

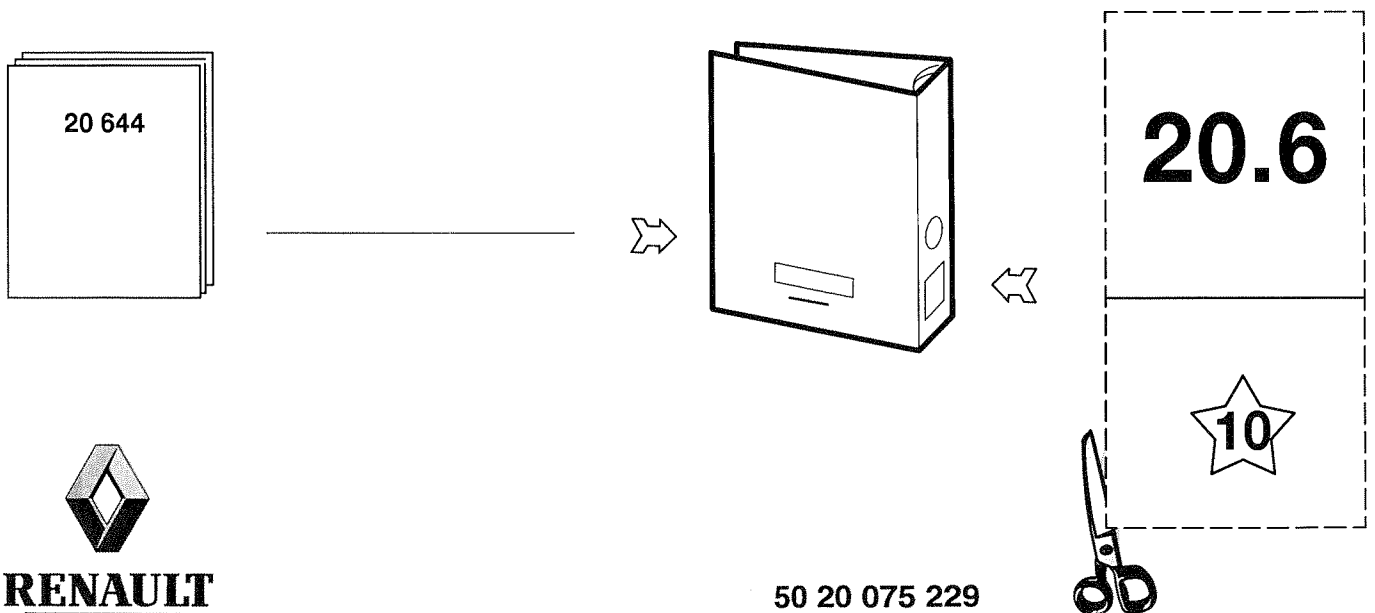
20 644 – AN – 09.1998

ENGINE MIDR 04.02.26

ENGINE	FAMILY	VEHICLE
MIDR 04.02.26 A4	2119	S 135
MIDR 04.02.26 B4	2119	S 150

NOTE

The above information may change in the course of time.
Only the "Consult" section of the workshop manuals repertory in standard N° 10320 serves as reference.



ENGINE

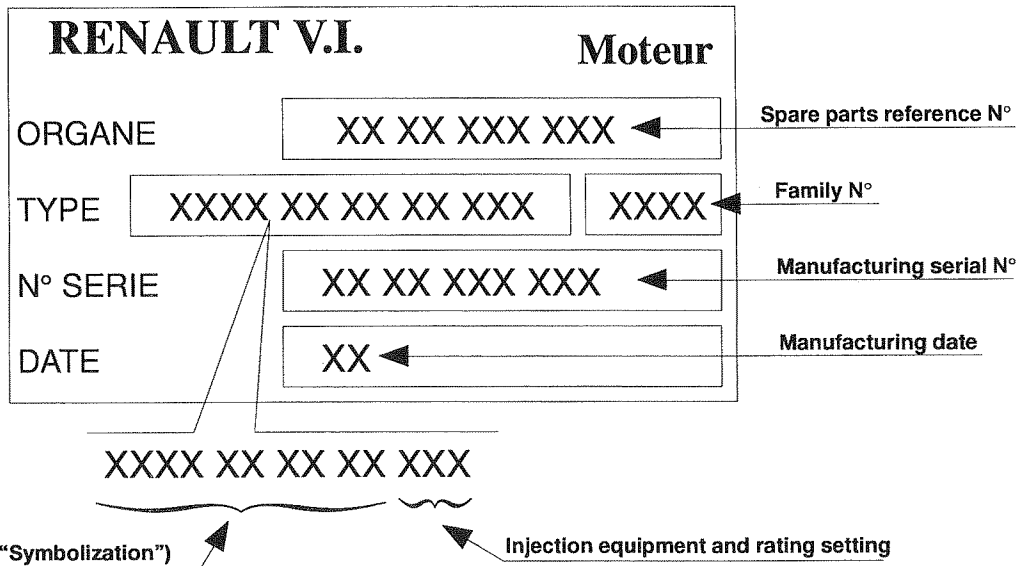
MIDR 04.02.26

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TECHNICAL DATA

Identification plate (original engine)



Service exchange engine

To identify service exchange engines: see Spare Parts department technical comments.

Symbolization

M	I	D	R	04	02	26
Engine	Direct injection	Cylinder arrangement: . D: straight . P: inclined . V: V . H: horizontal	S: supercharged R: supercharged and cooled	Cylinder number	Bore (102 mm)	Stroke (126 mm)

Injection setting A4–B4
 Cubic capacity 4.118 l
 Compression ratio 17.5/1
 Firing order 1.3.4.2
 N° 1 Cylinder flywheel end
 Fuel diesel fuel

Lubrication : forced feed by rotor type pump
 Minimum oil pressure at 85 ° C
 – at 600 rpm: 1 bar
 – at 2 400 rpm: 3.5 bar.

Cooling :

Pump–assisted water cooling system with thermostatic regulation.
 – Beginning of opening 86 ± 1.5°C
 – End of opening 96 °C
 – Fully open dimension (minimum) 7.9 mm

Turbocharger SCHWITZER S200

Fuel-Injection

Setting index	Injection pump	Governor	Timing	Injectors	Injector nozzle-holders	Opening pressure in bars (new parts)
A4	PES 4P	RQV PA 1257 K	7 °± 30' 0,62 ± 0,08 mm	DLLA 149 P 602	KDEL 77S15	300 → 320 (320 → 328)
A4	PES 4P	RQV PA1257-1K	28°± 30' 9,60 ± 0,33 mm	DLLA 149 P 602	KDEL 77S15	300→320 (320→328)
B4	PES 4P	RQV PA 1232 K	9 °± 30' 1,02 ± 0,11 mm	DLLA 148 P 500	KDEL 77S15	300 → 320 (320 → 328)
B4	PES 4P	RQV PA1232-1K	29 °± 30' 10,27 ± 0,34 mm	DLLA 148 P 500	KDEL 77S15	300 → 320 (320 → 328)

Hydraulic automatic timing advance 6°

Weight:

– Undressed engine 440 kg

Preparation prior to assembly :

Carefully clean and check all the parts.

Do not unpack a new bearing until you are ready to install it. Do not clean off the protective grease on new bearings.

Old seals and lock-plates must be discarded and new ones fitted.

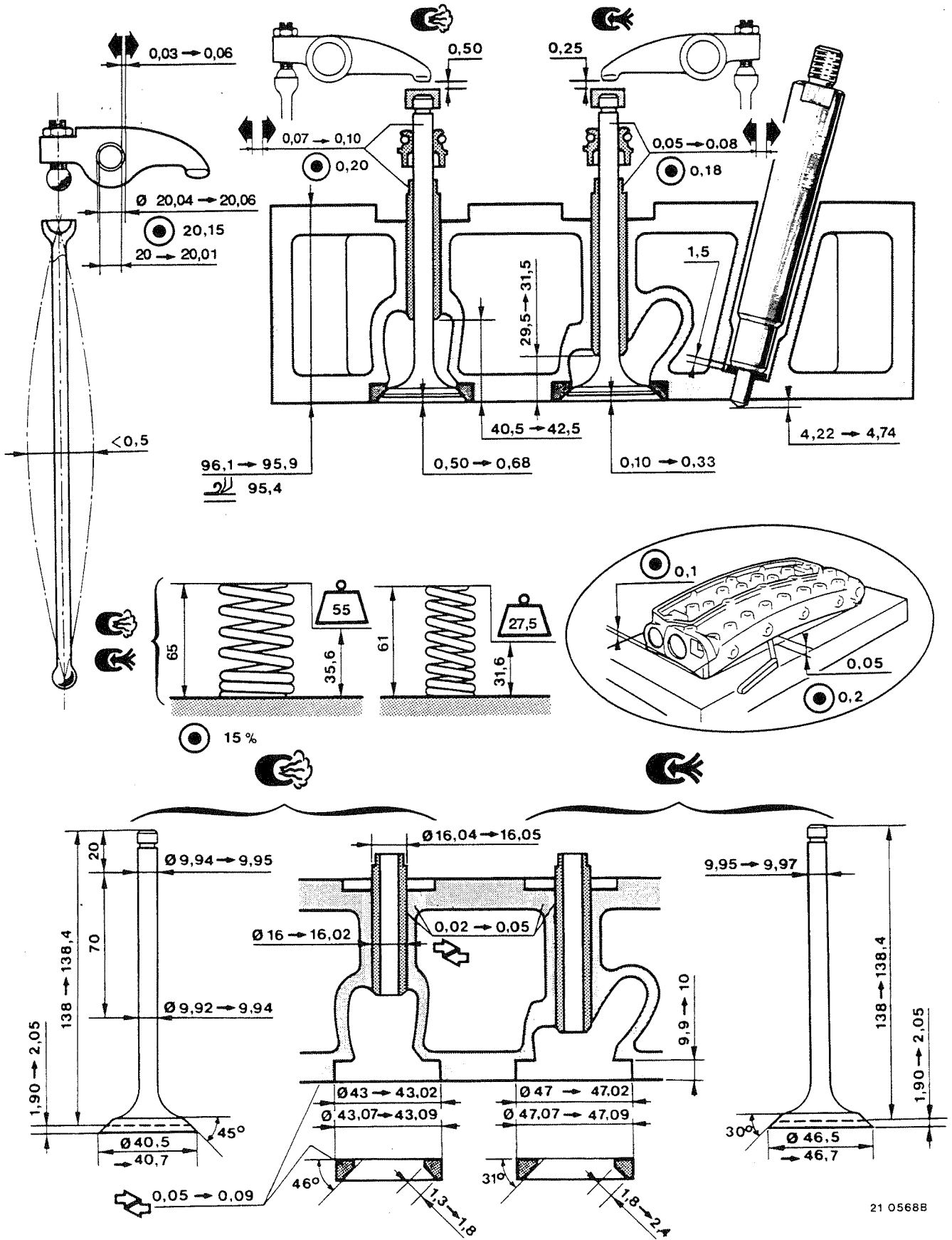
Never force fit parts with copper or brass punches or drifts. Always use a specially adapted driver to prevent ingress of metal particles into the casings and bearings. Always oil parts prior to force fitting.

Always apply grease on the inside of seal ring lips.

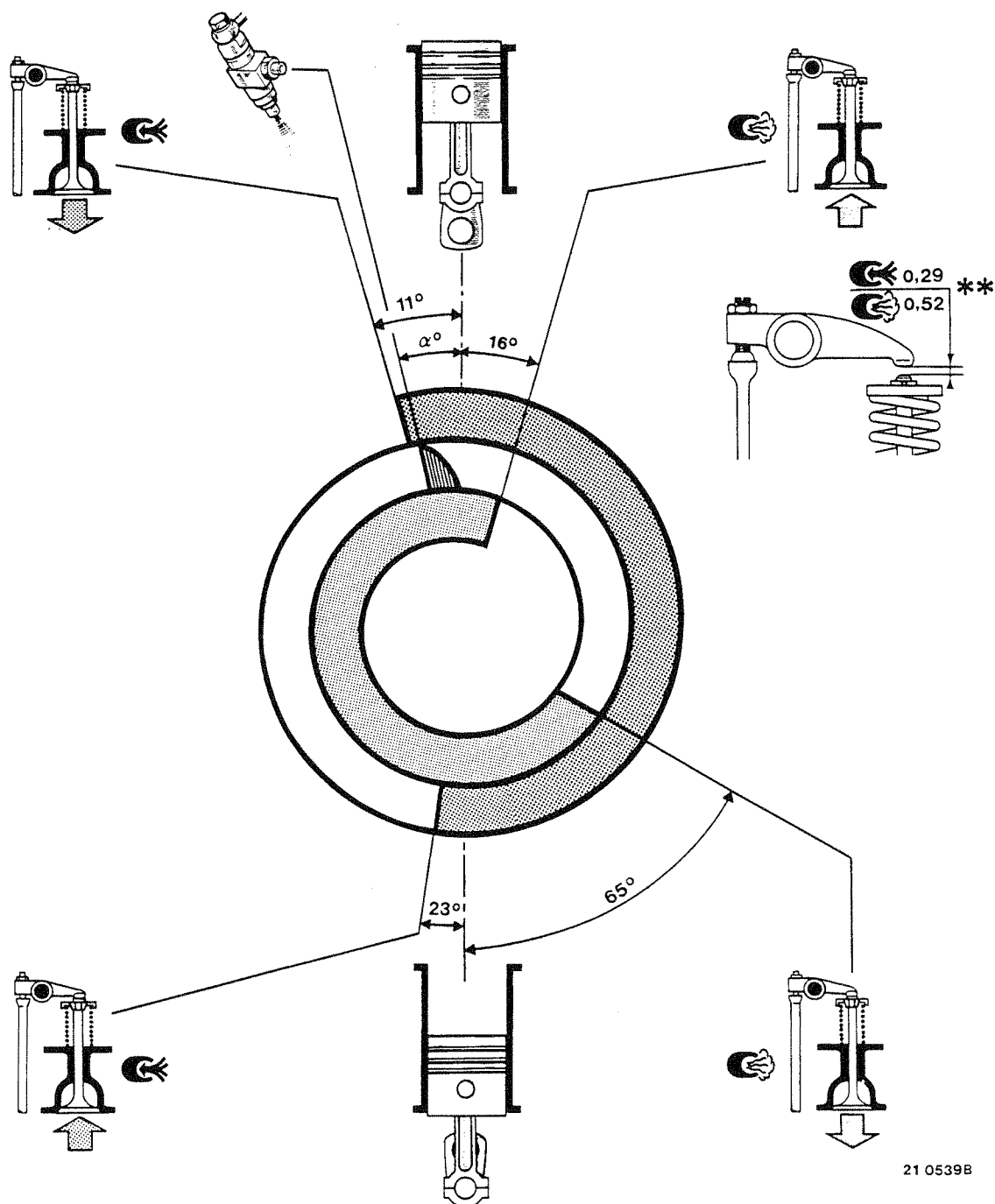
Shrink fitted parts are to be heated with a hot air blower or in an oven. etc... Flame heating is strictly forbidden.

NOTE

When using a torque multiplier. calibrate the torque wrench/multiplier unit at the required torque loading.



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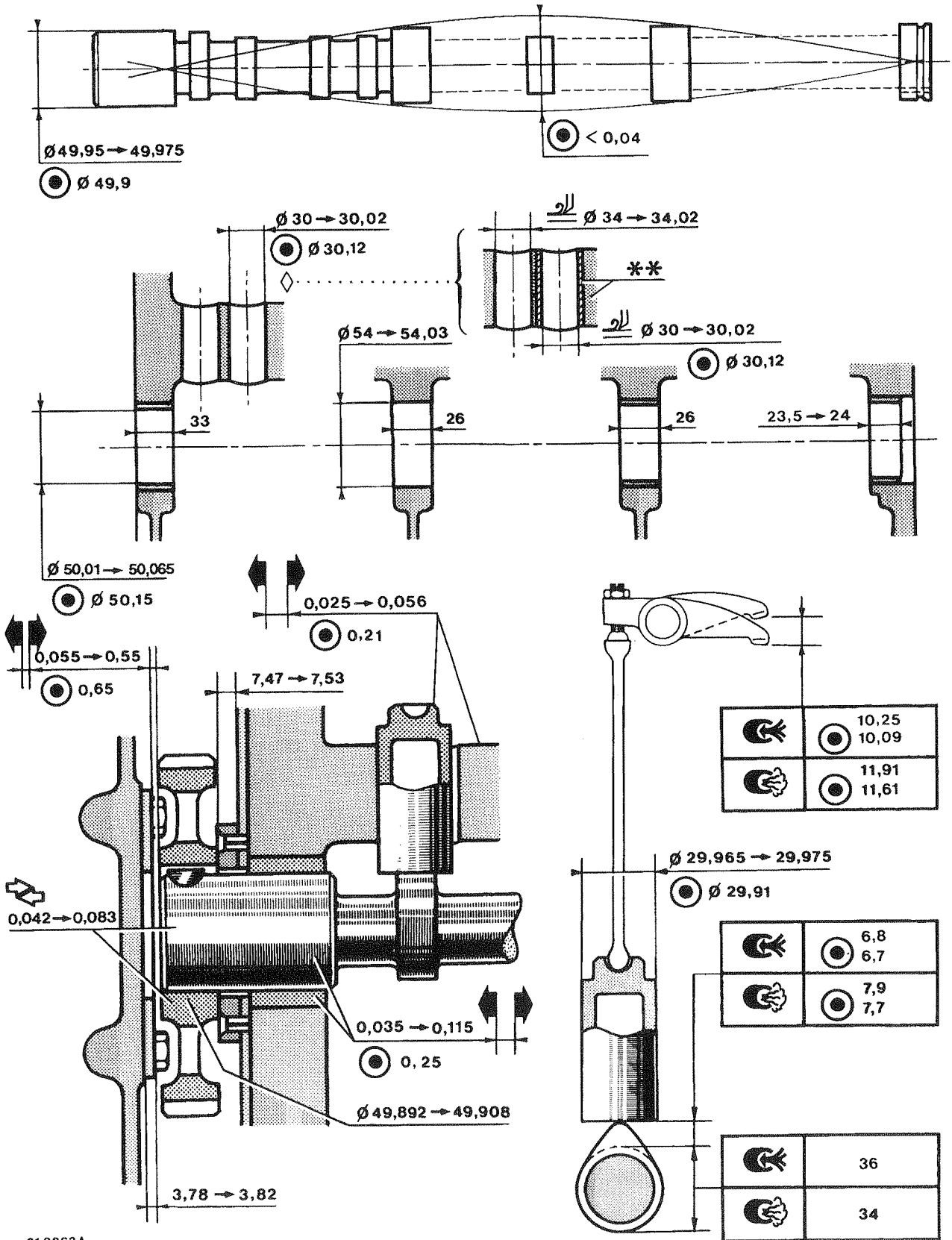
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Quick timing check :

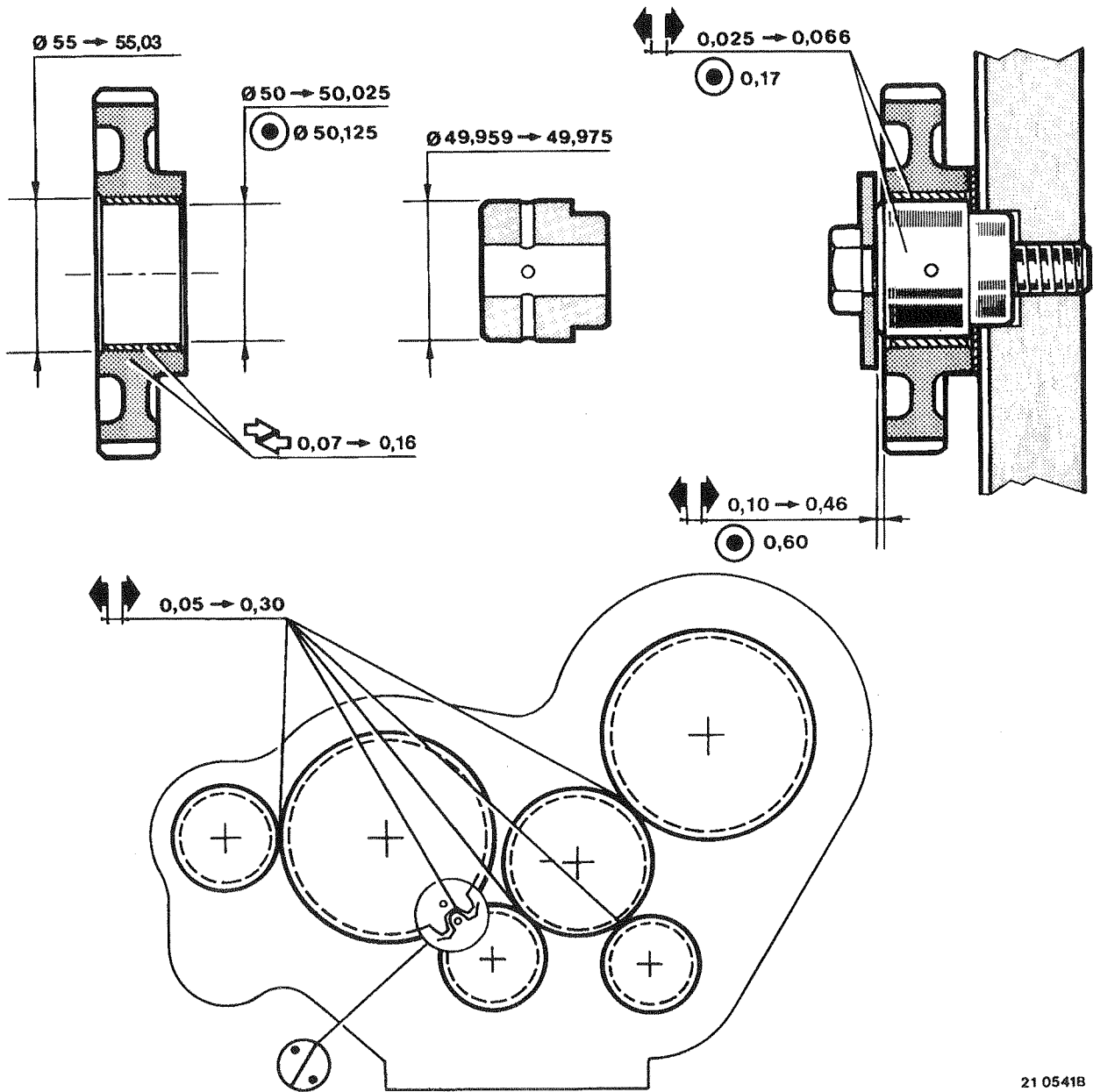
- Position the piston of cylinder 1 at end of exhaust/beginning of intake TDC (in direction of rotation).
- Scribe a mark on the crankshaft pulley.
- Adjust the valve clearances at the rocker arms to zero (without compressing the control).
- Crank the engine through one revolution, lining up the marks on the crankshaft pulley, so as to reach the "compression TDC".
- Check the valve clearances and make sure that the values are as follows :
 - . Inlet : 0.75 → 1.15 mm.
 - . Exhaust : 1.14 → 1.44 mm.

WARNING

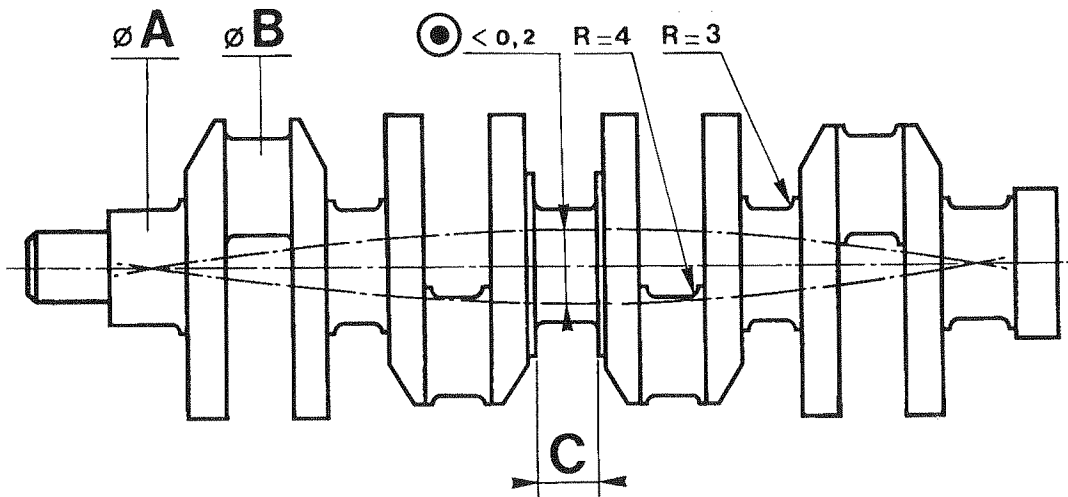
Carry out this check procedure twice, since accuracy is vital when adjusting the valve clearances to zero at the rocker arms.



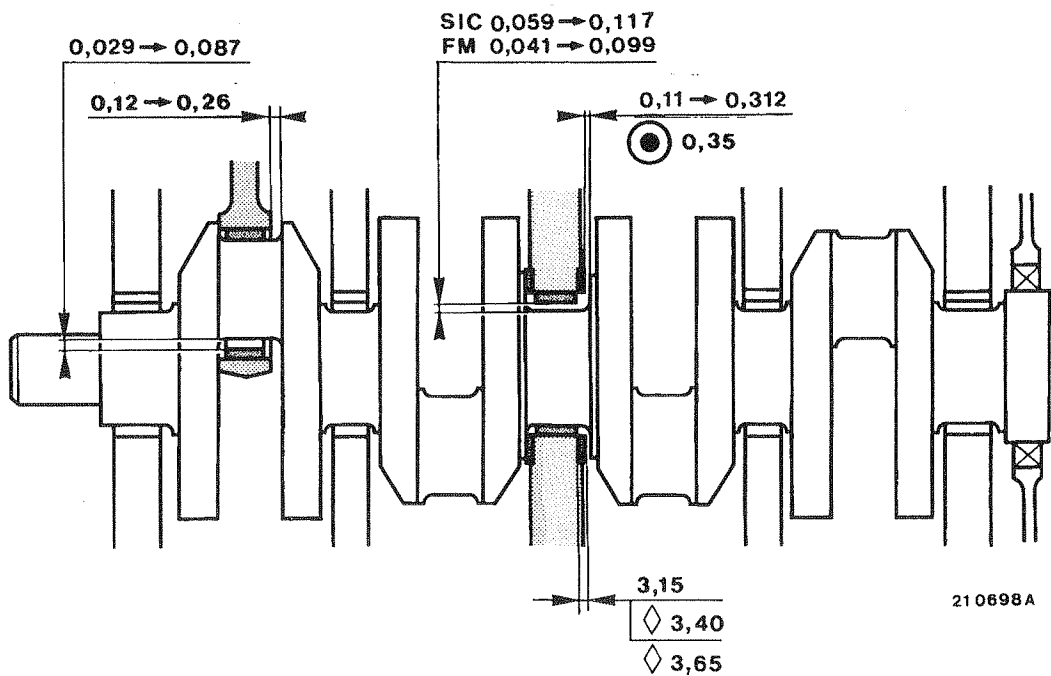
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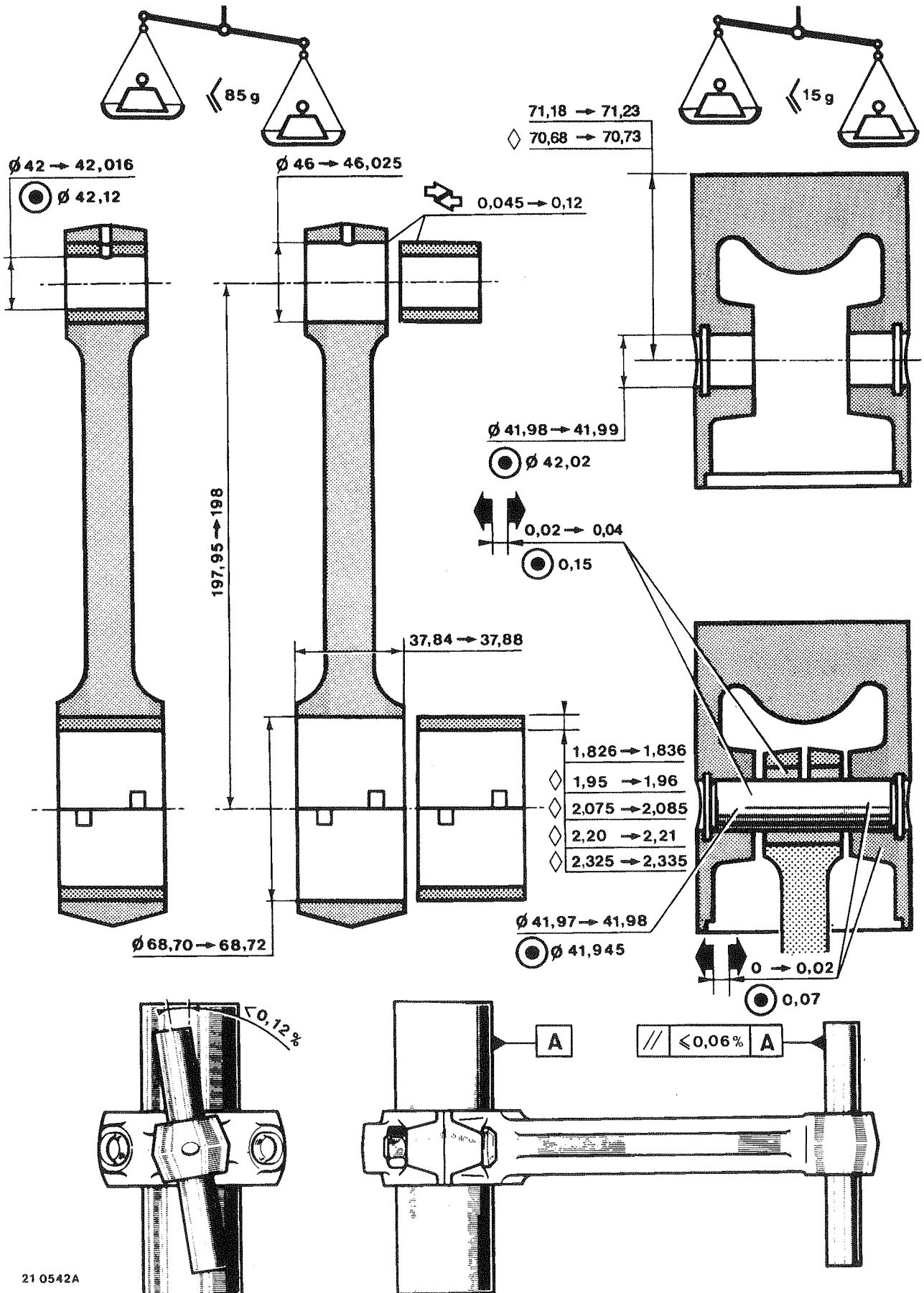
21 0541B



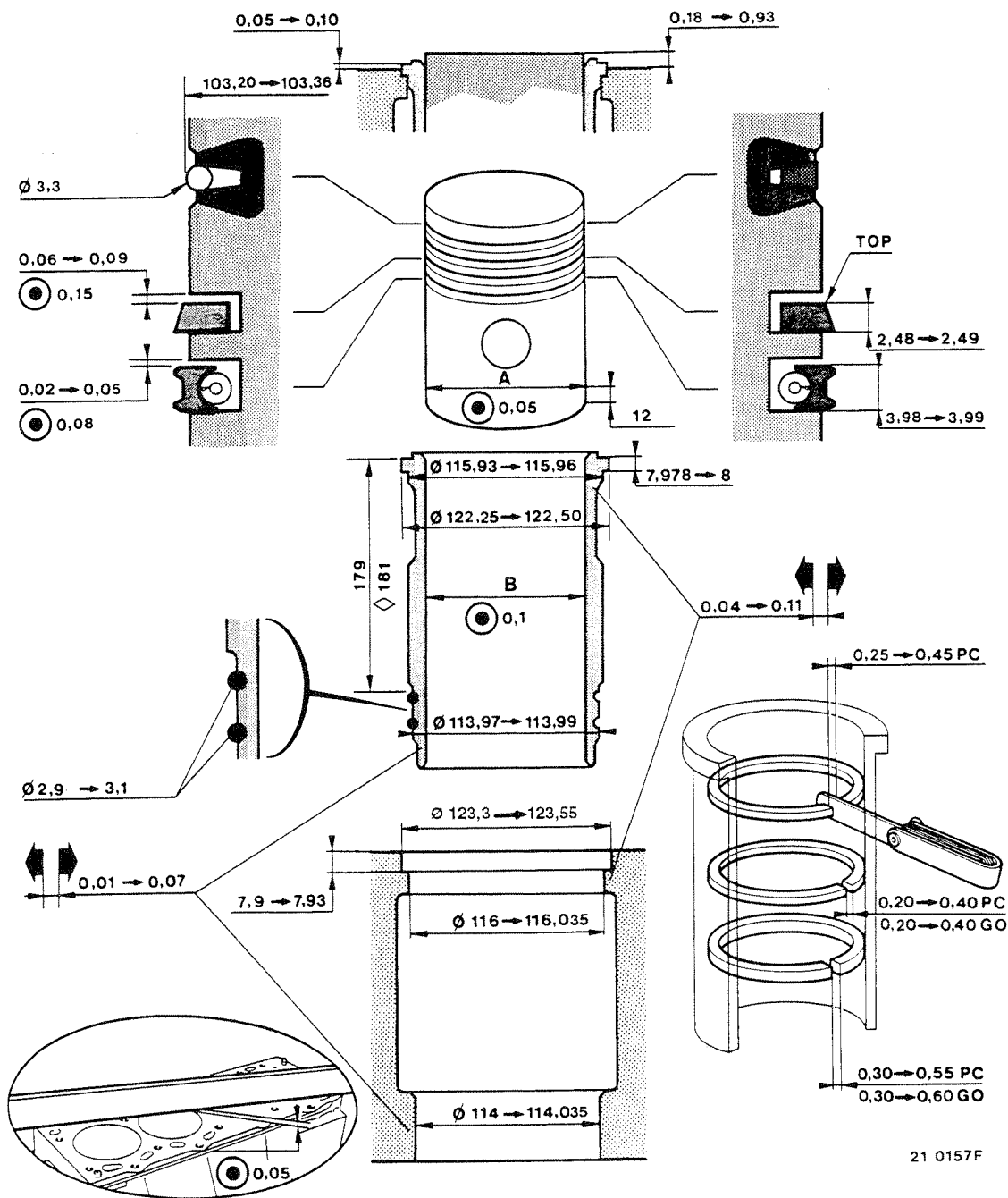
		$\varnothing A$	$\varnothing B$	C
		76,00 → 76,02	64,98 → 65,00	39,00 → 39,062
◇	1	75,75 → 75,77	64,73 → 64,75	39,50 → 39,562
	2	75,50 → 75,52	64,48 → 64,50	
	3	75,25 → 75,27	64,23 → 64,25	40,00 → 40,075
	4	75,00 → 75,02	63,98 → 64,00	



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LINER – PISTON PAIRING		
Item	Liner Ø B	Piston Ø A
A	102.015 → 102.027	101.945 → 101.957
B	102.023 → 102.035	101.953 → 101.965

Tightening torques

There are several types of tightening:

- Tightening to torque (in **Nm.**)
- Tightening to angle (in °)
- Tightening to torque-angle (in **Nm. + °**)

Torques given in **Nm** are nominal torques (average value calculated on the basis of the minimum torque and the maximum torque).

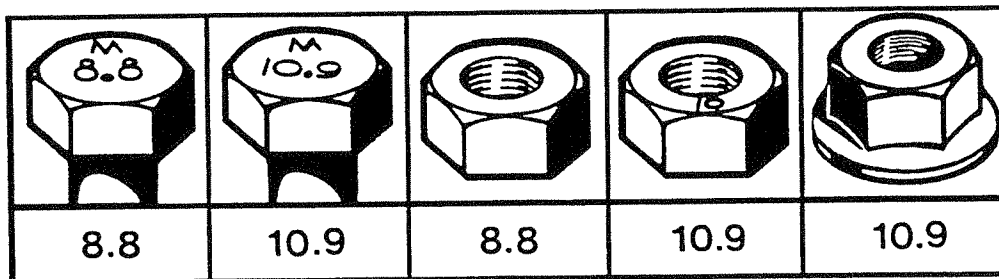
The tightening accuracy class defines the tolerance of this torque in percent as a function of the nominal torque applied.

Tightening accuracy classes:

- **Classe I** : Special threaded hardware (tolerances variable depending on assembly).
- **Classe II** : Reserved for precise tightening (tolerance $\pm 10\%$ of the nominal torque).
- **Classe III** : Reserved for normal standard tightening (tolerance $\pm 20\%$ of the nominal torque).

For standard threaded hardware indicated in the table below, use tightening class **III**.

For other torques, see page **A11**.



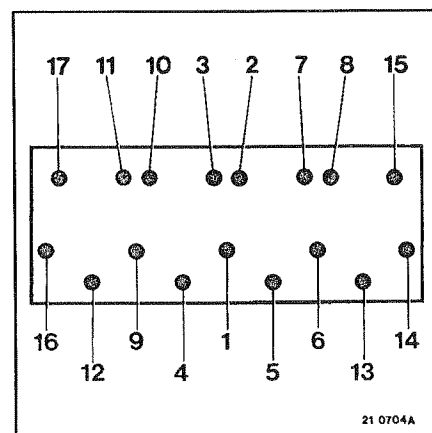
21 0122

Tightening torques for conventional nut and bolt hardware to "METRIC system" standard 01.50.4002		
Dia. and pitch of nuts and bolts (in mm)	Quality class 8.8	Quality class 10.9
	Tightening class III ($\pm 20\%$)	Tightening class III ($\pm 20\%$)
6 x 1.00	7.4	10.8
7 x 1.00	12.1	17.8
8 x 1.00	19.2	28.2
8 x 1.25	17.9	26.3
10 x 1.00	39.4	58
10 x 1.25	37.4	55
10 x 1.50	35.4	52
12 x 1.25	67	98
12 x 1.50	64	94
12 x 1.75	61	90
14 x 1.50	105	155
14 x 2.00	98	143
16 x 1.50	161	237
16 x 2.00	151	222
18 x 1.50	235	346
18 x 2.50	210	308
20 x 1.50	328	481
20 x 2.50	296	435
22 x 1.50	444	652
22 x 2.50	406	596

Cylinder heads

Tighten the setbolts in a 1st phase at a torque of **125 Nm** in the specified sequence ; then tighten at an angle of **180 °**.

Slacken the setbolts one-by-one and retighten at a torque of **125 Nm** then turn through an angle of **180 °** always in the specified sequence.



Inlet manifold bolt	30 (± 3)
Exhaust manifold setscrew	55 (± 5.5)
Rocker pedestal setscrew	80 (± 8)
Rocker arm adjusting nut	15 (+ 5)
Cylinder head cover securing nut	25 (± 2.5)

Reciprocating gear

Crankshaft bearings setscrew	
– hexagon head (with washer)	100 + 60° (+10°)
– twelve-point head with collar (without washer)	100 + 90° (+10°)
Connecting rod cap setscrew	35 + 150° (-10°)
Engine flywheel housing securing bolt	130 (± 13)
Flywheel screw	
– with washer	250 (± 50)
– without washer	60 + 45° (+10°)
Pulley damper setscrew	50 (± 5)
Pulley to crankshaft setscrew (see page D6)	100 + 55°

Lubrication

Oil pump gear attaching nut	40 (± 4)
Oil sump drain plug	70 (± 14)
Oil filter valve plug	5 (± 0.5)

Fuel-Injection

Injector pipe union	28 (± 3)
Injector nozzle-holder securing nut	100 (± 10)
Injector securing nut	40 (± 4)
Injection pump pinion setscrew	12 (± 1.2)
Injection pump timing-advance device securing nut	200 (+ 30)

Valve timing

Air compressor pinion securing nut	80 (± 8)
Air compressor attaching screw	40 (± 8)

Idler pinion setscrew (16x150):

Preliminary tighten at a torque of **200 Nm**, slacken, then retighten at **75 Nm** plus rotation through an angle of **70 (+10)°**.

Consumables

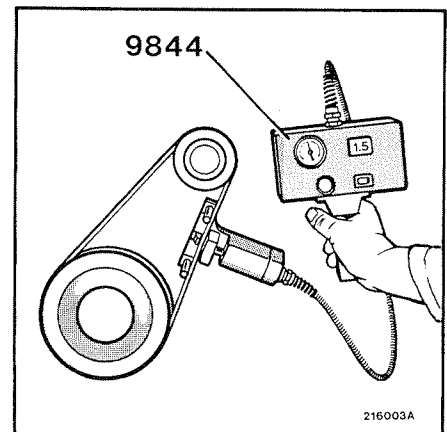
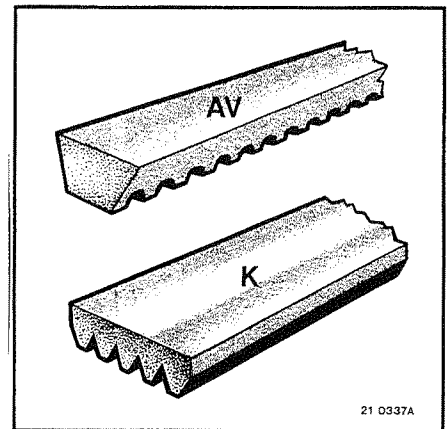
Fixing, locking and sealing products	
Industrial reference	Automotive reference
Loctite 270	LT 270 Freinfilet fort
Loctite 573	LT 573 Sérjoint
Loctite 648	Scelbloc
Loctite 542	LT 542 Oléoétanch
Silicone	Silmate RTV 1473
OMNIFIT	50 H SEAL
High temperature grease	GRIPCOTT NF

Oil: Specifications and operating temperatures (see servicing handbook).

Belt tension**CAUTION**

When a unit is driven by twin belts, and one belt becomes worn or damaged, it is essential to replace both of them.

Values are given for a 4 bar pressure with tool N° 9844



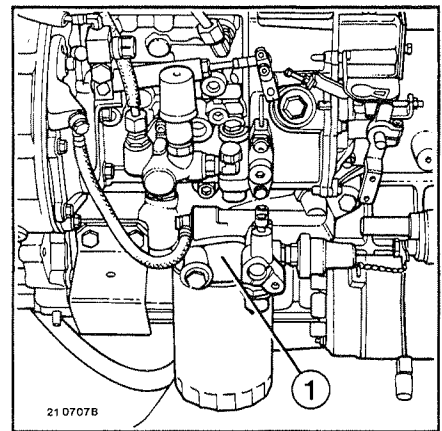
Type	Number of drive belts	Shape	Drive belt new	Drive belt used
AV 10	1	Studded	4.4	5.0
AV 10	2	Studded	2.7	3.3
AV 13	1	Studded	3.8	4.2
AV 13	2	Studded	2.3	2.6
K 5	—	5 grooves	2.6	3.7
K 6	—	6 grooves	2.4	3.3
K 7	—	7 grooves	2.1	2.9
K 8	—	8 grooves	1.9	2.6
K 9	—	9 grooves	1.6	2.3
K 10	—	10 grooves	1.5	2.2
K 12	—	12 grooves	1.4	2.0

STRIPPING EQUIPMENT AND INSTALLATION ON STAND

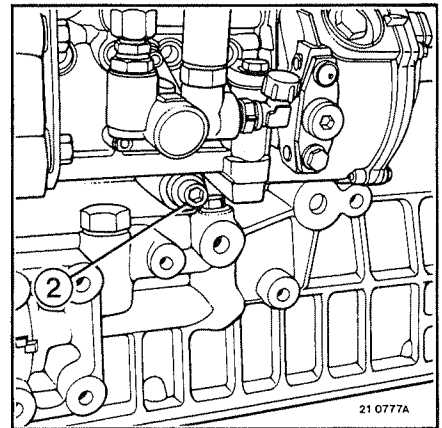
Installation on stand n° 1000

LH side

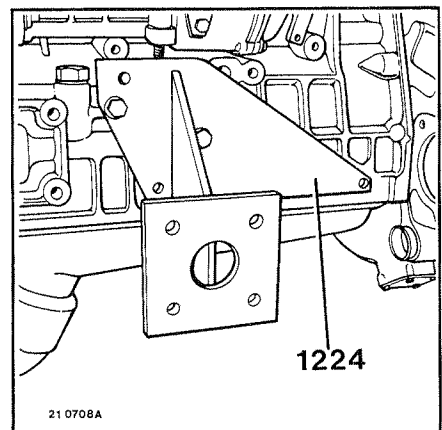
Remove the oil filter/filter head assembly (1).
Remove the starter motor.



Remove the injector pipes.
Remove the injection pump fastening.



Install tool N° 1224**.
See page(s) K7.



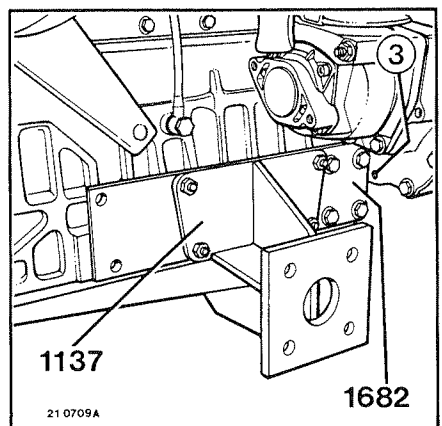
RH side

Withdraw the electrical oil gauge.

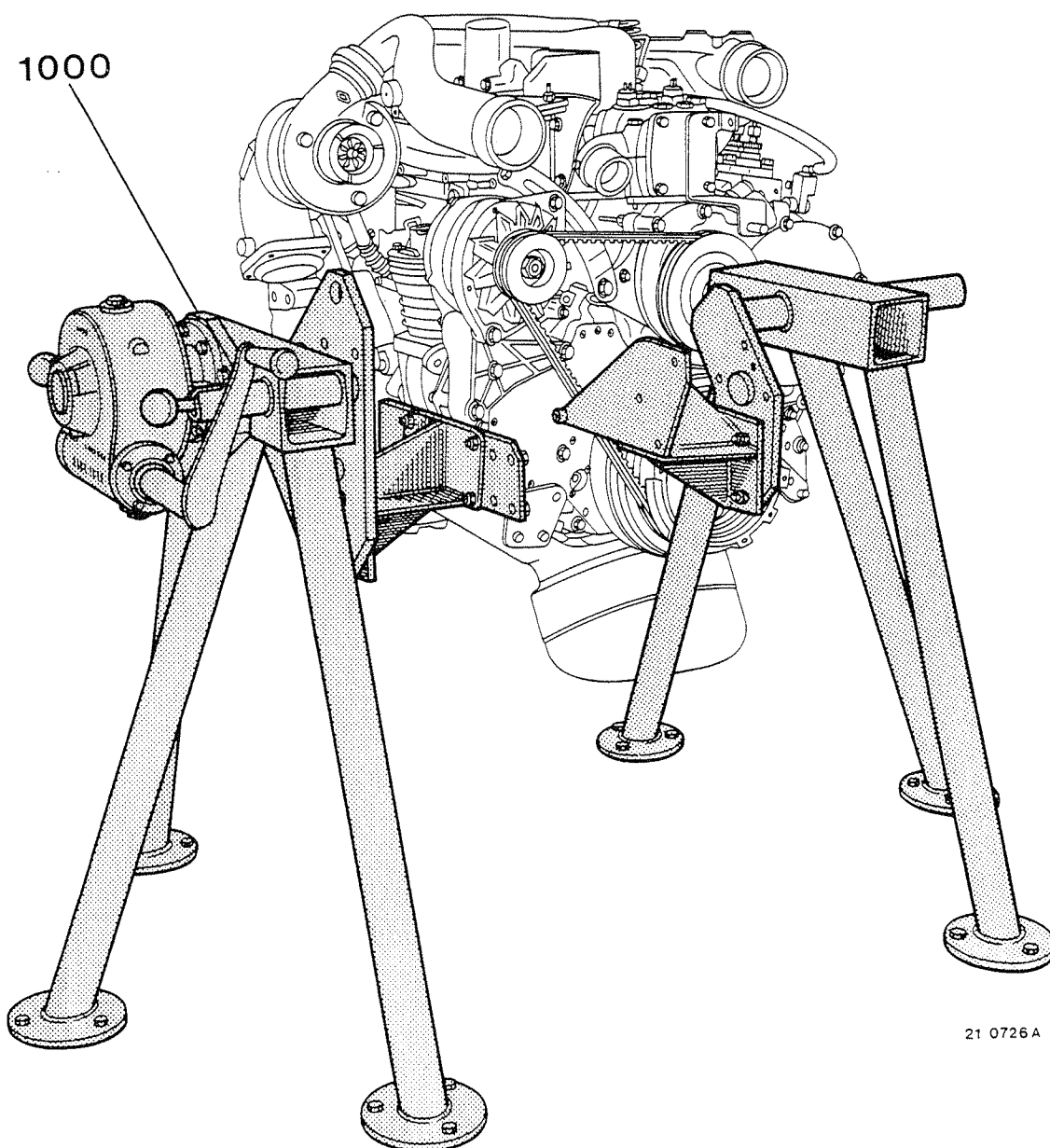
If necessary
Disconnect dipstick guide tube.

Remove nut and bolt (3).

Install tool N° 1137 + 1682**.
See page(s) K6.



** To be modified, if necessary.



21 0726 A

Fasten the engine to stand N° 1000.

Removal from stand n° 1000

Remove the engine from stand N° 1000.

Withdraw tool N° 1224 – 1137 – 1682.

Fit the injector pipes.

Install seals (1).

Fit the oil filter /filter head assembly.

Fit the starter motor.

Fit the injection pump fastening (2).

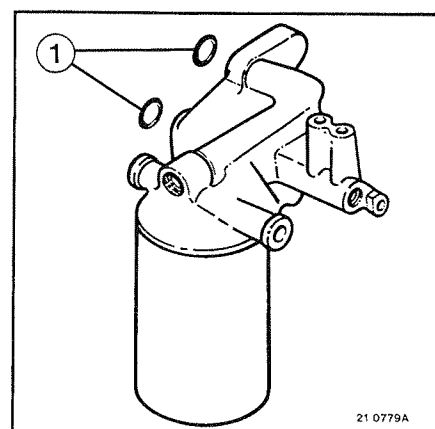
See page(s) B2.

Fit the electrical oil gauge.

Connect up the gauge guide tube.

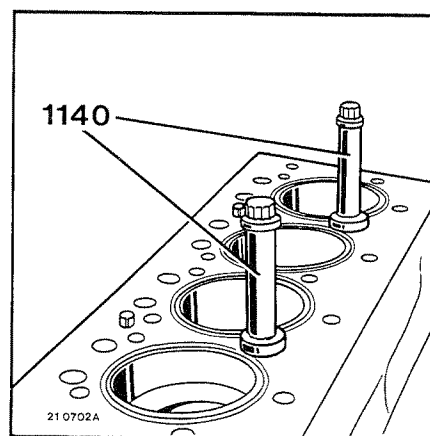
Fit nut and bolt (3).

See page(s) B2.



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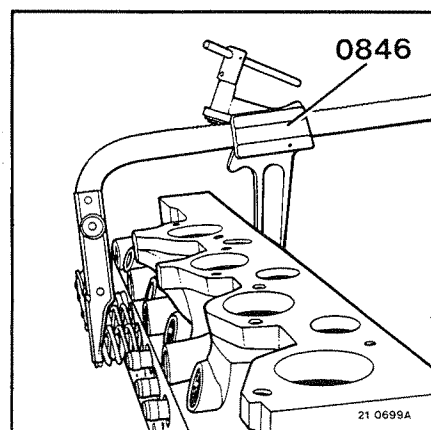
Retain the liners against motion.
Use tool N° 1140.



To disassemble

Remove intake manifold (18).
Remove turbocharger (32).
Remove exhaust manifold (29).
Remove the plate (15).
Remove the thermostat housing (24).

Take out springs (9).
Use tool N° 0846.
Save valve cotters (6).
Withdraw cups (7 – 10).
Save the washers (11).
Withdraw the seal rings (8).
Remove valves (21).
Classify the parts in order.



To inspect

To assemble

Inspect the joint face.

Cylinder head seal

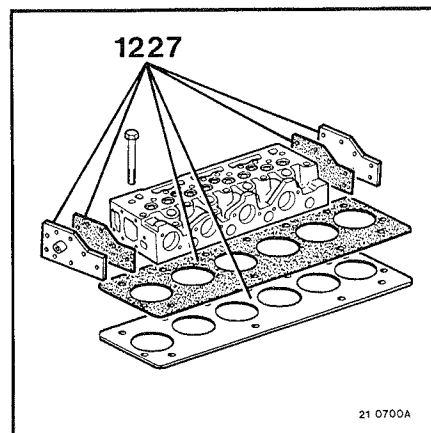
Test the cylinder head for leaks before commencing the overhaul.
In a bath of hot water (80°C), air pressure 6 bars, check for the absence of air bubbles.

Use tool N° 1227**.

** To be modified, if necessary.

See page(s) K6.

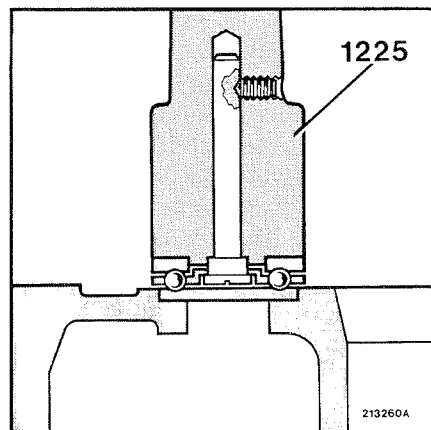
To decarbonize, take out core plugs (13 – 16).



Fit plugs (13) and crimp them.

Ensure a seal with "Loctite 270" oiltight compound.

Use tool N° 1225.



Fit plugs (16) and crimp them.

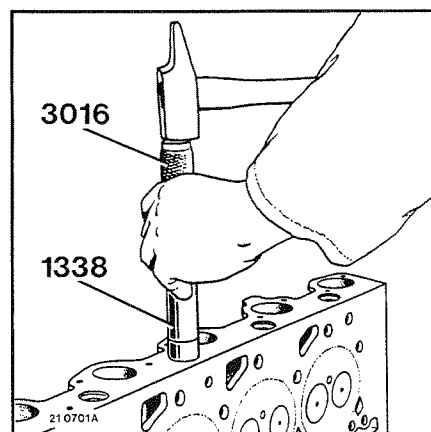
Ensure a seal with "Loctite 270" oiltight compound.

Use tool N° 1338 – 3016.

Check for leaks.

Valve guides

Check the radial clearance of the valves in their guides.



If necessary

Classify the parts in order (26).

Use tool N° 1080.

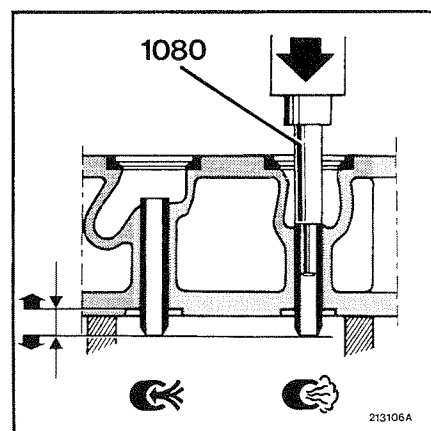
Use a press.

Apply tallow.

Press fit valve guides.

Use tool N° 1080.

Use a press.

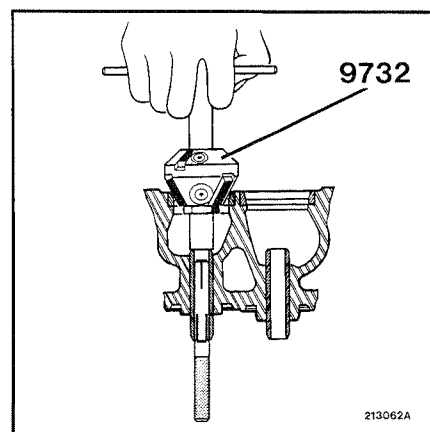


Valve seats**Valve seat grinding :**

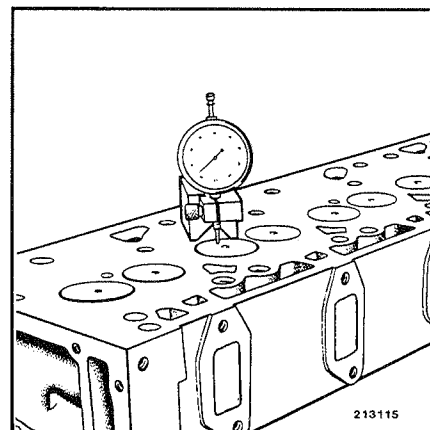
Remove as little metal as possible. Take valve set-back into account.

Use tool N° 9732.

Do not grind the valves.



Check the valves set-back or protrusion.

**Rocker assemblies**

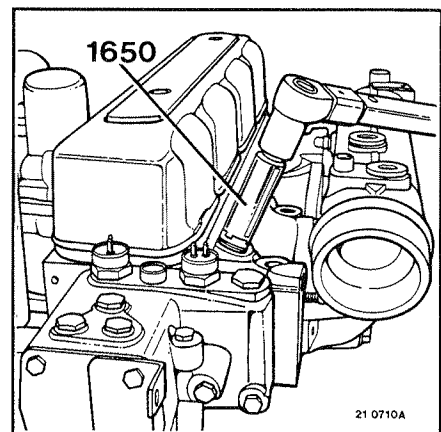
Check the rocker arm bore.

Check the rocker shaft.

Injector protrusion

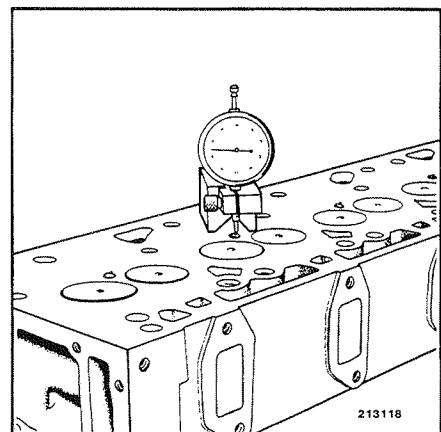
Install the gaskets.
Install the nozzle-holders.

Tighten at the recommended torque.
Use tool N° 1650.

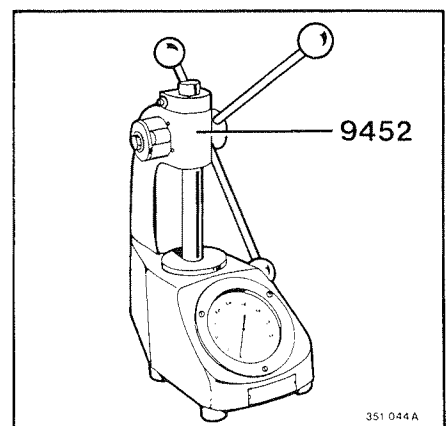


Check the injector protrusion.

Remove the nozzle-holders.
Take out the gaskets.
Classify the parts in order.



Check the calibration of the springs (9).
Use tool N° 9452.



Oil the valve stems and install the valves.
Install the gaskets (8).
Fit the washers (11).
Fit cups (10).

Assemble springs (9).

NOTE

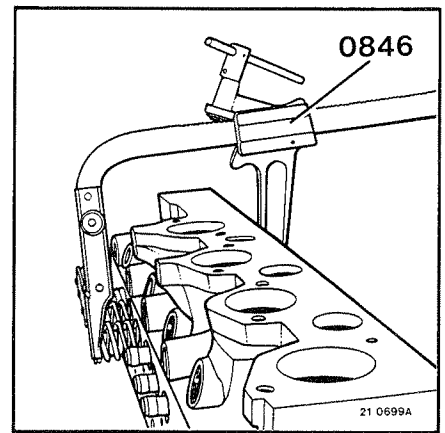
The closed-spirals end of the springs is to be fitted against the lower cups.

Fit cups (7).
Fit valve cotters (6).
Use tool N° 0846.
Fit the casing (24).
Fit the plate (15).

Install gasket (19).
Fit intake manifold (18).
Tighten at the recommended torque.

Install the gaskets (28).
Fit exhaust manifold (29).
Smear the threads with copper paste "GRIPCOTT NF".
Fit the setscrews.
Tighten at the recommended torque.

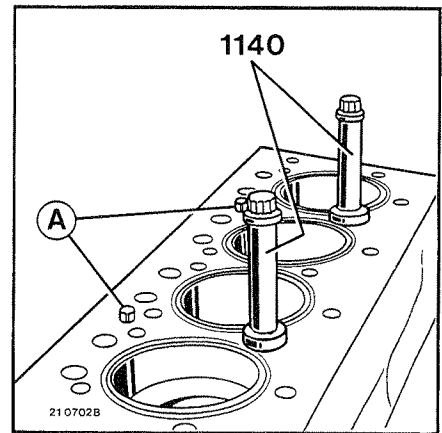
Install gasket (31).
Assemble turbocharger (32).
Tighten at the recommended torque.



To fit

Withdraw tool N° 1140.

Check for the presence of locating dowels (A).



Install gasket (20).

Fit the flange (22).

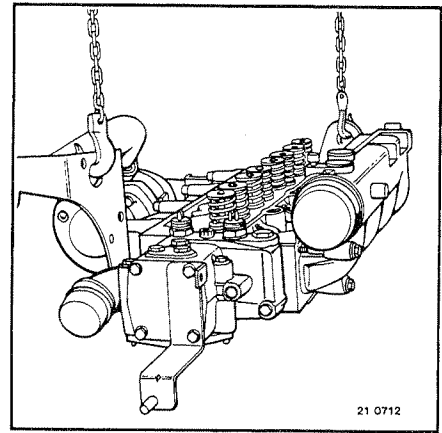
Install the O-ring (23).

Fit the cylinder head.

Apply oil.

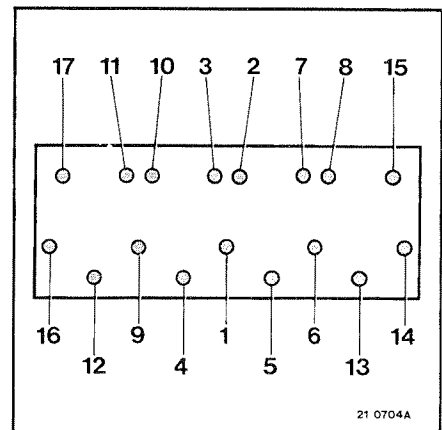
Tighten the setbolts (27).

Tighten at the recommended torque.

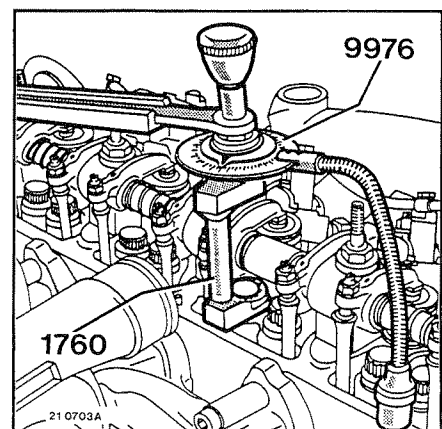
**To tighten down the cylinder head(s)**

Tighten the setbolts in a 1st phase at a torque of **125 Nm** in the specified sequence, then tighten at an angle of **180°**.

Slacken the setbolts one-by-one and retighten at a torque of **125 Nm** then turn through an angle of **180°**, always in the specified sequence.



Use tool N° 9776 – 1760.



Tighten the setbolts (25).
 Put push-rods (4) into place.
 Position caps (5).
 Remove the rocker assembly.
 Tighten the setbolts (3) moderately.
 Tighten at the recommended torque.
 Adjust the valve rocker clearances.
 Cylinder n° 1 flywheel end.

To adjust valve rocker clearances

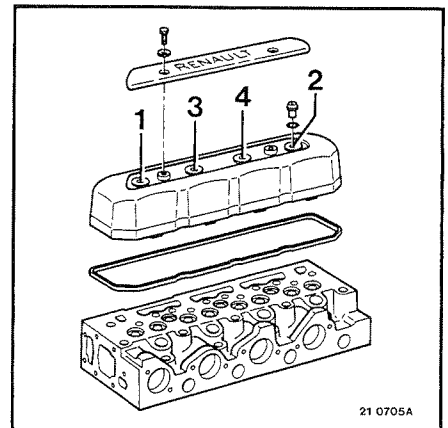
Adjustment values, engine cold:

- Exhaust : **0.50** mm
- Inlet : **0.25** mm

Valves in balance (end of exhaust, start of induction the valves in cylinder N°)	Adjust the clearances of the valves in cylinder N°
4	1
2	3
1	4
3	2

Install gasket.
 Fit rocker cover (2).
 Tighten at the recommended torque.
 In the specified sequence.

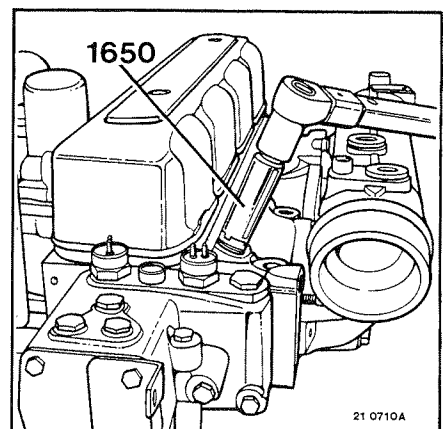
Fit the breather (1).



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Install the gaskets.
 Install the nozzle-holders.
 Tighten at the recommended torque.
 Use tool N° 1650.

Connect the flexible pipe (17).
 Fit the pipes (30 – 33).
 Assemble fuel leak-off gallery.
 Fit injector pipes.
 Tighten at the recommended torque.
 Fit fuel filter (12).

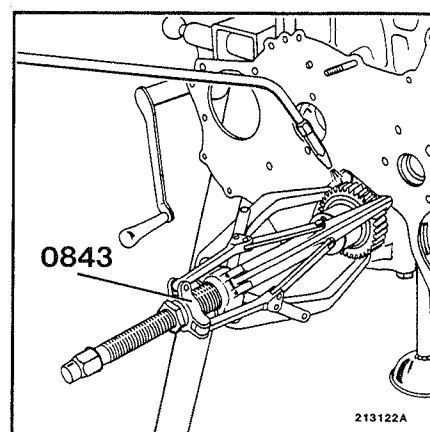


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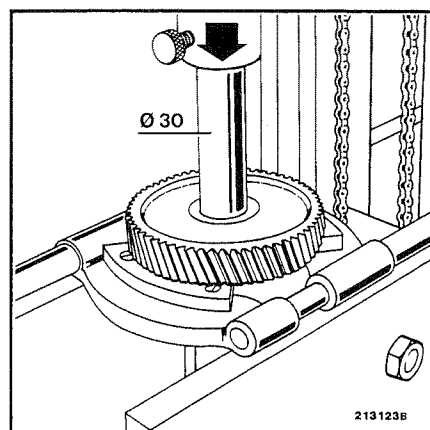
For replacement only.
Extract crankshaft pinion (29).
Use tool N° 0843.

Apply tension.
(rapid heating)

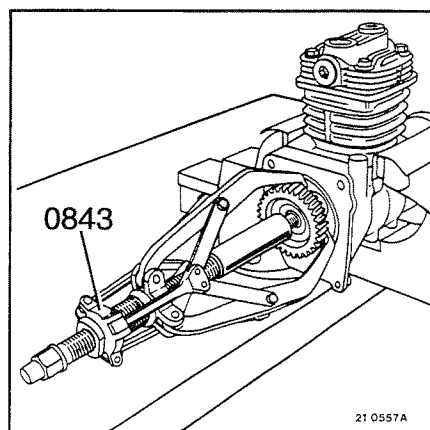
Remove the front plate (39).
Withdraw seal (40).
Take off stop (44).



Extract pinion (43).



Loosen the nut (1).
Extract pinion (2).
Use tool N° 0843.
Remove nut (1).
Withdraw pinion (23).



To inspect

On the camshaft, inspect:

- Coaxiality.
- Cam lift.
- Bearing surface diameter.
- Bushes.

On the idler gear, inspect:

- Bush bore.
- Support diameter.

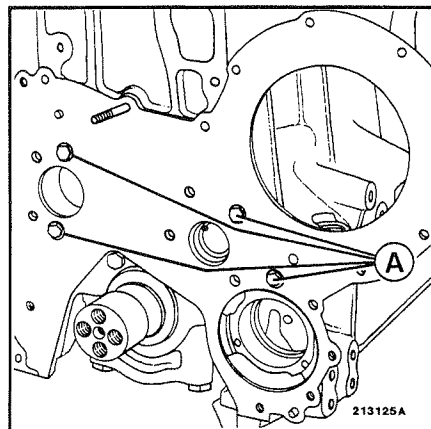
On the tappets, inspect:

- Diameter and housing.

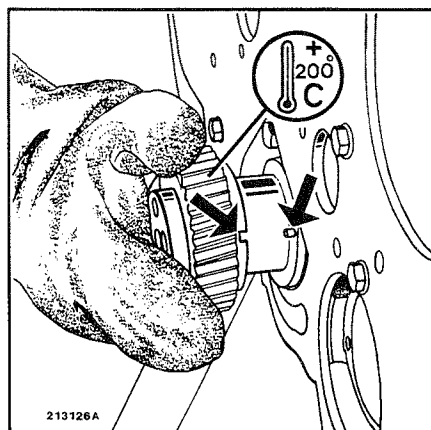
To assemble

Install seal (40).
Fit the front plate (39).

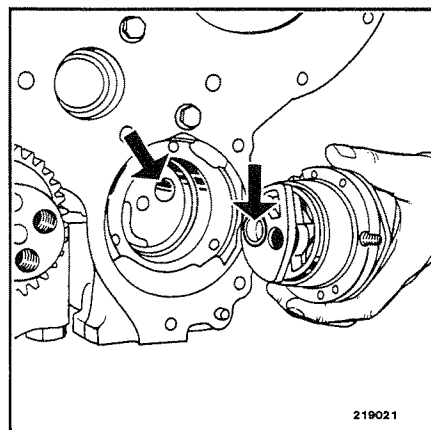
Fit the setscrews (A).
Tighten at the recommended torque.
Install stop (44).



Fit the locating dowel (30).
Heat (29) at 200 °C.
Assemble pinion (29).



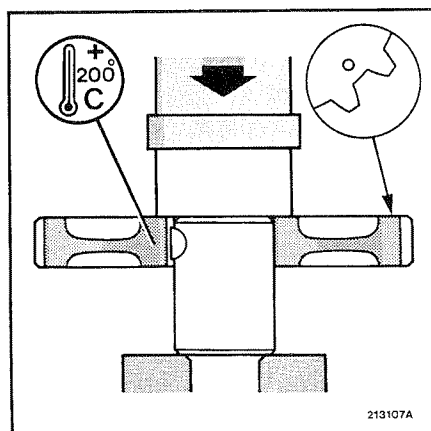
Install gaskets (15).
Apply oil.
Assemble oil pump (16).
Line up the lubrication holes.
Fit the setscrews (17).
Ensure a seal with "Loctite 542" oiltight compound.
Tighten at the recommended torque.



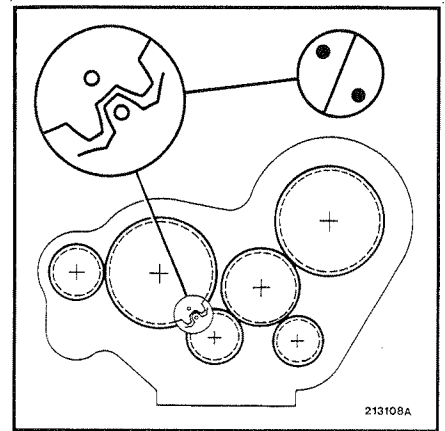
Install key (6).

Heat (43) at 200 °C.

Assemble pinion (43).
Respect the orientation.
Use a press.

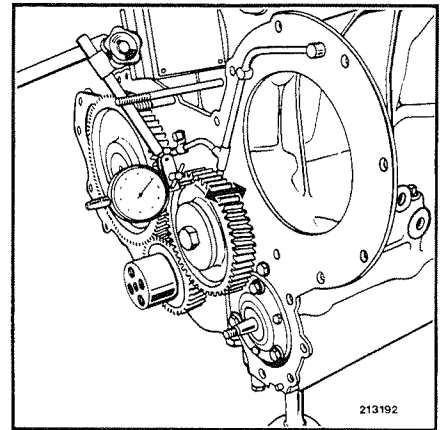


Apply oil.
Fit the camshaft assembly (9).



Idler gear

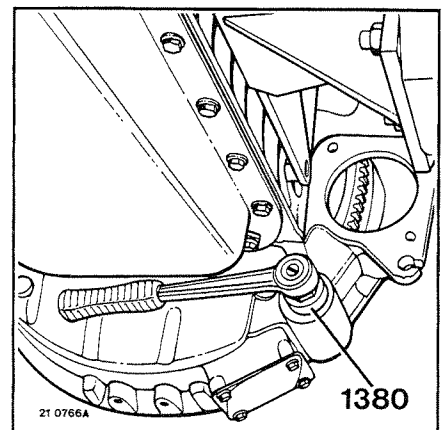
Fit the washer (12).
Fit the support (11).
Apply oil.
Assemble pinion (13).
Fit the washer (14).
Fit the setscrew (10).
Tighten at the recommended torque.
Check the clearance.



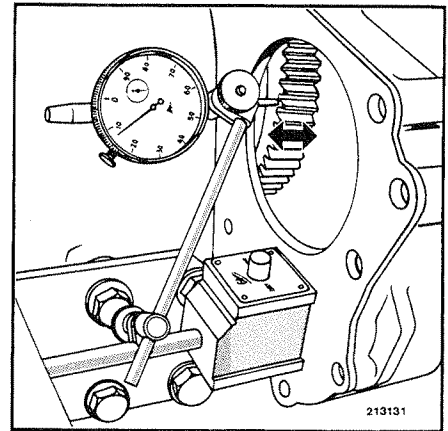
Immobilize the crankshaft.
Use tool N° 1380.

Assemble pinion (18).
Fit the washer (19).
Screw up the nut (20).
Tighten at the recommended torque.

Install stop (41).
Fit the setscrews (42).
Tighten at the recommended torque.
Fit timing case (38).
Ensure a tight seal with "Silmate RTV 1473" oiltight compound.
Tighten the bolts.



Check the clearance.

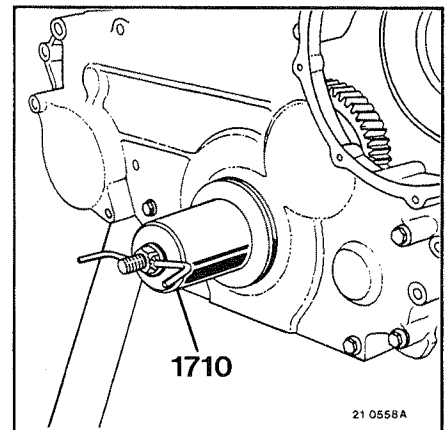


Install seal (35).

IMPORTANT

*Leave the seal on its protective ring until fitting it to the tool, so as to avoid damage to the lip.
Before assembly, oil the outside of the seal, and do not grease the lip.*

Use tool N° 1710.



Install O-ring (31).

Put spacer (32) into place.

Fit the damper (33).

Fit the setscrews (34).

Tighten at the recommended torque.

- 1st phase at a torque of **100 Nm** (at least 3 passes in diametrically opposed sequence).
- 2nd phase at an angle of **55° ± 5°** (at least 1 pass in diametrically opposed sequence).

Withdraw tool N° 1380.

Fit the oil sump.

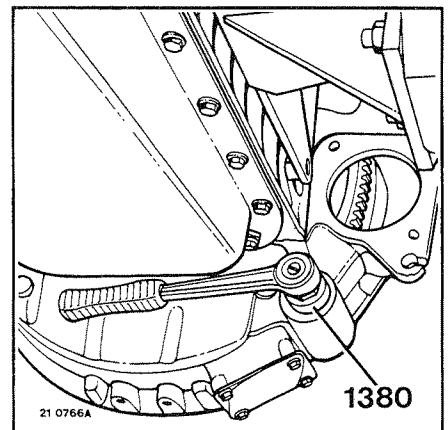
Ensure a tight seal with "Silmate RTV 1473" oiltight compound.

Apply oil.

Put tappets (7) into place.

Fit tappet cover (8).

Ensure a tight seal with "Silmate RTV 1473" oiltight compound.

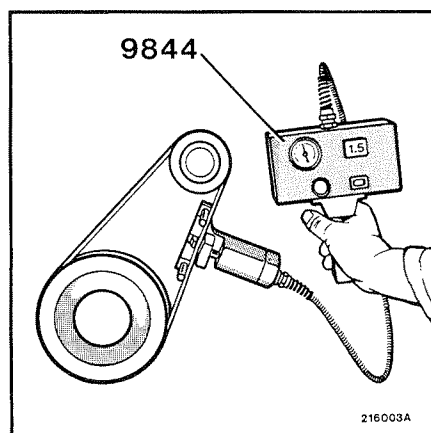
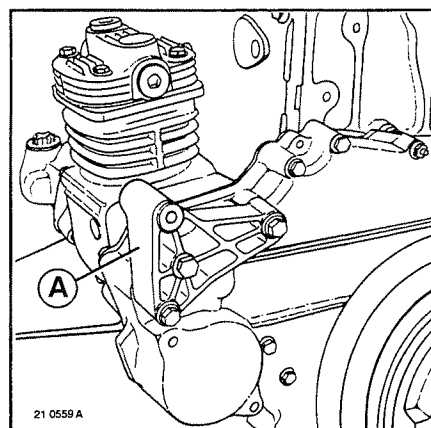
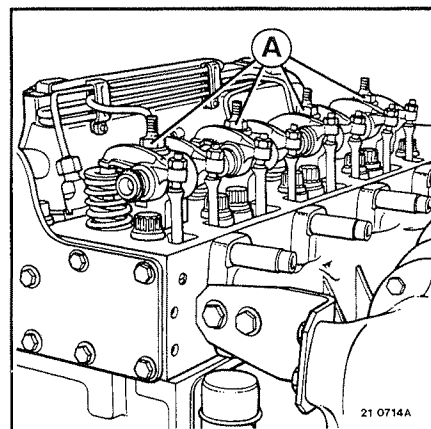


Fit the push-rods.
 Check that there are caps on the valve stems.
 Loosely-tighten the bolts (A).
 Tighten at the recommended torque.
 Adjust the rocker arms.
 Check the timing.

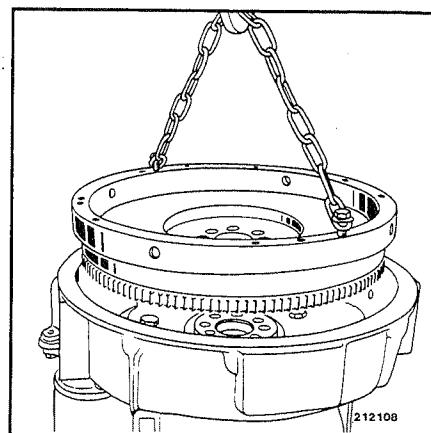
Assemble pinion (2).
 Fit the washer.
 Screw up the nut (1).
 Tighten at the recommended torque.
 Install O-ring (3).
 Install O-ring (4).

Fit the compressor (5).
 Fit the support (A).
 Tighten the bolts.
 Install O-ring (28).
 Install gaskets (27).
 Fit and time the injection pump.
 (See chapter: H)
 Tighten at the recommended torque.
 Fit inspection plate (37).
 Ensure a tight seal with "Silmate RTV 1473" oiltight compound.
 Fit rocker cover.
 Fit the water pump.
 Fit the alternator.

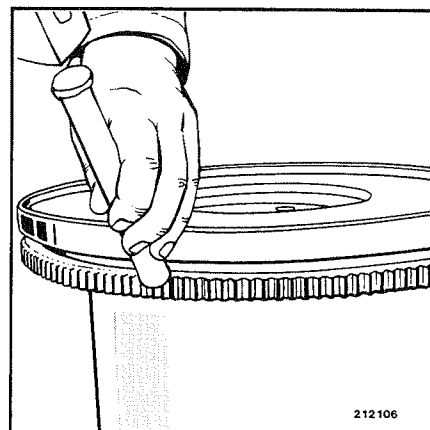
Fit and tension the drive belts.
 Use tool N° 9844.



Remove flywheel (12).

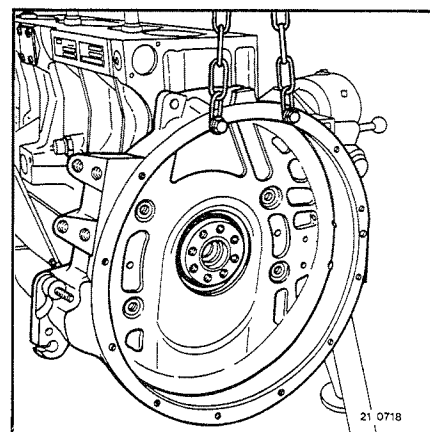


For replacement only.
Heat part (13) at a temperature of 250°C.
Minimum heating time: 30 minutes.
Withdraw ring gear (13).

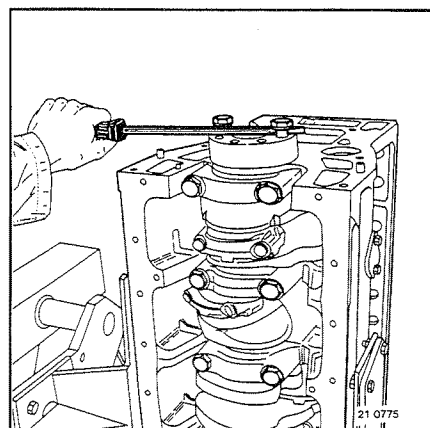


Remove screws (4).
Remove casing (5).

Remove the strainer (22).

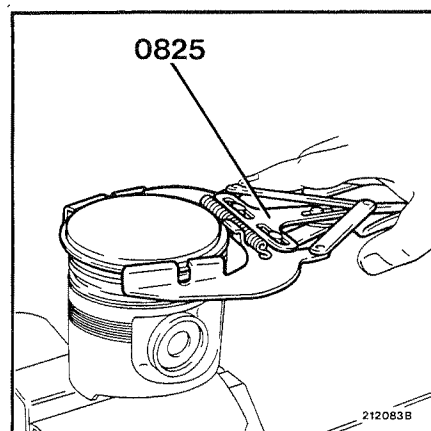


Check for the presence of connecting rod marks (camshaft side).
Remove screws (24).
Remove connecting rod caps (25).
Withdraw connecting rod/piston assemblies.
Save bearing half-shells.
Classify the parts in order.



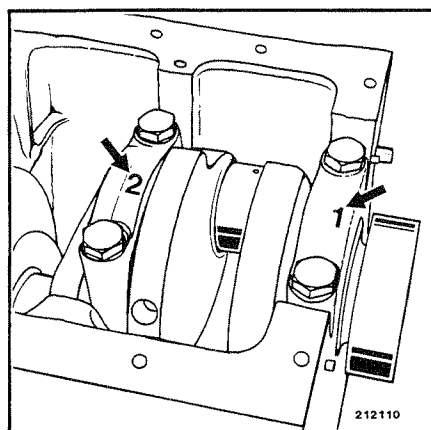
Remove piston rings (30).
Use tool(s) N° 0825.

Withdraw circlips (27).
Drive out gudgeon pins (28).
Withdraw pistons (29).



Check for the presence of main bearing cap marks.

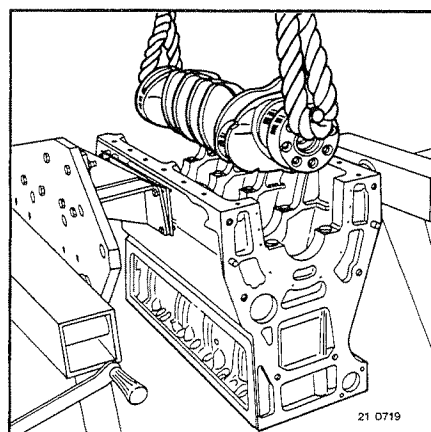
Remove screws (17).
Remove the bearing caps (16).
Remove bearing caps (15).
Classify the parts in order.
Save the half-rings (14).
Save the half-rings (21).



Remove crankshaft (19).

Save thrust half-rings (20).

Remove the pressure relief valve (8).

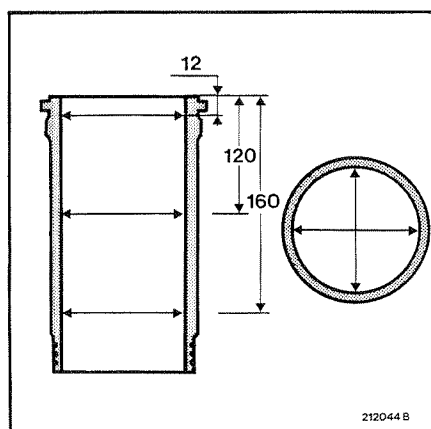


To inspect

To assemble

Inspect the liners:

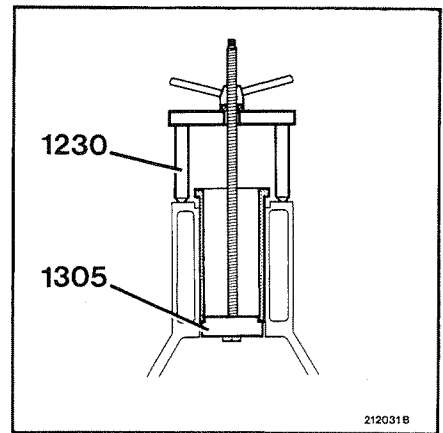
- out-of-round,
- taper.



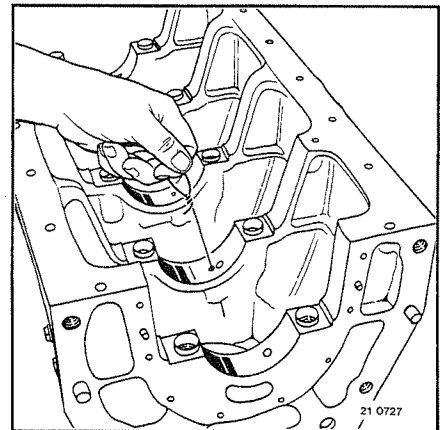
If necessary
Withdraw liners (1).
Use tool(s) N° 1230 – 1305.

Cylinder block

Inspect the joint face.

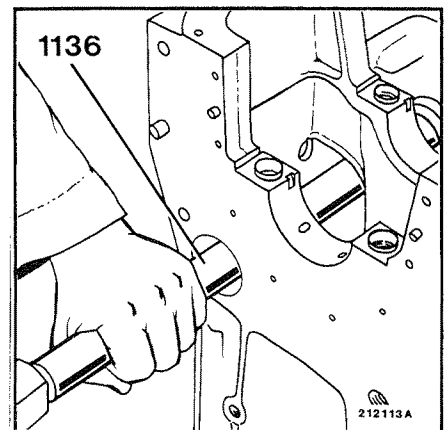


Thoroughly clean all the conduits.



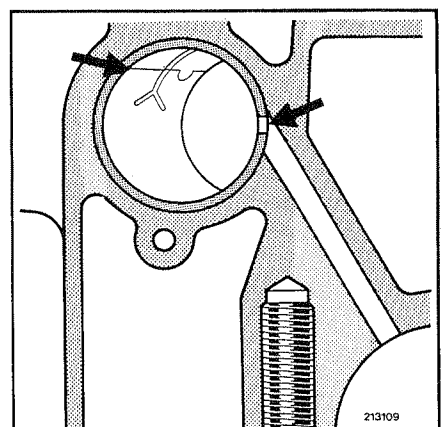
Camshaft bearing bushes

If necessary
Remove the cup (3).
Withdraw bushes (23).
Use tool(s) N° 1136.

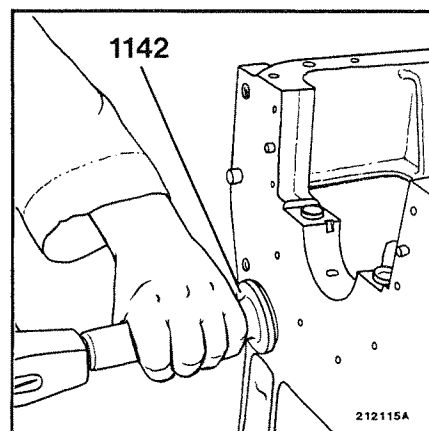


On assembly

Smear with tallow.
Respect the orientation.
Line up the lubrication holes.
Use tool(s) N° 1136.



Fit the cup (3).
Use a securing product such as "Loctite 270".
Use tool(s) N° 1142.



Liners

Install seals (2).

NOTE

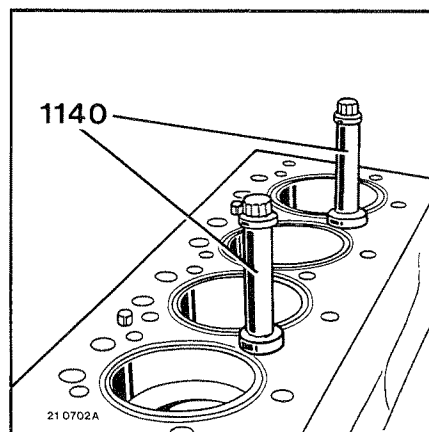
This operation requires special care.

Apply oil **SAE J 1703**

Fit liners (1).

Immobilize liners.

Use tool(s) N° 1140.



Check the liners protrusion.

Crankshaft

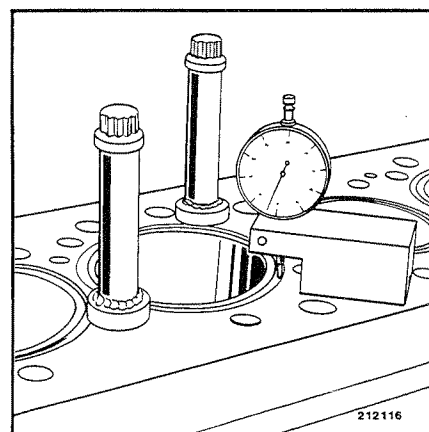
Thoroughly clean all the conduits.

Inspect the crankshaft :

- coaxiality,
- crankpin diameters,
- main journal diameters.

IMPORTANT

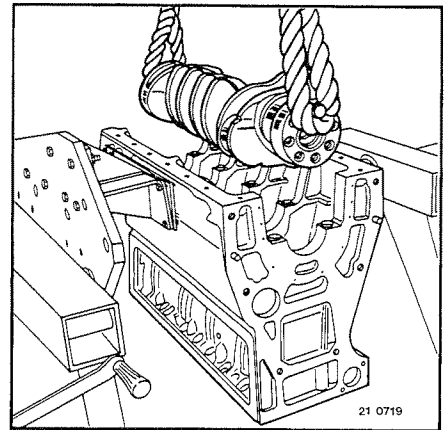
It is forbidden to straighten the crankshaft.



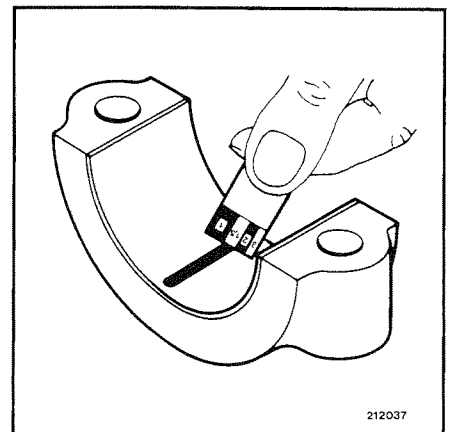
Check the shell bearings (15–20).
 Fit bearing half–shells (20).
 Apply oil.

Fit crankshaft.

Install thrust half–rings (21).

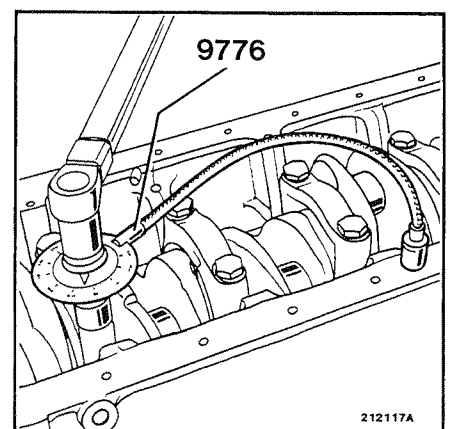


Check the clearance between bearing half–shells and crankshaft (product used: “Perfect Circle Plastigage”).
 Place a plastic strip on the crankpin or on the main journal. Assemble the corresponding bearing cap fitted with half–shell. Tighten at the recommended torques. Disassemble the bearing and measure the width of the strip.

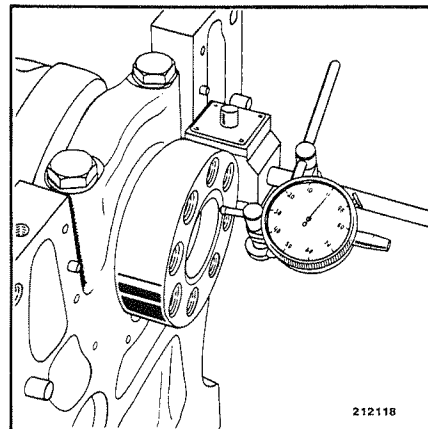


Apply oil.
 Install thrust half–rings (14).
 Fit bearing caps.

Tighten at the recommended torque.
 Use tool(s) N° 9776.
 Check for free rotation.



Check the clearance.
Correct, if necessary.



Connecting rods

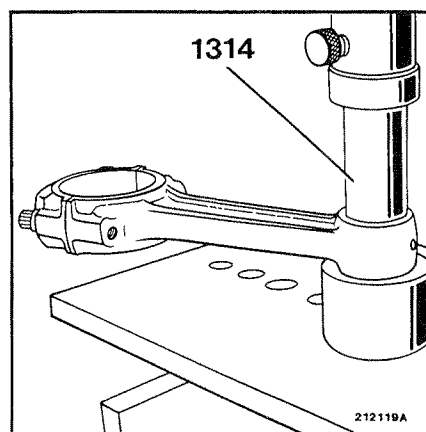
Inspect the connecting rods :

- weight,
- squareness and truing up,
- bushes.

If necessary
Withdraw bushes.
Use tool(s) N° 1314.

On assembly

Smear with tallow.
Line up the lubrication holes.
Fit the bushings
Bore out.



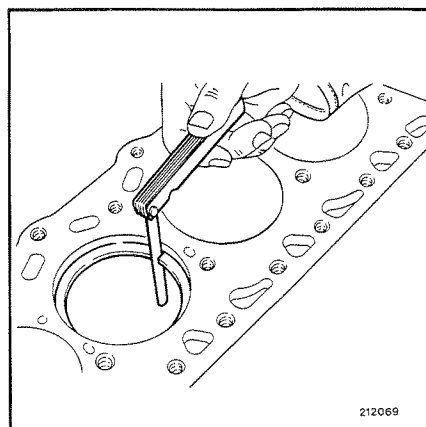
Pistons

Inspect the pistons :

- weight,
- diameter,
- gudgeon pin and its housing,
- ring grooves.

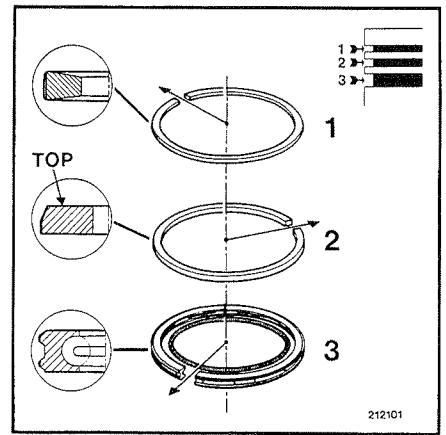
Inspect the piston rings:

- thickness,
- piston groove clearance,
- joint gap.



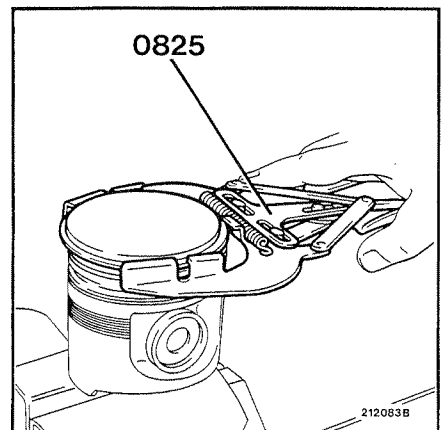
Join together connecting rods/pistons.
Respect the orientation.
See page(s) **E10**.

Install piston rings (**30**).

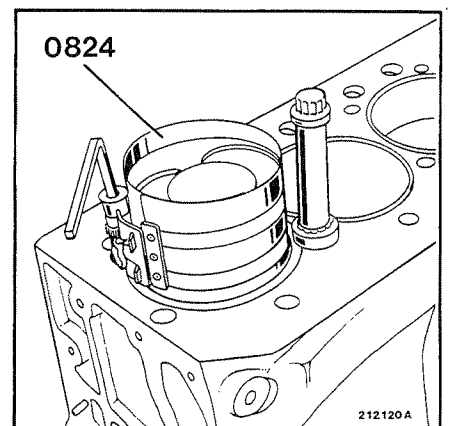


Use tool(s) N° **0825**.

Fit bearing half-shells (**26**).
Apply oil.



Assemble connecting rod/piston assemblies.
Use tool(s) N° **0824**.



Respect the orientation.

Assembling the connecting rods

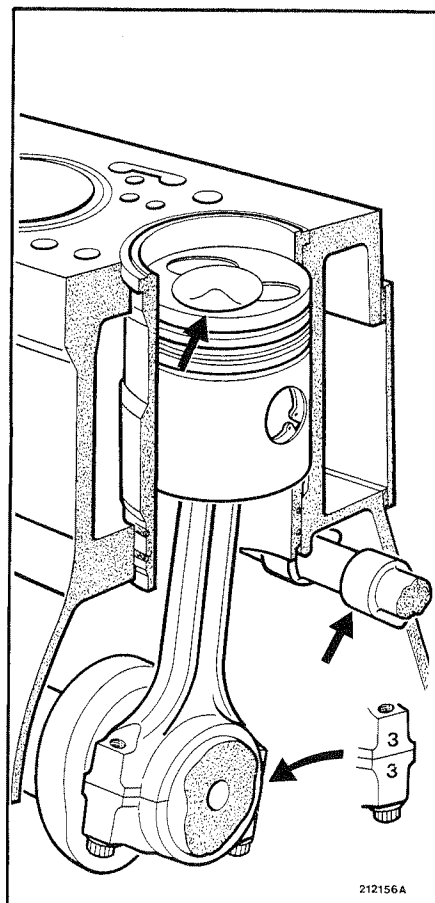
Since the connecting rods are symmetrical, there is no functional direction of assembly. For methodical assembly reasons, orient the marks in the direction of the camshaft.

Check the clearance between bearing half-shells and crankshaft (product used: "Perfect Circle Plastigage").

Place a plastic strip on the crankpin or on the main journal. Assemble the corresponding bearing cap fitted with half-shell. Tighten at the recommended torques. Disassemble the bearing and measure the width of the strip.

NOTE

Prior to tightening the connecting rod cap to measure play, push the connecting rod hard up against the crankshaft.

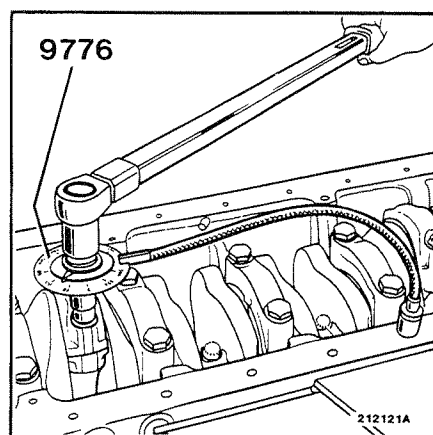


Fit the setscrews (24).

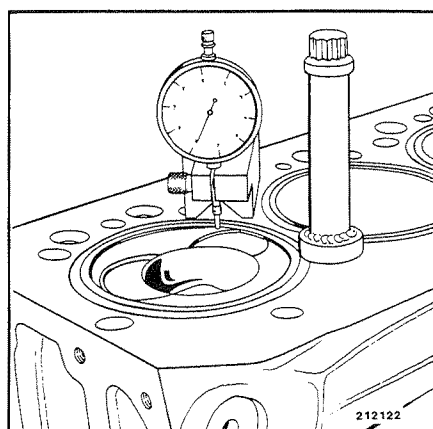
Tighten at the recommended torque.

Use tool(s) N° 9776.

Check for free rotation.

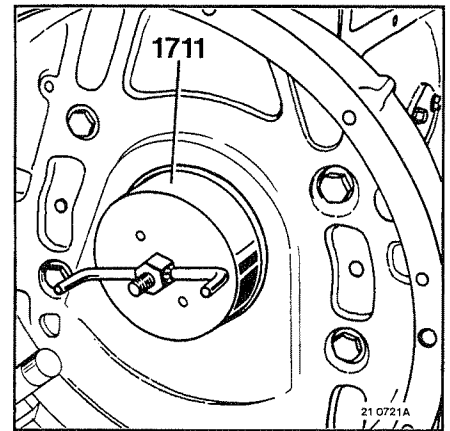


Check the pistons protrusion.



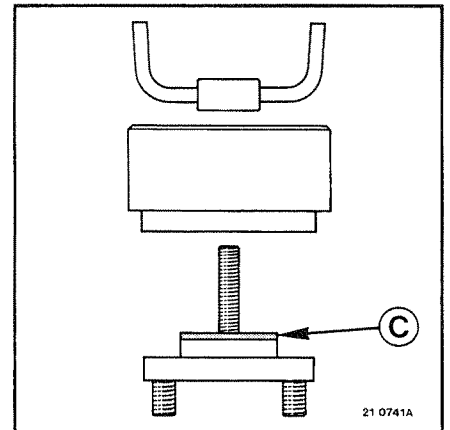
Fit strainer (22).
 Ensure a tight seal with "Loctite 573" jointing compound.
 Tighten at the recommended torque.
 Apply oil.
 Fit the relief valve (8).
 Fasten casing (5).
 Ensure a tight seal with "Loctite 573" jointing compound.
 Tighten at the recommended torque.

Assemble liners (6).
 Use tool(s) N° 1711.
 Use a washer **C**, thickness 3.5 mm.
 Insert washer **C** = 3.5 mm.



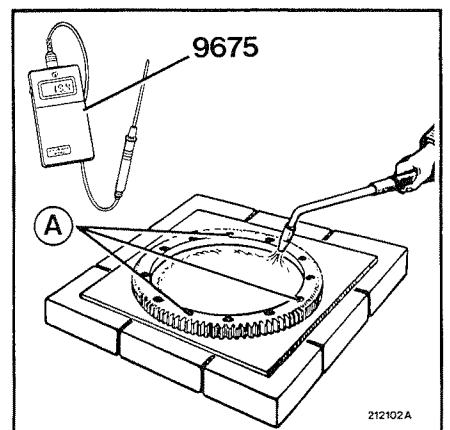
IMPORTANT

*Hold the seal on the protection ring until it is installed on the tool so as to avoid distortion of the lip.
 Prior to assembly, oil the exterior of the seal – do not grease the lip.*



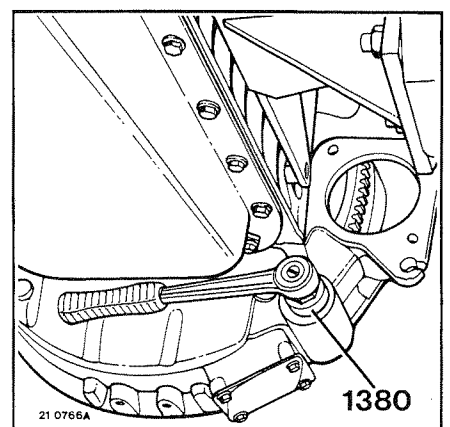
Fit ring gear (13).
 Heat part at a temperature of 200 °C.
 When using a blowlamp, use a sheet metal plate and heat it to distribute the heat. Check the temperature at 3 points (A).
 Use tool(s) N° 9675.

Check for the presence of locating dowels.
 Fit the flywheel (12).
 Fit the setscrews (9).
 Use a securing product such as "Loctite 542".



Immobilize the crankshaft.
 Use tool(s) N° 1380.
 Tighten at the recommended torque.
 Withdraw tool N° 1380.

Install bearing (11).
 Install circlip (10).
 Assemble the starter motor.
 Assemble the timing system.



To adjust the TDC pointer:

Position tool N° 1140 + 1305 + R Ø 70 mm on N° (4) cylinder.
Place a locally manufactured pointer on the flywheel end.

Using tool N° 1380 :

Turn the crankshaft slowly clockwise to bring the piston into contact with the tool .

Do not apply too much force

Scribe a mark (A) on the flywheel opposite locally manufactured pointer.

Turn the crankshaft counter-clockwise to bring the piston into contact with tool N° .

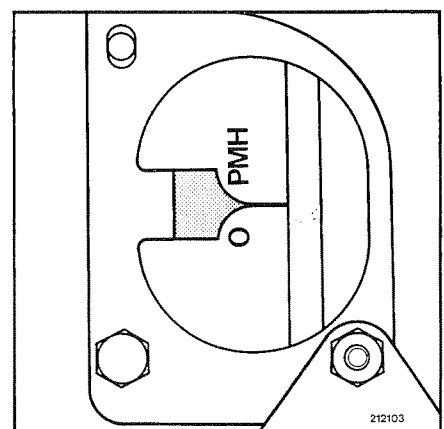
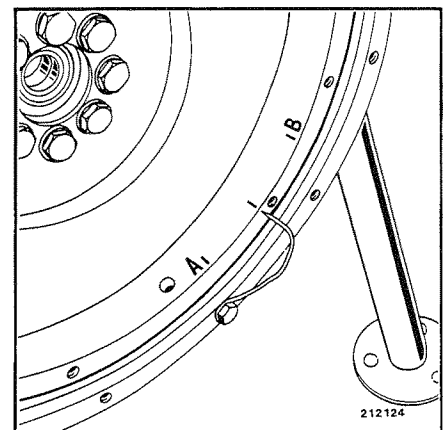
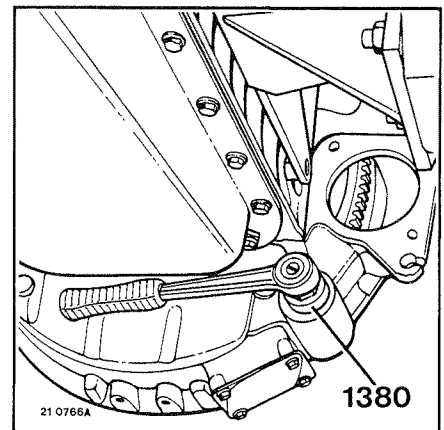
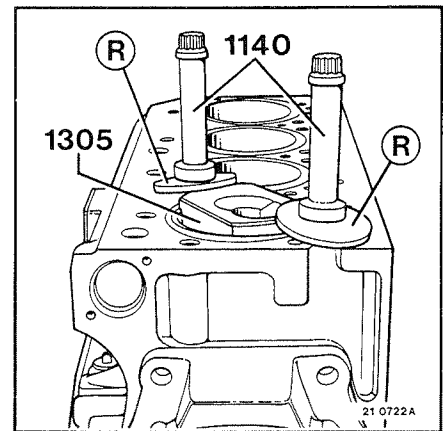
Scribe a mark (B) on the flywheel opposite locally manufactured pointer.

Trace a line at the mid-point of the quadrant (A-B).

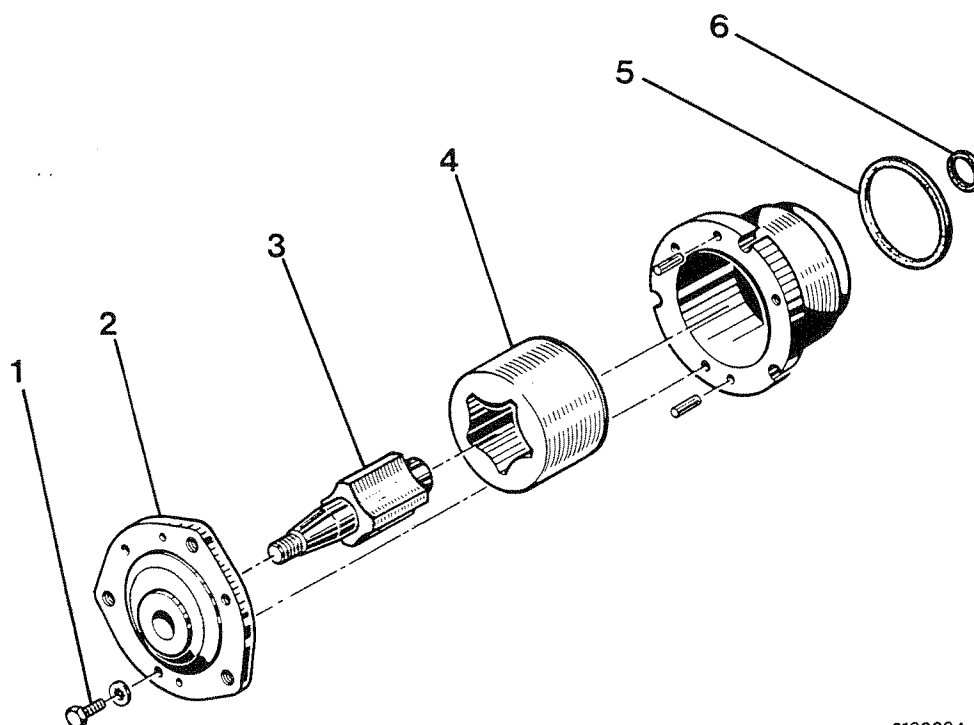
Turn the crankshaft to bring the mid-point opposite locally manufactured pointer.

Place pointer (7) opposite the mark on the flywheel. Tighten nuts at the recommended torque.

Withdraw tool N° 1140 + 1305 + R



LUBRICATION



219020A

Oil pump

To disassemble

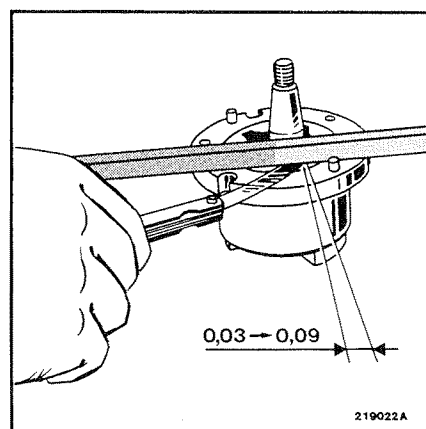
- Remove screws (1).
- Remove the cover (2).
- Withdraw the rotors (3 - 4).
- Take out seals (5 - 6).

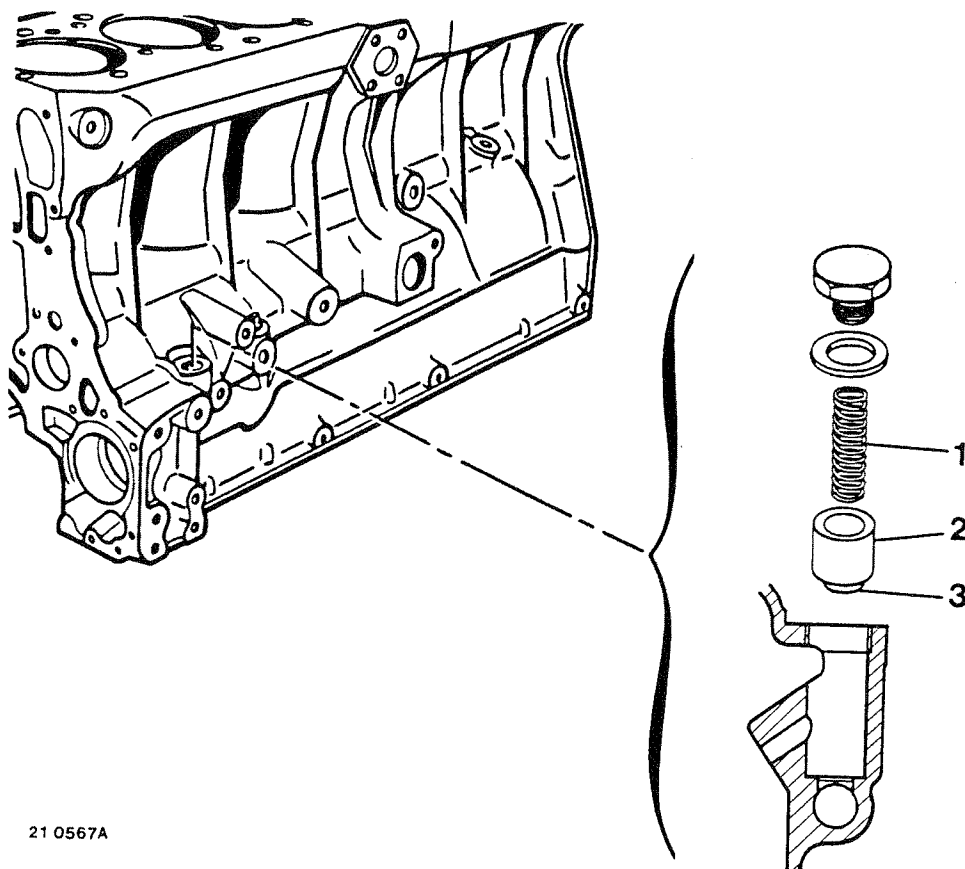
To assemble

- Install the rotors (3 - 4)

Check the play.

- Oil.
- Position cover (2).
- Fit screws (1).
- Tighten at the recommended torque.



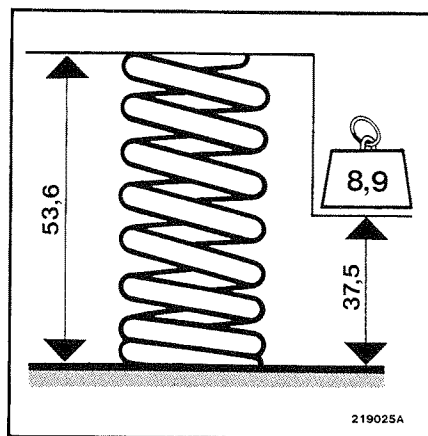


21 0567A

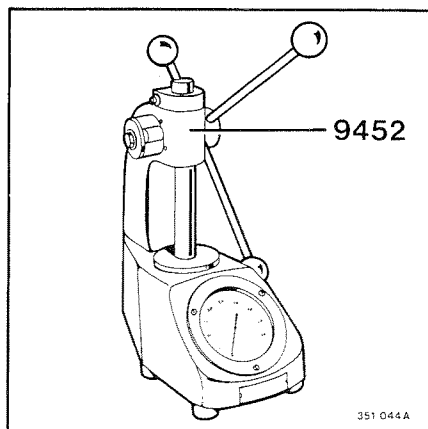
Regulating valve

Check the piston (2).
Clean sized hole (3).

Check the setting of the spring (1).

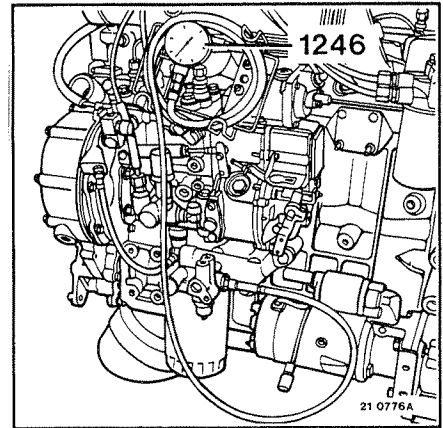


Use tool(s) 9452.



Oil pressure check

Use tool(s) 1246.

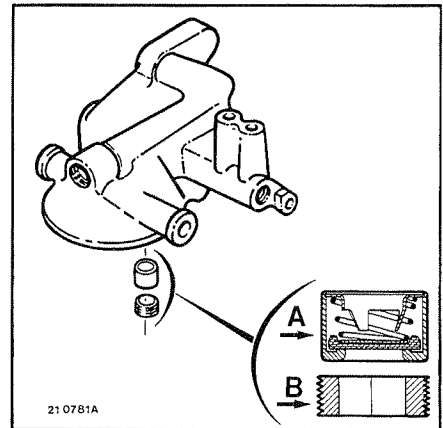
**By-pass valve**

Assemble valve (A).

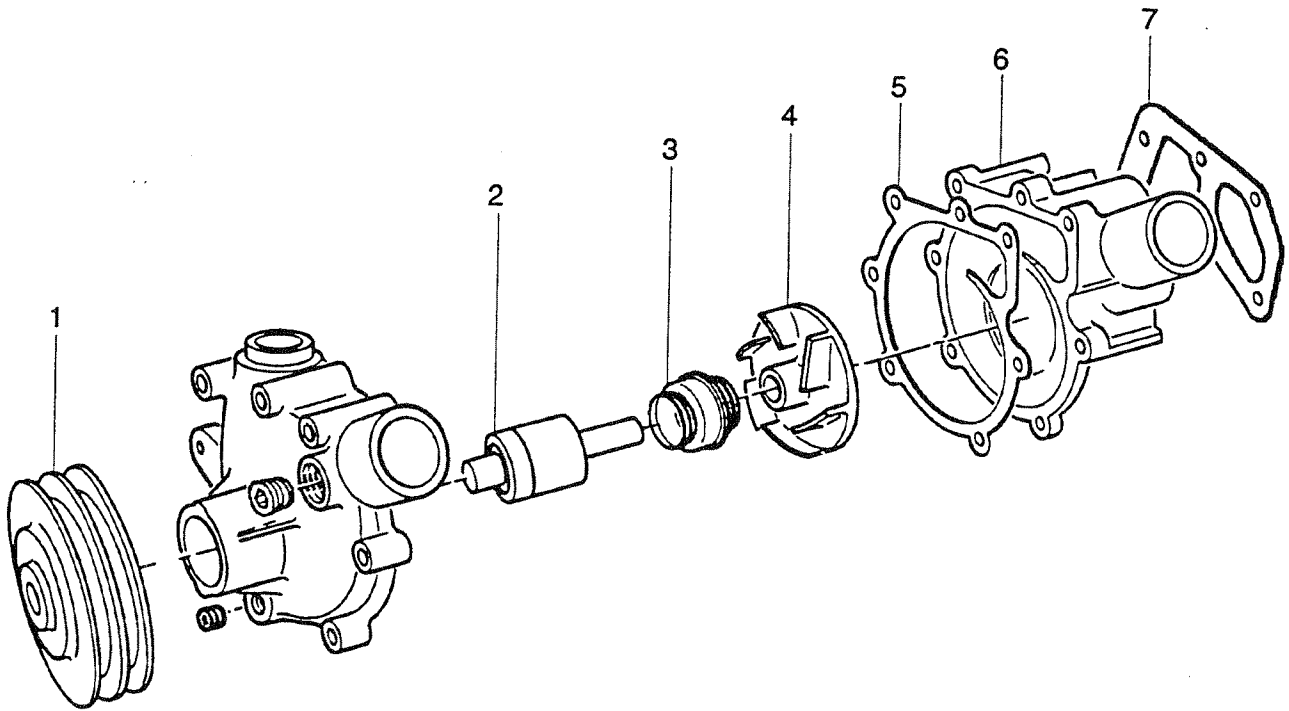
Respect the orientation.

Fit plug (B).

Tighten at the recommended torque.



COOLING



23 0022 A

Coolant pump

The item numbers indicated in the text refer to the figure on page G2.

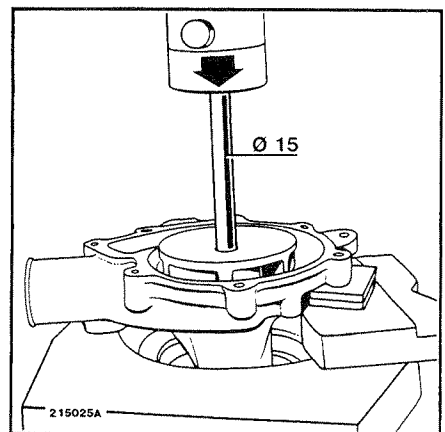
To disassemble

Remove cover (6).

Save gasket (5).

Drive out shaft (2).

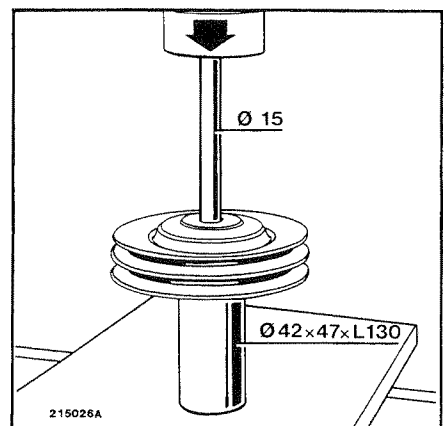
Use a press.



Separate pulley (1) from shaft (2).

Use a press.

Withdraw "Cyclam" ring (3).



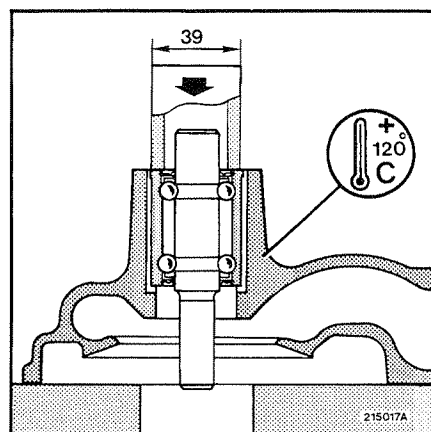
To assemble

Heat at a temperature of **120 °C**.

Assemble shaft (2).

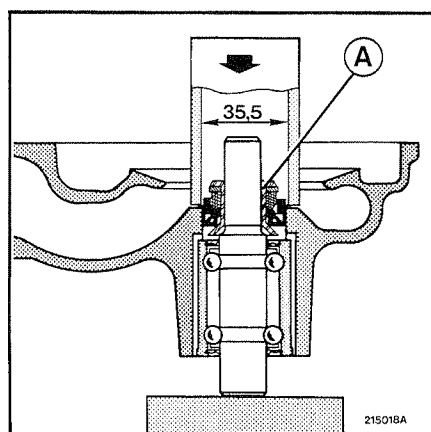
Use a press.

Allow to cool.



Assemble "Cyclam" ring (3)

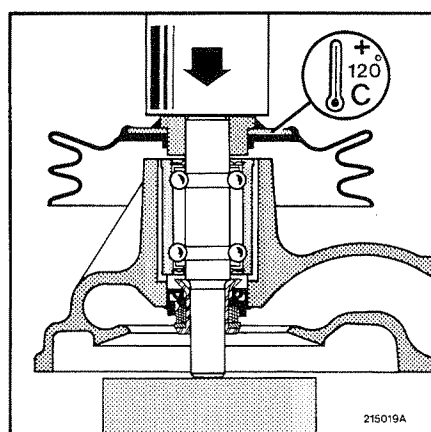
A = Water + 10% Teepol.



Heat at a temperature of **120 °C**.

Assemble pulley (1).

Use a press.



Heat at a temperature of **120 °C**.

Assemble impeller (4).

Ensure the clearance.

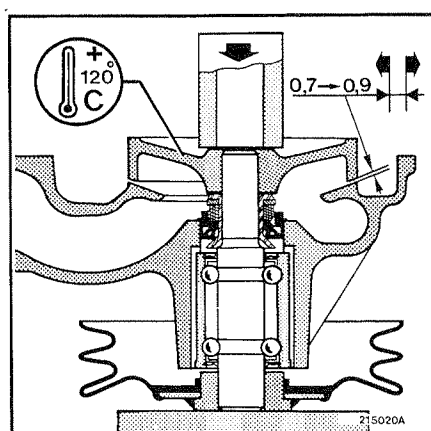
Use a press.

Install gasket (5).

Position cover (6).

Fit the setscrews.

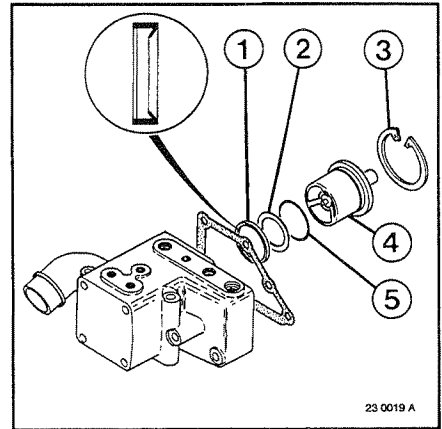
Tighten at the recommended torque.



Thermostat

To disassemble

- Remove the circlip (3).
- Remove the thermostat (4).
- Take out the O-ring (5).
- Withdraw washer (2).
- Withdraw the seal ring (1).

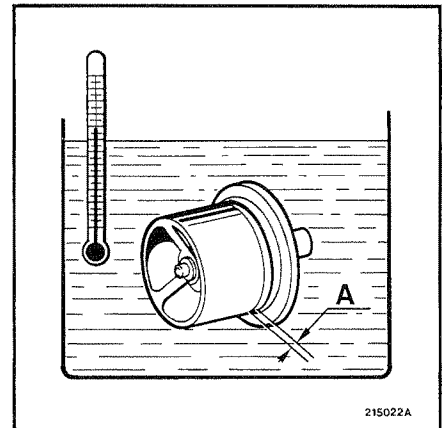


To inspect

Plunge the thermostat in a water bath. Heat progressively while stirring the water. Check the temperature at the commencement of opening. Measure dimension (A) at a temperature of 90 °C.

On assembly

- Fit the seal ring (1).
- Respect the orientation.



- Remove screws (1).
- Remove the collar (2).
- Take out O-ring (3).

To fit

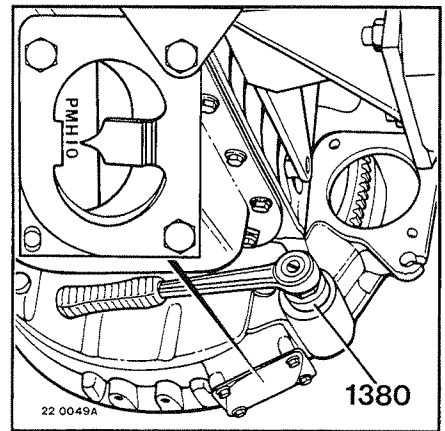
Timing

Check the setting of the Top Dead Centre (TDC) engine pointer.

To check the TDC pointer:

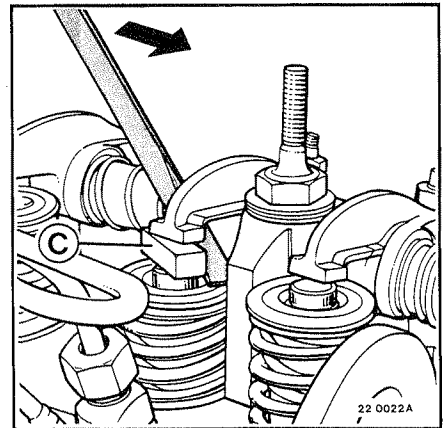
Use tool N° 1380 to rotate the crankshaft.

- Turn the crankshaft clockwise to bring the N° 1 cylinder valves into balance (end of exhaust/start of induction).
- Place a locally manufactured pointer (a) on the damper or flywheel end of the timing case.
- Turn the crankshaft clockwise through 3/4 turn.
- Insert a shim (c) (thickness 7 mm) between the inlet valve of N° 1 cylinder and its rocker arm.
- Slowly turn the crankshaft clockwise to bring the piston into contact with the valve.



Do not apply too much force.

- Make a mark (A) opposite the locally manufactured pointer (a).
- Turn the crankshaft anti-clockwise through a few degrees.
- Withdraw the shim (c).
- Turn the crankshaft clockwise through 1/4 turn.
- Insert the shim (c) once again between the inlet valve of N° 1 cylinder and its rocker arm.
- Slowly turn the crankshaft clockwise to bring the piston into contact with the valve.

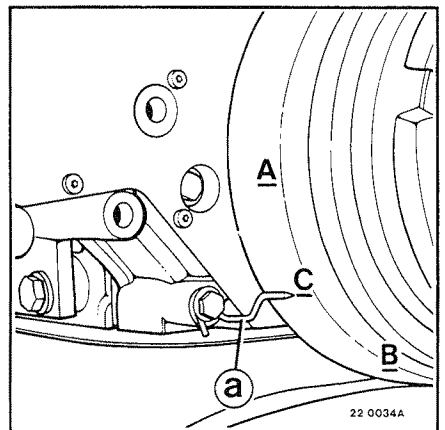


Do not apply too much force.

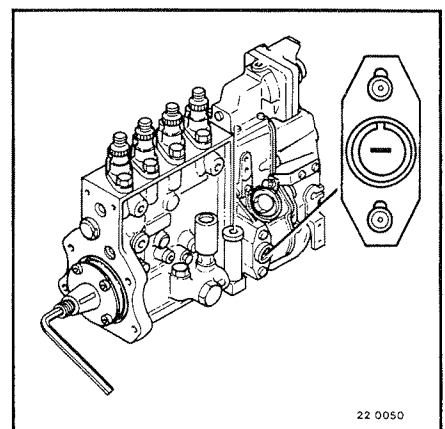
- Make a mark (B) opposite the locally manufactured pointer (a).
- Turn the crankshaft anti-clockwise through a few degrees.
- Withdraw the shim (c).
- Scribe the mid-point of the quadrant (A-B).
- Turn the crankshaft anti-clockwise to bring the mid-point mark opposite the locally manufactured pointer (a).

Check that pointer (23) lines up with the flywheel TDC mark. Correct, if necessary.

Withdraw tool N° 1380.



- Remove plug (12).
- Move the pointer to the middle of the inspection aperture.
- Install seals (8-9).
- Fit the flange (6).
- Tighten the nuts (13).
- Fit fitting (16).
- Install seals (4-5).
- Fit injection pump (10).
- Tighten the bolts (7).
- Tighten the bolts (11).
- Fit the pneumatic ram.



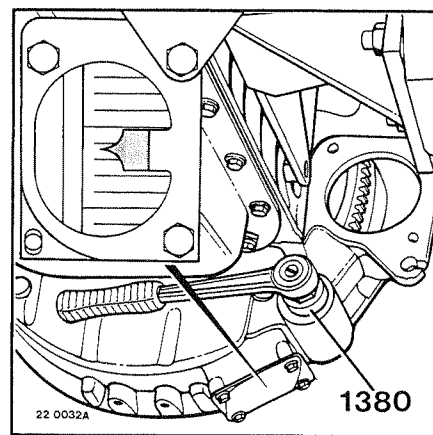
Install gasket (3).
 Fit the flange (2).
 Fit the setscrews (1).
 Tighten at the recommended torque.

Fit washer (17).
 Fit pinion (20).
 Centre the holes.
 Fit the setscrews (19).
 Tighten at the recommended torque.

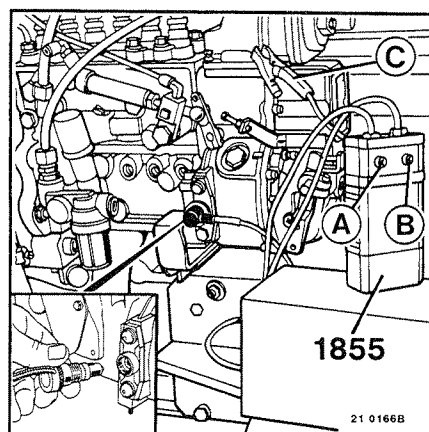
Calage

Turn the engine in the normal direction of rotation to bring it to the timing point (cylinder N° 4 compression stroke)
 (See chapter: A)
 Use tool N° 1380.

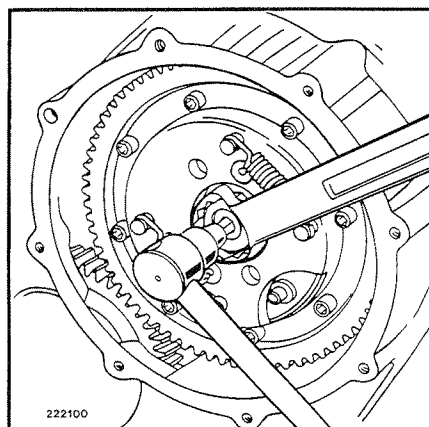
Degrease the tapers.
 Use a cleaning product.
 Fit automatic timing-advance device (20).
 Apply oil.
 Screw up nut (21).
 Screw up without tightening.



Check the sensor on tool 1855 for cleanliness and check the state of charge of the batteries by bridging two contacts at the end of the sensor using the earth clamp.
 Install tool N° 1855.
 Position the spline of the sensor in the slot and screw the knurled nut to abutment.
 Connect earth clamp (C).
 Turn the injection pump shaft a few degrees in the opposite direction to normal rotation.
 Slowly turn the injection pump shaft in the normal direction of rotation.
 Timing light (A) should come on.
 Continue turning slowly until timing light (B) comes on.
 The timing is correct when timing lights (A-B) are on.



Tighten nut (21) while holding the injection pump shaft.
 Tighten at the recommended torque.



To check the timing

Turn the engine in the opposite direction to normal rotation until the timing lights (A-B) go out.

Turn the engine slowly in the direction of normal rotation until timing light (A) comes on.

Continue turning the engine slowly in the same direction until timing light (B) comes on.

This position represents the commencement of fuel-injection.

Read out the static timing value in degrees on the engine flywheel by means of the stationary pointer.

Continue turning slowly in the same direction. Timing light (A) should go out at minus 0.25 of a degree of rotation of the flywheel. If this is not so, check the sensor (position, cleanliness...). After remedying the defect, repeat the checking operation.

To validate the check: two reliable timing readings are necessary. The difference between two readings should not exceed 0.25 of a degree. Take into account the second value measured and compare it with the tolerance announced for the corresponding engine setting.

If necessary:

Loosen the bolts (19).

Correct the timing.

Tighten the bolts (19).

Tighten at the recommended torque.

Check the timing.

Repeat the timing operation, if necessary.

Withdraw tool N° 1855.

Pour 0.5 litre of engine oil through port (A).

Fit plug (12).

Fit injector pipes.

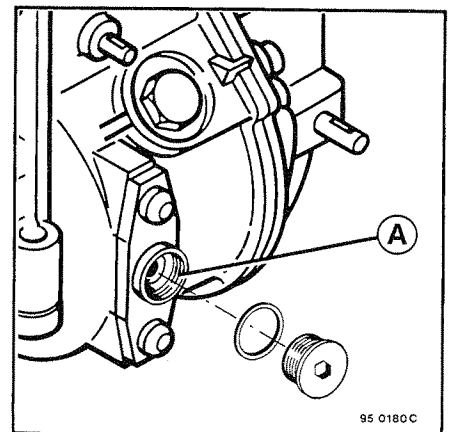
Connect the lines.

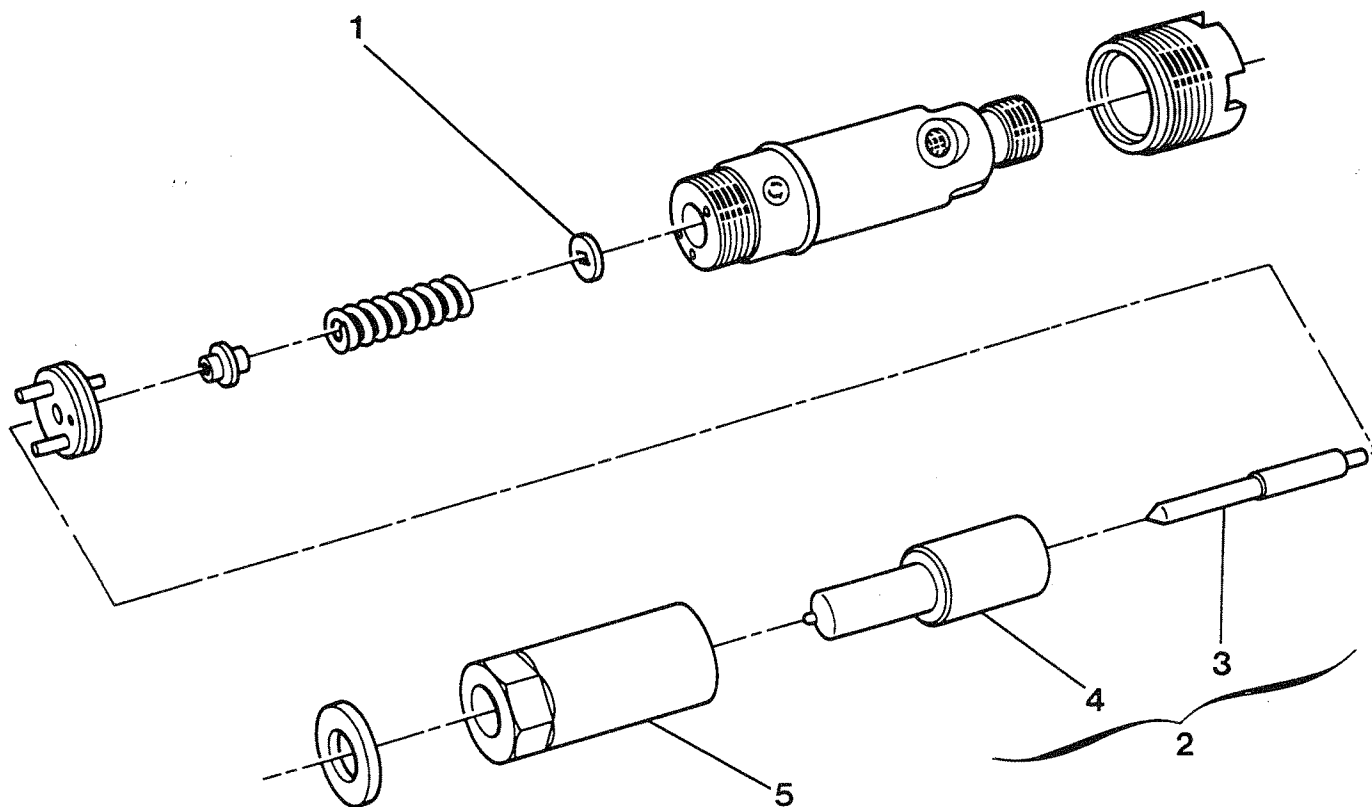
Couple up the controls.

Assemble inspection aperture plate (22).

Use a leak-preventer "**Slimate RTV 1473**" to ensure seal tightness.

Tighten at the recommended torque.





222018A

Injector nozzle-holders

Remove nut (5).

Withdraw injector nozzle (2).

Save shim (1).

Decarbonize the parts using a brush (nylon or brass) and rinse them with clean diesel fuel.

Check that the needle (3) valve slides freely in the injector body (4) angled at 45°.

On assembly

Screw up nut (5).

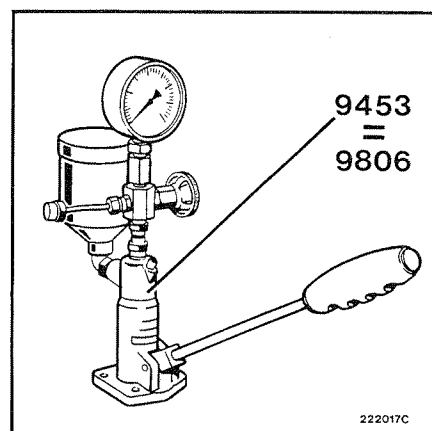
Tighten at the recommended torque.

Check the injector opening pressure.

Make the correction by means of shim (1).

Check the spray at a rate of 4 to 5 pump strokes per second. The injector nozzle should give a regular spray. Check for leakage by maintaining a pressure 10 bars lower than the calibrated pressure value. No droplet should form on the injector nose in a time below 10 seconds.

Use tool N° 9453 / 9806.



TURBOCHARGER

Turbocharger

Operating trouble

Each turbocharged engine possesses its own characteristic sound. Owing to this, many defects can be detected merely by noticing a change in the customary noise signature.

If the sound level becomes sharper, it may be due to leaking air (between turbocharger and intake manifold) or exhaust gas, or engine air filter clogging.

An intermittent change in noise level may be due to turbocharger fouling.

The appearance of vibration may indicate a drive shaft defect.

A sudden reduction in noise, accompanied by the appearance of black or blue exhaust smoke is the sign of total break-up of the turbocharger.

In all cases, immediately stop the engine to avoid more serious damage to the turbocharger and to the engine.

On-vehicle checks

Engine stopped :

Refer to technical document "DT 357".

Engine idling:

Check the air pipes between the air filter and the turbocharger for leaks by spraying Start Pilote fluid. Leakage will be indicated by an increase in engine speed.

Engine running at 1200 rpm:

Check for leaks between turbocharger and engine using a leak detector. Check for exhaust gas leaks (actuate the exhaust brake). Replace gaskets, if necessary. A gas leak can be detected by a change in colour at the place of the leak.

To remove / fit the turbocharger

Remove the manifolds/turbocharger assembly.

These operations do not present any difficulty. Clean the air conduits and make sure there is no foreign matter left. Before tightening the exhaust manifold setscrews, smear the screw-threads with high temperature-resistant grease (Huiles Renault Diesel Gripcott NF grease) or equivalent.

IMPORTANT

Any turbocharger replacement, where the cause of damage has not been defined, may lead to new incidents and serious engine damage.

*Do not use jointing compound on the turbocharger lubrication pipe fastening flanges. Before installing the turbocharger, pour fresh oil through the **oil inlet port** and turn the rotor by hand to lubricate the journals and the thrust bearing.*

After installing the turbocharger, run the engine and wait for 30 seconds before accelerating.

Incidents and probable causes

WARNING

Before implicating the turbocharger, ensure that the engine and its surrounds are in perfect condition.

Lack of engine power

- Air filter clogged
- Intercooler air exchanger (tube stack fouled)
- Aspiration air manifold blockage or crushing (between air filter and turbocharger)
- Boost air manifold blockage or crushing (between turbocharger and engine)
- Foreign matter between air filter and turbocharger
- Exhaust blockage or crushing
- Air or gas leak between turbocharger and engine
- Turbine housing damaged or fouled
- Turbo impeller vanes damaged
- Turbocharger pressure regulation system (waste-gate) malfunction*

Black exhaust smoke

- Air filter clogged
- Aspiration air manifold blockage or crushing (between air filter and turbocharger)
- Boost air manifold blockage or crushing (between turbocharger and engine)
- Air or gas leak between turbocharger and engine
- Turbocharger damaged or fouled
- Turbocharger pressure regulation system (waste-gate) malfunction*

Blue exhaust smoke

- Engine breather clogged
- Oil consumption
- Oil return pipe clogged or crushed
- Turbocharger damaged or fouled
- Prolonged running at idling speed
- Air compressor defective

Strange noise

- Air filter clogged
- Air filter / turbocharger link leakage
- Aspiration air manifold blockage or crushing (between air filter and turbocharger)
- Boost air manifold blockage or crushing (between turbocharger and engine)
- Foreign matter between air filter and turbocharger
- Exhaust blockage or crushing
- Air or gas leak between turbocharger and engine
- Turbocharger lubrication defect
- Turbocharger damaged or fouled
- Engine used at under-speed in relation to load
- Turbocharger pressure regulation system (waste-gate) malfunction*

Incidents and probable causes (cont.)**Excessive oil consumption**

- Air filter clogged
- Engine breather clogged
- Aspiration air manifold blockage or crushing (between air filter and turbocharger)
- Turbocharger lubrication defect
- Oil return pipe clogged or crushed
- Turbocharger damaged or fouled
- Prolonged running at idling speed
- Air compressor defective

Oil in air pipes before turbocharger

- Air filter clogged
- Aspiration air manifold blockage or crushing (between air filter and turbocharger)
- Air compressor defective

Oil in air pipes after turbocharger

- Air filter clogged
- Engine breather clogged
- Aspiration air manifold blockage or crushing (between air filter and turbocharger)
- Oil return pipe clogged or crushed
- Turbocharger damaged or fouled
- Prolonged running at idling speed

Oil in exhaust manifold

- Prolonged running at idling speed

Oil in exhaust pipes after turbocharger

- Engine breather clogged
- Oil return pipe clogged or crushed
- Turbocharger damaged or fouled
- Prolonged running at idling speed

TOOLS

RENAULT V.I. divide tools into three categories:

- **General-purpose tools:** proprietary tools.
- **Specific tools:** special tools, distributed by the RENAULT V.I. “Spare Parts” division.
- **Locally manufactured tools :** these tools are classified differently according to their degree of sophistication :
 - . **4-figure reference number** (represented by a drawing) : tools that are simple to make without need for special qualification.
 - . **50 00 26 reference number** (possibility of purchasing through the Renault V.I. Spare Parts department) : a certain skill is needed to make these tools.

Three levels (or echelons) determine their assignment :

- **LEVEL 1 :** tools for servicing, maintenance and minor tasks.
- **LEVEL 2 :** tools for major repairs.
- **LEVEL 3 :** tools for refurbishment.

NOTE

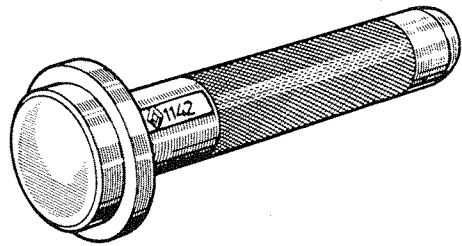
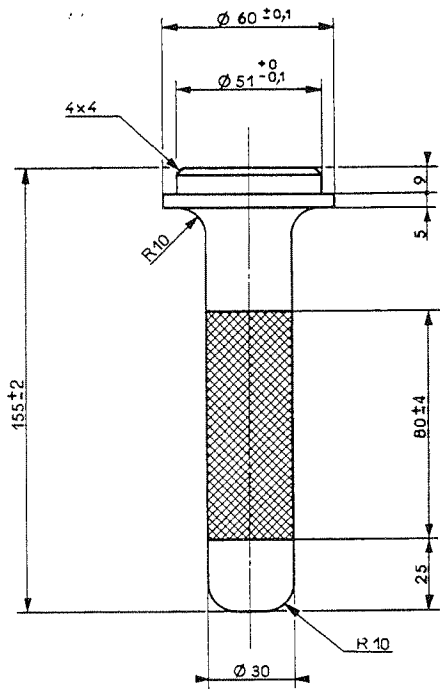
Standard tools mentioned in this manual do not appear in the tools list. These tools are identified in the standard tools manual (MO) by a 4-figure number.

General-purpose tools				
Ref. Renault V.I.	Designation	Level	Quantity	Page
50 00 63 0203	"Green" plastigage 0.0254 → 0.076 mm		1	E8
50 00 63 0204	"Red" plastigage 0.05 → 0.152 mm		1	E8
50 00 63 0205	"Blue" plastigage 0.1 → 0.23 mm		1	E8
50 00 26 0824	Piston ring collar	2	1	E9
50 00 26 0825	Piston ring clamp	2	1	E4
50 00 26 0934	Puller	1	1	E2
50 00 26 0843	Puller	1	1	D3
50 00 26 0846	Compressing device	3	1	C3
50 00 26 0918	Puller	1	1	C2
50 00 26 1000	Universal stand	2	1	B2
50 00 26 1246	Pressure guage	1	1	F4
50 00 26 1417	Turbo clearance test case	3	1	J4
50 00 26 1855	Sensor	1	1	H4
50 00 26 9776	Angular dial	1	1	C9

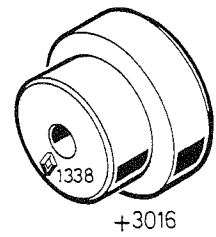
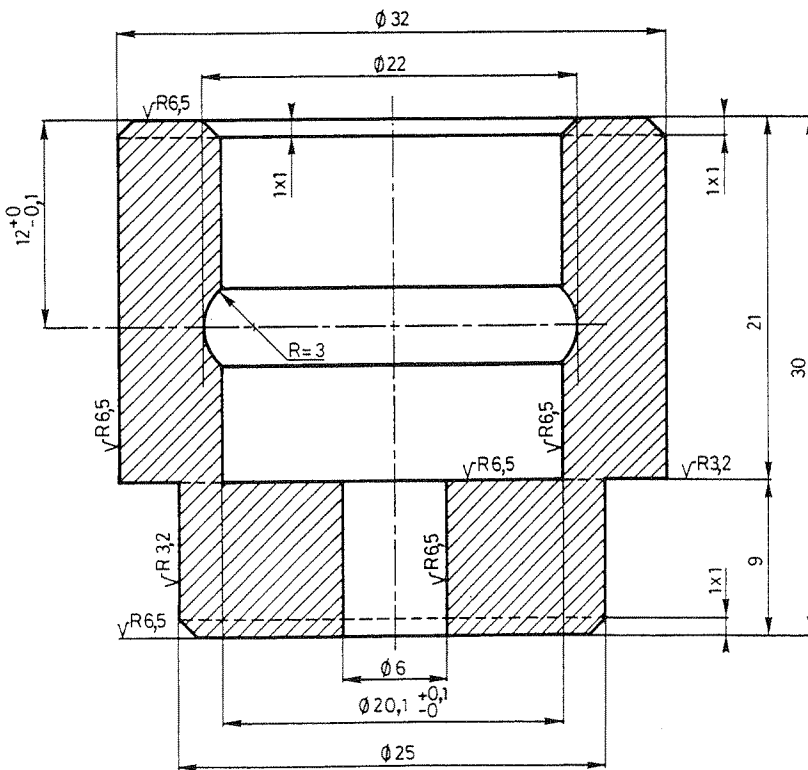
Special tools				
Ref. Renault V.I.	Designation	Level	Quantity	Page
50 00 26 1136	Pusher	3	1	E5
50 00 26 1137	Support	2	1	B2
50 00 26 1224	Support	2	1	B2
50 00 26 1225	Crimper	3	1	C4
50 00 26 1227	Seal plate	3	1	C4
50 00 26 1230	Puller	2	1	E5
50 00 26 1305	Flange	2	1	E5
50 00 26 1314	Pusher	3	1	E8
50 00 26 1380	Control	1	1	E12
50 00 26 1650	Pin wrench	1	1	C2
50 00 26 1672	Puller	1	1	C2
50 00 26 1682	Plate	2	1	B2
50 00 26 1710	Pusher	1	1	D6
50 00 26 1711	Pusher	1	1	E11
50 00 26 1760	Spanner	1	1	C9
50 00 26 3016	Handle	3	1	C4

Locally manufactured tools				
Ref. Renault V.I.	Designation	Level	Quantity	Page
1080	Pusher	3	1	C4
1140	Flange	1	2	C3
1142	Pusher	3	1	E6
1338	Pusher	3	1	C4

Locally manufactured tools

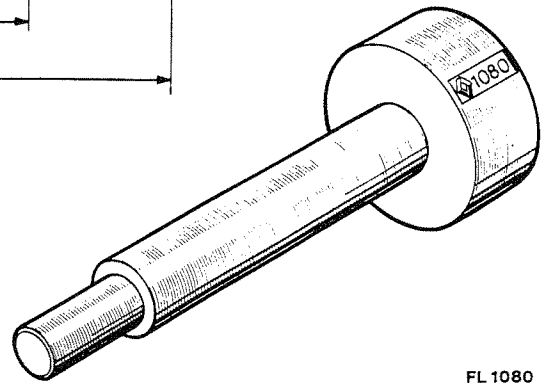
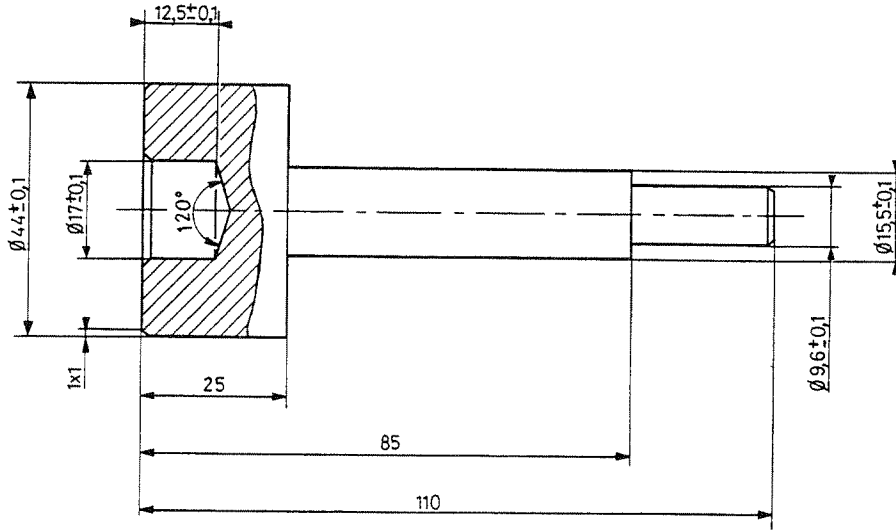


FL 1142

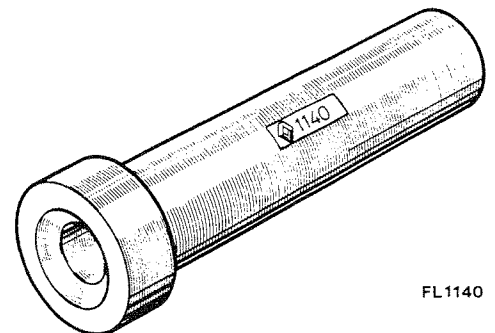
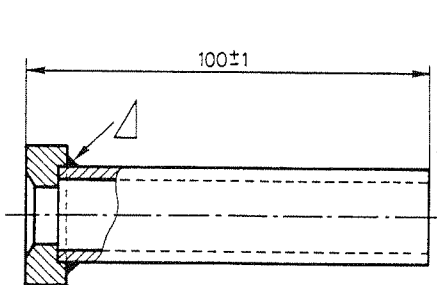
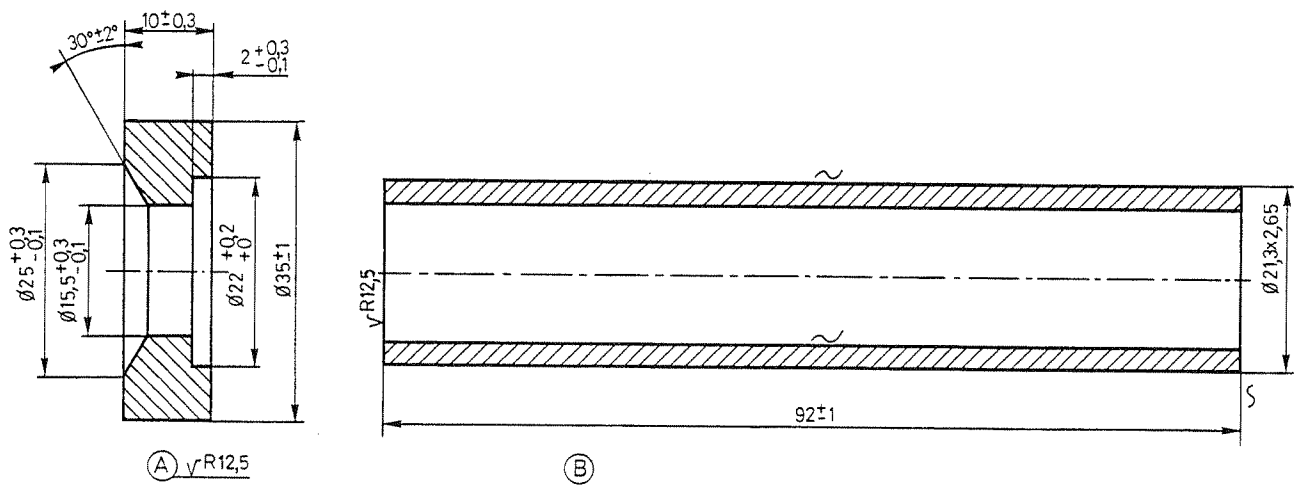


FL 1338

Locally manufactured tools

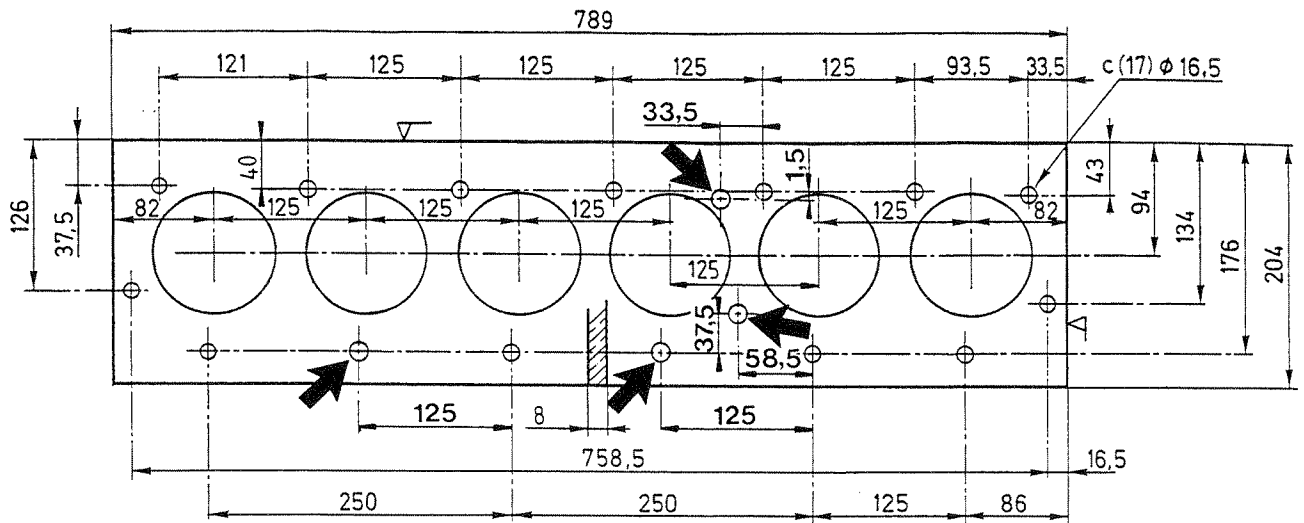


FL1080

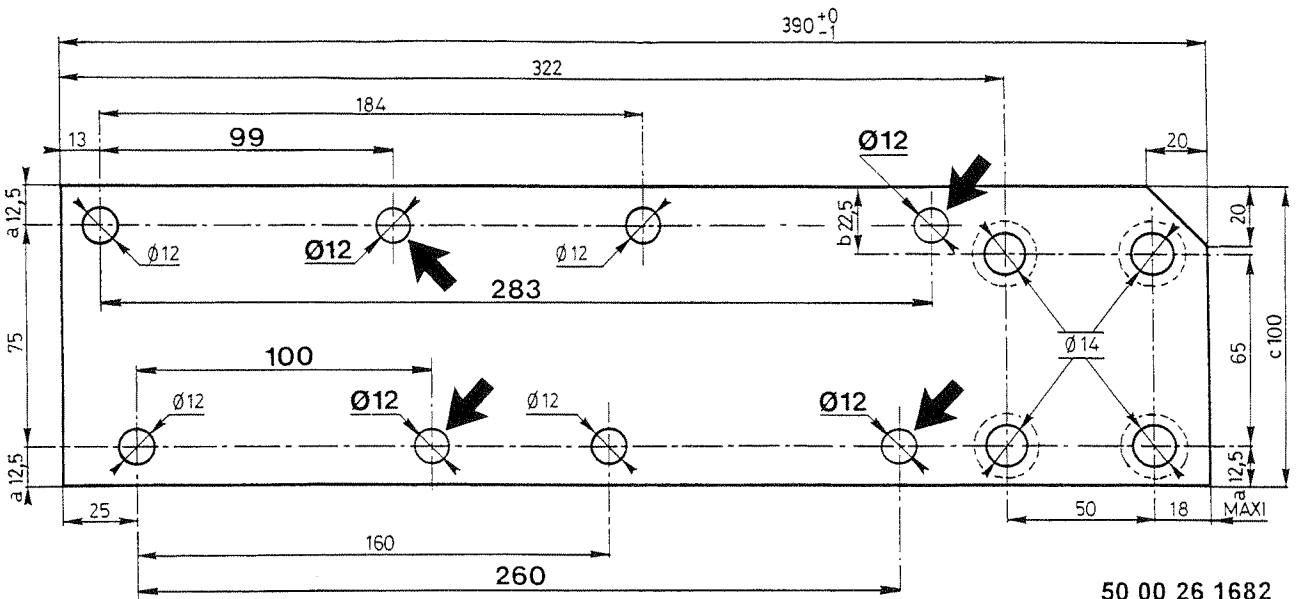


FL1140

1227 / 1682 To be modified, if necessary.

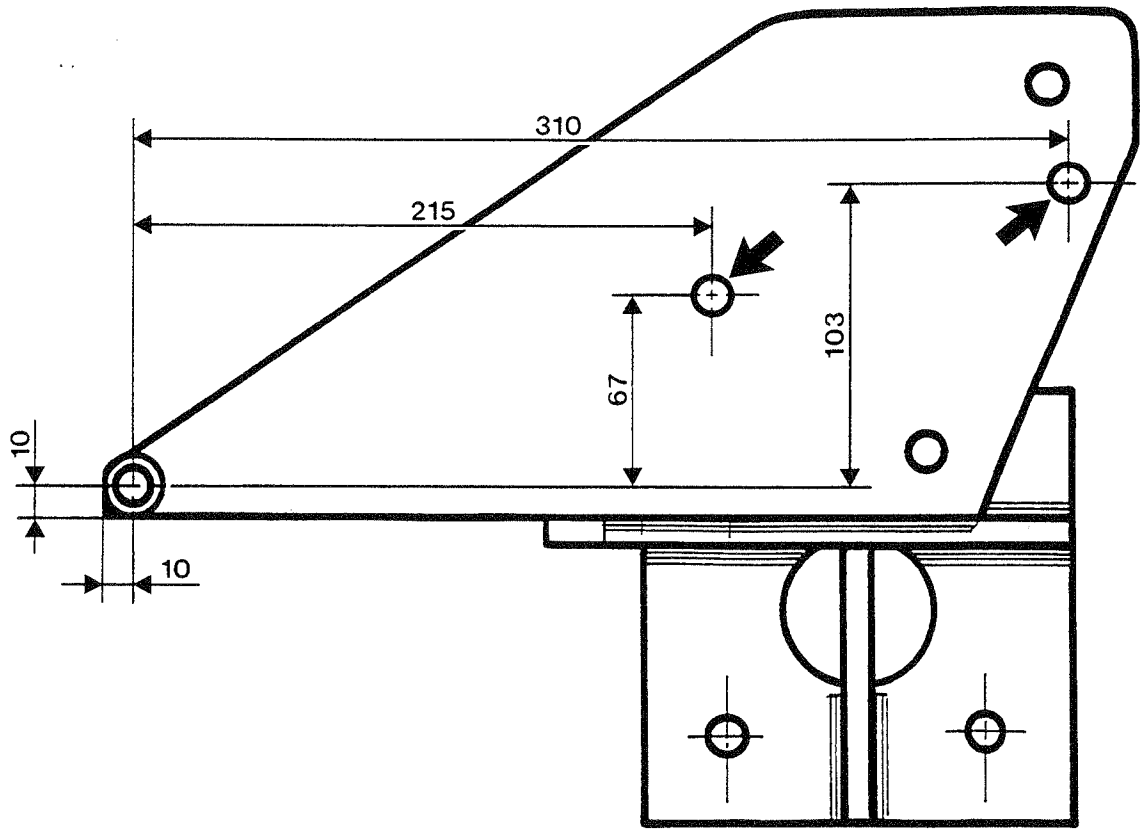


50 00 26 1227



50 00 26 1682

1224 To be modified, if necessary.



50 00 26 1224