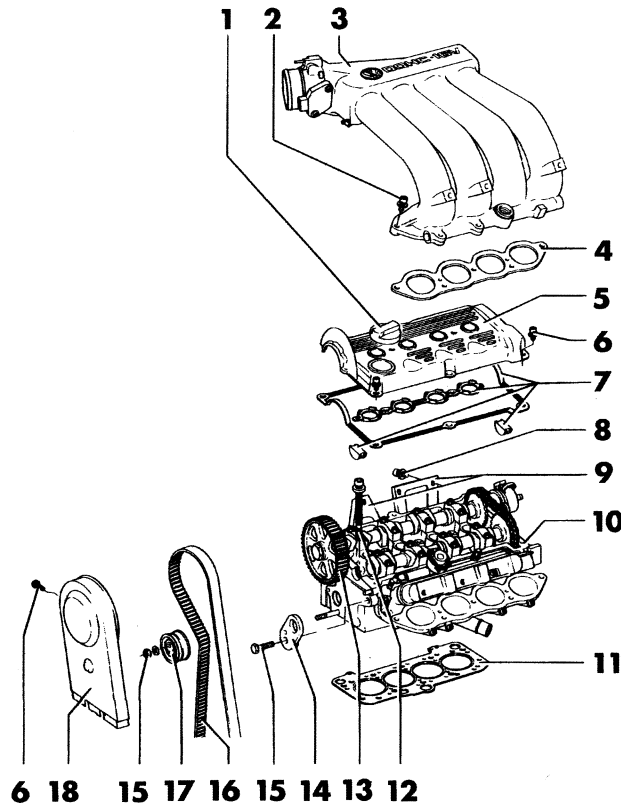


CYLINDER HEAD: EXPLODED VIEW

When using a spare cylinder head, after fitting to the engine, the contact areas between the hydraulic tappets and the camshaft cams must be lubricated.

The plastic bases supplied to protect the valves must be taken out immediately before fitting the cylinder head.

Whenever the cylinder head is removed, the cooling liquid must be changed.



15BD14

- | | |
|--|---|
| <p>1. Plug.
Replace the gasket if damaged.</p> <p>2. Intake manifold attachment. 20 Nm.</p> <p>3. Manifold intake, top.</p> <p>4. Manifold intake. Replace.</p> <p>5. Cylinder head cover.</p> <p>6. 10 Nm.</p> <p>7. Cylinder head cover gaskets.
Replace if damaged.</p> <p>8. Support fixing bolt. 20 Nm.</p> <p>9. Support.</p> <p>10. Cylinder head.
Check the cylinder head for distortion or knocks.
Removal and refitting.</p> <p>11. Cylinder head gasket.
Note the mounting position.</p> | <p>12. Cylinder head fixing bolt.
Follow the mounting instructions as well as the sequence for tightening and removing.
Check correspondence between screw and type of cylinder head gasket.</p> <p>13. Camshaft pinion.
Note the position when assembling the timing belt.
Remove and refit using the tool U-20002/1.</p> <p>14. Support.</p> <p>15. 45 Nm.</p> <p>16. Timing belt.
Before disassembling, mark the direction of rotation.
Do not bend.
Replacement and tightening (refer to Group 13).</p> <p>17. Distribution belt tensioning roller.</p> <p>18. Timing belt upper cover.</p> |
|--|---|

Engine 15

Cylinder head: valve operation. 2.0 I 16 V engine

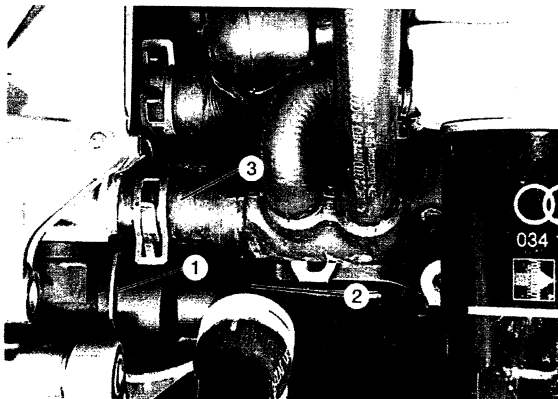
CYLINDER HEAD

Removal and refitting (on the vehicle)

Removal

To remove the cylinder head, with the engine fitted into the vehicle, carry out the following operations:

Disconnect the battery ground lead.

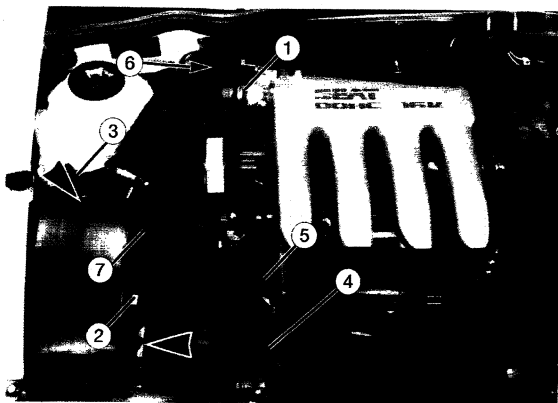


19B020

Remove the expansion tank cap.

Drain the coolant liquid by removing the safety clip "1", removing the hose "2" and the flexible tube "3", use the **U-10095** tool to remove the clamps.

(Raise the vehicle and separate the lower protector from the engine unit.)

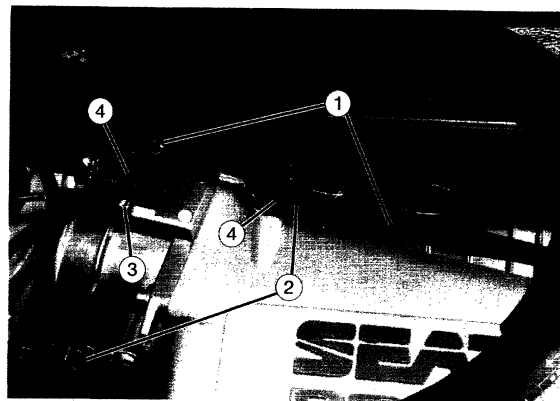


10B113

Remove the following items from the air filter/inlet tube assembly:

1. Junction clip between inlet tube and inlet manifold.
2. Suction take-off from its fixing to the inlet air thermo-regulator.
3. Inlet air temperature transmitter connector.
4. Sump gasses ventilation tube from its fixing to the pressure regulating valve.
5. Idling stabilizer valve tube from its fixing to the valve.
6. Hot air tube from its fixing to the exhaust manifold heat shield.
7. Tube for inlet air silencer from its fixture to the air filter set.

Remove the O-rings which connect the air filter assembly to the bodywork and remove the filter.



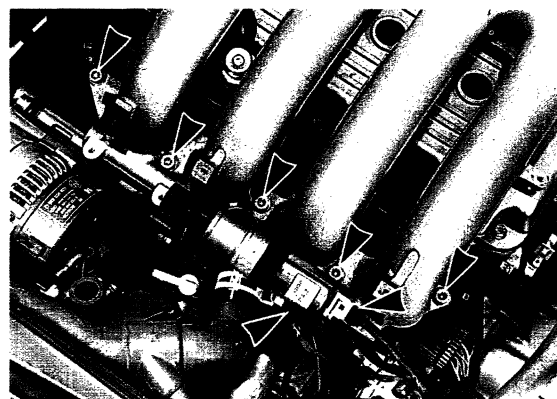
15B105

1. Detach the accelerator cable from the throttle valve assembly and from the support on the intake manifold (do not remove the fixing clamp).
2. Remove the throttle valve and the idling switch connectors.
3. Remove the pressure regulator suction take-off from its fixing point on the inlet manifold.
4. Remove the suction tubes and the gas inlet tube from the active coal deposit from its fixture to the throttle set.



10B124

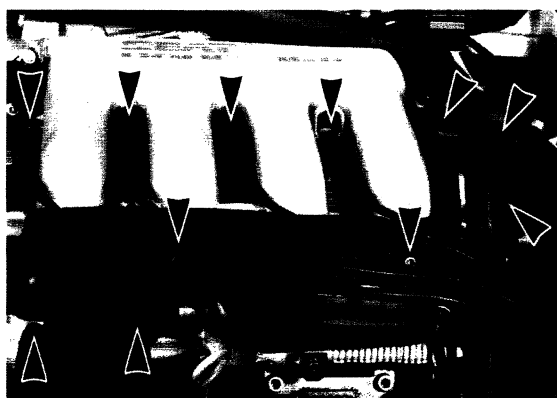
Disconnect the brake servo vacuum connection from the intake manifold.



15B061

Remove the connectors from the stabilizing valve and the fuel distributor.

Remove the bolts which hold together the upper and lower parts of the inlet manifold.



15B107

Partially remove the following items:

The spark plug cables cover, together with the cables and the distributor cap.

The sump gasses pressure regulating valve (it is not necessary to remove the gas outlet tube).



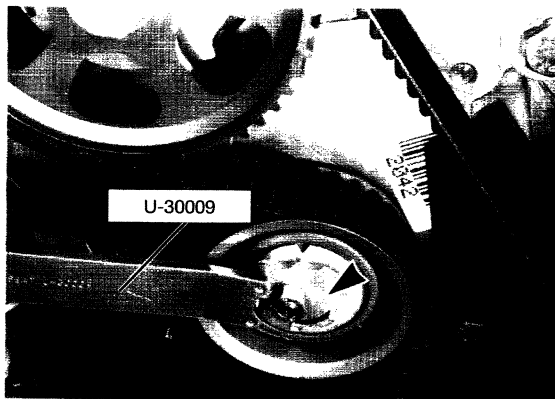
15B108

Remove the bolts holding the rear support brackets to the upper part of the inlet manifold.

Remove the upper part of the inlet manifold, removing the electrical installation fixtures from it.

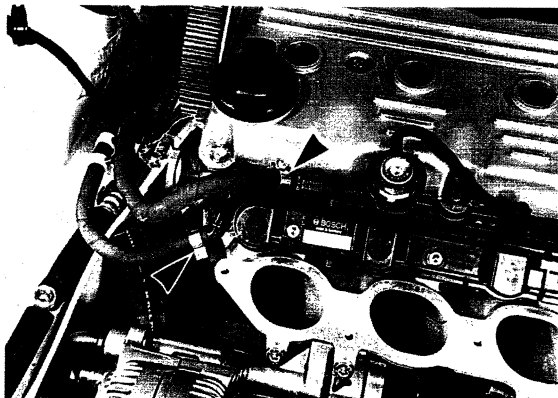
Engine 15

Cylinder head: valve operation. 2.0 I 16 V engine



13B107

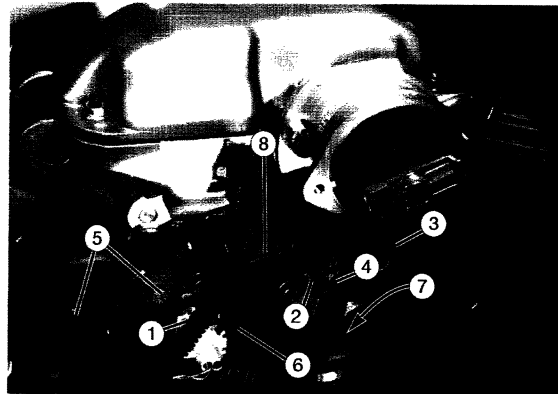
Remove the upper distribution cover, align the distribution marks, slacken the belt and remove the distributor shaft drive pinion from its fixing (for more information, see Repair Group 13).



15B063

Disconnect the fuel inlet (black) and return (blue) pipes and plug properly the system.

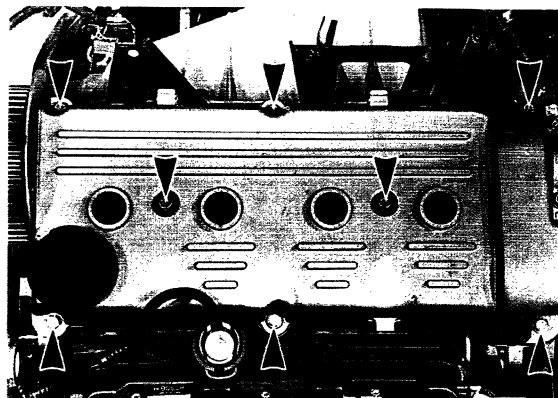
Remove the nuts holding the exhaust pipe to the manifold.



15B106

Detach from the cylinder head the following items:

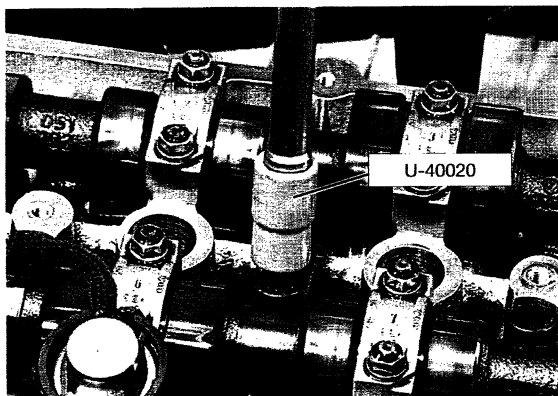
1. Temperature transmitter connector.
2. Instrument panel temperature transmitter connector.
3. Hall transmitter connector.
4. Earth strap.
5. Central connector bracket.
6. Coolant hose.
7. Coolant liquid rigid tube fixing bolt.
8. Connector from the control thermostat for 3rd. electric fan speed (versions with air conditioning only).



15B065

Remove the cylinder head cover.

Remove the tubes from their fixings on the coolant liquid distributor; use the **U-10095** tool to remove the clips.



15B067

Remove the cylinder head cover fixing bolts using the wrench **U-30022** or **U-40020**.

The sequence to loosen the bolts is the opposite for tightening.

Remove the cylinder head assembly.

If the cylinder head parts are to be disassembled and checked, the following must be removed:

- The fuel distributor together with the inlet manifold.
- Spark plugs.
- Ignition distributor.
- Exhaust manifold, together with the support brackets.
- Coolant liquid distributor tube.
- Distribution belt tensioning roller.
- The supports or part which may interfere with the positioning on the base-tool **U-10073/1**.

Metal cylinder head gasket

Engines come equipped with cylinder head gaskets made either of soft material or metal.

Where the cylinder head gasket is made of soft materials (standard), it can be substituted afterwards with a metal gasket.

Engine 15

Cylinder head: valve operation. 2.0 I 16 V engine

Refitting

To reassemble, reverse the above operations taking the following into account:

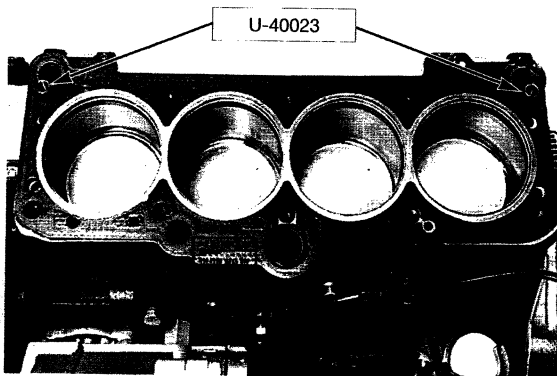
The engine must be cold when installing it.

Ensure that no pieces of the old gasket remain on the cylinder head and engine block; remove any pieces with great care from both parts, ensuring that no large scratches are produced in the process. If abrasive paper is used, this should not be coarser than 100 grade.

Carefully clean the cylinder head and the block of any particles of sand or emery.

The new cylinder head gasket must only be removed from its packaging just before it is fitted into place. Handle the gasket very carefully. If the silicone coating or the edges are damaged, the seal may be lost.

Position the pistons at about half the stroke to prevent any possible interference with the valves.



Install the new cylinder head gasket, "oben" brand or the existing number of replacements in it must face the cylinder head, bear in mind the centering studs in the block (if the block does not have these studs, use tool **U-20004** together with **U-40023** guide bolts for centering, screw the bolts to the drillings indicated in the diagram).

Fit the cylinder head and thread by hand the bolts fixing it into the eight holes that remain free.

Note

Always replace the cylinder head fixing bolts.

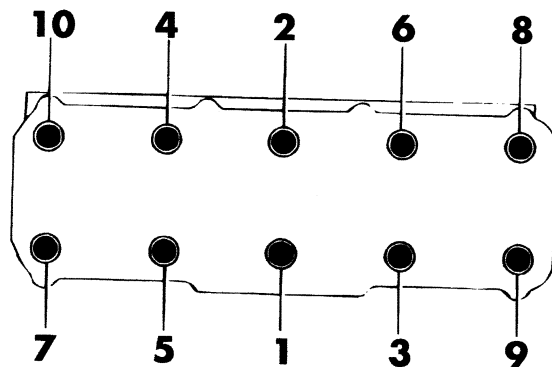
Remove the guide studs by turning counterclockwise the handle of the tool **U-20004** until the studs are removed.

Refit the two remaining cylinder head, fixing bolts and tighten all of them; remember the directions for tightening the cylinder head fixing bolts.

To refit and tighten the timing belt, refer to the Repair Group 13.

Refill the cooling system with fresh cooling liquid.

Notes for tightening the cylinder head bolts



15AD09

The tightening of the cylinder head bolts must be carried out in four stages, following the order indicated above.

Tighten using a torque wrench, the engine being cold.

First stage **40 Nm**
Second stage **60 Nm**

Tighten using a fixed wrench.

Third stage **90°**
Fourth stage **90°**

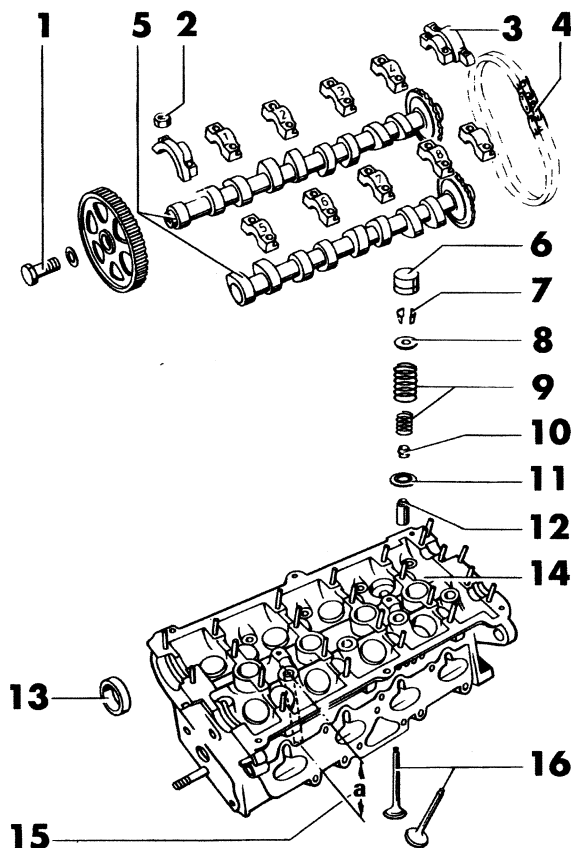
The cylinder head fixing bolts need not be retightened after the repair.

Engine 15

Cylinder head: valve operation. 2.0 I 16 V engine

VALVE OPERATION: EXPLODED VIEW

The cylinder heads showing cracks between valve seats or between a valve seat ring and the spark plug housing thread, can be used without any effects on the duration, provided the cracks do not exceed a maximum width of 0.5 mm or only the first threads are cracked.



15AD13

- | | |
|---|--|
| <p>1. Camshaft pinion fixing bolt. 65 Nm.</p> <p>2. Camshaft fixing bolt cap. 15 Nm.</p> <p>3. Cap.
Observe position and order of assembly and removal.</p> <p>4. Drive chain.
Mark direction of turn with a painted line before removal.</p> <p>5. Camshaft seals.
Check the axial and radial plays.
Maximum eccentricity: 0.01 mm.
Note the camshaft code letters.
Distribution timing.</p> <p>6. Hydraulic tappets.
Dot not interchange.
Checking.
Before refitting the cup tappets, check the camshaft axial play.</p> <p>7. Half cones.</p> <p>8. Top valve spring seat.</p> | <p>9. Valve springs.
Remove and refit using the tool U-10073/1 and the base plate U-30033.</p> <p>10. Valve springs.
Remove using the tool U-10070. Refit using the tool U-30007.</p> <p>11. Bottom valve spring seat.</p> <p>12. Valve guide.
Spare valve guides are supplied with collar.
Check.
Remove and refit using the tool U-30006.</p> <p>13. Camshaft oil seal.
Lightly oil the oil seal lip and outer edge.
Remove using tool U-10080, refit using tool U-30002.</p> <p>14. Cylinder head.
Valve seat grinding.</p> <p>15. "a" Cylinder head grinding dimension.
Minimum height = 118.1 mm.</p> <p>16. Valve.
Cannot be grinded, only polished with emery cloth.</p> |
|---|--|

Engine 15

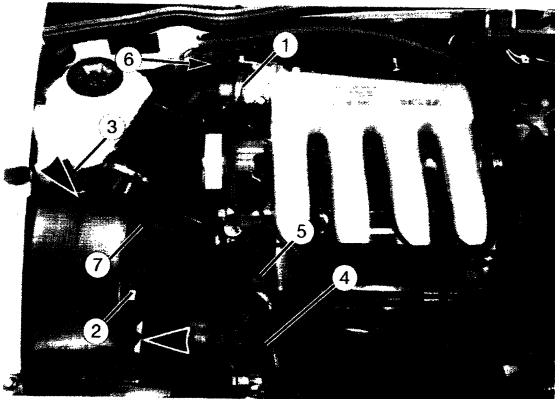
Cylinder head: valve operation. 2.0 I 16 V engine

CAMSHAFT OIL SEAL

Replacement (cylinder head fitted into the vehicle)

To replace the camshaft oil seal, with the cylinder fitted into the vehicle, proceed as follows:

Disconnect the battery negative lead.

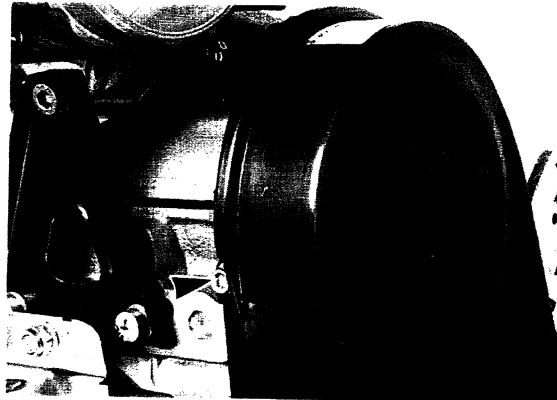


10B113

If the disassembly is carried out in the vehicle, disconnect the negative terminal on the battery and partially remove the air filter/inlet tube assembly, for which the following items must be removed:

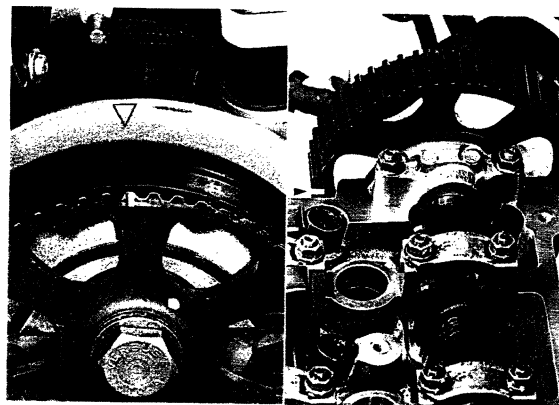
1. Junction clip between inlet tube and inlet manifold.
2. Suction take-off from its fixing to the inlet air thermo-regulator.
3. Inlet air temperature transmitter connector.
4. Sump gasses ventilation tube from its fixing to the pressure regulating valve.
5. Idling stabilizer valve tube from its fixing to the valve.
6. Hot air tube from its fixing to the exhaust manifold heat shield.
7. Tube for inlet air silencer from its fixture to the air filter set.

Remove the O-rings which connect the air filter assembly to the bodywork and remove the filter.



13A102

Remove the upper cover after removing the fixing bolts.



13B073

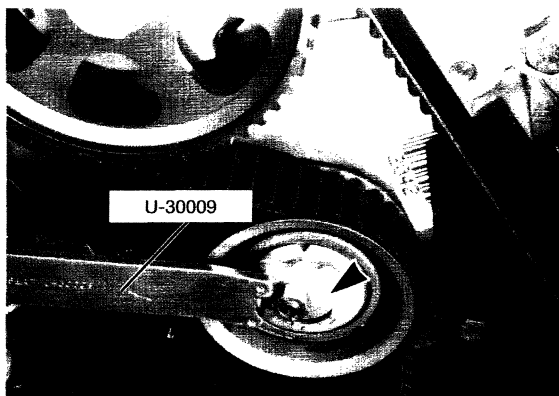
13B074

Align the mark on the distributor drive shaft pinion with the arrow on the cylinder head cover.

If the cylinder head cover has been removed, the mark on the back of the distributor drive shaft pinion must be flush with the cylinder head.

Engine 15

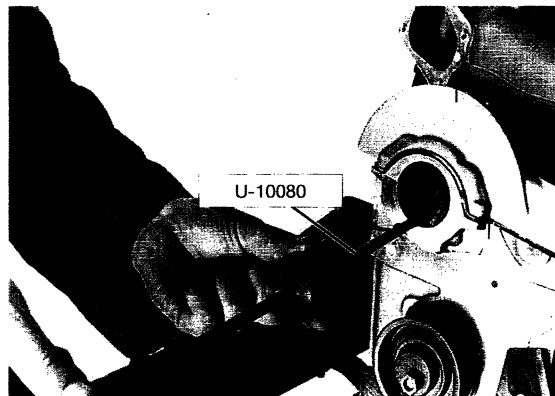
Cylinder head: valve operation. 2.0 I 16 V engine



13B107

Loosen the timing belt by loosening the tension roller fixing nut and turning the roller counterclockwise using the tool **U-30009**.

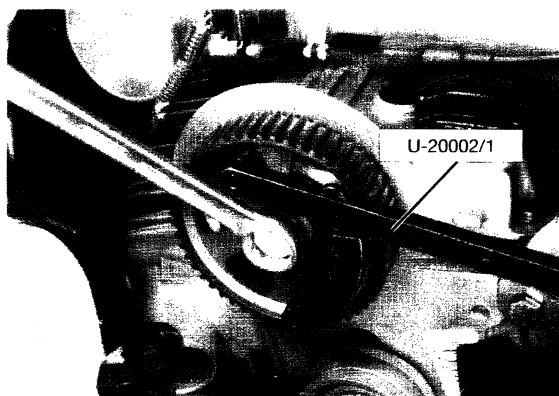
Remove the timing belt and mark the direction of movement if the belt is to be reused.



15A039

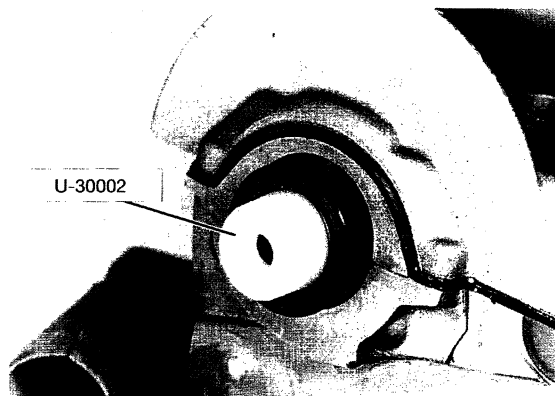
Remove the retainer using the special tool **U-10080**.

To refit, reverse the above operations taking the following into account:



13B108

Remove the camshaft drive pinion using the tool **U-20002/1**.



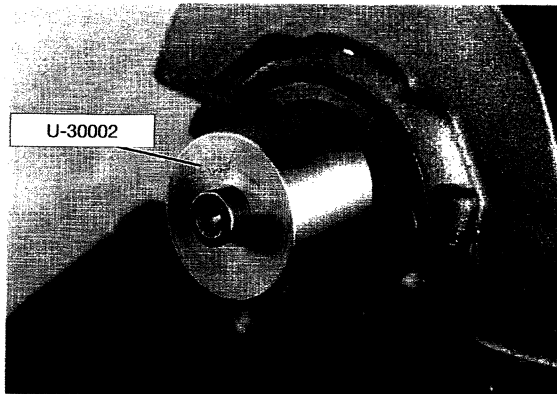
15A040

Lightly oil the oil seal lip and outer edge.

Position the centring part of the tool **U-30002** and slide the oil seal up to its position.

Engine 15

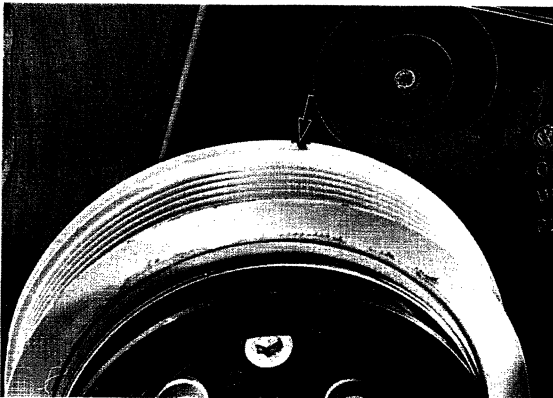
Cylinder head: valve operation. 2.0 I 16 V engine



15A041

Insert the oil seal using the tool pusher, until the oil seal is flush with the cylinder head.

Then refit the camshaft drive pinion so that the mark on the pinion matches the mark on the cylinder head-cover.



13B076

Check that the mark on the vibration damper aligns with the mark on the lower cover of the toothed belt.

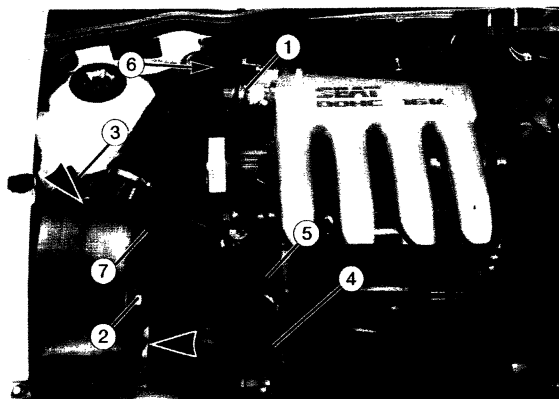
Refit and tighten the timing belt as described in Group 13.

DISTRIBUTOR SHAFTS Removal and refitting

Removal

The following operations must be carried out to remove the distributor shafts:

Disconnect the battery negative lead.

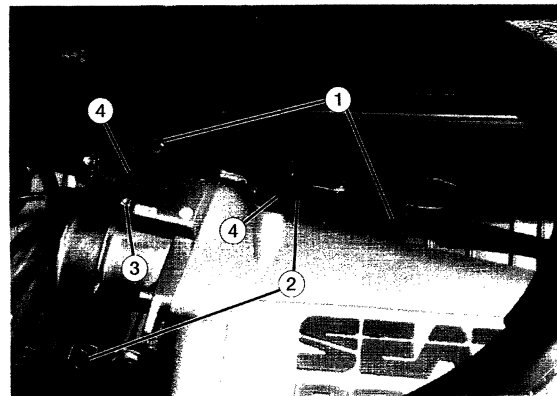


10B113

If the disassembly is carried out in the vehicle, disconnect the negative terminal on the battery and partially remove the air filter/inlet tube assembly, for which the following items must be removed:

1. Junction clip between inlet tube and inlet manifold.
2. Suction take-off from its fixing to the inlet air thermo-regulator.
3. Inlet air temperature transmitter connector.
4. Sump gasses ventilation tube from its fixing to the pressure regulating valve.
5. Idling stabilizer valve tube from its fixing to the valve.
6. Hot air tube from its fixing to the exhaust manifold heat shield.
7. Tube for inlet air silencer from its fixture to the air filter set.

Remove the O-rings which connect the air filter assembly to the bodywork and remove the filter.



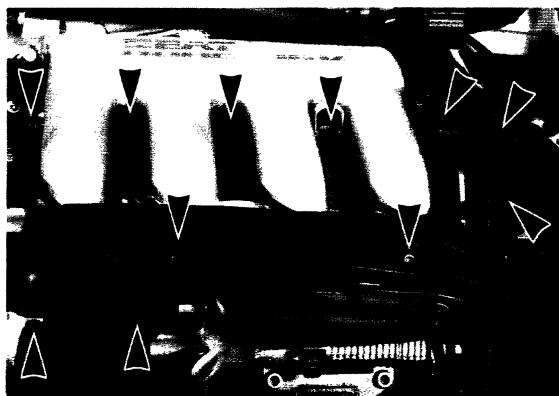
15B105

1. Detach the accelerator cable from the throttle valve assembly and from the support on the intake manifold (do not remove the fixing clamp).
2. Remove the throttle valve and the idling switch connectors.
3. Remove the pressure regulator suction take-off from its fixing point on the inlet manifold.
4. Remove the suction tube and the active carbon tank gases tube from their fixing on the throttle valve assembly.



10B124

Disconnect the brake servo vacuum connection from the intake manifold.



15B107

Partially remove the following items:

The spark plug cables cover, together with the cables and the distributor cap.

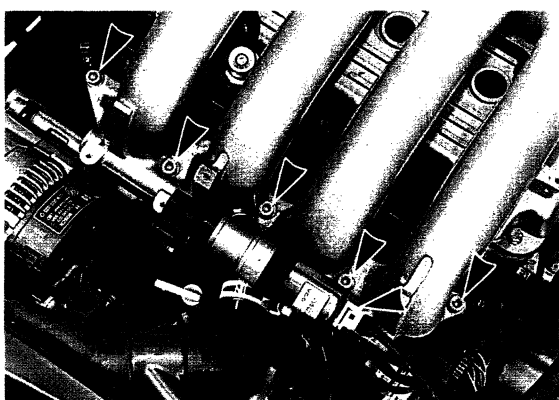
The sump gasses pressure regulating valve (it is not necessary to remove the gas outlet tube).



15B108

Remove the bolts holding the rear support brackets to the upper part of the inlet manifold.

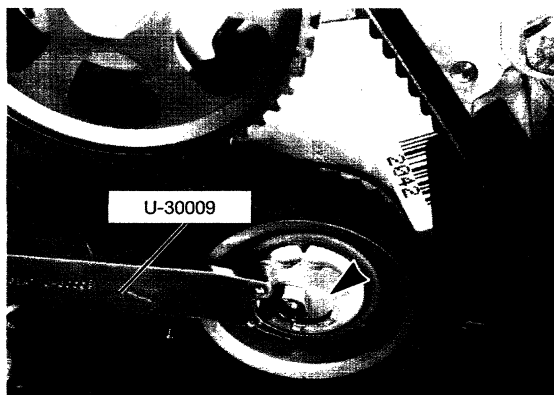
Remove the upper part of the inlet manifold, removing the electrical installation fixtures from it.



15B076

Remove the stabilizing valve connector.

Remove the bolts which hold together the upper and lower parts of the inlet manifold.

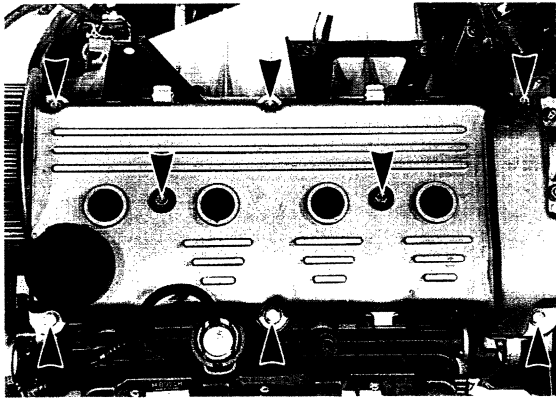


13B107

Remove the upper distribution cover, align the distribution marks, slacken the belt and remove the distributor shaft drive pinion from its fixing (for more information, see Repair Group 13).

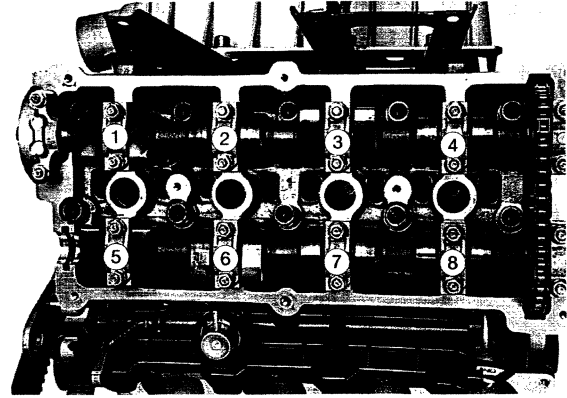
Engine 15

Cylinder head: valve operation. 2.0 I 16 V engine



15B065

Remove the cylinder head cover.



15B069

Then remove the caps, in the following order:

— **Inlet shaft.**

Remove caps 5, 7 and the cap at the chain end.

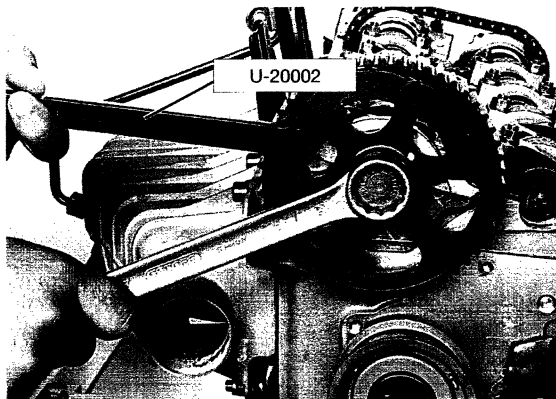
Cross-loosen caps 6 and 8.

— **Exhaust shaft.**

Remove caps 1, 3 and the caps at the ends.

Cross-loosen caps 2 and 4.

Remove both shafts together with the drive chain.
If the chain can be re-used, mark its direction of rotation with a dab of paint.



15B068

Remove the camshaft drive pinion using the tool **U-20002/1**.

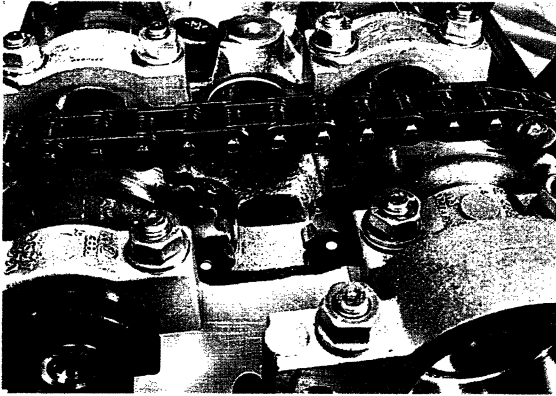
Remove the ignition distributor.

Engine 15

Cylinder head: valve operation. 2.0 I 16 V engine

Refitting

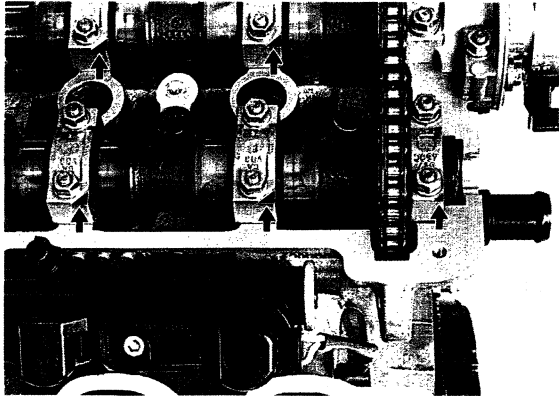
To reassemble, reverse the above operations taking the following into account:



15B070

Position camshafts with chain in such a manner that pinion marks coincide as indicated in figure.

(Take the mark made on the chain into account if it has been re-used.)



15B071

Cap cover grooves should face side of manifold intake.

Refit caps in the following order:
Tightening torque of caps: **15 Nm**.

— Inlet shaft.

Tighten caps 6 and 8.

Refit and tighten remaining caps.

— Exhaust shaft.

Tighten caps 2 and 4.

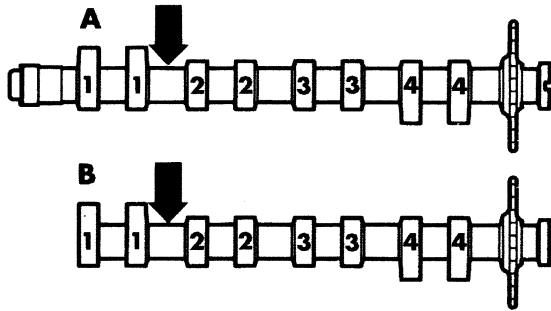
Refit and tighten remaining caps.

Mount the drive pinion and tension the toothed distribution belt as described in group 13.

Engine 15

Cylinder head: valve operation. 2.0 I 16 V engine

Camshaft code



15BD15

The shafts are identified by a series of numbers or letters stamped between the can pairs for cylinders 1 and 2 (arrow).

Exhaust shaft -A-: 051 102

Inlet shaft -B-: 051 101 o 051 101 A

Distribution timing, at 1 mm valve stroke

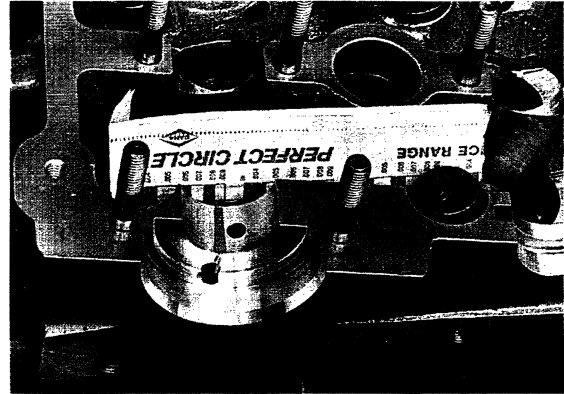
Engine code letters	ABF
Intake opens	1° before the TDC
Intake closes	38° after the BDC
Exhaust opens	39° before the BDC
Exhaust closes	1° after the TDC

CAMSHAFT RADIAL PLAY Checking

Remove the camshaft and the hydraulic tappets.

Clean the camshaft and bearing cap seats.

Refit the camshaft on the cylinder head so that the cams are not in contact with the valves.



15B072

Place a Plastigage strip, according to bearing width, on the camshaft seat in axial direction.

Fit the cap and tighten to the specified torque.

While making the measurement do not turn the camshaft.

Remove the bearing cap.

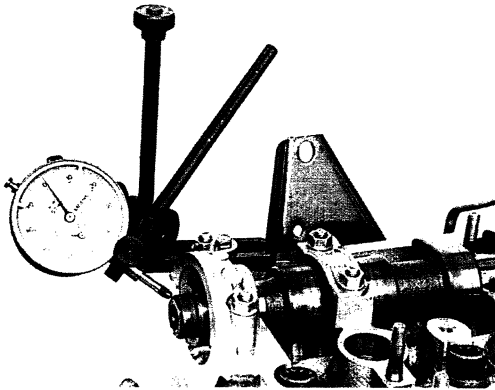
Check the width of the Plastigage strip using the measurement scale.

Maximum allowable wear: **0.1 mm**.

If this limit is exceeded, check the play with a new camshaft.

If the limit is exceeded again, the cylinder head must be replaced.

CAMSHAFT AXIAL PLAY Checking



15B077

Carry out measurements with a dial gauge on end of camshaft on pinion side.

First remove hydraulic tappets and refit caps No. 1 and 5.

Tolerance limit is **0.15 mm**.

HYDRAULIC TAPPETS
Removal, checking and refitting

Checking

A slight valve noise during the starting up is normal.

To carry out the checking, proceed as follows:

Start up the engine and keep it running until the radiator fan starts to operate.

Increase the engine speed up to about 2500 rpm for a couple of minutes.

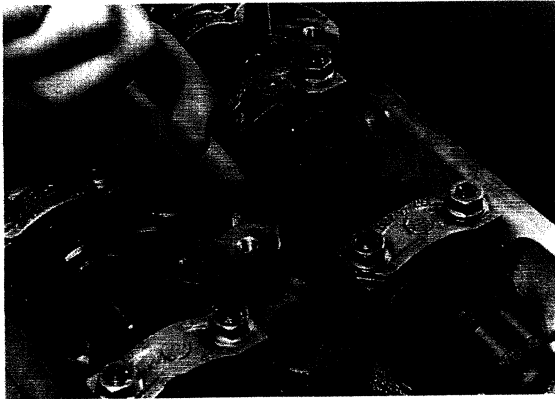
If the tappets are still noisy, proceed as follows to locate the faulty tappet:

Remove upper part of manifold intake and the cylinder head cover.

Turn the crankshaft clockwise (when viewed from the pinion) until the rocker arms of the tappets to be checked are upward.

Then measure the free play between the rocker arms and the pushrods:

- If the measurement obtained is greater than **0.1 mm**, replace the pushrod.
- If the measurement obtained is less than **0.1 mm**, continue with the check.

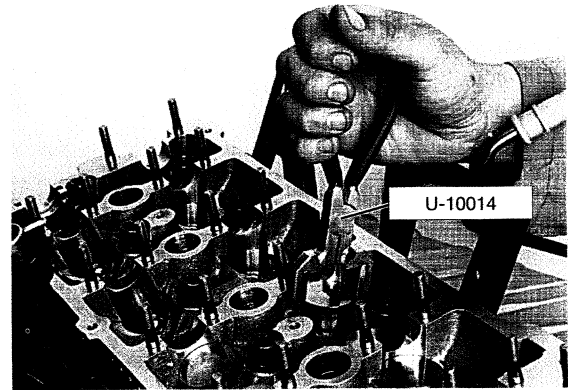


15A048

Press down the tappet using a plastic or wooden wedge. If there is a free run in excess of **0.1 mm** until the valve starts to open, replace the tappet.

The tappets must be replaced as complete parts and cannot be repaired or adjusted.

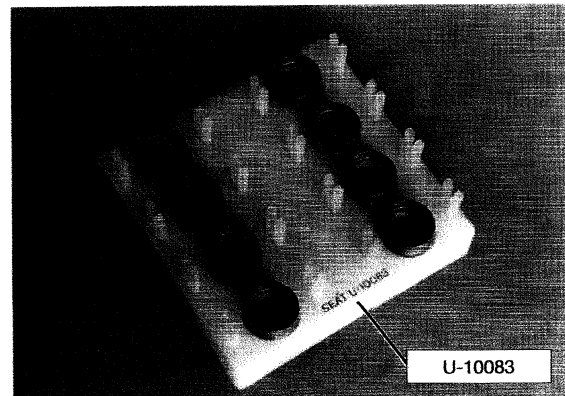
Removal



15B073

Remove camshafts.

Remove the tappets using the tool **U-10014**.



15A011

To prevent the switching of the tappets before they are replaced, place them in order on the **U-10083** base.

Place them with cams sliding surface downwards.

Replace the tappets in their original order, if they are re-usable.

Shorten friction surface.

Note

When new tappets have been fitted, engine should not be started until after approximately 30 minutes (valves may rest on piston).

Engine 15

Cylinder head: valve operation. 2.0 I 16 V engine

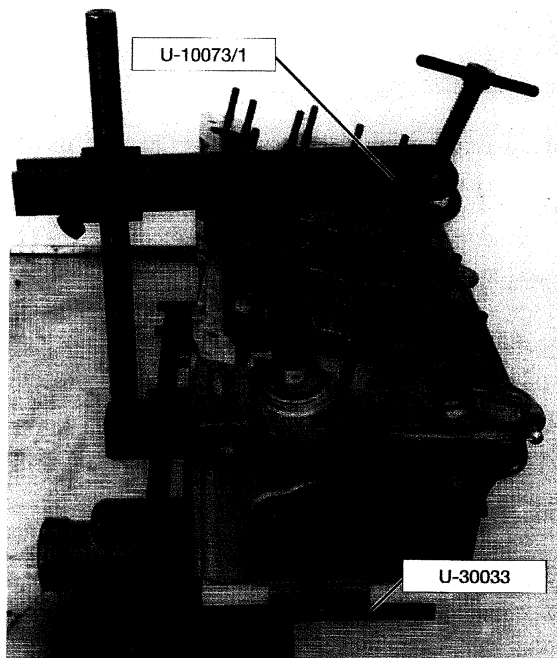
CYLINDER HEAD

Removal, checking and refitting

Disassembly

With the cylinder head removed from the vehicle, proceed as follows:

Remove the manifolds, the coolant liquid distributor, the spark plugs, the ignition distributor, the inlet and exhaust camshafts and the hydraulic tappets (take care not to mix them up).



Note

Never use a magnetized object to remove the half cones as this could impair the proper operation of the hydraulic tappets.

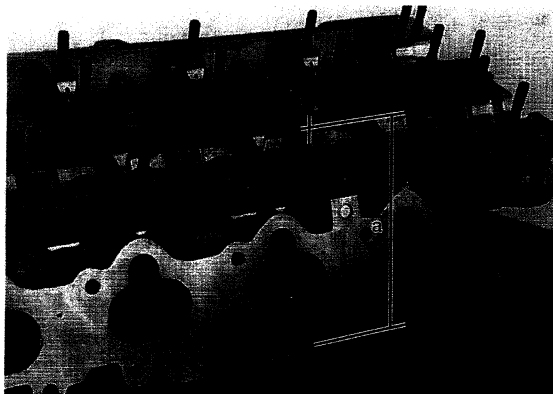
After removing the half cones, remove the spring upper discs and the valve springs.

Remove the valve fixing base **U-30033** and remove the valves through the cylinder head underside.

In order not to interchange parts during the reassembly, place orderly all parts on the base **U-10083**.

Checking

Cylinder head dimensions after grinding



Measure across fixing bolt housing "a".

Minimum height for grinding should be **118.1 mm**.

Fix the cylinder head on a bench vise using the fixing tool **U-10073/1**; the tool is fixed to the vise through the central rib.

Place the rule **U-30033** on the fixing tool base.

Position the pusher-support of tool **U-10073/1** over the cylinder head; the pusher-support must be positioned so that it operates properly on the upper disc of the valve spring which is to be compressed

Operate the tool until the valve spring is compressed and remove the half cones.

Engine 15

Cylinder head: valve operation. 2.0 I 16 V engine

Checking the distortion



15A053

With cylinder head removed check that maximum warping on cylinder head surface is 0.05 mm.

Use for checking a rule and a feeler gauge.

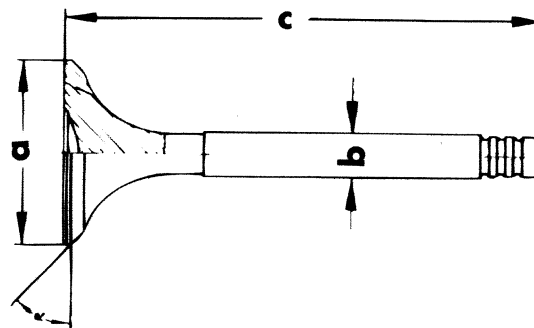
Reassembly

To refit, carry out the operations described for disassembling reversing the order.

VALVES

Testing and measuring

Valve grinding is not permitted, although polishing is.



15AD04

Valve dimensions (mm)

Dimensions (mm)	Intake valve	Exhaust valve
a	Ø 32.00	Ø 27.00
b	Ø 6.97	Ø 6.94
c	95.50	98.00
α	45°	45°

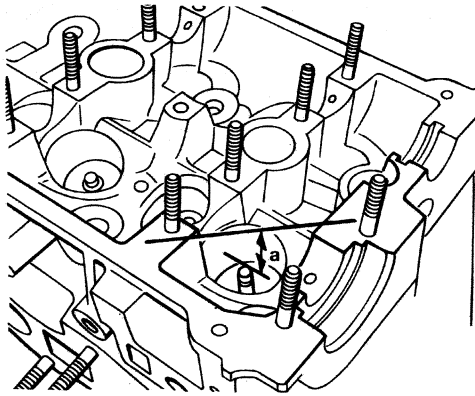
VALVE SEATS

Grinding

Grind the valve seats just up to the point a perfect valve contact surface is achieved.

When repairing leaking valves, it is important to check for wear in the valve guides apart from grinding or replacing the valve seats and valves.

Before grinding, the maximum allowable dimension after grinding must be calculated. If this dimensions is exceeded, the proper valve play compensation cannot be guaranteed and the cylinder head must be re-placed.



15AD14

To calculate the maximum allowable dimension after grinding, insert the valve and press it firmly against the seat. (If the valves is replaced during the repair work, use a new valve for measuring.)

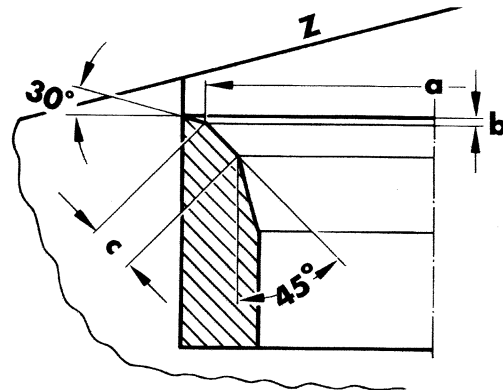
Measure gap "a" between end of stem and top edge of cylinder head.

The maximum allowable dimension after grinding is the result of subtracting to the value "a" the minimum dimension indicated in the following table:

Minimum dimension:

Intake valve	34.4 mm.
Exhaust valve	34.7 mm.

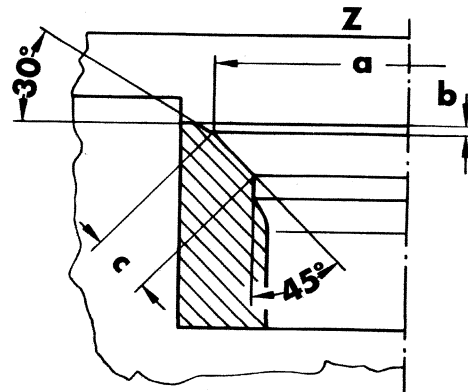
Intake valve seat grinding



15AD15

- a = Ø 31.2 mm.
- b = Maximum allowable dimension after grinding.
- c = 1.5 ÷ 1.8 mm, if necessary grind valve seat on a correction mill of 75°.
- z = Lower edge of cylinder head.
- 30° = Top angle of correction.
- 45° = Valve seat angle.

Exhaust valve seat grinding



15AD16

- a = Ø 26.6 mm.
- b = Maximum allowable dimension after grinding.
- c = Approximately 1.8 mm.
- z = Lower edge of cylinder head.
- 30° = Top angle of correction.
- 45° = Valve seat angle.

Engine 15

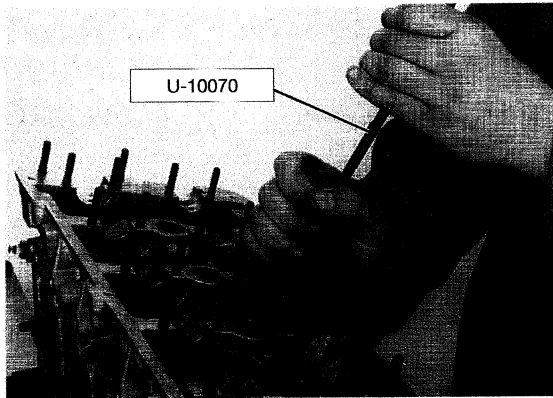
Cylinder head: valve operation. 2.0 l 16 V engine

VALVE GUIDE OIL SEALS Replacement

Carry out operation with cylinder head removed and fixed to support **U-10073/1** and base **U-30033**.

Remove the camshaft and the tappets.

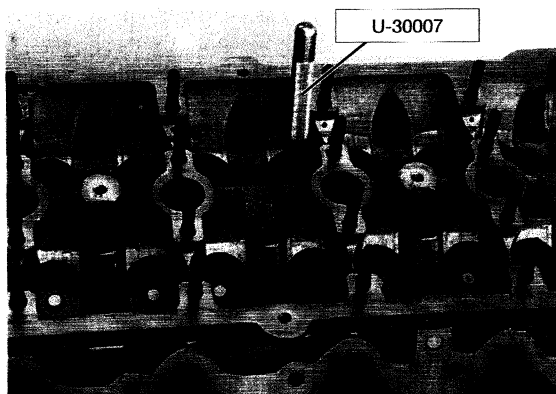
Remove half cones and valve springs with pusher of tool **U-10073/1**.



15A054

Remove the valve guide seal using the tool **U-10070**.

The oil seals are fitted with tool **U-30007** (oil the oil seals before fitting them).



15A055

Position the plastic bushing (supplied with the spare part) and slide the oil seal.

Insert the oil seal into position using tool **U-30007**.

VALVE GUIDES

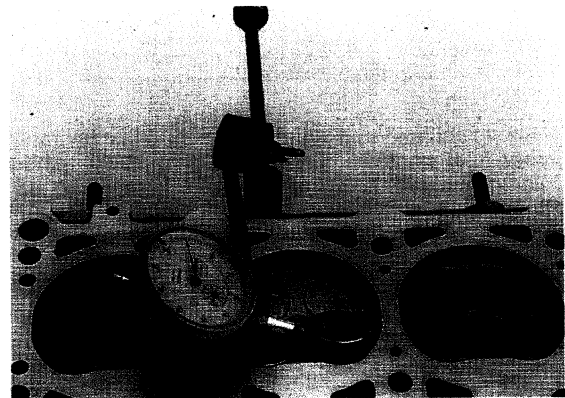
Checking the play between valve and guide

When the valve play is to be checked or to determine the faulty parts to be replaced, proceed as follows:

Insert the valve in its guide; the valve stem end must be flush with the guide.

Because the valve stem diameters are different, use the intake valve for the intake guide only and the exhaust valve for the exhaust guide only.

First of all, clean thoroughly the parts to be checked.



15A056

Measure the play using a dial gauge.

The maximum allowable wear is:

Intake valve guides	1.0 mm.
Exhaust valve guides	1.3 mm.

If the values measured are greater than the above values, replace the valve guides.

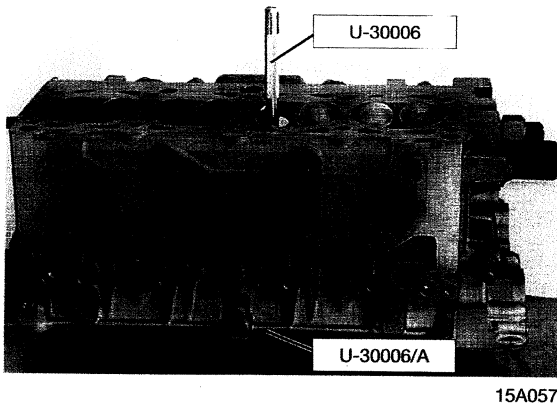
Valve guide replacement

Before carrying out the operation, take into account that the cylinder heads with valve seats not allowing additional grinding or the cylinder heads already grinded up to the allowable limit, are not suitable to replace the valve guides.

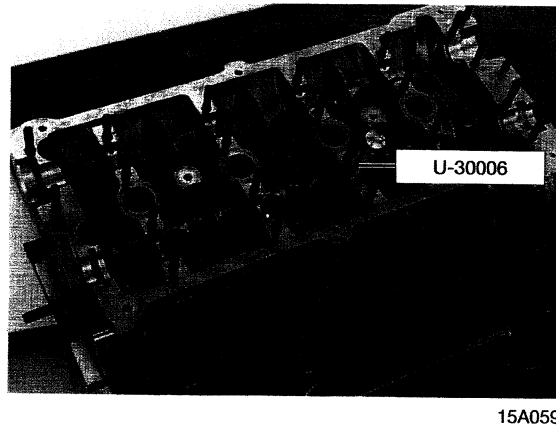
Engine 15

Cylinder head: valve operation. 2.0 I 16 V engine

Disassembly



Remove valve guides with tool **U-30006** in a hydraulic press from combustion chamber side. Rest cylinder head on base **U-30006/A**.



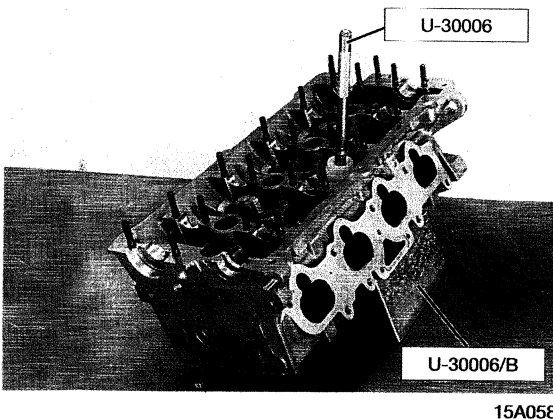
● Exhaust valves:

Insert new guides with tool **U-30006** to flange in a hydraulic press from camshaft side.

Position plastic sliding bushing guide to carry out this operation.

Reassembly

Oil new guides before refitting.



● Intake valves:

Insert new guides with tool **U-30006** to flange in a hydraulic press from camshaft side.

Place cylinder head beforehand on base **U-30006/B** and work at right angles to guide. To carry out this operation it is necessary to position plastic center of tool.

Note

Once valve guide flange is in position, do not increase clamp pressure to more than 1 ton as this may break the flange.

- Ream by hand the valve guides, making sure to use water soluble cooling oil.
- Grind the valve seats.
- Polish the valves if they are not to be replaced.