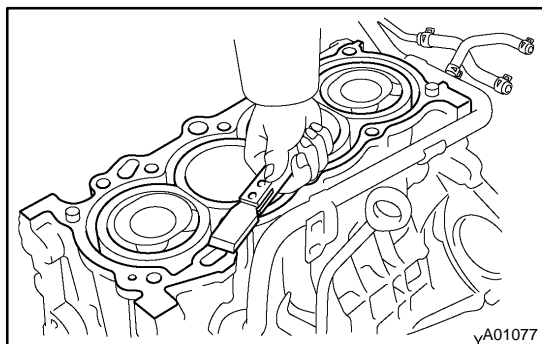


## INSPECTION

### 1. CLEAN TOP SURFACES OF PISTONS AND CYLINDER BLOCK

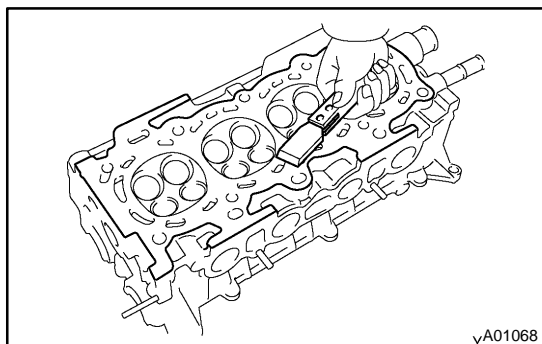
- (a) Turn the crankshaft, and bring each piston to top dead center (TDC). Using a gasket scraper, remove all the carbon from the piston surface.



- (b) Using a gasket scraper, remove all the gasket material from the cylinder block surface.
- (c) Using compressed air, blow carbon and oil from the bolt holes.

#### CAUTION:

Protect your eyes when using high pressure compressed air.

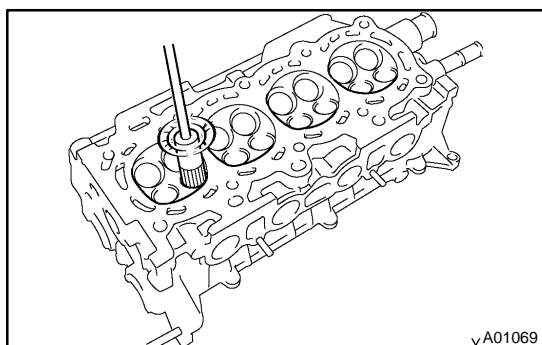


### 2. REMOVE GASKET MATERIAL

Using a gasket scraper, remove all the gasket material from the cylinder block contact surface.

#### NOTICE:

Be careful not to scratch the cylinder block contact surface.

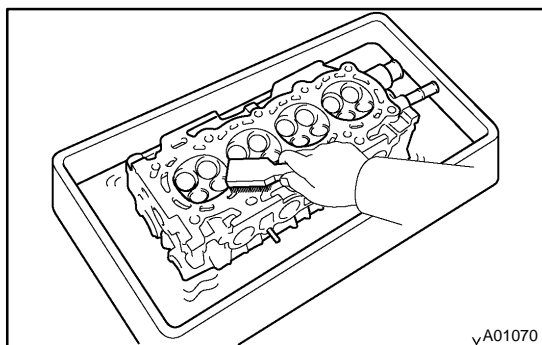


### 3. CLEAN COMBUSTION CHAMBERS

Using a wire brush, remove all the carbon from the combustion chambers.

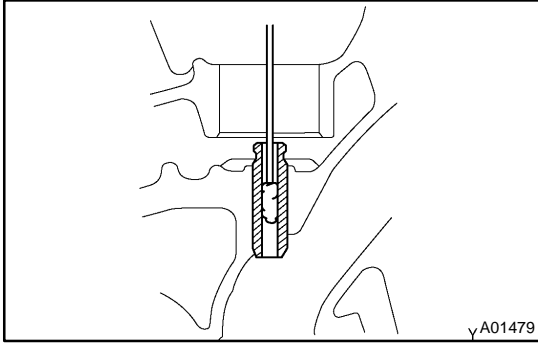
#### NOTICE:

Be careful not to scratch the cylinder block contact surface.



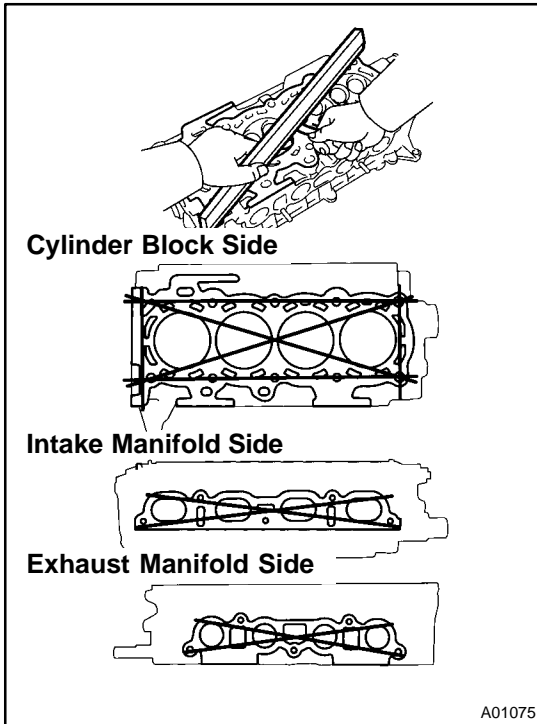
### 4. CLEAN CYLINDER HEAD

Using a soft brush and solvent, thoroughly clean the cylinder head.



### 5. CLEAN VALVE GUIDE BUSHINGS

Using a valve guide bushing brush and solvent, clean all the guide bushings.

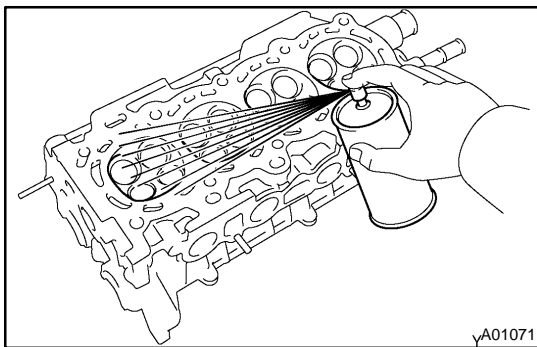


### 6. INSPECT FOR FLATNESS

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder block and the manifolds for warpage.

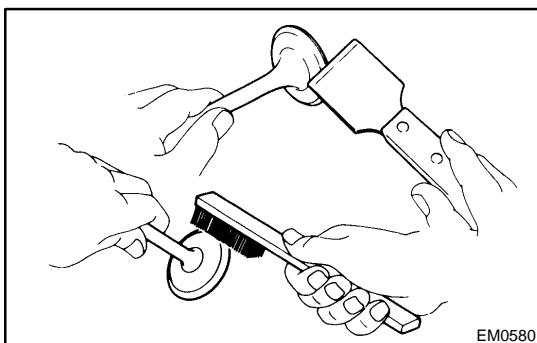
**Maximum warpage: 0.05 mm (0.0020 in.)**

If warpage is greater than maximum, replace the cylinder head.



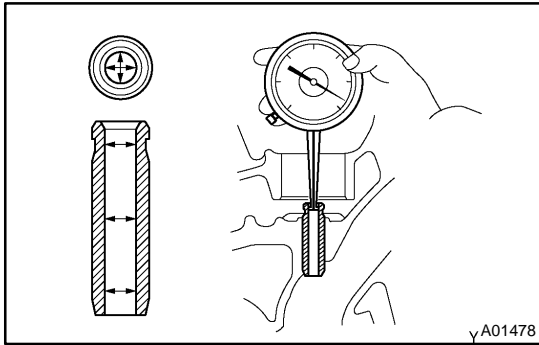
### 7. INSPECT FOR CRACKS

Using a dye penetrant, check the combustion chamber, intake ports, exhaust ports and cylinder block surface for cracks. If cracked, replace the cylinder head.



### 8. CLEAN VALVES

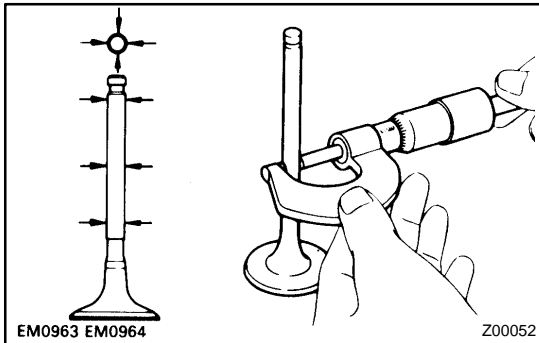
- (a) Using a gasket scraper, chip off any carbon from the valve head.
- (b) Using a wire brush, thoroughly clean the valve.

**9. INSPECT VALVE STEMS AND GUIDE BUSHINGS**

- (a) Using a caliper gauge, measure the inside diameter of the guide bushing.

**Bushing inside diameter:**

**5.010 - 5.030 mm (0.19724 - 0.19803 in.)**



- (b) Using a micrometer, measure the diameter of the valve stem.

**Valve stem diameter:**

**Intake 4.970 - 4.985 mm (0.19567 - 0.19626 in.)**

**Exhaust 4.965 - 4.980 mm (0.19547 - 0.19606 in.)**

- (c) Subtract the valve stem diameter measurement from the guide bushing inside diameter measurement.

**Standard oil clearance:**

**Intake 0.025 - 0.060 mm (0.00098 - 0.00236 in.)**

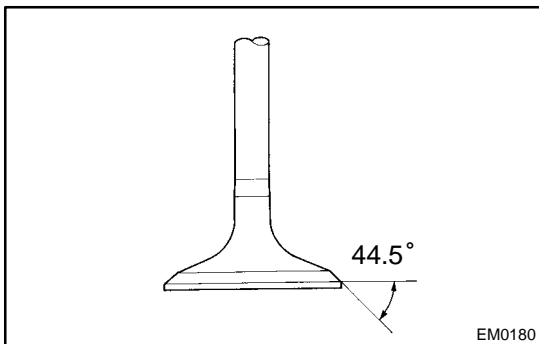
**Exhaust 0.030 - 0.065 mm (0.00118 - 0.00256 in.)**

**Maximum oil clearance:**

**Intake 0.08 mm (0.0031 in.)**

**Exhaust 0.10 mm (0.0039 in.)**

If the clearance is greater than maximum, replace the valve and guide bushing.

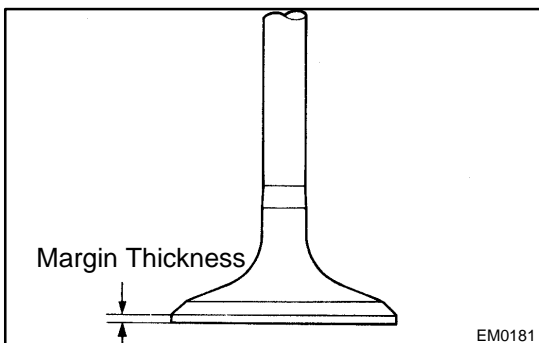
**10. INSPECT VALVES**

- (a) Check the valve is ground to the correct valve face angle.

**Valve face angle: 44.5°**

- (b) Check that the surface of the valve for wear.

If the valve face is worn, replace the valve.



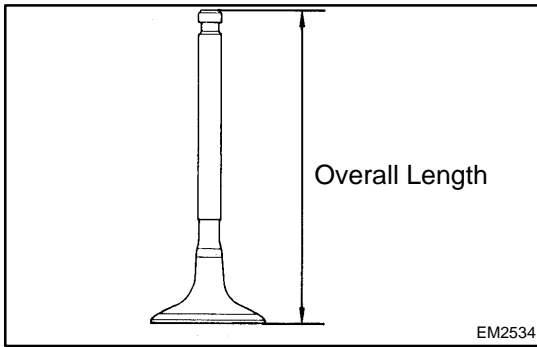
- (c) Check the valve head margin thickness.

**Standard margin thickness:**

**1.00 - 1.15 mm (0.0393 - 0.0453 in.)**

**Minimum margin thickness: 0.7 mm (0.028 in.)**

If the margin thickness is less than minimum, replace the valve.



- (d) Check the valve overall length.  
**Standard overall length:**  
**Intake 89.25 mm (3.5138 in.)**  
**Exhaust 87.90 mm (3.4606 in.)**  
**Minimum overall length:**  
**Intake 88.75 mm (3.4941 in.)**  
**Exhaust 87.40 mm (3.4409 in.)**

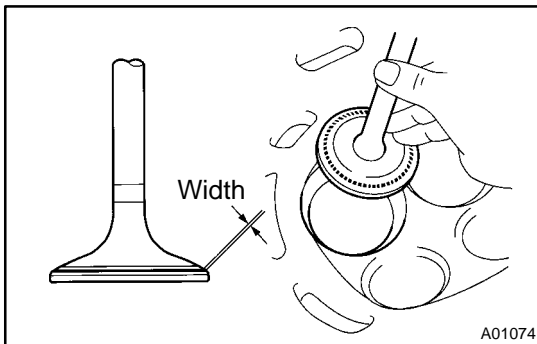
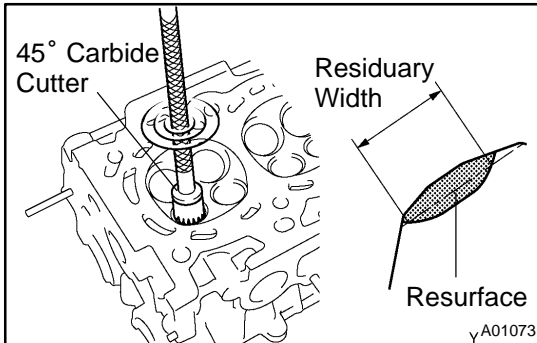
If the overall length is less than minimum, replace the valve.

- (e) Check the surface of the valve stem tip for wear.

If the valve stem tip is worn, replace the valve.

#### 11. INSPECT AND CLEAN VALVE SEATS

- (a) Using a 45° carbide cutter, resurface the valve seats.  
 Remove only enough metal to clean the seats.



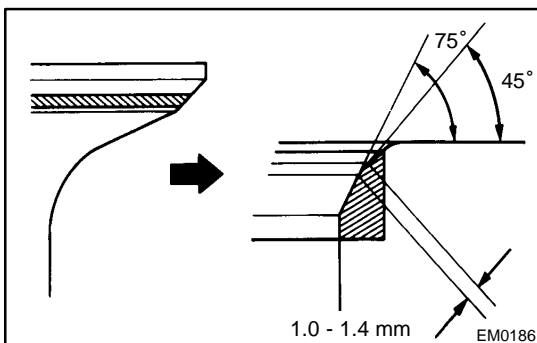
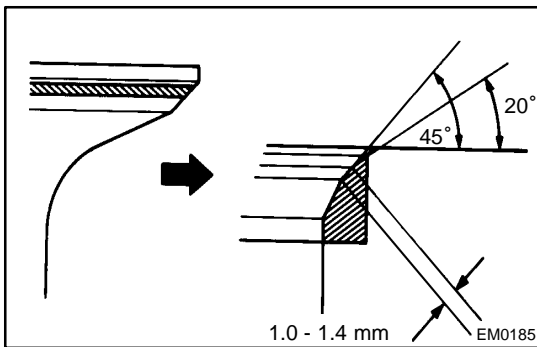
- (b) Check the valve seating position.  
 Apply a light coat of prussian blue (or white lead) to the valve face. Lightly press the valve against the seat. Do not rotate valve.

- (c) Check the valve face and seat for the following:
- If blue appears 360° around the face, the valve is concentric. If not, replace the valve.
  - If blue appears 360° around the valve seat, the guide and face are concentric. If not, resurface the seat.
  - Check that the seat contact is in the middle of the valve face with the following width:

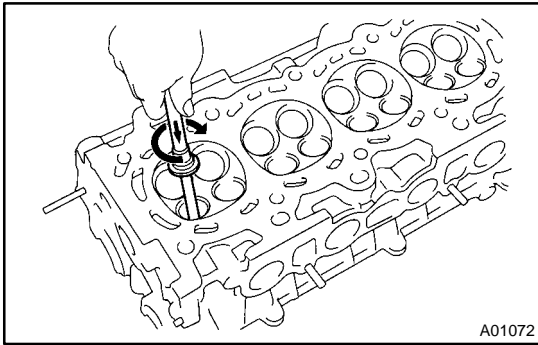
**1.0 - 1.4 mm (0.039 - 0.055 in.)**

If not, correct the valve seats as follows:

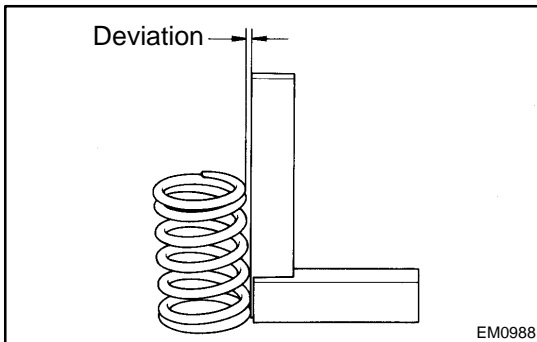
- (1) If the seating is too high on the valve face, use 20° and 45° cutters to correct the seat.



- (2) If the seating is too low on the valve face, use 75° and 45° cutters to correct the seat.



- (d) Hand-lap the valve and valve seat with an abrasive compound.
- (e) After hand-lapping, clean the valve and valve seat.



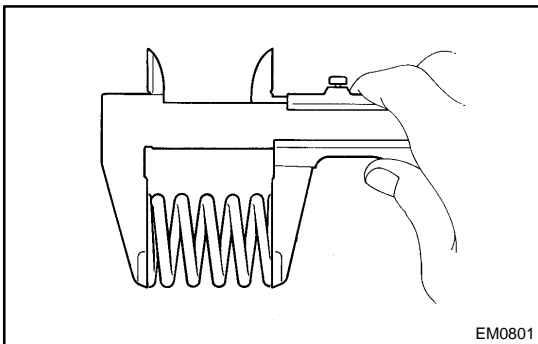
## 12. INSPECT VALVE SPRINGS

- (a) Using a steel square, measure the deviation of the valve spring.

**Maximum deviation: 1.6 mm (0.063 in.)**

**Maximum angle (reference): 2°**

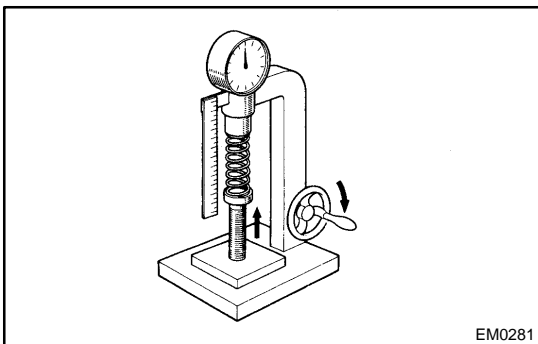
If the deviation is greater than maximum, replace the valve spring.



- (b) Using vernier calipers, measure the free length of the valve spring.

**Free length: 45.1 mm (1.776 in.)**

If the free length is not as specified, replace the valve spring.



- (c) Using a spring tester, measure the tension of the valve spring at the specified installed length.

**Installed tension:**

**149 - 165 N (15.2 - 16.8 kgf, 33.5 - 37.1 lbf)**

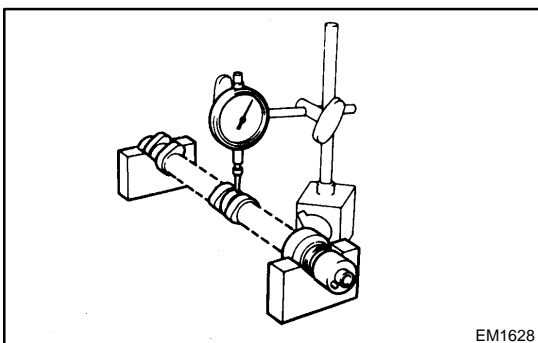
**at 32.5 mm (1.280 in.)**

**Maximum working tension:**

**286 - 316 N (29.1 - 32.2 kgf, 64.2 - 71.0 lbf)**

**at 23.9 mm (0.941 in.)**

If the installed tension is not as specified, replace the valve spring

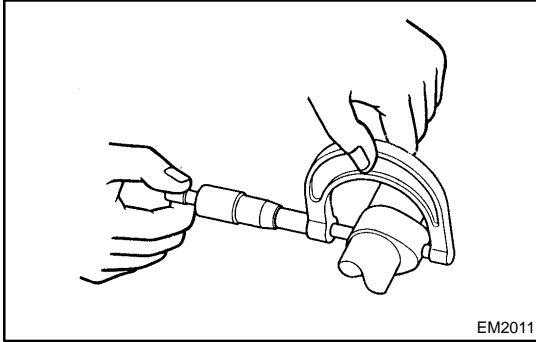


## 13. INSPECT CAMSHAFT FOR RUNOUT

- (a) Place the camshaft on V-blocks.
- (b) Using a dial indicator, measure the circle runout at the center journal.

**Maximum circle runout: 0.03 mm (0.0012 in.)**

If the circle runout is greater than maximum, replace the camshaft.



#### 14. INSPECT CAM LOBES

Using a micrometer, measure the cam lobe height.

**Standard cam lobe height:**

**Intake 44.617 - 44.717 mm (1.75657 - 1.76051 in.)**

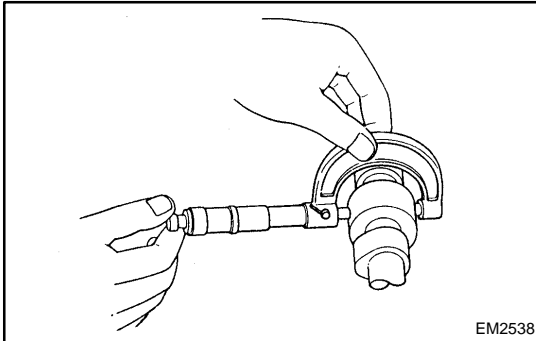
**Exhaust 44.666 - 44.766 mm (1.75850 - 1.76244 in.)**

**Minimum cam lobe height:**

**Intake 44.47 mm (1.7508 in.)**

**Exhaust 44.52 mm (1.7528 in.)**

If the cam lobe height is less than minimum, replace the camshaft.



#### 15. INSPECT CAMSHAFT JOURNALS

Using a micrometer, measure the journal diameter.

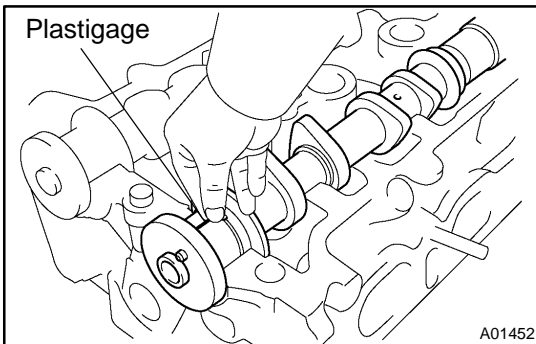
**No.1 journal diameter:**

**34.449 - 34.465 mm (1.35626 - 1.35689 in.)**

**Others journal diameter:**

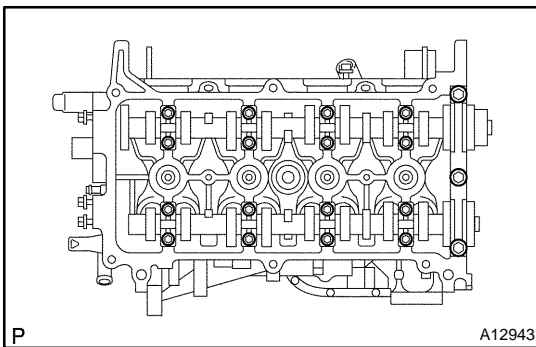
**22.949 - 22.965 mm (0.90350 - 0.90413 in.)**

If the journal diameter is not as specified, check the oil clearance.



#### 16. INSPECT CAMSHAFT JOURNAL CLEARANCE

- Clean the bearing caps and camshaft journals.
- Place the camshafts on the cylinder head.
- Lay a strip of Plastigage across each of the camshaft journal.



- Install the bearing caps (See page [EM-44](#) ).

**Torque:**

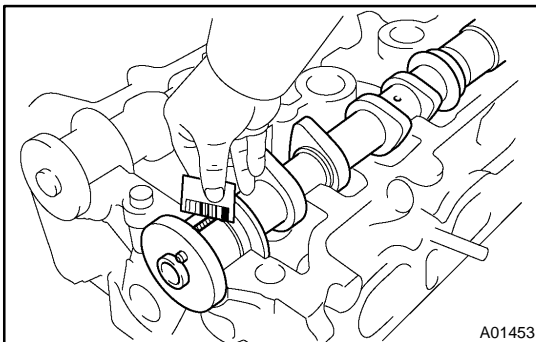
**No.1 23 N·m (235 kgf·cm, 17 ft·lbf)**

**No.2 12.7 N·m (130 kgf·cm, 10 ft·lbf)**

**NOTICE:**

**Do not turn the camshaft.**

- Remove the bearing caps.



- Measure the plastigage at its widest point.

**Standard oil clearance:**

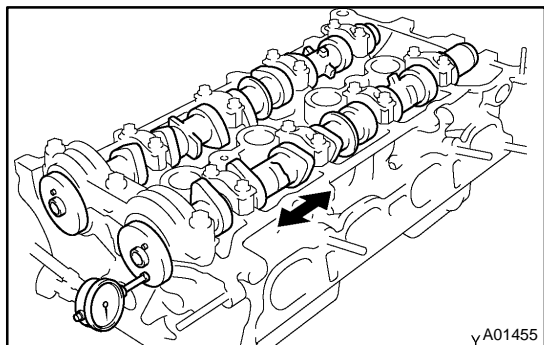
**0.040 - 0.095 mm (0.00157 - 0.00374 in.)**

**Maximum oil clearance:**

**0.115 mm (0.00453 in.)**

If the oil clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

- Completely remove the Plastigage.
- Remove the camshafts.

**17. INSPECT CAMSHAFT THRUST CLEARANCE**

- (a) Install the camshafts (See page [EM-44](#) ).
- (b) Using a dial indicator, measure the thrust clearance while moving the camshaft back and forth.

**Standard thrust clearance:**

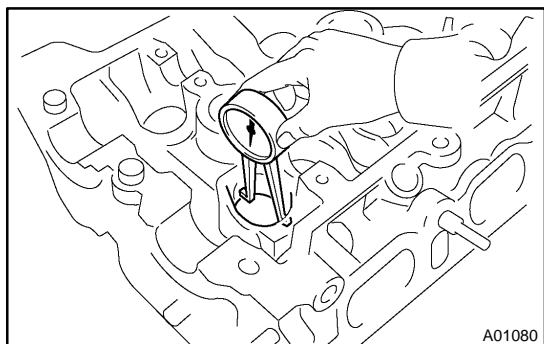
**0.040 - 0.095 mm (0.0016 - 0.0037 in.)**

**Maximum thrust clearance:**

**0.11 mm (0.0043 in.)**

If the thrust clearance is greater than maximum, replace the camshaft. If necessary, replace the bearing caps and cylinder head as a set.

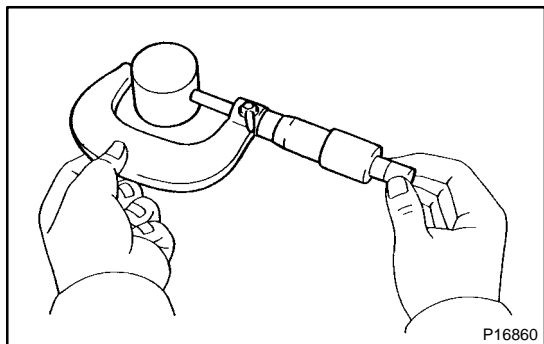
- (c) Remove the camshafts.

**18. INSPECT VALVE LIFTERS AND LIFTER BORES**

- (a) Using a caliper gauge, measure the lifter bore diameter of the cylinder head.

**Lifter bore diameter:**

**31.000 - 31.025 mm (1.22047 - 1.22145 in.)**



- (b) Using a micrometer, measure the lifter diameter.

**Lifter diameter:**

**30.966 - 30.976 mm (1.21913 - 1.21953 in.)**

- (c) Subtract the lifter diameter measurement from the lifter bore diameter measurement.

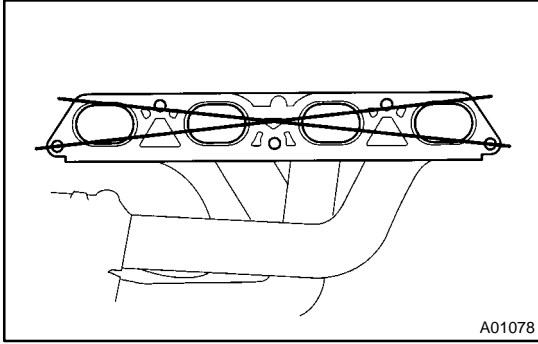
**Standard oil clearance:**

**0.024 - 0.059 mm (0.00094 - 0.00232 in.)**

**Maximum oil clearance:**

**0.1 mm (0.004 in.)**

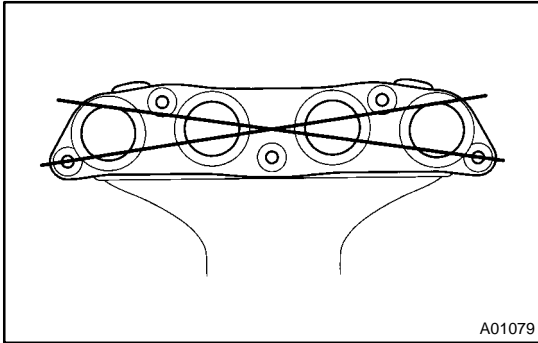
If the oil clearance is greater than maximum, replace the lifter. If necessary, replace the cylinder head.

**19. INSPECT INTAKE MANIFOLD**

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

**Maximum warpage: 0.10 mm (0.0039 in.)**

If warpage is greater than maximum, replace the manifold.

**20. INSPECT EXHAUST MANIFOLD**

Using a precision straight edge and feeler gauge, measure the surface contacting the cylinder head for warpage.

**Maximum warpage: 0.70 mm (0.0276 in.)**

If warpage is greater than maximum, replace the manifold.