

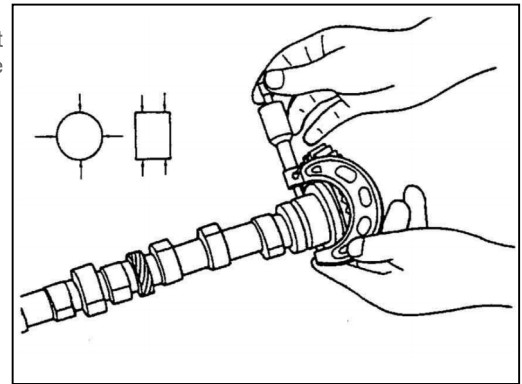


## Inspection of the camshaft

### Inspection

Measure the diameter of the bearing journal and the bore in the camshaft bearing to find the clearance, as shown in the figure. If the clearance exceeds the limit, replace the bearing.

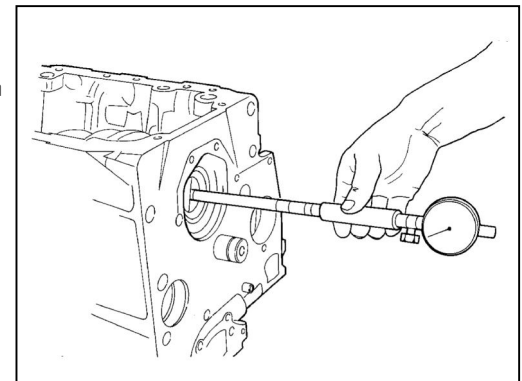
Item	Standard
Clearance between camshaft journal and bearing	0.15 mm (0.0059 in)



1.

Measuring the bore of the camshaft bearing]

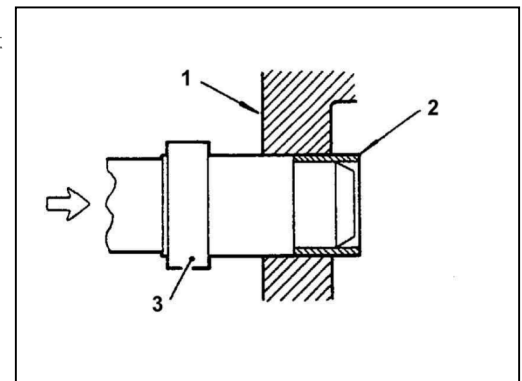
- o To renew the camshaft bearings, use the special bearing installation tool.



2.

Remove the sump. Using the "remover" end of the tool, force the bearing out of the engine block. Crush and remove the bearing from the block.

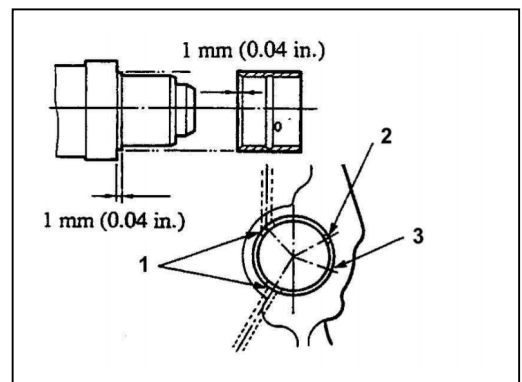
1. Front end of engine block
2. Camshaft bearing
3. Bearing installer



3.

Install a new bearing, aligning the oil holes with those of the oil gallery.

1. Oil holes
2. Notch in bearing
3. End of bearing

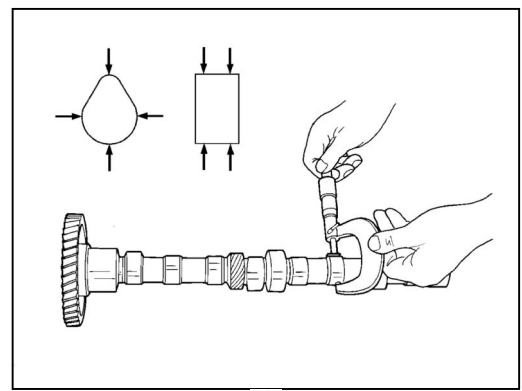


4.

Measure the cam lobe height and base circle as shown in the figure. Subtract the base circle from the lobe height to find the cam lift. If the cam lift

exceeds the specified limit, renew the camshaft.

Item	Standard	Limit
Cam lobe height	35.72 mm (1.4063 in)	34.72 mm (1.3669 in)



5.

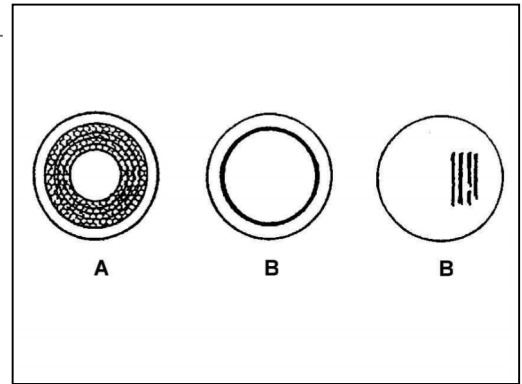


## Inspection of the camshaft

### Inspection

The correct contact surfaces of the tappets are shown in (A). Check for abnormal wear patterns on the individual tappets (B).

- o If the contact surface is incorrect (B), renew the tappet.

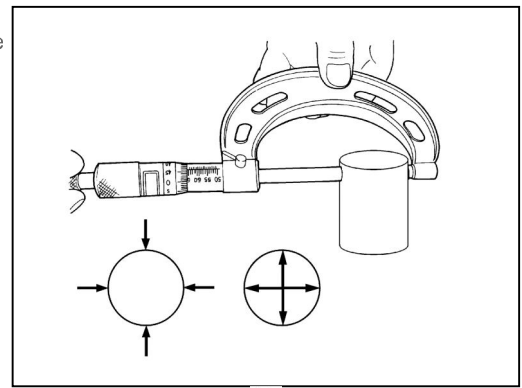


1.

Measure the diameter of the tappet and of the corresponding bore in the engine block to find the clearance.

- o If the clearance exceeds the specified limit, replace the tappet.

Item	Standard
Clearance between tappet and engine block	0.15 mm (0.0059 in)



2.



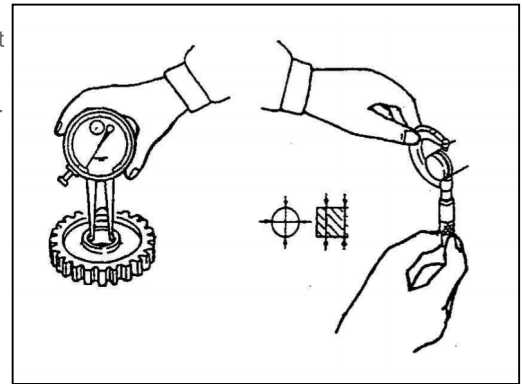
## Inspection of the idler gear

### Inspection

Measure the bore in the idler gear for the shaft and the diameter of the shaft to find the clearance.

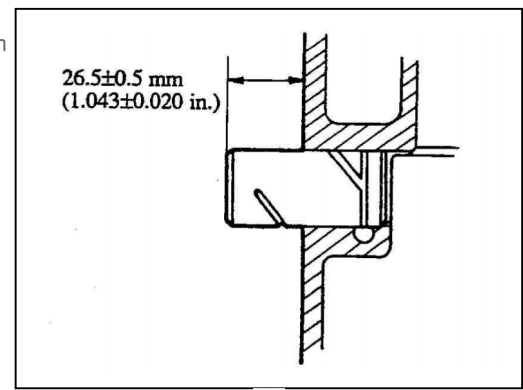
- If the clearance exceeds the specified limit, replace either the gear or the shaft, whichever is most worn.

Item	Standard	Limit
Clearance between idler gear and shaft	From 0.03 mm to 0.07 mm (From 0.0012 in to 0.0028 in)	0.20 mm (0.0079 in)



1.

The new idler shaft should be installed so that it protrudes  $26.5 \pm 0.5$  mm ( $1.043 \pm 0.020$  in.) from the face of the engine block.



2.



## Inspection of the valves, valve guides and valve seats

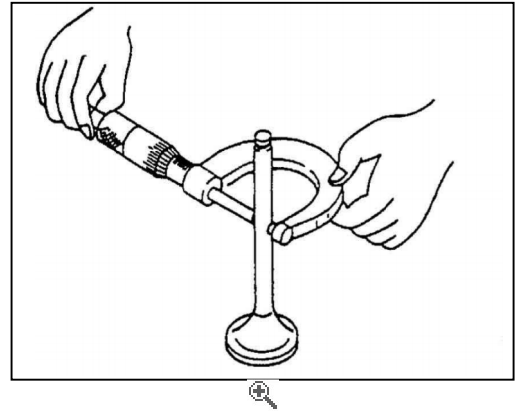
### Test

Measure the diameter of the valve stem as shown in the figure.

- If the stem is worn beyond the limit, or if it is abnormally worn, replace the valve.

Item	Nominal dimensions	Standard	Limit
Diameter of valve stem	Intake valve 6.6 mm (0.260 in)	From 6.565 mm to 6.580 mm (from 0.25846 in to 0.25905 in)	6.500 mm (0.25591 in)
	Exhaust valve 6.6 mm (0.260 in)	From 6.530 mm to 6.550 mm (from 0.25709 in to 0.25787 in)	

1.



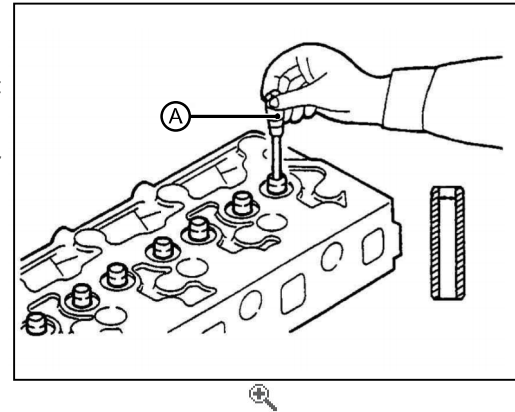
Valve guides wear more rapidly at their ends than at any other part.

Using a bore gauge (A), measure the inside diameter of the valve guides at both ends to find the clearance between valve stem and valve guide,

- If the clearance exceeds the specified limit, renew the valve guide or valve, whichever is most worn.

Item	Nominal size	Standard	
Clearance between valve stem and valve guide	Intake valve -	From 0.02 mm to 0.05 mm (from 0.0008 in to 0.0020 in)	0.10 mm (0.0039 in)
	Exhaust valve -	From 0.05 mm to 0.085 mm (from 0.0020 in to 0.00335 in)	0.15 mm (0.0059 in)
Height to top of valve guide	10 mm (0.39 in)	From 9.5 mm to 10.5 mm (From 0.374 in to 0.413 in)	-

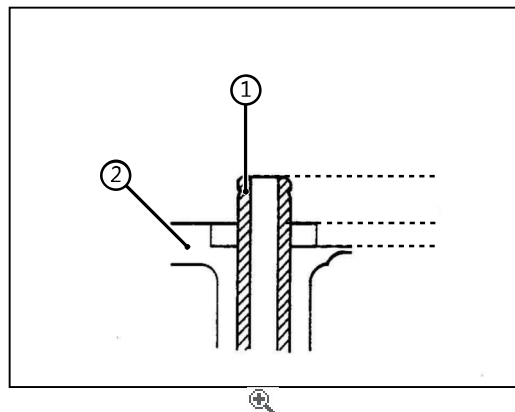
2.



- Before measuring the valve guides, remove all traces of paint and carbon deposits.

Force old valve guide (1) from cylinder head (2) using a suitable tool and an arbor press from the underside of the head.

Install the new valve guide (1) in the cylinder head (2) by inserting it with an arbor press from the upper side of the cylinder head to obtain the specified stand-out (10 mm ± 0.5 mm; 0.93 in ± 0.020 in).

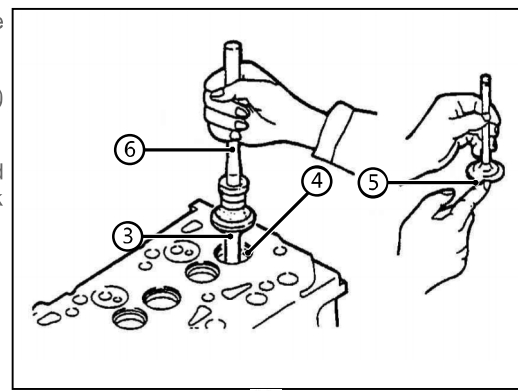


3.

Insert a new valve (3) in the guide (1); make sure the valve slides in the guide freely.

After renewing the valve guide (1), check the contact between the valve (3) and its seat (4)

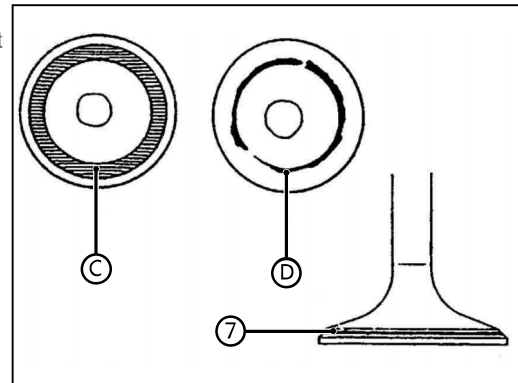
Put a small amount of Prussian blue or red lead on the valve face (5). Hold valve (3) with a valve lapping tool (6) and press it against seat (4) to check the contact.



4.

The width of contact (7) must be uniform all the way around both the seat and the valve (C).

- o If the contact is incorrect (D), reface the valve and seat.

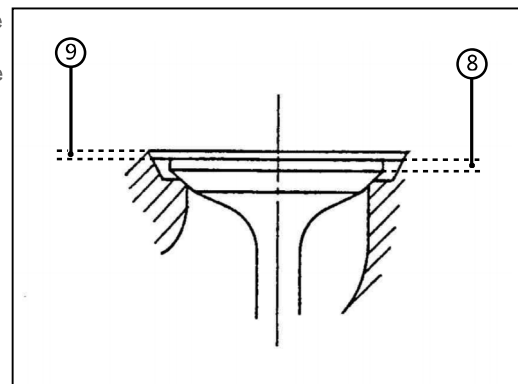


5.

- o If the valve margin (8) exceeds the specified limit, renew the valve (3).
- o If the valve sinkage (9) exceeds the specified limit, recondition the valve seat or renew the cylinder head assembly

Item	Standard	Limit
Valve margin (valve lip thickness)	1.0 mm (0.039 in)	0.5 mm (0.020 in)

Item	Standard	Limit
Valve sinkage (distance between the top of a closed valve and the face of the cylinder head)	0.5 mm ± 0.25 mm (0.020 in ± 0.0098 in)	1.5 mm (0.059 in)

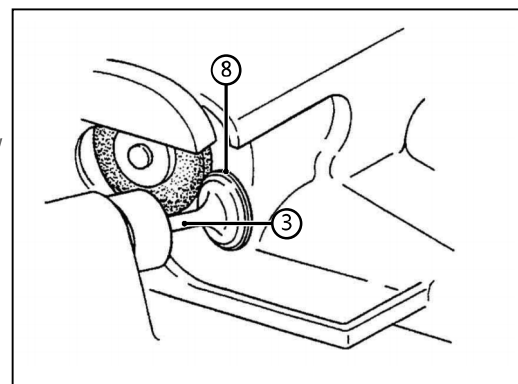


6.

Set the valve refacer at an angle of 45° and grind the valve.

The valve margin (8) must be not less than the specified limit.

- o If the margin (8) is below the limit when the valve is refaced, renew the valve (3).

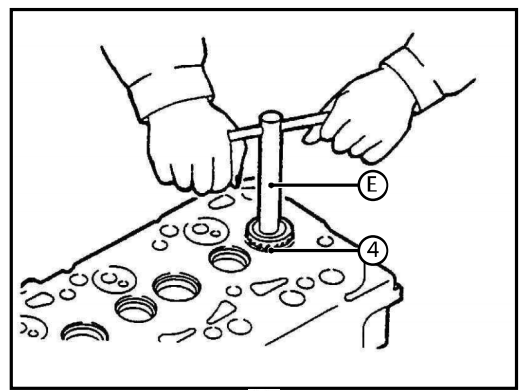


7.

Check the clearance between the valve (3) and valve guide (1) before refacing the valve seat (4).

- o Renew the valve guide (1) if necessary.

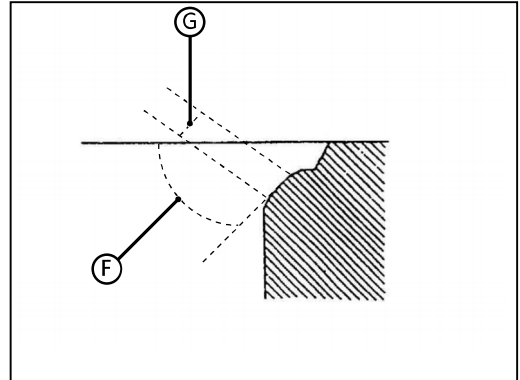
Finish the valve seat (4) using a finishing tool or a valve seat grinder (E).



8.

Check the valve face angle (F) and valve seat width (G).

Item	Standard	Limit
Valve face angle (F)	45°	-
Valve seat width (G)	From 1.3 mm to 1.8 mm (from 0.051 in to 0.071 in)	2.5 mm (0.098 in)



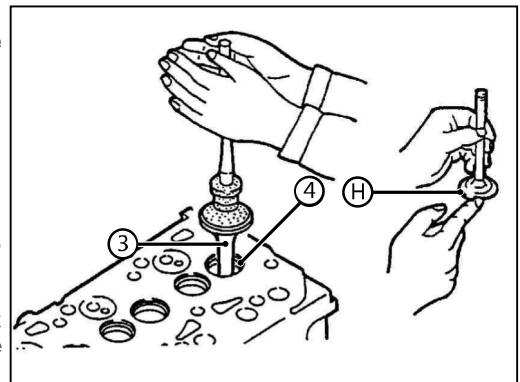
9.

Be sure to lap the valves (3) in their seats after refacing or renewal of the valves or valve seats (4).

Put a small amount of lapping compound on the valve face.

- o Do not put lapping compound on the valve stem.
- o Use a 120 - 150 grit lapping compound (H) for initial lapping and a compound finer than 200 grit for finish lapping.
- o Mixing the compound with a small amount of engine oil will help distribute the compound on the valve face uniformly.

Using a lapping tool, hold the valve (3) in its seat (4) and rotate it only a part of a turn, then raise the valve off its sealing surface to reposition it. Press the valve against the sealing surface and rotate through another part turn.



Repeat this operation until the compound wears and loses its cutting property.

Wash the valve (3) and valve seat (4) with dry cleaning solvent.

Apply engine oil to the valve (3) and lap it in the seat (4).

Check the valve face contact (7).

10.



## Valve clearances

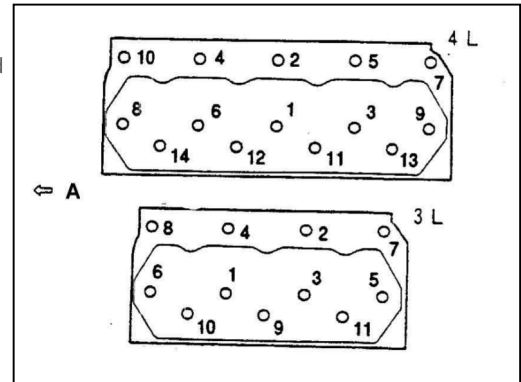
### Maintenance

- Adjust valve clearances when the engine is cold.

Slightly loosen the cylinder head screws and retighten them to the specified torque in numeric order.

Tightening torque	9 ± 0.5 kgf x m
	(65 ± 4 lbf x ft)
	[88 ± 5 N x m]

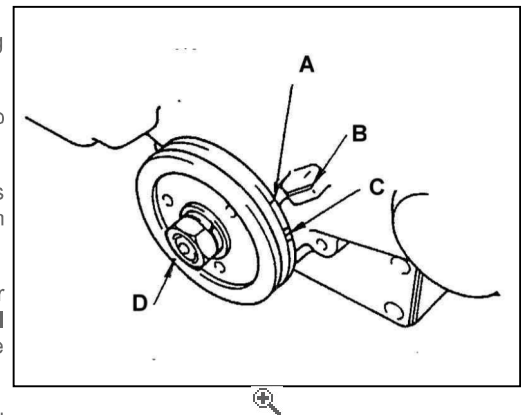
A - Front of engine



1.

Find TDC on the compression stroke for No. 1 piston using the following procedure:

- rotate the crankshaft to bring the TDC mark on the crankshaft pulley into alignment with the mark on the timing cover;
- with No. 1 piston at TDC on the compression stroke, the rocker arms should not move when the crankshaft is turned approximately 20° in both directions;
- if the rocker arms move, No. 1 piston is at top dead center on the intake or exhaust stroke; in this case, rotate the crankshaft through 360° in the normal direction of engine rotation. No. 1 piston is now at top dead center on the compression stroke.



Loosen the lock nut of the adjusting screw. With a feeler gauge inserted between the rocker arm and valve cap, adjust the valve clearance by turning the adjusting screw.

Item	Standard
Valve clearances (intake and exhaust valves)	0.25 mm (0.0098 in)

A - TDC (top dead center) mark for pistons No. 1 and No. 4

B - Mark on timing cover.

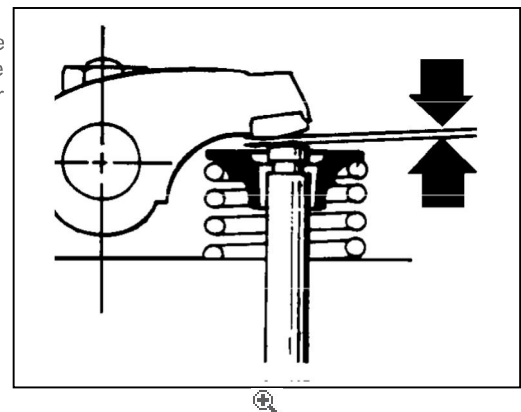
C - Injection timing mark.

D - TDC mark for pistons No. 2 and No. 3.

2.

Hold the adjusting screw and tighten the lock nut. After adjusting the valve clearance on the valves for No. 1 cylinder, rotate crankshaft 180° in the direction of engine rotation and adjust the valve clearance on the valves for the remainder of the cylinders in firing order (injection sequence).

Firing order (injection sequence)		Crankshaft rotation angle
S3L	1 - 3 - 2	240°
S4L	1 - 3 - 4 - 2	180°



- After adjusting the valve clearance on the valves for all cylinders, rotate the crankshaft two or three times and check that the valve clearances are still correct.

3.







## Inspection of the rocker arms and rocker shaft

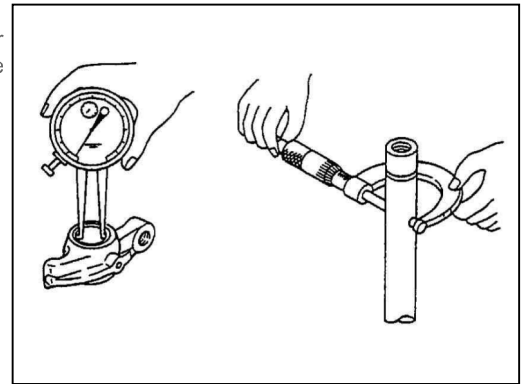
### Inspection

Measure the inside diameter of the bore in the rocker arm for the rocker shaft and the diameter of the rocker shaft to find the clearance between the arm and shaft.

- If the clearance is on the limit, renew the rocker arm.
- If it exceeds the limit, renew both the rocker arm and the shaft.

Item	Nominal size	Standard	Limit
Bore in rocker arm for rocker shaft	18.9 mm (0.744 in)	from 18.910 mm to 18.930 mm (from 0.74449 in to 0.74527 in)	-
Diameter of rocker shaft	18.9 mm (0.744 in)	from 18.880 mm to 18.898 mm (from 0.74331 in to 0.74401 in)	-
Clearance between rocker arm and shaft		from 0.012 mm to 0.050 mm (from 0.00047 in to 0.00197 in)	0.200 mm (0.00787 in)

1.



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