

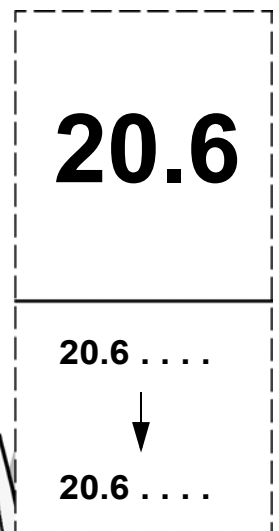
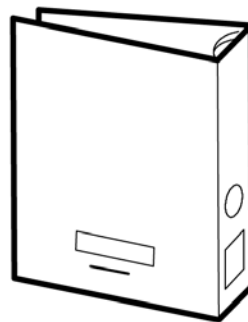
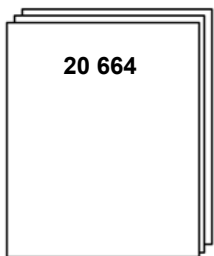
20 664 - GB - 07/2005

ENGINE - DXi 11

RANGE	FAMILY	VARIANT
RENAULT PREMIUM DXi 11 EURO 3	27BC - TR 4X2 LC	120AR+13103
	27JC - TR 6X2 Pusher	
	27RC - PR 6x2	
	27SC - PR 4x2	
	27TC - TR 4x2	



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.



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GENERALITIES

Warnings

In this document, safety instructions are symbolized as follows:



DANGER! NON-OBSERVANCE OF THE PROCEDURE DESCRIBED OR LACK OF CARE OR ATTENTION, RISK CAUSING SERIOUS INJURY OR EVEN DEATH.



WARNING! Any different or inappropriate working method risks causing damage to the product.








NOTE! *Draws attention to particular or important points of the method.*













Comply without fail with the regulations in force relative to the recovery and treatment of used parts and waste.

Conventional symbols









Fitting

	Tighten to torque (Nm) (left-hand thread)		Tighten by indicated value
	Tighten to torque (Nm) (right-hand thread)		Loosen by indicated value
	Tightening torque with lubricated threaded hardware		










Dimensioning

	Tightening		... Greater than or equal to ...
	Equal to		Wear limit
	... Less than ...		Machining limit or dimension
	... Greater than ...		Maximum out-of-true
	... Less than or equal to ...		Maximum parallelism error



















Repair

	Force to be exerted in the direction shown (hammer - press)		Smear or coat (see "Consumables" table)
	Heat or cool: Temperature in degrees Celsius (e.g. + 80 °C)		Fill to level (see "Technical Data" and "Consumables" table)
	Weld bead		Grease or oil (see "Consumables" table)
	Repair time - Heating time		Mark - Assemble according to marking

Adjustment

	Rotating friction torque		Turn anti-clockwise
	Turn in alternate directions		Turn anti-clockwise (the figure shows the number of turns)
	Turn clockwise		Turn clockwise (the figure shows the number of turns)
	Place in contact		Move in the direction shown
	Dimension to be assured (mm)		

Various information

	Exhaust - Outlet		Operation with a sequence
	Intake - Inlet		Involves
	Weight in kg (example: 275 kg)		Return to numbered operation - Connected with numbered operation
	Depending on versions or options		Withdraw - Delete
	Wrong		Direction of disassembly (the arrow shows the direction)
	Correct		Direction of assembly (the arrow shows the direction)
	Injection		... to ...
	Repair dimension		Inspect - Check condition of part
	Part to be replaced		Danger for persons, vehicle or equipment

General instructions

Practical advice

Prior to any work:

- Clean the major unit and its surrounds (See Driving Servicing Handbook, "Vehicle washing").
- Disconnect the batteries, starting with the negative terminal.
- Mark the pipes and wiring harnesses, if necessary.
- Protect all ports to prevent the ingress of foreign matter.
- Before disconnecting an air pipe, drop the circuit pressure.
- If liquid is splashed onto the bodywork, clean quickly with a cleaning product recommended by RENAULT TRUCKS.

Raising a vehicle on lifts or elevators

- For tyres with size less than or equal to **16** inches, place fork reducers on each lift column.
- Position and centre the lift columns.
- Release the parking brake.
- Raise the vehicle and put safety trestles into place.

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, circlips 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.



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

Fastening, locking, sealing and adhesive products:

Prior to assembly, carefully clean the product application surfaces of the parts. Old product residue is to be removed. Threaded portions are to be brushed, tapped and, if necessary, cleaned with a suitable product.

Using the product:

Always adapt the recommended product while observing the utilization conditions appearing on the pack:

- Surface finish,
- Working temperature,
- Reaction, drying, etc. time,
- Shelf life.

Stick to the assembly method so as to guarantee the quality of the repair.

Fuel system

Recommendations

Observe maximum cleanliness when working on the fuel supply system.

Always wash the engine before you start any work.

The Spare Parts Department supplies appropriate disposable blanking plugs and storage bags.


To avoid the ingress of impurities into the system, blank off all ports with these plugs as soon as you start to dismantle any pipes and store the dismantled parts in these bags.

All these recommendations guarantee reliability of the fuel-injection system.

GENERAL DATA

General features

Identification plate

RENAULT		ENGINE INFORMATION	
11	DXi	16	ENGINE MODEL: <input type="text" value="1"/>
	12		PROP. VERSION: <input type="text" value="2"/>
	13		MAX. TORQUE: <input type="text" value="3"/>
	14		RATED POWER: <input type="text" value="4"/>
			RATED POWER SPEED: <input type="text" value="5"/> rpm
15			DISPLACEMENT: <input type="text" value="6"/> Litre
			LOW IDLE: <input type="text" value="7"/> rpm
			INJECTOR TYPE: <input type="text" value="8"/>
			EXHAUST BRAKE: <input type="text" value="9"/>
	17		10
e11*92/24*0014		Engine manufacturer: Volvo Powertrain Corporation	

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- (1): Engine model
- (2): Engine part number
- (3): Maximum torque
- (4): Engine horsepower
- (5): Maximum full load engine speed
- (6): Cubic capacity
- (7): Idling speed
- (8): Fuel injectors type
- (9): Exhaust brake
- (10): Optifuel option
- (11): Engine type approval country
- (12): Type approval number
- (13): Type approval number
- (14): Type approval number
- (15): -
- (16): Engine type
- (17): Smoke index

Engine horsepower and torque

Type designation	Maximum horsepower	Maximum torque
DXi 11 330	243 kW at 1900 rpm	1650 Nm at 1150 rpm
DXi 11 380	280 kW at 1900 rpm	1800 Nm at 1150 rpm
DXi 11 440	324 kW at 1900 rpm	2000 Nm at 1150 rpm

Technical data

Number of cylinders	6
Bore	123 mm
Stroke	152 mm
Displacement	10500cm³
Compression ratio	18.3/1
n°1 cylinder:	end opposite flywheel
Direction of rotation of engine:	anticlockwise seen from flywheel end
Firing order	1.5.3.6.2.4
Idling speed	600⁺⁵⁰/₋₁₀ rpm
Max. no-load speed	2200 rpm
Max. full load speed	2200 rpm
Fuel:	diesel fuel
Supercharged:	by turbocharger with intercooler
Engine weight including accessories	1115 kg

Engine cooling system

Thermostat

Cooling:

Circulating coolant activated by thermostat-regulated pump.

Beginning of opening:	80 → 84 °C
End of opening:	90 → 94 °C
Min. full opening dimension:	16 mm

Engine lubrication system

Oil pressure

Lubrication: forced by gear pump

Oil pressure, main rail

Engine speed in rpm	Temperature in °C	Pressure in bars
600	100	2
> 1100	100	2.5 → 6.0

Oil pressure, rocker shaft

Engine speed in rpm	Temperature in °C	Pressure in bars	
		Optibrake retarder activated	Optibrake retarder disabled
600	100	1.7 → 2	1.2
> 1100	100	3.4 → 3.5	1.2

Oil: specifications and operating temperatures (see Driving & Servicing handbook).

Oil capacity: (see Driving & Servicing handbook).

Oil filter

Number of full flow filters	2
Number of by-pass filters	1

Standard tightening torques

Definitions

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 precision class defines the tolerance of this torque in percent as a function of the nominal torque applied.

For standard threaded hardware, use the following table.

For other torques, see the following page(s).



"FIH" type (Nylstop) locknuts must be replaced whenever removed. "DRH" type (oval) locknuts can be re-used. If locknuts (DRH, FIH or other) are re-used, make absolutely certain that the screw-thread of the bolt protrudes least two threads above the top edge of the nut.

Standard nut and bolt tightening torques table



The tightening torque values given in the table are based on standard 01.50.4002 and apply to new nuts and bolts fitted dry and re-used nuts and bolts with oil applied to the screw-threads. If any nuts and bolts are replaced, it is absolutely essential to use nuts and bolts recommended by the RENAULT TRUCKS Spare Parts Department (coefficient of friction in compliance with standard 01.50.4002).

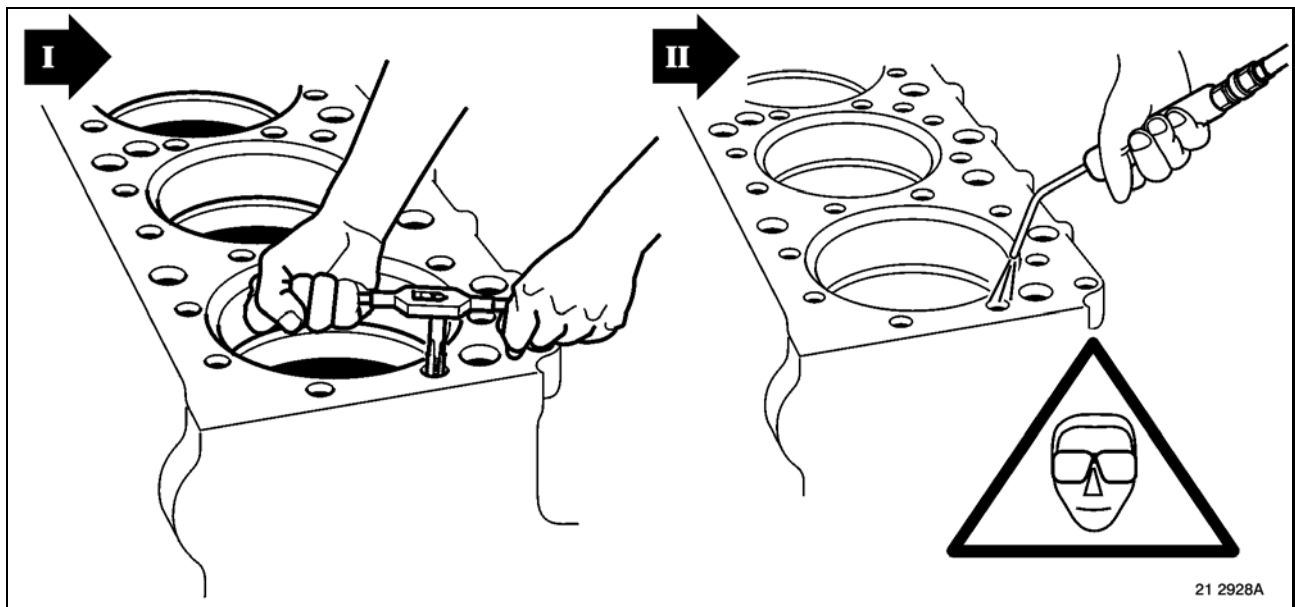
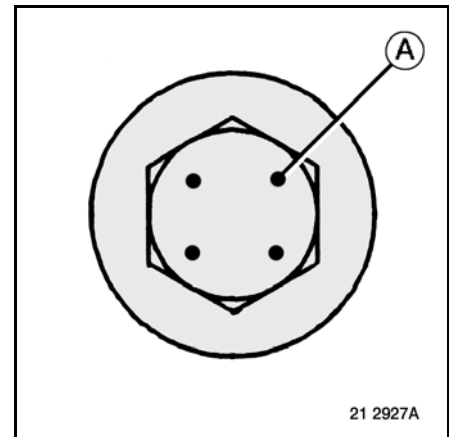
Tightening torques for conventional nut and bolt hardware to "metric system" standard 01.504.002 (H: normal and HE: flanged)		
Diameter and pitch of nuts and bolts	Quality class 8.8	Quality class 10.9
6 x 1.00	10 ± 1.5	12 ± 2
8 x 1.25	24 ± 4	30 ± 5
10 x 1.50	48 ± 8	60 ± 10
12 x 1.75	85 ± 15	105 ± 20
14 x 2.00	140 ± 25	175 ± 30
16 x 2.00	220 ± 35	275 ± 45
18 x 2.50	290 ± 45	360 ± 55
20 x 2.50	430 ± 70	540 ± 90
22 x 2.50	580 ± 90	730 ± 120
24 x 3.00	740 ± 120	900 ± 140

Specific tightening torques

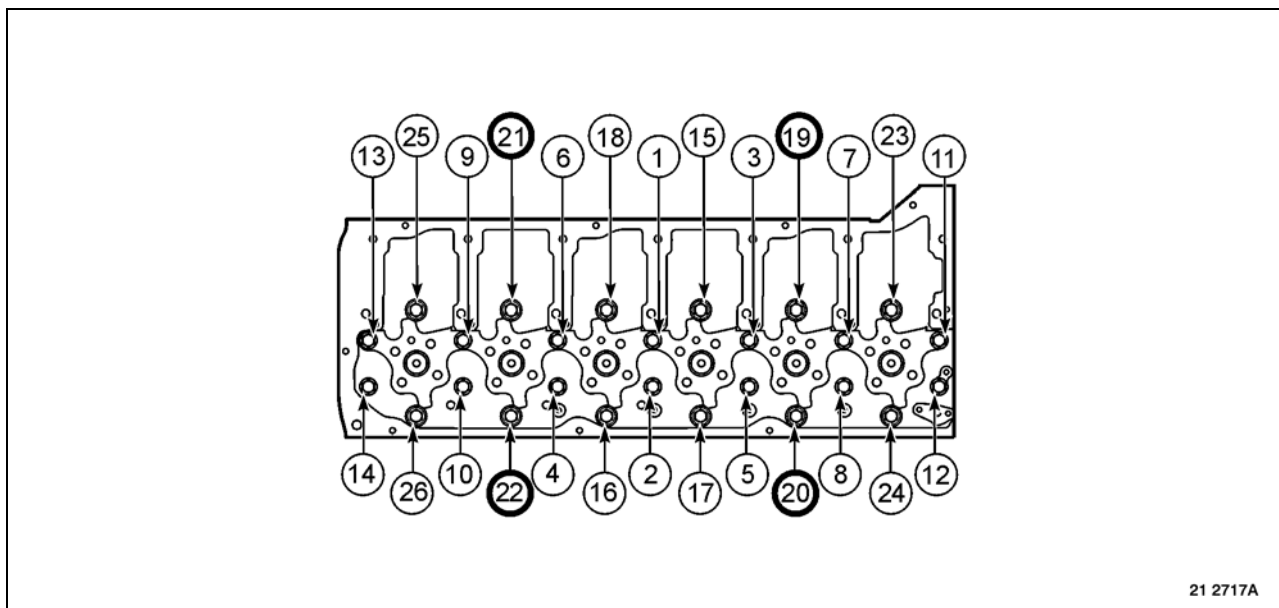
Cylinder head



The bolts can be re-used 4 times. Mark the bolt head with an indentation (A) after tightening using a centre punch. In this case, apply engine oil to the screw-threads and under the bolt heads. Do not apply engine oil to new bolts, which are already pre-lubricated.



Tap the screw-threads in the cylinder block then blow through with compressed air.



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The cylinder head must be positioned and tightened in accordance with the instructions given in the method (see page F-4-4).

The item numbers indicate the tightening sequence.

Stage 1	$65^{\pm 5}$ Nm
Stage 2 (check tightening)	$65^{\pm 5}$ Nm
Stage 3	$120^{\pm 5}$ °
Stage 4	$90^{\pm 5}$ °
Bolts M8 securing the unit pump injectors wiring harness bracket	$24^{\pm 4}$ Nm



The bolts **M8** can be re-used 5 times. If they are, do not apply any product to the screw-threads. Do not apply any product to new bolts, which are already pre-coated.

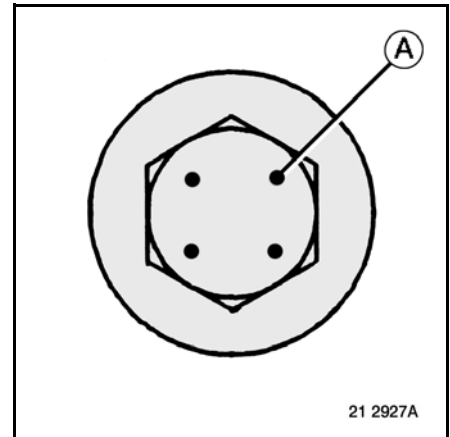
Cylinder head core plugs

Plug M10 x 1.00	$20^{\pm 4}$ Nm
Pre-coated plug M14 x 1.50	$30^{\pm 3}$ Nm
Pre-coated plug M10 x 1.00	$10^{\pm 2}$ Nm
Pre-coated straight union	10 Nm

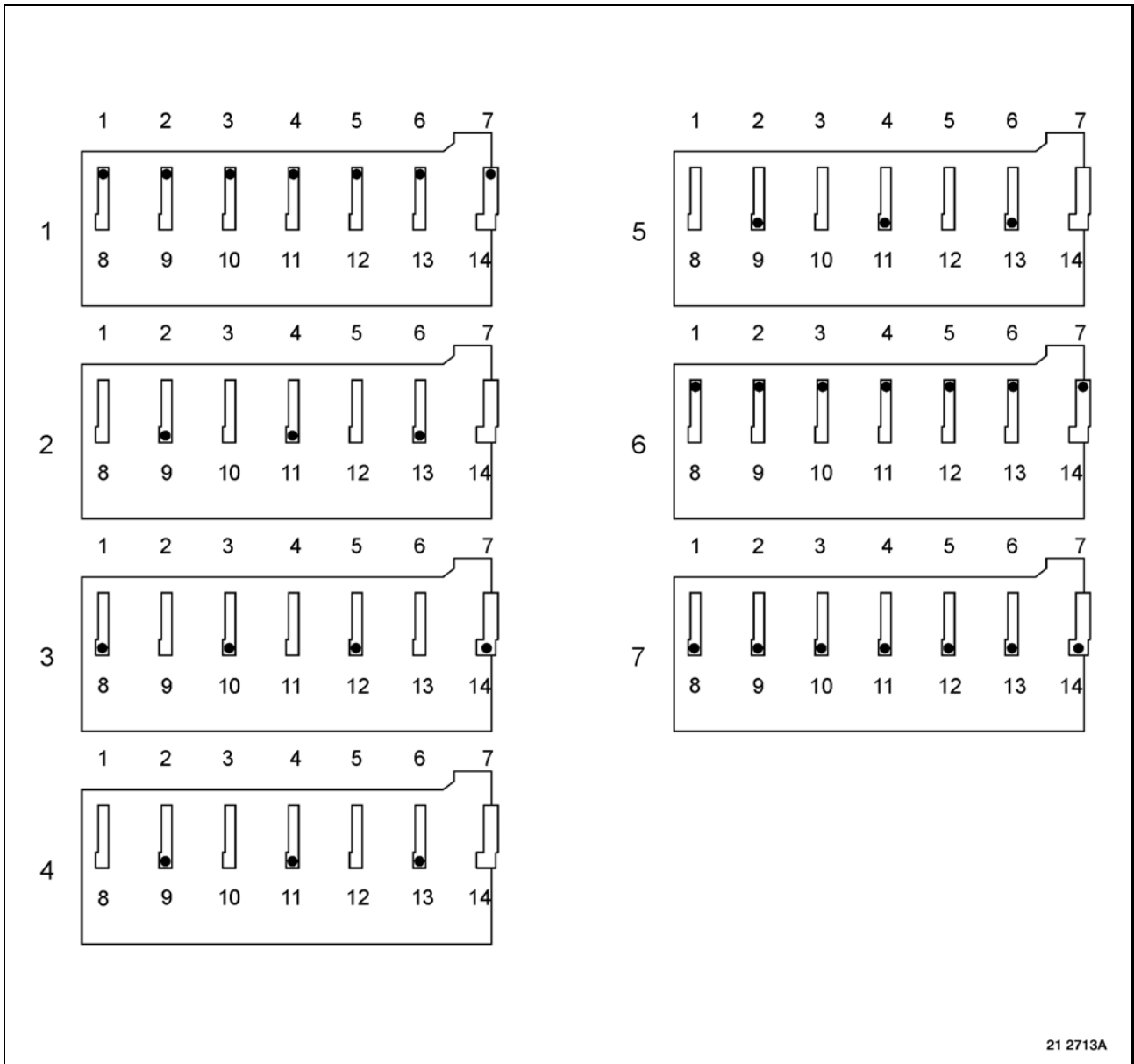
Camshaft and rocker shaft bearing caps



The bolts can be re-used 4 times. Mark the bolt head with an indentation (A) after tightening using a centre punch. In this case, apply engine oil to the screw-threads and under the bolt heads. Do not apply engine oil to new bolts, which are already pre-lubricated.



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Stage 1: bolts (1 → 7)	$25^{\pm 3}$ Nm
Stage 2: bolts (9 - 11 - 13)	$90^{\pm 5}$ Nm



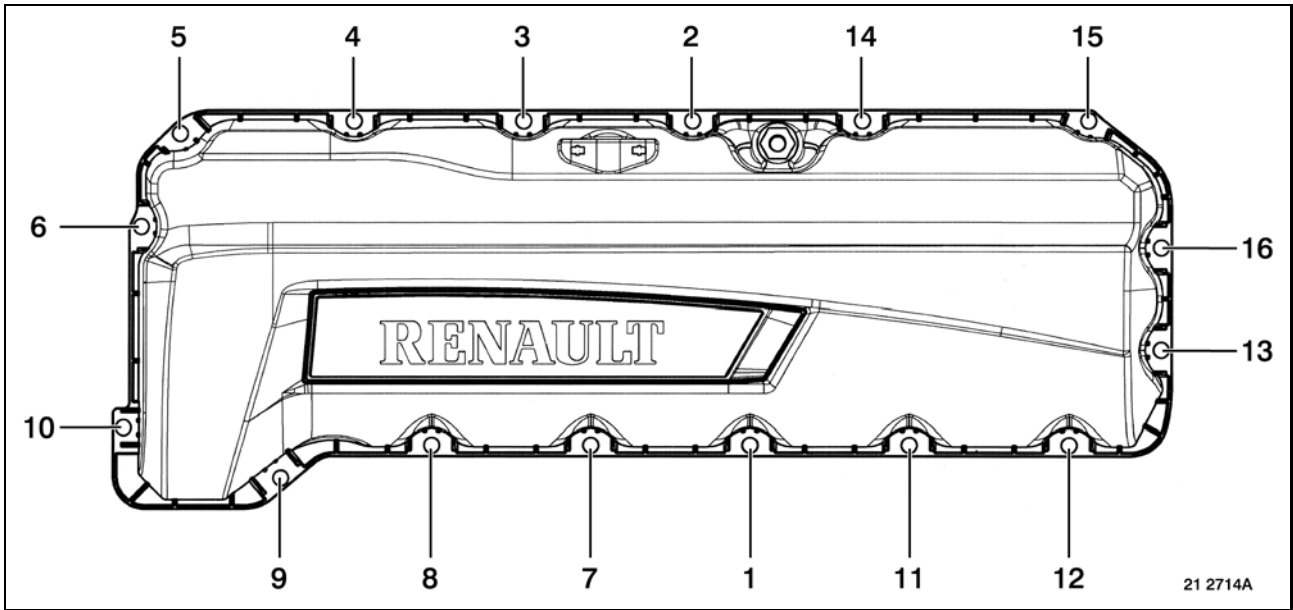
For the 2nd stage, tighten the bolts gradually, starting with bolt (11), so the rocker shaft descends without distorting.

Stage 3: bolts (8 - 10 - 12 - 14)	$60^{\pm 5}$ Nm
Stage 4: bolts (9 - 11 - 13)	Loosen the bolts
Stage 5: bolts (9 - 11 - 13)	$60^{\pm 5}$ Nm
Stage 6: bolts (1 → 7)	$90^{\pm 5}$ °
Stage 7: bolts (8 → 14)	$100^{\pm 5}$ °

Rocker arms

Valve play adjusting screw locknut	$38^{\pm 4}$ Nm
Exhaust valves play adjusting shim securing bolts (Optibrake retarder)	$38^{\pm 4}$ Nm
Unit pump injector pre-travel adjusting screw locknut	$52^{\pm 4}$ Nm

Cylinder head cover

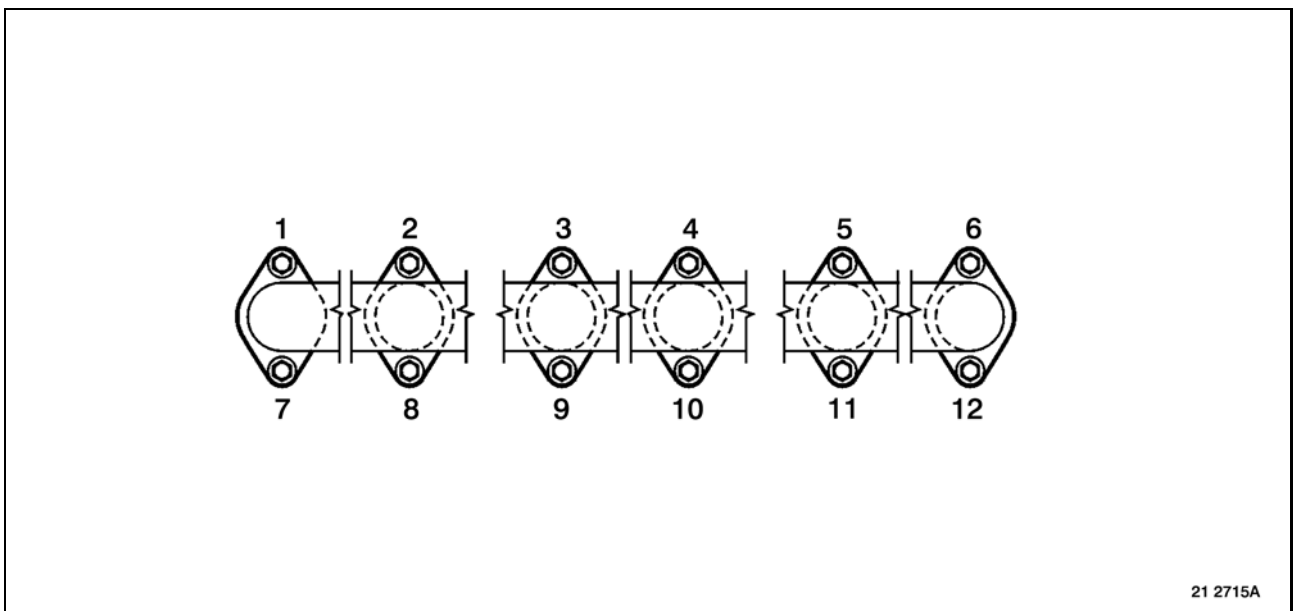


The item numbers indicate the tightening sequence.

Cylinder head cover securing bolts

24 ± 4 Nm

Exhaust manifold



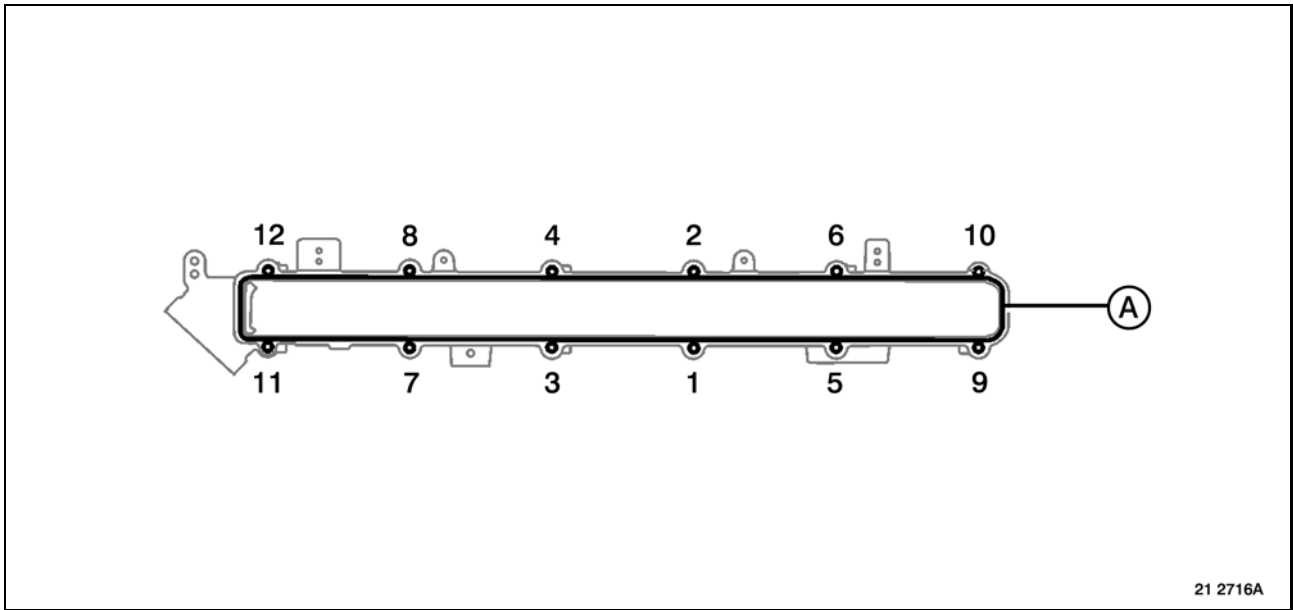
Stage 1: bolts (1 - 8 - 3 - 10 - 5 - 12)

10 ± 2 Nm

Stage 2: bolts (2 - 7 - 4 - 9 - 6 - 11 - 1 - 8 - 3 - 10 - 5 - 12)

48 ± 8 Nm

Intake manifold



21 2716A

The item numbers indicate the tightening sequence.

Intake manifold securing bolts

24 ± 4 Nm

Apply a bead of silicone **dia. 2 mm (A)** as shown in the drawing. Perform assembly within 20 minutes of application of the silicone.
Apply "CAF 44" sealant.

Plug **M10**

20 ± 3 Nm

Boost air pressure / temperature sensor

12 ± 2 Nm

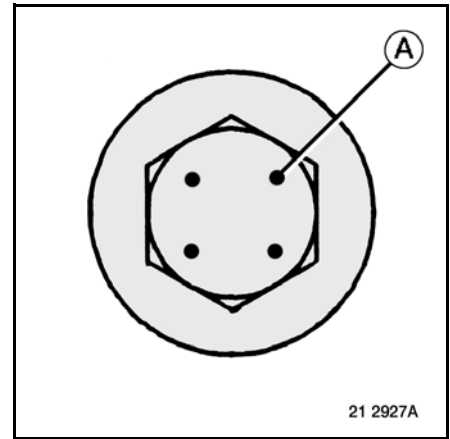
Intake air heater securing bolts

24 ± 4 Nm

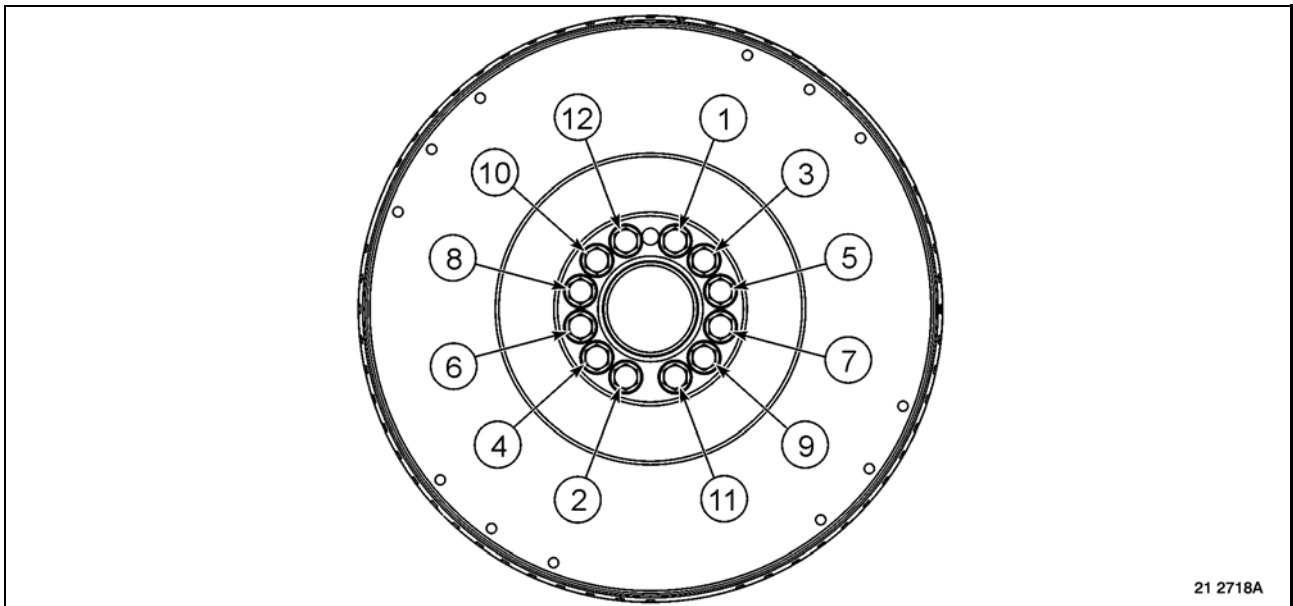
Engine flywheel



The bolts can be re-used 4 times. Mark the bolt head with an indentation (A) after tightening using a centre punch. In this case, apply engine oil to the screw-threads and under the bolt heads. Do not apply engine oil to new bolts, which are already pre-lubricated.



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The item numbers indicate the tightening sequence.

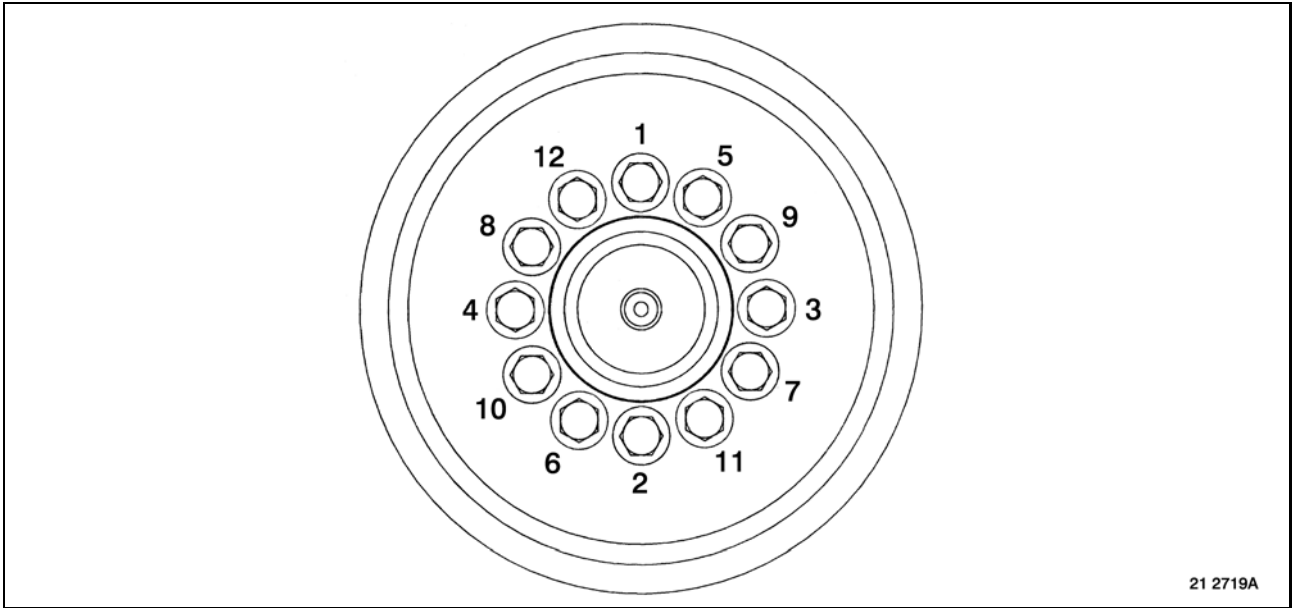
Stage 1

$60 \pm 5 \text{ Nm}$

Stage 2

$135 \pm 10 \text{ }^\circ$

Flywheel damper



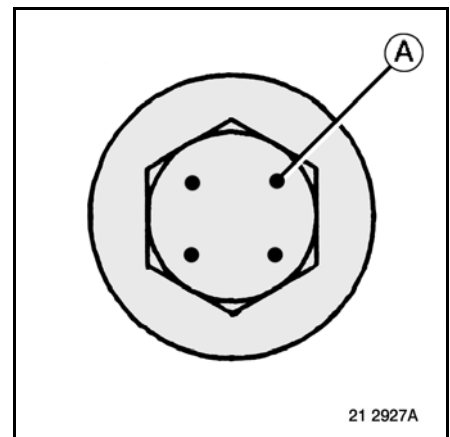
The item numbers indicate the tightening sequence.

Stage 1	$40^{\pm 4}$ Nm
Stage 2	$90^{\pm 10}$ Nm

Crankshaft bearing caps



The bolts can be re-used 4 times. Mark the bolt head with an indentation (A) after tightening using a centre punch. In this case, apply engine oil to the screw-threads and under the bolt heads. Do not apply engine oil to new bolts, which are already pre-lubricated.



Stage 1	$150^{\pm 20}$ Nm
Stage 2	$120^{\pm 5}$ °

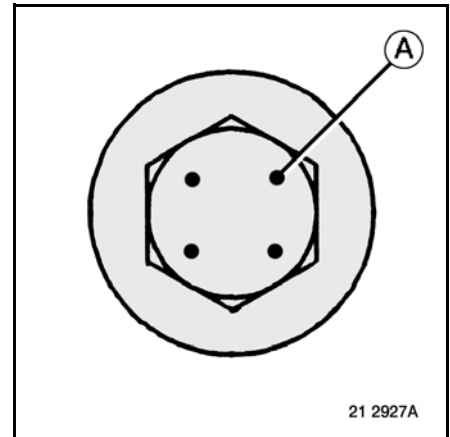
Connecting rod caps



The bolts can be re-used 4 times. Mark the bolt head with an indentation (A) after tightening using a centre punch. In this case, apply engine oil to the screw-threads and under the bolt heads. Do not apply engine oil to new bolts, which are already pre-lubricated.



Tighten in diagonally opposed sequence.



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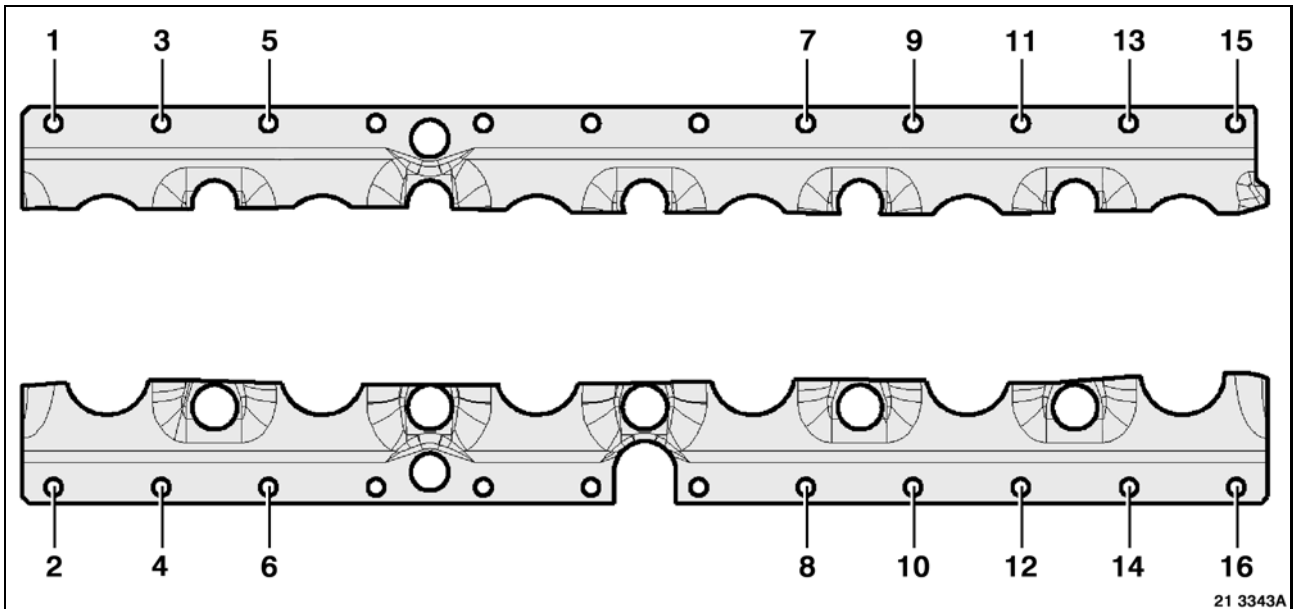
Stage 1

30 ± 3 Nm

Stage 2

$180 \pm 6^\circ$

Cylinder block stiffener

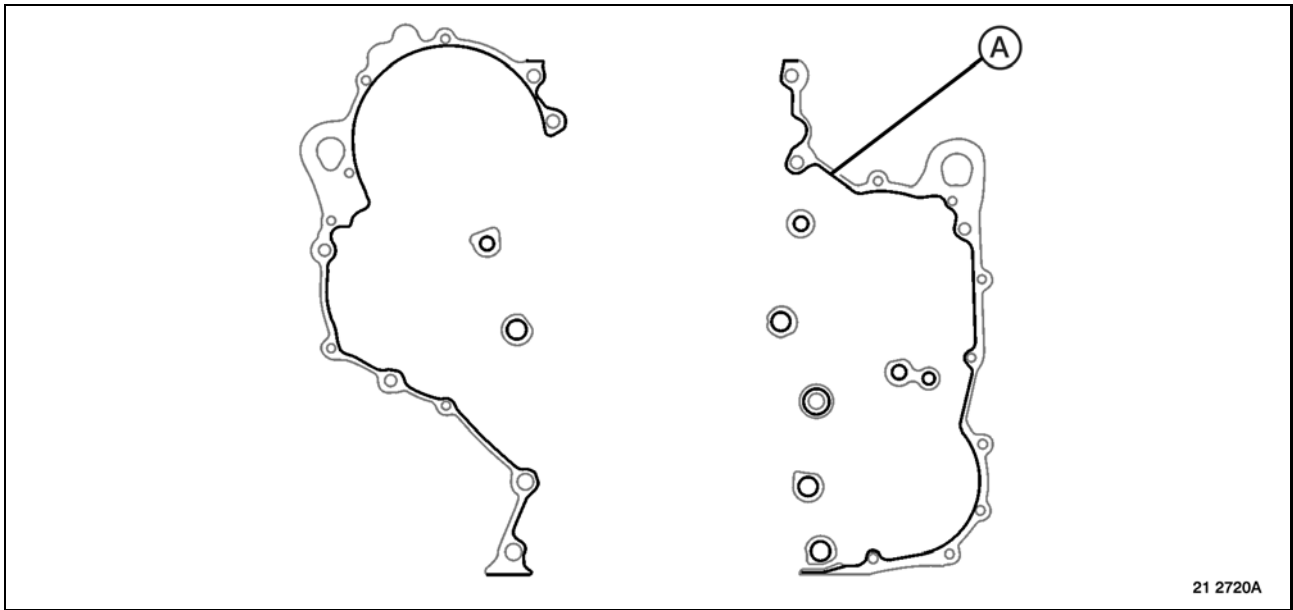


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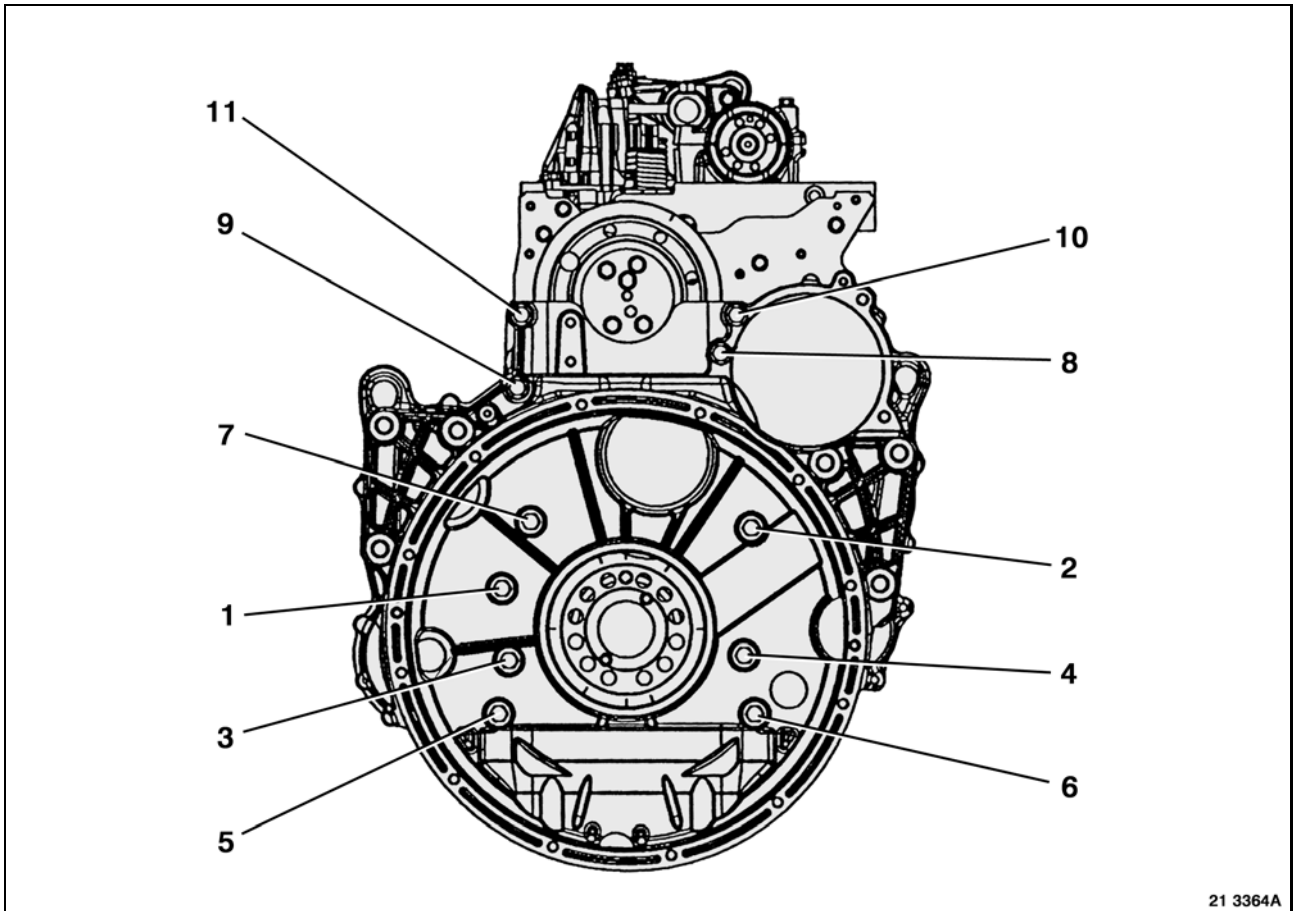
The item numbers indicate the tightening sequence.

Cylinder block stiffener securing bolts

48 ± 8 Nm

Flywheel casing

Apply a bead of silicone **dia. 2 mm (A)** as shown in the drawing. Perform assembly within 20 minutes of application of the silicone.
Apply "**CAF 44**" sealant.

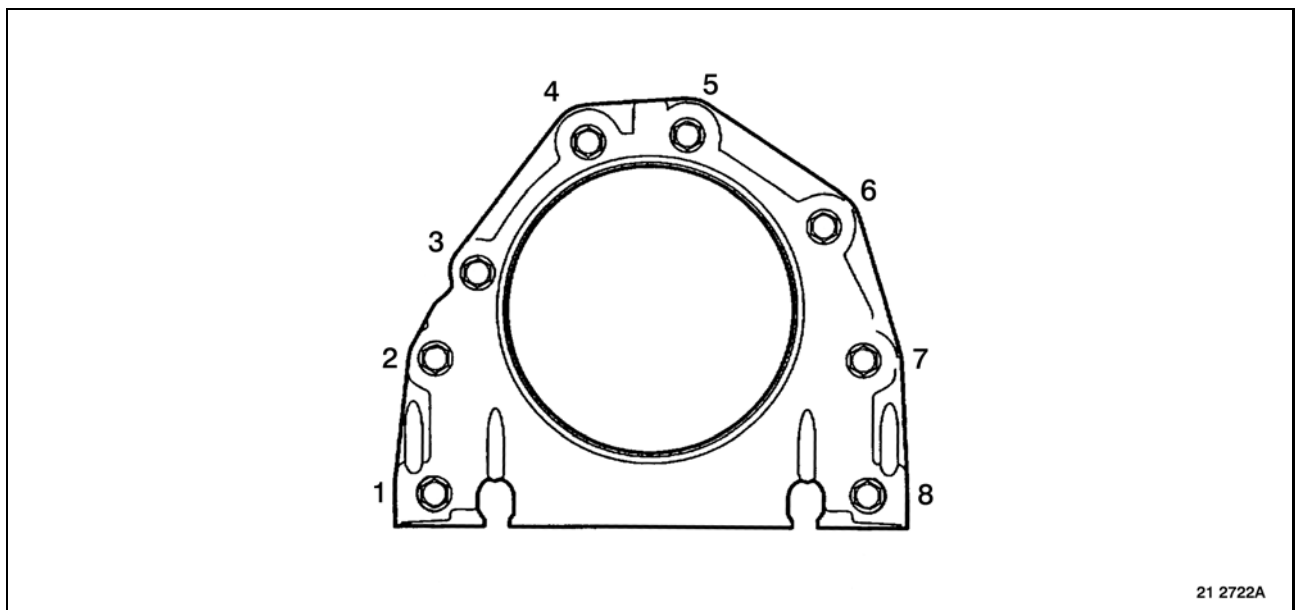
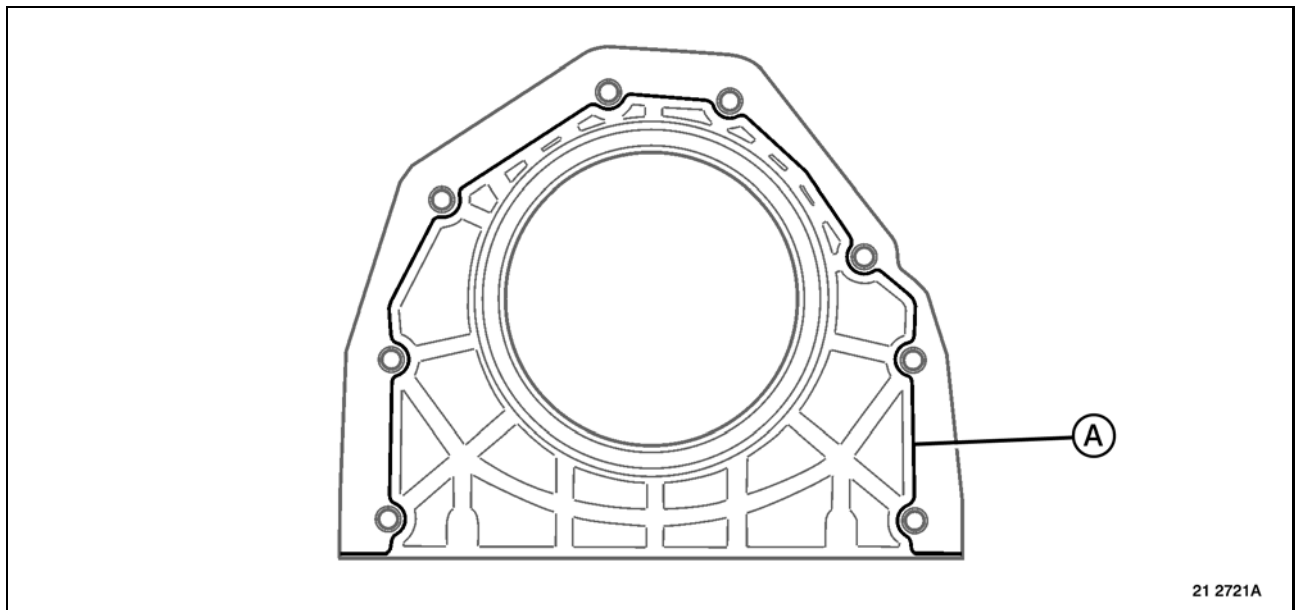


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The item numbers indicate the tightening sequence.

Stage 1: bolts M8 - M12 - M14	24^{±4} Nm
Stage 2: bolts M12	85^{±15} Nm
Stage 2: bolts M14	140^{±15} Nm

Crankshaft seal casing



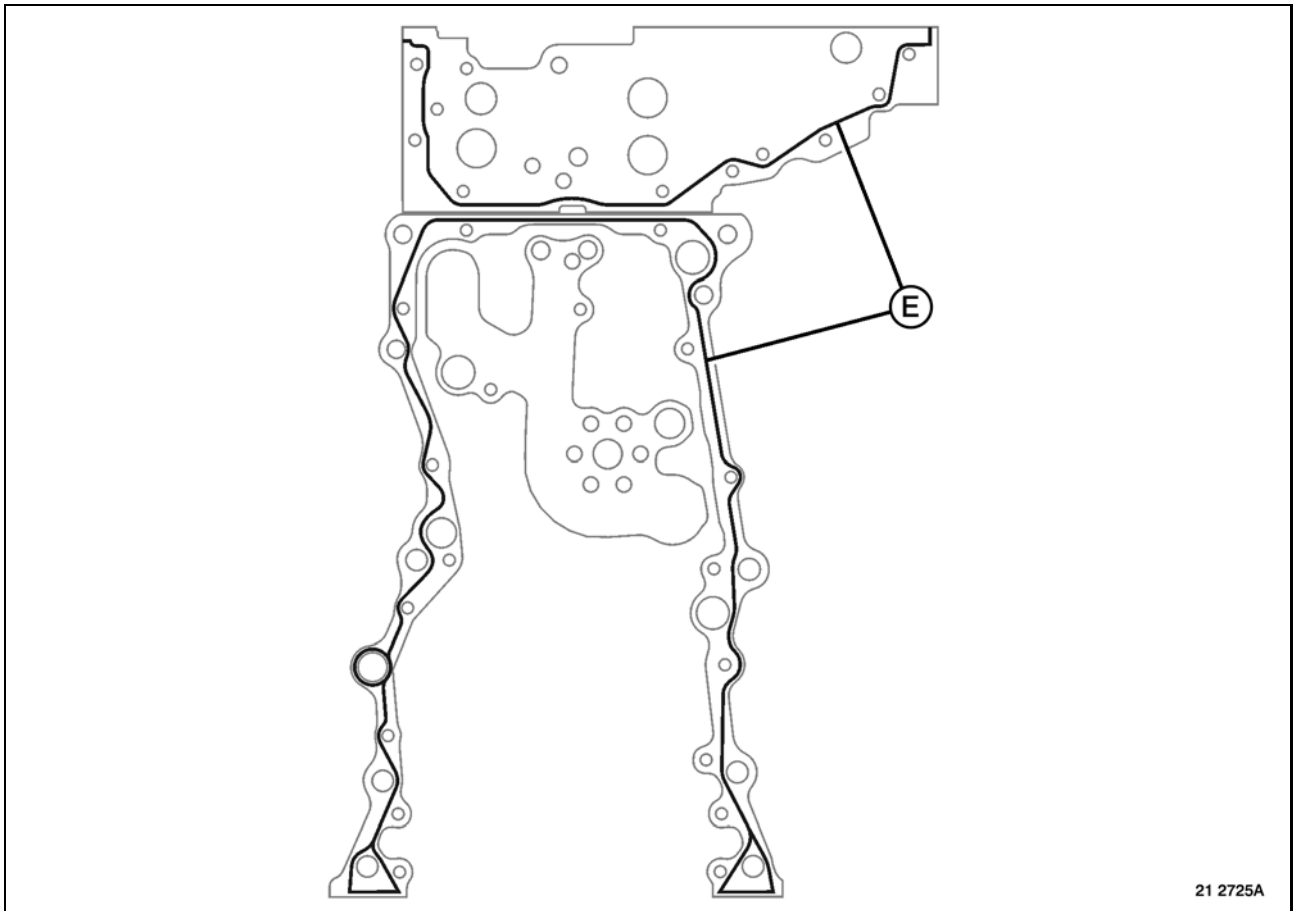
The item numbers indicate the tightening sequence.

Crankshaft seal casing securing bolts

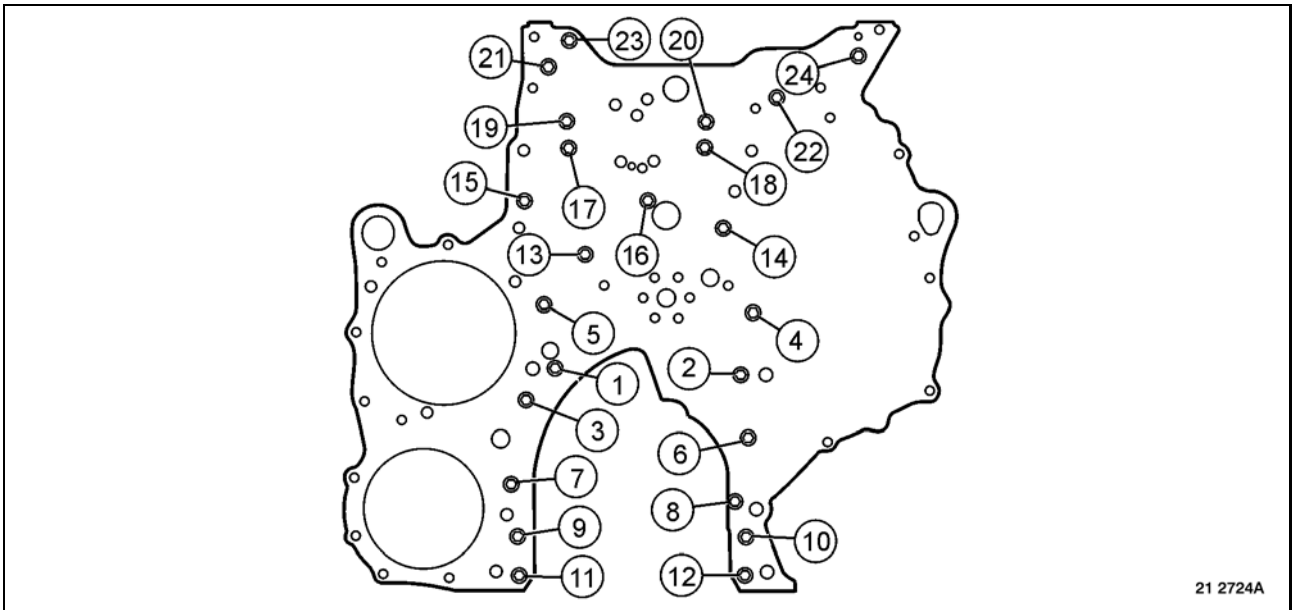
24 ± 4 Nm

Apply a bead of silicone **dia. 2 mm (A)** as shown in the drawing. Perform assembly within 20 minutes of application of the silicone.
Apply "**CAF 44**" sealant.

Valve timing



Apply a bead of silicone **dia. 2 mm (E)** as shown in the drawing. Perform assembly within 20 minutes of application of the silicone.
Apply "**CAF 44**" sealant.



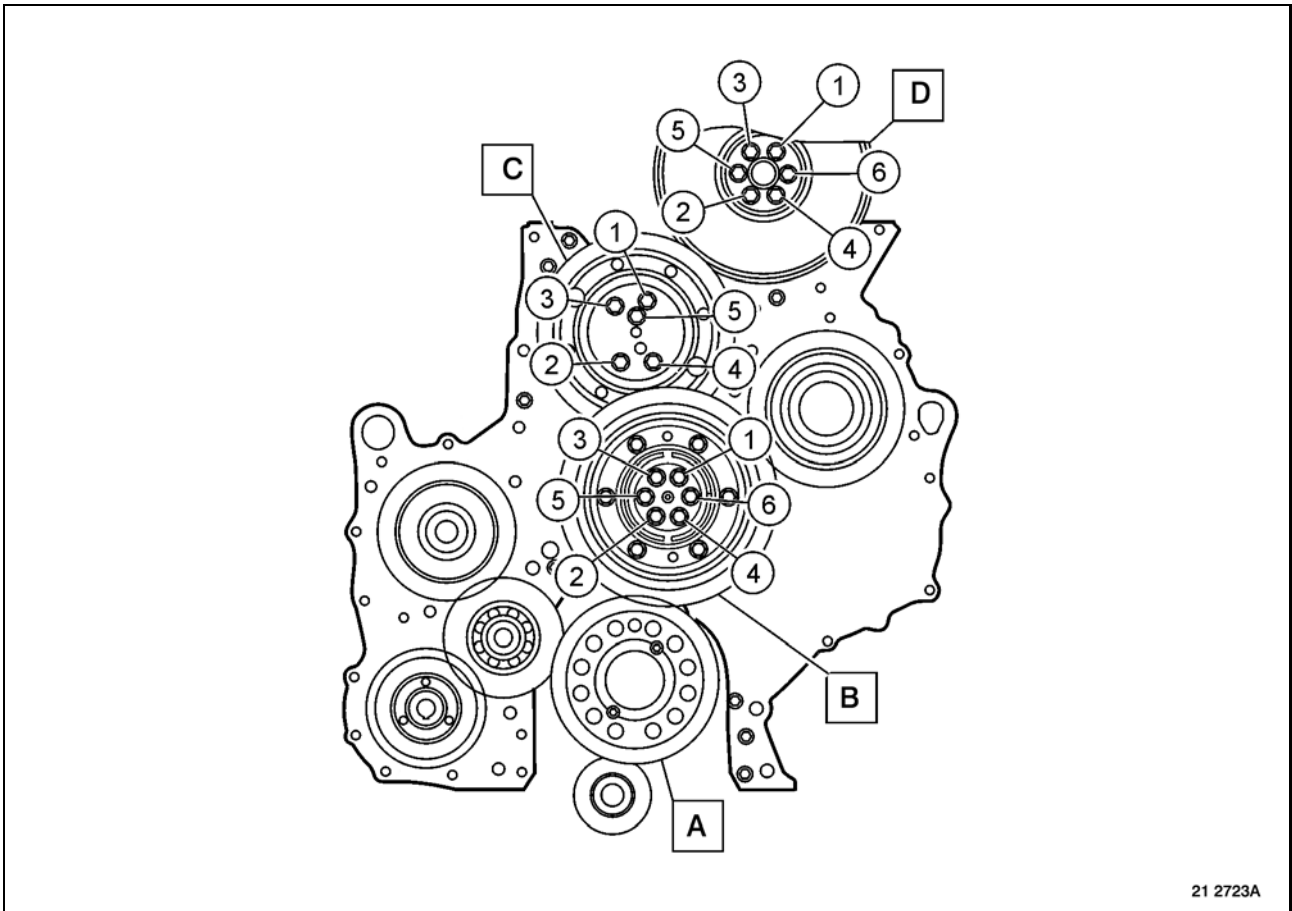
The item numbers indicate the tightening sequence.



The bolts can be re-used 5 times. If they are, do not apply any product to the screw-threads. Do not apply any product to new bolts, which are already pre-coated.

Timing plate securing bolts

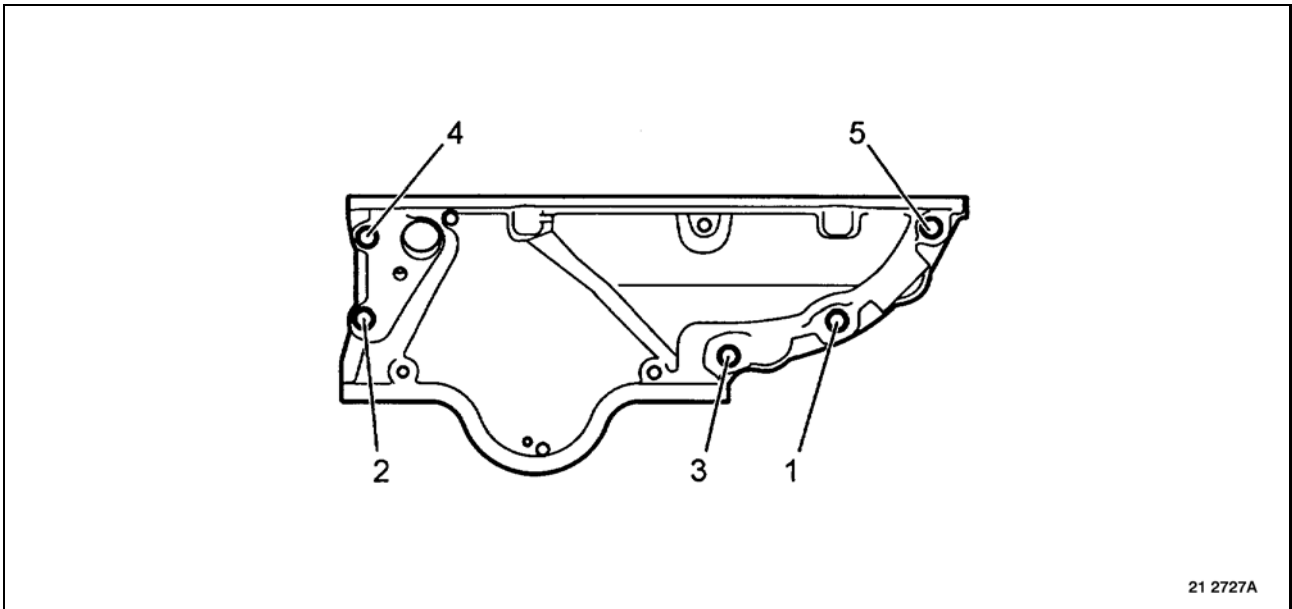
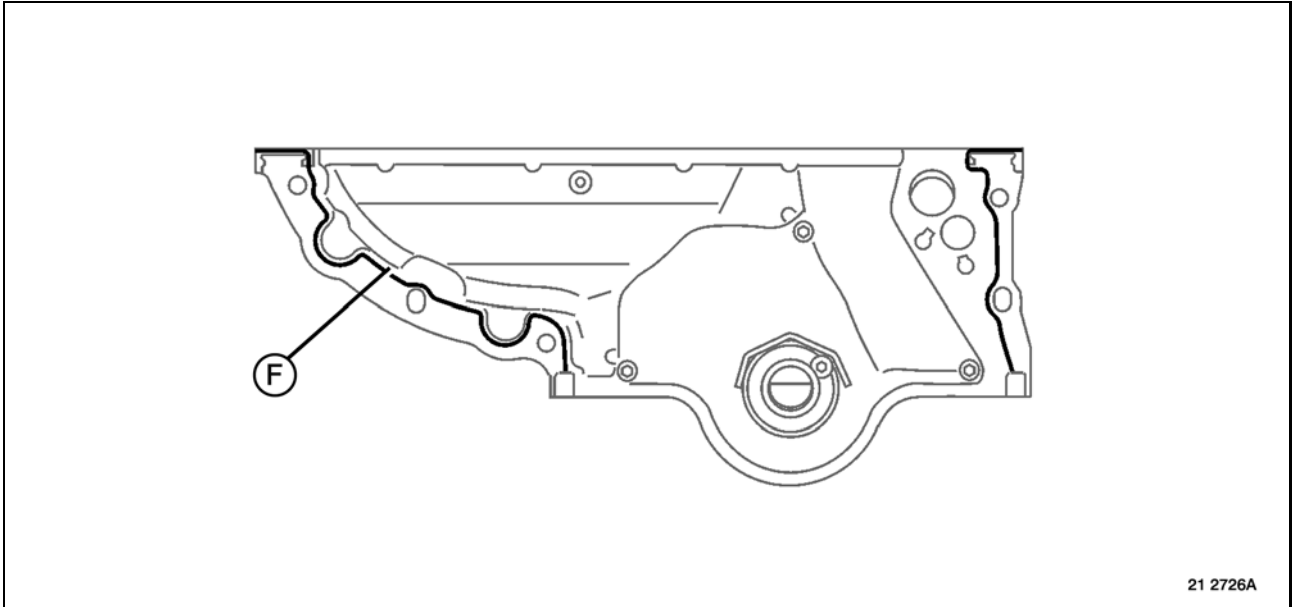
28^{±4} Nm



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The item numbers indicate the tightening sequence.

Crankshaft pinion securing bolt (A)	$24^{\pm 4} \text{ Nm}$
Idler gear hub securing bolt (B)	$25^{\pm 3} \text{ Nm} + 110^{\pm 5} \circ$
Adjustable idler gear hub securing bolt (C)	$35^{\pm 4} \text{ Nm} + 120^{\pm 5} \circ$
Camshaft pinion securing bolt (D)	$45^{\pm 5} \text{ Nm} + 90^{\pm 5} \circ$



The item numbers indicate the tightening sequence.

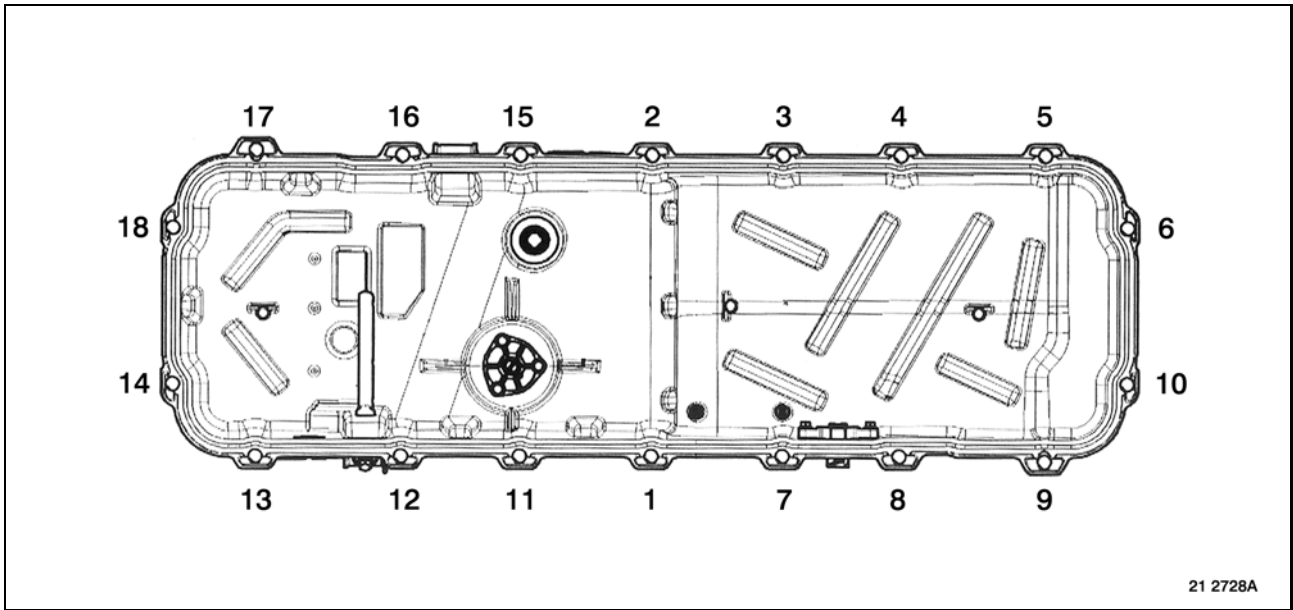
Timing case securing bolts

24 ± 4 Nm

Apply a bead of silicone **dia. 2 mm (F)** as shown in the drawing. Perform assembly within 20 minutes of application of the silicone.

Apply "**CAF 44**" sealant.

Oil sump

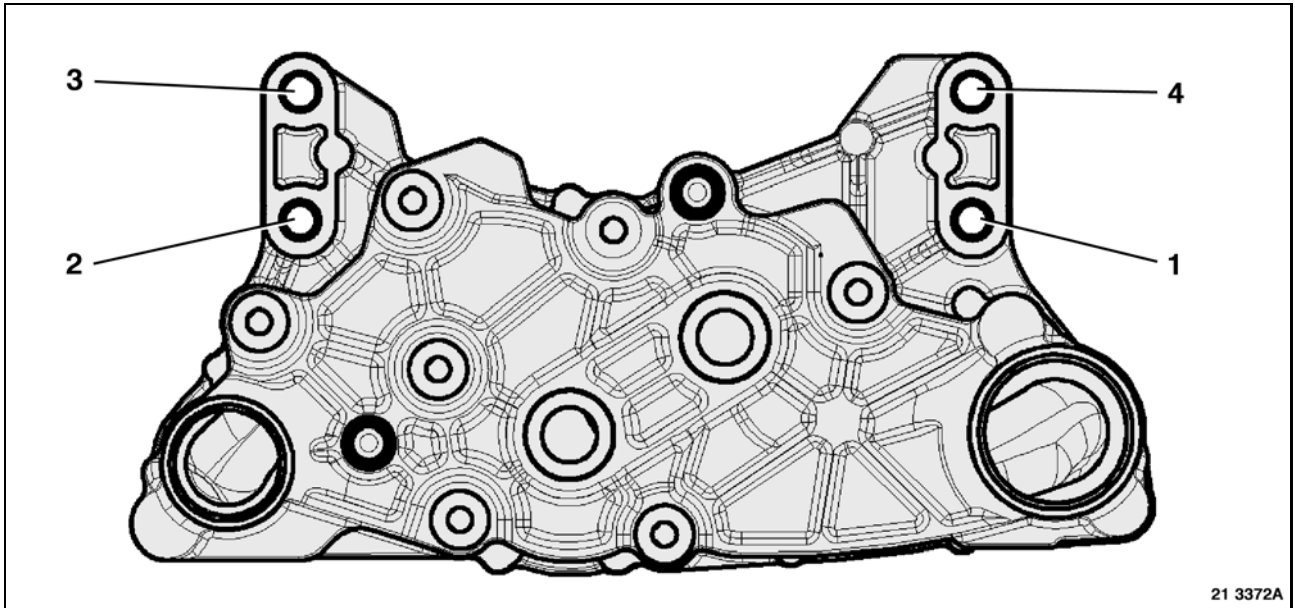


The item numbers indicate the tightening sequence.

Oil sump securing bolts	$24^{\pm 4}$ Nm
Oil sump drain plug	$60^{\pm 5}$ Nm
Oil dipstick securing bolt	$10^{\pm 1}$ Nm

Lubrication

Oil pump

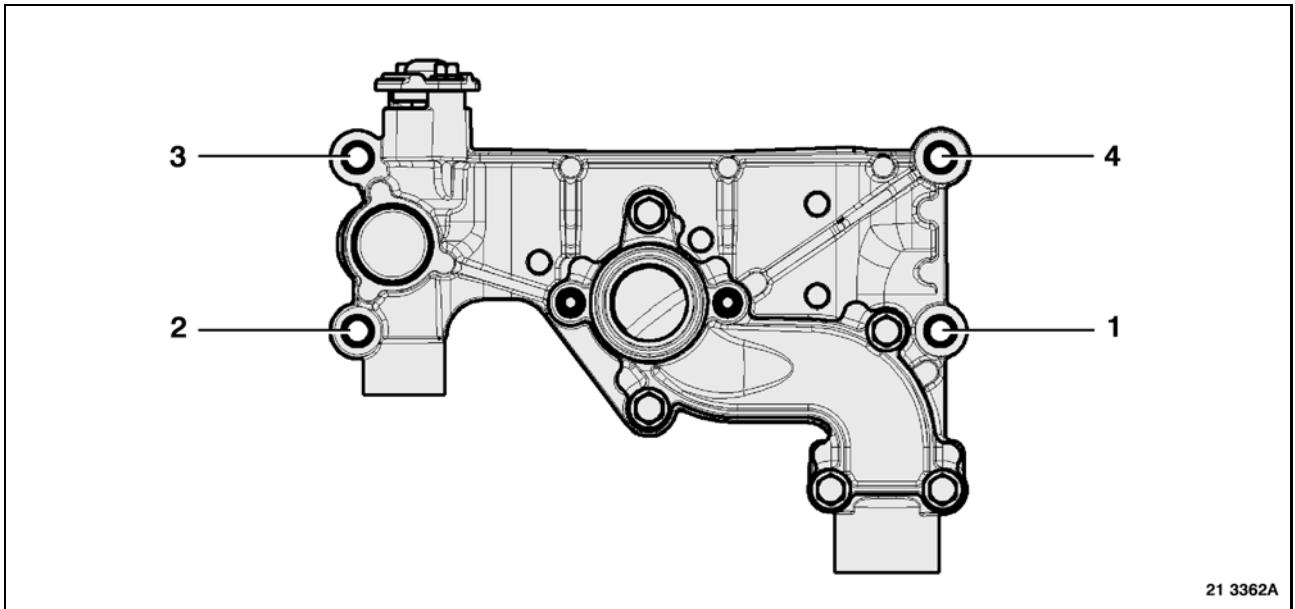


21 3372A

The item numbers indicate the tightening sequence.

Oil pump securing bolts

24^{±4} Nm



21 3362A

The item numbers indicate the tightening sequence.

Oil strainer bracket securing bolts

48^{±8} Nm

Oil strainer securing bolts

24^{±4} Nm

Oil pressure safety valve cover securing bolts

10^{±2} Nm

Oil jets

Oil jet securing bolts

$24^{\pm 4}$ Nm

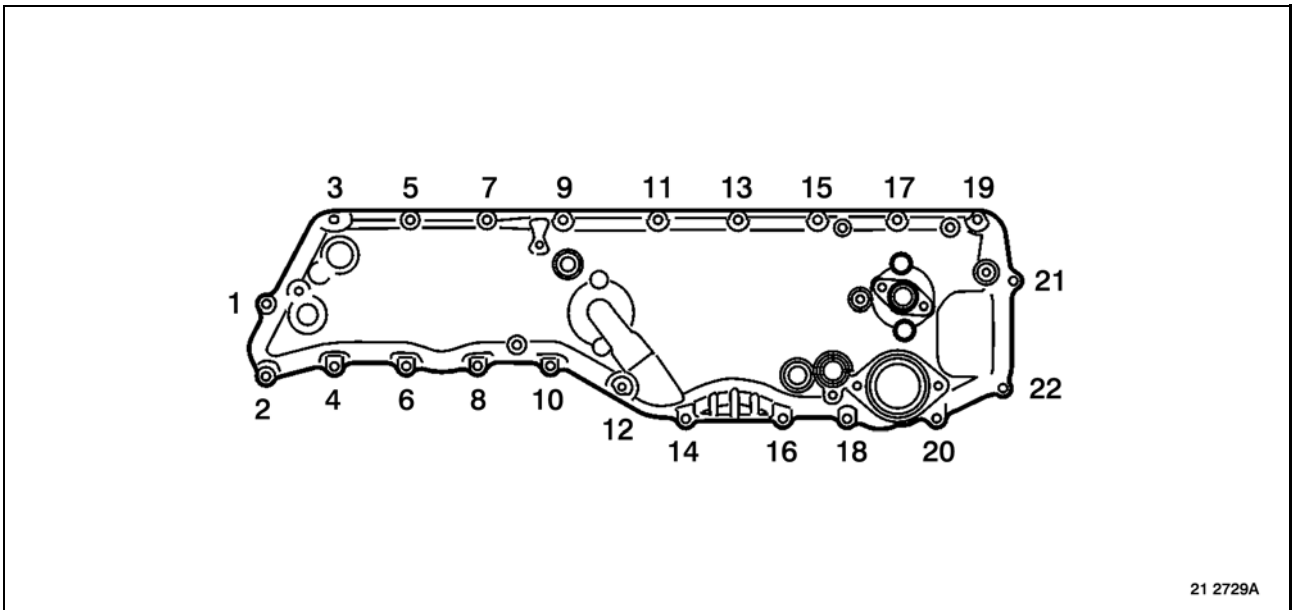


The bolts can be re-used 5 times. If they are, do not apply any product to the screw-threads. Do not apply any product to new bolts, which are already pre-coated.

Oil cooler

Oil cooler securing bolts

$27^{\pm 4}$ Nm



Begin by tightening bolts (11 - 14 - 3) to a torque of $24^{\pm 4}$ Nm, then tighten all the bolts in the specified sequence.

Oil cooler casing securing bolts

$24^{\pm 4}$ Nm

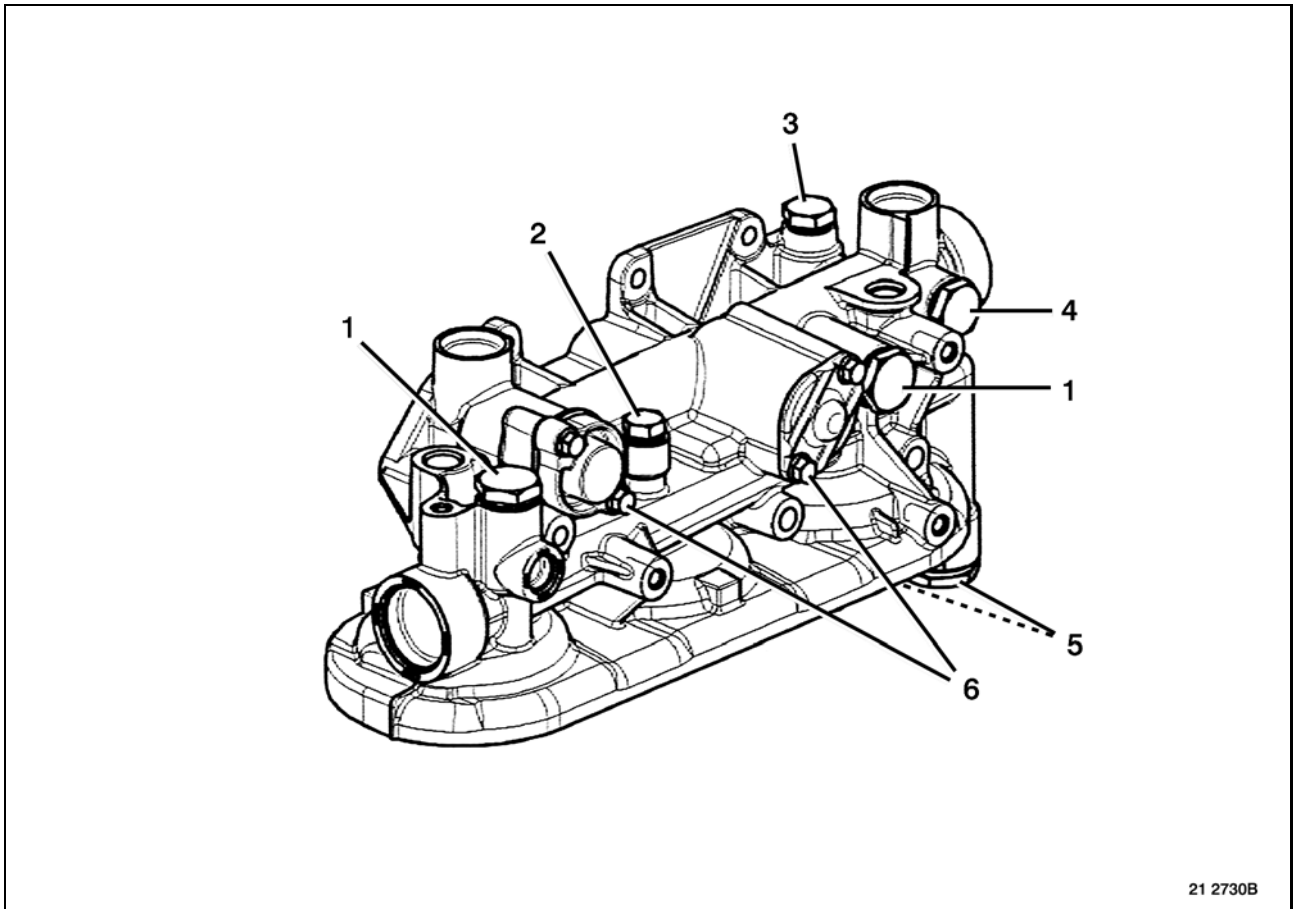
Oil cooler casing plug

$30^{\pm 3}$ Nm

Oil cooler casing water circuit drainage union

$40^{\pm 4}$ Nm

Oil filter bracket

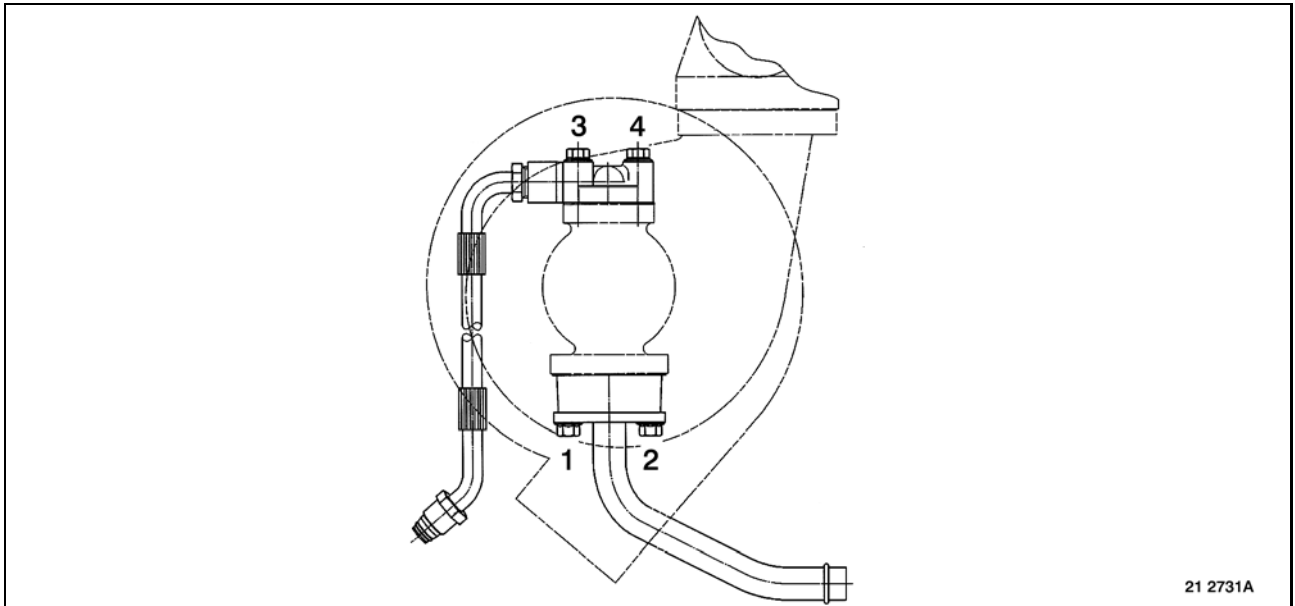


21 2730B

Oil filter bracket unit securing bolts	$24^{\pm 4}$ Nm
Oil filter	$25^{\pm 5}$ Nm
Plugs (1)	$55^{\pm 5}$ Nm
Plug (2)	$40^{\pm 4}$ Nm
Plug (3)	$50^{\pm 5}$ Nm
Plug (4)	$55^{\pm 5}$ Nm
Plugs (5)	$55^{\pm 5}$ Nm
Bolt (6) dia. M6	$10^{\pm 2}$ Nm

Turbocharger

Turbocharger to exhaust manifold securing bolts	$48^{\pm 8}$ Nm
Turbocharger oil supply pipe union	$25^{\pm 5}$ Nm
Turbocharger oil supply tube union (on oil filter bracket)	$40^{\pm 5}$ Nm
Turbine casing exhaust pressure regulator	$24^{\pm 2}$ Nm



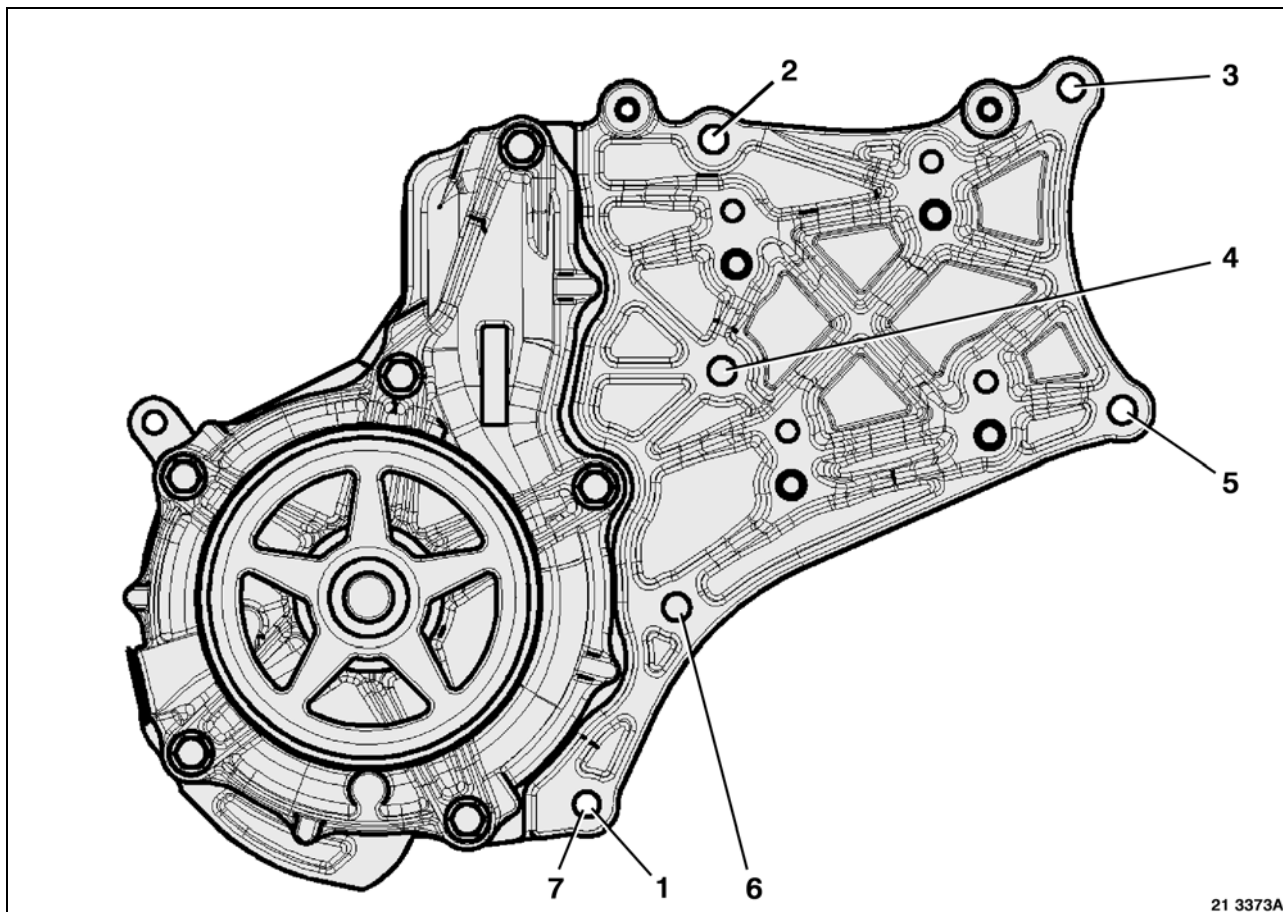
Stage 1: bolts (1 - 3)	12 Nm
Stage 2: bolts (2 - 4 - 1 - 3)	$24^{\pm 2}$ Nm

Engine cooling

Water pump

Water pump securing bolts

24^{±4} Nm



The item numbers indicate the tightening sequence.

Casing securing bolts M10	48 ^{±8} Nm
Water pump pulley securing bolts	24 ^{±4} Nm
Water pump drive belt tensioner bracket securing bolts M16	275 ^{±45} Nm
Water pump drive belt tensioner bracket securing bolts M10	48 ^{±8} Nm
Free pulley securing bolts M10	48 ^{±8} Nm
Tensioner roller securing bolts M10	48 ^{±8} Nm

Viscous coupling

Viscous coupling fan to hub securing nuts

24^{±4} Nm

Viscous coupling hub to water pump casing securing nut

48^{±8} Nm

Air compressor

Air compressor 636 cm3 drive pinion securing nut	200^{+ 50} Nm
Air compressor 636 cm3 securing nut	85^{± 15} Nm

Fuel feed pump

Fuel feed pump securing bolt	8^{± 2} Nm
Fuel feed pump banjo unions	40^{± 5} Nm

Steering pump

Steering pump drive pinion securing nut	100^{± 10} Nm
Steering pump securing bolts	24^{± 4} Nm

"Optibrake" retarder

Control solenoid valve	24^{± 4} Nm
Power supply wires securing nut	1.8^{± 0.3} Nm

Unit pump injector securing yoke

Tightening procedure for new copper injector sleeves

Stage 1	$20^{\pm 5}$ Nm
Stage 2	$180^{\pm 5 \circ}$

Fully loosen the yoke securing bolt before proceeding with stage 3.

Stage 3	$20^{\pm 5}$ Nm
Stage 4	$60^{\pm 5 \circ}$

Tightening procedure for already used copper injector sleeves

Stage 1	$20^{\pm 5}$ Nm
Stage 2	$60^{\pm 5 \circ}$

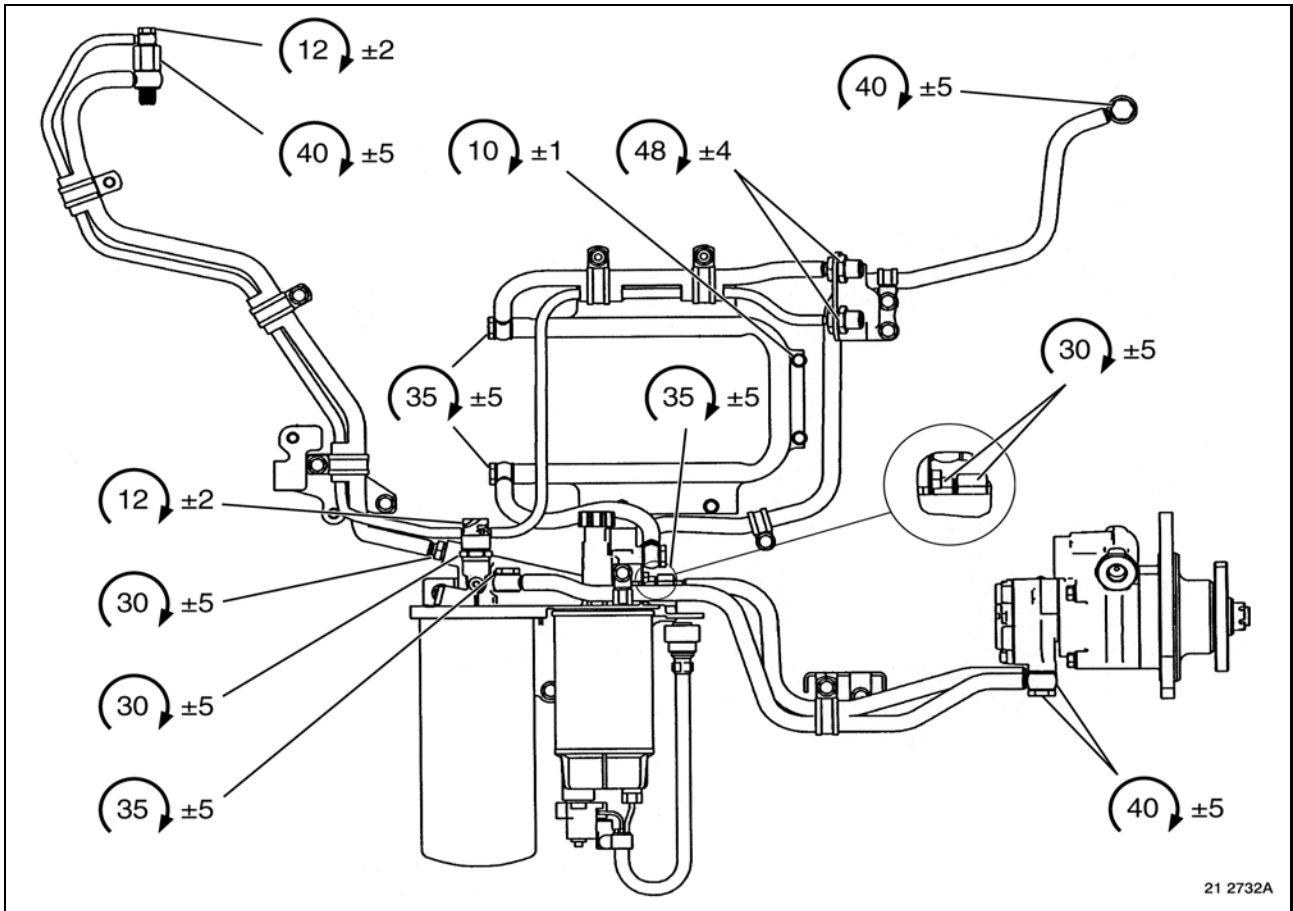
Wiring harness bracket

Wiring harness bracket securing bolts	$24^{\pm 4}$ Nm
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The bolts M8 can be re-used 5 times. If they are, do not apply any product to the screw-threads. Do not apply any product to new bolts, which are already pre-coated.

Low pressure fuel circuit



Bolt dia. **M8x1.25**

24^{±4} Nm

Starter

Starter securing nuts	$45^{\pm 5}$ Nm
Starter control wire securing nut	$2.7^{\pm 0.3}$ Nm
Starter power cable securing nut M10	$18^{\pm 2}$ Nm

Alternator

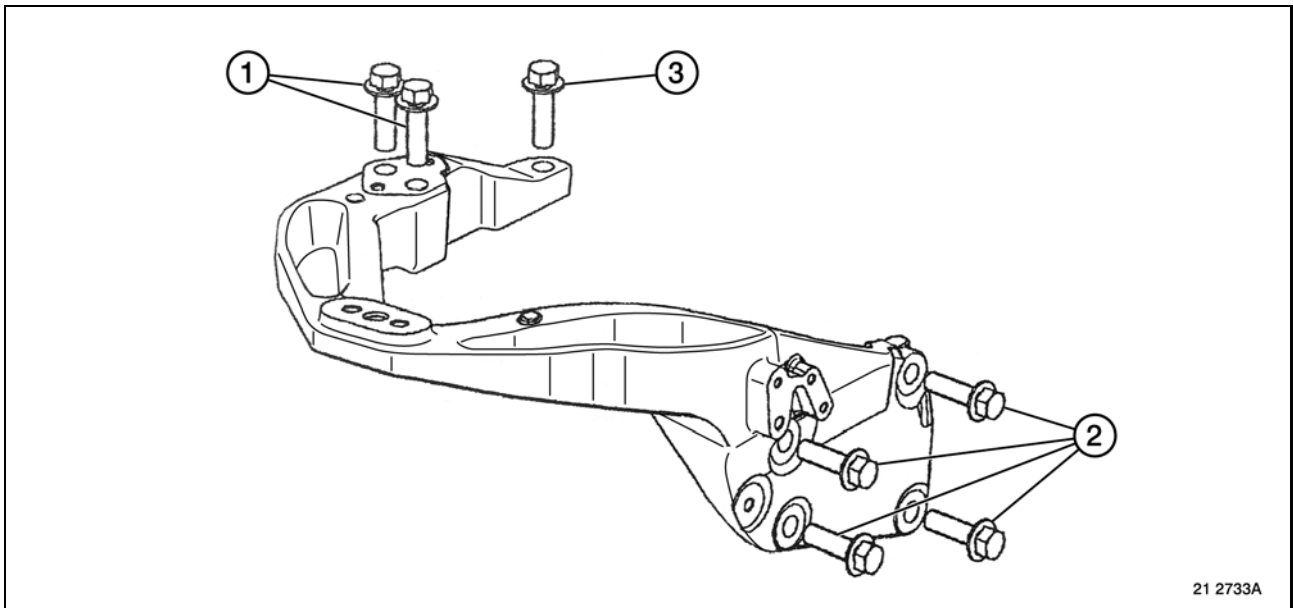
Bolt dia. M10	$48^{\pm 8}$ Nm
Bolt dia. M12	$85^{\pm 15}$ Nm
Tensioner roller securing bolts	$48^{\pm 8}$ Nm

Air conditioning compressor

Bolt dia. M8	$24^{\pm 4}$ Nm
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Engine brackets

Engine front bracket



21 2733A

Stage 1: bolts (1)	$48^{\pm 8}$ Nm
Stage 2: bolts (2)	$275^{\pm 45}$ Nm
Stage 3: bolts (1 - 3)	$275^{\pm 45}$ Nm

Engine rear bracket

Engine rear bracket securing bolts	$300^{\pm 30}$ Nm
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Sensors

Coolant temperature sensor	$22^{\pm 2}$ Nm
Crankcase pressure sensor	$30^{\pm 5}$ Nm
Oil pressure and temperature sensor	$30^{\pm 5}$ Nm

Dimensions and tolerances

Cylinder head

Type	6 cylinders
Length	996 mm
Width	410 mm
Height	135 mm
Weight	129 kg
Maximum flatness fault (bottom face)	0.15 mm



The lower face of the cylinder head cannot be ground.

Valves

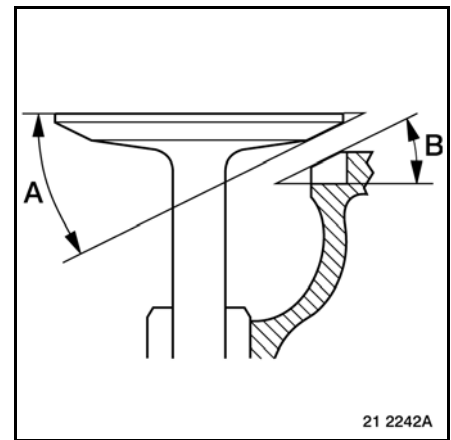
Valve heads diameter

Inlet	39.9 → 40.1 mm
Exhaust	37.9 → 38.1 mm

Valve stems diameter

Inlet	7.925 → 7.955 mm
Exhaust	7.91 → 7.94 mm

Facing angle



Angle (A)

Inlet	29° 45'
Exhaust	29° 45'

Angle (B)

Inlet	30°
Exhaust	30°

Valve set-back

Inlet	1.1 → 1.6 mm
Exhaust	0.4 → 0.9 mm



If the valve seats are replaced, replace the valves.

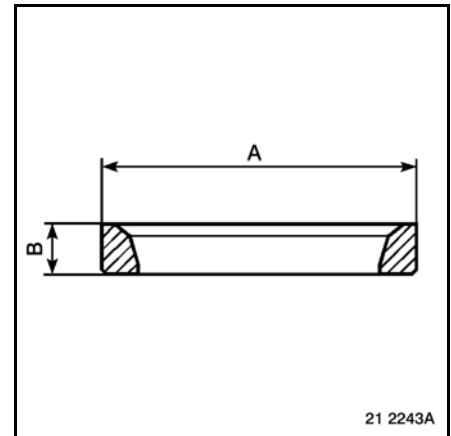
Valve clearances

Adjustment values, engine cold:

Inlet	0.2 mm
Exhaust	0.5 mm
Exhaust with Optibrake	1.6 mm

Adjustment values, engine cold:

Inlet	0.15 → 0.25 mm
Exhaust	0.45 → 0.55 mm
Exhaust with Optibrake	1.55 → 1.65 mm

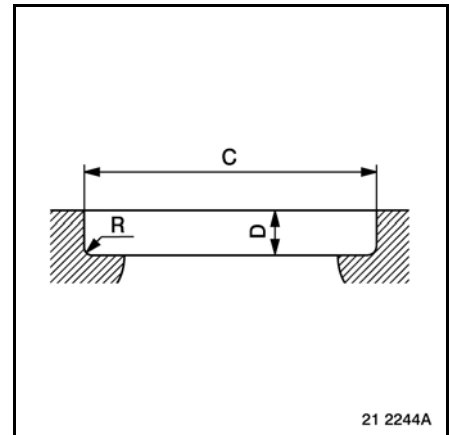
Valve seats**Diameter (A)**

Inlet	42.07 → 42.086 mm
Exhaust	40.06 → 40.076 mm

Height (B)

Inlet	6.71 → 6.79 mm
Exhaust	6.01 → 6.09 mm

Valve seat housings



Diameter (C)

Inlet	42 → 42.025 mm
Exhaust	40 → 40.025 mm

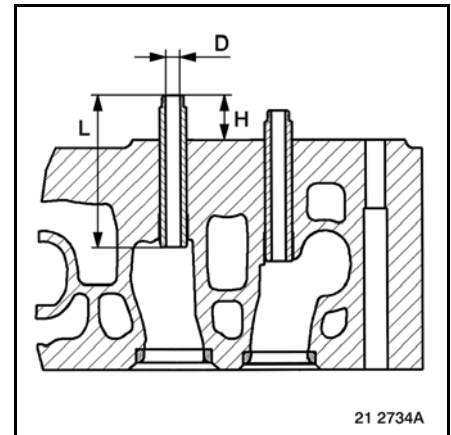
Depth (D)

Inlet	11.37 → 11.63 mm
Exhaust	9.77 → 10.03 mm

Radius (R)

Inlet	0.4 mm
Exhaust	0.4 mm

Valve guides



Length (L)

Inlet	83.2 → 83.5 mm
Exhaust	83.2 → 83.5 mm

Inside diameter (D)

Inlet	8 → 8.015 mm
Exhaust	8 → 8.015 mm

Protrusion (H)

Inlet	23.75 → 25.25 mm
Exhaust	15.75 → 17.25 mm

Clearance between valve stem and valve guide

Inlet	0.025 → 0.054 mm
Exhaust	0.038 → 0.068 mm

Valve springs

Inlet and exhaust valves outer spring

Length uncompressed	73.8 mm
Length under a load of $590^{\pm 40}$ N	58.4 mm
Length under a load of $1150^{\pm 50}$ N	45.3 mm
Maximum solid coil length	39.5 mm

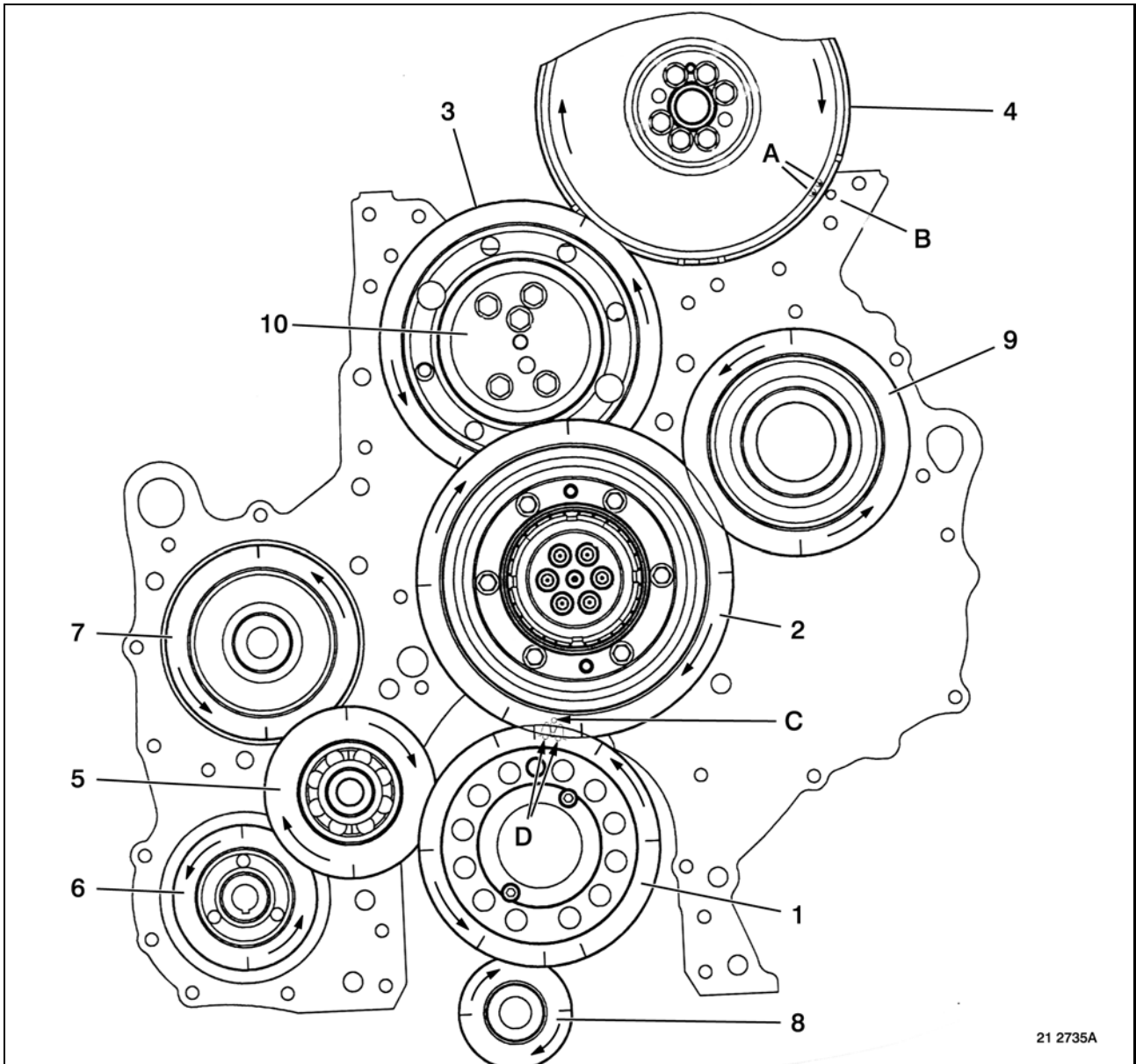
Inlet and exhaust valves inner spring

Length uncompressed	70.5 mm
Length under a load of $328^{\pm 20}$ N	54.4 mm
Length under a load of $630^{\pm 20}$ N	41.3 mm
Maximum solid coil length	36.5 mm

Rocker arms

Bearing play	0.03 → 0.08 mm
Roller play	0.04 → 0.07 mm

Timing



Timing gears

Number of teeth

Crankshaft drive pinion (1)	54
Outer idler gear (2)	72
Inner idler gear (2)	56
Adjustable idler gear (3)	73
Camshaft drive pinion (4)	84
Steering hydraulic pump and air compressor idler gear (5)	37
Steering hydraulic pump and fuel feed pump drive pinion (6)	31
Air compressor drive pinion (7)	42
Oil pump drive pinion (8)	23
Engine PTO drive pinion (9)	-

Play, clearances and diameters

Backlash	0.05 → 0.18 mm
Hub (10) of idler pinion (3) diameter	99.98^{± 0.01} mm
Idler gear (3) bush diameter	104.04^{± 0.01} mm
Idler gear radial play	0.04 → 0.08 mm

Quick timing check: :

The inlet valve of N° 1 cylinder opens by **1.3^{± 0.3} mm** when the flywheel is positioned at **6°** after top dead centre.
See page(s) G-7.

Camshaft

Checking the camshaft timing

See page(s) G-7.




Drive

Pinion

Camshaft bearings

End play	0.04 → 0.24 mm
Number of bearings	7
Main bearing journals diameter	69.97 → 70.00 mm
Out-of-round (with new bearing journals)	< 0.05 mm
Bearing journal diametric wear	< 0.05 mm
Central bearing coaxiality	< 0.12 mm




Repair dimensions

- 0.25 mm		69.72 → 69.75 mm
- 0.50 mm		69.47 → 69.50 mm
- 0.75 mm		69.22 → 69.25 mm

Bearing half-shells

Original thickness	1.92mm
--------------------	--------

Repair dimensions

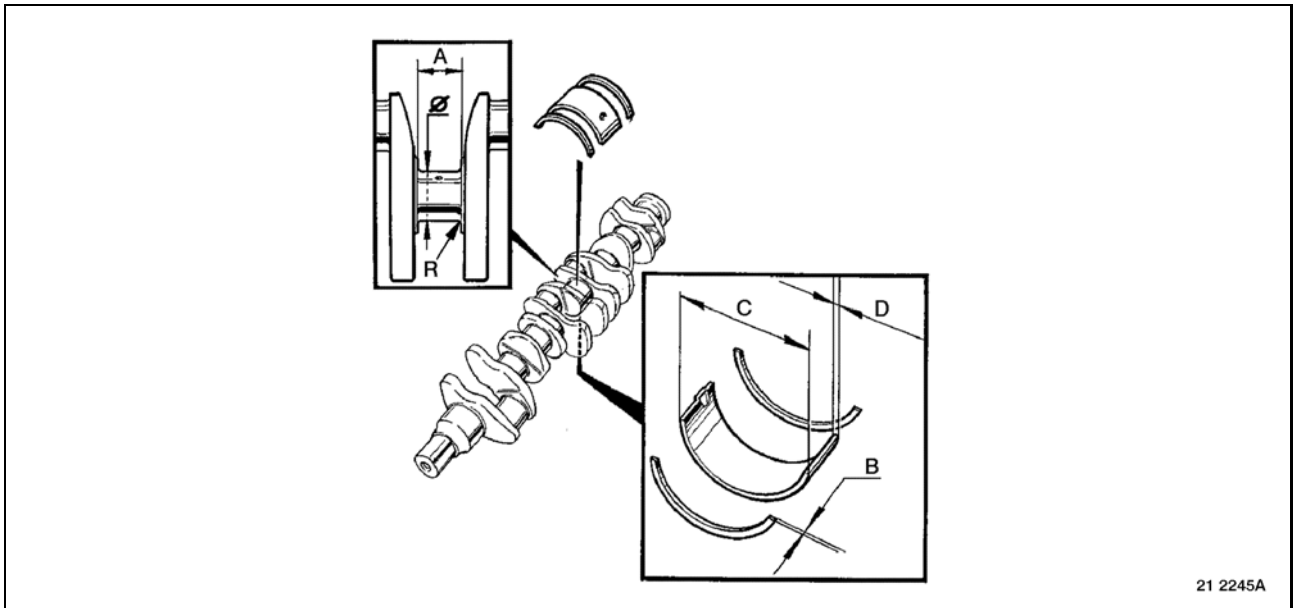
0.25 mm		2.045 mm
0.50 mm		2.17 mm
0.75 mm		2.295 mm

Cams

Valve lift

Inlet	13.1 mm
Exhaust with Optibrake	13.1 mm
Exhaust with exhaust brake	12.0 mm
Cam lobe wear	0.1 mm
Unit pump injector travel	12.99 mm

Crankshaft



Length

1066.5 mm






Crankpins

Diameter (dia.)	107.978 → 108 mm
Maximum out-of-round	< 0.01 mm
Taper	< 0.01 mm
Crankshaft bearing radial play (*)	0.046 → 0.113 mm
Central bearing coaxiality	< 0.15 mm



(*) The play values apply to oiled parts.






Repair dimensions

- 0.25 mm		107.728 → 107.75 mm
- 0.50 mm		107.478 → 107.50 mm
- 0.75 mm		107.228 → 107.25 mm
- 1.00 mm		106.978 → 107.00 mm
- 1.25 mm		106.728 → 106.75 mm
Surface finish (main bearing journal)		Ra 0.25
Surface finish (radius)		Ra 0.4
Fillet radius (R)		4.4 → 4.6 mm

Bearing half-shells

Outside diameter (C)	113 mm
Original thickness (D)	2.487 → 2.497 mm

Repair dimensions

+ 0.25 mm		2.612 → 2.622 mm
+ 0.50 mm		2.737 → 2.747 mm
+ 0.75 mm		2.862 → 2.872 mm
+ 1.00 mm		2.987 → 2.997 mm
+ 1.25 mm		3.112 → 3.122 mm

Central crankpin





Crankshaft end float (*) 0.07 → 0.31 mm



(*) The play values apply to oiled parts.

Original width (A) 41.975 → 42.025 mm





Repair dimensions

+ 0.2 mm		42.175 → 42.225 mm
+ 0.4 mm		42.375 → 42.425 mm
+ 0.6 mm		42.575 → 42.625 mm
+ 0.8 mm		42.775 → 42.825 mm

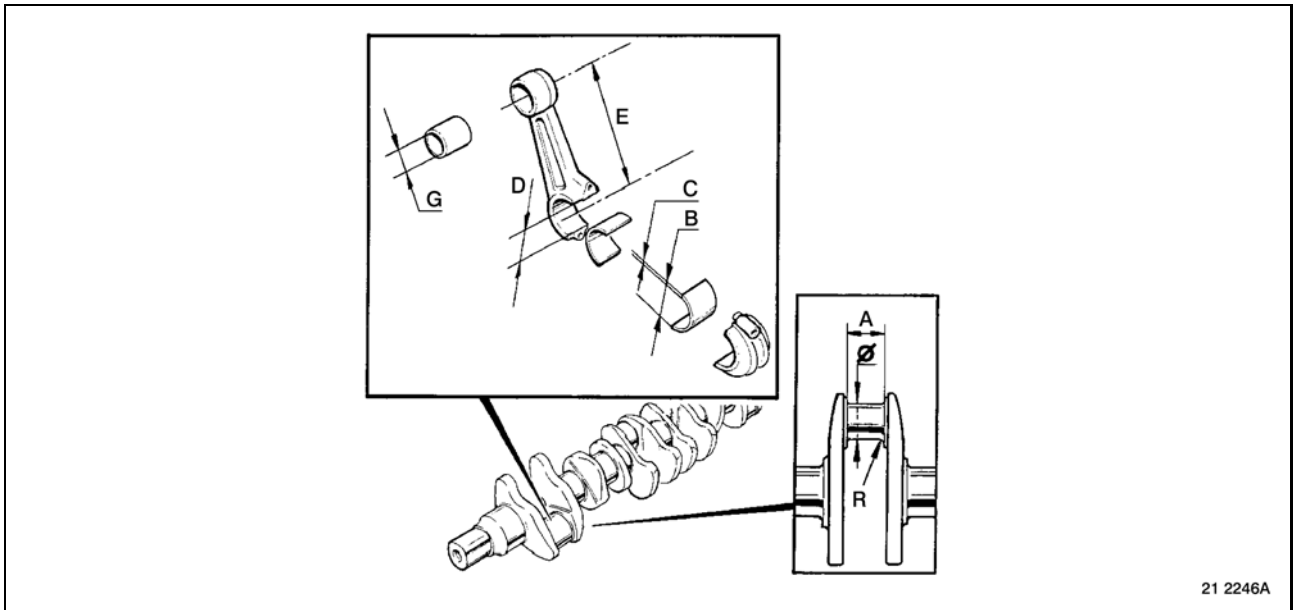
Thrust half-rings

Original thickness (B) 3.14 → 3.21 mm

Repair dimensions

+ 0.1 mm		3.24 → 3.31 mm
+ 0.2 mm		3.34 → 3.41 mm
+ 0.3 mm		3.44 → 3.51 mm
+ 0.4 mm		3.54 → 3.61 mm




Crankpins



21 2246A

Width (A)	53.9 → 54 mm
Diameter (dia.)	85.978 → 86 mm
Maximum out-of-round	< 0.01 mm
Taper	< 0.01 mm

Repair dimensions




- 0.25 mm		85.728 → 85.75 mm
- 0.50 mm		85.478 → 85.50 mm
- 0.75 mm		85.228 → 85.25 mm

Surface finish (crankpin)	Ra 0.25
Surface finish (radius)	Ra 0.4
Fillet radius (R)	4.4 → 4.6 mm

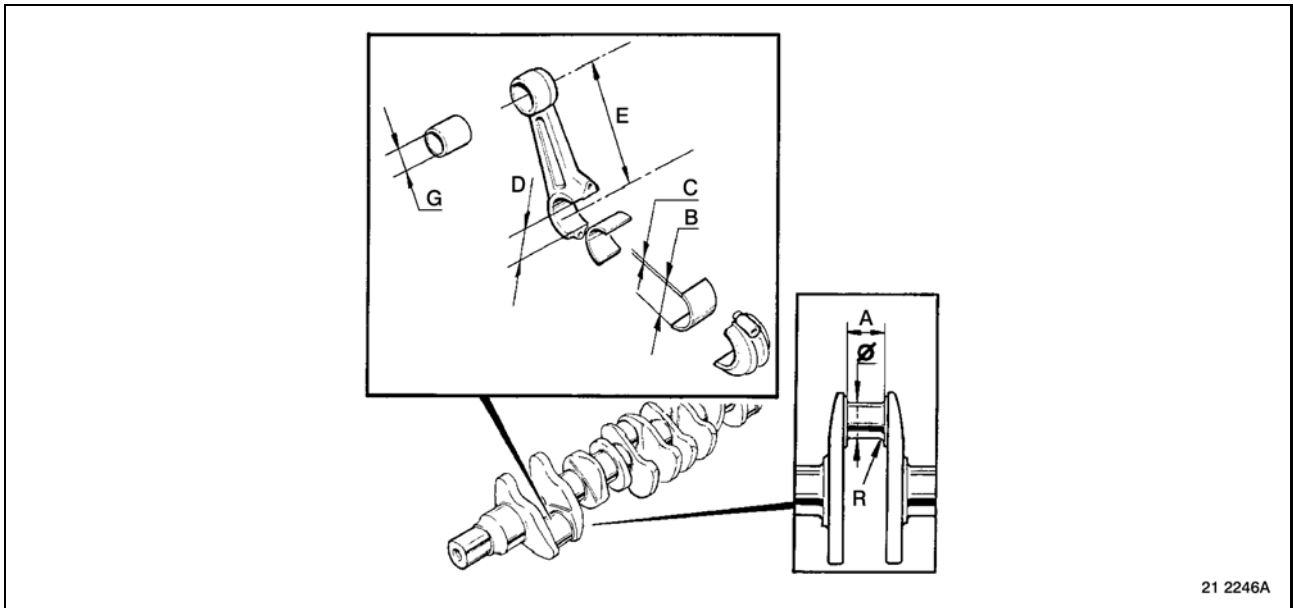
Bearing half-shells

Outside diameter(B)	90.845 mm
Original thickness (C)	2.383 → 2.393 mm

Repair dimensions

+ 0.25 mm		2.508 → 2.518 mm
+ 0.50 mm		2.633 → 2.643 mm
+ 0.75 mm		2.758 → 2.768 mm

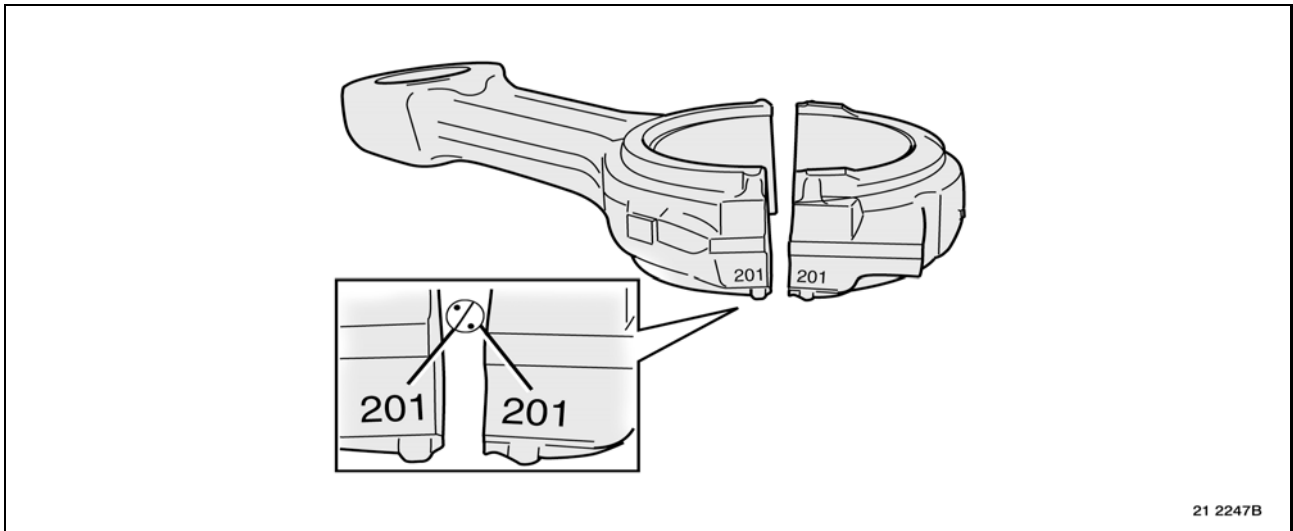
Connecting rod



Between-centres length (E)	224.97 → 225.02 mm
Small end bush inside diameter (G)	54.018 → 54.028 mm
Big end diameter (D)	90.83 → 90.845 mm
Connecting rod / crankshaft end play (*)	0.15 → 0.35 mm
Connecting rod / crankshaft radial play (*)	0.044 → 0.101 mm
Connecting rod / gudgeon pin radial play (*)	0.04 → 0.056 mm
Deviation in straightness over a measuring length of 100 mm	< 0.05 mm
Deviation in twisting over a measuring length of 100 mm	< 0.05 mm



(*) The play values apply to oiled parts.

**Identification marking**

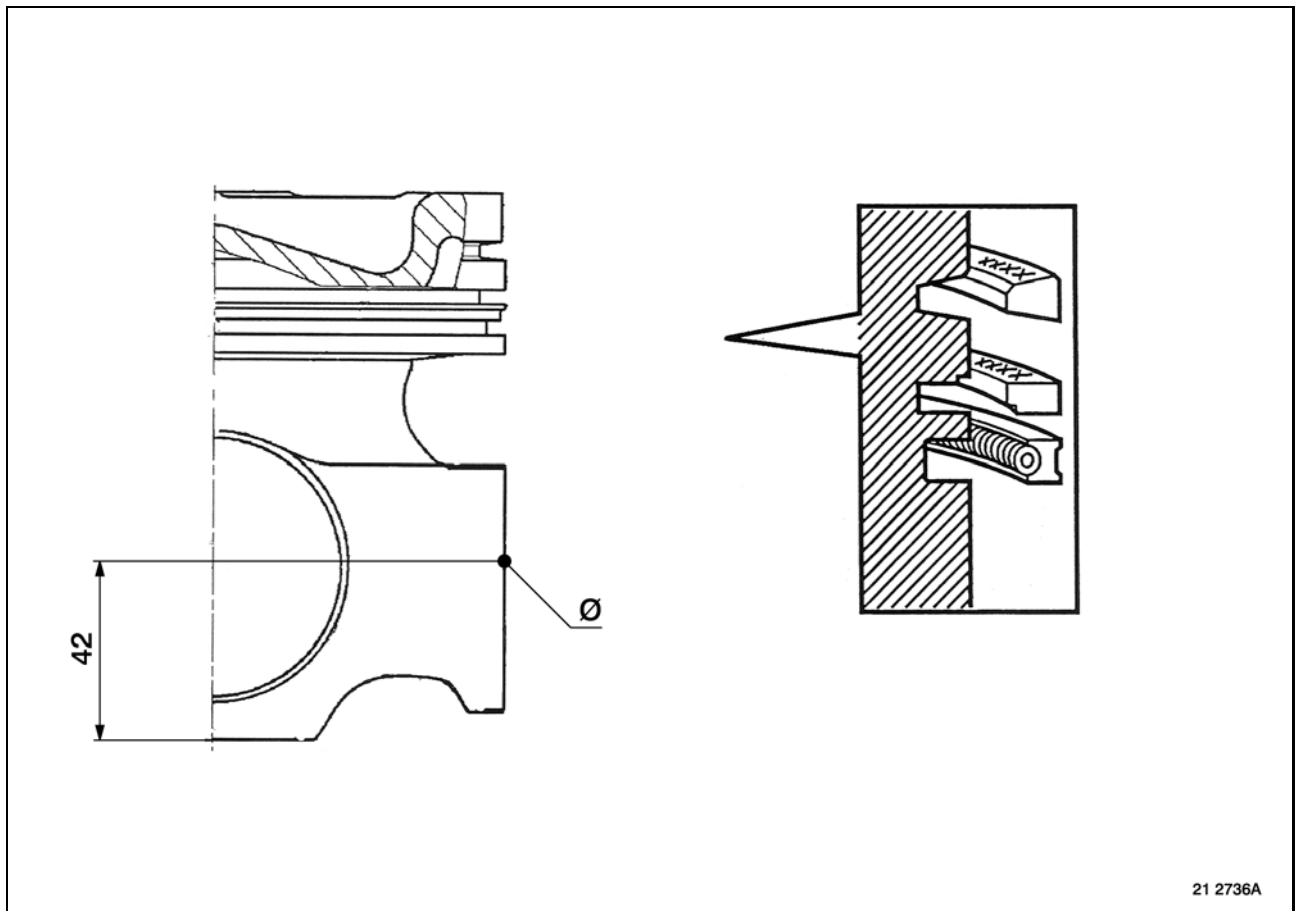
The connecting rod and its cap are paired and marked with a 3-figure identification marking (*).



(*) *With the identification markings opposite one another.*

The marking **FRONT** must be directed towards the front of the engine (N° 1 cylinder).

Pistons



Material	Steel
Nominal diameter	122.954 ^{±0.1} mm
Gudgeon pin diameter	53.972 → 53.978 mm
Combustion chamber diameter	83.6 mm
Combustion chamber depth	17 mm
Protrusion above top face of cylinder block	< 0.514 mm

The marking **FRONT** must be directed towards the front of the engine (N° 1 cylinder).

Piston rings

Designation		Standard dimensions	Max. war dimensions
Gap clearance	Fire ring	- mm	- mm
	Compression ring	0.06 → 0.11 mm	- mm
	Scraper ring	0.06 → 0.11 mm	- mm
Gap clearance	Fire ring	0.4 → 0.55 mm	0.75 mm
	Compression ring	1 → 1.2 mm	1.4 mm
	Scraper ring	0.3 → 0.55 mm	0.75 mm
Thickness	Fire ring	3.0 mm	- mm
	Compression ring	2.47 → 2.49 mm	- mm
	Scraper ring	2.97 → 2.99 mm	- mm

Liners

Type	wet / detachable
Number of watertight seals (black)	2
Number of oiltight seals (violet)	1
Nominal diameter	123 → 123.02 mm
Maximum out-of-round	0.03 mm
Height	249.55 ^{± 0.18} mm
Protrusion above top face of cylinder block	0.14 → 0.21 mm

Cylinder block

Length	967 mm
Maximum flatness defect (top face)	0.06 mm

Engine flywheel

Flywheel installed

Runout (measuring radius: 150 mm)	< 0.2 mm
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Sensors

Flywheel engine speed sensor air gap	1.0 → 2.0 mm
Camshaft speed sensor air gap	0.65 → 1.35 mm

Fuel-injection

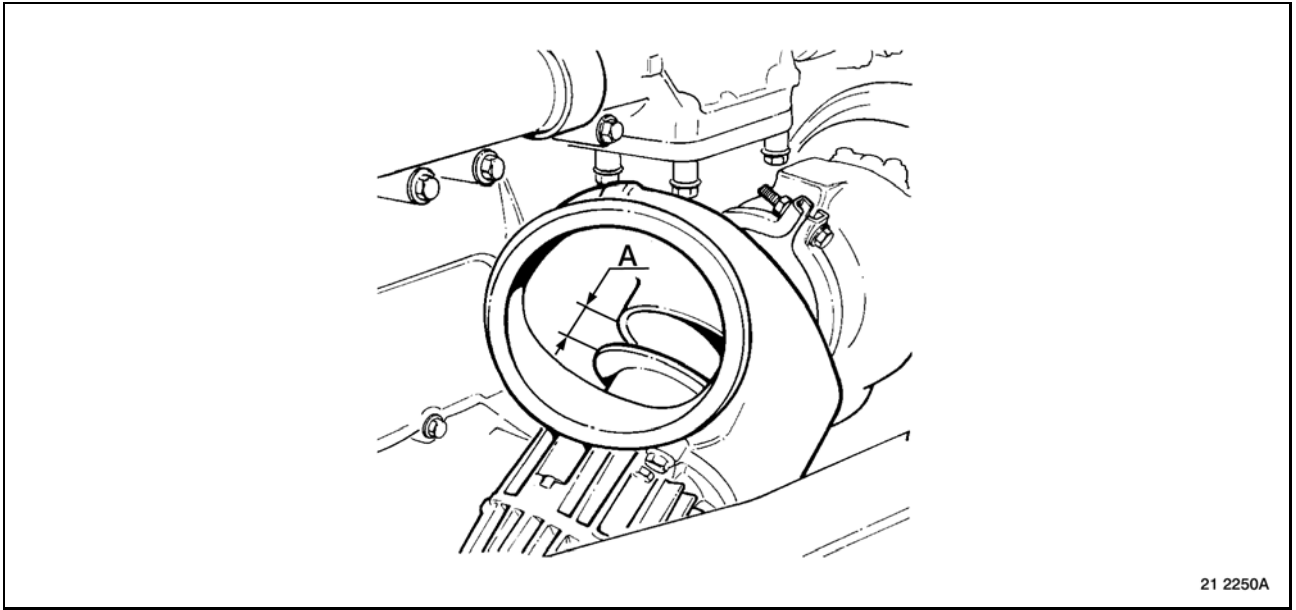
Low pressure fuel circuit

Supply pressure at 600 rpm	≥ 1 bar(s)
Supply pressure at 1200 rpm	≥ 3 bar(s)
Supply pressure at 2200 rpm	≥ 3 bar(s)
Regulation pressure	4 → 5.5 bars

High pressure fuel circuit

Injector protrusion	2.46 → 3.34 mm
Injector pre-travel	0.75 ^{± 0.15} mm

Exhaust pressure regulator (ATR)



Travel of flap (A)

≥ 29 mm

Oil pressure

Lubrication:

forced by gear pump

Oil pressure, main rail

Engine speed in rpm	Temperature in °C	Pressure in bars
600	100	2
> 1100	100	2.5 → 6.0

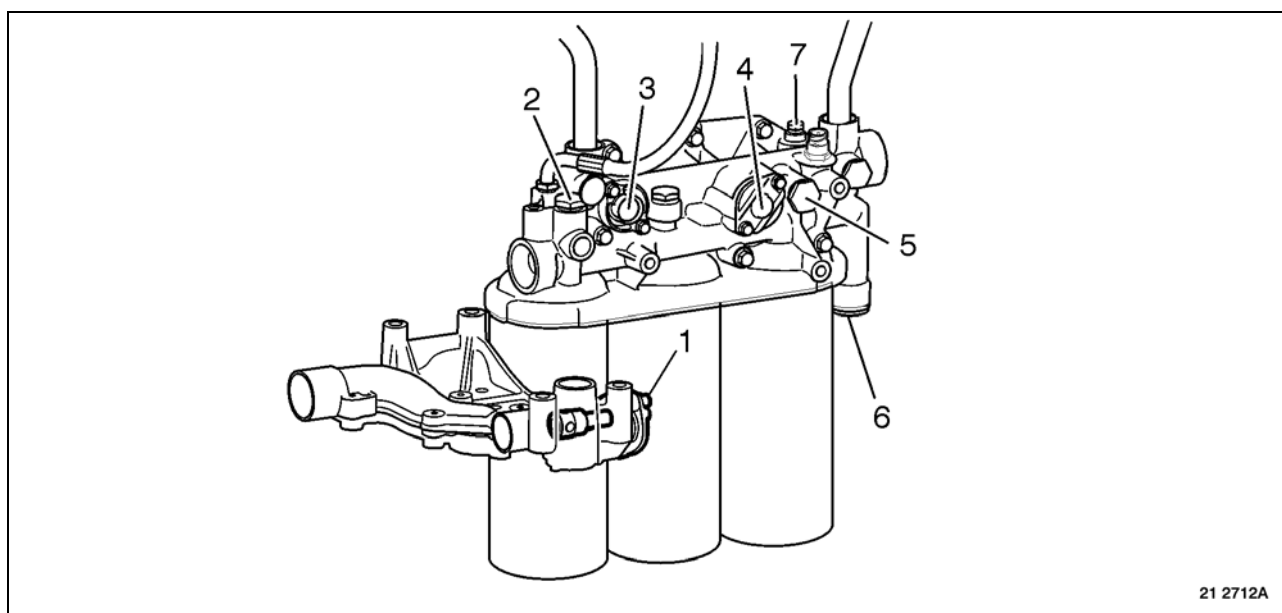
Oil pressure, rocker shaft

Engine speed in rpm	Temperature in °C	Pressure in bars	
		Optibrake retarder activated	Optibrake retarder disabled
600	100	1.7 → 2	1.2
> 1100	100	3.4 → 3.5	1.2

Oil: specifications and operating temperatures (see Driving & Servicing handbook).

Oil capacity: (see Driving & Servicing handbook).

Pressure and full flow valves



Item	Valve type	Identification	Spring length	
			No-load	Full load
(1)	Safety valve (pressure limitation)	Violet	-	-
(2)	By-pass filter by-pass valve	-	69 mm	40 mm for 13 → 15 N
(3)	Oil cooler by-pass valve	124	-	-
(4)	Pressure reducing valve	Blue	-	-
(5)	Full flow filter by-pass valve	-	69 mm	40 mm for 13 → 15 N
(6)	Pistons cooling opening valve	-	122 mm	63 mm for 95 N
(7)	Pistons cooling pressure regulation valve	-	122 mm	84 mm for 60 N

TOOLS

Generalities

RENAULT TRUCKS divides tools into three categories:

- **General-purpose tools:** proprietary tools
 - **50 00 26 reference number** (possibility of purchasing through the RENAULT TRUCKS Spare Parts department).
 - **4-figure reference number** (tools classified by RENAULT TRUCKS but available from the supplier).
- **Special tools:** specifically created tools distributed by the RENAULT TRUCKS Spare Parts Department
 - To be ordered according to the reference numbers appearing in the list of tools on the following pages.
- **Locally manufactured tools:**
 - **4-figure reference number** (represented by a drawing): tools that are simple to make without need for special qualification.

Three levels (or echelons) determine their assignment:

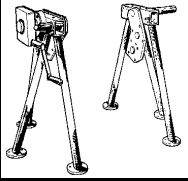
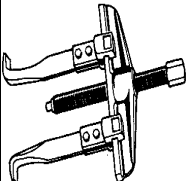
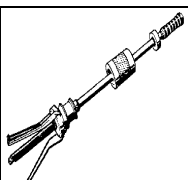

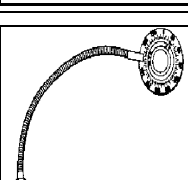

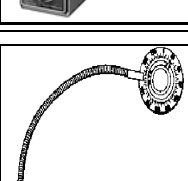
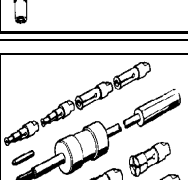
- **Level 1:** tools for servicing, maintenance and minor tasks
- **Level 2:** tools for major repairs
- **Level 3:** tools for refurbishment

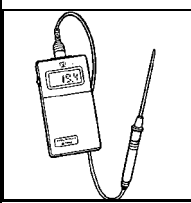
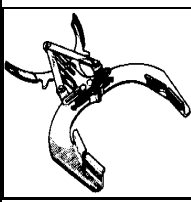
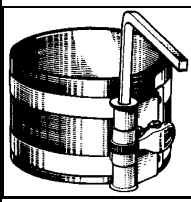


*Proprietary tools mentioned in this manual do not appear in the tools list.
These tools are identified in the standard tools manual (MO) by a 4-figure number.*

LIST OF TOOLS


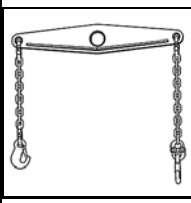
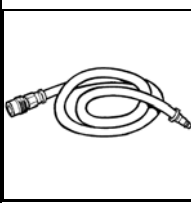
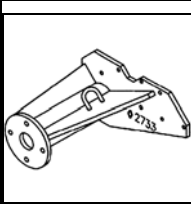
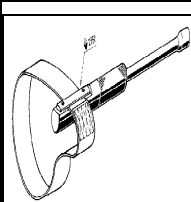
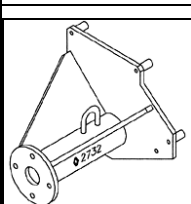
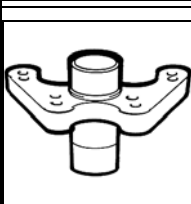
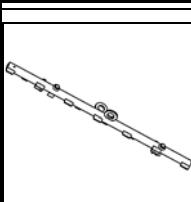
General-purpose tools


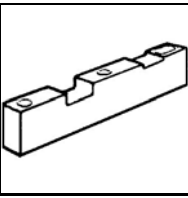
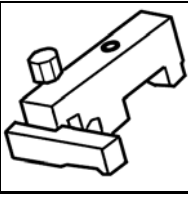

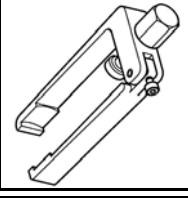
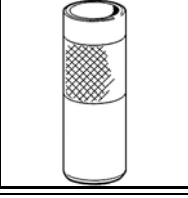
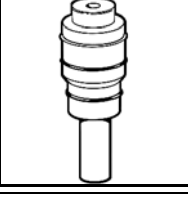

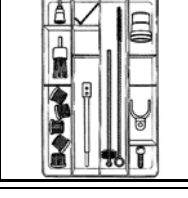
Illustration	RENAULT TRUCKS Ref.	Designation	Manufacturer reference	Manufacturer code	Level	Qty
	5000261000	Universal stand			1	1
	5000260857	Puller			1	1
	5000260834	Puller			1	1
	5000269804	Strap			1	1
	5000269776	Angular dial			1	1
	9661	Dial gauge + magnetic foot		AQ	1	1
	5000269777	Angular dial			1	1
	5000262740	Puller			2	1


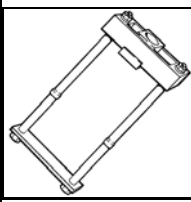
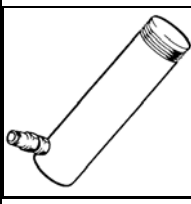
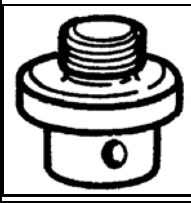
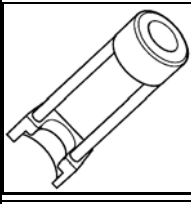
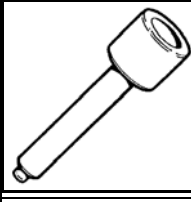
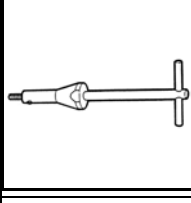
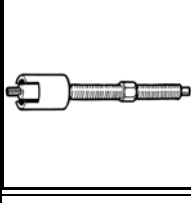
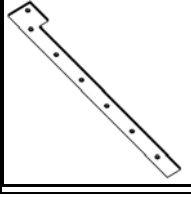
	50 00 26 9675	Thermometer	APPA 51 + 80110	AL	1	1
	5000260825	Piston ring clamp			2	1
	5000260824	Piston ring clamp			2	1

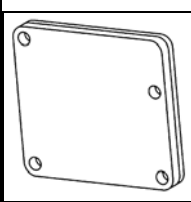
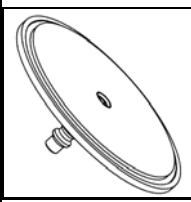
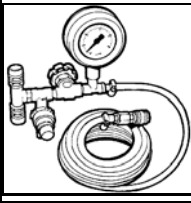
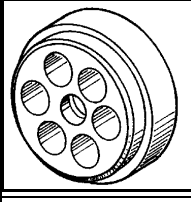
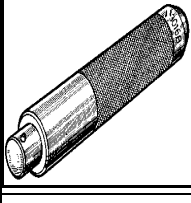
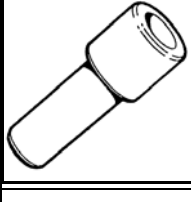
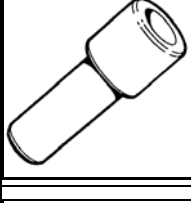
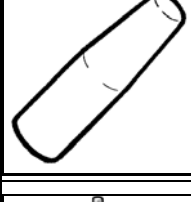
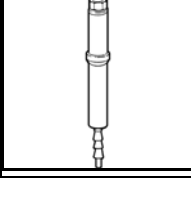
AQ	BROWN SHARP ROCH					
	13-15 avenue Georges de la Tour BP 45					
	54303 LUNEVILLE CEDEX				FRANCE	
	☎ 03 83 76 83 76			☎ 03 83 74 13 16		
AL	CHAUVIN ARNOUX					
	190 rue Championnet					
	75890 PARIS CEDEX 18				FRANCE	
	☎ 01 44 85 44 85			☎ 01 46 27 73 89		

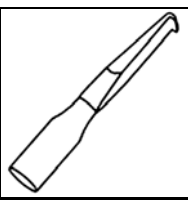
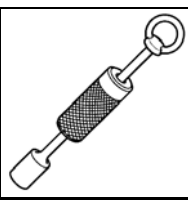
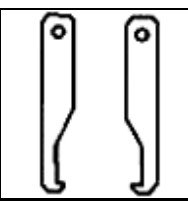

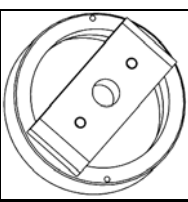
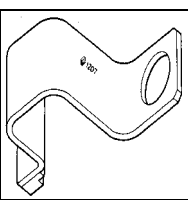
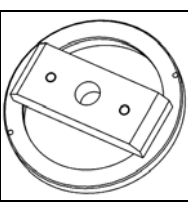
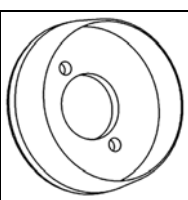
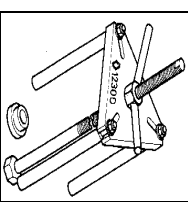
Special Tools

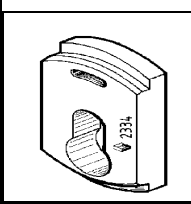
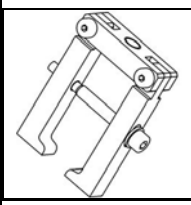
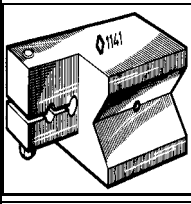
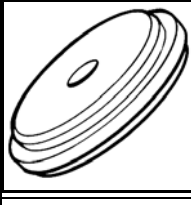

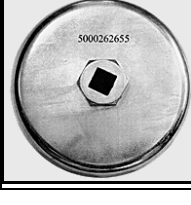
Illustration	RENAULT TRUCKS Ref.	Designation	Manufacturer reference	Manufacturer Code	Level	Qty
	740998547	Engine lifting beam			1	1
	7409990115	Lifting chain			1	1
	7409996049	6-cylinder block drainage union			1	1
	5000262733	Engine oil filter side bracket for stand 1000			1	1
	5010262595	Filter strap wrench			1	1
	5000262732	Engine bracket for stand 1000			1	1
	7409996956	Engine cranking bar			1	1
	7409990185	Lifting tool			1	1

	7409998511	Lever			1	1
	7409998601	Cylinder head positioning tool			1	1
	7409998389	Press			1	1
	7409990013	Inertia weight			2	1
	7409990006	Puller			1	1
	7409998249	Unit injector protection sleeve			1	6
	7409998251	Fuel injector blanking plug			1	6
	7409998250	Blanking plug			1	2
	7409998599	Cleaning kit			1	1

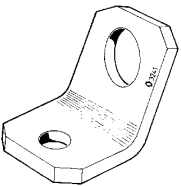
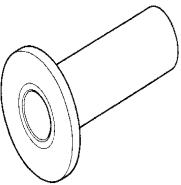
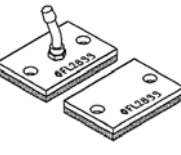
	7409809726	Hydraulic pump			2	1
	7409990176	Press tool			1	1
	7409809729	Jack			2	1
	7409996159	Adapter			2	1
	7409998246	Mandrel			2	1
	7409998263	Pusher			1	1
	7409998252	Tapping tool			1	1
	7409998253	Puller			1	1
	7409990105	Cylinder head sealing plate			1	2

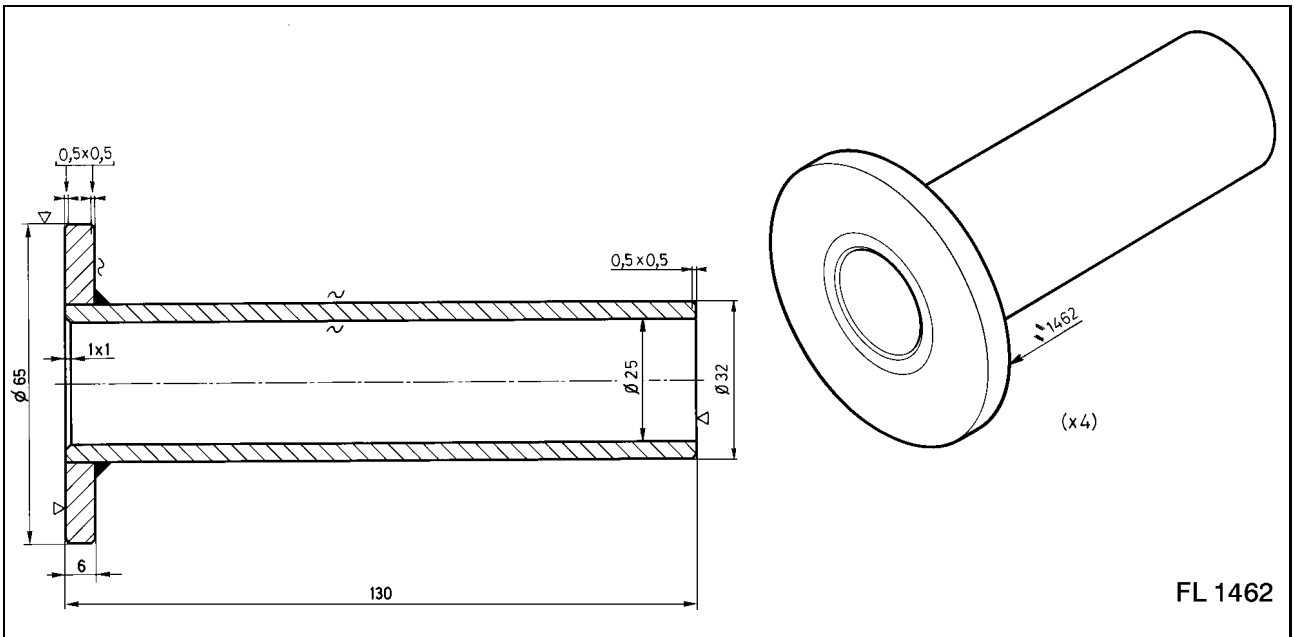
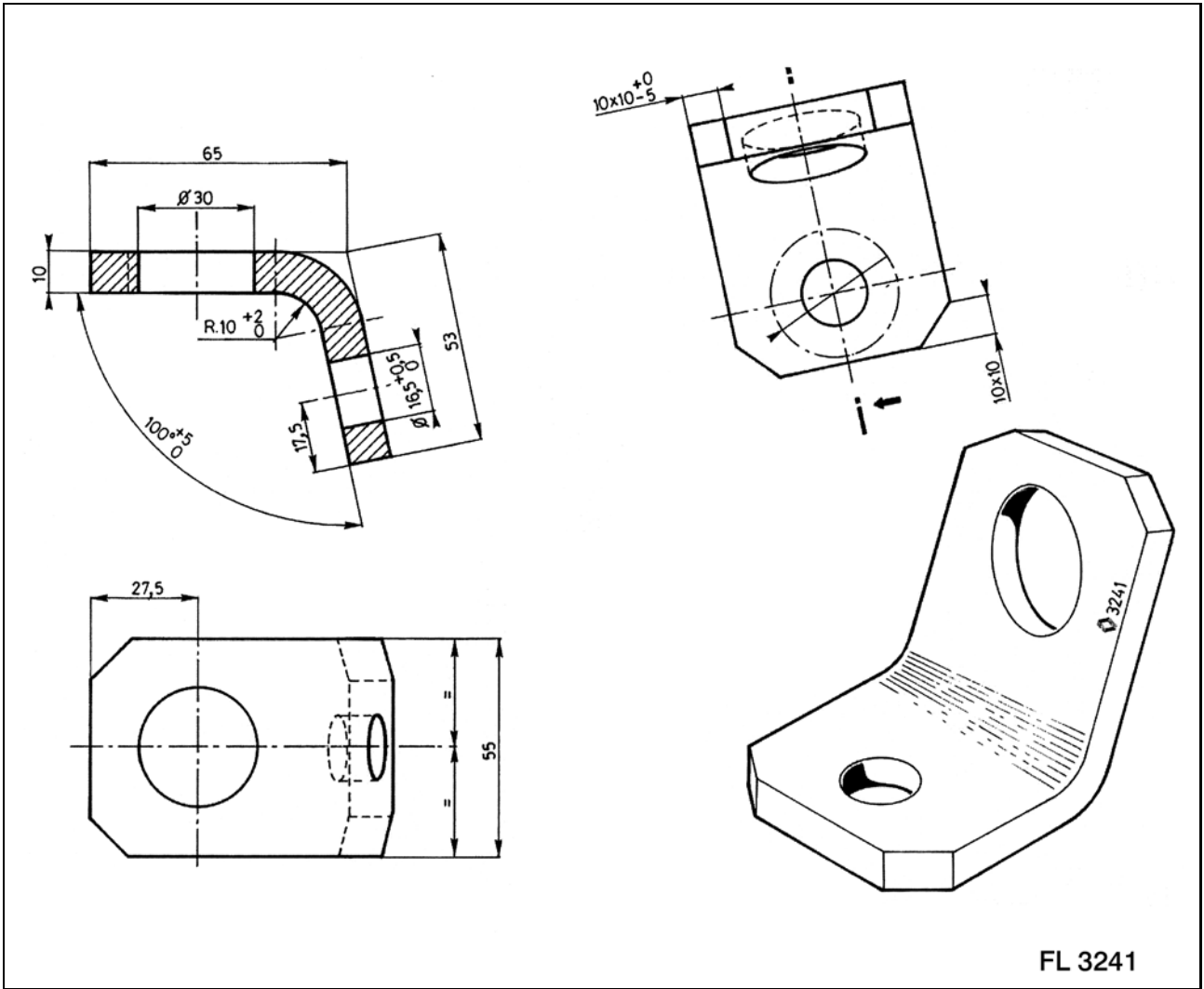
	7409990106	Cylinder head sealing plate			1	1
	7409990107	Cylinder head plug			1	1
	7409996662	Pressure reducer			1	1
	5000262363	Set of pushers			1	1
	5000263016	Handle			1	1
	7409990049	Pusher			2	1
	7409990050	Pusher			2	1
	7488800011	Press fitting cone			2	1
	7409998688	Opening out tool			2	1

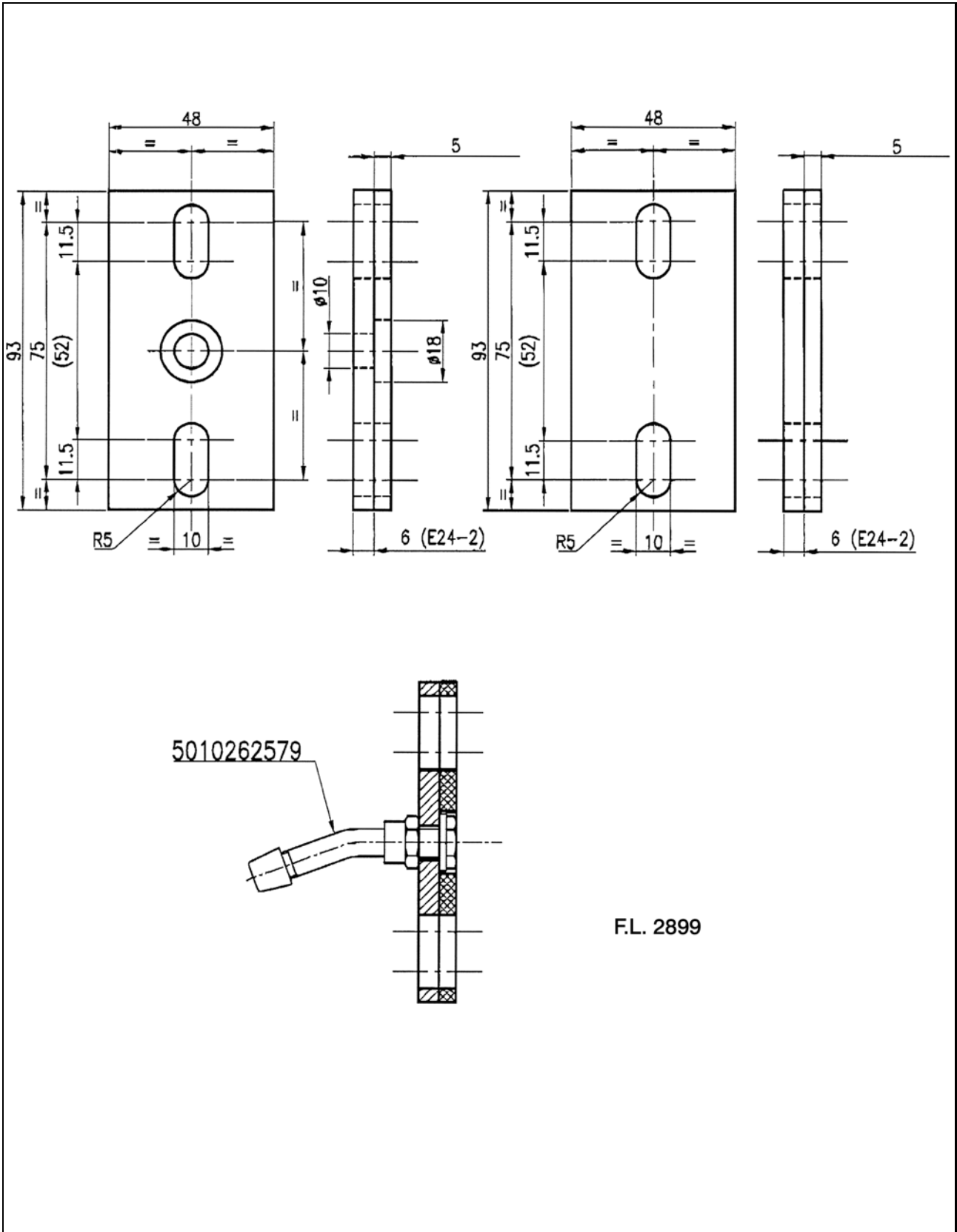
	7409990192	Puller			1	1
	7409996400	Puller			1	1
	7409996401	Front plate arm			2	2
	7409992000	Mandrel			1	1
	7488800021	Pusher			1	1
	5000261207	Hook			1	1
	7409990113	Pusher			1	1
	7409990117	Cone			1	1
	5000261230	Puller			2	1

	5000262334	Flange			2	1
	7409990114	Puller			2	1
	5000261141	Dial gauge support			2	1
	7409996599	Pusher			2	1
	7409996454	Pusher			2	1
	5000262655	Filter wrench			1	1

Locally manufactured tools

Illustration	RENAULT TRUCKS Ref.	Designation	Manufacturer reference	Manufacturer code	Level	Qty
	3241	Hook			1	1
	1462	Spacer			1	3
	2899	Blanking plugs			2	1





CONSUMABLE PRODUCTS

Lubricants

Consumables and oil capacity: (see Driving & Servicing Handbook).

Coolant

Coolant ingredients and capacity: (see Driving & Servicing Handbook).

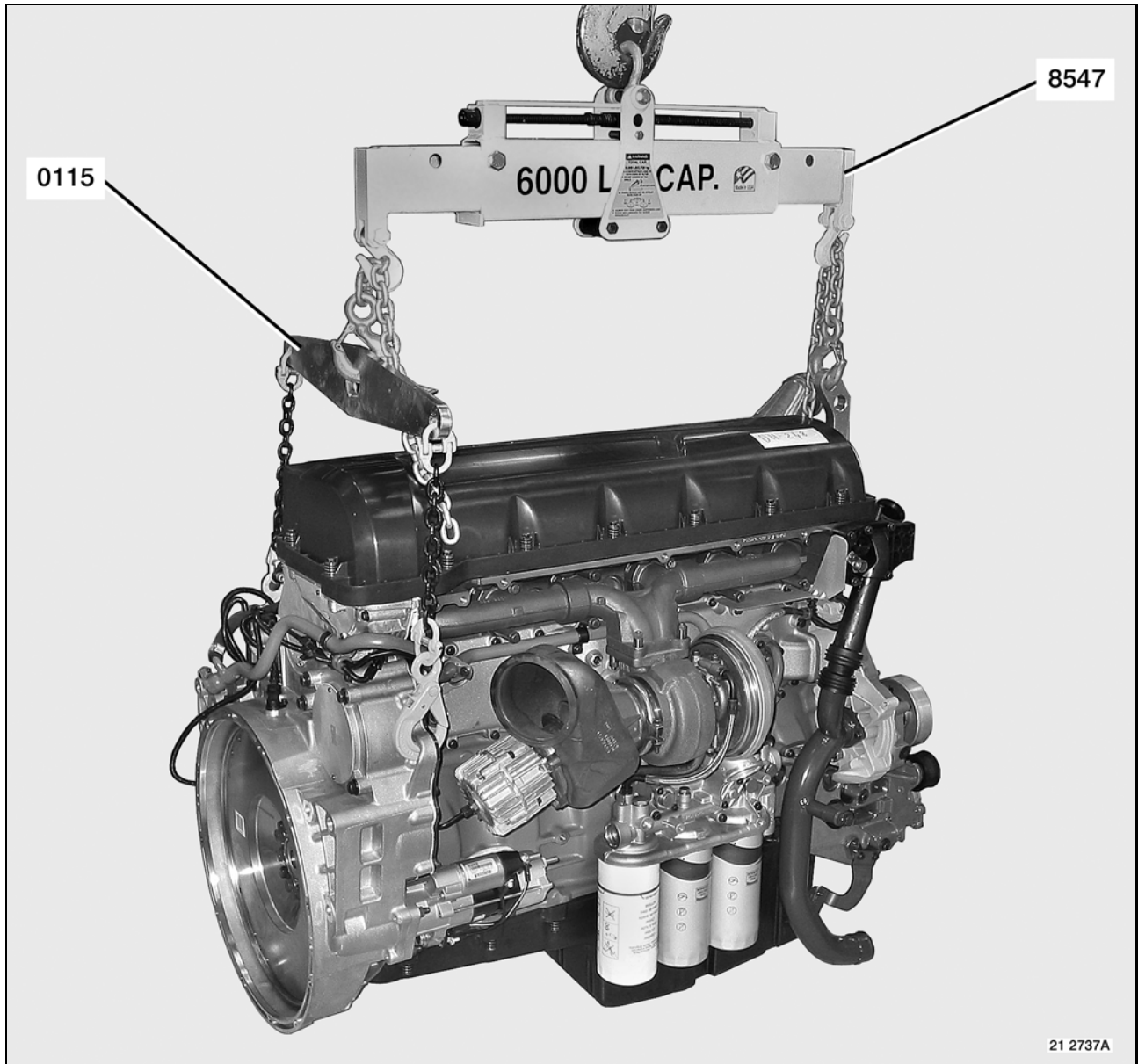
LIST OF CONSUMABLES

Automotive reference	Industrial reference
CAF 44	SILICONE SEALANT CAF 44

STRIPPING AND MOUNTING ON STAND

Handling

Lifting the engine



Lift the engine.
Use tool **8547 + 0115**

Drive belt(s)

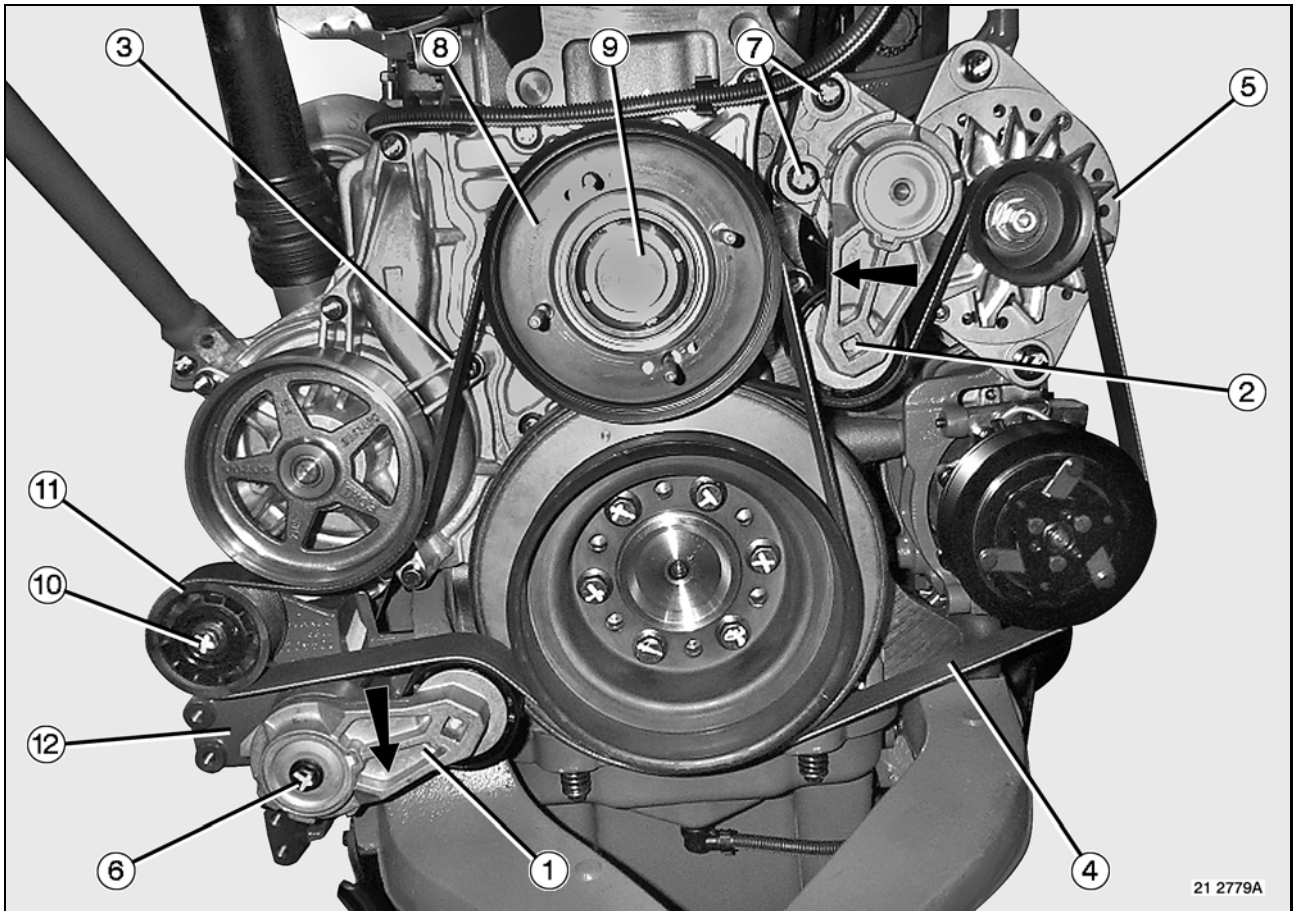
Removal / Fitting

Removal

Remove the viscous coupling / fan assembly.



It is vital to keep the viscous coupling in a vertical position during its storage.



21 2779A

Using a wrench fitted with a 1/2 inch square socket , compress automatic tensioner roller spring (1).
Remove drive belt (3).



Gradually release the automatic tensioner roller (1).

Remove pulley (8).

Using a wrench fitted with a 1/2 inch square socket , compress automatic tensioner roller spring (2).



Gradually release the automatic tensioner roller (2).

Remove drive belt **(4)**.
Remove alternator **(5)**.
Remove bolt **(6)**.
Remove tensioner roller **(1)** from its bracket.
Remove bolts **(7)**.
Remove tensioner roller **(2)** complete with bracket.
Remove hub **(9)**.
Remove bolt **(10)**.
Remove jockey pulley **(11)**.
Remove bracket **(12)**.

Fitting

To fit, proceed in the reverse sequence to removal.
Tighten to torque.
See pages B-5-22, B-5-26, B-5-26.

Stand 1000

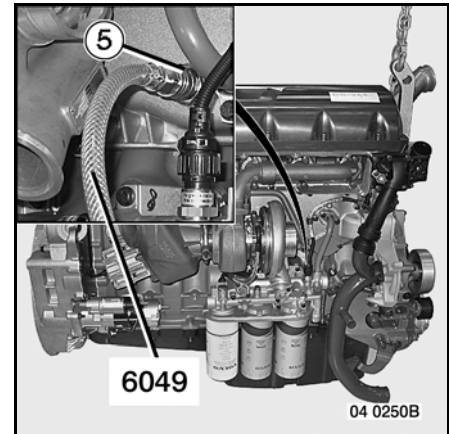
Mounting

Put a drain pan into place.
 Drain the oil from the engine.
 Drain the cylinder block.
 Use tool **6049**.

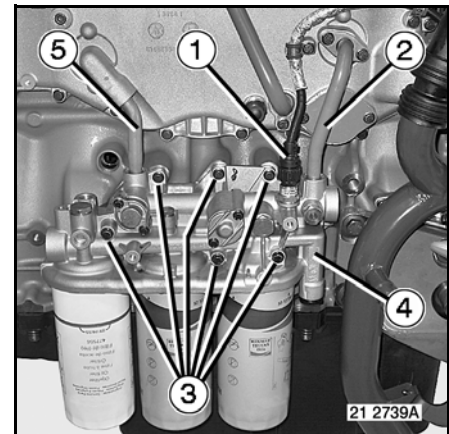
Mounting on stand N° 1000

Right-hand side

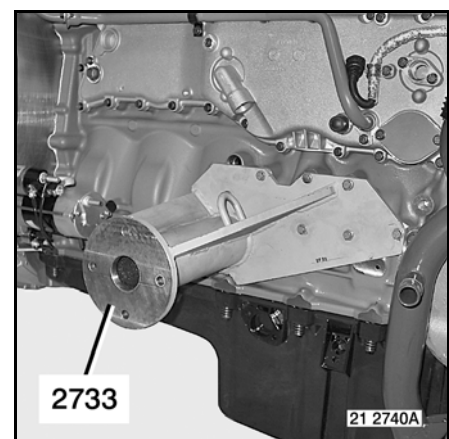
Remove the exhaust manifold.
 See page(s) E-4-1.



Unplug connector **(1)**.
 Remove tube **(2)**.
 Put a drain pan into place.
 Remove securing nuts and bolts **(3)**.
 Remove oil filter/bracket unit **(4)**.
 Remove tube **(5)**.

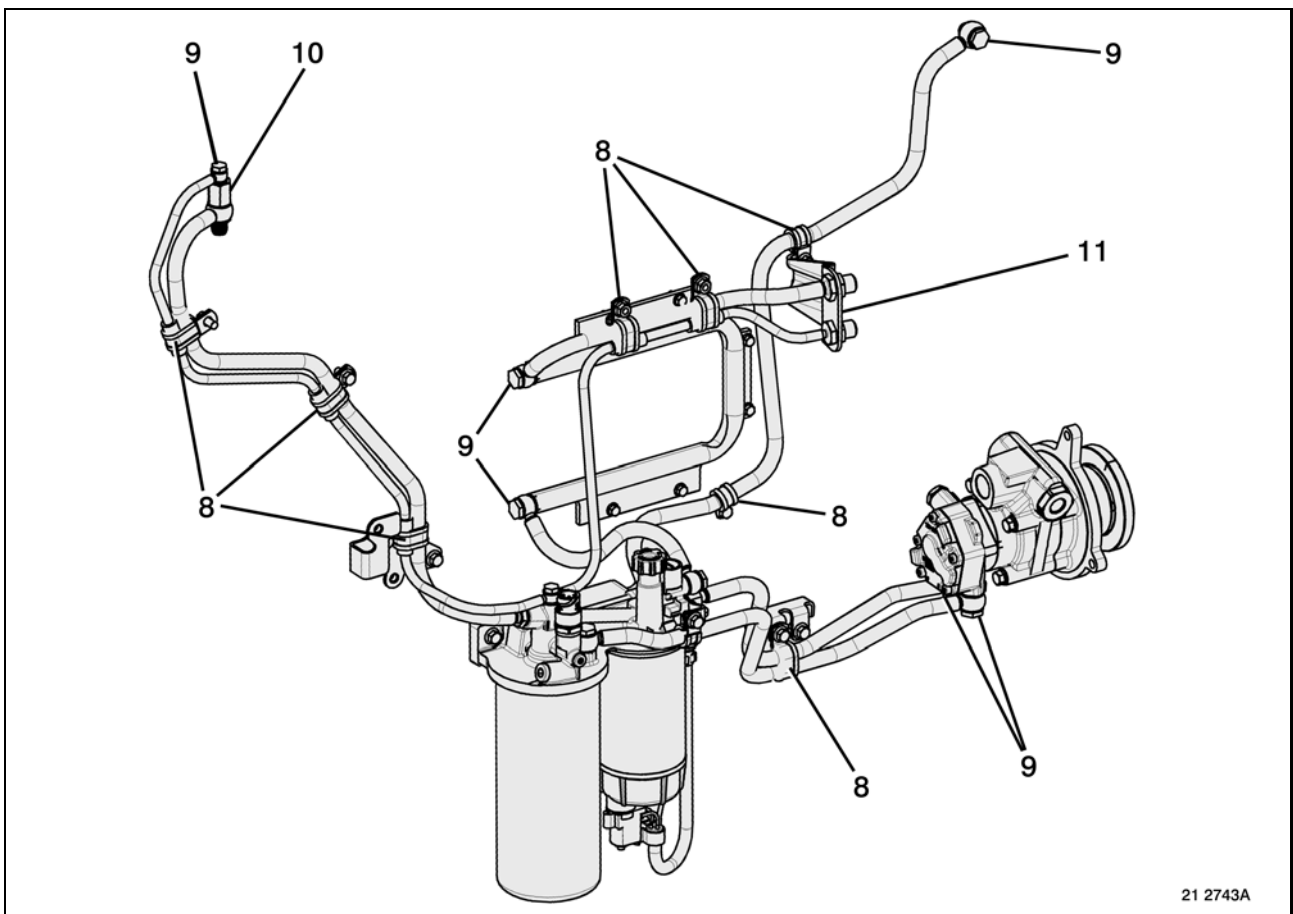
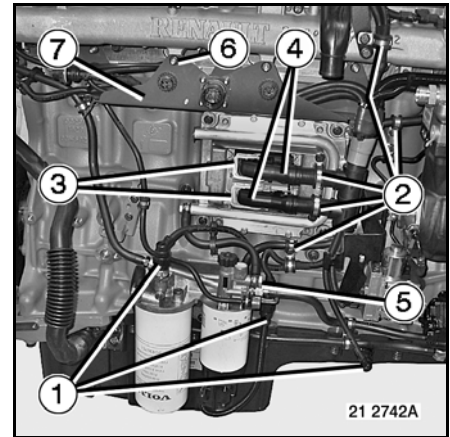


Mount tool **2733**.
 Tighten tool **2733** to a torque of 24 ± 4 Nm.



Left-hand side

- Unplug connectors (1).
- Remove clamps (2).
- Pull out catches (3) and unplug connectors (4).
- Remove connector (5).
- Remove nuts (6).
- Disengage connection sockets bracket (7).



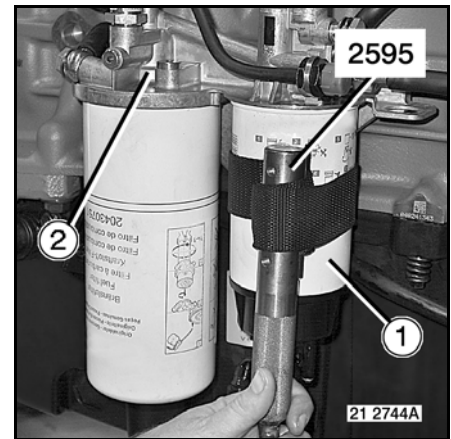
- Remove clamps (8).



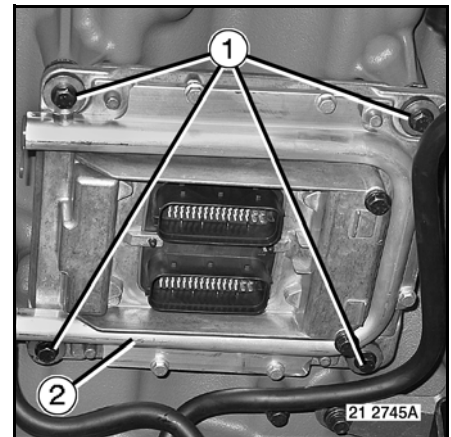
Install clean blanking plugs in all the openings in the fuel system.

- See page(s) A-5.
- Remove banjo unions (9).
- Remove scavenge valve (10).
- Remove bracket (11).

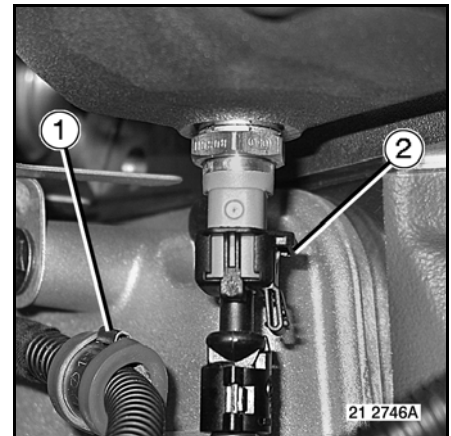
- Put a drain pan into place.
 Remove the fuel prefilter (1).
 Use tool **2595**.
 Remove the filter bracket/filter assembly (2).



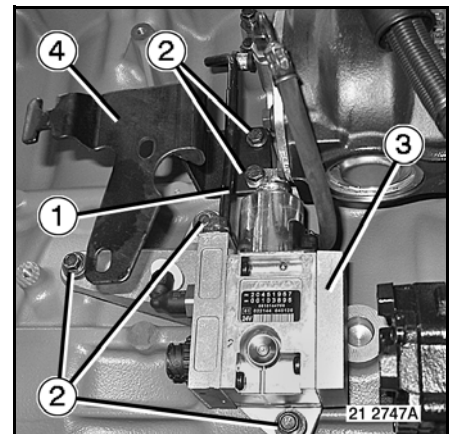
- Remove securing nuts and bolts (1).
 Remove engine control unit **EECU** (2).



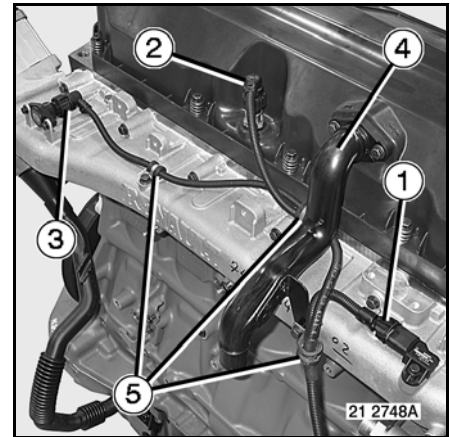
- Remove clamp (1).
 Disconnect coolant temperature sensor (2).



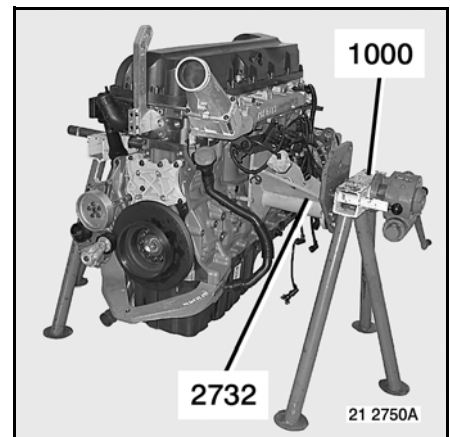
- Disconnect air pipe (1).
 Remove securing nuts and bolts (2).
 Remove exhaust brake control electrovalve (3).
 Remove bracket (4).



- Disconnect boost pressure sensor (1).
- Disconnect oil sump overpressure sensor (2).
- Disconnect engine stop button (3).
- Remove breather (4).
- Remove clamps (5).



- Mount tool 2732.
- Tighten tool 2732 to a torque of $24^{\pm 4}$ Nm.
- Fasten the engine to stand N° 1000.



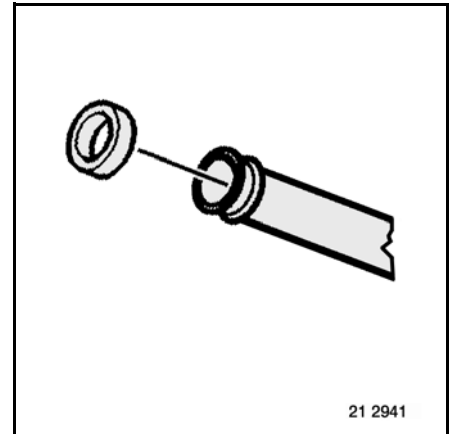
Fitting

Proceed in the reverse sequence to removal.
Replace seals.



To facilitate the assembly of this type of seal in its housing, mount it on the fitting tube and lubricate the outside with engine oil if it is a green or violet seal or with engine coolant if it is a black seal.

Tighten to torque.
See pages B-5-25, B-5-20, B-5-21, B-4-1.
Fit the exhaust manifold.
See page(s) E-4-1.



Exhaust manifold

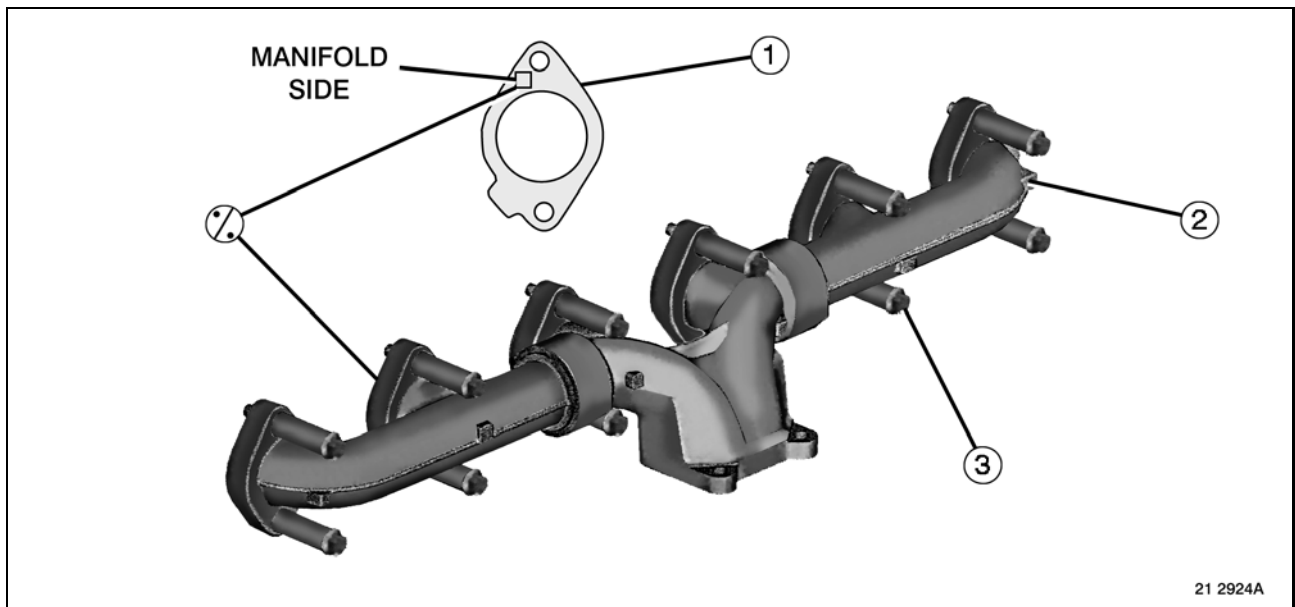
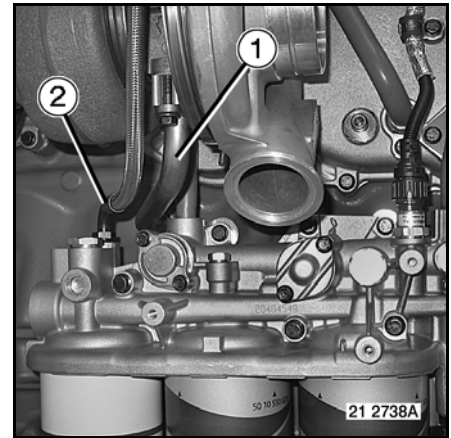
Removal / Fitting

Removal

Disconnect flexible oil pipe (2).

Remove oil return pipe (1).

Remove the exhaust manifold unit with the turbocharger .



Fitting

Install bolts **(3)** in locations.

Fit new gaskets **(1)**.

Ensure the marking.

Fit exhaust manifold **(2)**.

Tighten bolts **(3)** to torque.

See page(s) B-5-5.

For the rest of the fitting operations, proceed in the reverse sequence to removal.

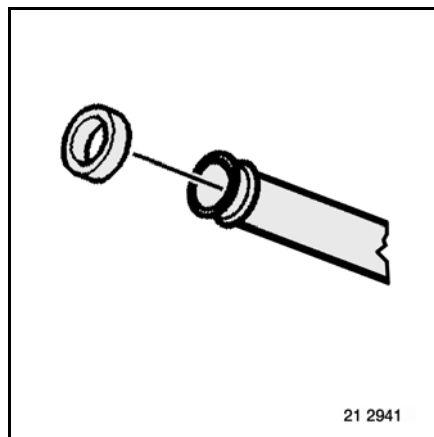
Replace seals.

Tighten to torque.

See page(s) B-5-21.



To facilitate the assembly of this type of seal in its housing, mount it on the fitting tube and lubricate the outside with engine oil if it is a green or violet seal or with engine coolant if it is a black seal.

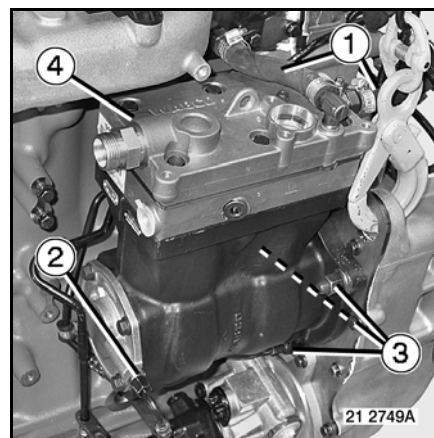


Air compressor

Removal / Fitting

Removal

- Disconnect hoses (1).
- Unscrew connector (2).
- Remove nuts (3).
- Remove compressor (4).
- Remove lube tube.



Fitting

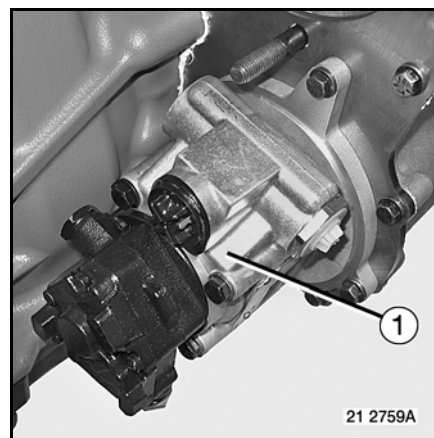
- To fit, proceed in the reverse sequence to removal.
- Replace O-ring with a new O-ring.
- Tighten nuts (3) to torque.
- See page(s) B-5-23.

Steering pump

Removal / Fitting

Removal

Remove power-assisted steering pump (1).



Fitting

To fit, proceed in the reverse sequence to removal.

Replace O-ring with a new O-ring.

Tighten the bolts to torque.

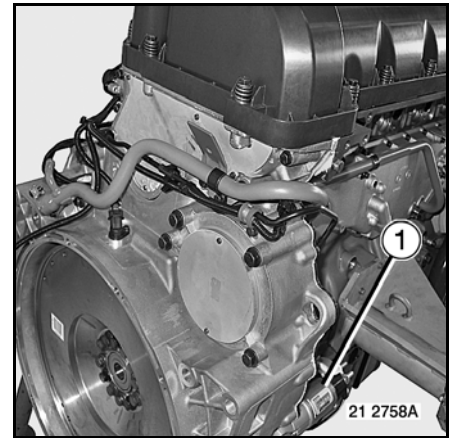
See page(s) B-5-23.

Starter

Removal / Fitting

Removal

Remove starter motor (1).



Fitting

To fit, proceed in the reverse sequence to removal.
Tighten the bolts to torque.
See page(s) B-5-26.

CYLINDER HEAD

Camshaft

Removal

Disconnect engine speed sensor (1).

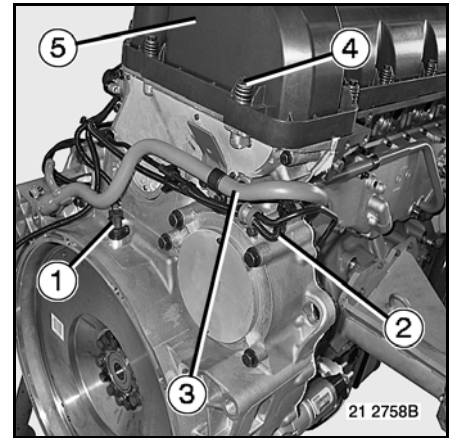
Disconnect camshaft speed sensor (2).

Remove tube (3).

Remove securing bolts (4) from cylinder head cover (5) proceeding in the reverse sequence to tightening.

See page(s) B-5-5.

Remove cylinder head cover (5).

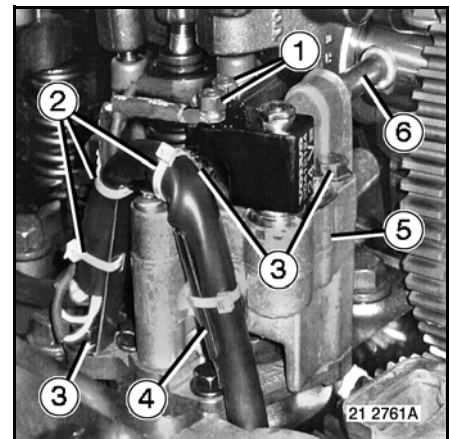


Remove nuts (1) from the connection terminal.

Remove clamps (2).

Remove bolts (3).

Remove wiring harness bracket (4), Optibrake retarder control valve (5) and tube (6).

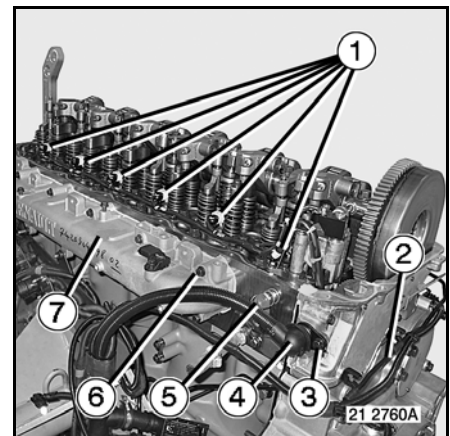


Disconnect fuel injectors (1).

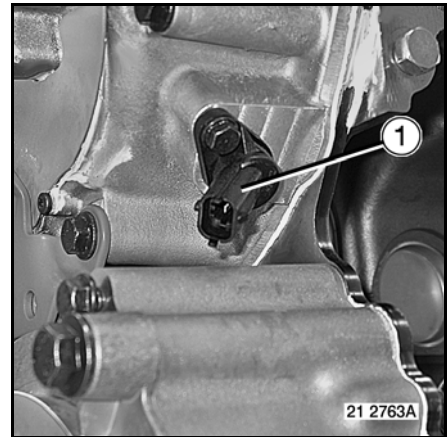
Remove ATR air supply pipe (2).

Remove setscrew (3) and disengage grommet (4).

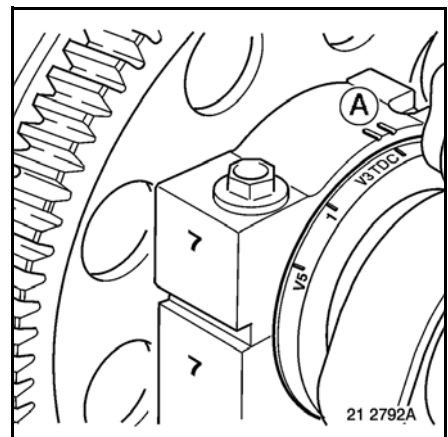
Remove wiring harness (5).



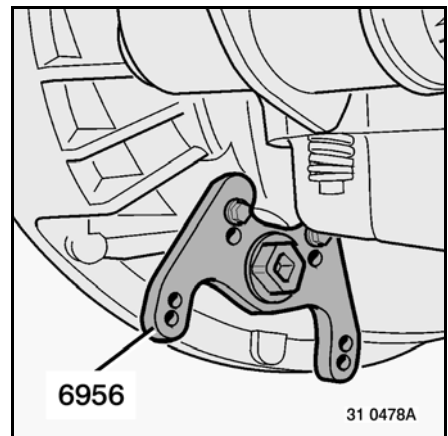
Remove camshaft speed sensor (1).



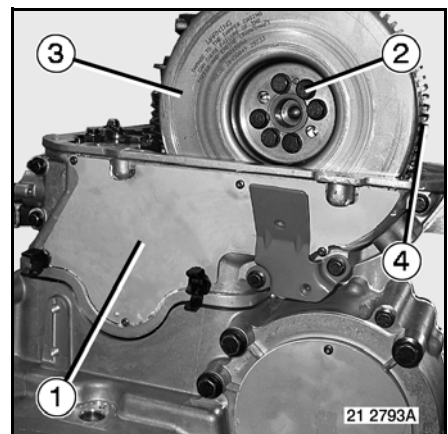
Position the crankshaft with N° 1 cylinder at TDC.
Line up marks (TDC) and (A).



Use tool 6956.

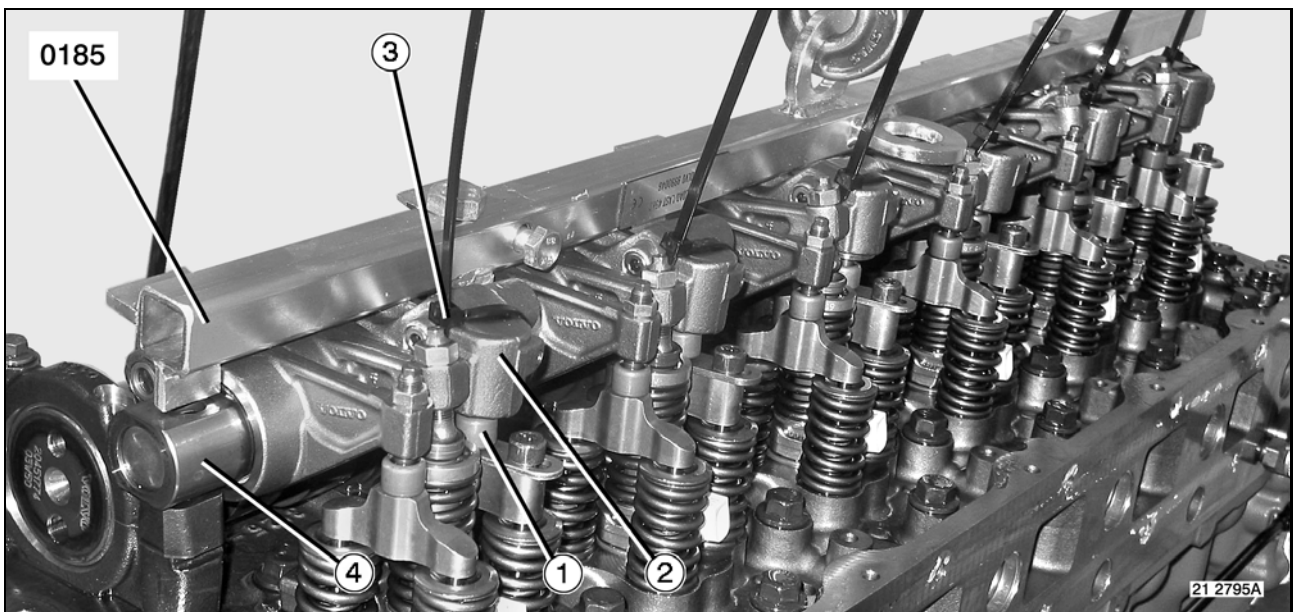
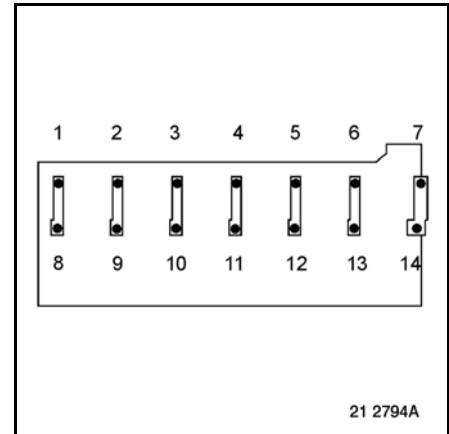


Remove casing (1).
Remove bolts (2) proceeding in the reverse sequence of tightening.
See page(s) B-5-16.
Remove vibration damper (3) and camshaft pinion (4).



Remove the rocker shaft and camshaft bearing caps securing bolts:

- Loosen bolts (8 - 10 - 12 - 14);
- Gradually loosen bolts (9 - 11 - 13) so as to not apply torsional strain on the rocker shaft;
- Loosen bolts (1 - 2 - 3 - 4 - 5 - 6 - 7).



Mount tool **0185**.

For an engine equipped with **Optibrake** retarder, immobilize the piston (1) of each exhaust rocker arm (2) with a plastic clamp (3).

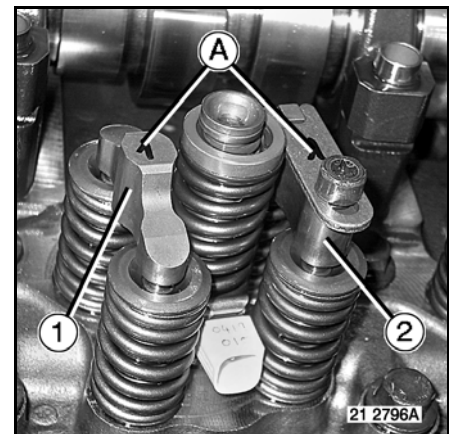


Each piston (1) is paired with a rocker arm (2).

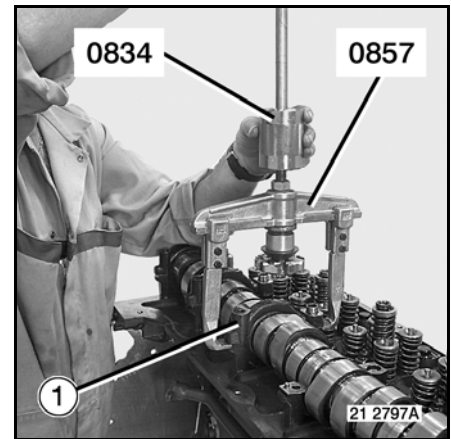
Remove the rocker assembly (4).

Make a mark (A) on the inlet valve (1) and exhaust valve (2) yokes.

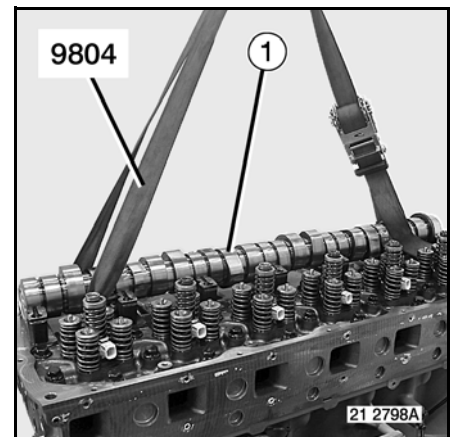
Remove clips (1 - 2).



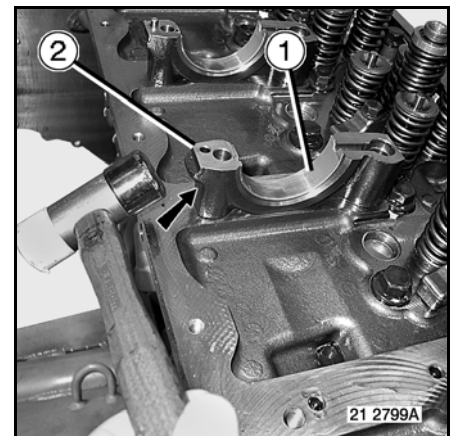
Remove upper half-bearings (1).
 Use tool **0857** + **0834**
 Remove bearing half-shells.



Mount tool **9804**.
 Remove the camshaft (1).



Remove bearing half-shells (1).
 Remove lower half-bearings (2).



Inspection

On the camshaft, inspect:

- Coaxiality,
- Cam lift,
- Bearings out-of-round diameter,
- Bearing half-shells.

For values, see "Technical data" chapter.
 See page(s) B-6-9.

Fitting

Oil all moving parts.

Apply oil (engine oil) to the inner faces of bearing half-shells (2 - 3) when installing them. Do not apply oil to the support face.

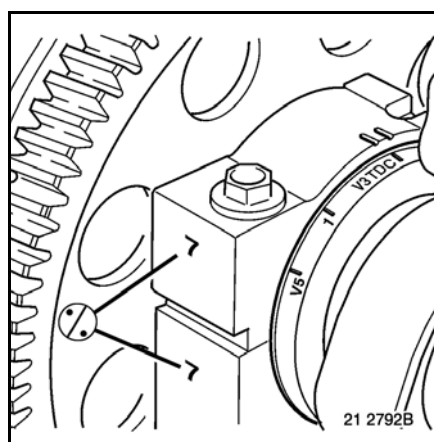
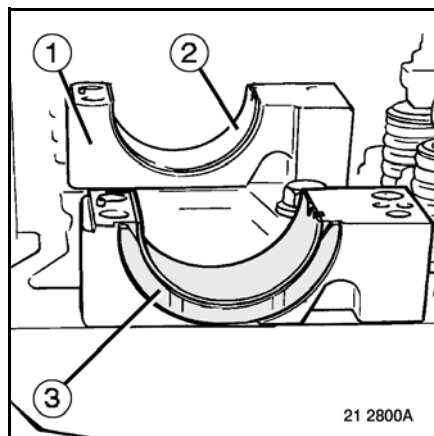
Fit camshaft lower half-bearings (1) on the cylinder head.

Marks positioned on exhaust manifold end.

Fit bearing half-shells (2).

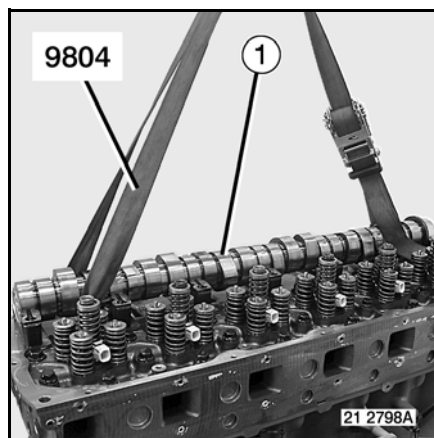


The half-shells (3) of N° 7 bearing determine the camshaft end float.



Fit the camshaft (1).

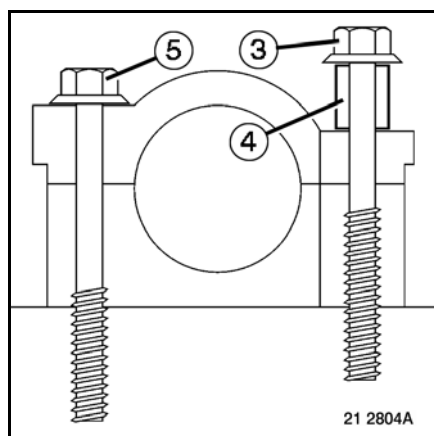
Use tool 9804.



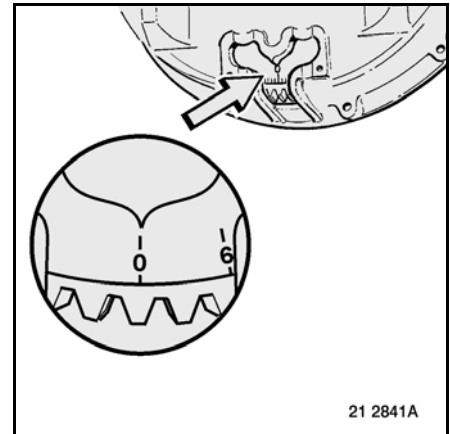
Temporarily fit a bolt (3) complete with spacer (4) to N° 7 bearing.

Fit bolt (5).

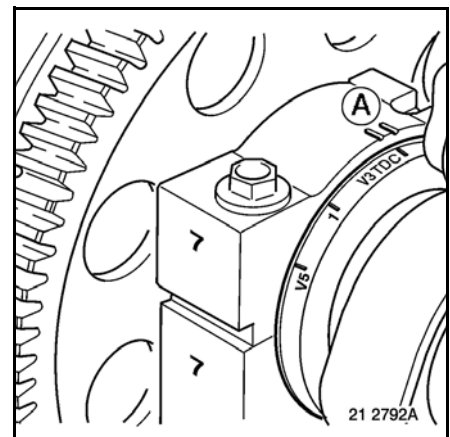
Tighten to a torque of 25 Nm.



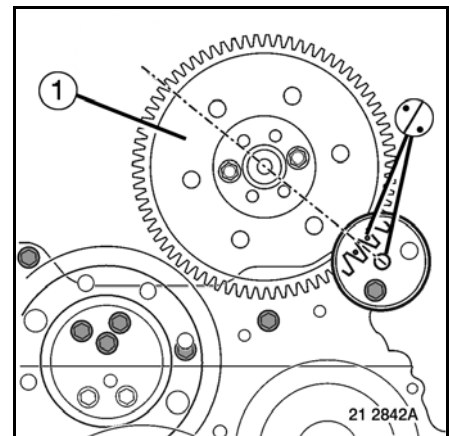
Position the crankshaft with N° 1 cylinder at TDC.



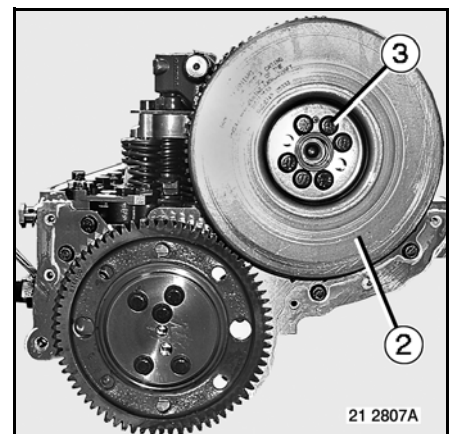
Line up marks (TDC) and (A).



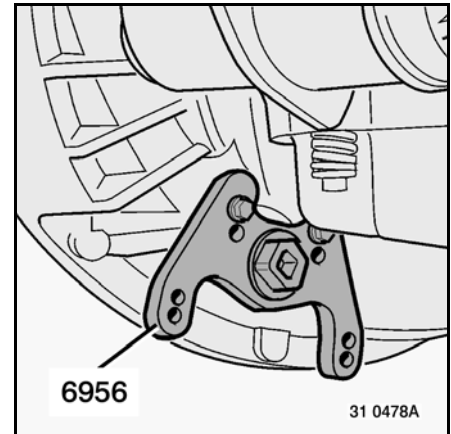
Fit pinion (1) ensuring the position of marks.



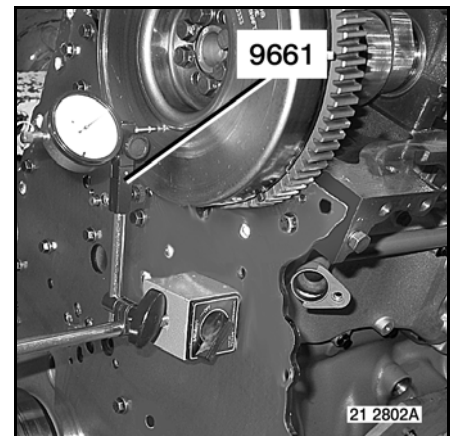
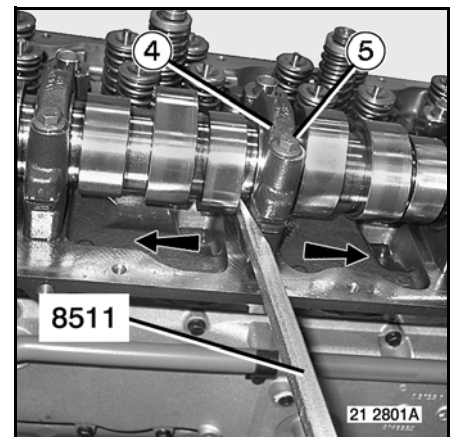
Fit vibration damper (2).
Tighten bolts (3) to torque.
Use tool **9776**.
See page(s) B-5-16.



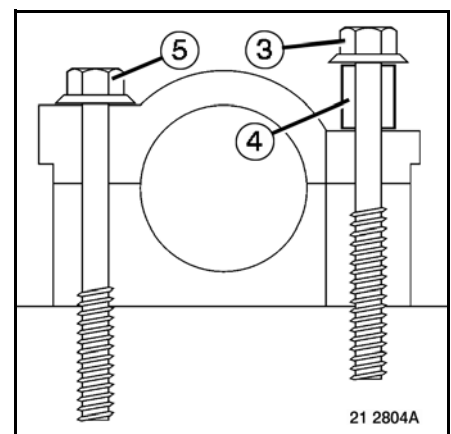
If necessary
 Immobilize crankshaft.
 Use tool **6956**.



Fit upper half-bearings (**4**) in their original locations.
 Ensure the marking.
 Fit bolts (**5**).
 Tighten to a torque of **25 Nm**.
 Check the camshaft end float.
 Use tool **8511 + 9661**
 For values, see "Technical data" chapter.
 See page(s) B-6-9.



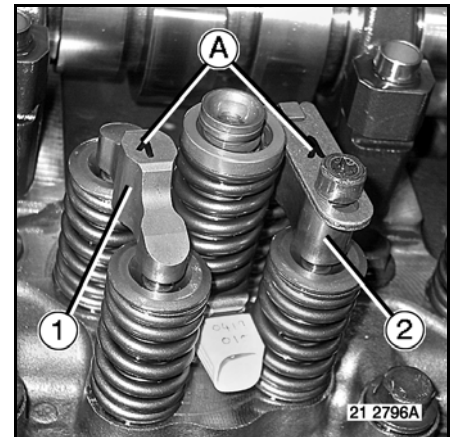
Remove bolt (**3**).
 Remove spacer (**4**).
 Adjust the camshaft bearing backlash.
 See page(s) G-5.



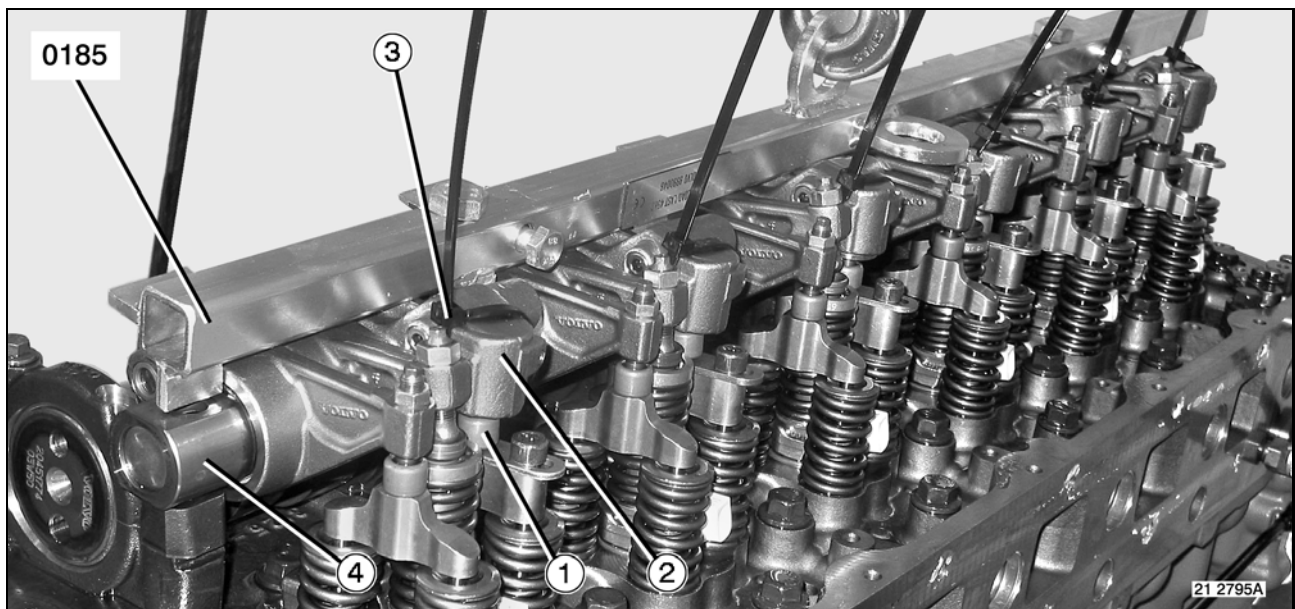
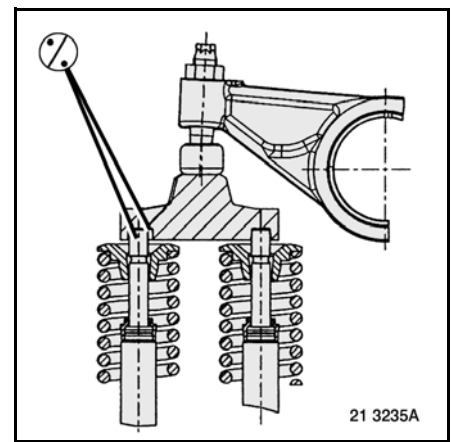
Fitting the rocker shaft

Fit yokes (1 - 2).

Line up the marks (A) made upon removal.



When fitting new yokes, line up the marks.



Oil all moving parts.

Remove the rocker shaft (4).

Use tool **0185**.

Cut clamps (3) to free the pistons (1) of rocker arms (2).

Inspect the rocker arms.

See page(s) F-2-4.

Tighten securing bolts **(1)** on the rocker shaft unit and on the camshaft bearings to torque.

Follow the tightening sequence.

For values, see "Technical data" chapter.

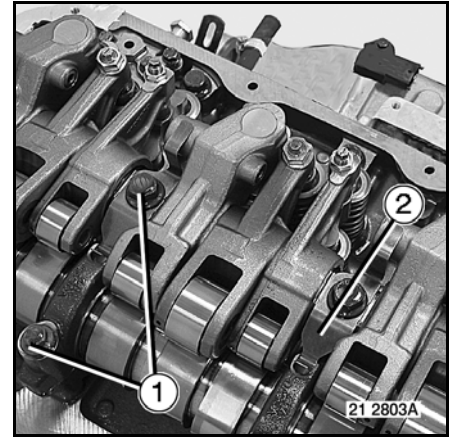
See page(s) B-5-3.

Check that spring **(2)** stays in its housing during tightening.

Adjustment of rocker arms

Adjust the valve rocker clearances.

See page(s) F-2-1.



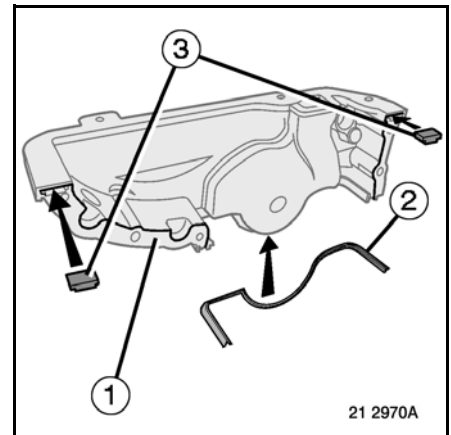
Install seals **(2 - 3)**.

Apply sealing compound to the timing case joint face **(1)**.

See page(s) B-5-16.

Apply "CAF 44" sealant.

Fit casing **(1)**.



Start bolts **(4)** but do not tighten them.

Align the timing case joint face **(A)** with the upper joint face **(B)** of the cylinder head to ± 0.1 mm.

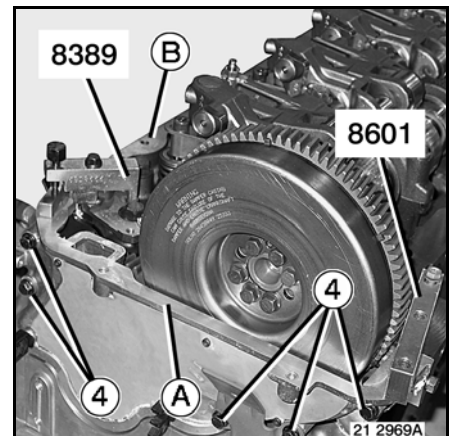
Use tool **8601 + 8389**

Tighten bolts to torque.

Follow the tightening sequence.

See page(s) B-5-16.

Withdraw the tool.

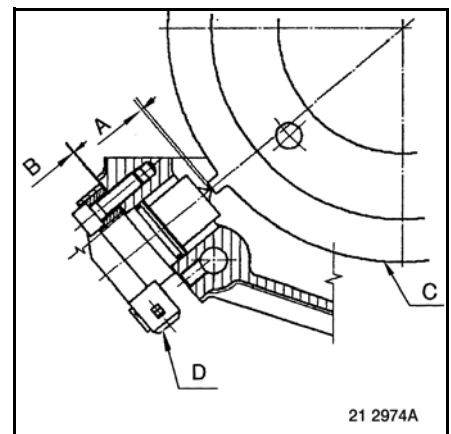


Check the air gap.

For values, see "Technical data" chapter.

See page(s) B-6-20.

- (A): Play (mm)
- (B): Adjusting shim
- (C): Pulse ring
- (D): Camshaft speed sensor



Fit pipe (6).

The small diameter of tube (6) facing the solenoid valve (5) end.

Fit solenoid valve (5).

Fit bracket (4).

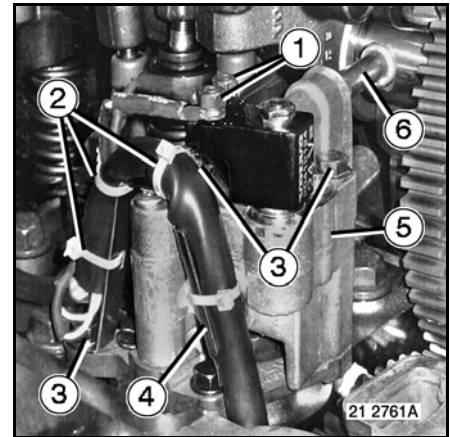
Tighten bolts (3) to torque.

Tighten nuts (1) to torque.

See page(s) B-5-23.



Fit heat-resistant clamps (2).

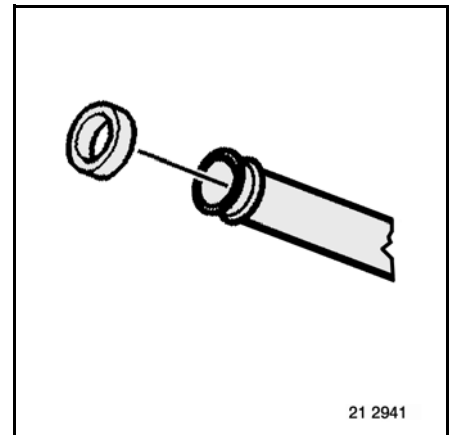


For the rest of the fitting operations, proceed in the reverse sequence to removal.

Replace all seals and gaskets without fail.



To facilitate the assembly of this type of seal in its housing, mount it on the fitting tube and lubricate the outside with engine oil if it is a green or violet seal or with engine coolant if it is a black seal.



Apply a bead of silicone **dia. 2 mm (A)** as shown in the drawing.

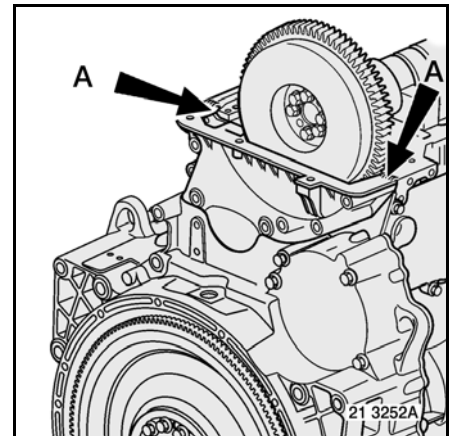
Perform assembly within 20 minutes of application of the silicone.

Fit the rocker cover.

Tighten bolts to torque.

Follow the tightening sequence.

See page(s) B-5-5.



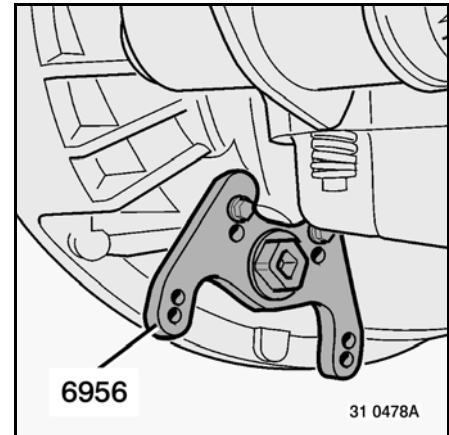
Rocker arms

Adjustment of rocker arms

Direction of rotation of engine: **anticlockwise**.

See page(s) B-1-3.

Use tool **6956**.



Camshaft marks

With Optibrake retarder

The marks **(B) 1 - 5 - 3 - 6 - 2 - 4** correspond to the inlet valves clearance adjustment and to the unit pump injectors pre-travel adjustment for each corresponding cylinder.

The marks **(C) V1 - V5 - V3 - V6 - V2 - V4** correspond to the exhaust valves clearance adjustment for each corresponding cylinder.

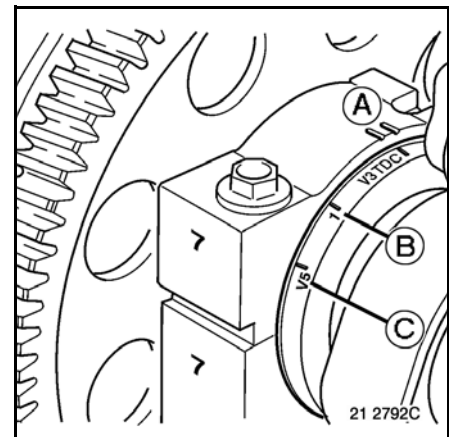
With exhaust brake

The marks **(B) 1 - 5 - 3 - 6 - 2 - 4** correspond to the inlet valves clearance adjustment, the exhaust valves clearance adjustment and to the unit pump injectors pre-travel adjustment for each corresponding cylinder.

The mark **(B)** or **(C)** must be positioned in the middle of marks **(A)** to make the adjustment.

For values, see "Technical data" chapter.

See pages B-6-2, B-6-20.



Adjustment of exhaust valves with Optibrake retarder

Before making the adjustment, press rocker arm (1). Compress valve spring (2) to free the oil in the rocker arm. Use a piece of rigid iron wire to make a hook (A).

Mount tool 9661.

Measure clearance Y while moving the rocker arm up and down – note down the value.

If clearance Y is < or > than 1.6 mm, remove bolt (3) and adjusting shim (4). Note down the thickness X engraved on adjusting shim (4).

Calculate the new thickness for adjusting shim (4).

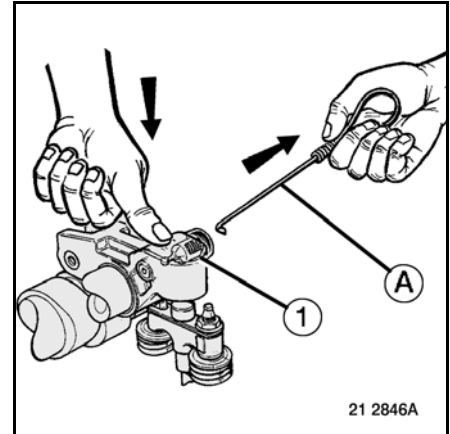
$$Y \text{ mm} - 1.6 \text{ mm} = Z \text{ mm}$$

$$X \text{ mm} + Z \text{ mm} = X' \text{ mm}$$

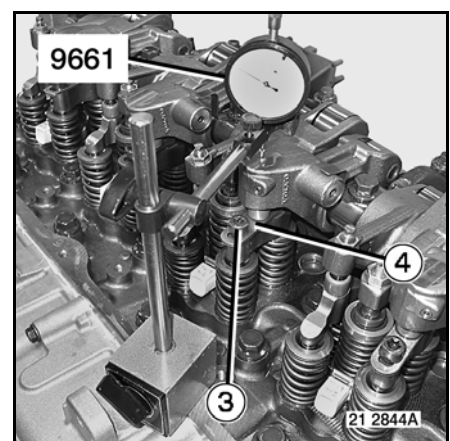
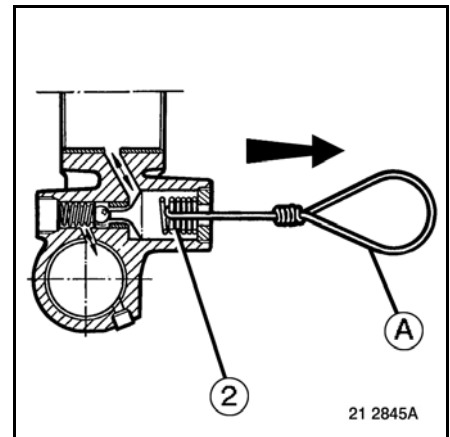
Install a new adjusting shim (4) with a thickness of X' mm.

Tighten bolt (3) to torque.

See page(s) B-5-4.

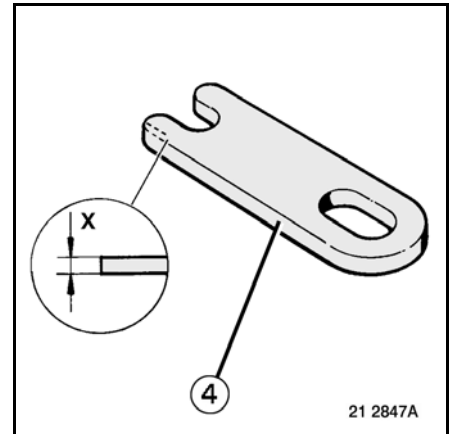


You can superimpose a maximum of 2 adjusting shims, provided that they have the same thickness. Adjusting shims (4) are available with thicknesses of 0.05 by 0.05 mm.



Adjustment of exhaust valves without Optibrake retarder and adjustment of inlet valves

This adjustment does not present any difficulty.
Tighten the locknuts to torque.
See page(s) B-5-4.



Adjustment of unit pump injectors pre-travel

Mount tool **9661**.

Loosen locknut **(1)**.

Loosen adjusting screw **(2)** to give a slight clearance to rocker arm **(3)**.

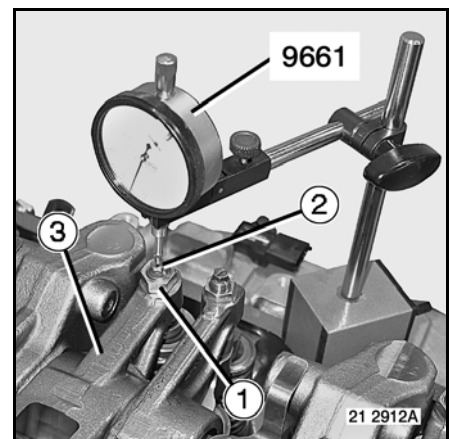
Retighten adjusting screw **(2)** until there is no clearance on rocker arm **(3)**.

Set the dial gauge to zero and mark the measuring point.

Tighten adjusting screw **(2)** to obtain a travel of **0.75 mm** on the injector.



*This corresponds to an angle of around 180° to 240° on adjusting screw **(2)**.*



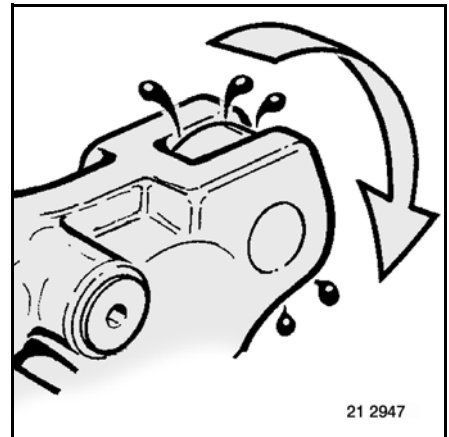
Tighten locknut **(1)** to torque.

Check that the value remains identical during tightening of locknut **(1)**.

See page(s) B-5-4.

Inspection of rocker arms

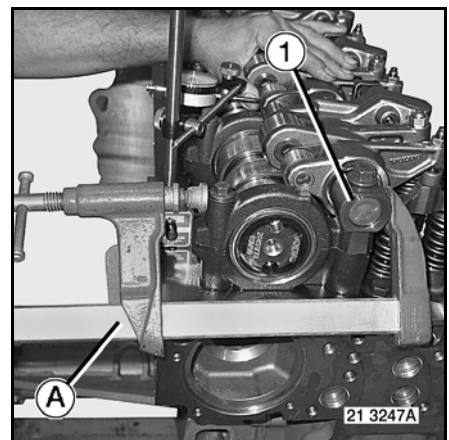
Turn the roller to eliminate the film of oil.
Check that the roller rotates freely.



Checking the roller play

- With the rocker shaft bolts loosened, immobilize rocker shaft **(1)** using a screw clamp **(A)**.
- Position the stylus of the dial gauge in the horizontal axis of the rocker arm roller.
- Push roller **(2)** in the horizontal axis to eliminate the clearances.
- Reset the dial gauge to zero.
- Using a screwdriver **(B)**, measure the roller clearance while holding rocker arm **(3)** in a horizontal position .

Use tool **9661**.



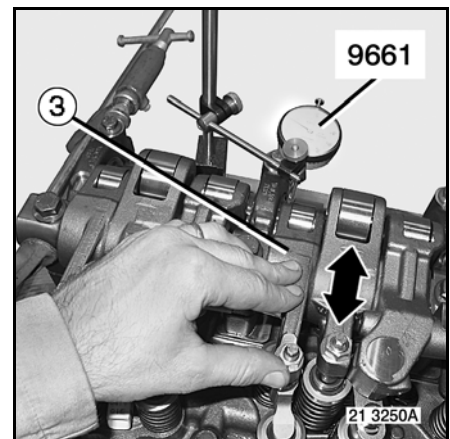
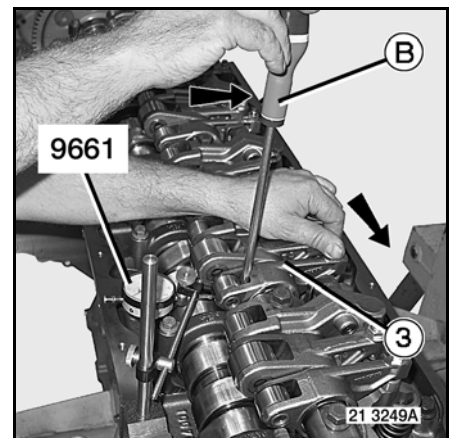
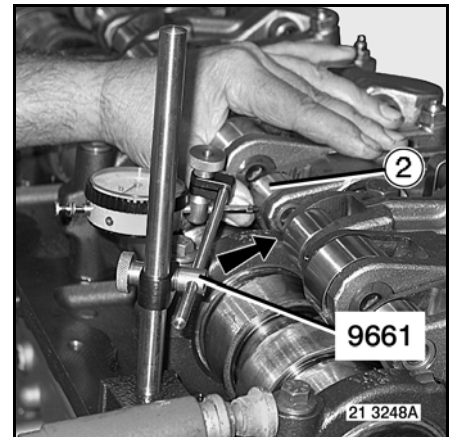
Checking the rocker arm bearing clearance

- With the rocker shaft bolts loosened, immobilize rocker shaft, **(1)** using a screw clamp **(A)**.
- Position the stylus of the dial gauge at the end of the rocker shaft in the horizontal axis.
- Push rocker arm **(3)** in the horizontal axis to eliminate the clearance.
- Reset the dial gauge to zero.
- Push rocker arm **(3)** back in the opposite direction to measure the clearance.

Use tool **9661**.

For values, see "Technical data" chapter.

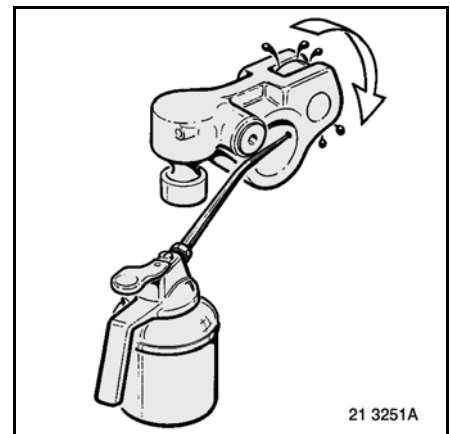
See page(s) B-6-6.



When replacing a rocker arm, use an oil can to squirt engine oil through the lubrication hole in the rocker arm to lubricate the roller shaft.



Upon removal, mark the position of the rocker arms on their shafts.



Fuel injectors

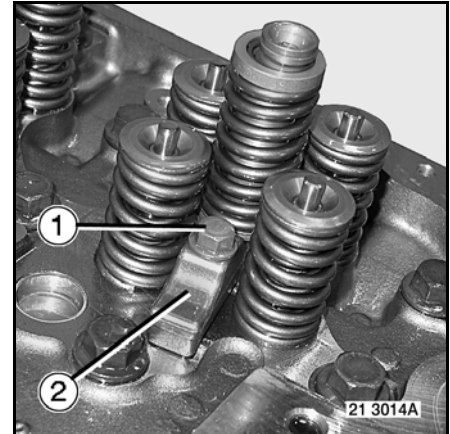
Removal

Remove the rocker assembly.

See page(s) F-1-2.

Remove bolts (1).

Remove retainers (2).

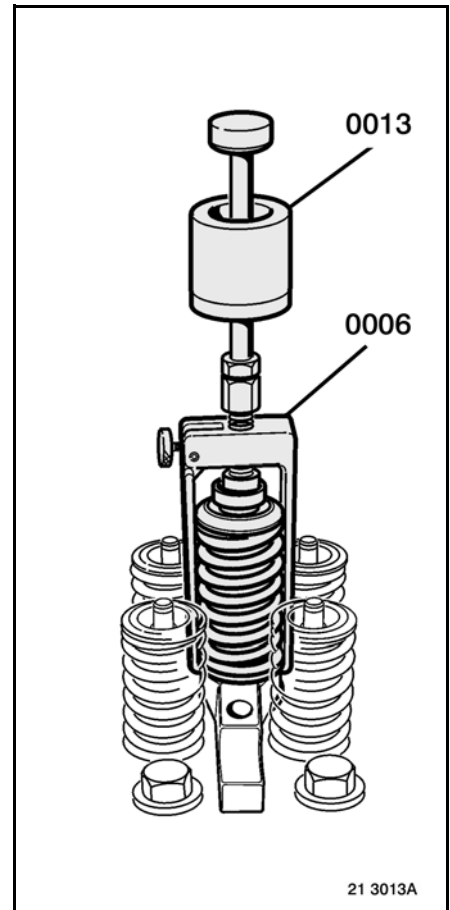


Remove the injectors.

Use tool **0013** + **0006**

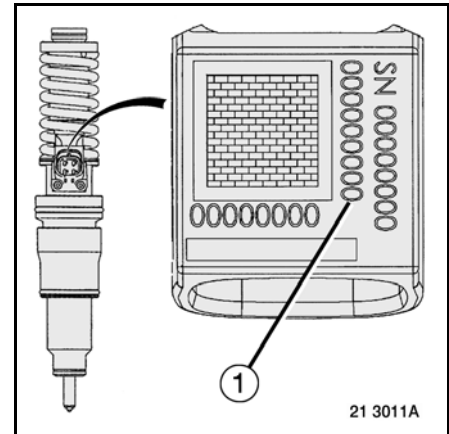
Protect the injector.

Use tool **8249**.

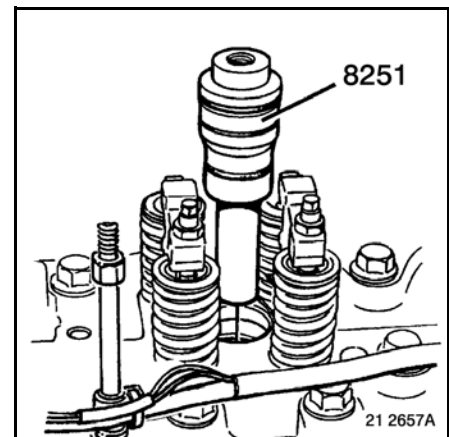




If the injectors are removed and do not have to be replaced, note down the "TRIM" number (1) for each injector, paying attention to the relative position of the cylinders. N° 1 cylinder at the front end of the engine.



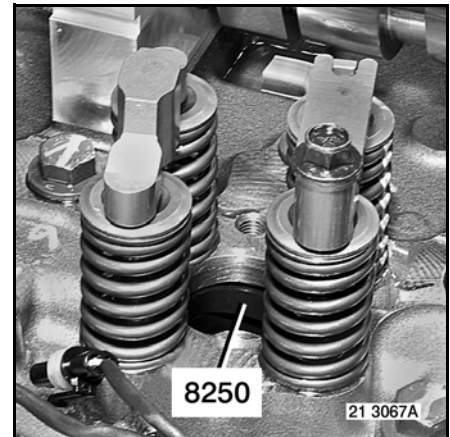
Blank off the ports.
Mount tool 8251.



Fitting



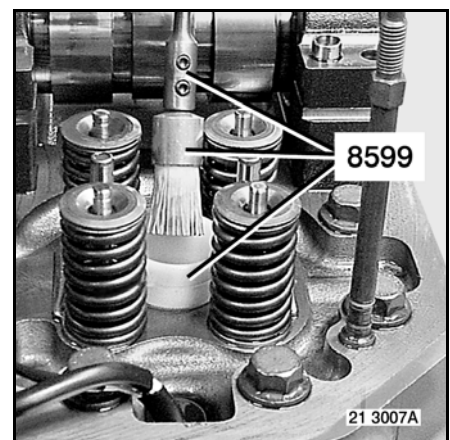
Insert tool 8250 into the groove in the fuel circuit to prevent the ingress of impurities..



Clean the copper sleeve of the unit pump injector.

Use tool **8599**.

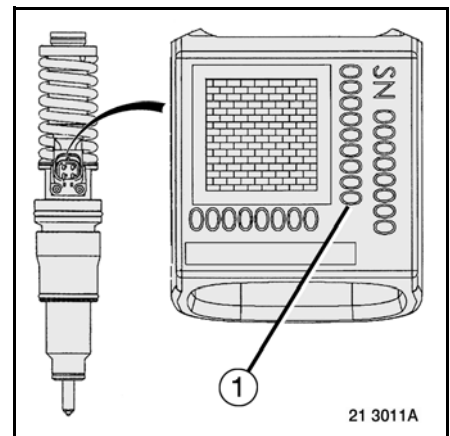
Refit the injectors placing them in the same position as before removal .



If the injectors are removed and do not have to be replaced, note down the "TRIM" number (1) for each injector, paying attention to the relative position of the cylinders. N° 1 cylinder at the front end of the engine.



Re-program the engine management ECU using the Renault Trucks test tool.



Replace seals.

Lubricate the seals with engine oil.

Fit clamps (2).

Tighten bolts (1) to torque.

For values, see "Technical data" chapter.

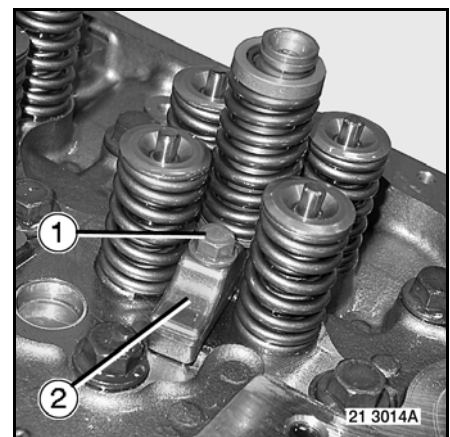
See page(s) B-5-24.

Remove the rocker shaft.

See page(s) F-1-9.

Adjust the valve rocker clearances.

See page(s) F-2-1.



Cylinder head

Removal

Remove the camshaft.

See page(s) F-1-2.

Remove the injectors.

See page(s) F-3-1.

Remove inlet manifold.

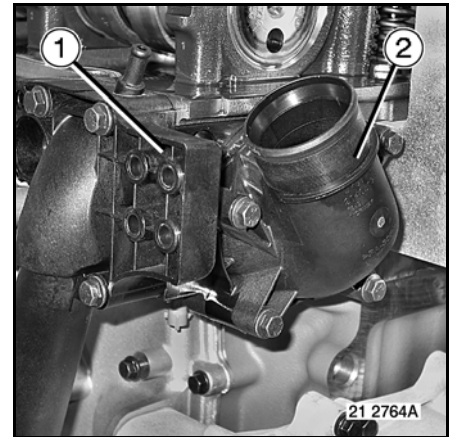
Remove tube **(2)**.

Remove thermostat casing **(1)**.

Remove the thermostat.

Remove the timing pinions.

See page(s) G-3.



Engine on chassis

Align an orifice (1) of the pinion with a bolt (2).

Use tool **6956**.

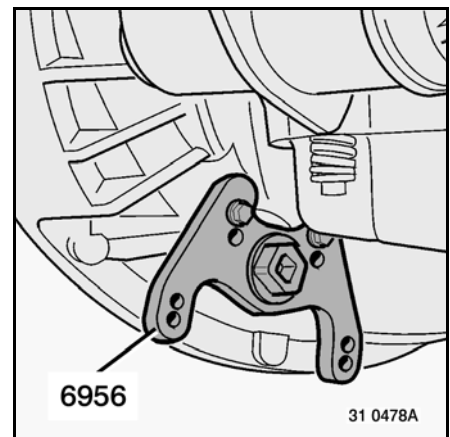
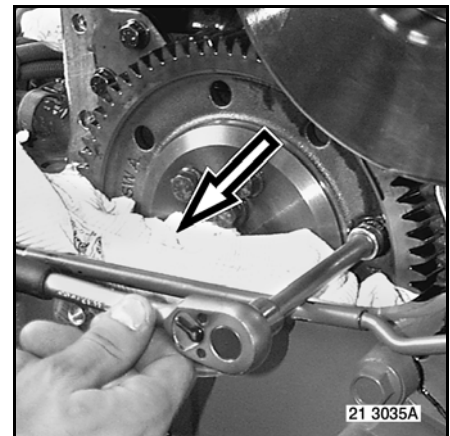
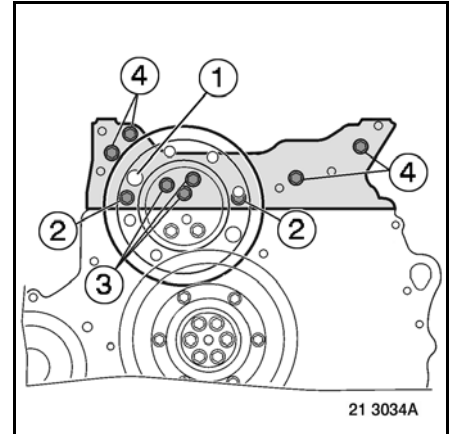
Place a cloth in position to prevent the bolts from dropping into the timing gear.

Tighten nuts (2).

Tighten nuts (3 - 4).



Operations to be carried out with engine on chassis

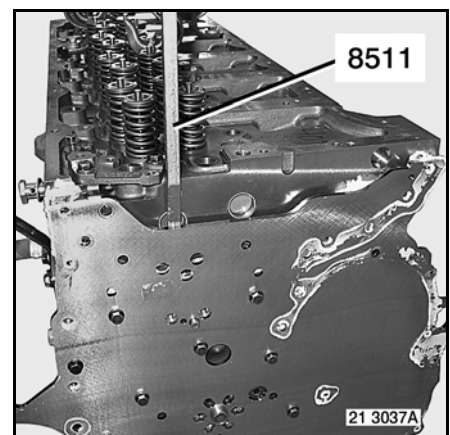


Remove the cylinder head bolts proceeding in the reverse sequence to fitting.

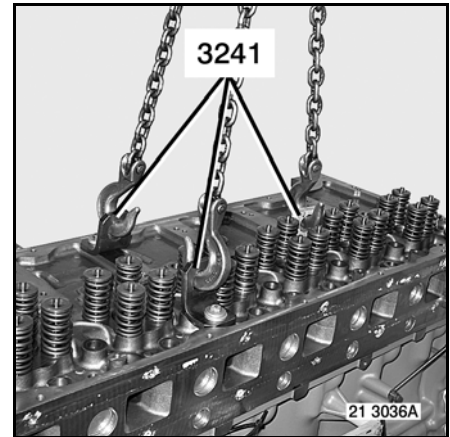
See page(s) B-5-2.

Dislodge the cylinder head from the timing plate.

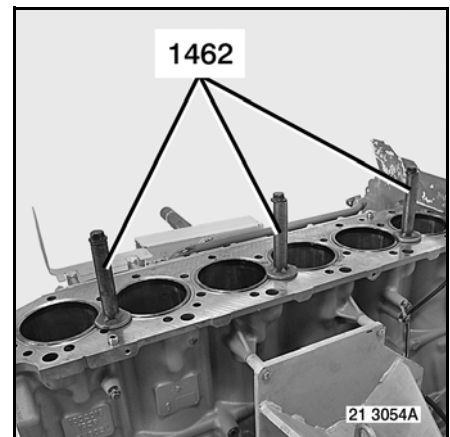
Use tool **8511**.



Remove the cylinder head.
Use tool **3241**.



Immobilize liners.
Use tool **1462**.



Fitting

Withdraw tool **1462**.

Clean the joint faces.

Clean the copper sleeve of the unit pump injector.

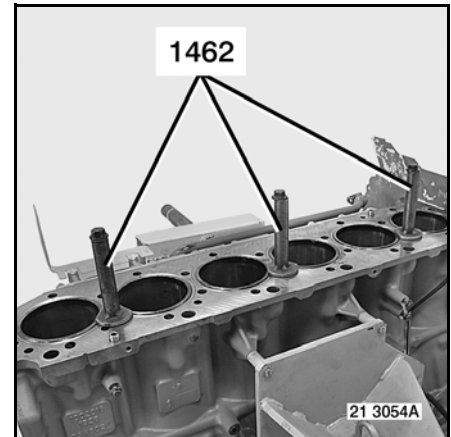
See page(s) F-3-3.

Tap the screw-threads in the cylinder block then blow through with compressed air.

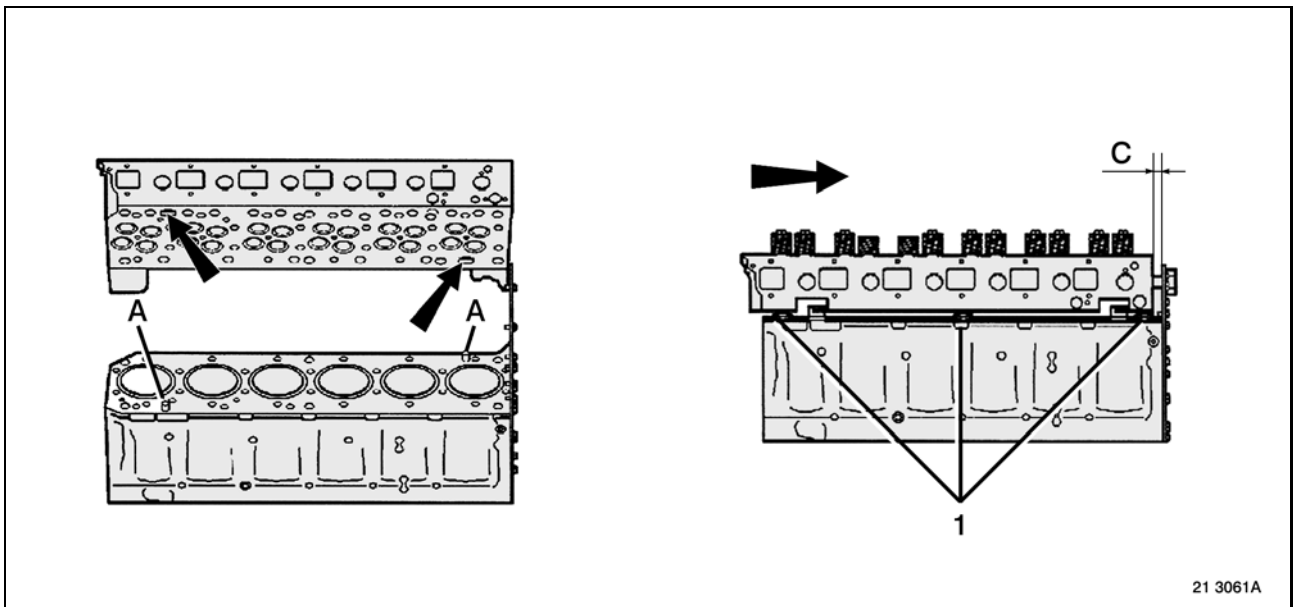
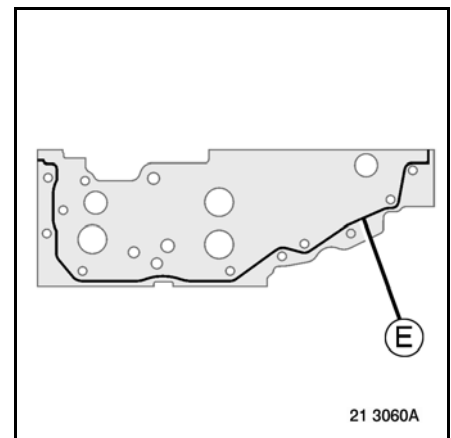
See page(s) B-5-1.

Fit timing plate.

See page(s) G-4.



Apply a bead of silicone **dia. 2 mm (E)** as shown in the drawing.
Perform assembly within 20 minutes of application of the silicone.
Apply "CAF 44" sealant.



Check for the presence of cylinder head locating bushes **(A)**.

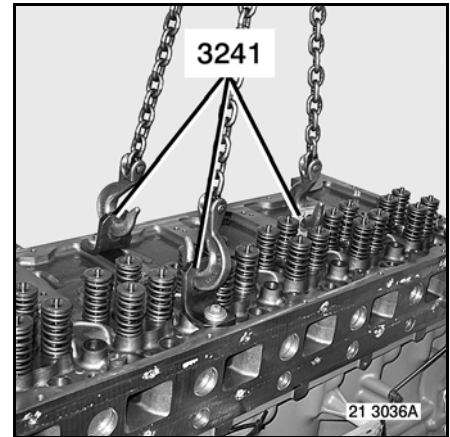
Install the cylinder head gasket.

Place the cylinder head delicately on the bosses on the cylinder head gasket **(1)**, leave a space **(C)** between the rear joint face of the cylinder head and the timing plate .

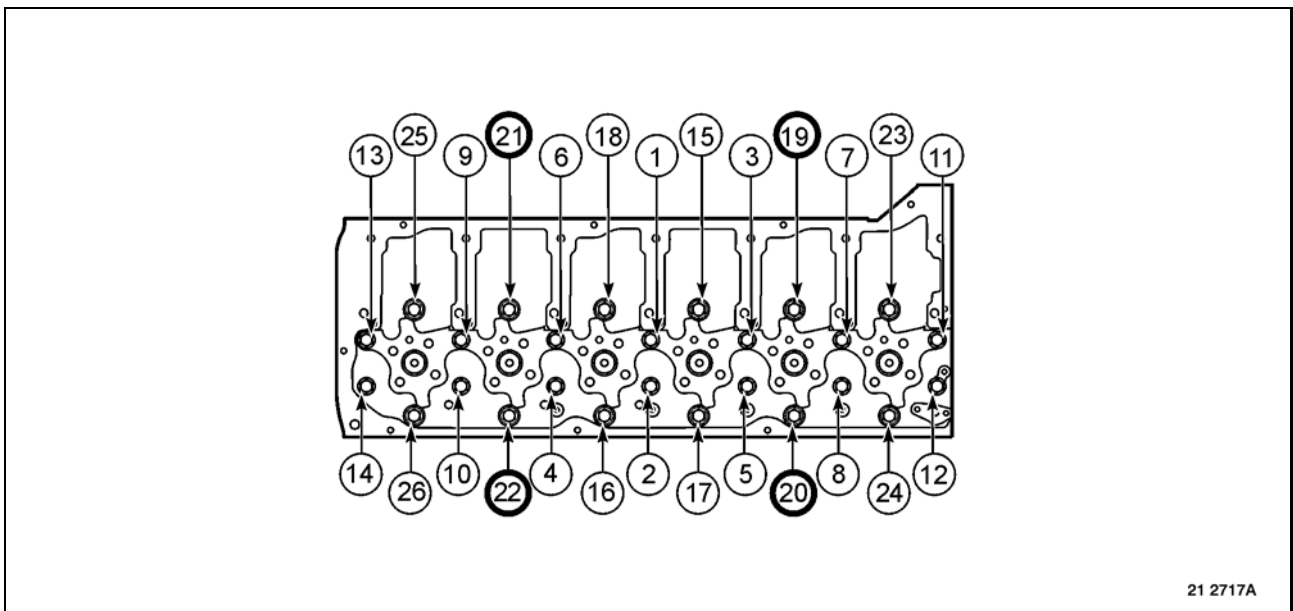
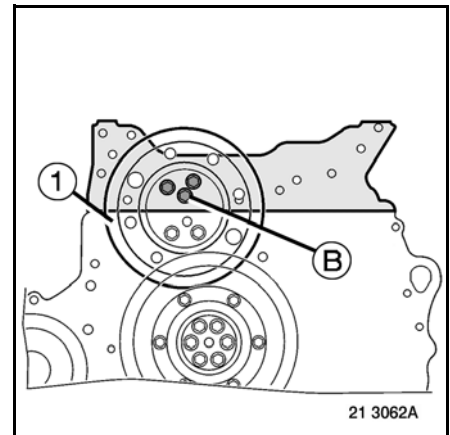
Use tool **3241**.



The bosses serve to slide the cylinder head without damaging the cylinder head gasket. They are crushed down when the cylinder head is tightened.

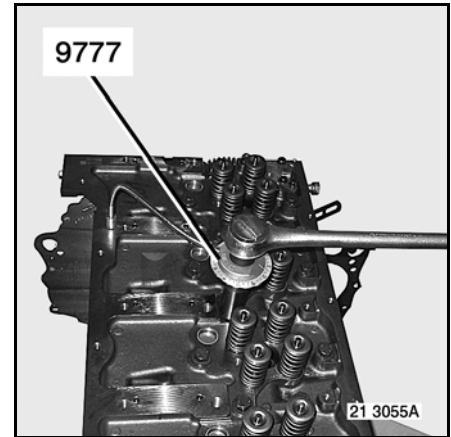


Fit play take-up pinion (1).
 Start bolts but do not tighten them.
 Tighten bolt (B) to a torque of 85 ± 15 Nm.



Tighten bolt (19 - 22 - 21 - 20) to a torque of **25 Nm**.
 Loosen bolt (B).
 Tighten the cylinder head bolts to torque, proceeding in the procedure described in the "Tightening torques" chapter.
 See page(s) B-5-1.

Use tool **9777**.



Fit bolts **(4)**.

Tighten bolts **(4)** to torque.

See page(s) B-5-15.

Fit the injectors.

See page(s) F-3-3.

Fit the intake manifold.

See page(s) B-5-6.

Fit the camshaft.

See page(s) F-1-6.

Fit the timing pinions.

See page(s) G-4.

Adjust the valve rocker clearances.

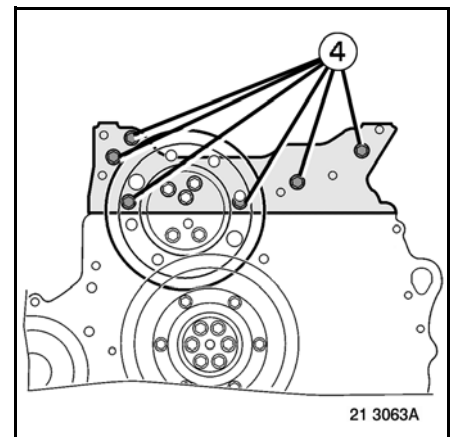
See page(s) F-2-1.

For the rest of the fitting operations, proceed in the reverse sequence to removal.

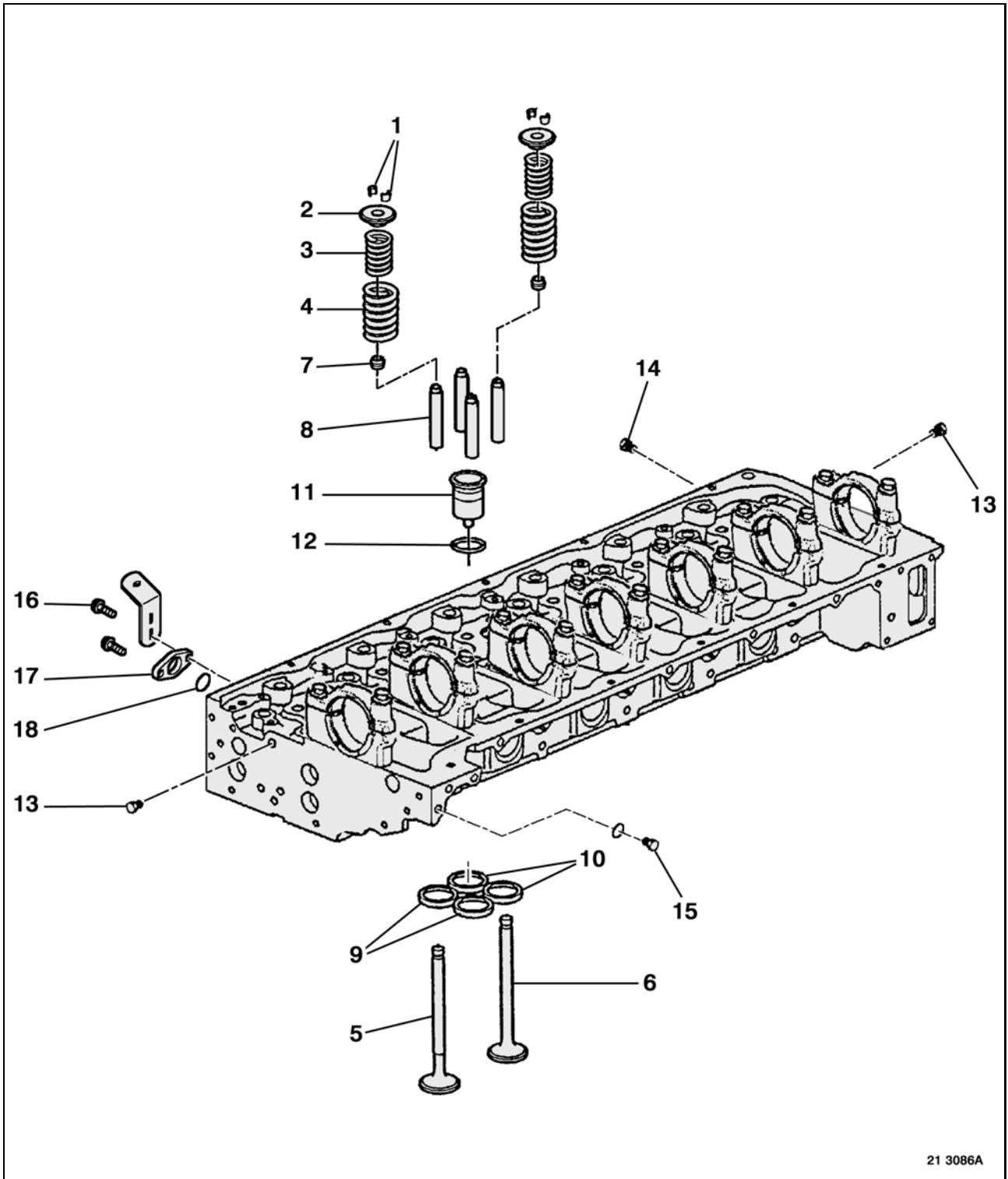
Replace seals.

Tighten to torque.

For values, see "Technical data" chapter.



Exploded view



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Disassembly

The item numbers indicated in the text refer to the drawing on page F-4-7.

Valves



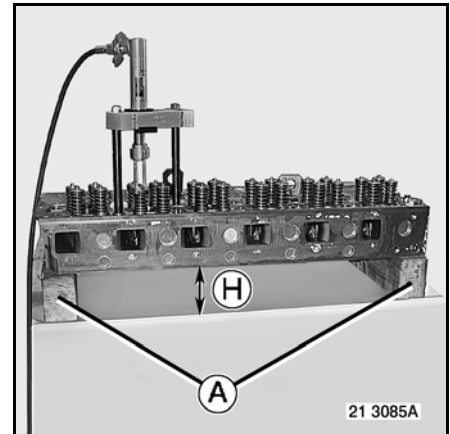
WEAR SAFETY GOGGLES FOR PROTECTION.



Carefully note down the dismantling sequence.

Fit the cylinder head.

Use 2 wooden blocks (A), H = 160 mm.



Tension springs (3 - 4).

Use tool 9726 + 0176 + 9729 + 6159 + 8246.

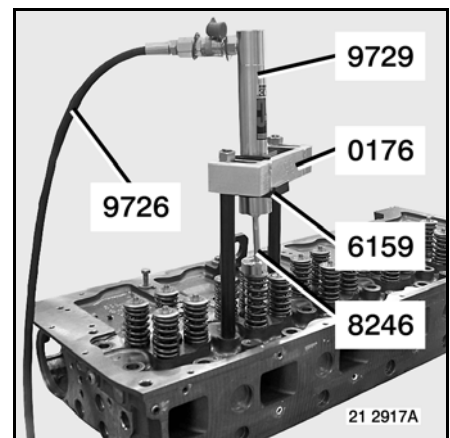
Tighten tool 0176 to a torque of 70 Nm.

Save valve cotters (1).

Decompress springs (3 - 4).

Withdraw cups (2).

Remove hold-down springs (3 - 4).



Remove plate (A) securing tool 0176.

Remove valves (5 - 6).



The operation described above serves to remove 2 valves each time.

Remove valve stem seals (7).

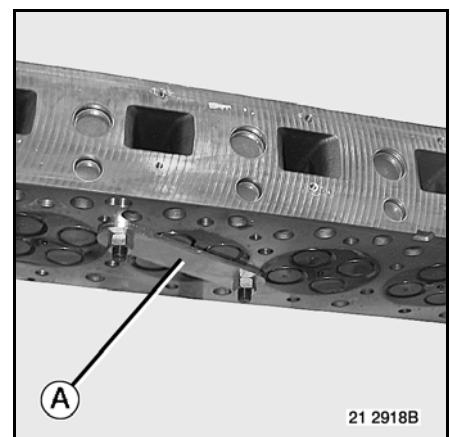
Valve guides

Check the radial play of the valves in their guides.

See page(s) F-4-14.

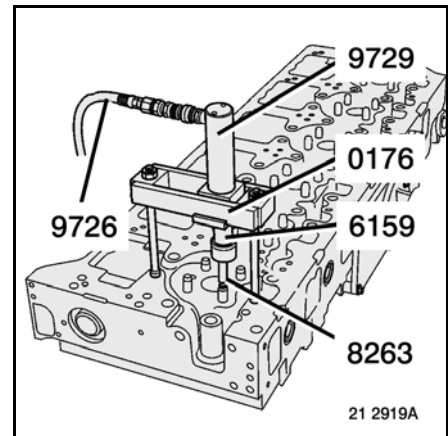


Replace valve guides that are outside the tolerance.



Classify the parts in order (8).

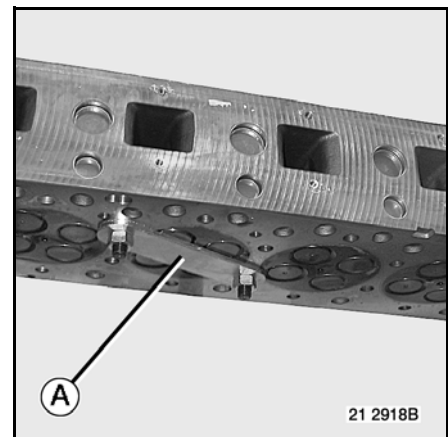
Use tool 9726 + 0176 + 9729 + 6159 + 8263.



Tighten tool 0176 to a torque of 70 Nm.

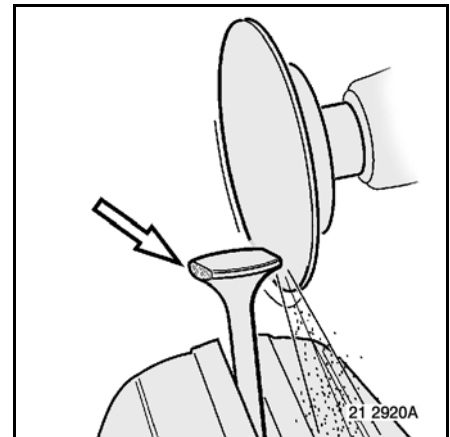


Replace plate (A) with washers.



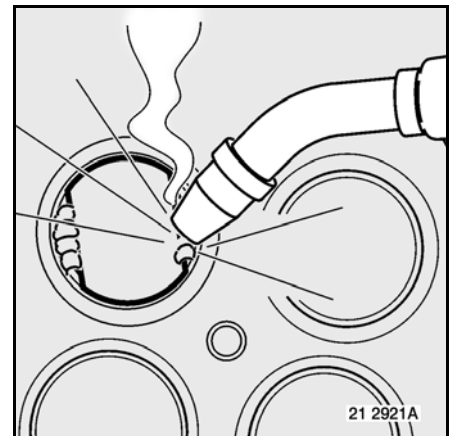
Valve seats

Grind a worn valve .

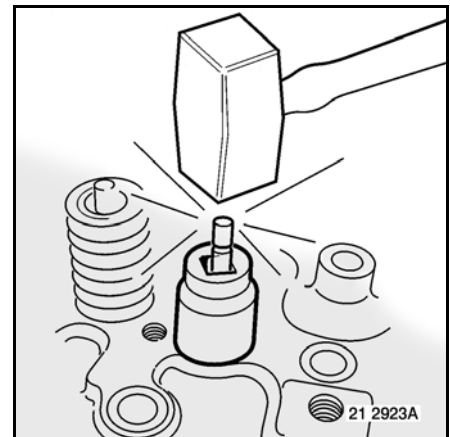


Weld the valve to the seat while protecting the surface of the cylinder head to prevent hot metal spatter from damaging it.

Let cool.



Remove valve seats (9 - 10).
Use a socket.



Injector sleeves

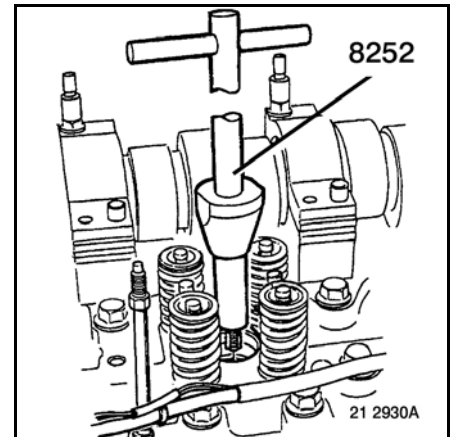
Insert tool 8250 into the groove in the fuel circuit to prevent the ingress of impurities..

Tap injector sleeve (11) to dia. M9 over 20 mm.



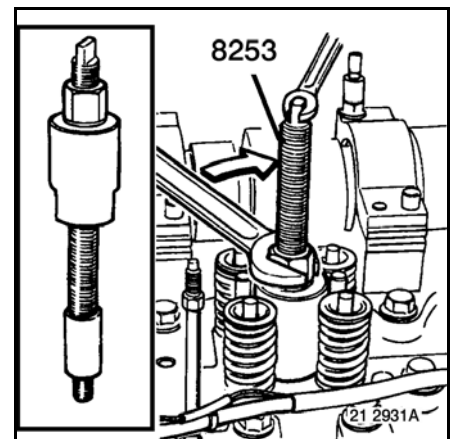
Apply grease to the tap to retain the maximum of swarf.

Use tool 8252.



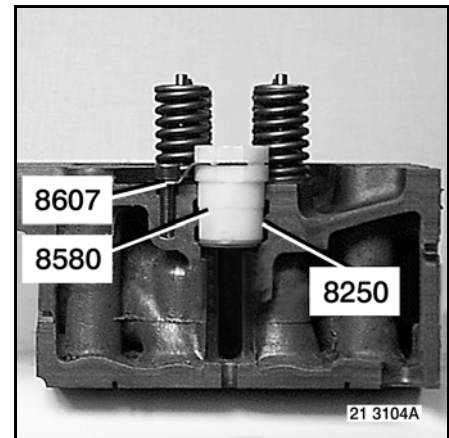
Extract injector sleeve (11).

Use tool 8253.



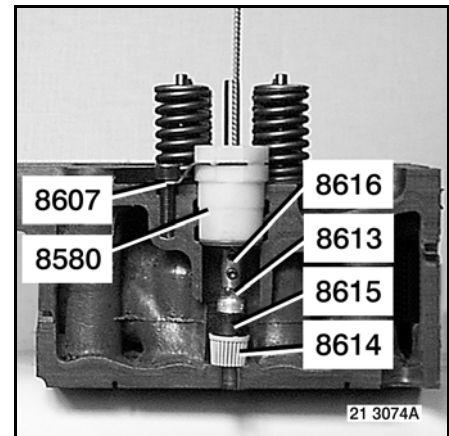


Install tools 8607 + 8580 from the cleaning kit 8599 using tool 8250 to prevent the ingress of impurities into the fuel circuit .

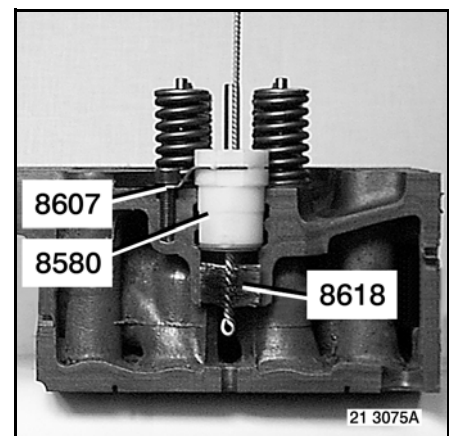


Clean the injector sleeve housing (11).

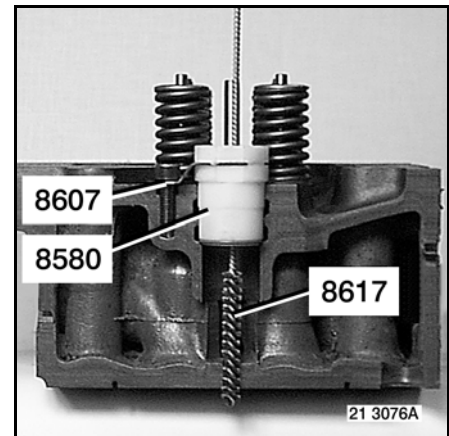
Use tools 8607 + 8580 + 8616 + 8613 + 8615 + 8614 from cleaning tools kit 8599.



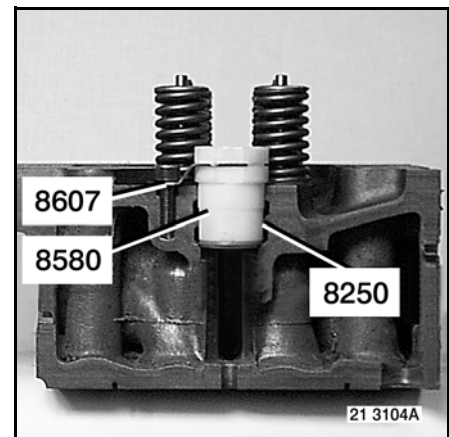
Use tools 8607 + 8580 + 8618 from cleaning tools kit 8599.



Use tools **8607 + 8580 + 8617** from cleaning tools kit **8599**.



Remove tools **8250 + 8580 + 8607**.



Inspection

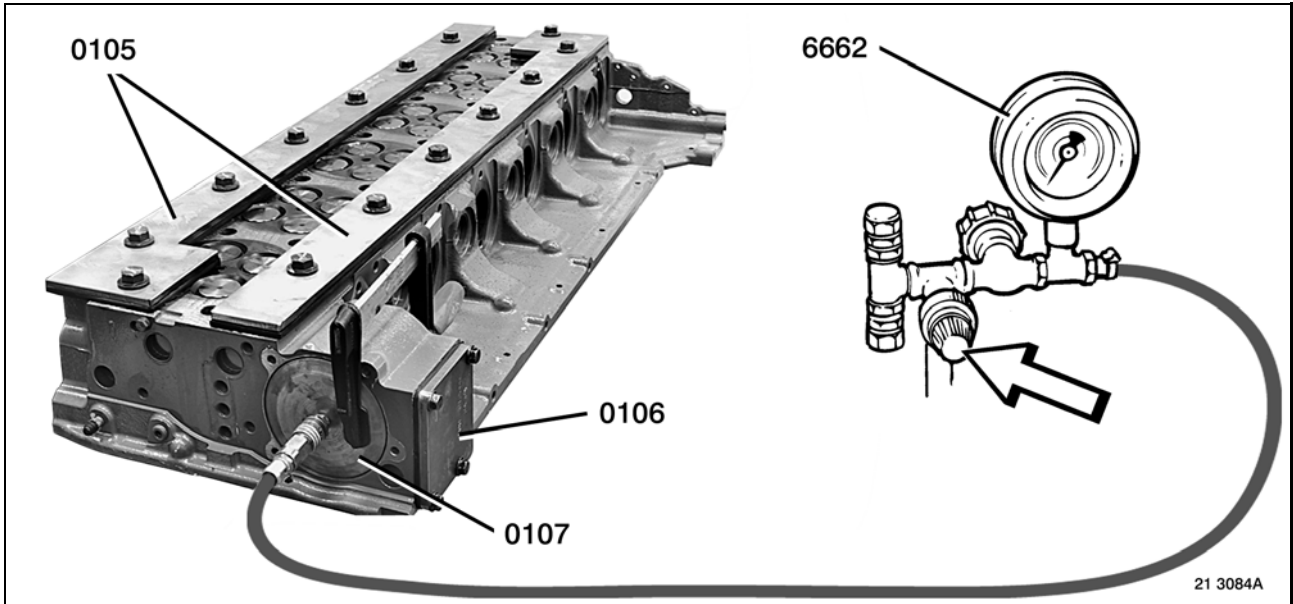
Clean the joint faces.

Inspect the joint face.

For values, see "Technical data" chapter.

See page(s) B-6-1.

Cylinder head leak test



Install tool **0105 + 0106 + 0107**.

Fasten tool **0105** with the cylinder head tightening bolts and nuts **M16**.

Blank off the port of the cooling system temperature sensor with a plug **dia. 12 x 150 x 10**.

Blank off the port of the air compressor cooling connection union with a plug **dia. 16 x 150 x 9**.



*Check that the pressure reducer screw is fully loosened before using tool **6662**.*

Mount tool **6662**.

Test the cylinder head for leaks before commencing the overhaul. In a bath of hot water (**70°C**), air pressure **1.5 bars**, check for the absence of air bubbles.

Adjust the pressure with the pressure reducer to **1.5 bars** and close the tool valve **6662**. Wait for **2 minutes**, watching that the pressure does not fall.

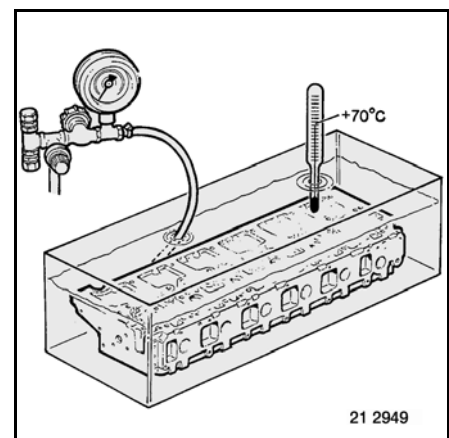
Fully loosen the pressure reducer screw of tool **6662** to drop the pressure.

Take the cylinder head out of the hot water bath.

Withdraw the tool.



Clean the cylinder head with compressed air, paying special attention to fuel system passages since they are subject to a high risk of pollution.



Valves

Check the calibration of the springs.

For values, see "Technical data" chapter.

See page(s) B-6-6.

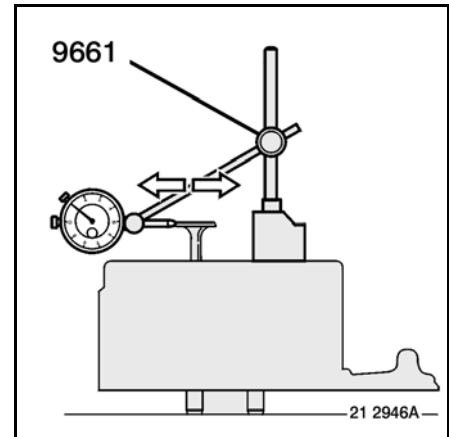
Valve guides

Check the radial play of the valves in their guides.

Use tool **9661**.

For values, see "Technical data" chapter.

See page(s) B-6-2.

**Valve seats**

Check the valve seats contact surface: it must be free from traces of pitting and excessive wear.

Check the set-back of the valves.

For values, see "Technical data" chapter.

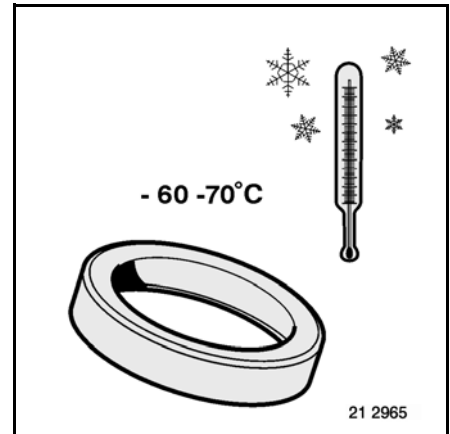
See page(s) B-6-2.

Assembly

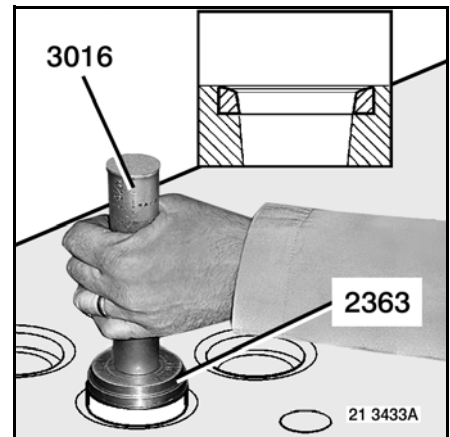
The item numbers indicated in the text refer to the drawing on page F-4-7.

Valve seats

Shrink parts (9 - 10) in liquid nitrogen.



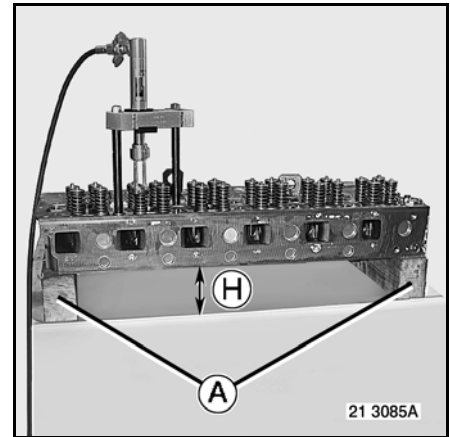
Fit valve seats (9 - 10).
Use tool 2363 + 3016



Valve guides

Fit the cylinder head.

Use 2 wooden blocks (A), H = 160 mm.



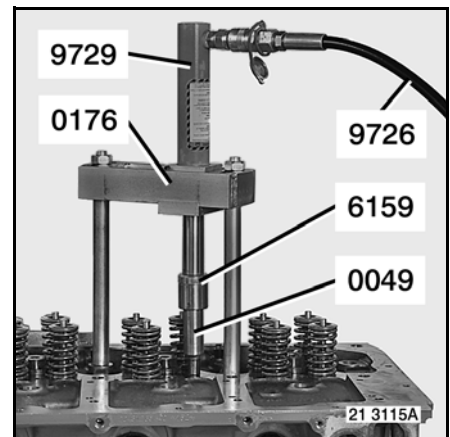
Lubricate.

Press fit inlet valve guides (8).

Use tool 9729 + 9726 + 0176 + 6159 + 0049.

Press fit exhaust valve guides (8).

Use tool 9729 + 9726 + 0176 + 6159 + 0050.



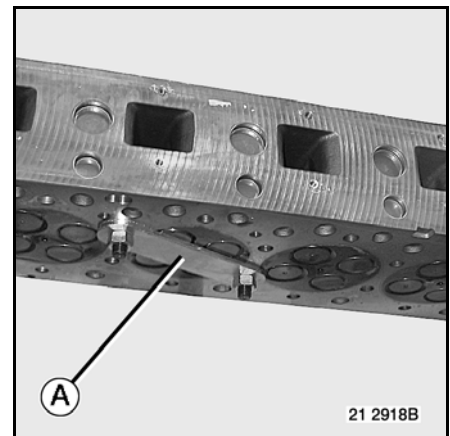
Tighten tool 0176 to a torque of 70 Nm.



Replace plate (A) with washers.

Check the protrusion.

See page(s) B-6-5.



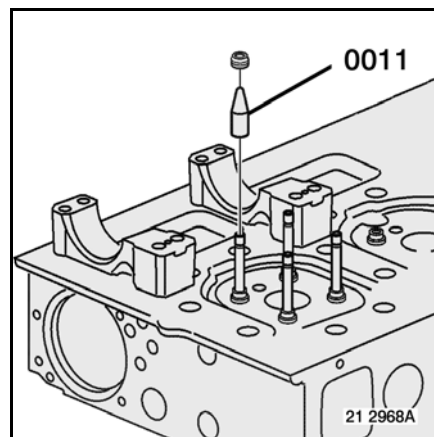
Valves

Oil the valve stems and install the valves.

Mount tool **0011**.

Apply oil to the valve stem seals **(7)** and fit.

Use a suitable tube.



Fit securing plate **(A)** of tool **0176**.

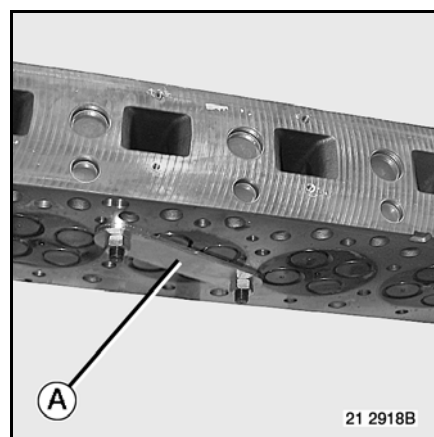
Tighten tool **0176** to a torque of **70 Nm**.

Fit springs **(3 - 4)**.

Fit cups **(2)**.



WEAR SAFETY GOGGLES FOR PROTECTION.



Tension springs **(3 - 4)**.

Fit valve cotters **(1)**.

Decompress springs **(3 - 4)** gradually while checking the correct position of the valve cotters **(1)**.

Use tool **9729 + 9726 + 0176 + 6159 + 8246**.

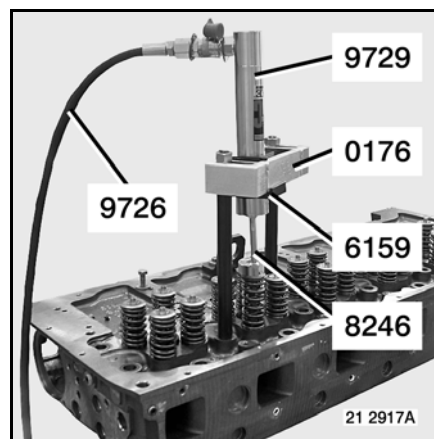


*The operation described above serves to remove **2 valves** each time.*

Withdraw the tool.

Check the set-back of the valves.

See page(s) B-6-2.

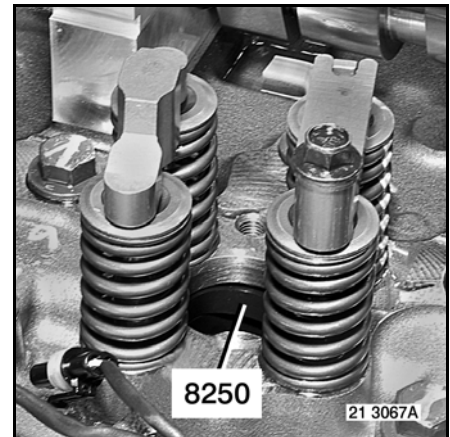


Injector sleeves

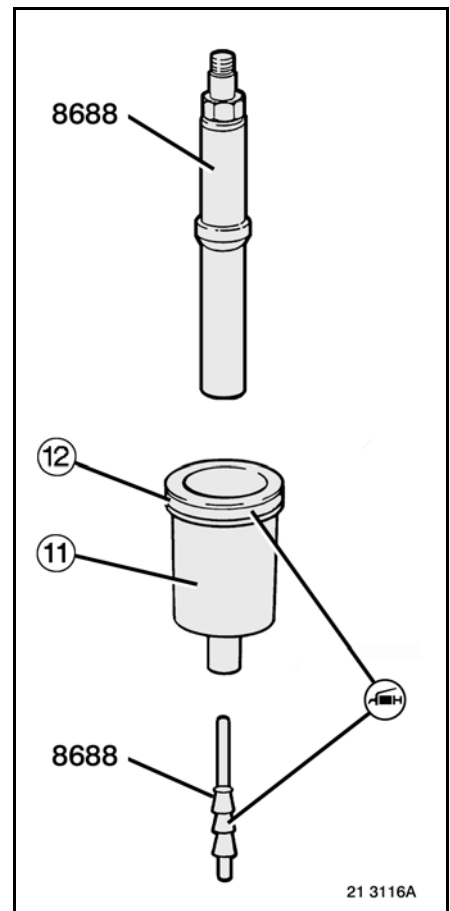
Clean the injector sleeve housing .
See page(s) F-4-12.



Insert tool 8250 into the groove in the fuel circuit to prevent the ingress of impurities.



Fit a new gasket (12).
Lubricate the seal (12).
Apply oil to the end of tool 8688.
Use engine oil.
Position sleeve (11) on tool 8688.

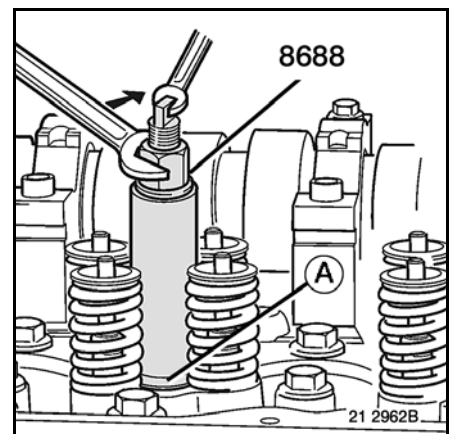


Fit socket (11).
Use the yoke of the unit pump injector to hold tool 8688.



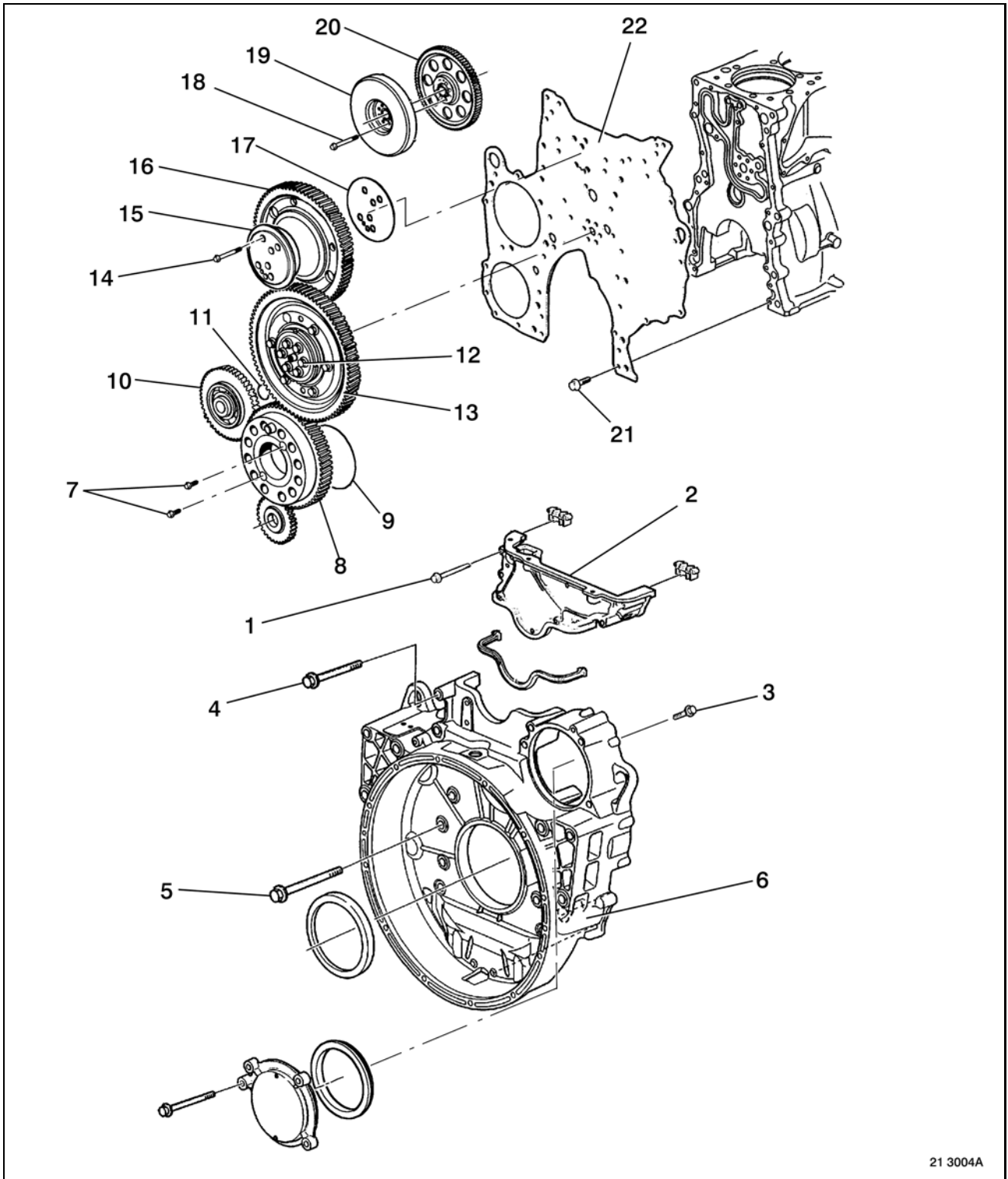
After tightening the yoke, check that the collar (A) of tool 8688 is flush with the cylinder head to ensure that the injector sleeve is correctly in position.

Tighten the nut while holding the screw of the tool 8688 to flange over the end of the injector sleeve.
Withdraw the tool.



VALVE TIMING

Exploded view



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Removal

The item numbers indicated in the text refer to the drawing on page G-2.

Remove starter motor.

See page(s) E-7-1.

Remove compressor.

See page(s) E-5-1.

Remove the power-assisted steering pump.

See page(s) E-6-1.

Remove flywheel.

See page(s) H-5.

Remove the rocker cover.

See page(s) F-1-2.

Remove the oil sump.

See page(s) J-3.

Remove the crankshaft rear seal.

See page(s) H-10.

Remove bolts (1).

Remove lower timing casing (2).

Remove bolts (3) M8 - (4) M12 - (5) M14.

Remove casing (6).

Remove bolts (7).

Remove pinion (8).

Use tool 0857.

Remove pinion (10).

Save seal (11).

Loosen bolts (12 - 14 - 18) proceeding in the reverse sequence to tightening.

See page(s) B-5-16.

Remove pinions (13 - 16).

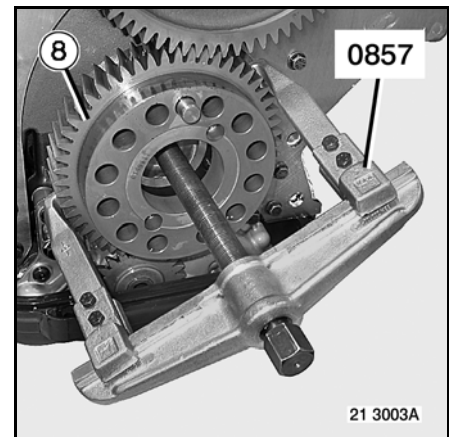
Remove vibration damper (19) and camshaft pinion (20).

Remove hub (15).

Remove washer (17).

Remove bolts (21).

Remove timing plate (22).



Inspection

The item numbers indicated in the text refer to the drawing on page G-2.

Check the diameter of hub (15) and of idler gear bush (16).

For values, see "Technical data" chapter.

See page(s) B-6-7.

Check the state of the teeth of each gear and pinion.

Check the state of the pinion bearings (10 - 13).

Fitting

The item numbers indicated in the text refer to the drawing on page G-2.

Clean the joint faces.

Fit timing plate (22).

Apply a bead of silicone.

Apply "CAF 44" sealant.

Tighten bolts (21) to torque following the tightening sequence.

See page(s) B-5-15.

Line up marks **TDC** and **(A)**.

Fit pinion (20).

Fit vibration damper (19).

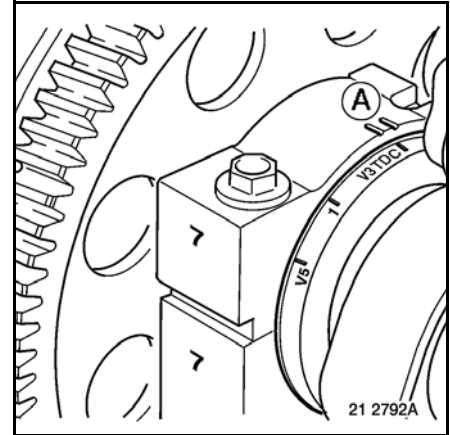
Start bolts (18) but do not tighten them.

Fit the washer (17).

Fit idling gear (16).

Position hub (15).

Start bolts (14) but do not tighten them.



Lightly oil a new O-ring (9) and install.

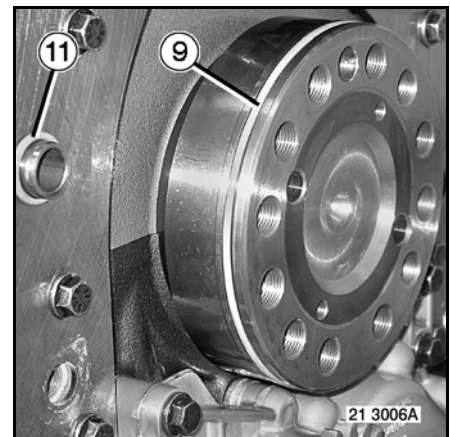
Fit a new O-ring (11).

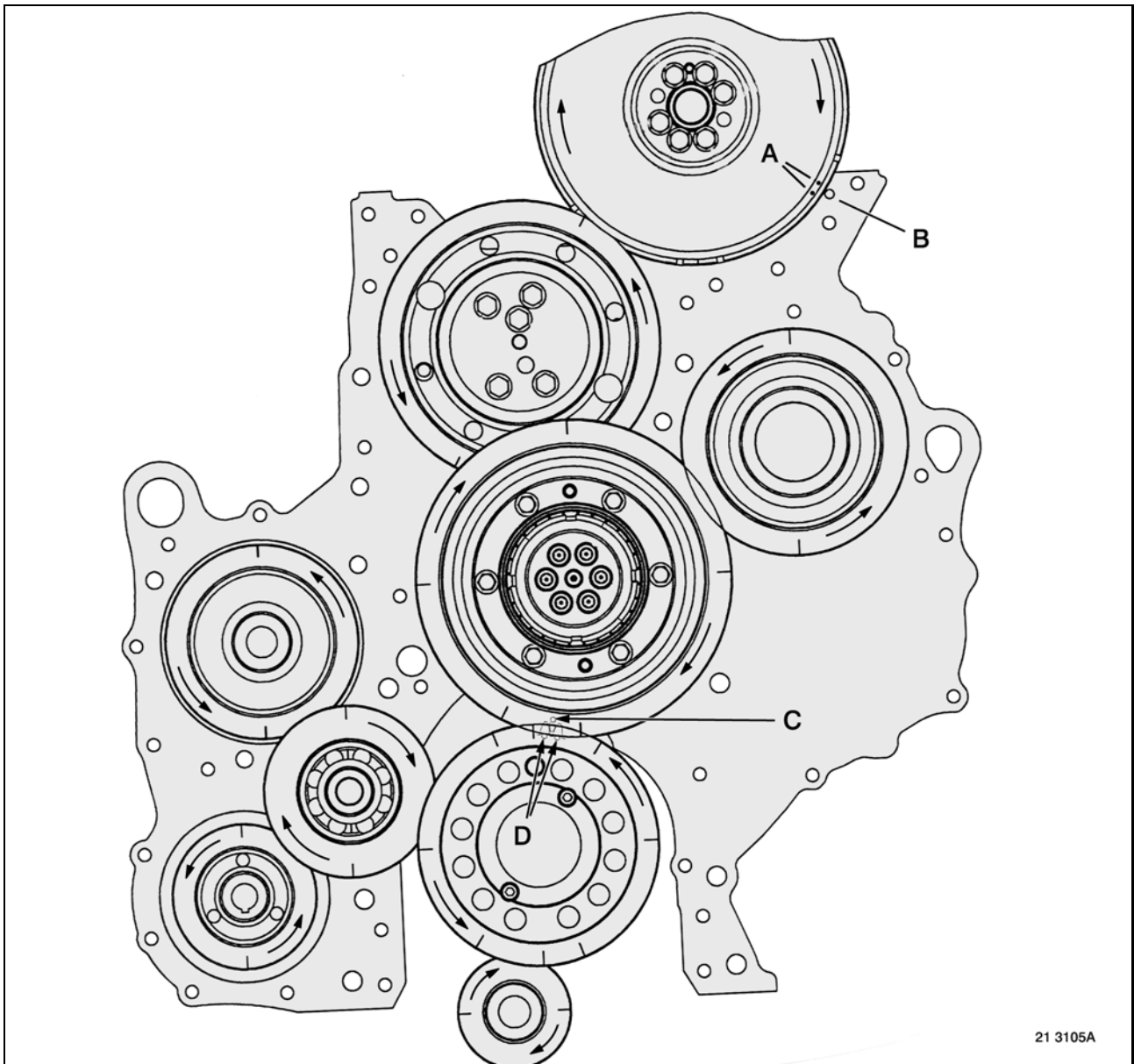
Fit pinion (8).

Tighten bolts (7) to torque.

See page(s) B-5-16.

Fit pinion (10).





Fit pinion (13) ensuring the position of marks (A - B) / (C - D).

Fit bolts (12).

Tighten bolts (12 - 18) to torque following the tightening sequence.

Use tool 9776.

See page(s) B-5-16.

Slide a feeler gauge (A) with a thickness of 0.1 mm between the teeth contact faces of pinions (16 - 20).

Preliminary tighten bolts (14) to a torque of 10 Nm.



Check the backlash .

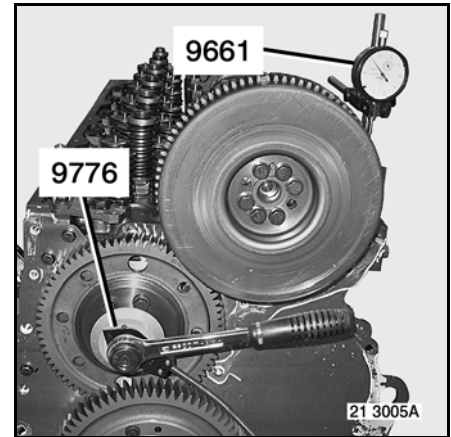
Use tool **9661**.

For values, see "Technical data" chapter.

See page(s) B-6-7.

If the backlash is correct, tighten bolts **(14)** to torque (see page(s) B-5-16).

Use tool **9776**.



Place the engine in a vertical position.

Fit casing **(6)**.

Apply a bead of silicone.

Apply "**CAF 44**" sealant.

Tighten bolts **(3) M8 - (4) M12 - (5) M14** to torque.

See page(s) B-5-10.

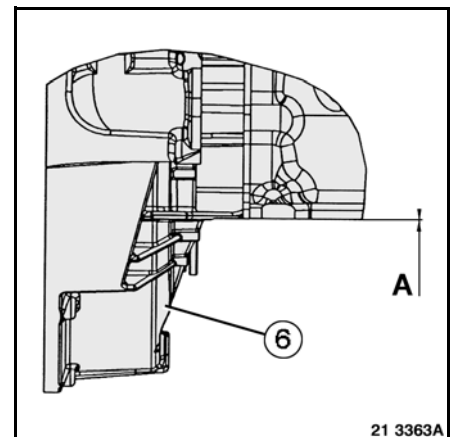
Check that the alignment of the casing joint face **(6)** with the crankcase joint face is within the tolerance: **(A) = 0.0[±]0.25 mm**.

Fit lower timing casing **(2)**.

See page(s) F-1-10.

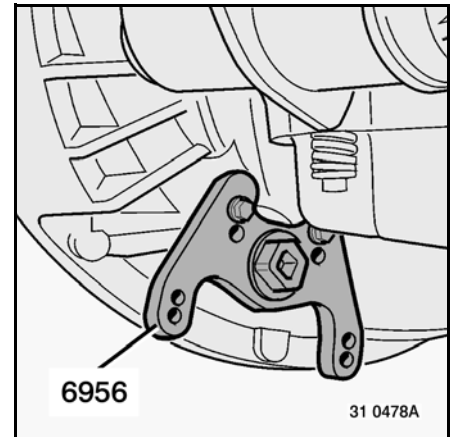
Fit the crankshaft rear seal.

See page(s) H-11.

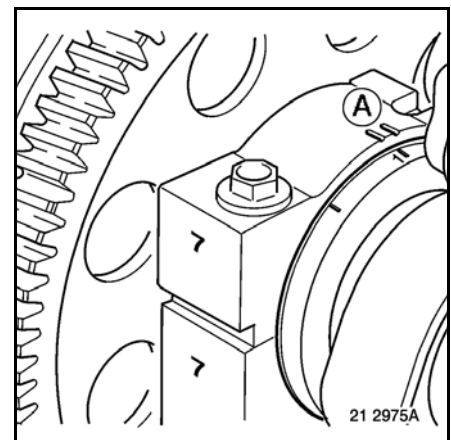


Checking the valve timing

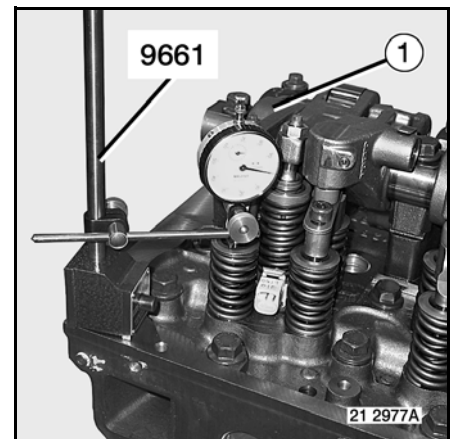
Turn the flywheel using tool **6956**.



Line up marks **(1)** and **(A)**.



Adjust the inlet valve rocker arm clearance of **(1) N° 1** cylinder to nil.
Install a dial gauge.
Use tool **9661**.
Set the dial gauge to zero and mark the measuring point.

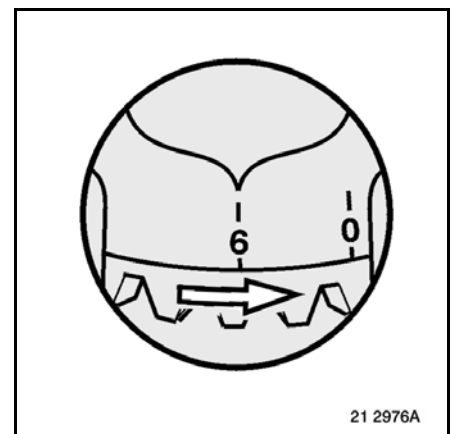


Turn the engine in the normal direction of rotation as far as mark 6 after TDC (about 1 1/4 of a revolution), **N° 6 cylinder compression**. The inlet valve of N° 1 cylinder opens by $1.3^{±0.3}$ mm when the flywheel is positioned at **6°** after top dead centre.



After making the check, do not forget to adjust the N° 1 cylinder inlet valve rocker arm clearance.

See page(s) F-2-1.



RECIPROCATING GEAR

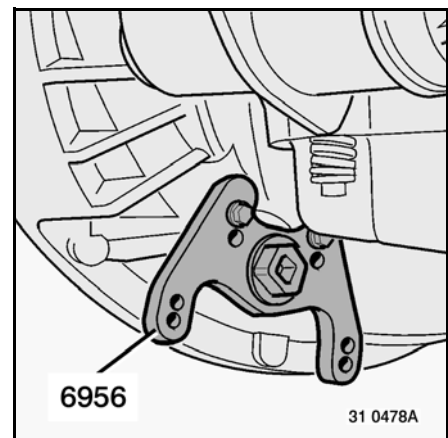
Flywheel damper

Removal

Remove drive belts.

See page(s) E-2-1.

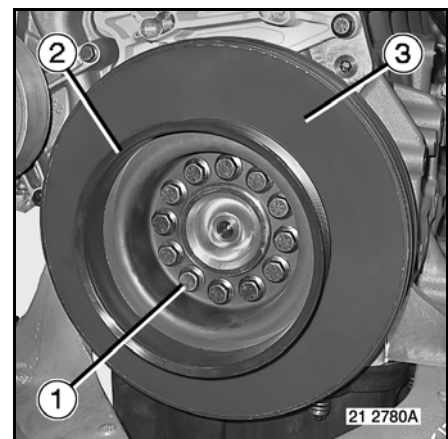
Retain the flywheel against motion using tool **6956**.



Remove bolts (1).

Remove pulley (2).

Remove damper (3).



Fitting

Proceed in the reverse sequence to removal.

Thoroughly clean the contact faces.

Tighten the bolts to torque.

Follow the tightening sequence.

See page(s) B-5-8.

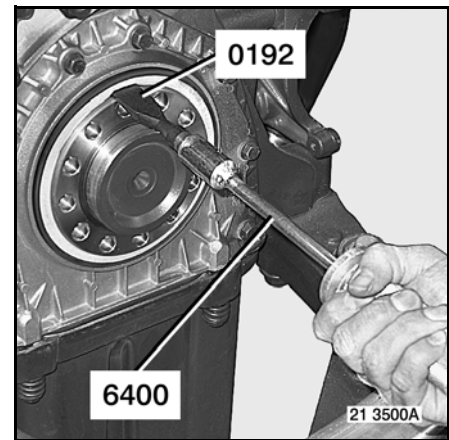
Withdraw tool **6956**.

Crankshaft front seal

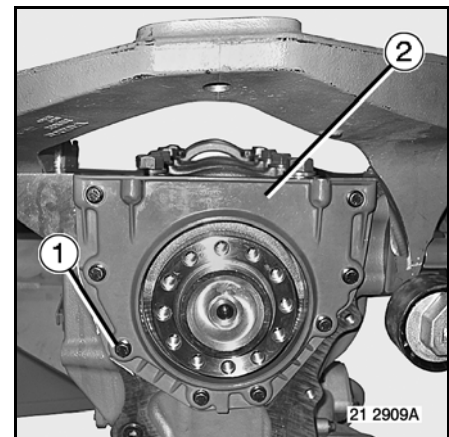
Remove damper.
See page(s) H-2.

Removal

Install tool **0192 + 6400**.
Extract seal.
Remove the oil sump.
See page(s) J-3.



Remove securing nuts and bolts (1).
Remove casing (2).



Fitting

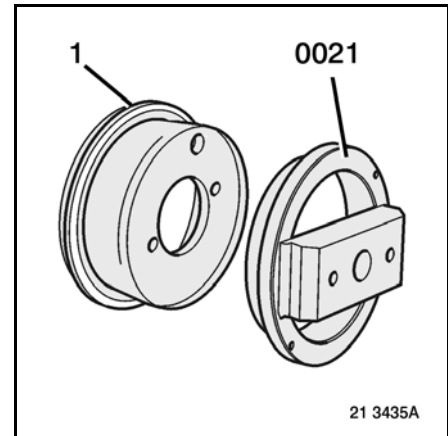
Carefully clean and check the contact faces of the seal (1).



The seal is supplied fitted to a protective ring that is placed on the assembly tool. It is essential to hold the seal to the ring until it is finally installed in the case.

Do not apply grease to the lips.

Any gasket that has been removed from its ring must not be re-used.



Install tool **6401**.

Apply a bead of sealing compound to the gearbox casing joint face (3).

See page(s) B-5-12.

Apply "CAF 44" sealant.

Fit casing (3).

Start bolts (2) but do not tighten them.

Using tool **2000**, bring tool **0021** into abutment against the crankshaft so as to position seal (1) correctly in its housing.

After fitting seal (1), do not withdraw tool **0021**.

Tighten bolts (2) to torque.

See page(s) B-5-12.

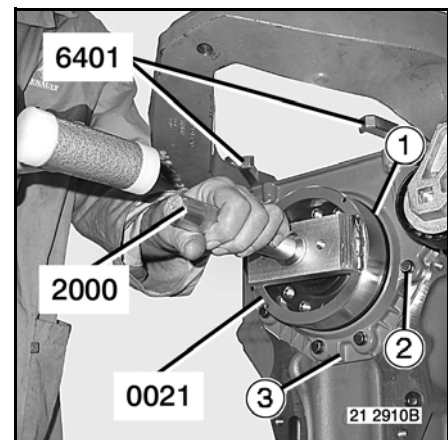
Withdraw tool **6401** + **0021**.

Fit the oil sump.

See page(s) J-3.

Fit the damper.

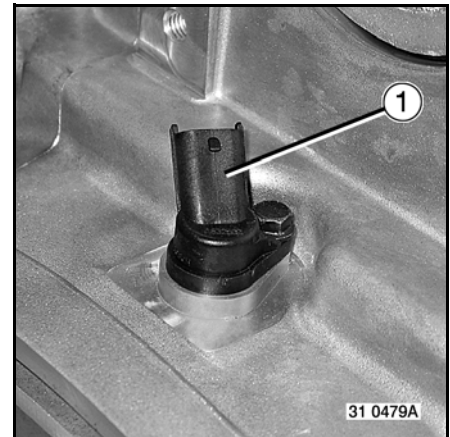
See page(s) H-2.



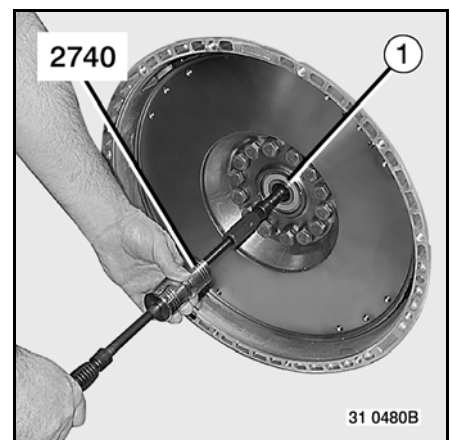
Engine flywheel

Removal

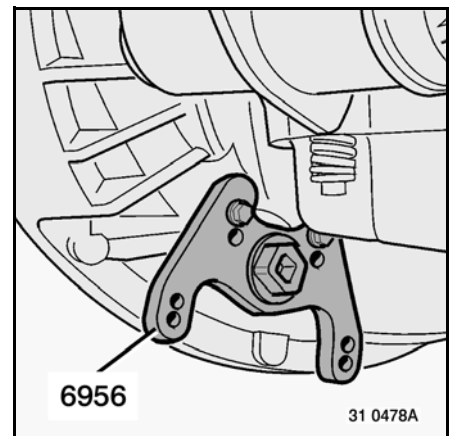
Remove engine speed sensor (1).



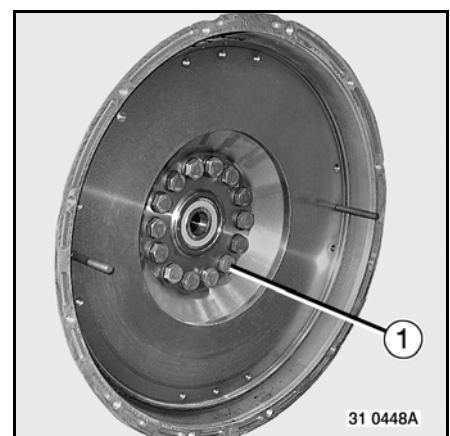
Remove pilot bearing (1).
Use tool 2740.



Retain the flywheel against motion using tool 6956.



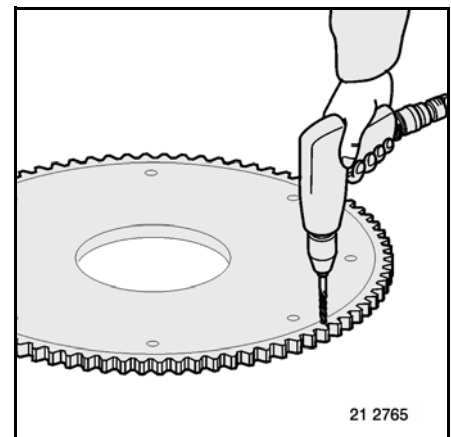
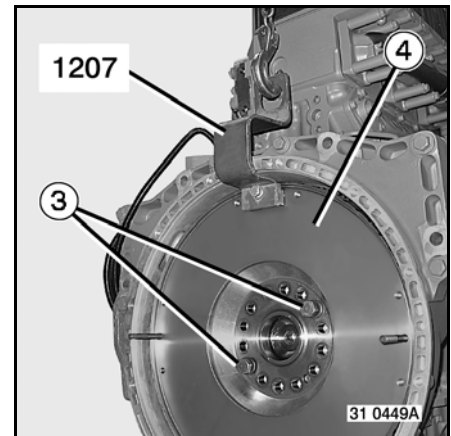
Loosen bolts (1) proceeding in the reverse sequence to tightening.
See page(s) B-5-7.
Withdraw tool 6956.





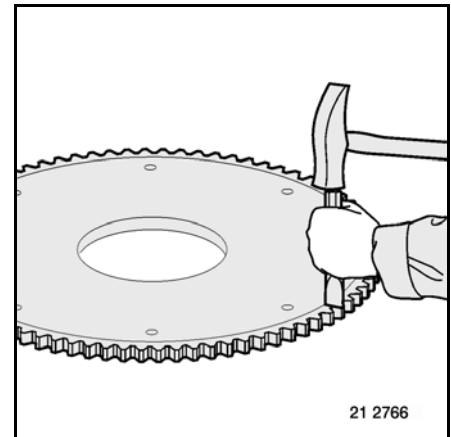
LEAVE 2 BOLTS (3) IN PLACE TO HOLD THE FLYWHEEL (4).

Mount tool 1207.
Remove bolts (3).
Remove flywheel (4).

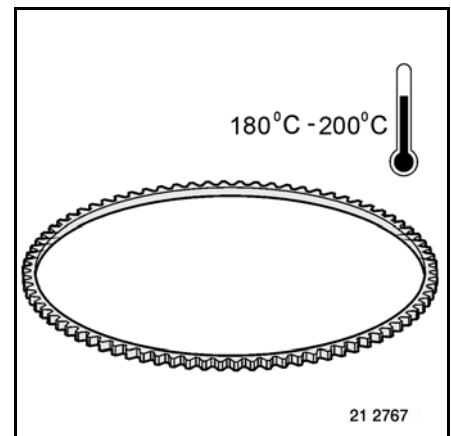


Ring gear**Disassembly**

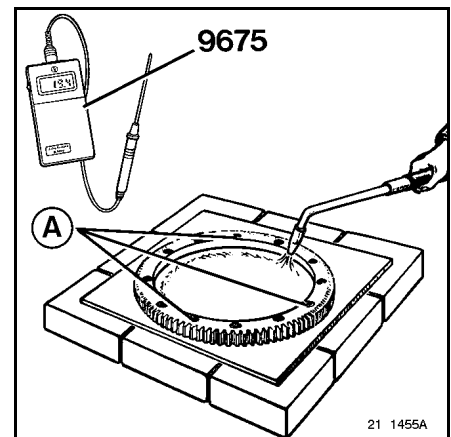
Remove ring gear.

**Assembly**

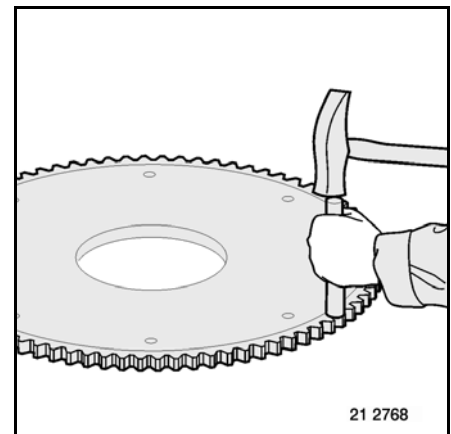
Heat at **200°C**.



If a welding torch is used, take a sheet metal plate and heat it to distribute the heat evenly. Check the temperature at 3 points (A). Use tool **9675**.

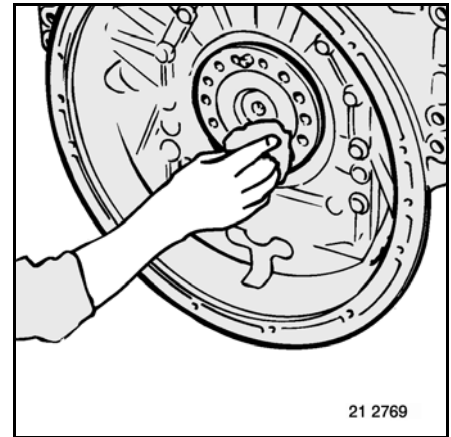


Fit ring gear.

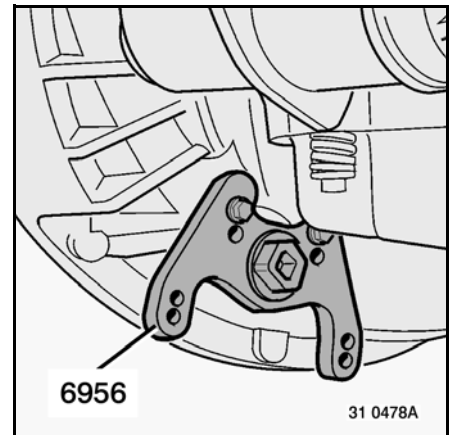


Fitting

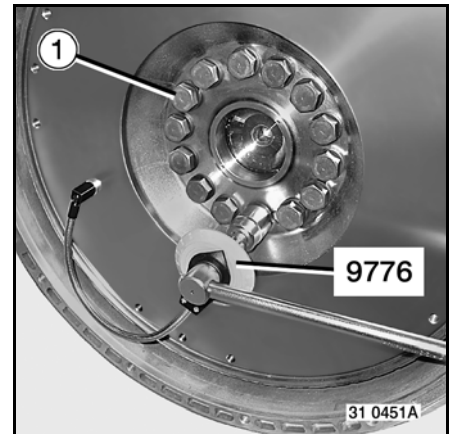
Clean the contact faces thoroughly.



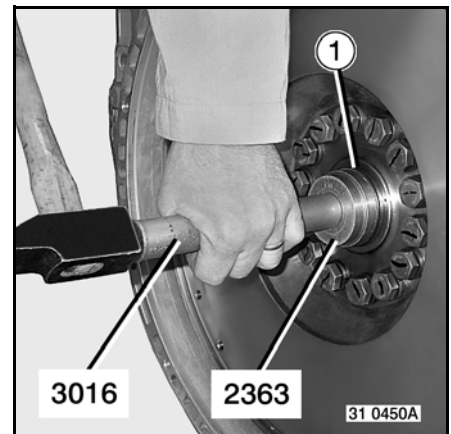
To fit, proceed in the reverse sequence to removal.
Retain the flywheel against motion using tool **6956**.



Tighten bolts **(1)** to torque following the tightening sequence.
Use tool **9776**.
See page(s) B-5-7.
Fit engine speed sensor.
Check the air gap.
See page(s) B-6-20.



Fit pilot bearing **(1)**.
Make pilot bearing **(1)** flush with its housing.
Use tool **3016 + 2363**



Inspection of the flywheel run-out

Check the buckle.

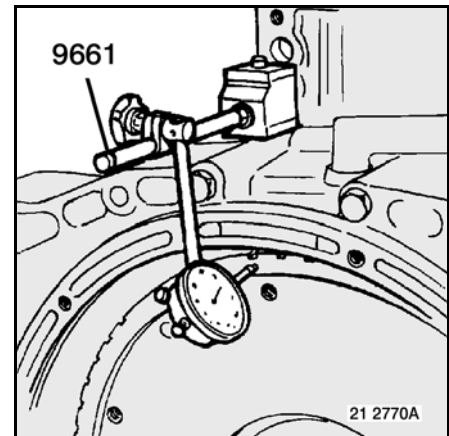
Use tool **9661**.

Note down the value.

If the measured value is higher than the Manufacturer's value, see page(s) B-6-20.

Remove the engine flywheel.

Clean the contact faces thoroughly.

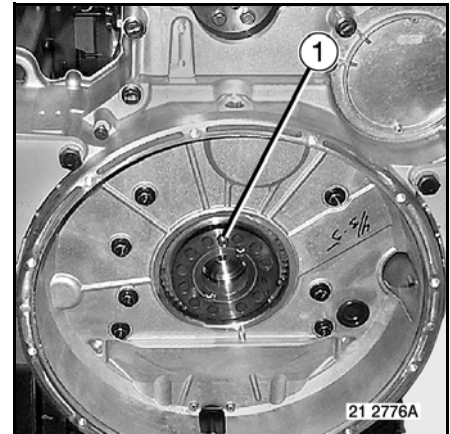


Crankshaft rear seal

Remove the engine flywheel.
See page(s) H-5.

Removal

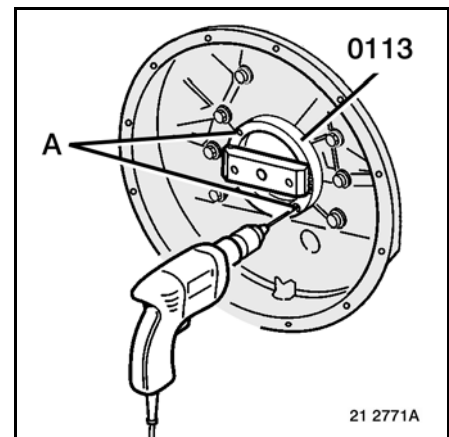
Fit clamps (1).
Ensure the position 12:00.



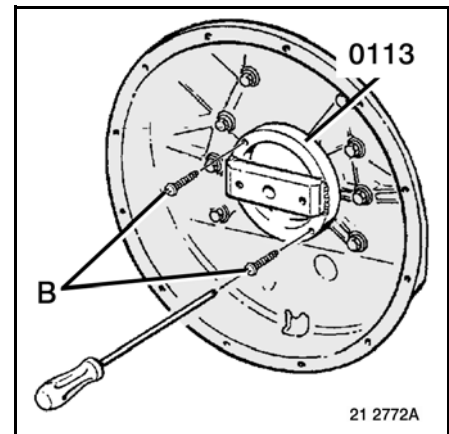
Mount tool 0113.



Drill two holes dia. 3.5 mm in the seal, using the guide holes (A). Pay attention that the drill bit is kept properly centred during drilling so as to not damage the contact faces of the seal. Apply grease to the drill bit to retain the swarf.



Screw two self-tapping screws (B) dia. 5 x 25 mm into the seal.

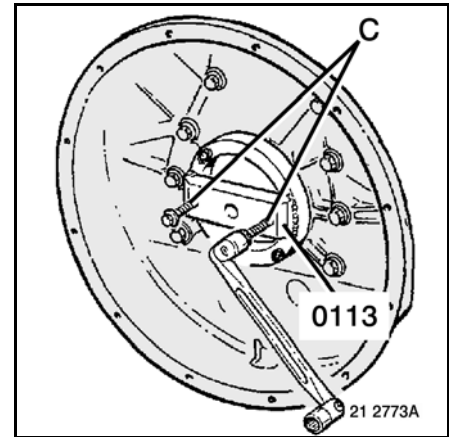


Remove the crankshaft rear seal.

Use two screws (C) dia. 10 x 150 x 55 mm with tool 0113.



Grease the screw support faces.



Fitting

Carefully clean and check the contact faces of the seal.



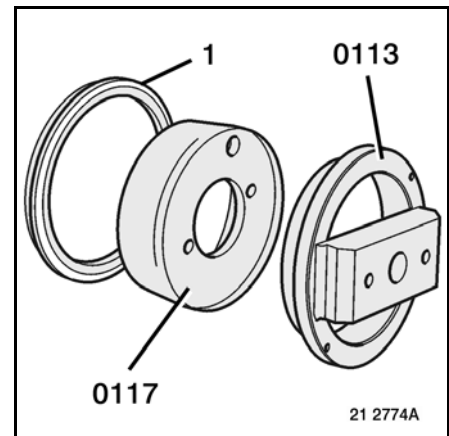
Before using tools 0117 and 0113, check that they are not themselves damaged, to avoid causing damage to seal (1).

Place tool 0117 in position on tool 0113 and lubricate them with engine oil.

Lubricate the outside and the lip of seal (1).

Slide seal (1) onto tool 0113.

Withdraw tool 0117.

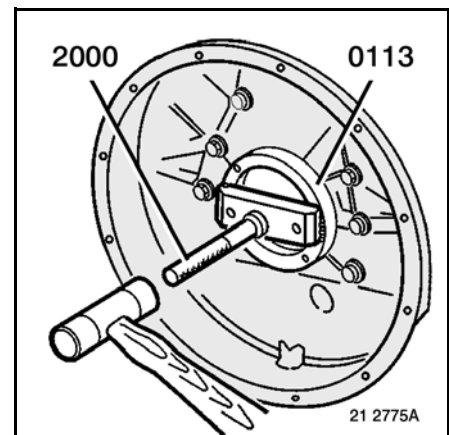


Using tool 2000, bring tool 0113 into abutment against the crankshaft pinion so as to position seal (1) correctly in its housing.

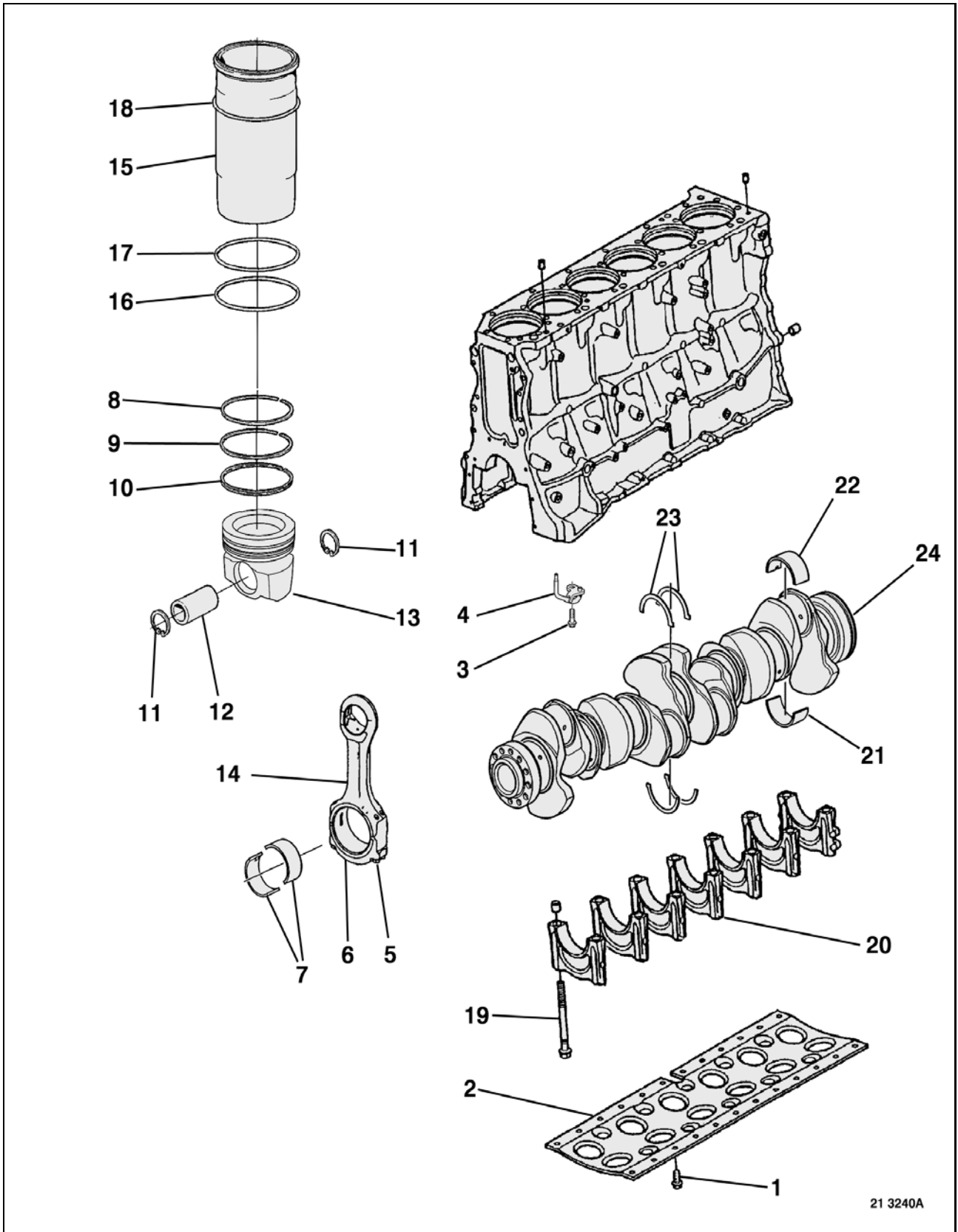
Withdraw tool 0113.

Fit the engine flywheel.

See page(s) H-8.



Exploded view



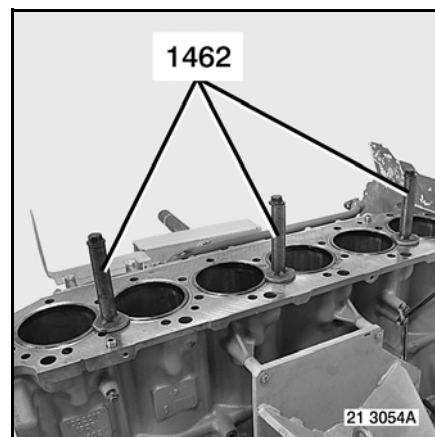
21 3240A

Disassembly

The item numbers indicated in the text refer to the drawing on page H-12.
Install tool **1462**.



During the reciprocating gear removal operation, carefully mark the position of installation of each part, and more particularly the connecting rod bearing half-shells and caps.



Oil jets

Remove bolts **(1)**.

Remove cylinder block stiffener **(2)**.

Remove bolts **(3)**.

Remove oil jets **(4)**.

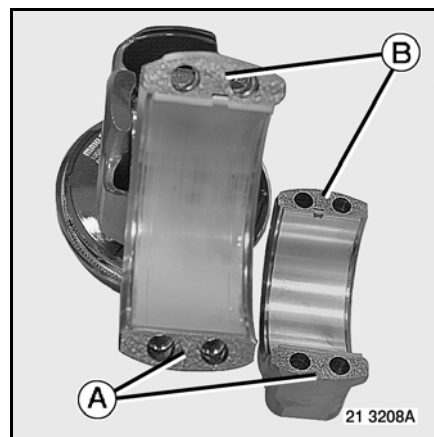
Connecting rods

Precautions



Split connecting rod

So as to not have to loosen a connecting rod during operation, it is crucial to not bump, nor apply oil to the part and keep the contact faces (A - B), which correspond to the relief of the connecting rod cap / connecting rod parting line, immaculately clean.



Identification marking

The connecting rod and its cap are paired and marked with a 3-figure identification marking (*).



(*) With the identification markings opposite one another.

Turn the crankshaft so as to be able to gain access to the connecting rod cap to be removed.

Remove bolts (5).

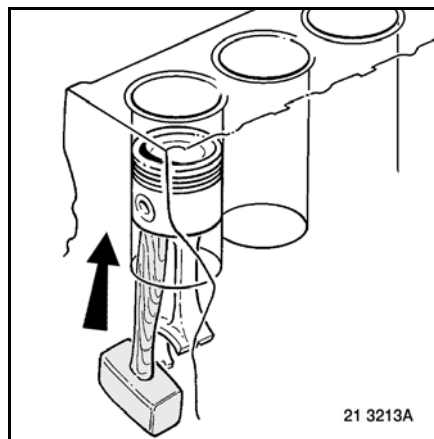
Remove connecting rod caps (6).



If necessary, remove the scale from the top of the liner.

Take out the connecting rod/piston assembly through the top of the cylinder block by pushing with the handle of a hammer.

Remove bearing half-shells (7).



Piston rings

Withdraw piston rings (8 - 9 - 10).

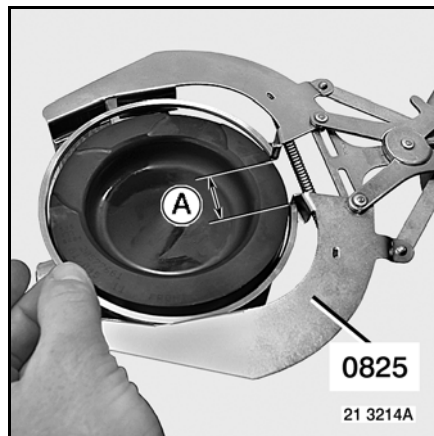


To avoid breakage of the piston rings during operation and during assembly / dismantling of the fire and compression rings, it is vital to not exceed the spacing value A.

Fire ring (8) A = 30 ± 1 mm

Compression ring (9) A = 38 ± 1 mm

Use tool 0825.



Pistons

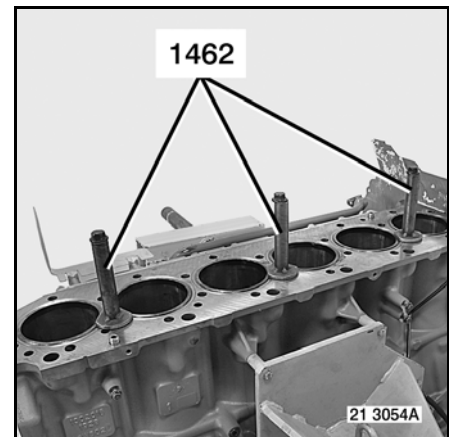
Withdraw circlips (11).

Remove pin (12).

Remove piston (13).

Liners

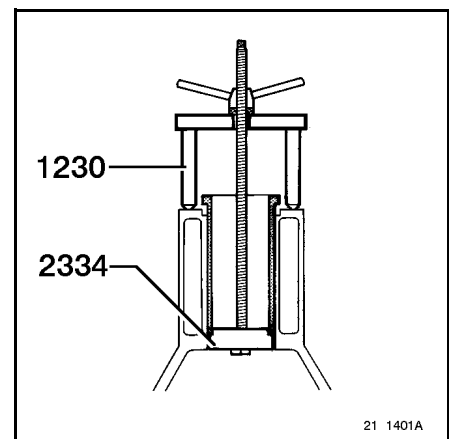
Withdraw tool 1462.



Withdraw liners (15).

Use tool 1230 + 2334

Take out seals (16 - 17 - 18).

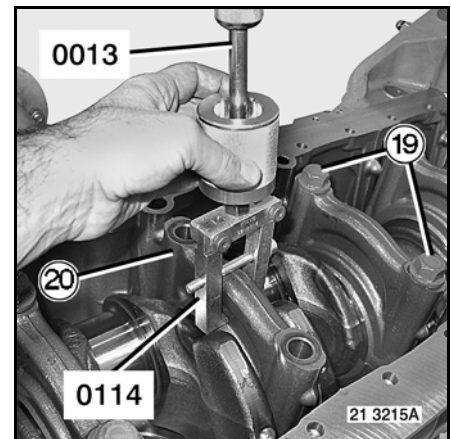


Crankshaft

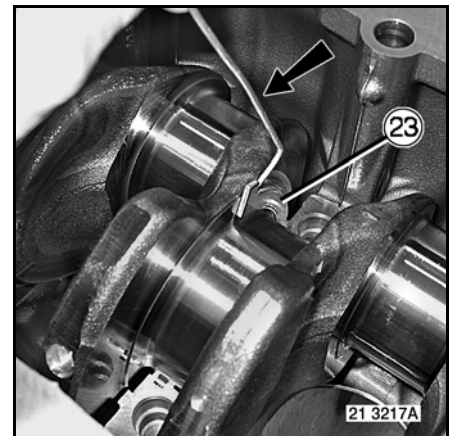
Remove bolts (19).

Remove bearing caps (20).

Use tool 0114 + 0013



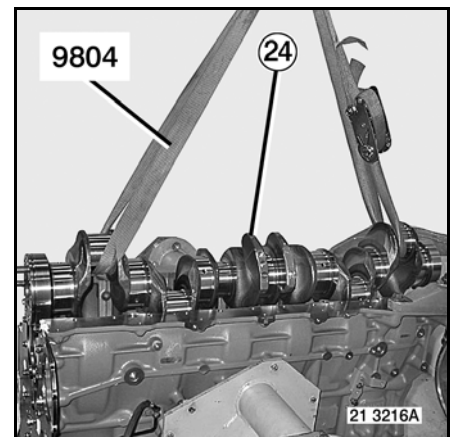
Remove half-rings (23).



Remove crankshaft (24).

Use tool 9804.

Remove bearing half-shells (22).



Inspection

Cylinder block

Inspect the cylinder block joint face.

See page(s) B-6-20.

Liners

Inspect:

- out-of-round,
- taper.

See page(s) B-6-20.

Pistons

Inspect:

- diameter,
- gudgeon pin and housing,
- piston ring grooves,
- skirt surface.

See page(s) B-6-18.

Piston rings

Inspect:

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

See page(s) B-6-18.

Connecting rods

Inspect:

- straightness and true,
- bushes.

See page(s) B-6-16.

Crankshaft

Inspect:

- coaxiality,
- crankpin diameters,
- journal diameters.

See page(s) B-6-11.

Oil jets

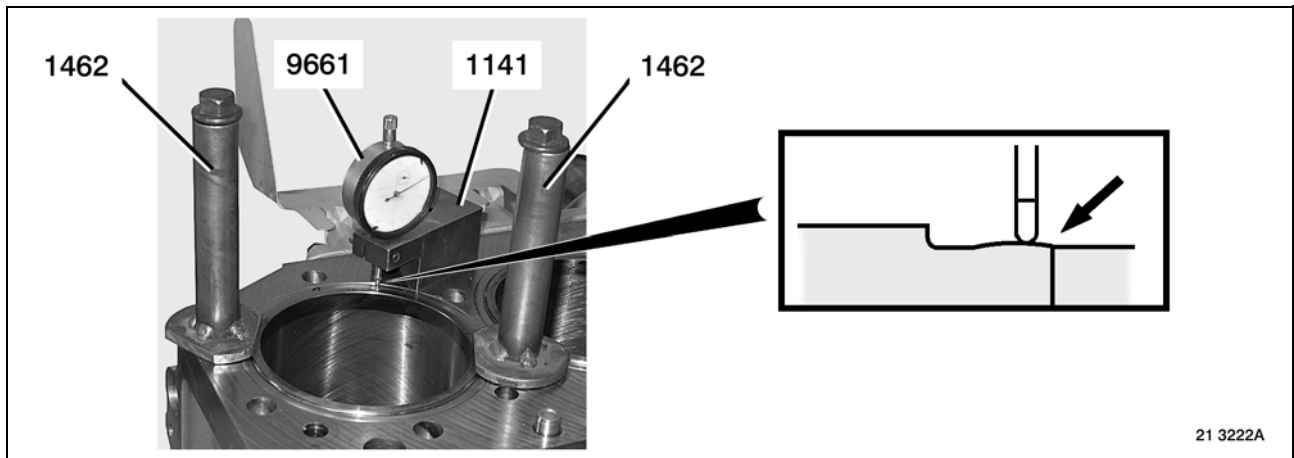
Clean the oil jets.

Assembly

The item numbers indicated in the text refer to the drawing on page H-12.

Liners

Install the liners without seals.



Immobilize liners.

Check the protrusion of the liners.

Use tools **1462 + 9661 + 1141**.



- **Make 2 diagonally opposed measurements on the highest point of the sealing face of the liner. Calculate the average value of the 2 readings.**
- **Mark the positioning of the liners in the cylinder block with a felt pen so as to obtain the same positioning during assembly.**

For values, see "Technical data" chapter.

See page(s) B-6-20.

Install seals **(18 - 17 - 16)**.

Ensure the position

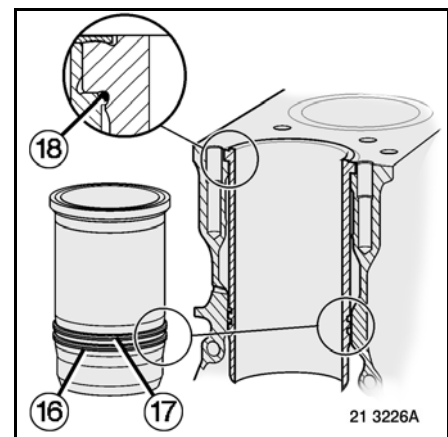


Place the violet seal (16) in position in the lower groove.

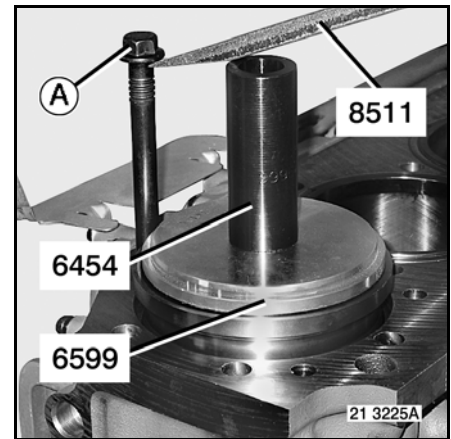


O-rings (18 - 17 - 16) are to be fitted dry and the exposed part then greased.

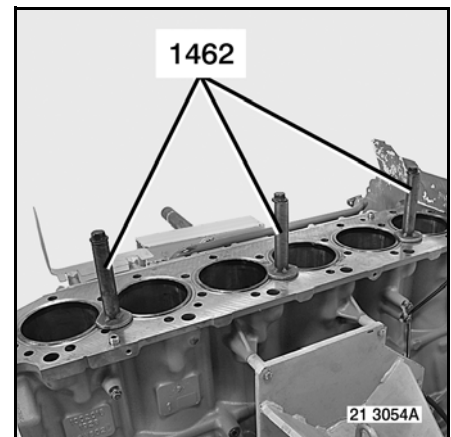
Lubricate seals **(18 - 17 - 16)** with coolant.



Fit liners (15).
Use a cylinder head bolt (A).
Use tools 6599 + 6454 + 8511.



Immobilize liners (15).
Use tool 1462.



Crankshaft

Fit bearing half-shells **(22)**.

Line up the lubrication holes.

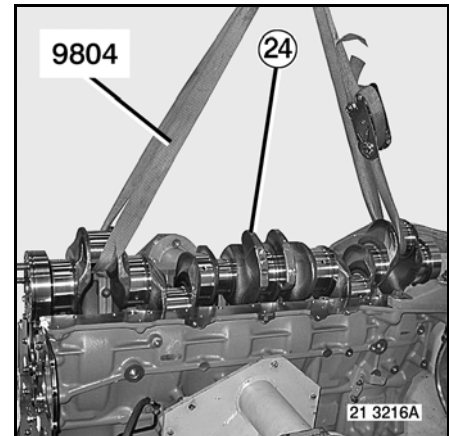
Fit bearing half-shells **(21)**.

Match the direction of orientation.

Apply oil (engine oil) to the inner faces of bearing half-shells **(21 - 22)** when installing them. Do not apply oil to the support face.

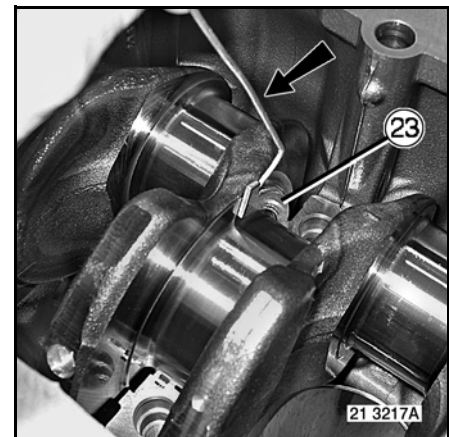
Apply oil to the crankpins.

Fit crankshaft **(24)**.



Install thrust half-rings **(23)**.

Match the direction of orientation.



Fit bearing caps **(20)**.

Match the direction of orientation.

Ensure the marking.

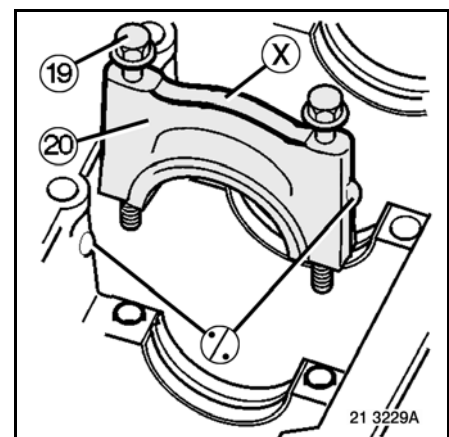
The bearing caps are marked from **1** to **7**, N° **1** bearing at the engine front end.

Fit bolts **(19)**.

Tighten to torque.

See page(s) B-5-8.

Check the rotation.



Crankshaft end play

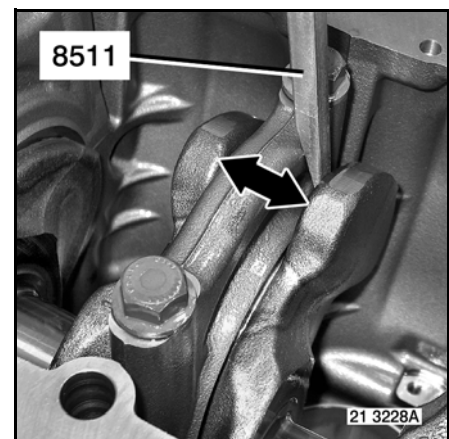
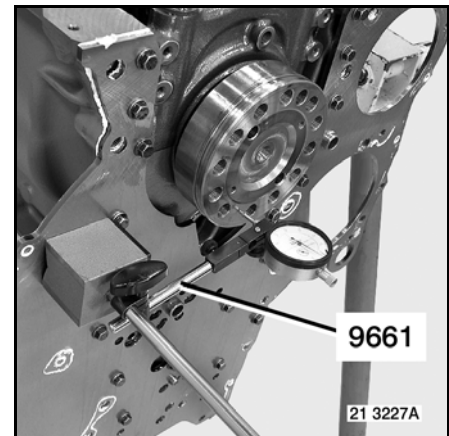
Gauge the crankshaft end play.

Use tool **9661** + **8511**

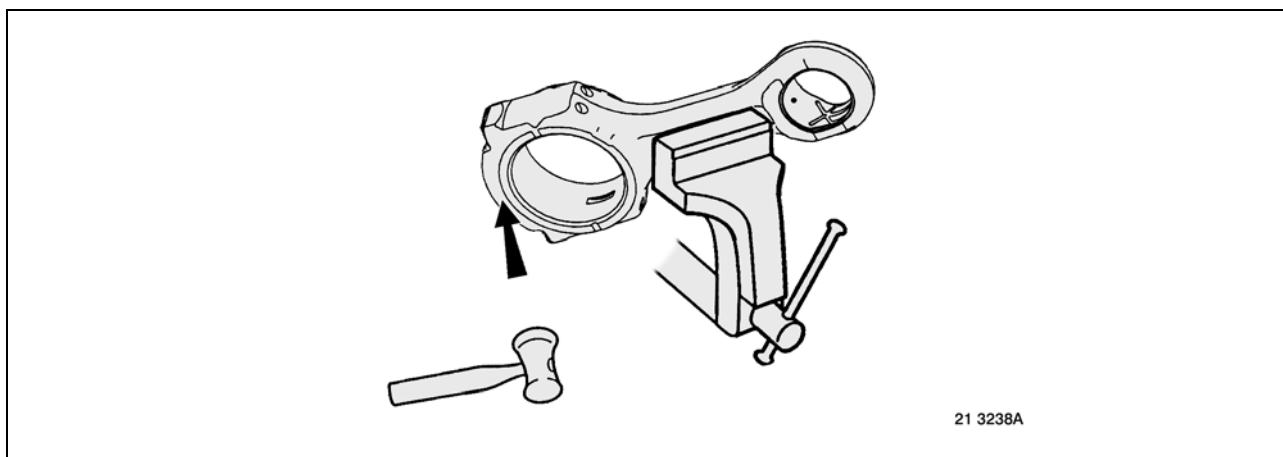
Correct, if necessary.

For values, see "Technical data" chapter.

See page(s) B-6-11.



Connecting rod



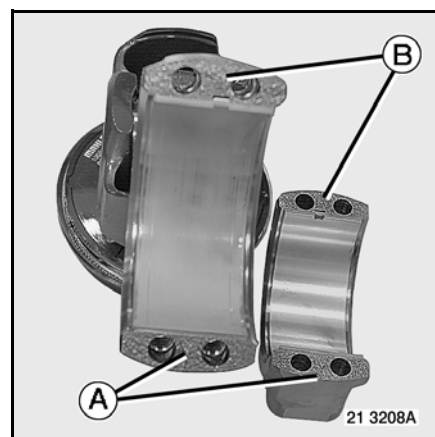
Preparing a new connecting rod

- Immobilize the connecting rod (14) in a vice; use protections.
- Remove bolts (5).
- Free connecting rod cap (6) using a plastic mallet.
- Blow compressed air over the contact faces (A - B) of the connecting rod and of the connecting rod cap.



Split connecting rod

So as to not have to loosen a connecting rod during operation, it is crucial to not bump, nor apply oil to the part and keep the contact faces (A - B), which correspond to the relief of the connecting rod cap / connecting rod parting line, immaculately clean.



Piston

Lubricate gudgeon pin, piston and small end bush.

Assemble pistons (13) and connecting rods (14) with gudgeon pins (12).



When assembling the connecting rod / piston assembly, take care to position the marks correctly.

Install circlips (11).

Install piston rings (10 - 9 - 8).

Use tool 0825.



To avoid breakage of the piston rings during operation and during assembly / dismantling of the fire and compression rings, it is vital to not exceed the spacing value A.

Fire ring A = 30 ± 1 mm

Compression ring A = 38 ± 1 mm

Fit piston rings (10 - 9 - 8) so that the TOP markings are facing upwards.

For the oil scraper ring (10), the spring gap must be diametrically opposed to the joint gap.

The piston ring joint gaps must be staggered in relation to one another.

Fit bearing half-shells (7).

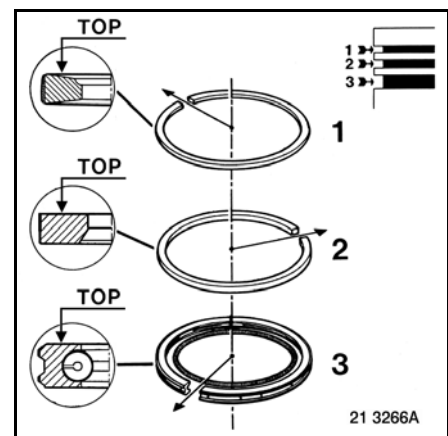
Apply oil.

Match the direction of orientation.

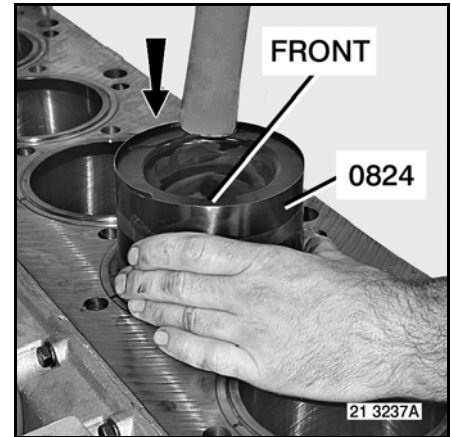
Apply oil to piston (engine oil).

Compress rings.

Mount tool 0824.



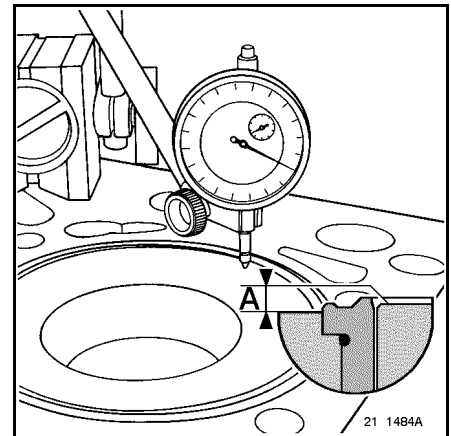
Install connecting rod/piston assemblies.
The marking **FRONT** must be directed towards the front of the engine (N° 1 cylinder).
Use tool **0824**.



Fit connecting rod caps (**6**).
Match the direction of orientation.
Fit securing bolts (**5**).
Tighten to torque.
See page(s) B-5-9.
Check the rotation.



Check the pistons protrusion.
See page(s) B-6-18.



Oil jets

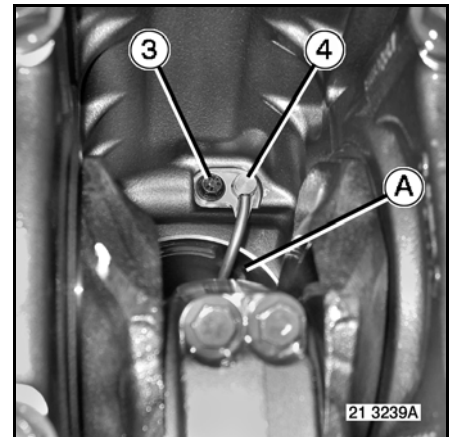
Fit oil jets (4).

Fit securing bolts (3).

Tighten to torque.

See page(s) B-5-19.

In the bottom dead centre position, check that oil jet (4) enters into the notch in piston (A) without touching it.

**Cylinder block stiffener**

Fit cylinder block stiffener (2).

Fit securing bolts (1).

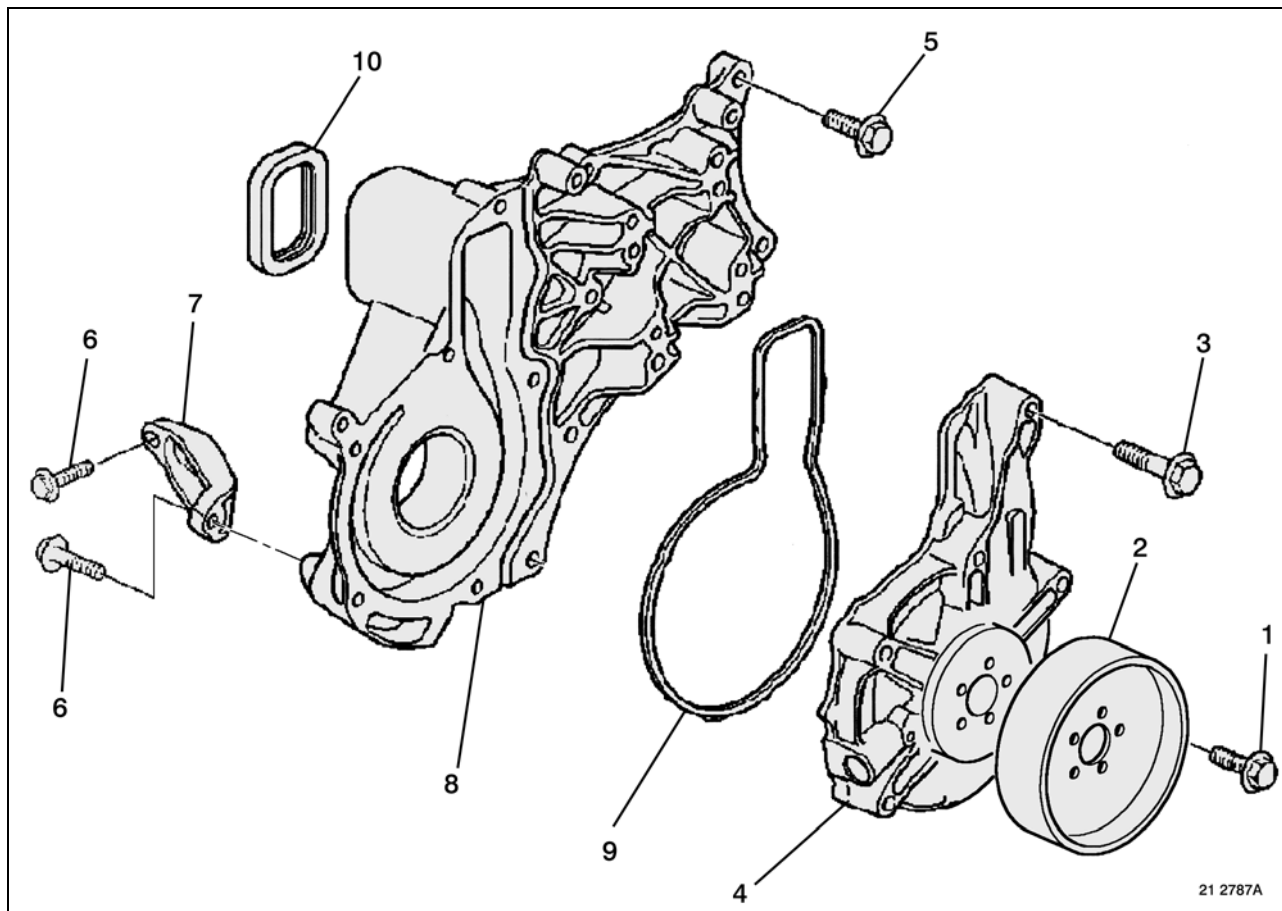
Tighten to torque.

See page(s) B-5-9.

ENGINE COOLING

Water pump

Removal



21 2787A

- Remove bolts (1).
- Remove pulley (2).
- Remove bolts (3).
- Remove water pump (4).
- Remove bolts (5 - 6).
- Remove bracket (7).
- Remove water pump casing (8).

Inspection

- Ensure that the water pump impeller turns freely, without hard spots.
- Inspect the state of the water pump fins.
- Ensure there is no significant water pump shaft play.



The water pump cannot be repaired.

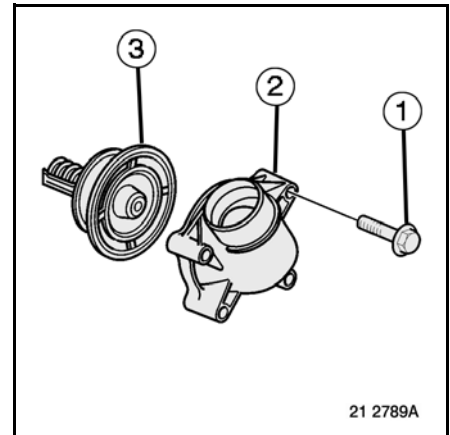
Fitting

- To fit, proceed in the reverse sequence to removal.
- Replace seals (9 - 10).
- Tighten to torque.
- See page(s) B-5-22.

Thermostat

Removal

- Remove bolts (1).
- Remove cover (2).
- Remove thermostat (3).



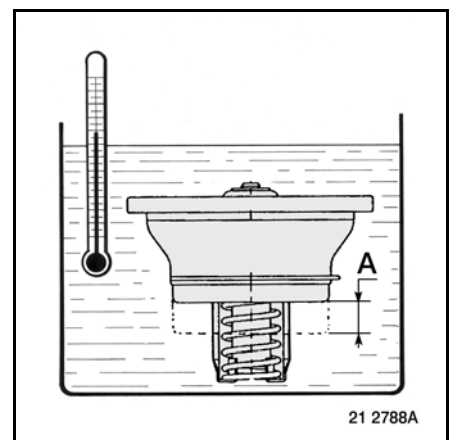
Inspection

Immerse thermostat (3) in a bath filled with water. Gradually heat the water and stir. The beginning of opening temperature should be between **80** and **84 °C**. For the maximum thermostat opening dimension of **A = 16 mm**, the temperature should be between **90** and **94 °C**.

Let the water cool down and check the temperature at which thermostat closes. Closing temperature: **80 → 84 °C**.



Replace the thermostat if the values measured are outside the tolerances.



Fitting

To fit, proceed in the reverse sequence to removal.

Oil cooler

Removal

The item numbers indicated in the text refer to the drawing on page J-2.

Loosen bolts **(43)** proceeding in the reverse sequence to tightening.

See page(s) B-5-19.

Remove casing **(44)**.

Remove bolts **(46)**.

Remove oil cooler **(47)**.

Cleaning

Oil circuit: Use a degreasing product.

Inspection

Mount tool **2899** to the oil cooler.

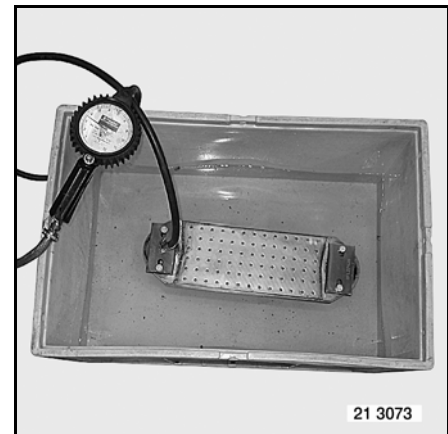


Test for leaks in a water bath at ambient temperature, air pressure:

2.5 bar(s) for at least 1 minute. Check there are no air bubbles.

Take the oil cooler out of the water bath.

Withdraw tool **2899**.



Fitting

Replace seals **(48)**.

Place oil cooler **(47)** in position.

Tighten bolts **(46)** to torque.

See page(s) B-5-18.

Install seal **(45)**.

Fit oil cooler casing **(44)**.

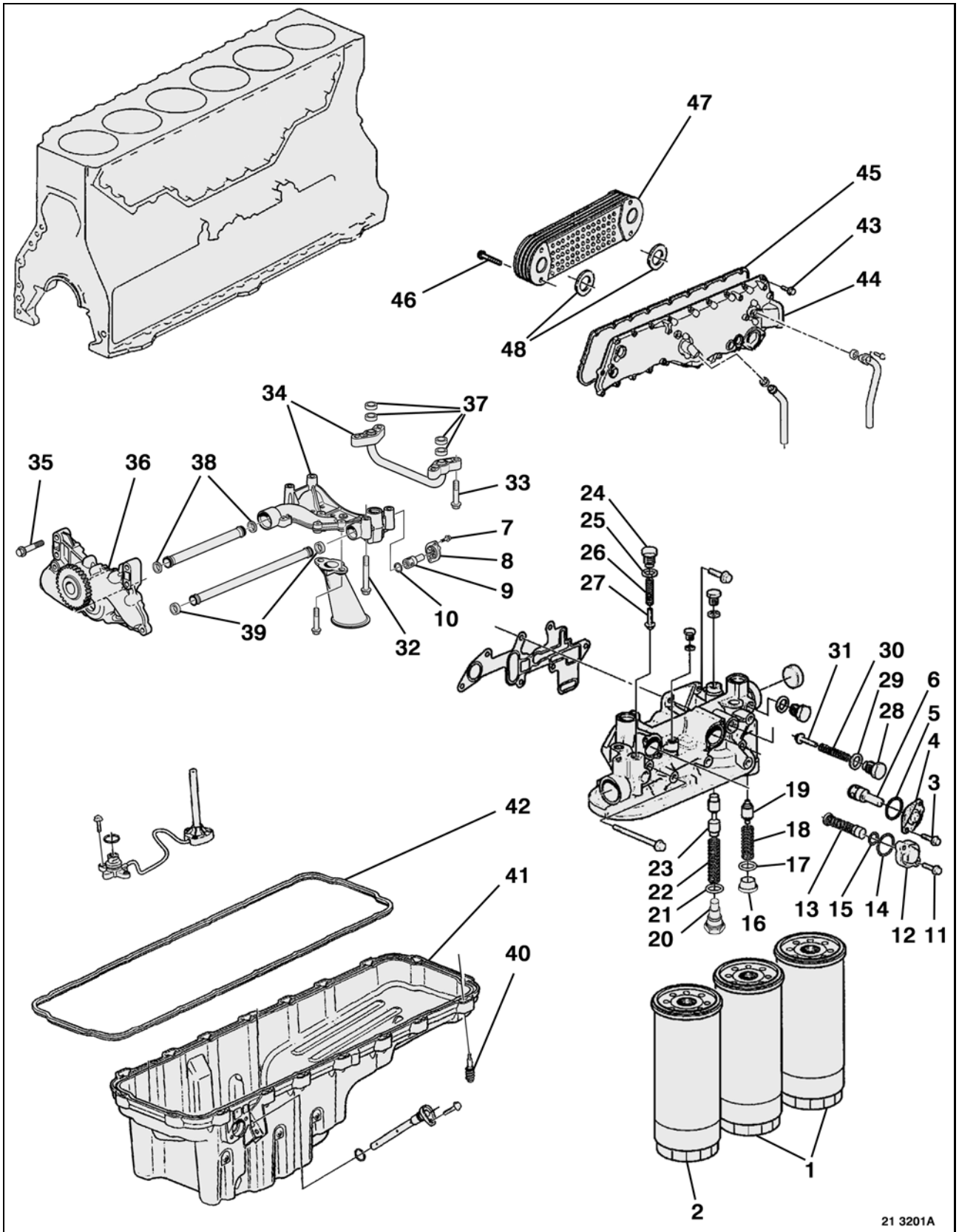
Tighten bolts **(43)** to torque.

Follow the tightening sequence.

See page(s) B-5-19.

LUBRICATION

Exploded view



21 3201A

Oil sump

Removal

The item numbers indicated in the text refer to the drawing on page J-2.

Loosen bolts **(40)** proceeding in the reverse sequence to tightening.

See page(s) B-5-17.

Remove oil sump **(41)**.

Fitting

To fit, proceed in the reverse sequence to removal.

Apply a bead of silicone **dia. 2 mm** as shown in the drawing.

Perform assembly within 20 minutes of application of the silicone.

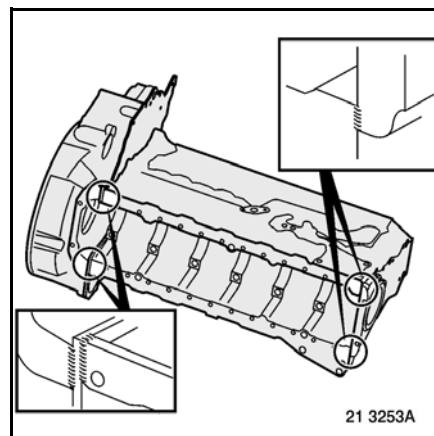
Use a silicone sealant "**CAF 44**".

Replace the gasket **(42)**.

Tighten bolts **(40)** to torque.

Follow the tightening sequence.

See page(s) B-5-17.



Oil filter

The item numbers indicated in the text refer to the drawing on page J-2.

Removal

Put a drain pan into place.

Remove oil filters **(1 - 2)**.

Use tool **2655**.

Fitting

Fill the oil cartridge(s) with oil **(1 - 2)**.

Apply oil to seals.

Screw up the cartridge(s) until contact is made with the bracket.

Tighten to torque.

See page(s) B-5-20.

Pressure reduction valve

The item numbers indicated in the text refer to the drawing on page J-2.

Disassembly

Remove bolts (3).

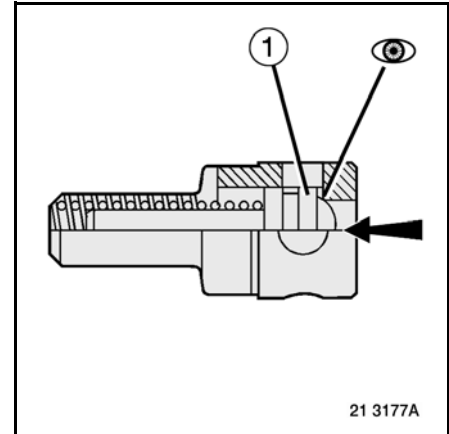
Remove bottom cover cap (4).

Save seal (5).

Remove pressure reduction valve (6).

Inspection

Press the valve to check the state and the cleanliness of the contact face of the valve and its seat. Check that the valve does not seize in its housing and that it takes proper support on its seat.



Assembly

Check that the coloured mark on the new cooling valve is correct.

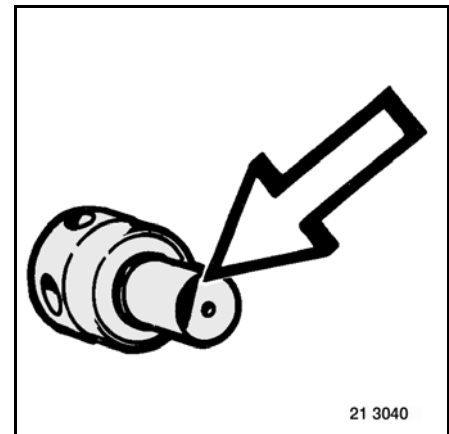
See page(s) B-6-23.

Proceed in the reverse sequence to removal.

Replace O-ring (5) with a new O-ring.

Tighten bolts (3) to torque.

See page(s) B-5-20.



Safety valve (pressure limiter)

The item numbers indicated in the text refer to the drawing on page J-2.

Disassembly

Remove bolts (7).

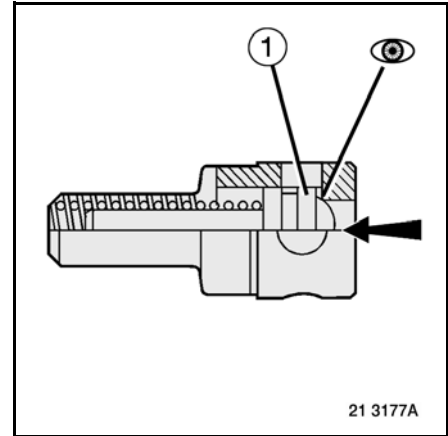
Remove bottom cover cap (8).

Remove safety valve (9).

Save seal (10).

Inspection

Press the valve to check the state and the cleanliness of the contact face of the valve and its seat. Check that the valve does not seize in its housing and that it takes proper support on its seat.



Assembly

Check that the coloured mark on the new cooling valve is correct.

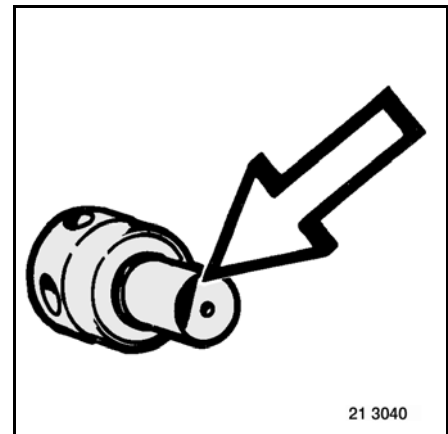
See page(s) B-6-23.

Proceed in the reverse sequence to removal.

Replace O-ring (10) with a new O-ring.

Tighten bolts (7) to torque.

See page(s) B-5-18.



Oil cooler by-pass valve

The item numbers indicated in the text refer to the drawing on page J-2.

Disassembly

Remove bolts (11).

Remove bottom cover cap (12).

Remove by-pass valve (13).

Save seal (14).

Inspection

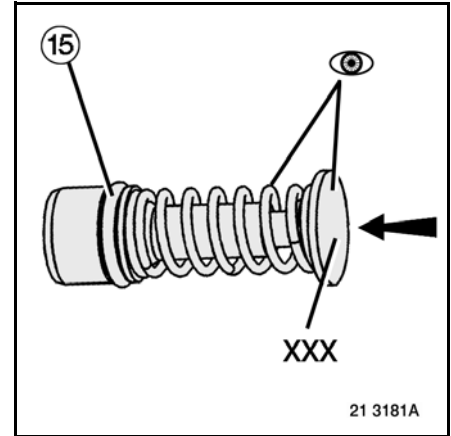
Visually check the condition of the contact surface of valve.



Check the state of the valve seat in the oil filters bracket.

Tension the spring.

Check that the valve is not seized.



Assembly

Check the correct identification of the valve.

See page(s) B-6-23.

Proceed in the reverse sequence to removal.

Replace seals (14 - 15).

Tighten bolts (11) to torque.

See page(s) B-5-20.

Pistons cooling opening valve

The item numbers indicated in the text refer to the drawing on page J-2.

Disassembly

Remove plug (16).

Save seal (17).

Remove spring (18).

Remove valve (19).

Inspection

Visually check the condition of the contact surface of valve (19).



Check the state of the valve seat in the oil filters bracket.

Check the length of spring (18) under no-load and under full load.

For values, see "Technical data" chapter.

See page(s) B-6-23.

Assembly

Proceed in the reverse sequence to removal.

Replace the gasket (17).

Tighten plug (16) to torque.

See page(s) B-5-20.

Pistons cooling pressure regulation valve

The item numbers indicated in the text refer to the drawing on page J-2.

Disassembly

Remove plug **(20)**.

Save seal **(21)**.

Remove spring **(22)**.

Remove valve **(23)**.

Inspection

Visually check the condition of the contact surface of valve **(23)**.



Check the state of the valve seat in the oil filters bracket.

Check the length of spring **(22)** under no-load and under full load.

For values, see "Technical data" chapter.

See page(s) B-6-23.

Assembly

Proceed in the reverse sequence to removal.

Replace the gasket **(21)**.

Tighten plug **(20)** to torque.

See page(s) B-5-20.

By-pass filter by-pass valve

The item numbers indicated in the text refer to the drawing on page J-2.

Disassembly

Remove plug (24).

Save seal (25).

Remove spring (26).

Remove valve (27).

Inspection

Visually check the condition of the contact surface of valve (27).



Check the state of the valve seat in the oil filters bracket.

Check the length of spring (26) under no-load and under full load.

For values, see "Technical data" chapter.

See page(s) B-6-23.

Assembly

Proceed in the reverse sequence to removal.

Replace the gasket (25).

Tighten plug (24) to torque.

See page(s) B-5-20.

Full flow filter by-pass valve

The item numbers indicated in the text refer to the drawing on page J-2.

Disassembly

Remove plug **(28)**.

Save seal **(29)**.

Remove spring **(30)**.

Remove valve **(31)**.

Inspection

Visually check the condition of the contact surface of valve **(31)**.



Check the state of the valve seat in the oil filters bracket.

Check the length of spring **(30)** under no-load and under full load.

For values, see "Technical data" chapter.

See page(s) B-6-23.

Assembly

Proceed in the reverse sequence to removal.

Replace the gasket **(29)**.

Tighten plug **(28)** to torque.

See page(s) B-5-20.

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 charge air (between turbocharger and intake manifold) or exhaust gas, or a drive shaft defect.

An intermittent change in noise level may be due to turbocharger fouling or use of the engine at underspeed in relation to load.

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

Engine running at 1 200 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.

Removal / fitting of turbocharger

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

Tighten to torque (see page B-5-21).



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



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

Lack of engine power

- Air filter clogged
- Aftercooler air/air heat exchanger (tube stack fouled)
- Air inlet pipe blockage or crushing (between air filter and turbocharger)
- Boost air pipe blockage or crushing (between turbocharger and engine)
- Foreign matter between air filter and turbocharger
- Exhaust pipe blockage or crushing
- Air or gas leak between turbocharger and engine
- Turbine casing damaged or fouled
- Turbo impeller vane(s) damaged

Black exhaust smoke

- Air filter clogged
- Air inlet pipe blockage or crushing (between air filter and turbocharger)
- Boost air pipe blockage or crushing (between turbocharger and engine)
- Air or gas leak between turbocharger and engine
- Turbocharger damaged or fouled

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
- Air inlet pipe blockage or crushing (between air filter and turbocharger)
- Boost air pipe blockage or crushing (between turbocharger and engine)
- Foreign matter between air filter and turbocharger
- Exhaust pipe blockage or crushing
- Air or gas leak between turbocharger and engine
- Turbocharger lubrication fault
- Turbocharger damaged or fouled
- Engine used at underspeed in relation to load

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

- Air filter clogged
- Engine breather clogged
- Air inlet pipe blockage or crushing (between air filter and turbocharger)
- Turbocharger lubrication fault
- 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
- Air inlet pipe blockage or crushing (between air filter and turbocharger)
- Air compressor defective

Oil in air pipes after turbocharger

- Air filter clogged
- Engine breather clogged
- Air inlet pipe 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