DIESEL ENGINES

010 GB

Réf.N3 RE 01

SUPERSEDES XUD9 ENGINE OVERHAUL BROCHURE

Réf. 2992

XUD7...
XUD9...

Overhaul

TO BE FILED IN THE UNIT OVERHAUL BINDER

STM0167

vetus

AUTOMOBILES PEUGEOT

direction des pièces et services

CONTENTS

This brochure covers the following engines :

XUD7 (A9A) (161)
XUD7TE (A8A)

XUD9 (D9A) (162)
XUD9A (D9B)
XUD9Y (DJ2)

As these operations have been performed on an XUD9A engine, some illustrations may differ in detail from the engine being worked on.

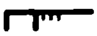
IMPORTANT : Unless shown otherwise, all dimensions are in millimetres.

SYMBOLS USED IN THIS BROCHURE

⊗ : **EXHAUST**

● : **INLET**

 : **PRODUCTION DIMENSION**

 : **REPAIR DIMENSION**

Modifications can affect adjustments and overhaul operations on these engines.

To maintain this brochure up-to-date, please enter below the source of information (Service Information, Info-Flash, etc.), the type and subject of the modification and the page affected.

Information type and reference	Modification	See page
Example : SI N°	Cylinder head tightening torque ... Nm instead of... Nm	32

CYLINDER HEAD

- Cylinder head height h is measured with the camshaft in place fitted with two bearing caps

  h is measured on the oil seal lip contact diameter (the largest diameter)

  h nominal : 157,40 to 157,75

- Maximum permisible bow : **0,07** (the camshaft must turn freely)

- Maximum permissible gasket face machining : **0,4** in relation to the measured h nominal

- Cylinder heads machined undersize are stamped **R** in the area **(a)**

- After machining a gasket face, the following operations must be carried out :

  . Valve seat machining to re-establish correct recess (page 7)
  . Replacement of the swirl chambers by repair dimension chambers and correction of their protrusion (page 8)
  . Fitting of **0,4** thick compensation washers under the valve springs

- Cylinder heads with oversize camshaft bearings (+ 0,5) are stamped 1 in the area **(a)**

CYLINDER HEAD GASKET

Thickness identification : **(b)**

Engine identification : **(b)**

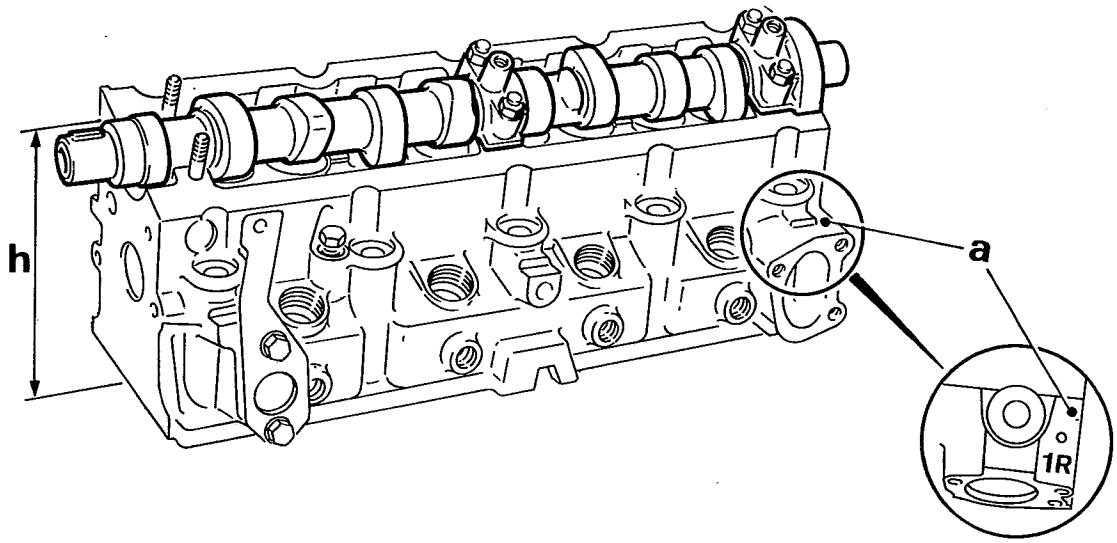
Engine	Identification **(c)**	Identification **(b)**	Thickness
XUD9..	No notch	2 notches	1,61 mm
XUD7	1 notch	3 notches	1,73 mm
XUD7TE	2 notches	2 notches	1,65 mm
		3 notches	1,80 mm

CAMSHAFT

The camshaft for the XUD7TE engine is identified by a boss between the cams of n. 1 cylinder

Camshafts with **0,5 mm** oversize bearings* are identified by a yellow paint ring **(d)** between the cams of n. 1 cylinder

* These camshafts are fitted only to exchange engines and can be obtained from Parts on special order.



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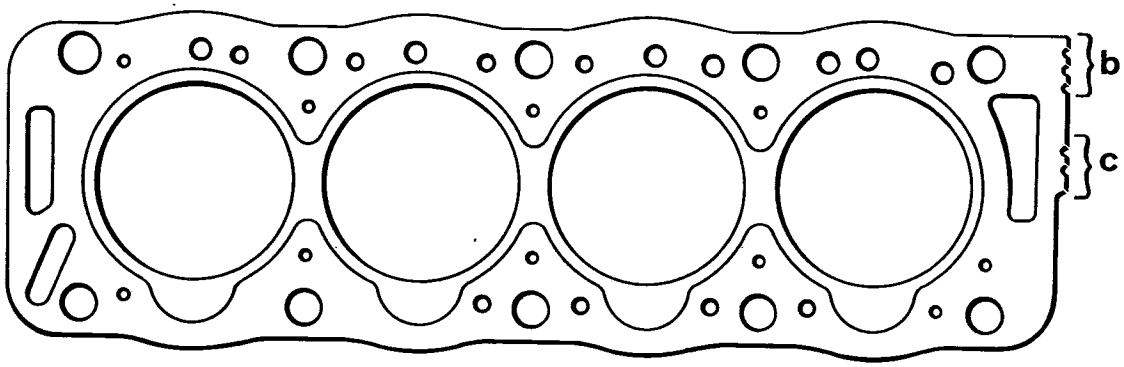
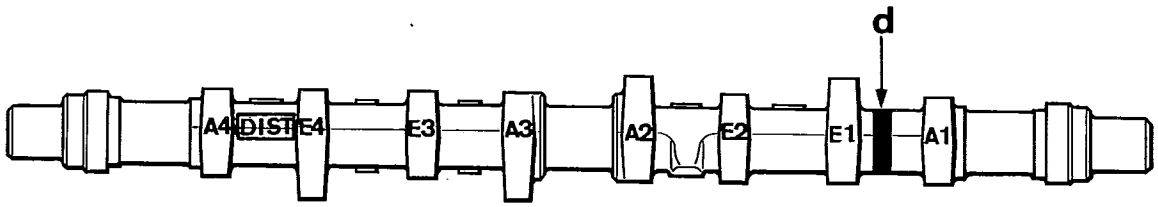
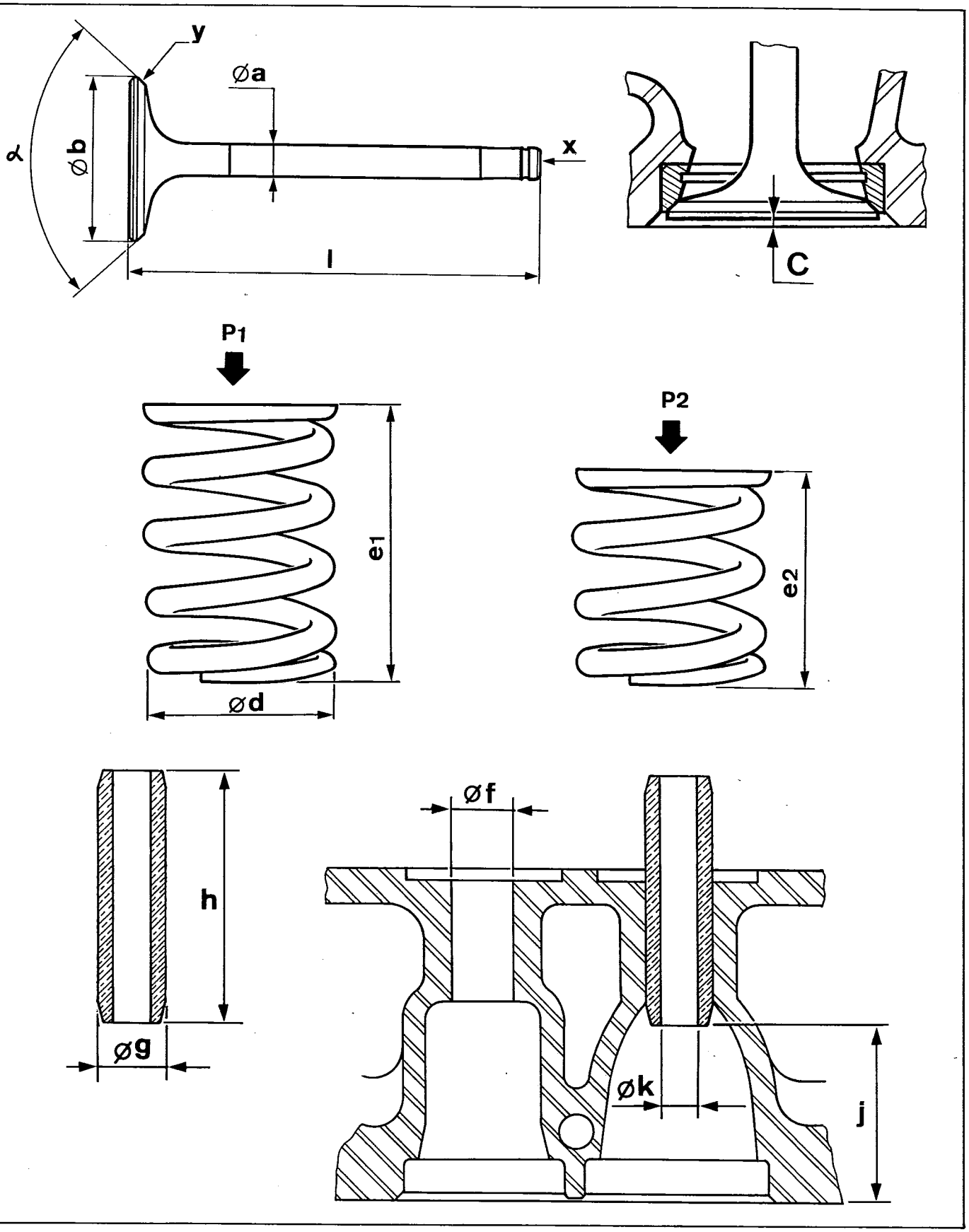





y
Øa
α
Øb
x
l
C
P1
e1
Ød
P2
e2
h
Øg
Øf
Øk
j

VALVES

	●		⊗
	—>| 10/86	|—> 10/86	
Min. length 1	112,2	112,2	
ø a $^{0}_{-0,015}$	8,005	8,005	7,985
ø b ± 0,1	36	38,5	33
α	120°	90°	90°

● : Faces **(x)** and **(y)** can be machined a maximum of 0,2mm

⊗ : No machining is permissible

VALVE RECESS

	●	⊗
c	0,5 to 1,05	0,9 to 1,45

VALVE SPRINGS

	Inner	Outer
ø d	19,5	29
P1 : daN e1	8,5 38,4	18 42,4
P2 : daN e2	23,7 29,3	45 33,3

VALVE GUIDES

	ø G	ø F	h	j	ø k
Tolerance	0 -0,011	+0,032 0	±0,25	±0,50	0 +0,2
|—> 0	14,02 14,13	13,981 14,051	52,00	36,50	8,02
⌐¯¯ 1	14,29	14,211			
⌐¯¯ 2	14,59	14,511			

ø **k** is obtained by machining after fitting in the cylinder head

VALVE SEATS

	●					
	ø a		ø b		c	d
	—>|10.86	|—>10.86	—>|10.86	|—>10.86		
Tolerance	+0,137 +0,112	0 -0,025	±0,025		0 -0,1	±0,15
⊢—> 0	39 39,2	40,161 40,361	39 39,2	40 40,2	6,25 6,45	8,267 8,467
⌐‴ 1	39,3	40,461	39,3	40,3	6,45	8,467
⌐‴ 2	39,5	40,661	39,5	40,5	6,45	8,467

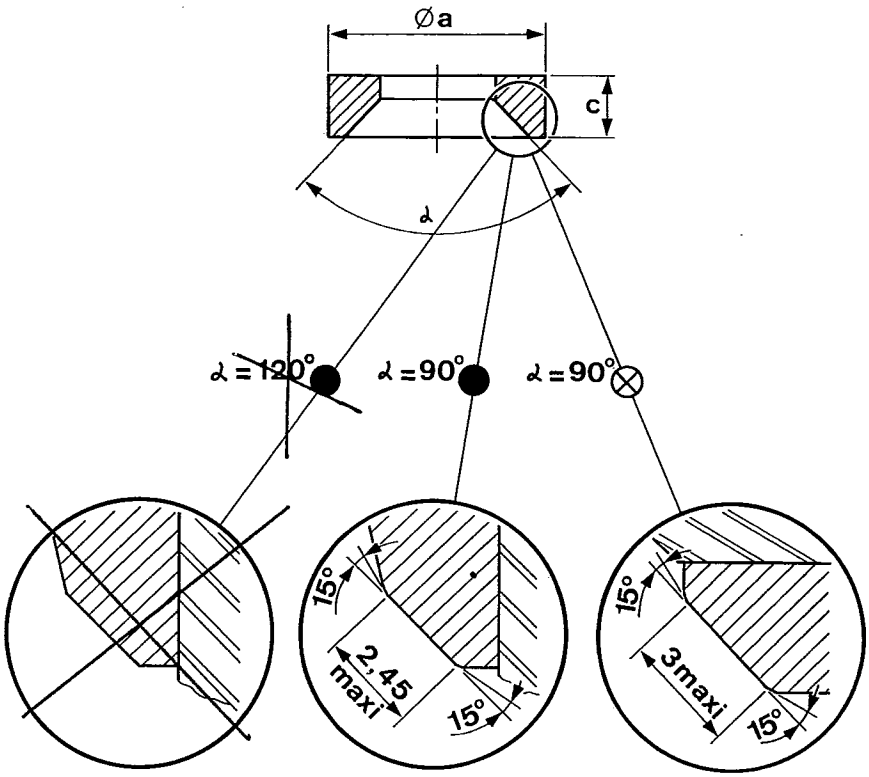
	⊗			
	ø a	ø b	c	d
Tolerance	0 -0,025	±0,025	0 -0,1	±0,15
⊢—> 0	34,137 34,337	34 34,2	6,05 6,25	8,15 8,35
⌐‴ 1	34,437	34,3	6,25	8,35
⌐‴ 2	34,637	34,5	6,25	8,35

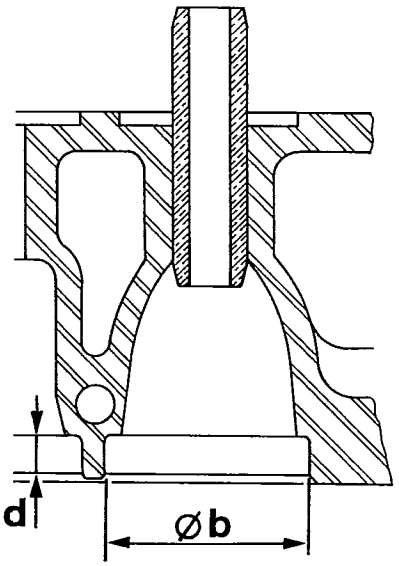
After fitting valve seats into the cylinder head, machine them according to the drawings opposite

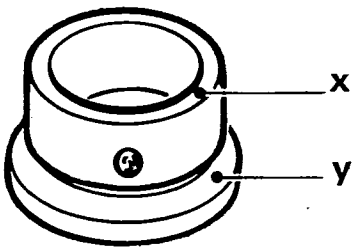
SWIRL CHAMBERS

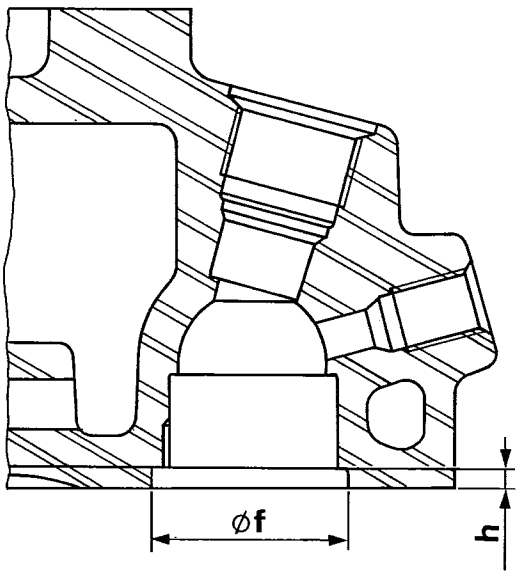
	ø e	ø f	g	h
Tolerance	+0,099 -0,060	+0,039 +0	+0,020 -0,025	+0,02 -0,04
⊢—> 0	32,05 32,25	32 32,2	4 4,1	3,9 4
⌐‴ 1	32,45	32,4	4,2	4,1
⌐‴ 2	32,65	32,6	4,3	4,2

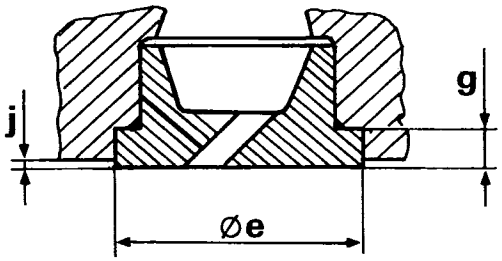
The protrusion **j** must be between **0 and 0,03 mm**
Dimension **j** is obtained by machining faces **(x)** and **(y)**

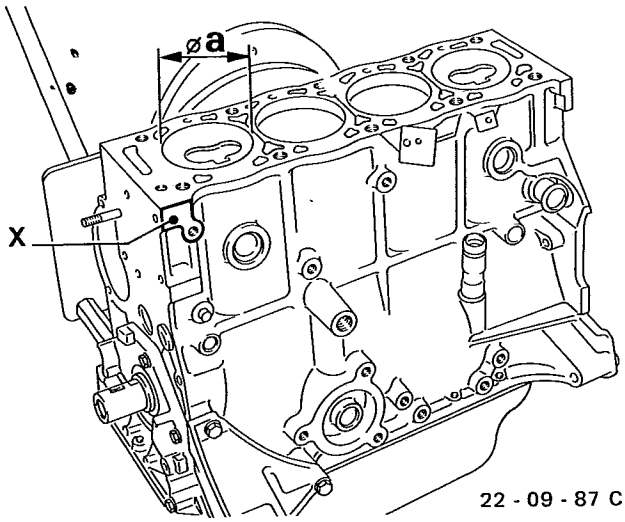

Øa
c
α
α = 120°
α = 90°
α = 90°
15°
2,45 maxi
15°
15°
3 maxi
15°


d
Øb


x
y


Øf
h


j
g
Øe



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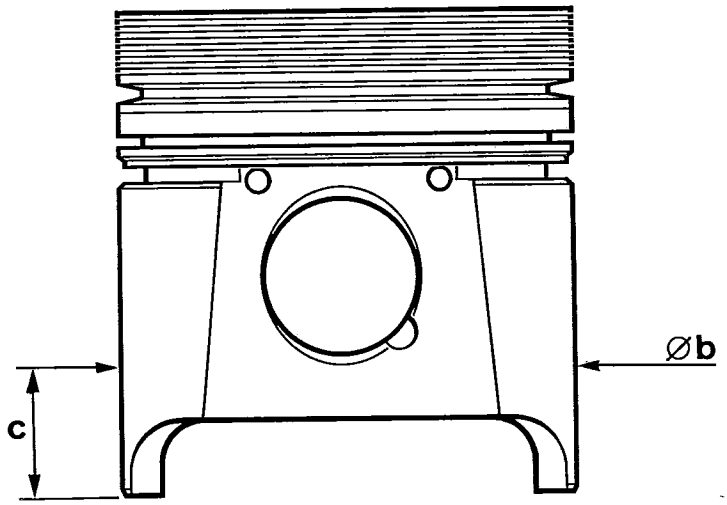
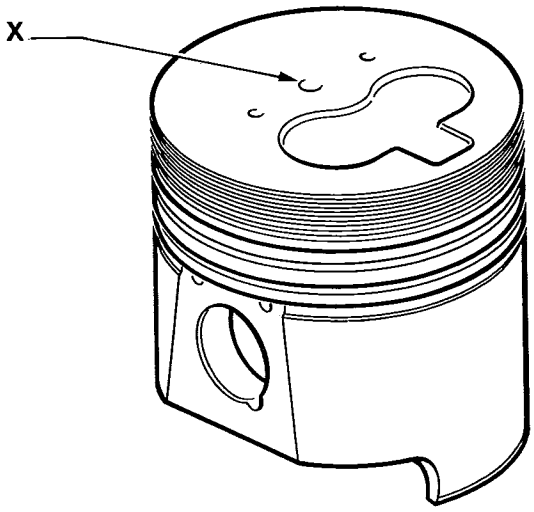




CYLINDER/PISTON MATCHING

		CYLINDER Ø a Tolerance : $^{+0,018}_{-0}$		PISTON Ø b Tolerance : $\pm 0,009$	
	Identification (x)	XUD7..	XUD9..	XUD7..	XUD9..
⟶ 0	None	80	83	79,93	82,93
	A1	80,03	83,03	79,96	82,96
1	R1	80,20	83,20	80,13	83,13
2	R2	80,50	83,50	80,43	83,43
3	R3	80,80	83,80	80,73	83,73

NOTE

- the piston **Ø b** must be measured at dimension **c**

	XUD7TE	XUD7/XUD9..
c	22,50	25,00

- The repair dimension identification **(x)** is stamped on the cylinder block and pistons

GUDGEON PIN

	XUD7/XUD9..	XUD7TE
Ø	25	28

CRANKSHAFT

- CRANK PINS AND JOURNALS

	ø c	d	ø a	b
Tolerance	-0 -0,016	±0,003	-0 -0,019	±0,003
⊢—> 0	50,00	1,827	60,00	1,842
⌐¬ 1	49,70	1,977	59,70	1,992

NOTE

Big end and main bearing shells ⌐¬ 1 can be identified by white paint (1) on the edge of the shell.

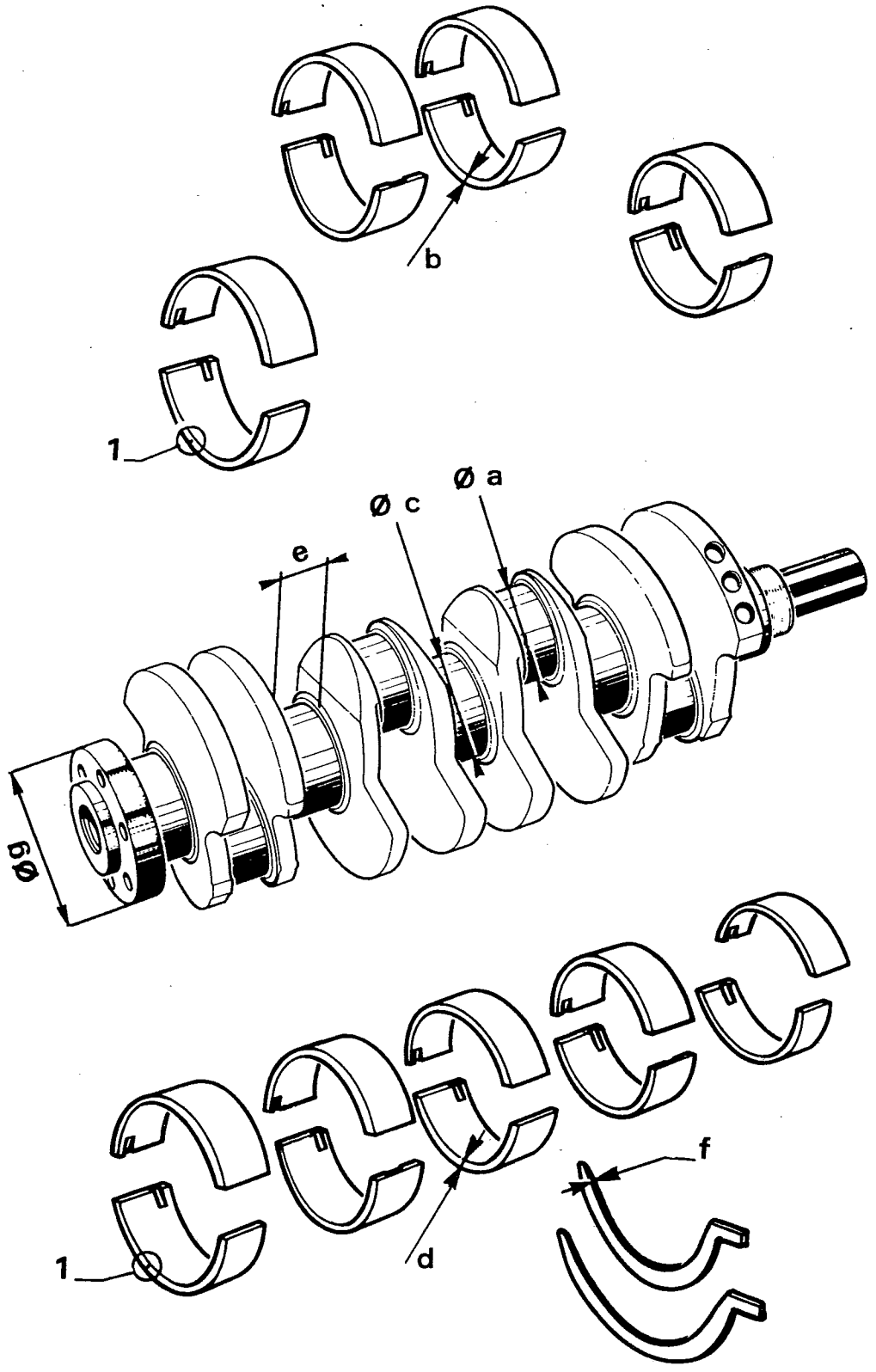
- END FLOAT

End float must be between **0,07 and 0,32**

	N°. 2 JOURNAL		HALF SHELL THICKNESS	
	e		f	
	XUD7 XUD9..	XUD7TE	XUD7 XUD9..	XUD7TE
Tolerance	+0,05 0		± 0,025	
⊢—> 0	26,60	25,7	2,305	1,855
⌐¬ 1	26,80	25,9	2,405	1,955
⌐¬ 2	26,90	26	2,455	2,005
⌐¬ 3	27,00	26,1	2,505	2,055

- OIL SEAL CONTACT SURFACE

DIMENSION	ø g Tolerance -0 -0,087
⊢—> 0	90,00
⌐¬ 1	89,80


b
1
Ø a
Ø c
e
6Ø
f
d
1

DISMANTLING
RE-ASSEMBLY

XUD7.. XUD9..	TOOLS

I

SPECIAL TOOLS

(-).0110

DZ - Spacer, 2mm thick

GY - Support for dial indicator on cylinder head

H - Support for dial indicator on gasket face

II

(-).0117

EZ - Crankshaft turning spanner
F - Dial indicator
AAZ - Support Pompe
AB - Knurled nut Roto diesel
AC - Support DPC
AD - Plunger
AK - Dial indicator support and extension for BOSCH pump
N - Engine positioning rod

AM - Tools for timing Roto Diesel DPC pump

(-).0504

A1-A2 - Dial indicator support

(-).0164

- Injection pipe spanner

III

(-).0153

A1 -Universal tool for fitting no.1 main bearing with side seals

A2 -Set of shims 0,15 mm thick

C-D-E - Oil seal fitting plugs

N - TDC setting rod

IV

(-).0149

- Spanner for screwed injector carriers

0016901900

- Clutch plate centralising mandrel

(-).1504

- Dial indicator with attachment lug

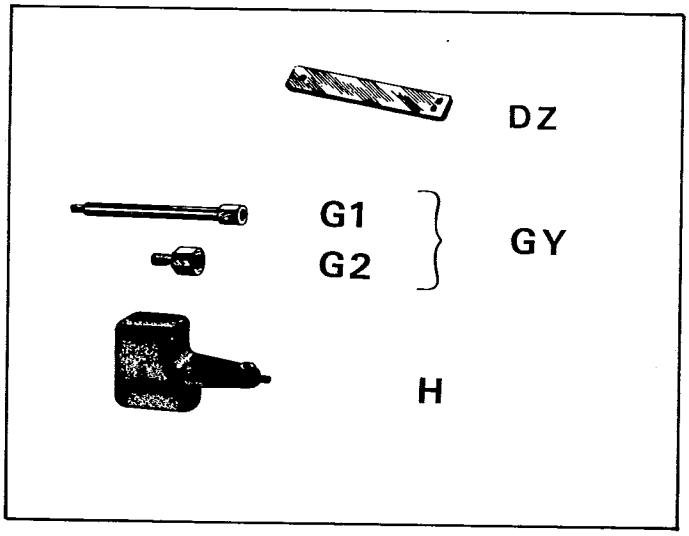
V

TOOLS TO BE MADE LOCALLY

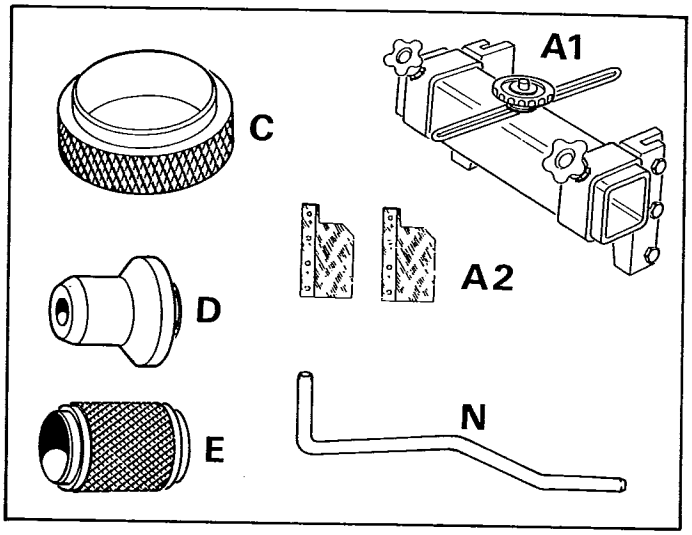
0.0149

- Cylinder head separating levers

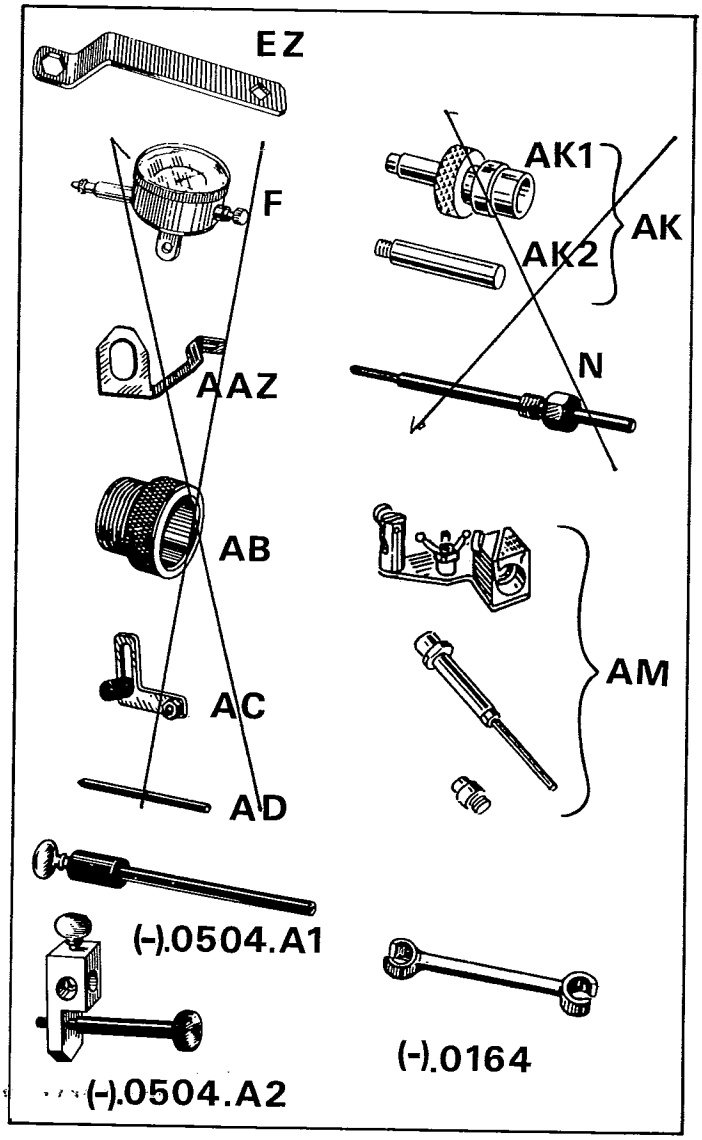
I


DZ
G1
G2
GY
H

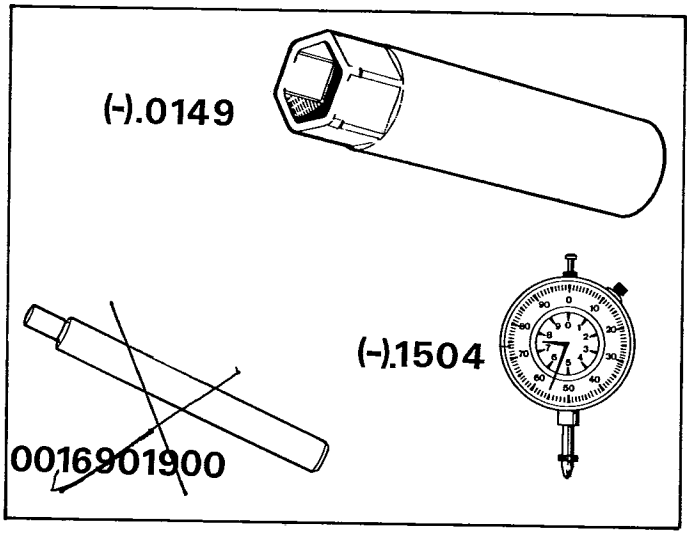
III


A1
C
A2
D
E
N

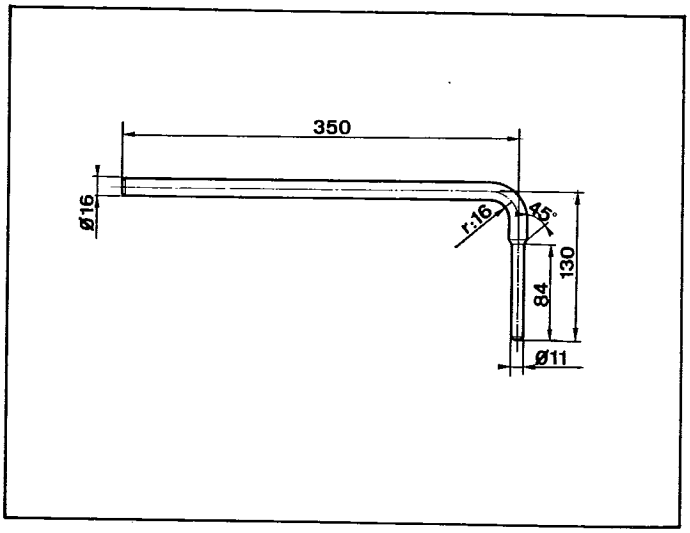
II


EZ
F
AK1
AK2
AK
AAZ
N
AB
AM
AC
AD
(-).0504.A1
(-).0164
(-).0504.A2

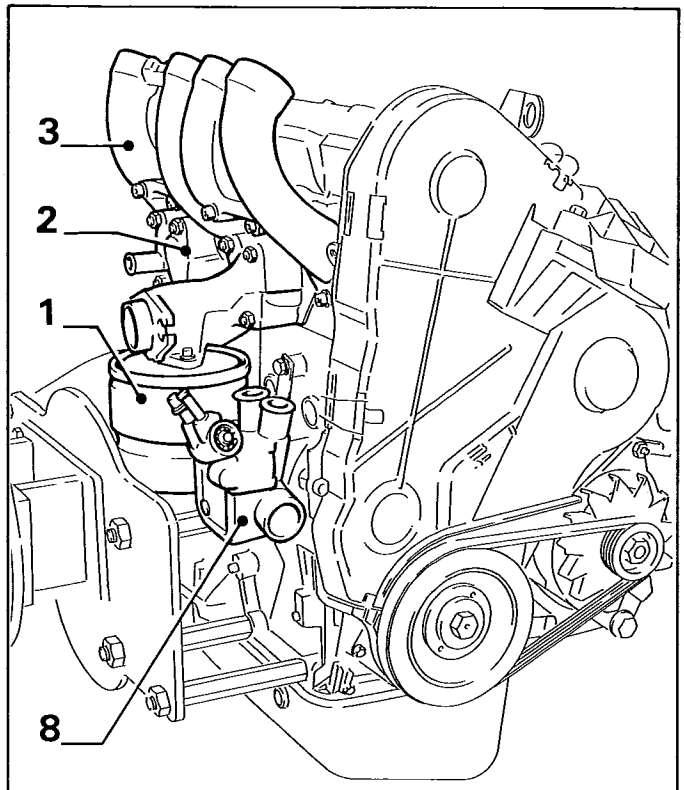
IV


(-).0149
(-).1504
0016901900

V


350
ø16
r:16
45°
130
84
ø11

I



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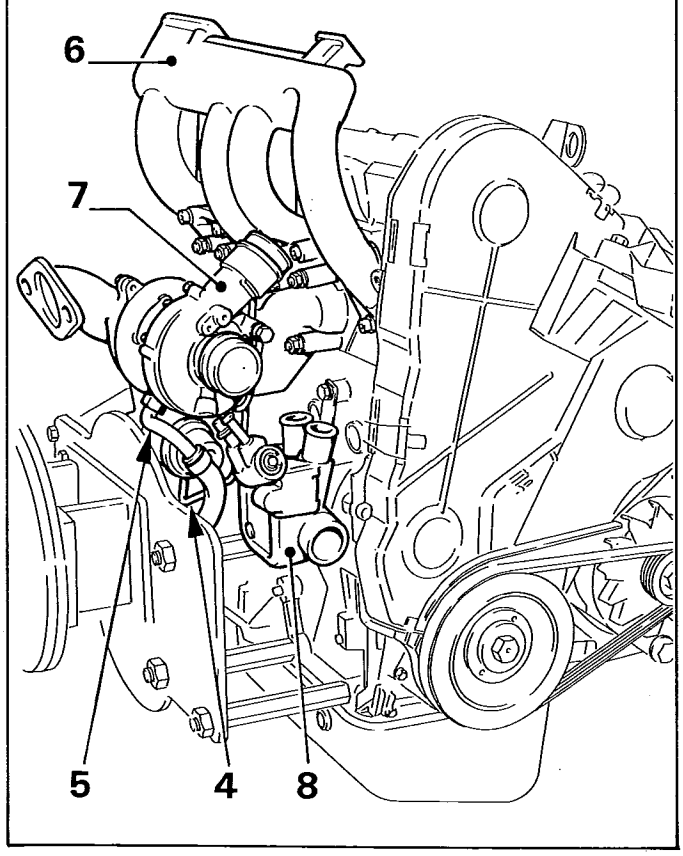

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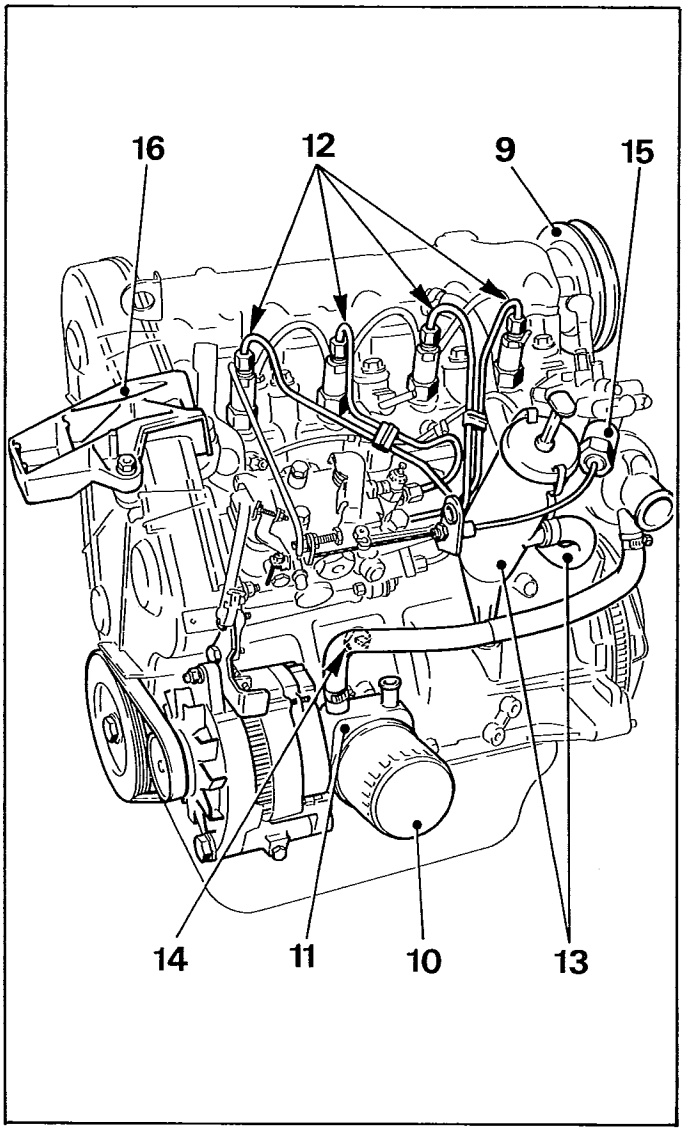

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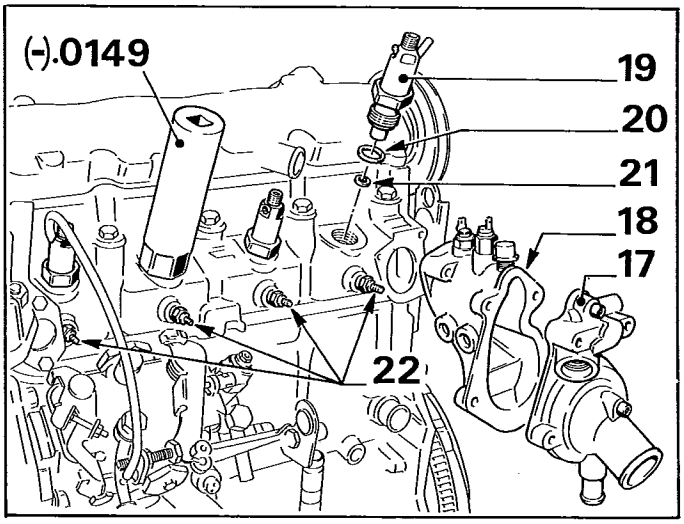

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I

STRIPPING THE ENGINE

- Remove :
  - the TDC captor
  - the clutch housing centralising dowel
- Mount the engine on the Desvil stand (reference 175/3)
- Lock the flywheel with a tool of FACOM D86
- **Remove :**
  - the exhauster drive belt*

XUD7 - XUD9 - XUD9A

- the expansion chamber **(1)**
- the exhaust **(2)** and inlet **(3)** manifolds

XUD7TE

- the turbocharger lubrication supply **(4)** and return **(5)** pipes
- the inlet manifold **(6)**
- the turbocharged **(7)**
- the exhaust manifold

XUD9Y

- the expansion chamber
- the inlet and exhaust manifold assembly

ALL MODELS

- the coolant manifold **(8)** and its metal pipe

* according to specification

II

- Remove :
  - the pulley **(9)**
  - the alternator and its belt
  - the oil filter **(10)**
  - the oil cooler **(11)***
  - the fast idle control **(15)**
  - the injector pipes **(12)**
  - the glow plug leads
  - the crankcase breather pipes/ oil filter/filter pipe assembly **(13)***
  - the oil pressure switch **(14)**
  - the engine mounting **(16)**

* according to specification

III

- Remove :
  - the thermostat housing cover **(17)**
  - the thermostat housing **(18)**
  - les injectors **(19)** using spanner **(-).0149** and retrieve the copper washer **(20)** and the flame trap washer **(21)**
  - the glow plugs **(22)**

DISMANTLING

I

- Remove :
  - the bolt **(1)** and the pulley
  - the clutch mechanism
  - the flywheel
  - the flywheel locking tool

TIMING BELT REMOVAL

- Remove the covers **(2)**, **(3)** and **(4)** in that order

II

- Retrieve the rubber spacer **(5)**
- Refit the bolt **(1)** and the washer
- Turn the crankshaft to the setting point of the camshaft gears **(6)** and injection pump **(7)**
- Lock :
  - the camshaft gear **(6)** with an M8 x 125 x 40 bolt
  - the injection pump gear **(7)** with an M8 x 125 x 35 bolt

IMPORTANT

These locking bolts must be only finger tight

III

- Slacken the nut **(8)** and the bolt **(9)** securing the roller tensioner bracket **(10)**
- Turn the roller tensioner bracket square **(a)** to compress the spring **(11)**
- Re-tighten the bolt **(9)**
- Remove :
  - the toothed belt
  - the gears from the camshaft **(6)**, the injection pump **(7)** and the crankshaft **(12)** and retrieve the keys
  - the roller tensioner **(10)** and retrieve the plunger **(13)** and the spring **(11)**
  - the lifting eye **(14)** *
  - the engine mounting **(15)**
  - the fixing roller **(16)**
  - the coolant pump **(17)**
  - the plate **(18)**

  * according to specification

IV

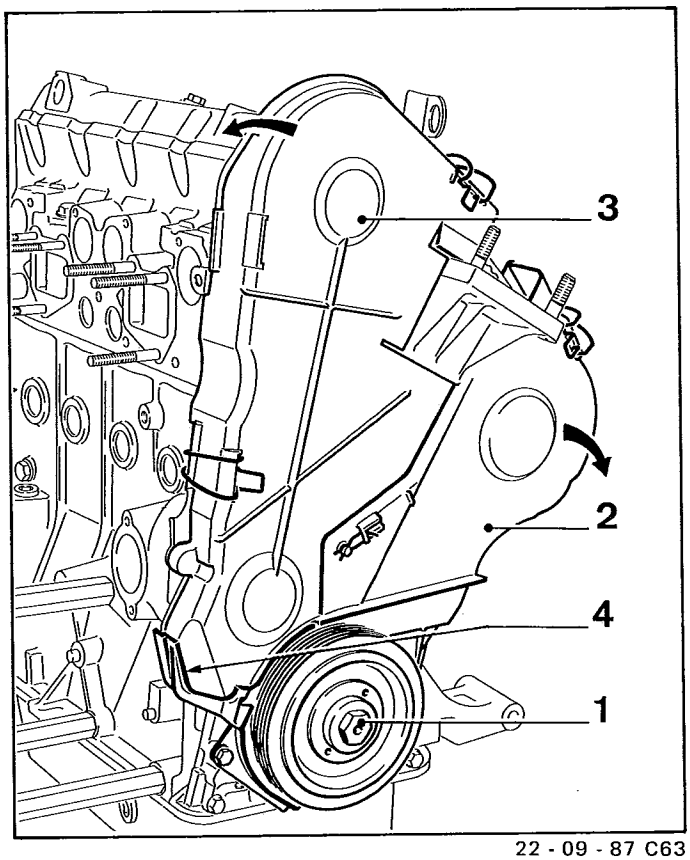
REMOVING THE INJECTION PUMP

- Remove :
  - the injection pump **(19)**
  - the bracket **(20)**

NOTE

If the pump needs to be checked, entrust this to a BOSCH or ROTO DIESEL agent

I



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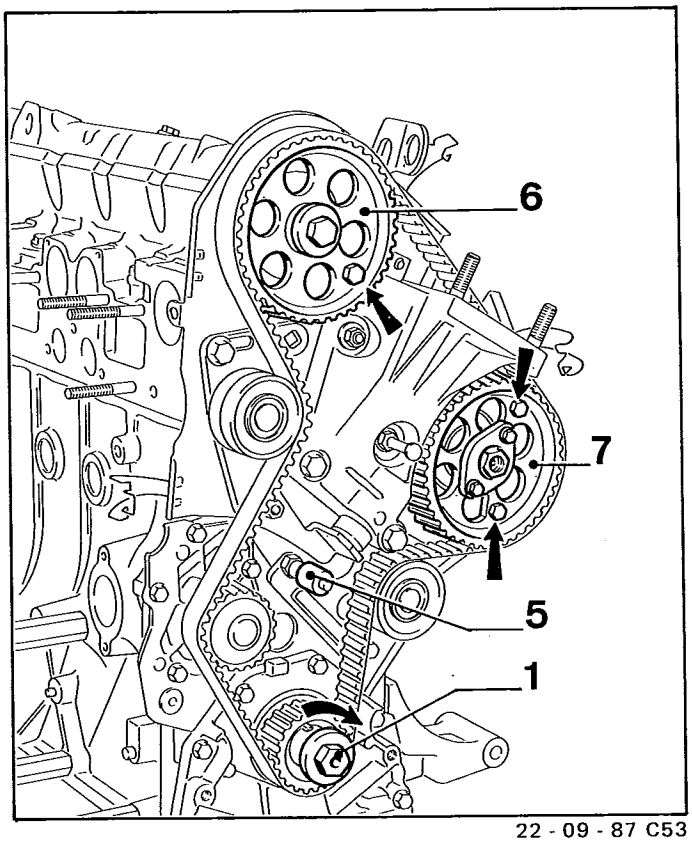

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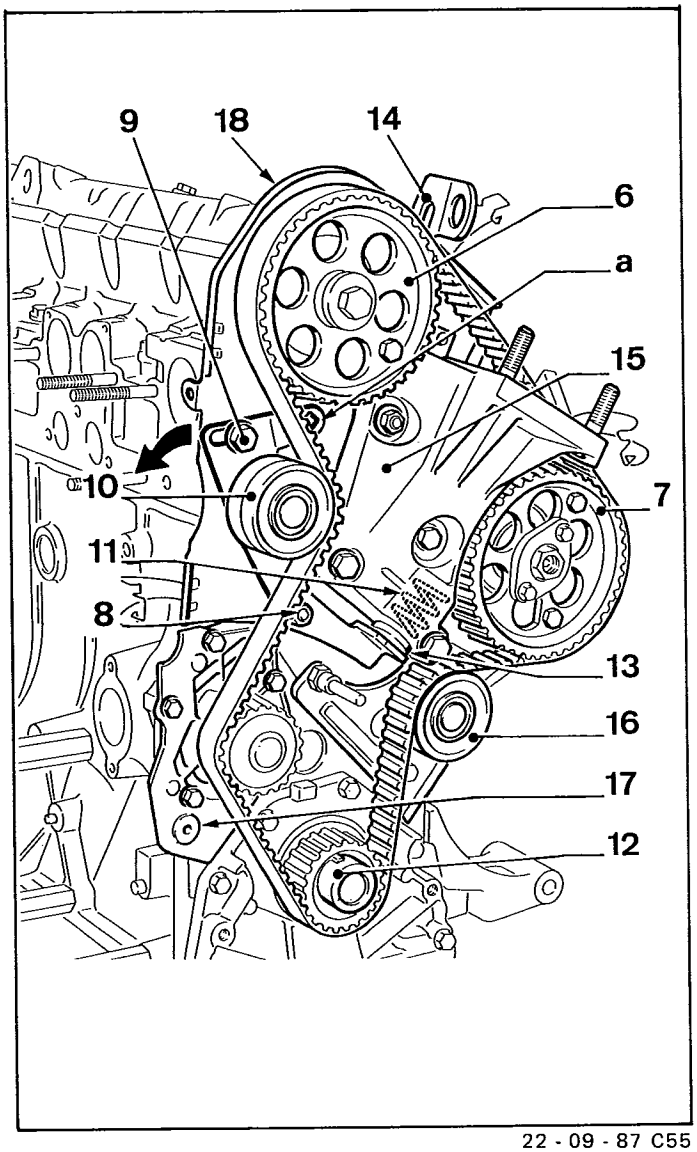

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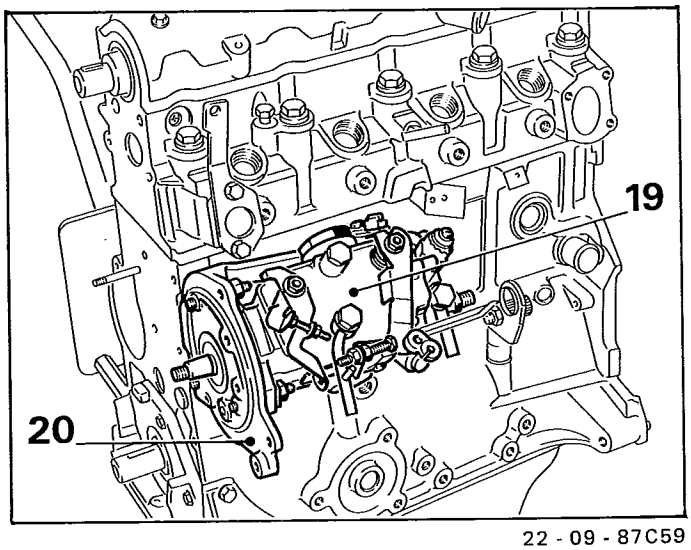

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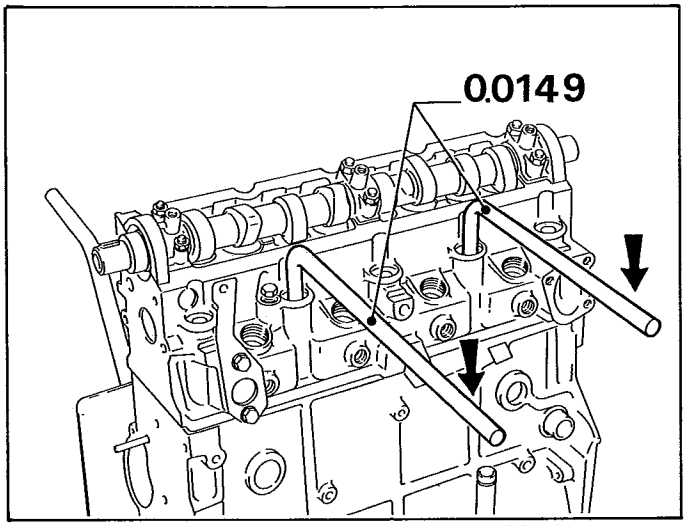

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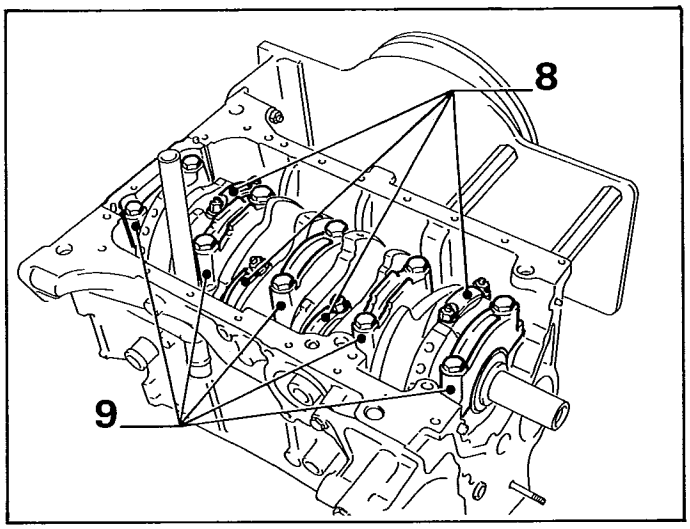

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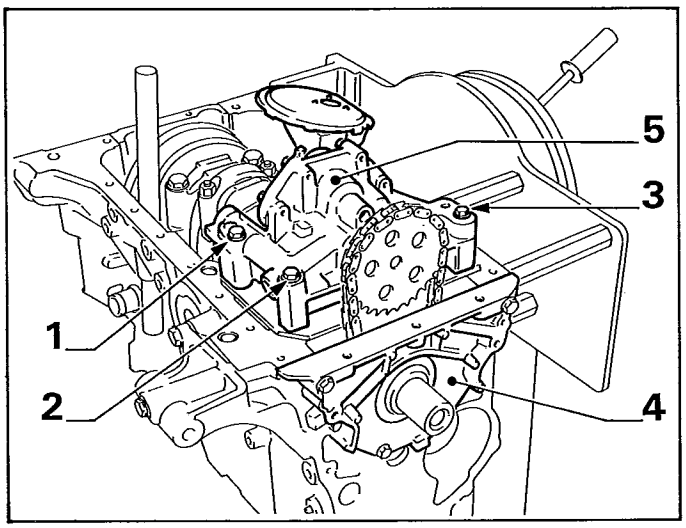

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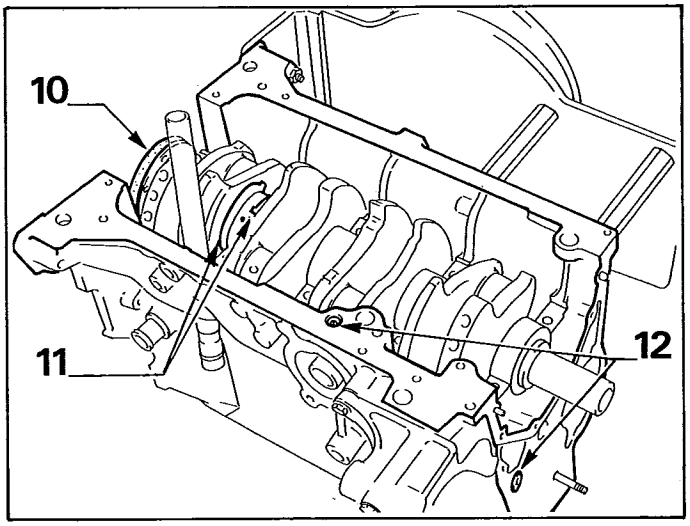

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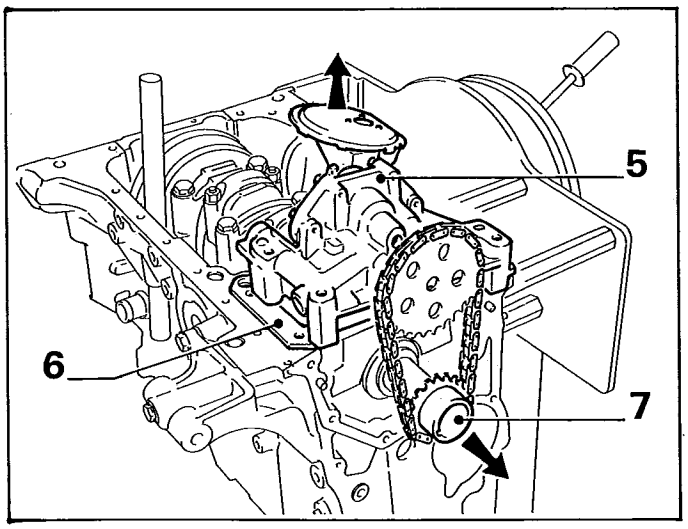

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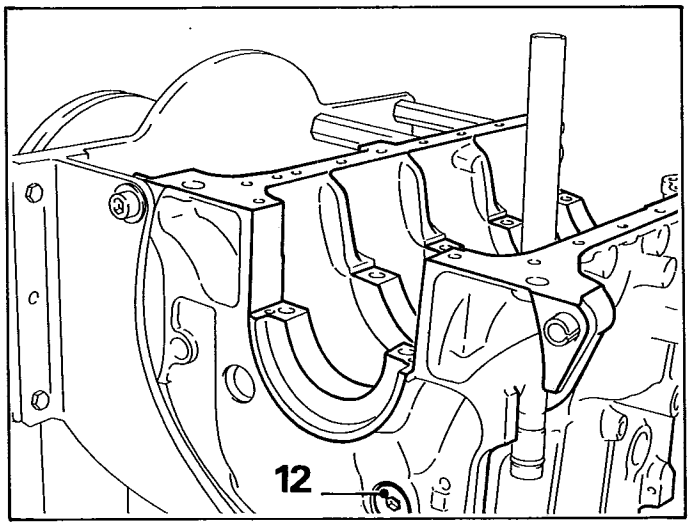


22 - 09 - 87 C78

I

REMOVING THE CYLINDER HEAD

- Remove the cylinder head cover
- Progressively slacken the cylinder head bolts, working in a spiral from the outside.
- Release the cylinder head using levers **0.0149**
- Remove the cylinder head and gasket

II

REMOVING THE OIL PUMP

- Remove :
  - the sump and its joint
- Remove :
  - the bolts **(1)**, **(2)** and **(3)**
  - the seal carrier plate **(4)**

WARNING

The bolt **(1)** is special as it serves to centralise the pump **(5)**

III

- Lift the pump **(5)** to free it from its centralising dowel
- Remove :
  - the spacer **(6)** (according to engine type)
  - the pump **(5)**/drive chain/ crankshaft sprocket **(7)** assembly
- Retrieve the key and the centralising dowel

IV

REMOVE THE CRANKSHAFT AND PISTON

- Remove :
  - the big end caps **(8)**, marking them
  - the main bearing caps **(9)** (cast-in marks)
  - with n.2 cap, retrieve the end float washers

V

- Remove :
  - the oil seal **(10)**,
  - the end float washers **(11)**
  - the crankshaft
  - the main bearing shells
  - the piston/connecting rod assemblies
- Remove the gudgeon pin circlips and separate the pistons from the connecting rods

VI

- Remove :
  - the plugs **(12)** from the oil galleries (◁ illustrations V and VI)

XUD7TE

- the piston crown cooling jets
- Throroughly clean out all oilways

CYLINDER HEAD OVERHAUL

I

- Progressively slacken the camshaft bearing caps **(1)**

- Remove :
  - the bearing caps **(1)** (cast-in marking)
  - the oil seals **(2)**
  - the camshaft **(3)**
  - the tappets **(4)**
  - the adjustment shims **(5)**

II

- Remove :
  - the eight valves, using a valve lifter
  - the swirl chambers by drifting them out from the injectors orifices

- Clean the cylinder head, using DECAPLOC 88 stripper for the gasket face

III

- Check the gasket face for bow. Maximum bow : **0,07 mm**

- Check the condition of :
  - the valve seats and guides*
  - the valve*
  - the valve springs*
  - the swirl chambers
  - the camshaft
  - the camshaft bearings
  - the various tapped holes

* **IMPORTANT**
For checking, rectification or replacement of these parts, (◁ page 4 to 9)

IV

- Check the protrusion of the swirl chambers **(A)**
  Protrusion : **0 to 0,03**

- Achieve this dimension by machining faces **(a)** and **(b)**

- Check the valve recess **(B)** :
  ⓧ **0,9 to 1,45**
  ● **0,5 to 1,05**

- Achieve these dimensions by machining the valve seats

V

- Lap in the valves
- Refit the valves

IMPORTANT
If the cylinder head has been machined, fit compensating washers under the valve springs (◁ page 4)

- Fit a basic shim **2,425** thick to each valve stem and check that they are proud of the cup (6)

- If they are not, grind the top face of the cup **(6)**

VI

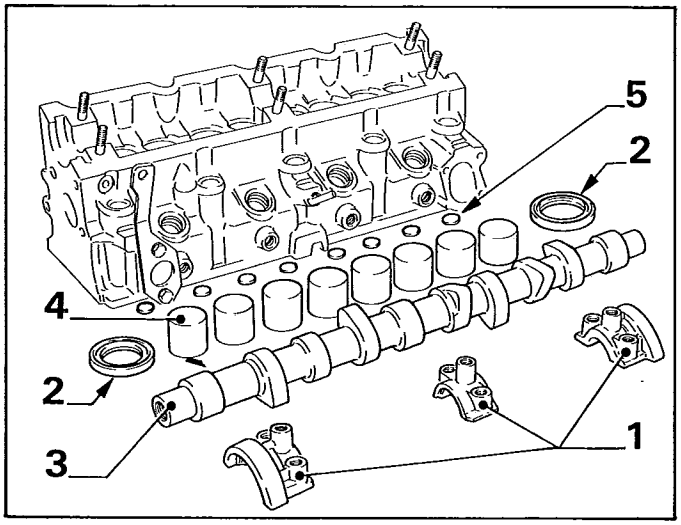
- Refit the tappets

- Oil the camshaft bearings

- Fit the camshaft, with the **DIST** marking at the timing gear end

- Progressively tighten the bearing caps to **1,75 Nm** (13 lbf ft) (cast-in markings)

I



22 - 09 - 87 C72

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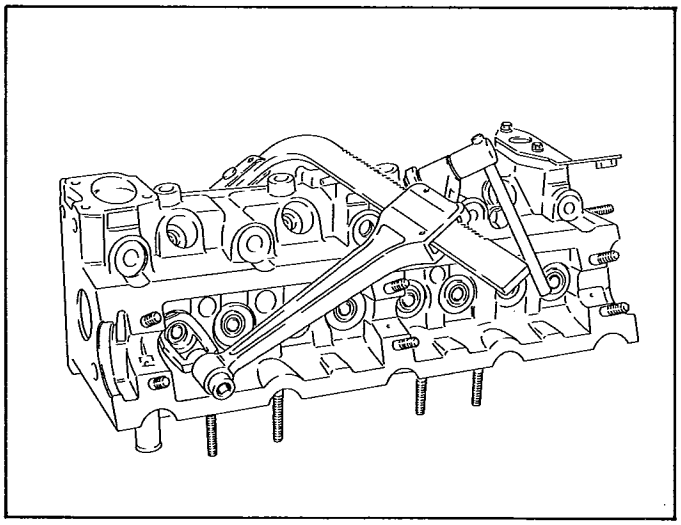

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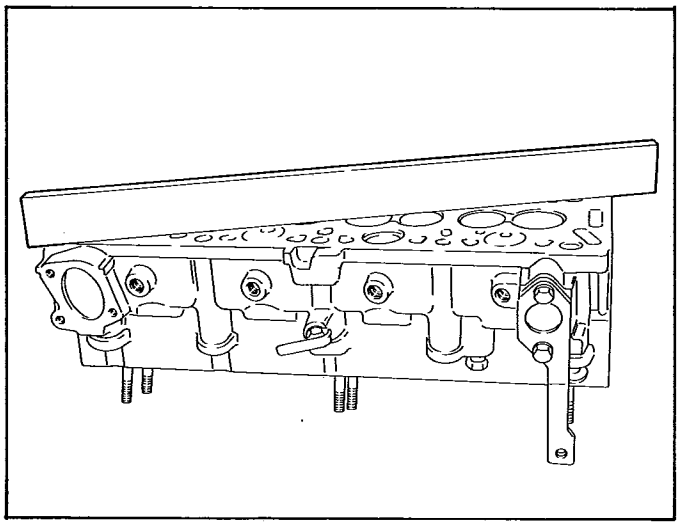

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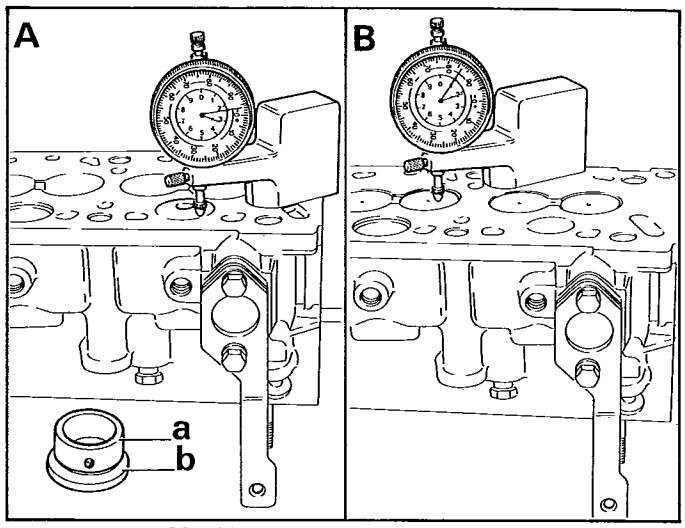

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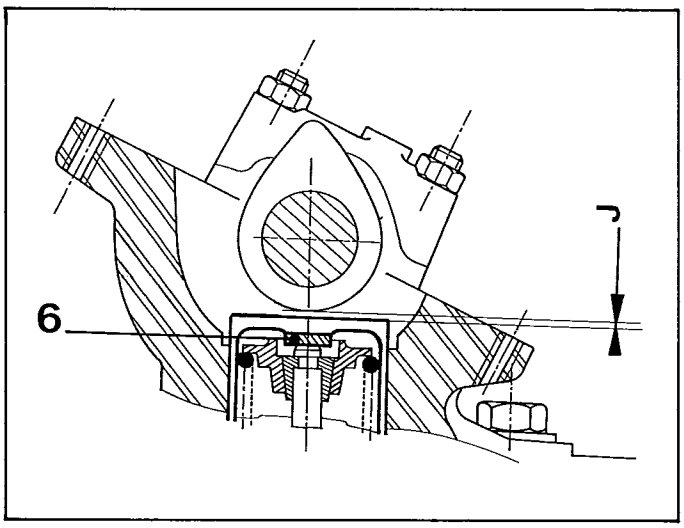

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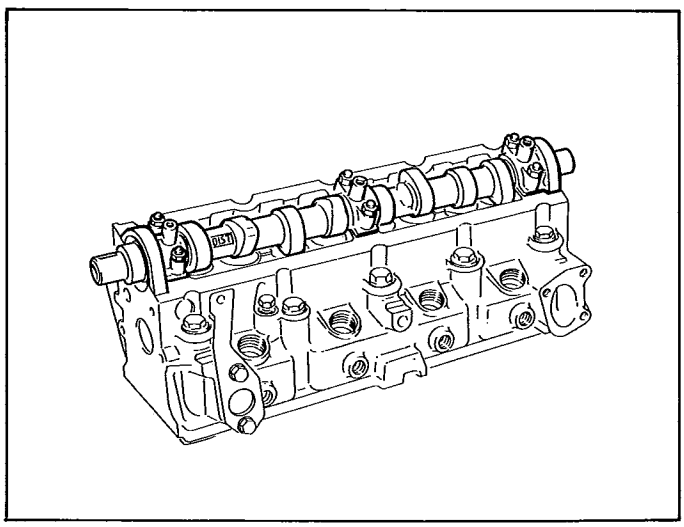

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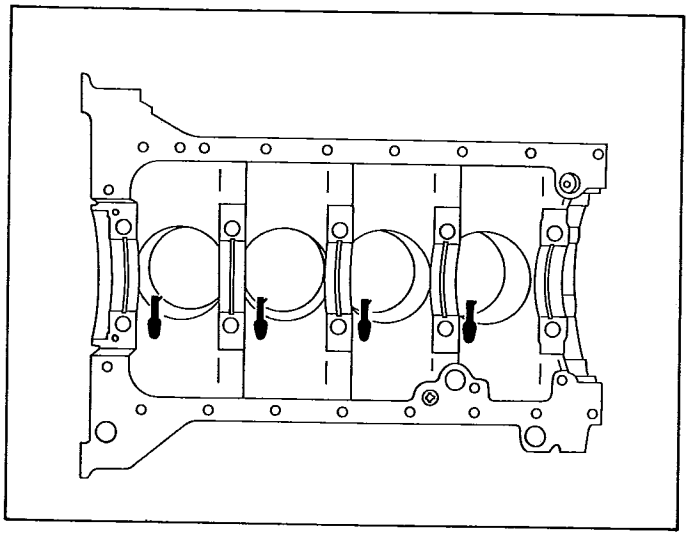

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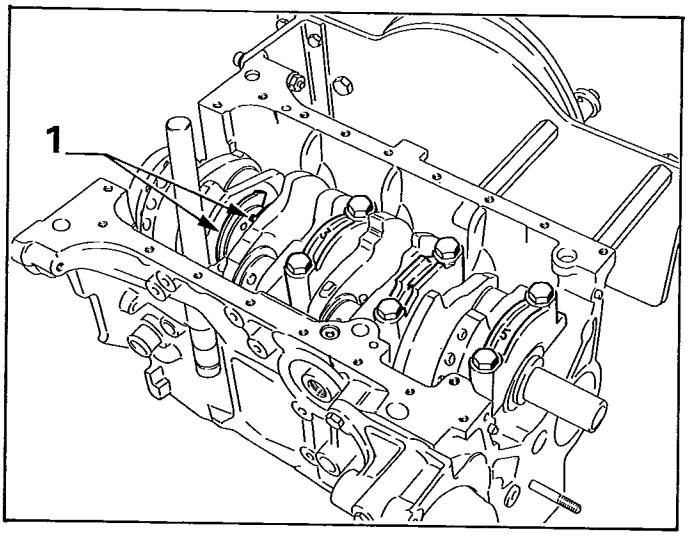

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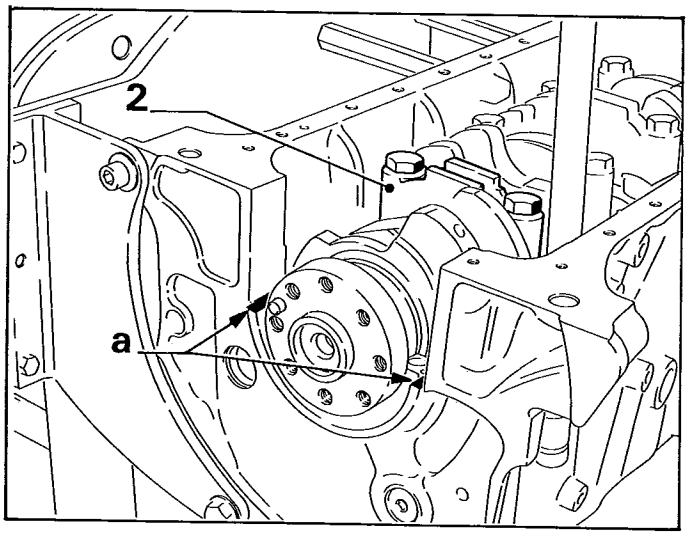

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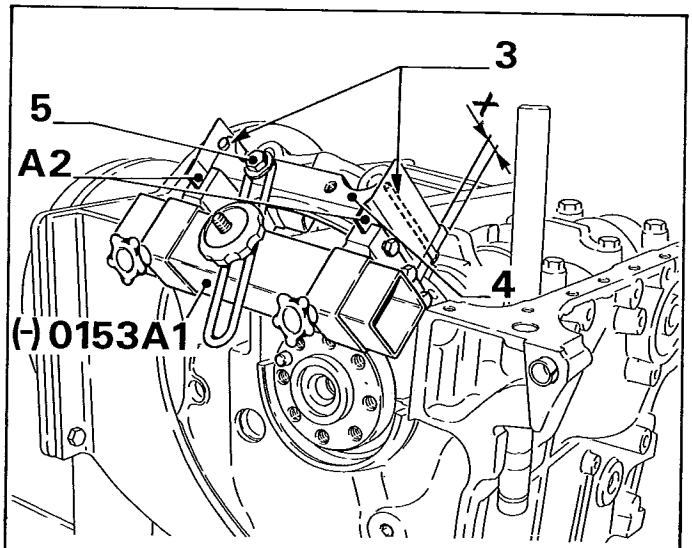

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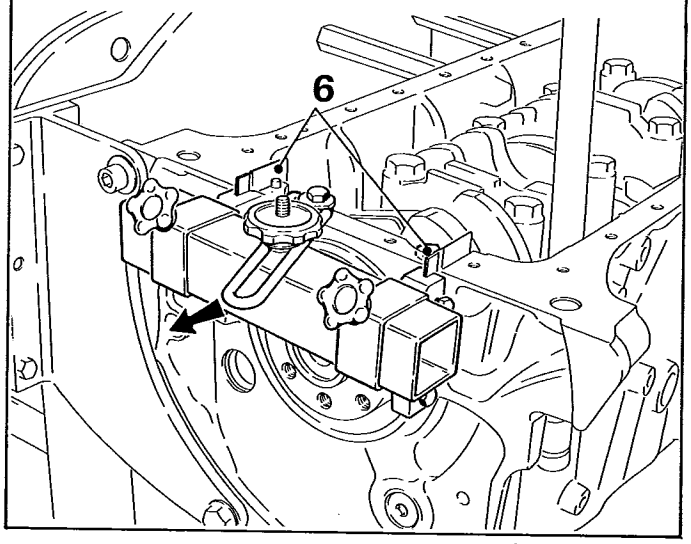

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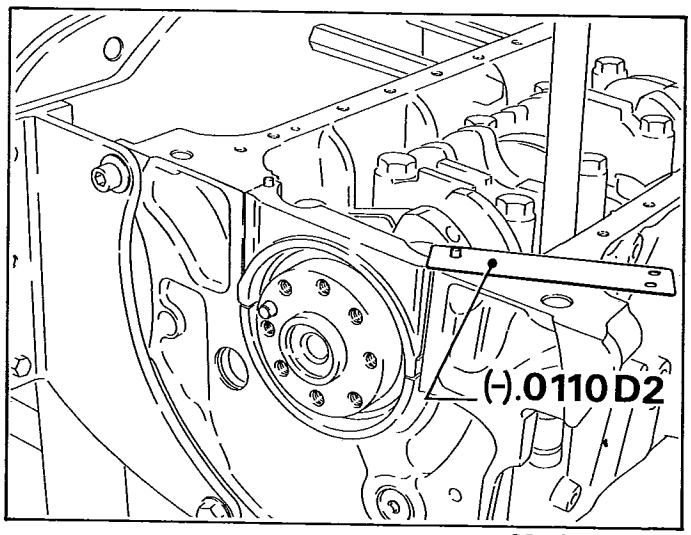

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I

FITTING THE CRANKSHAFT

- Fit in the cylinder block :
  - the oil gallery plugs, coated with threadlock LOCTITE
  - the grooved main bearing shells

XUD7TE
  - the piston crown cooling jets

NOTE
For bearing shell thickness,
(◁ page 12)

II

- Fit :
  - the crankshaft
  - nos. 3, 4 and 5 main bearing caps
  - the two end float half-washers **(1)**, with the anti-friction faces towards the crankshaft

III

- Fit the no.2 main bearing cap **(2)** with its two end float half-washers, their anti-friction faces towards the crankshaft
- Apply a thin coat of FORMETANCH sealant to the ends **(a)** of the bearing

IV

- Fit two new side seals **(3)** to no.1 main bearing cap
- Using a bolt and washer (5), attach tool (-).0153 fitted with shims A2 TO no.1 main bearing cap **(4)**
- Adjust the height (x) of the shims
- Oil the shims and the housing

WARNING

To avoid stretching the side seals, fit the cap as follows :

- engage it in its housing at 45
- straighten it
- lower it slowly
- tighten the two bearing cap bolts **(6)** to 70 Nm (52 lbf ft)
- withdraw the tool horizontally

V

- Using shim **(-).0110.D2**,cut off the side seals so that they protrude **2mm**
- Tighten the bearing cap bolts **70 Nm (52 lbf ft)**
- Check that the crankshaft rotates without tight spots

RE-ASSEMBLY

I

CHECKING CRANKSHAFT END FLOAT

- Fit the dial indicator, using tools **(-).0110 G1, (-).0504 A1** and A2
- End float must be between **0,07** and **0,32 mm**

NOTE
For choice of half-washer thickness, ◁ page 12

II

FITTING PISTONS - CONNECTING RODS

- Assemble the connecting rods and pistons with the bearing shell tab recess **(a)** on the same side as the piston crown recess **(b)**
- Fit the piston rings

  NOTE - The marked face of the tapered ring must be towards the combustion chamber

- To assemble, use special pliers

  (1) - scraper ring
  (2) - tapered ring
  (3) - domed chrome ring

- Space the ring gaps at 120 in relation to the scraper ring gap **(c)**
- Oil the piston and moderately tighten the piston ring clamp **(4)** (◁ illustration III)

IV

- Remove the big end caps
- Fit the pistons in the bores, observing the markings made on removal and with the piston crown recess **(a)** on the oil filter side of the block
- Fit the big end caps and tighten the nuts to ↷ 40 ↷ ↷ **20 + 70°**

see Page 48.

NOTE - For choice of bearing shell thickness, ◁ page 12

IV

- Position a new oil seal on tool **(-).0153 C**
- Fit the seal by tapping it fully home with a mallet
- Withdraw the tool with a twisting movement
- Check that the visible lip of the seal is towards the outside

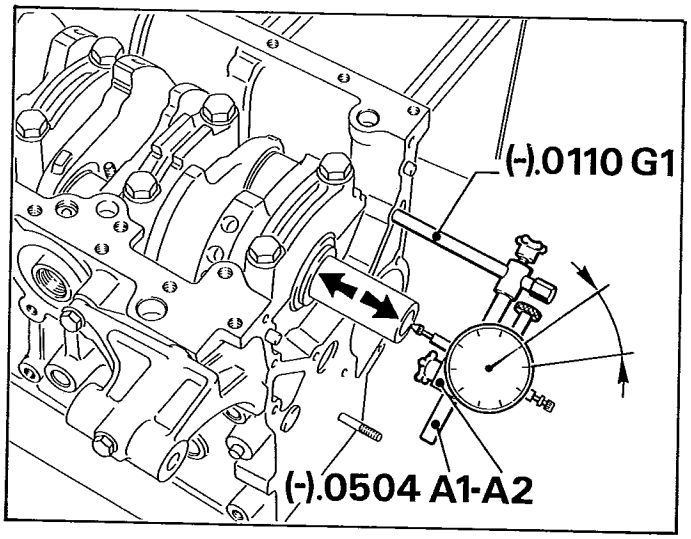
V

FITTING THE OIL PUMP

- Fit in the following order :
  - the centralising dowel **(5)** to the cylinder block
  - the key **(6)**
  - the pump **(7)**/drive chain/ sprocket **(8)** assembly
  - the "L" -shaped spacer at **(9)***

* according to engine type

I



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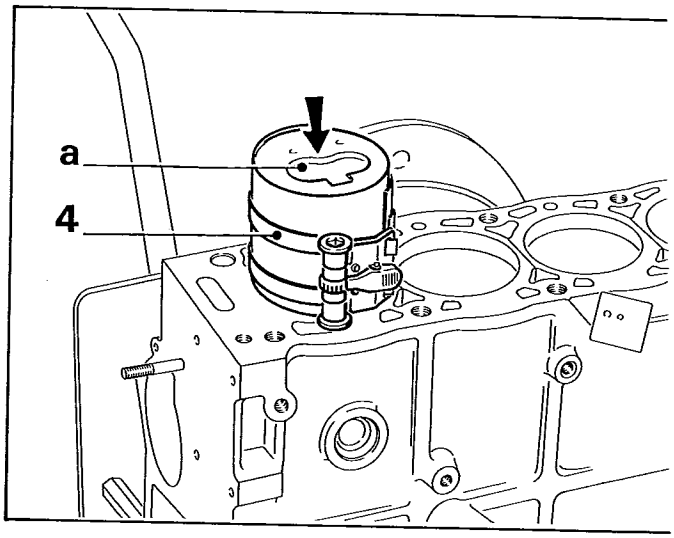
III



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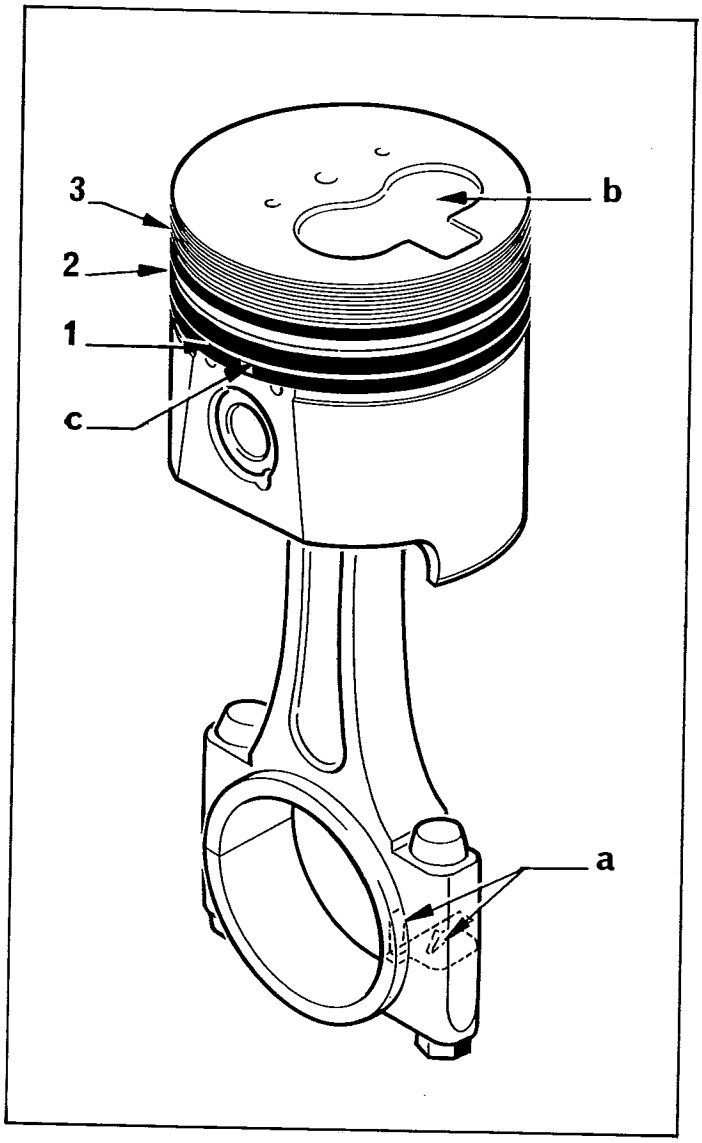

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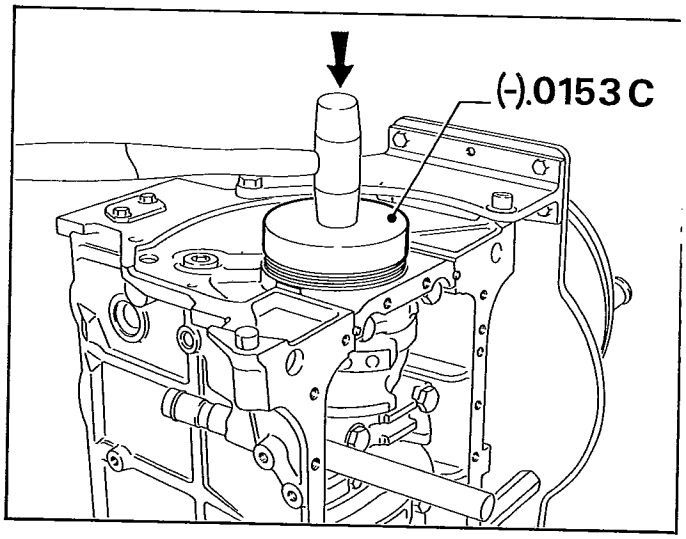

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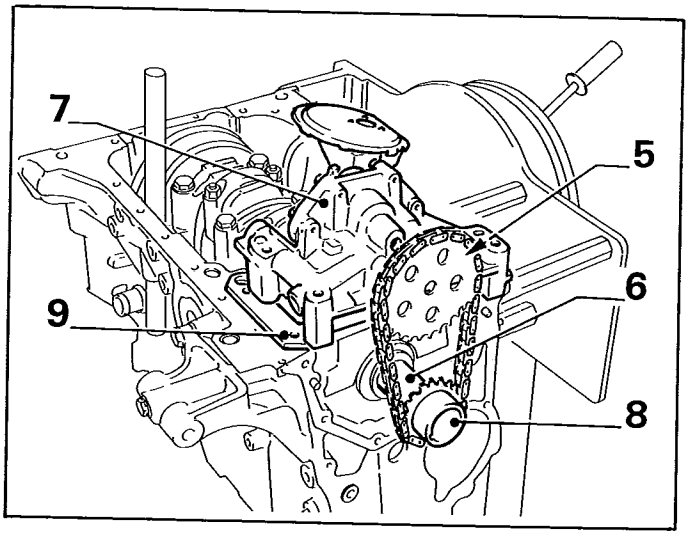

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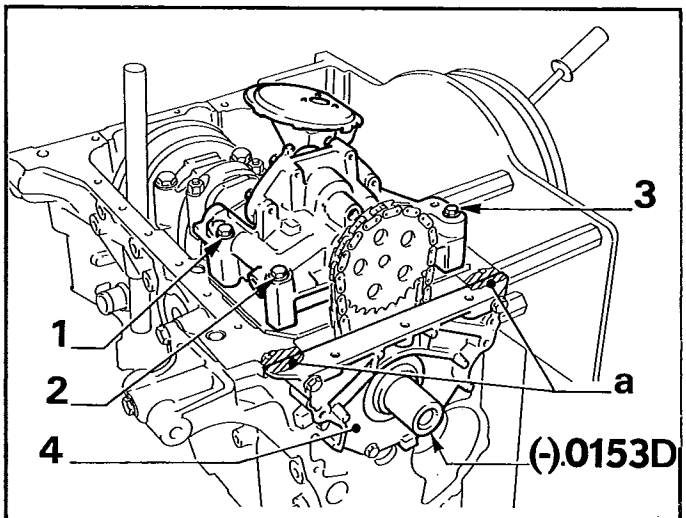

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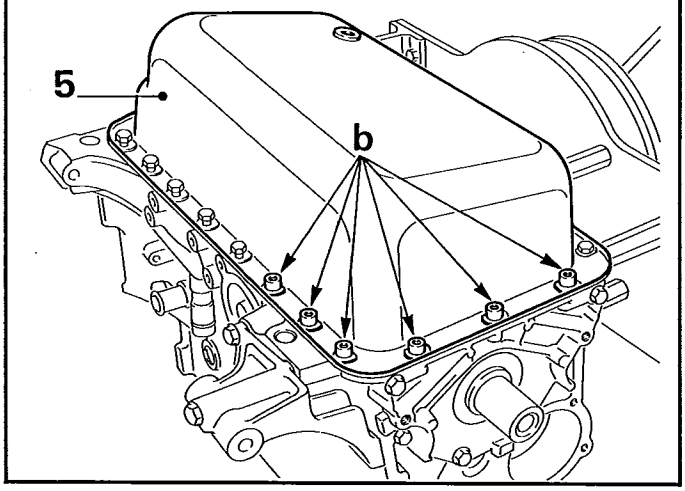

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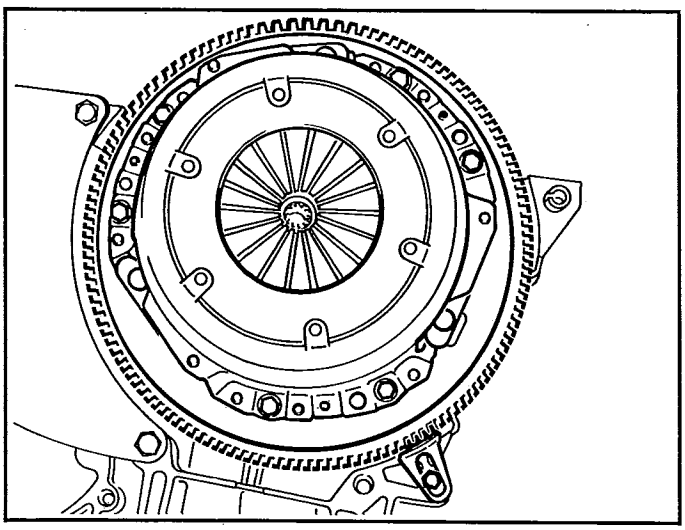

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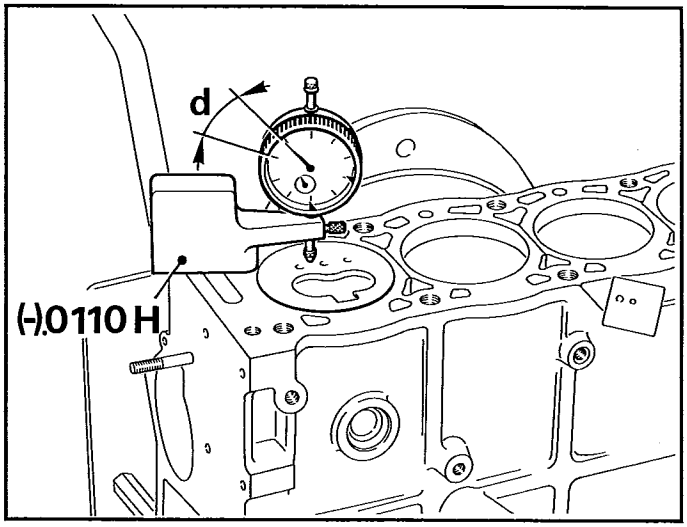

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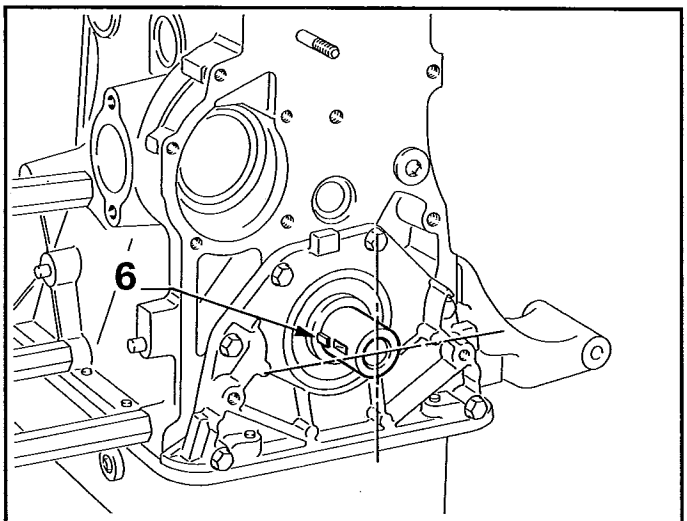

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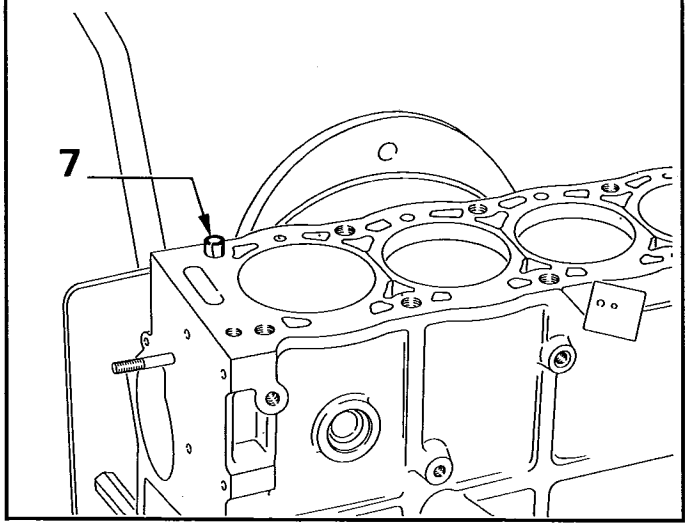

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I

WARNING

The bolt **(1)** is special : it serves to centralise the pump

- Thighten the bolts **(1)**, **(2)** and **(3)** to **20 Nm (15 lbf ft)**
- Fit the seal carrier plate with a new seal **(4)** and tighten the bolts to **1,5 Nm (11 lbf ft)**
- Position a new oil seal on tool **(-).0153 D**
- Fit the seal by tapping it fully home with a mallet
- Apply SILICONE CLASS 1 jointing paste at **(a)**
- Fit the sump **(5)** with a new joint
- Tighten the bolts to **20 Nm (15 lbf ft)**

NOTE

The bolts at **(b)** have socket heads

II

FITTING THE CLUTCH

- Fit the flywheel and fit the bolts coated with threadlock LOCTITE
- Fit a FACOM D86 type locking tool
- Tighten the bolts to **50 Nm (89 lbf ft)**
- Position the clutch plate with centralising mandrel 0016901900
- Fit the mechanism and tighten the bolts to **25 Nm (18 lbf ft)**
- Remove the flywheel locking tool

III

CYLINDER HEAD GASKET SELECTION

- Fit the dial indicator on support **(-).0110 H** and zero it on a surface plate
- Turn the crankshaft and measure the protrusion of each piston at TDC
- Note the maximum protrusion **(d)**
- Select a cylinder head gasket of suitable thickness

Protrusion **(d)**	Thickness identification
0,77 ≤ d	**2 notches**
d > 0,77	**3 notches**

NOTE

For gasket identification, ◁ page 4

IV

FITTING THE CYLINDER HEAD

- Turn the crankshaft to position the pistons at mid stroke with the damper pulley key **(6)** at 9 o'clock
- Clean the tapped holes in the cylinder block (12x150 thread)
- Fit :
  - the centralising dowel **(7)**
  - the head gasket, dry
  - the cylinder head
- Carefully brush the threads of the cylinder head bolts
- Coat the bolt threads and the washer contact faces with MOLYKOTE G RAPID

I

CYLINDER HEAD TIGHTENING

- Fit the bolts with new washers

~~METHOD 1 BOLTS "A"~~

~~In the order shown :~~

~~- pre-tighten to **30 Nm (22 lbf ft)**~~
~~- tighten to **60 Nm (44 lbf ft)**~~
~~- bolt by bolt, slacken a quarter turn, then re-tighten to **60 Nm (44 lbf ft)**~~

METHOD 2 BOLTS "B"

In the order shown :
- pre-tighten to **20 Nm (. lbf ft)**
- tighten to **Nm (60 lbf ft)**
- tighten a further **120°** using a spanner of FACOM D360 type

IMPORTANT

For re-tightening operations, page 47

II
VALVE CLEARANCE ADJUSTMENT

- Fit the camshaft gear **(1)**

- Running clearance
  Inlet ● : **0,15 mm**
  Exhaust ⊗ : **0,30 mm**
  Tolerance : **± 0,04 mm**

Set "on the rock"	● 4 ⊗ 4	● 1 ⊗ 1
Check	● 1 ⊗ 1 ● 2 ⊗ 3	● 4 ⊗ 4 ● 3 ⊗ 2

- Note the clearances

III

- Remove :
  - the camshaft gear **(1)**
  - the camshaft bearing caps (2)
  - the camshaft **(3)**
  - the tappets **(4)**
  - the basic shims **(5)**

- Determine the shim thickness to be fitted for each valve

  - Example

	● 1
Specified clearance	**0,15**
Clearance measured	**0,25**
Difference	**+ 0,10**
Shim fitted	**2,425***
Shim to be fitted	**2,50**
Clearance obtained	**0,175**

* Basic shim

IV

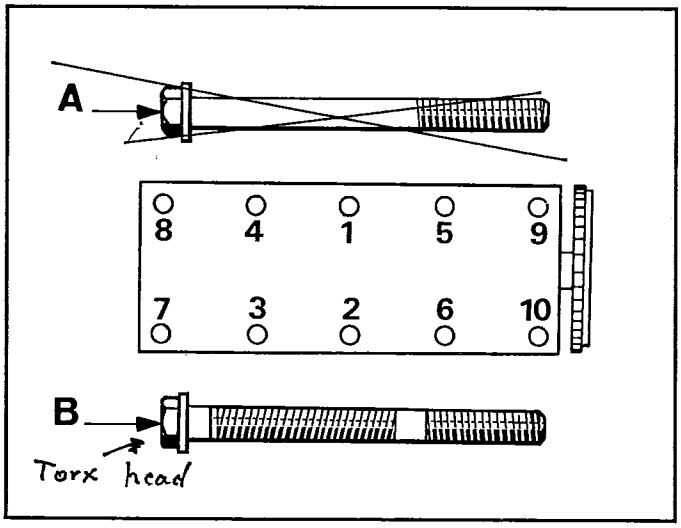
- Fit :
  - the shims thus determined
  - the tappets

- Apply :
  - a thin coat of FORMETANCH sealant to each end of the bearing housing at **(a)**
  - MOLYKOTE G.RAPID to the bearing surfaces on the camshaft

- Fit :
  - the camshaft **(3)** with the DIST marking at the timing gear end
  - the camshaft bearing caps **(2)** (cast-in markings)

- Progressively tighten the bearing caps to **17,5 Nm (13 lbf ft)**

I



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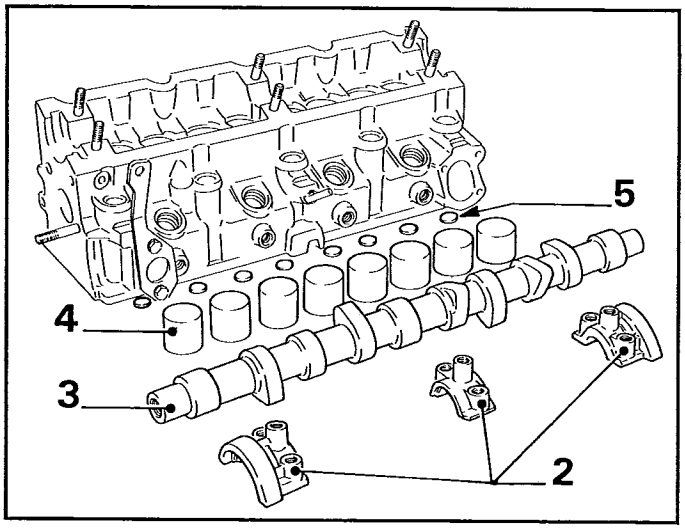

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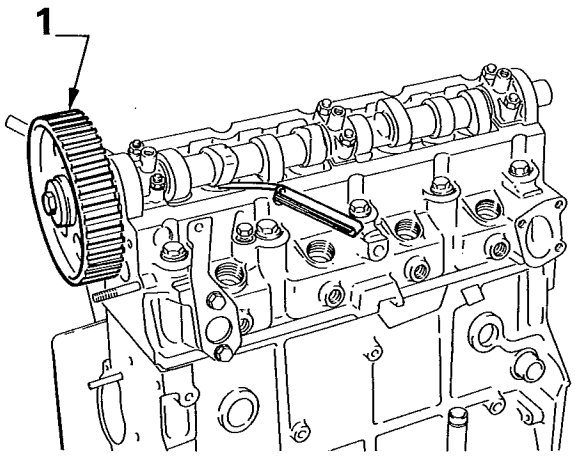

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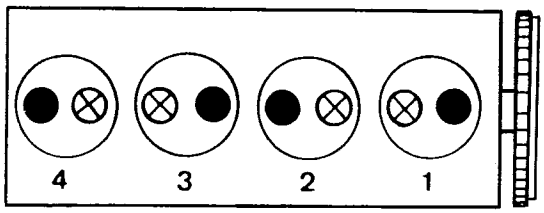

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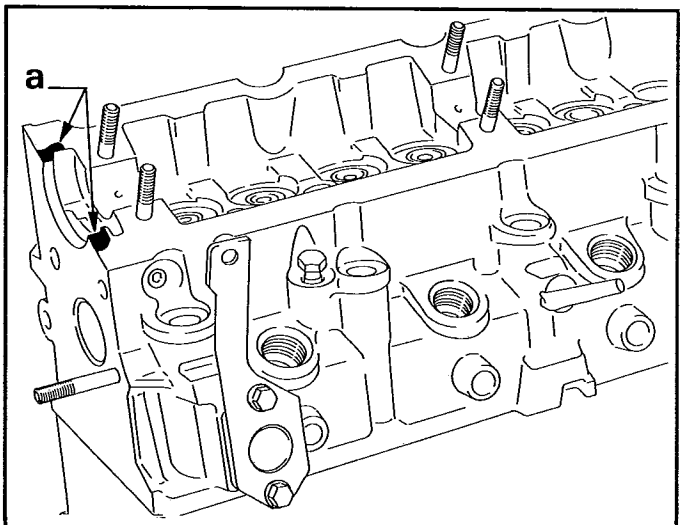

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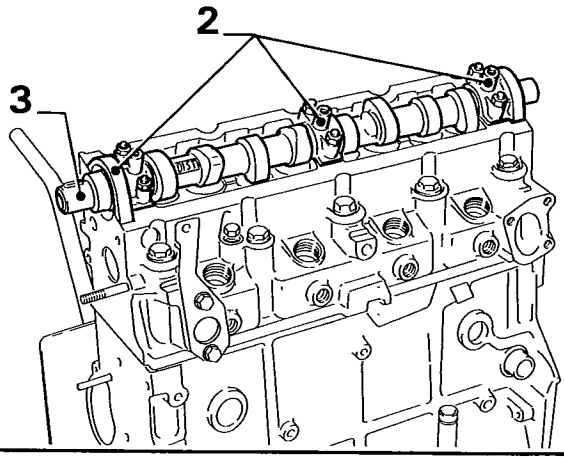

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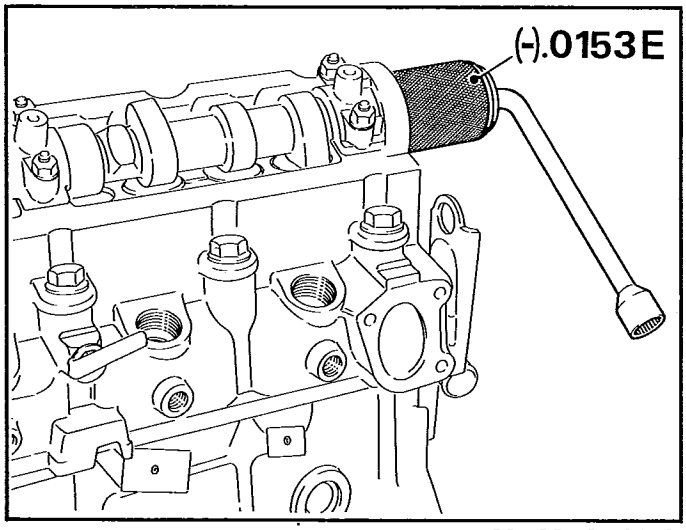

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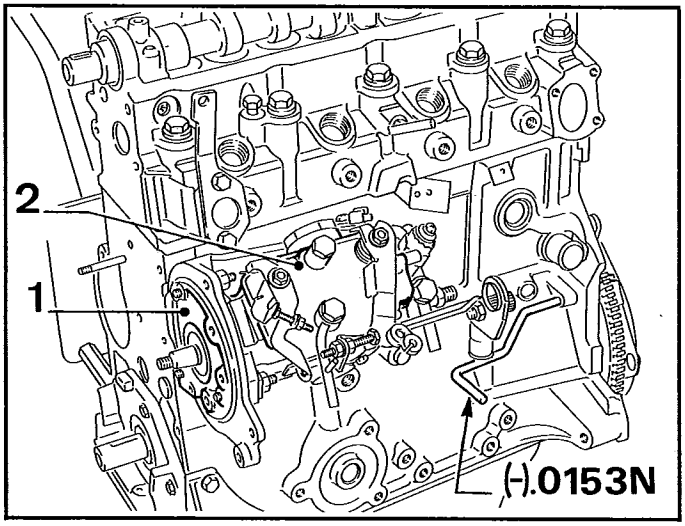

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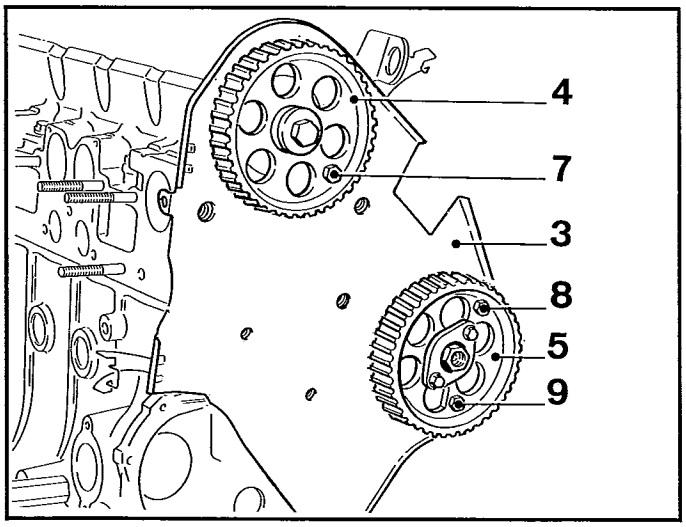

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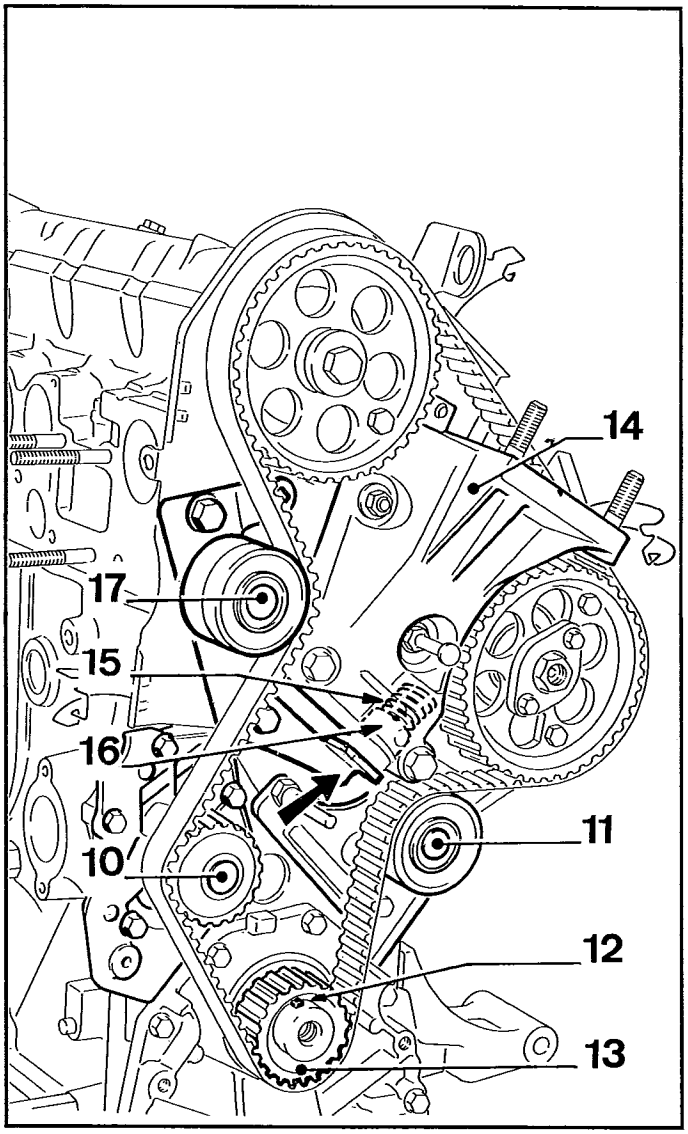

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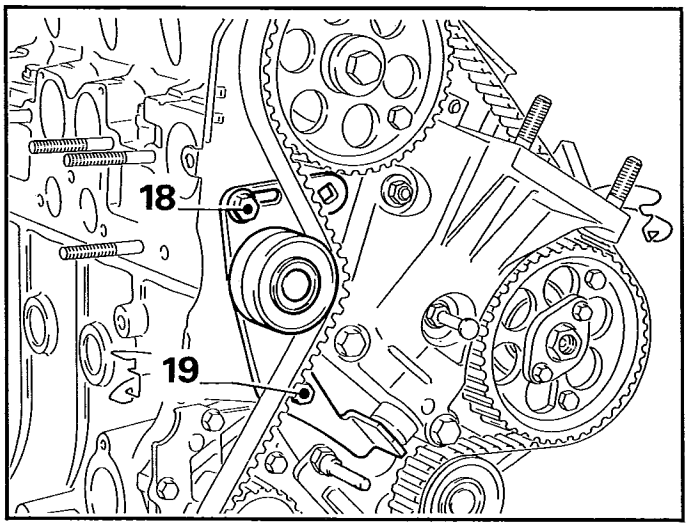

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I

- Fit a new oil seal to tool **(-).0153 E** on the side where the inner flange is the farthest away

- Fit the two camshaft oil seals, using a camshaft gear or pulley bolt

II

FITTING THE TIMING BELT

- Fit :
  - the pump bracket **(1)**
  - the injection pump **(2)**

III

- Fit :
  - the plate **(3)**
  - the camshaft gear **(4)** and the injection pump gear **(5)**

- Position the gears with bolts **(7)**, **(8)** and **(9)**, finger tight

- Tighten :
  - the bolt of gear **(4)** to **40 Nm (30 lbf ft)**
  - the nut of gear **(5)** to **50 Nm (37 lbf ft)**

IV

- Turn the crankshaft in the running direction and locate the flywheel with tool **(-).0153 N** (◁ illustration II)

- Fit :
  - the coolant pump **(10)** with a new joint and tighten the bolts to **15 Nm (11 lbf ft)**
  - the fixed roller **(11)**
  - the key **(12)** and the crankshaft gear **(13)**
  - the engine mounting **(14)**; coat the bolts with threadlock LOCTITE and tighten them to **20 Nm (15 lbf ft)**
  - the spring **(15)** and plunger **(16)**, then the tensioner roller **(17)**
- Immobilise the roller **(17)**, with the plunger compressed

- Fit a new timing belt, with the runs taut, in the following order :
  - crankshaft gear
  - fixed roller
  - injection pump gear
  - camshaft gear
  - tensioner roller
  - coolant pump gear

V

- Slacken the bolt **(18)** and the nut **(19)** to release the tensioner roller

- Re-tighten the bolt **(18)** then the nut **(19)** when the belt is tensioned

I

CHECKING THE VALVE TIMING

- Remove the three setting bolts and the setting tool
- Fit the bolt **(1)** and washer **(2)**
- Turn the crankshaft two revolutions
- Refit the setting tool (-).0153 N and the three setting bolts

IMPORTANT

If it is impossible to fit any one of the setting devices, repeat the belt fitting operation from the start

- Slacken the tensioner roller and re-tighten the bolt then the nut to **17,5 Nm (13 lbf ft)**
- Remove the four setting devices
- Fit in the following order :
  - the rubber spacer **(3)**
  - the covers **(4)**, **(5)** and **(6)**
  - the key and the pulley **(7)**

II

FITTING THE PULLEY DAMPER

- Lock the flywheel with a FACOM D86-type tool
- Brush and degrease :
  - the threads of bolt **(1)**
  - the bearing faces of the washer **(2)** and the head of bolt **(1)**
- Fit the bolt **(1)**, coated with threadlock LOCTITE, and the washer **(2)** and tighten to **40 Nm (30 lbf ft)**
- Tighten a further **60**, that is, one flat

III

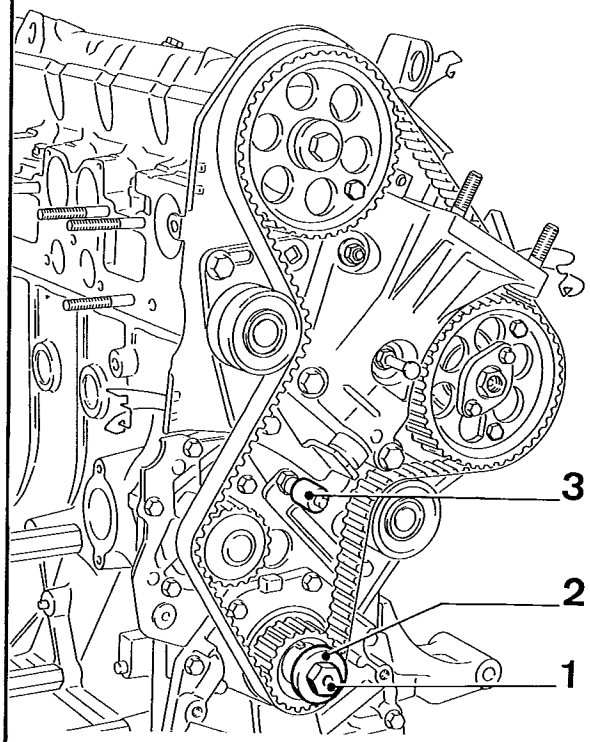
TIMING THE INJECTION PUMP
METHOD 1

- Timing at injection point
- Use for :
  - ROTO DIESEL pump with inspection plug at **(a)**
  - BOSCH pump on XUD7 - XUD9 - XUD9Y engines

METHOD 2

- Timing at TDC
- Use for :
  - ROTO DIESEL pump with inspection plug at **(b)** and timing value shown at **(c)**
  - BOSCH pump on XUD9A - XUD7TE engines

I



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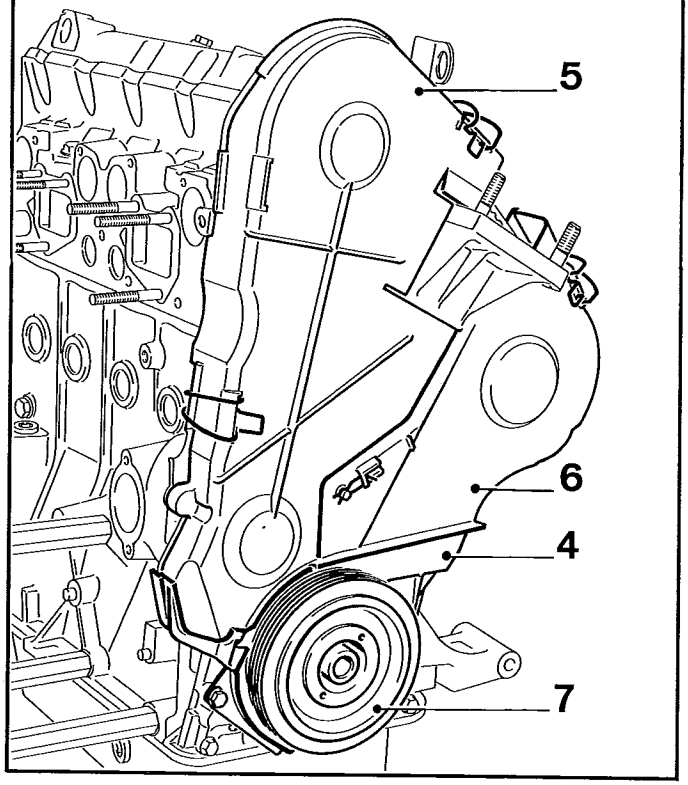

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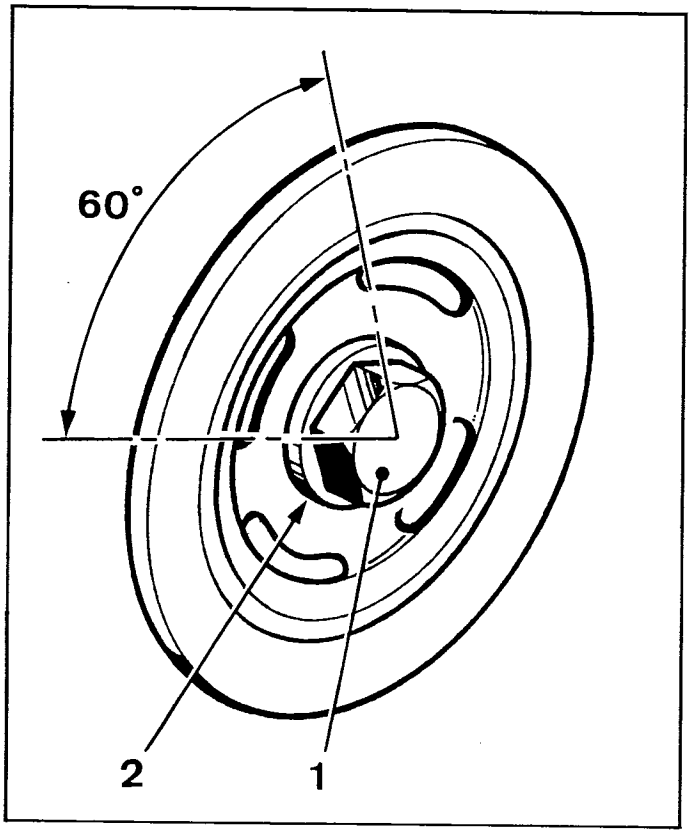

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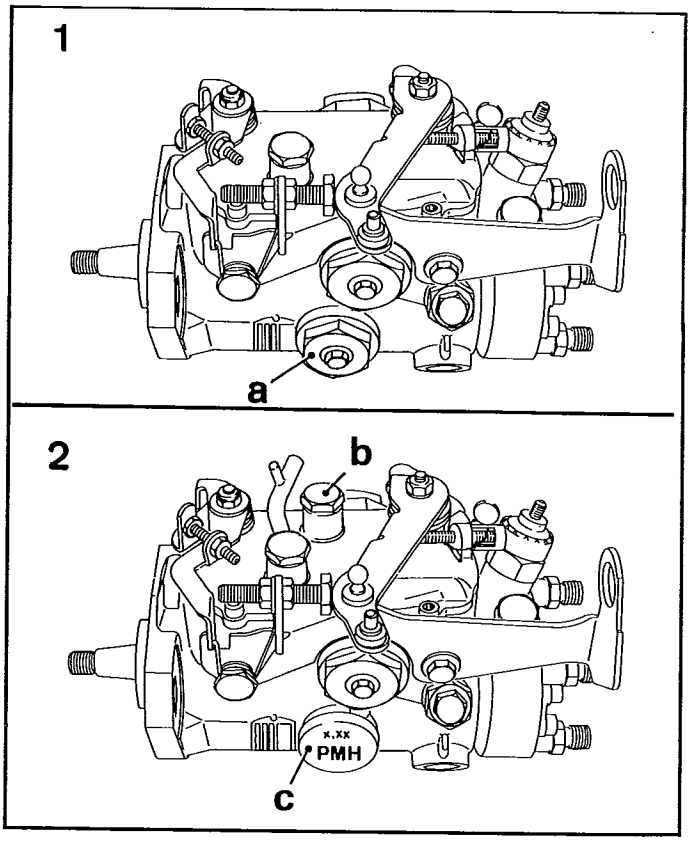

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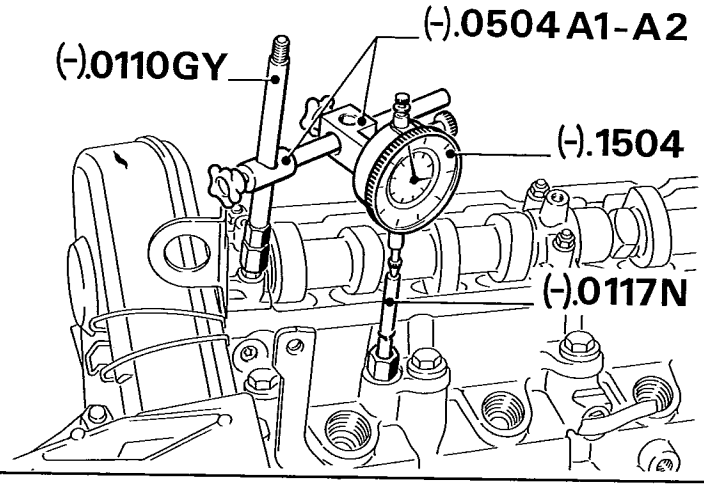

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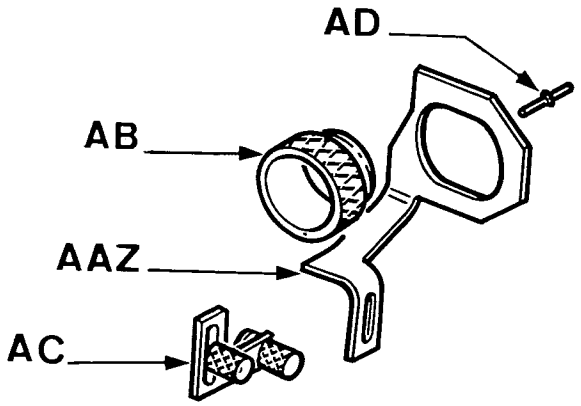
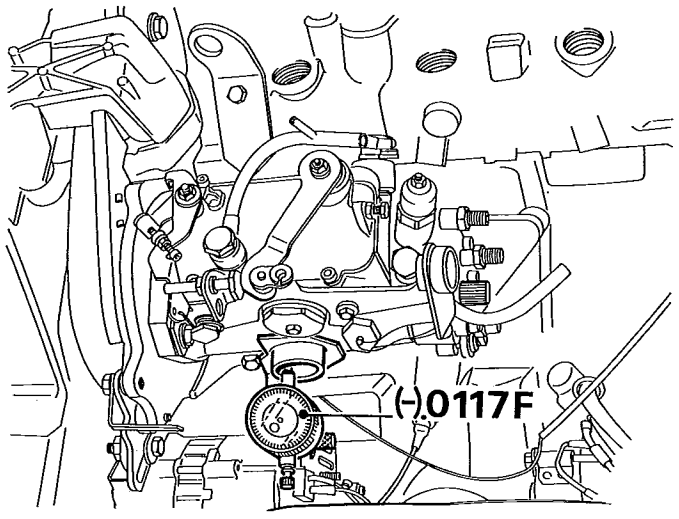
A





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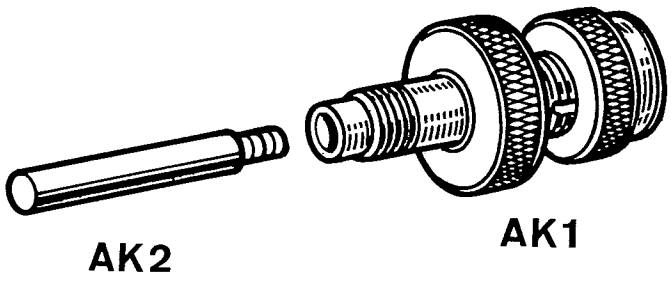

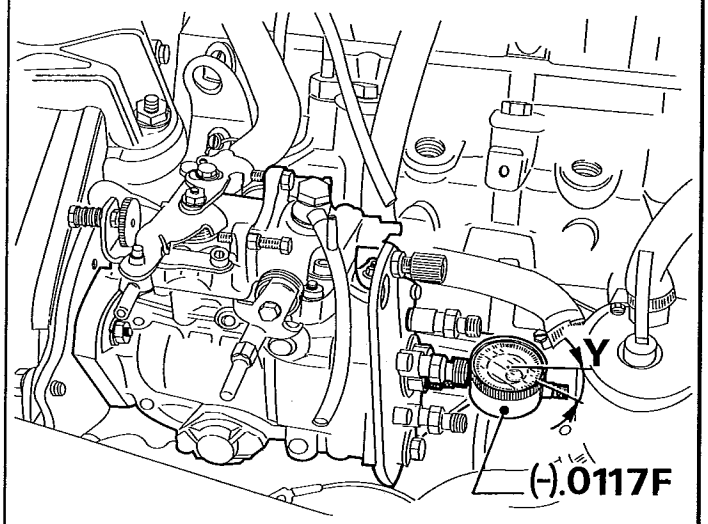

I

TIMING THE INJECTION PUMP

METHOD 1

1. PREPARING THE ENGINE

- Turn the crankshaft with spanner **(-).0117 EZ** to bring the valves of no.1 cylinder "On the rock"
- Screw rod **(-).0117 N** in place of the TDC setting plug
- Fit the dial indicator **(-).1504** using supports **(-).0110 GY, (-).0504 A1** and **A2**

IMPORTANT

- Position the dial indicator in line with the rod
- Locate TDC
- Zero the dial indicator
- Turn the crankshaft 1/8 turn in the opposite direction to running (anti-clockwise)

2. PREPARING THE INJECTION PUMP

- Remove the inspection plug
- Swing the pump to the full retard position away from the engine

A ROTO DIESEL PUMP	B BOSCH PUMP
- Fit the dial indicator **(-).0117 F** using supports **(-).0117 - AAZ-** AB - AC and the plunger **(-).0117 AD**	- Fit the dial indicator **(-).0117 F** using support **(-).0117 AK1** and plunger **(-).0117 AK2** - Turn the crankshaft to locate bottom dead centre on the pump - Zero the dial indicator

3. TIMING THE INJECTION PUMP

- Position the crankshaft at the timing point*

- Slowly turn the pump in the advance direction (towards the engine) to the point where the plunger drops into the groove then lifts **0,01 mm**	- Slowly turn the pump in the advance direction (towards the engine) to the point where the dial indicator shows a pump piston lift of **Y***

- Tighten the pump fixings

* For values, ◁ workshop charts or technical cards

I

METHOD 2

1/ PREPARING THE INJECTION PUMP

- Turn the crankshaft with spanner **(-)0119 EZ** to the point where no.1 exhaust valve starts to open
- Remove the inspection plug
- Swing the pump to the full retard position away from the engine

A ROTO DIESEL PUMP	B BOSCH PUMP
- Use tool assembly **(-).0117 AM** - Fit the rod **(1)** - Attach the support **(2)** and the dial indicator **(-).1504** fitted with the flat adaptor **(3)** - Hold the bell crank **(a)** against the rod and zero the dial indicator (rod in contact with the pump)	-Fit the dial indicator **(-).0117 F** using support **(-).0117 AK1** and plunger **(-).0117 AK2** -Turn the crankshaft to locate bottom dead centre on the pump -Zero the dial indicator

2/ TIMING THE PUMP

- Turn the crankshaft to position the valves of **no.1** cylinder "on the rock" (TDC no.4 cylinder)
- Set the flywheel with tool **(-).0153 N**

A ROTO DIESEL PUMP	B BOSCH PUMP
- Slowly turn the pump in the advance direction (towards the engine) to obtain the reading X engraved on the capsule **(b)**	- Slowly turn the pump in the advance direction (towards the engine) to the point where the dial indicator shows a reading **Y*** after bottom dead centre * For the value Y, ◁ data sheets

- Tighten the pump fixings

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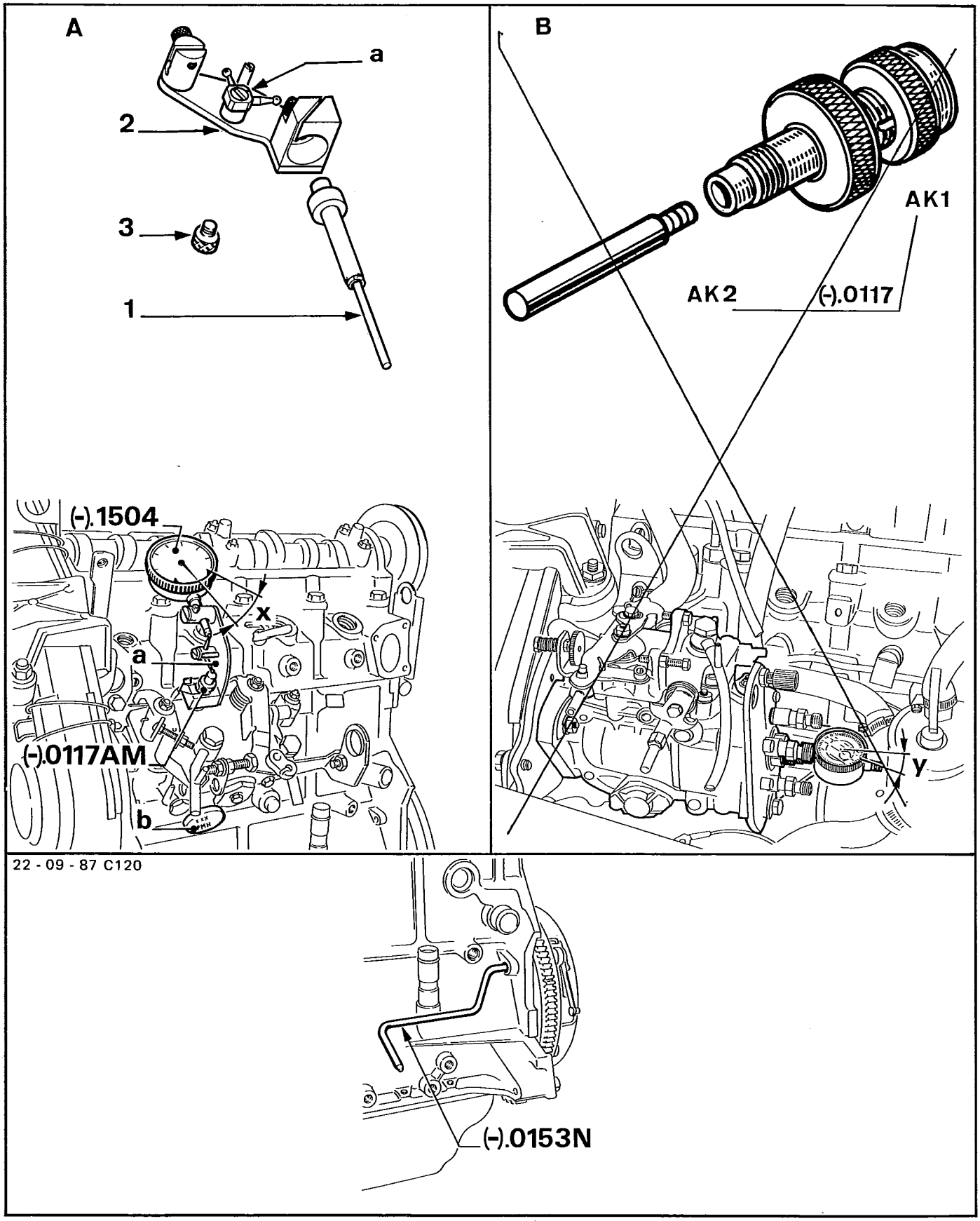

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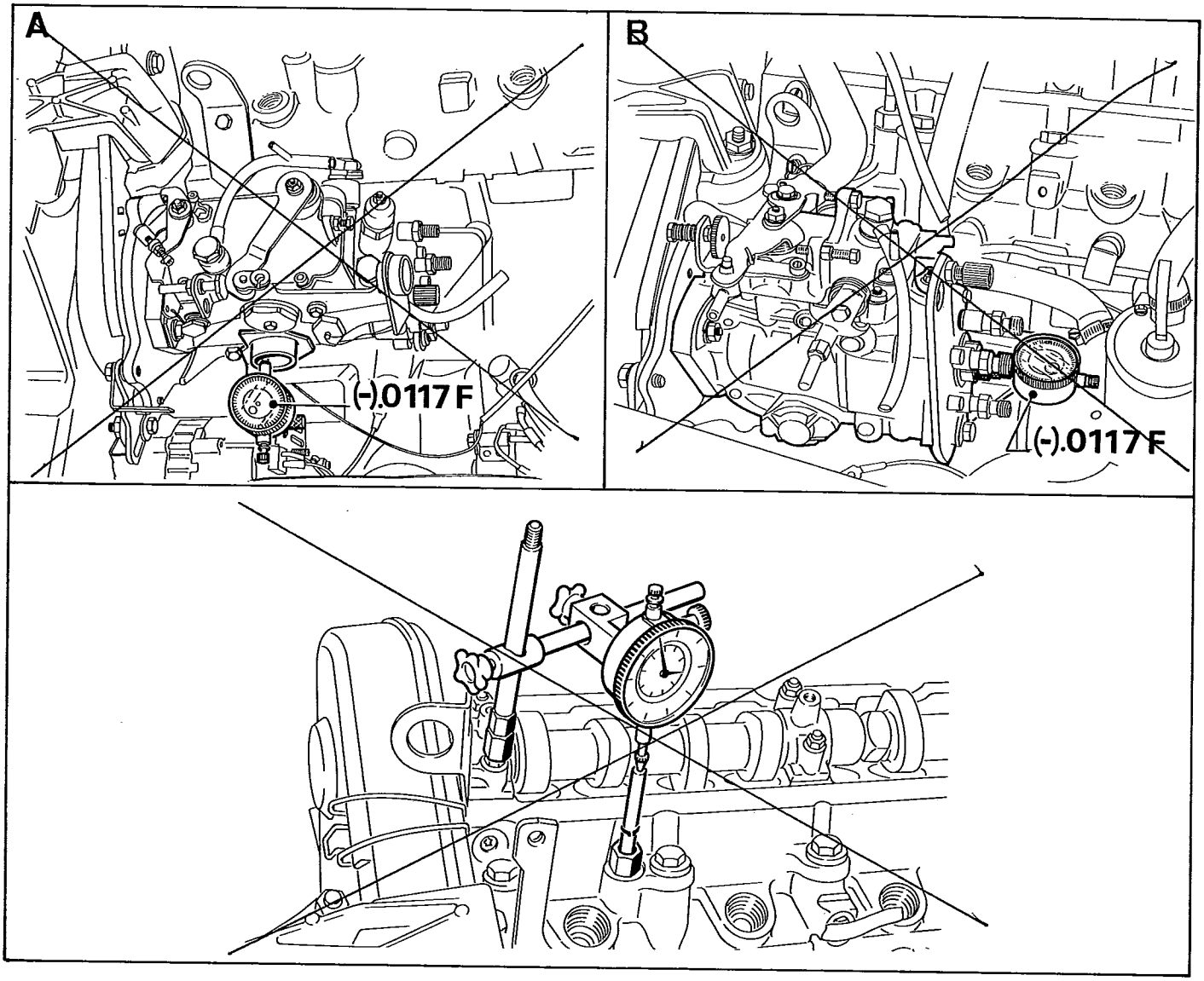

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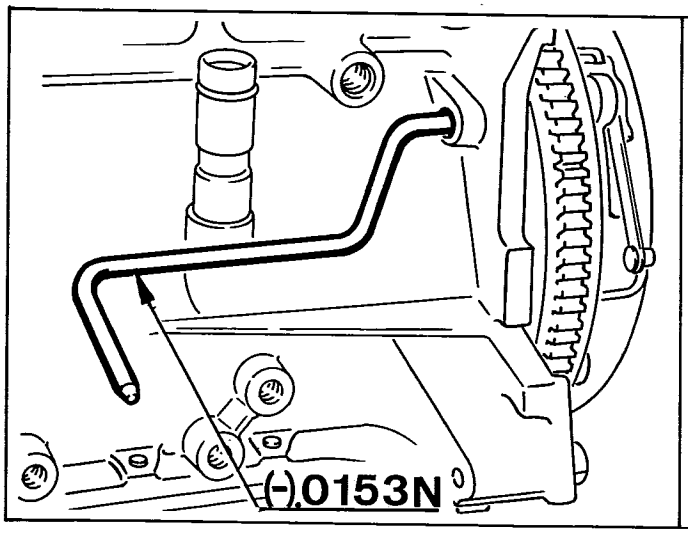

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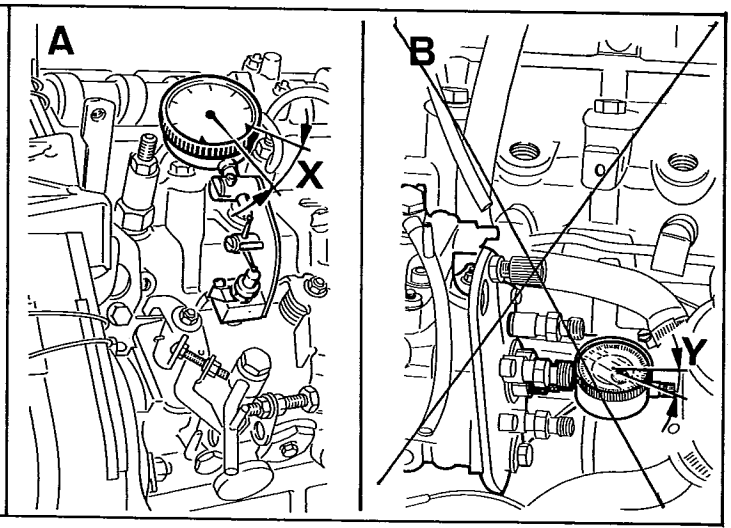

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I

CHECKING THE PUMP TIMING

METHOD 1

- ~~Check the setting of the dial indicator at TDC~~

A ROTO DIESEL PUMP	B BOSCH PUMP
- Turn the crankshaft a quarter turn in the opposite direction to running - Turn the crankshaft slowly in the running direction until the plunger drops into the groove and lifts **0,01 mm**	- Turn the crankshaft a quarter turn in the opposite direction to running - Turn the crankshaft slowly in the running direction to the point where the dial indicator shows the pump piston lift value **Y***

- In this position, the engine dial indicator shows the timing point BTDC*

II

METHOD 2

- Remove the rod **(-).0153 N**
- Turn the crankshaft a quarter turn in the opposite direction to running
- Turn the crankshaft slowly in the running direction and fit the rod at TDC
- In this position,the dial indicator mounted on the pump should read:
  - **A - ROTO DIESEL PUMP** : the value **X** shown on the pump ± 0,04
  - ~~**B - BOSCH PUMP : the piston lift value Y***~~

* For this value, ◁ data sheets

I
REASSEMBLING THE ENGINE

- Refit :
  - The new heat-resistant washers (1), convex surface upwards
  - the new copper washers **(2)**
  - the injectors **(3)** and tighten to **90 Nm (66 lbf ft)**
  - the pre-heat plugs **(4)** and tighten them to **22 Nm (16 lbf ft)**
    NOTE : The injectors must be checked before refitting
  - the thermostat housing **(5)** and its cover **(6)**, fitted with a new thermostat
  - the cylinder head cover **(7)**, and tighten to **10 Nm (7 lbf ft)**
  - the pulley **(8)** and tighten to **35 Nm (26 lbf ft)**

II

- Refit :
  - the pre-heat plugs wire
  - the breather pipe assembly, with the oil filler pipes and the filler orifice*
  - the injector pipes
  - the accelerated idle control cable coated with CLASS 1 SILICONE compound on the threaded part
  - the oil pressure switch, and tighten to **27,5 Nm (20 lbf ft)**
    the oil cooler*
  - the oil filter
  - the alternator and the belt
    New belt tension :
    72 SEEM units (60 daN/run)

* if fitted

III

- Refit :
  - the water inlet housing and its metal pipe
  - the engine bracket **(9)** and tighten to **45 Nm (33 lbf ft)**

XUD7 - [XUD9] - XUD9A

- the exhaust manifold with new seals
- the expansion chamber (wide part on the water inlet housing side)
- the inlet manifold

XUD7TE

- the exhaust manifold
- the turbo charger
- the inlet manifold
- the turbo charger lubrication system oil inlet and return pipes

XUD9Y

- the exhaust and inlet manifold assembly
- the expansion chamber (wide part on water inlet housing side)

All MODELS

- Remove the engine from the DESVIL support
- Refit :
  - the clutch housing centering pin
  - the TDC sensor

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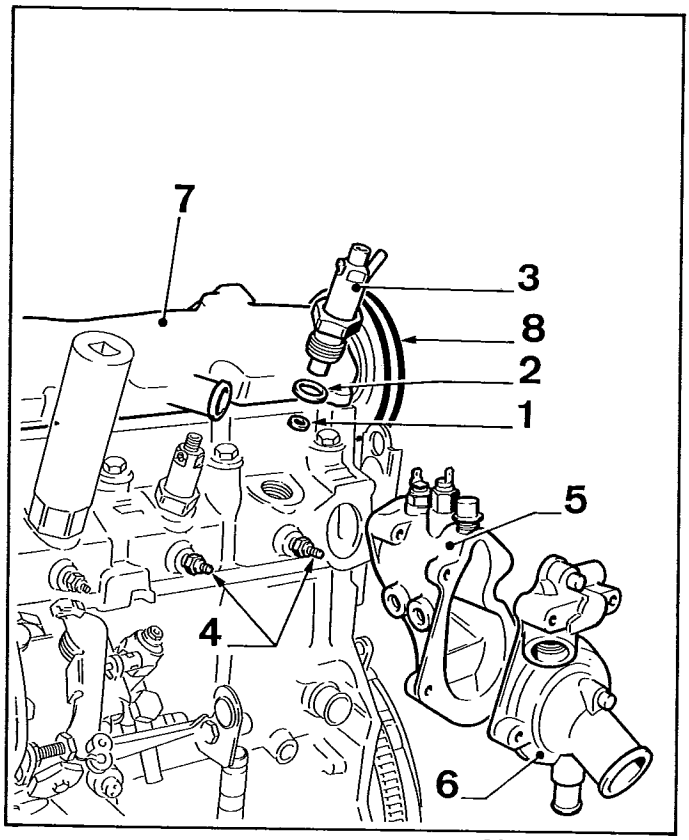

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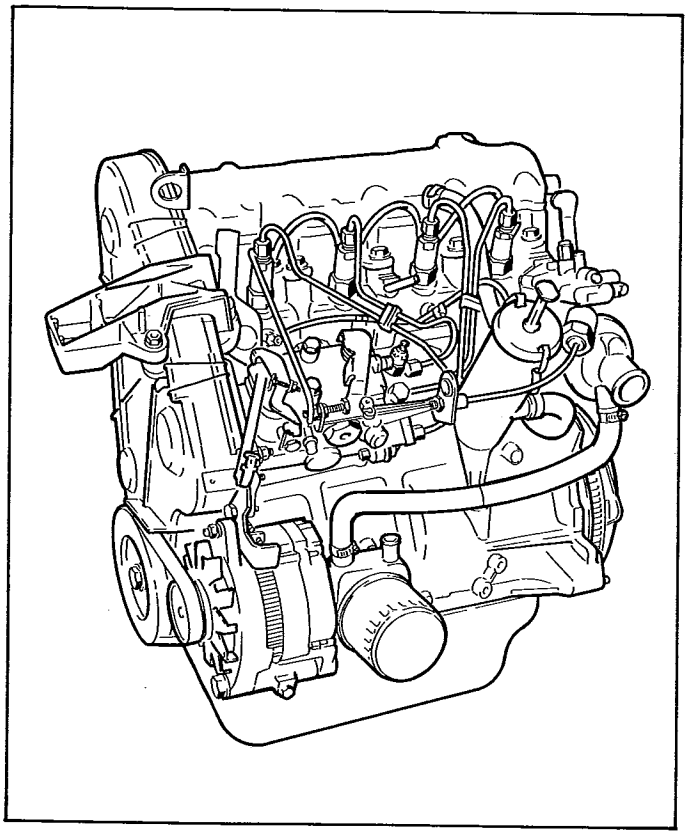

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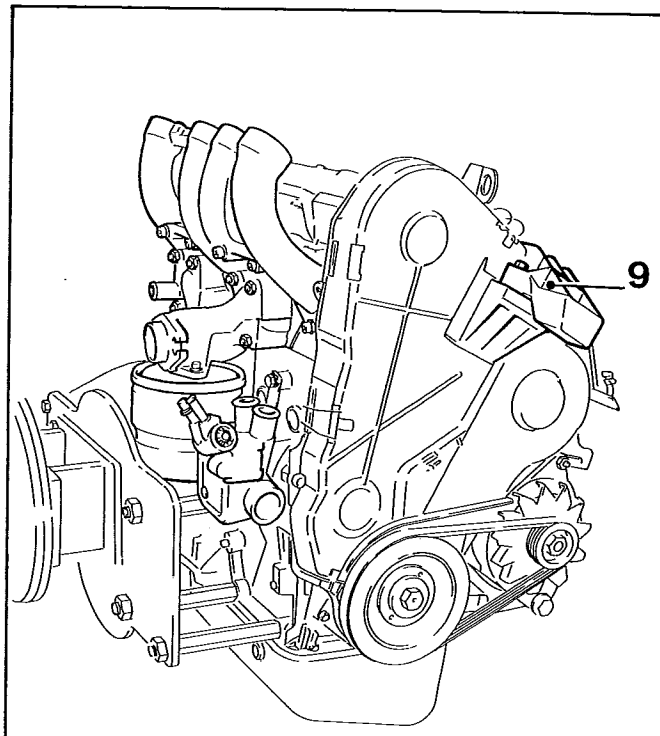

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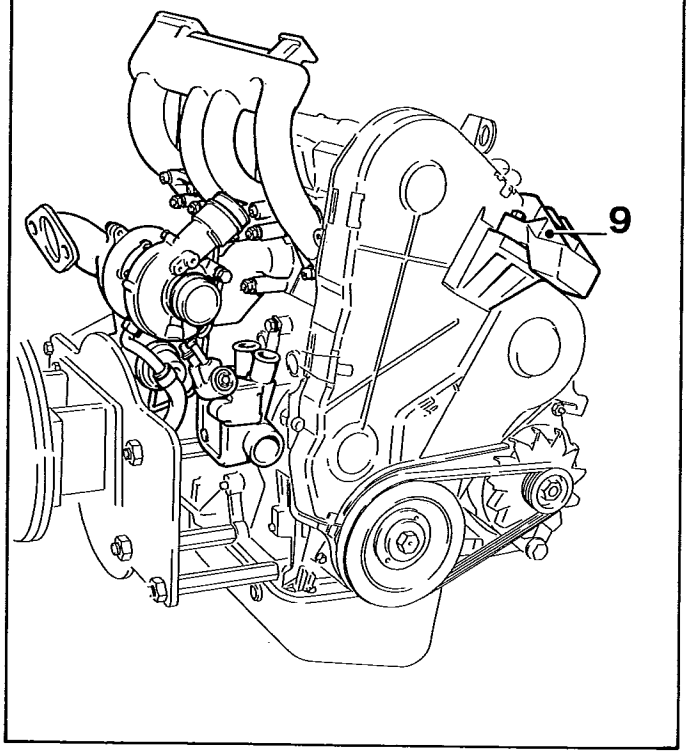

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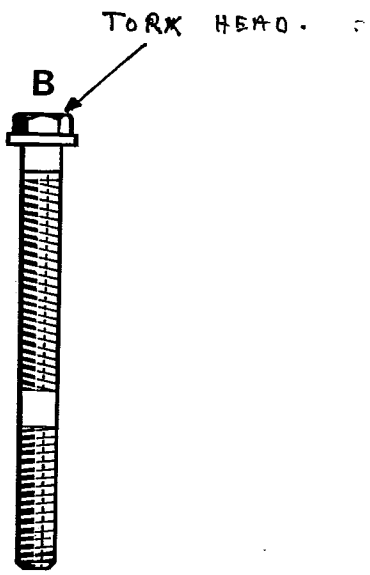

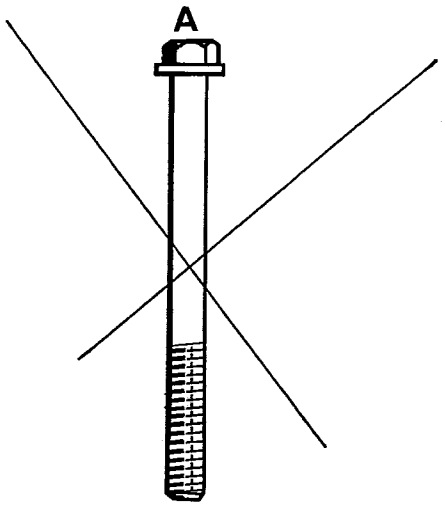

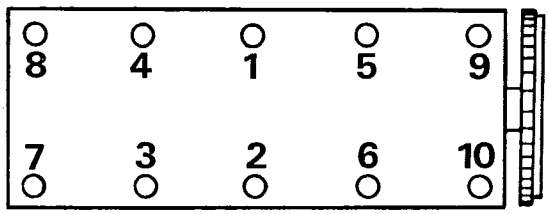

I

- Replace the coolant hoses and hose clips
- Check the condition of the radiator (scaling, leaks, damage)
- Check the operation of the cooling fan
- Check the coolant filler cap for leaks and setting
- Replace the air cleaner and fuel filter elements
- Oil bath air cleaner : thoroughly clean the casing and filter element, and fill to level with engine oil
- Add engine oil (◁ wall charts or technical cards)
- Adjust the controls (◁ Workshop Manual)
- Fill and bleed the cooling system (◁ Workshop Manual)
- Warm up the engine
- Check that the cooling fan starts
- Adjust the idling speed (◁ Workshop Manual)

CYLINDER HEAD RE-TIGHTENING

Bolts A

- Run the engine for **10 minutes** at **3000 rpm**
- Allow the engine to cool for **2 hours 30 minutes** with the bonnet open
- Release the cooling system pressure
- Bolt by bolt, in the order shown :
  - slacken a quarter turn
  - re-tighten to **70 Nm (52 lbf ft)**
  - repeat these operations

Bolts B

No cylinder head re-tightening

TIGHTENING TORQUES

I

	Nm	lbf ft
- Big ends	↷ 40 ↶ ↷ 20+70°	↷ 30 ↶ ↷ 15+70°
- Camshaft bearing caps	17,5	13
- Camshaft gear	40	30
- Clutch mechanism	25	18
- Coolant pump	15	11
- Crankshaft pulley	40 + 60°	30 + 60°
- Cylinder head bolts	Bolts A / Bolts B	Bolts A / Bolts B
. pre-tightening	30 / 20	22 / 15
. tightening	60 / 60	44 / 45
. slackening	1/4 turn / None	1/4 turn / None
. re-tightening	70 / +120°	52 / +120°
- Cylinder head cover	10	7
- Exhauster pulley	35	26
- Flywheel	50	37
- Glow plugs	22	16
- Injection pump gear	50	37
- Injectors	90	66
- Main bearing caps	70	52
- Oil cooler	65	48
- Oil pump	20	15
- Oil seal carrier, timing gear end	15	11
- Sump to block	20	15
- Timing belt tensioner	15	11