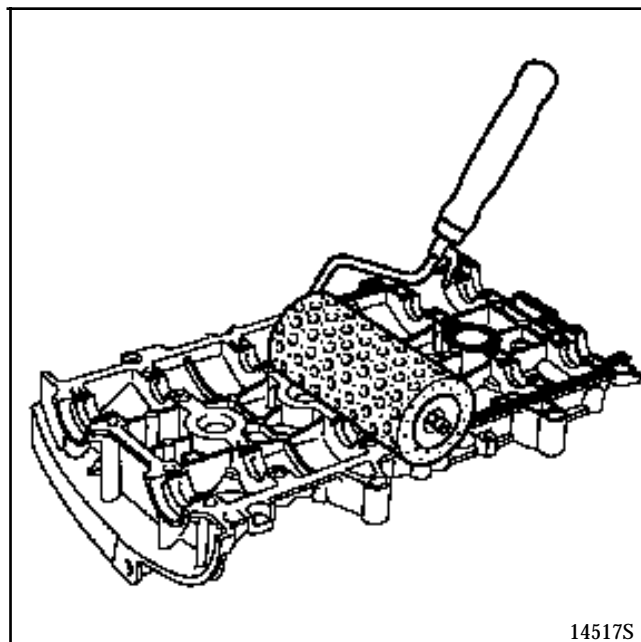
Engine repair

Position the camshaft grooves as shown in the diagram below.



NOTE : the gasket faces must be clean, dry and free of grease (avoid finger-marks especially).

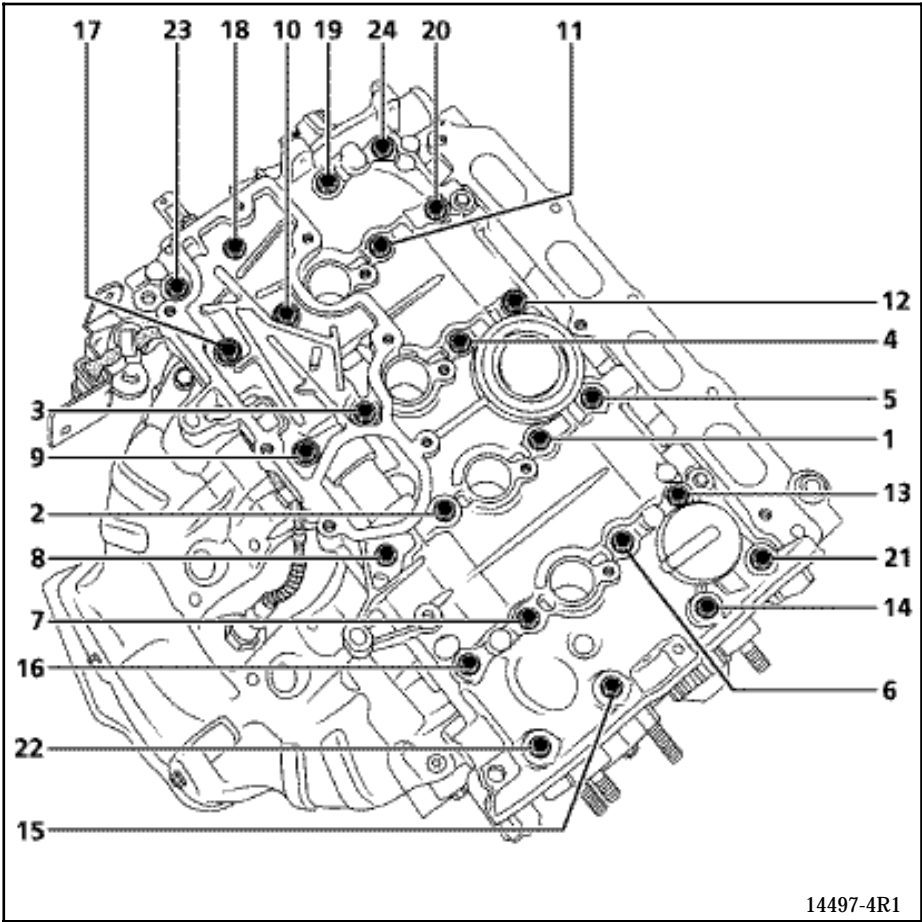
Use a roller to apply **Loctite 518** to the gasket face of the cylinder head cover until it is **reddish** in colour.



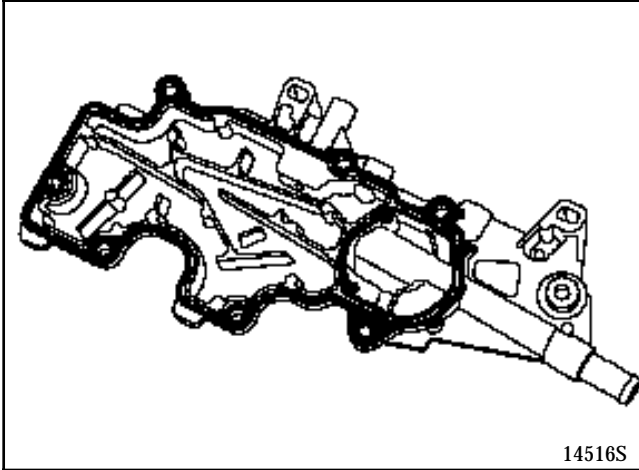
Refit the cylinder head cover, tightening it to the correct torque.

Tightening method

Fitting	Bolt tightening order	Bolt slackening order	Tightening torque (in daN.m)
Operation n° 1	22-23-20-13	-	0.8
Operation n° 2	1 to 12 14 to 19 21 and 24	-	1.2
Operation n° 3	-	22-23-20-13	-
Operation n° 4	22-23-20-13	-	1.2

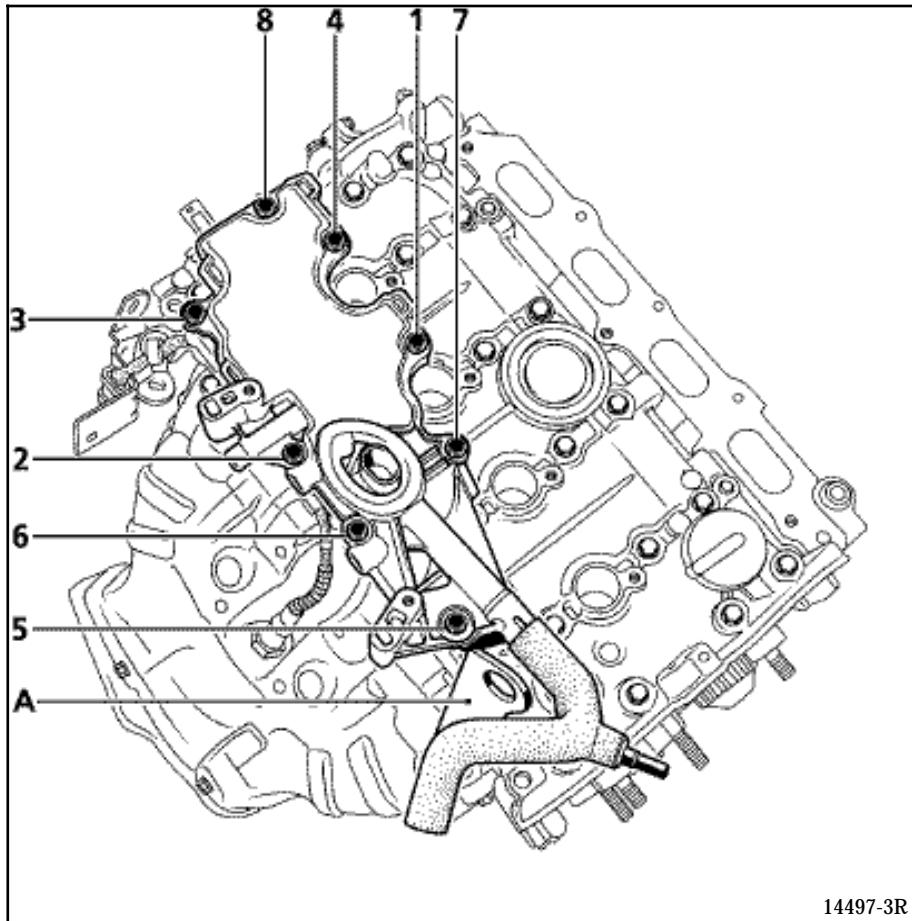


Engine repair



NOTE : the gasket faces must be clean, dry and free of grease (avoid finger-marks especially).

Use a roller to apply **Loctite 518** to the gasket face of the oil decanter until it is **reddish** in colour.



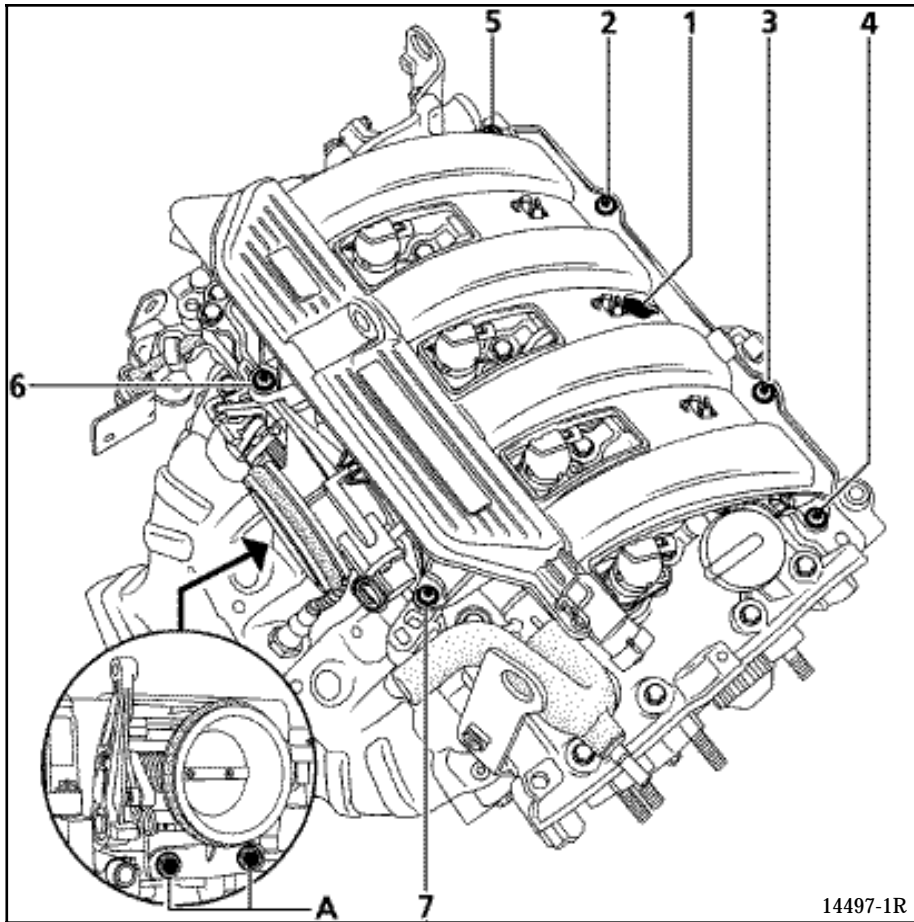
Refit:

- the oil decanter and torque tighten it to **1.3 daN.m** in the recommended order (the self tapping bolts must be torque tightened with a torque wrench),
- the lifting ring (A).

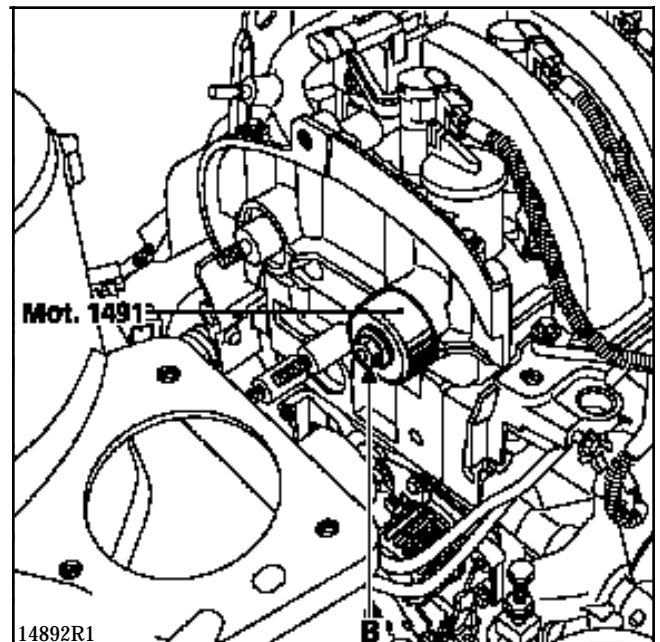
Engine repair

Refit:

- the coils, torque tightening them to **1.3 daN.m**,
- the inlet distributor (with new seals), torque tightening to **0.9 daN.m** in the recommended order,



- the throttle body, tightening bolts (A) to a torque of **1.3 daN.m**,
- the air filter unit, tightening the bolts to a torque of **0.9 daN.m**,
- the camshaft seals, using tool **Mot. 1491** (use the old nuts (B)).



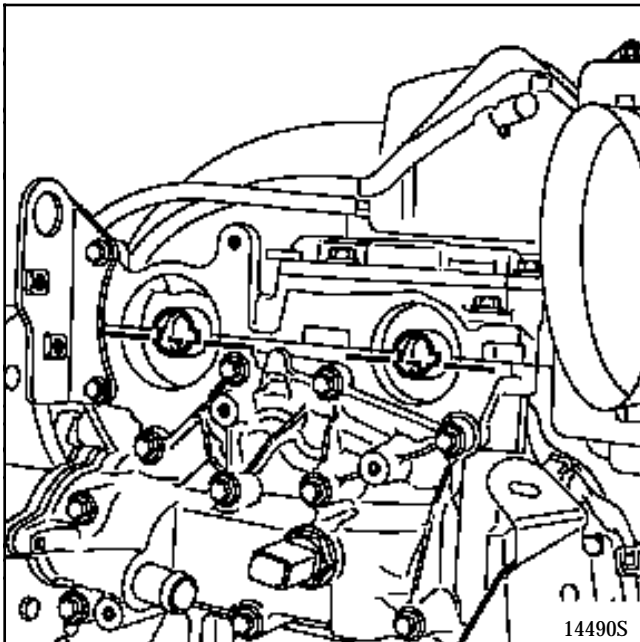
Engine repair

Setting the timing

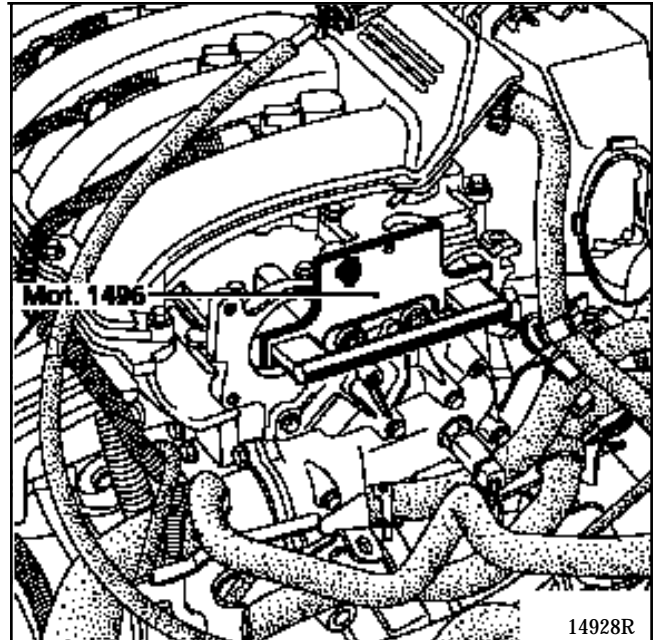
IMPORTANT: it is vital to degrease the end of the crankshaft, the timing sprocket bore, the pressure faces of the accessories pulley and the ends of the camshafts (timing end) and the camshaft pulley bores to prevent slip between the timing, the crankshaft and the camshaft pulleys which would risk damaging the engine.

Fit the camshaft pulleys in place, pretightening the new nuts (the old ones must be renewed) (without locking the nuts, there should be play of 0.5 to 1 mm between the nut and the pulley).

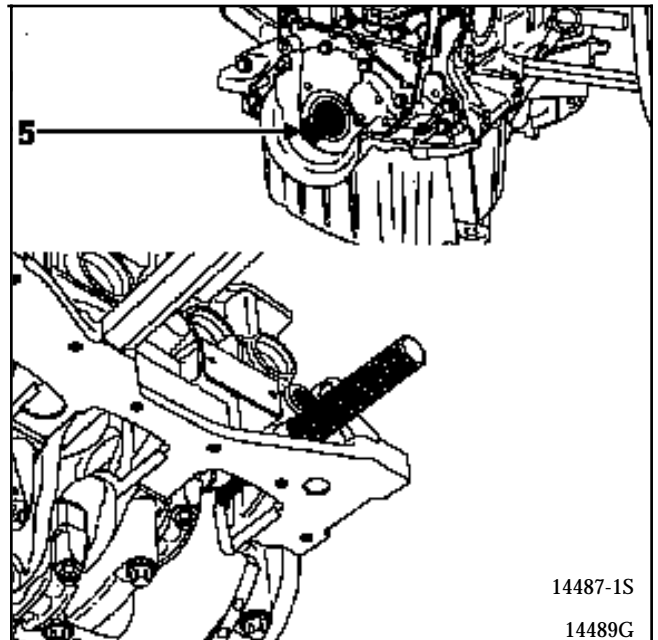
Position the camshaft grooves as shown in the diagram below.



Fit tool **Mot. 1496**, securing it at the end of the camshafts.

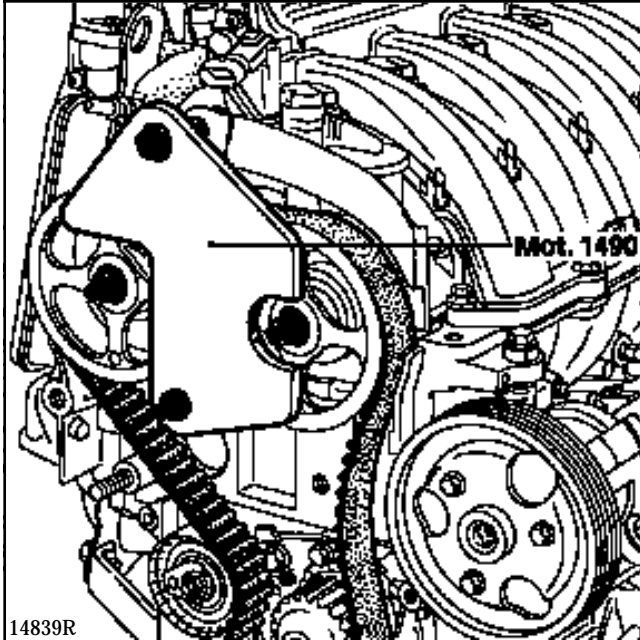
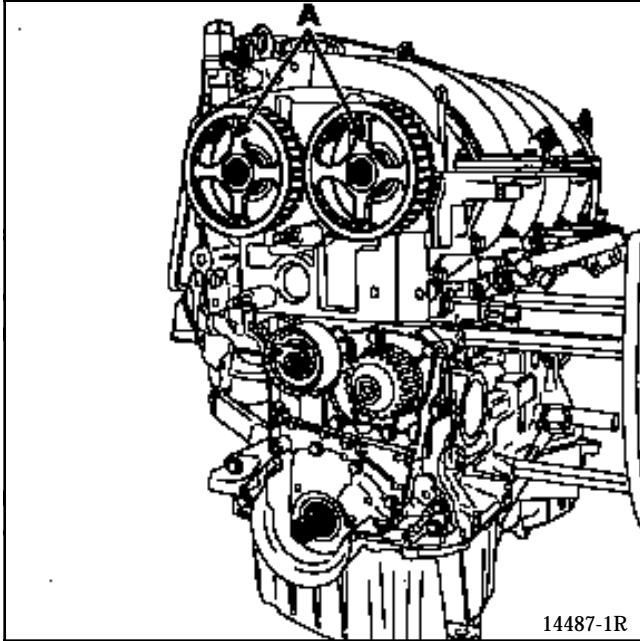


Check that the crankshaft is against the TDC pin (groove (5) on the crankshaft uppermost).



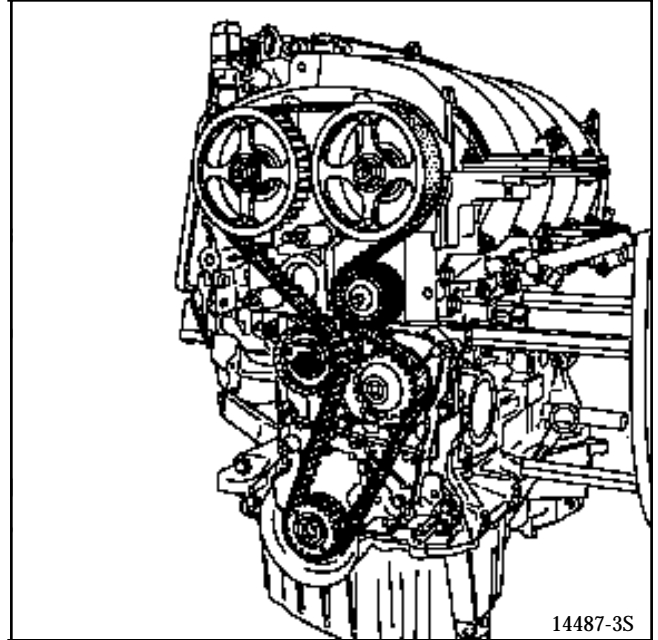
Engine repair

Position the **Renault** logo on the camshaft pulley spokes vertically upwards (A). Fit the timing belt to the camshaft sprockets then fit the camshaft pulley locking tool **Mot. 1490**.



Refit:

- the timing belt,
- the pulley, tightening the mounting bolts to a torque of **4.5 daN.m**.



NOTE : the accessories crankshaft pulley bolt may be reused if the length under the head does not exceed **49.1 mm**, otherwise renew it.

Fit the accessories crankshaft pulley into position, pretightening the bolt (**without locking the bolt there should be play of 2 to 3 mm between the bolt and the pulley**).

NOTE : do not lubricate the new bolt. If the bolt is being reused, however, it must be lubricated with engine oil.

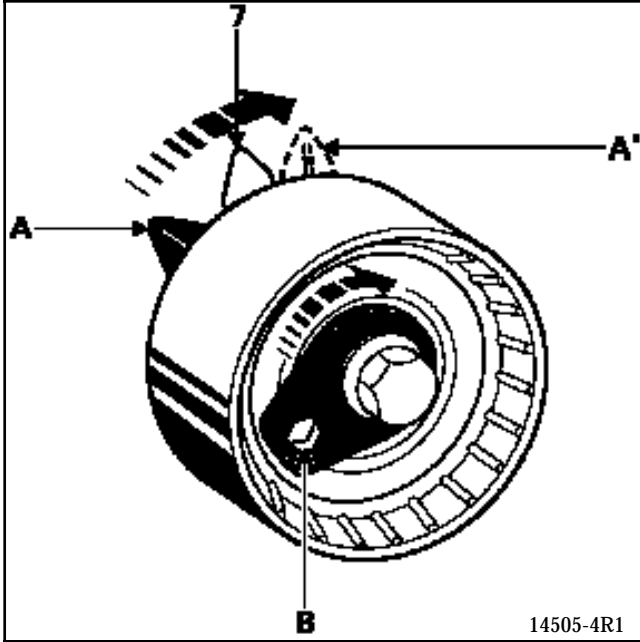
Engine repair

Belt tension

Check that there is still 0.5 to 1mm play between the nuts and the camshaft pulleys.

Move the mobile index (A') of the tension wheel 7 to **8 mm** in relation to the fixed index (7), using a **6 mm** allen key (B).

NOTE : (A) corresponds to the mobile index in the rest position.



Pretighten the tension wheel nut to a torque of **0.7 daN.m**.

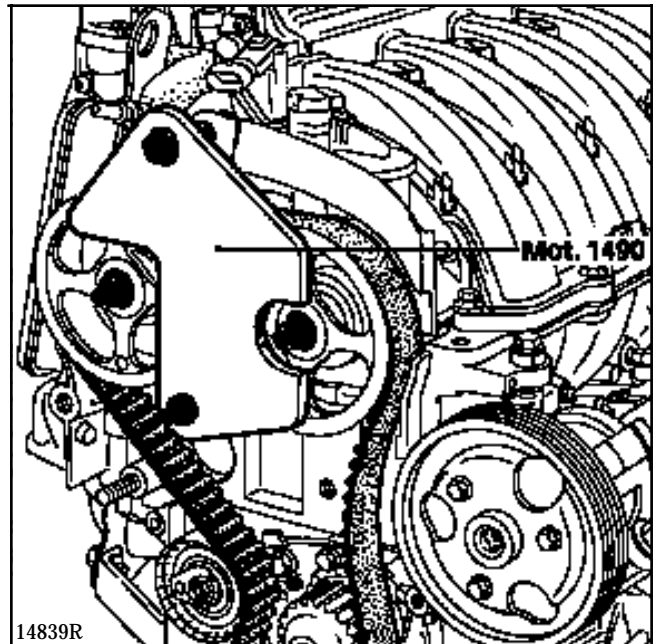
Remove the camshaft pulley locking tool **Mot. 1490**.

Turn the timing face **six times** using the **exhaust camshaft pulley** using tool **Mot. 799-01**.

Slacken the tension wheel nut a maximum of one turn, holding it using a **6 mm** allen key.

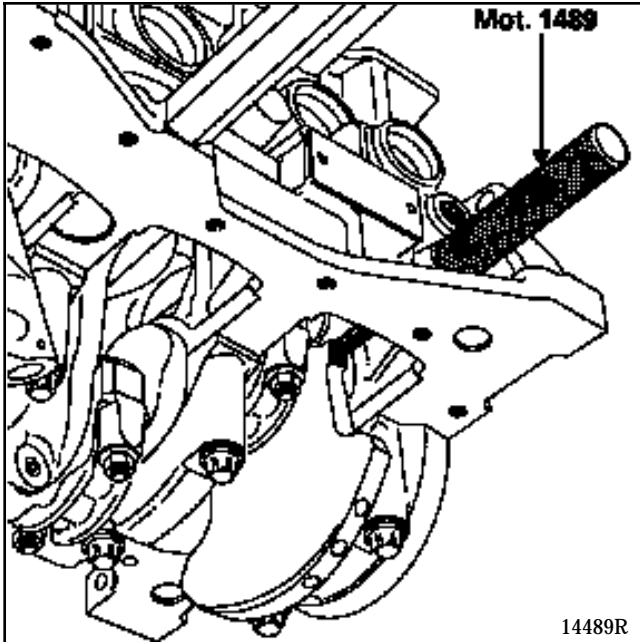
Align the mobile index (A') with the fixed index (7) and torque tighten the nut to **2.7 daN.m**.

Fit the camshaft pulley locking tool **Mot. 1490**.



Engine repair

Check that the crankshaft is against the TDC pin **Mot. 1489**.



Tighten the accessories crankshaft pulley bolt to a torque of **2 daN.m**, then angle tighten by **135° ± 15°** (crankshaft against the TDC pin).

Tighten the **inlet** camshaft pulley nut to a torque of **3 daN.m** then angle tighten by **84°**.

Tighten the **exhaust** camshaft pulley nut to a torque of **3 daN.m** then angle tighten by **84°**.

Remove the camshaft setting tool **Mot. 1496**, the camshaft locking tool **Mot. 1490** and the TDC pin **Mot. 1489**.

Checking the tension setting

Checking the tension:

Turn the crankshaft clockwise twice (timing side), before the end of the two revolutions, screw the pin **Mot. 1489** into the cylinder block and slowly and without jerky movements, adjust the crankshaft until it touches the pin.

Remove the TDC pin.

Check that the tension wheel indices are aligned, otherwise repeat the tensioning procedure. Slacken the tension wheel nut a maximum of one turn while holding the tension wheel using a **6 mm** allen key.

Align the mobile index with the fixed index and tighten the nut to a torque of **2.7 daN.m**.

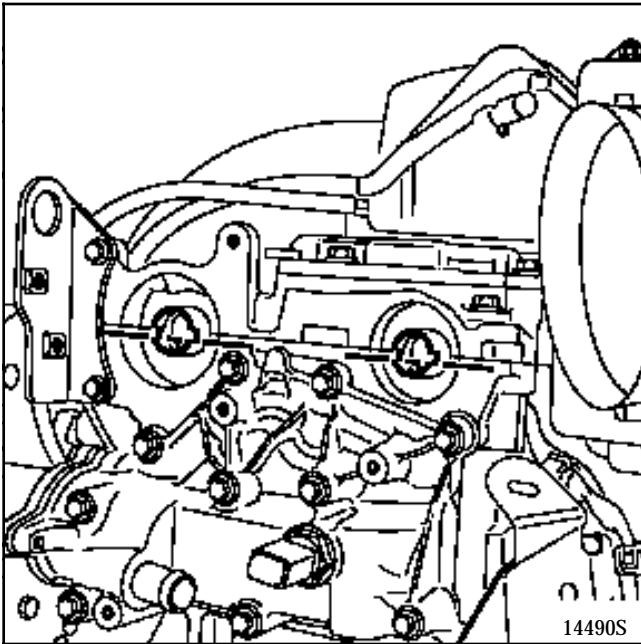
Engine repair

Checking the setting

Ensure that the tension wheel indices are correctly positioned before checking the setting of the timing.

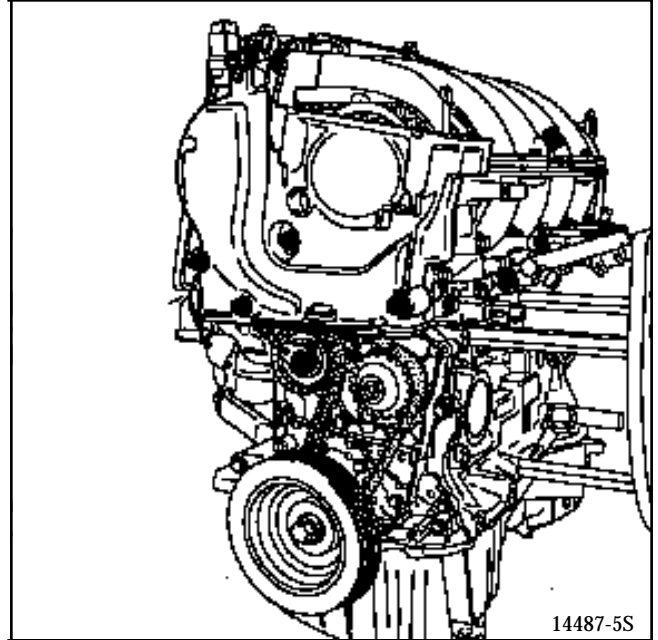
Screw pin **Mot. 1489** into the cylinder block then position and retain the crankshaft against the pin.

Fit (without forcing) tool **Mot. 1496** for setting the camshafts (the camshaft grooves must be horizontal). If the tool does not engage, the timing must be reset and the tension adjusted.

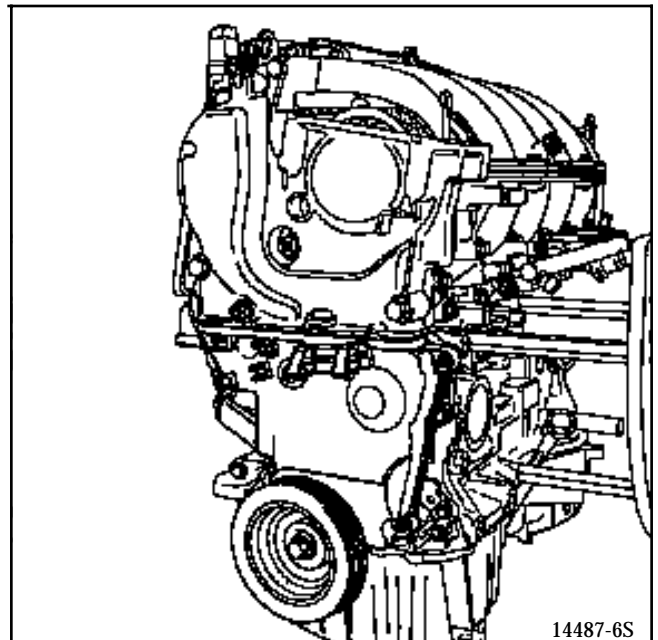


Refit:

- the TDC pin plug,
- the upper timing cover, tightening the bolts and nuts to a torque of **4.1 daN.m**,

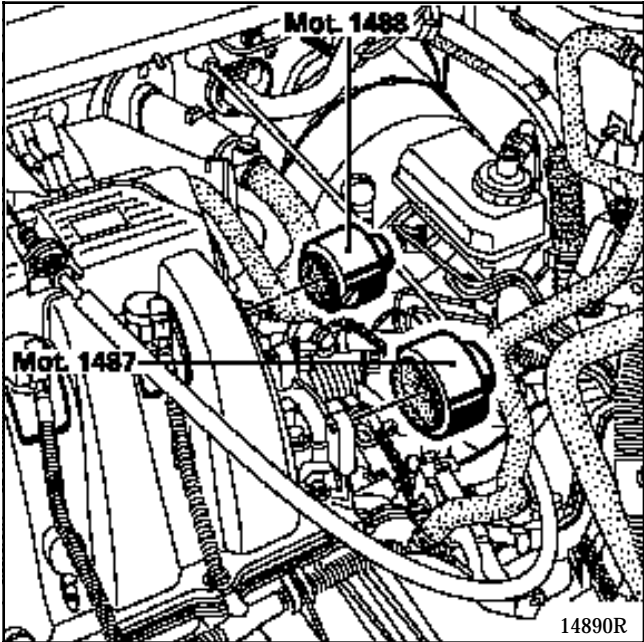


- the intermediate timing cover.



Engine repair

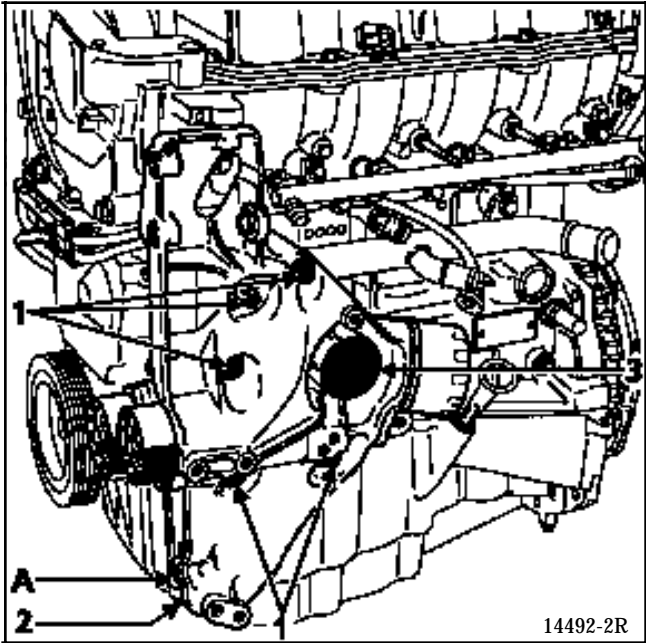
- Refit new plugs for:
- the inlet camshaft (Mot. 1487),
 - the exhaust camshaft (Mot. 1488).



Remove the engine from support Mot. 790-03.

- Refit:
- the coolant pipe with a new seal,
 - the multifunction mounting (check that it touches the sump at (A) before tightening) then torque tighten the bolts (see table below).

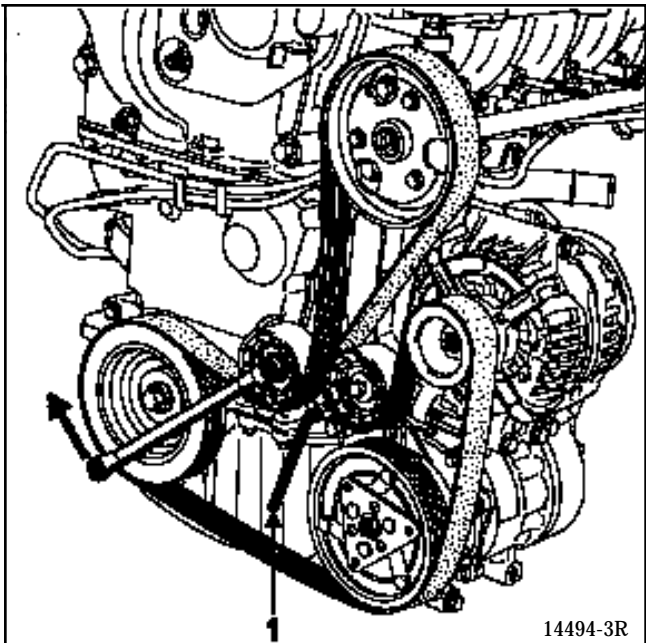
Bolts	Tightening torque
1	5.3 daN.m
2	2.1 daN.m
3	11 daN.m



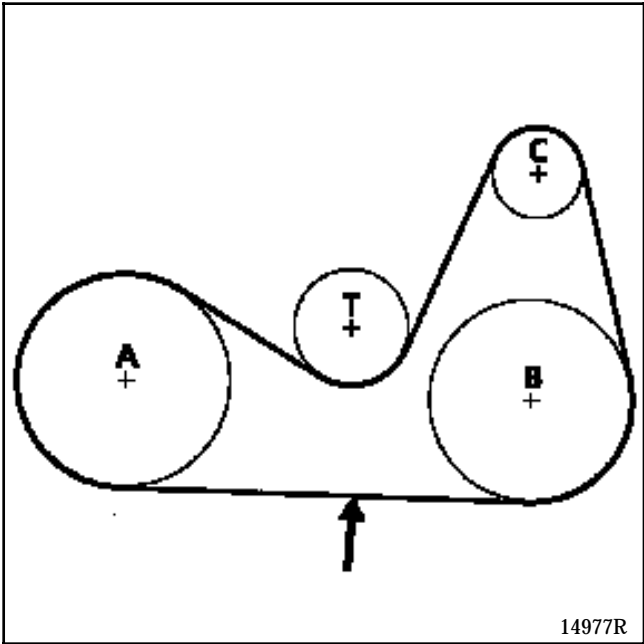
- Refit:
- the air conditioning compressor, tightening the bolts to a torque of **2.1 daN.m**,
 - the alternator, tightening the bolts to a torque of **2.1 daN.m**,
 - the power assisted steering pump, tightening the bolts to a torque of **2.1 daN.m**,
 - the accessories belt.

With air conditioning
To fit the belt, pivot the wrench to the left.

Lock the tension wheel using a **6 mm** allen key (1).



Alternator and power assisted steering



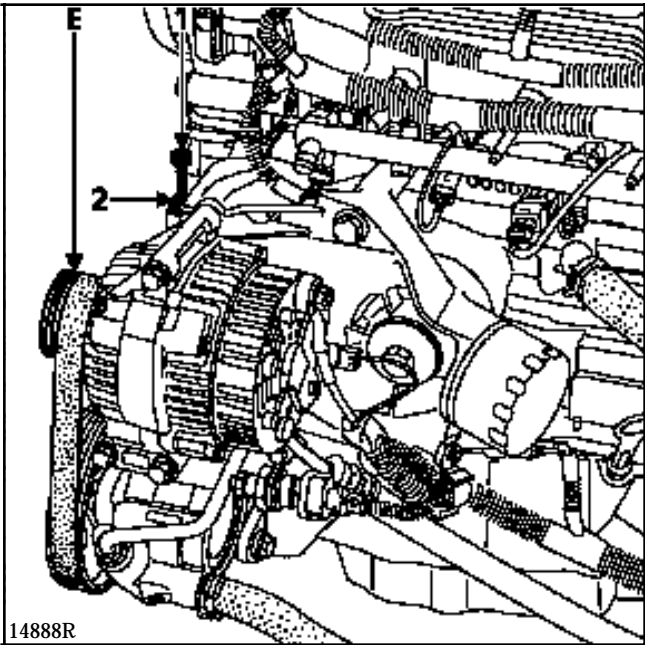
Without air conditioning

The belt is tensioned using bolt (1) (the two tension wheel mounting bolts are slackened) then tighten nut (2).

Tension (US = SEEM units)	Multitooth power assisted steering belt
Fitting	108 ± 6

- A Crankshaft
- B Power assisted steering pump
- C Alternator
- T Tension wheel

→ Point for checking belt tension



NOTE : the accessories belt has five teeth, while the alternator pulley and the PAS pump pulley have six; when fitting the belt, it is therefore vital to ensure that the tooth at the end of the pulleys at (E) remains free.