

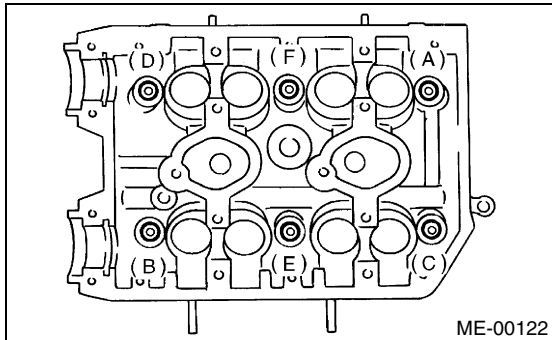
## 19. Cylinder Head Assembly

### A: REMOVAL

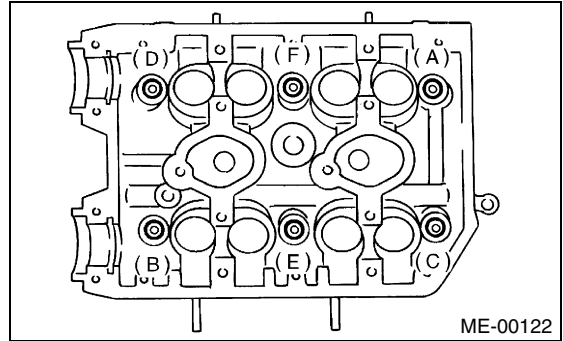
- 1) Remove the V-belt. <Ref. to ME(H4DOTC)-44, REMOVAL, V-belt.>
- 2) Remove the crankshaft pulley. <Ref. to ME(H4DOTC)-46, REMOVAL, Crankshaft Pulley.>
- 3) Remove the belt cover. <Ref. to ME(H4DOTC)-47, REMOVAL, Belt Cover.>
- 4) Remove the timing belt assembly. <Ref. to ME(H4DOTC)-48, REMOVAL, Timing Belt Assembly.>
- 5) Remove the camshaft sprocket. <Ref. to ME(H4DOTC)-57, REMOVAL, Camshaft Sprocket.>
- 6) Remove the intake manifold. <Ref. to FU(H4DOTC)-15, REMOVAL, Intake Manifold.>
- 7) Remove the bolt which installs the A/C compressor bracket on cylinder head.
- 8) Remove the camshaft. <Ref. to ME(H4DOTC)-59, REMOVAL, Camshaft.>
- 9) Remove the cylinder head bolts in alphabetical sequence shown in the figure.

#### CAUTION:

**Leave bolts (A) and (D) engaged by three or four threads to prevent the cylinder head from falling.**



- 10) While tapping the cylinder head with a plastic hammer, separate it from cylinder block. Remove the bolts (A) and (D) to remove the cylinder head.



- 11) Remove the cylinder head gasket.

#### CAUTION:

**Do not scratch the mating surface of cylinder head and cylinder block.**

- 12) Similarly, remove the right side cylinder head.

### B: INSTALLATION

- 1) Install the cylinder head and gaskets on cylinder block.

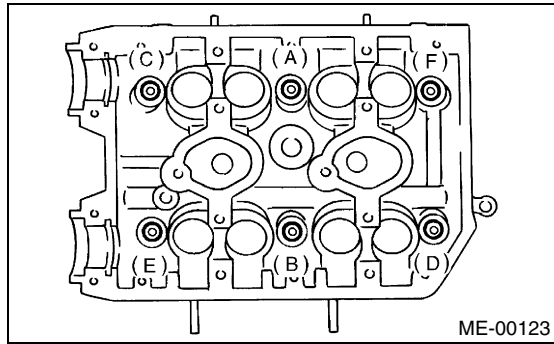
#### CAUTION:

- Use new cylinder head gaskets.
- Be careful not to scratch the mating surface of cylinder head and cylinder block.

- 2) Tighten the cylinder head bolts.
  - (1) Apply a coat of engine oil to washers and bolt threads.
  - (2) Tighten all bolts to 29 N·m (3.0 kgf-m, 22 ft-lb) in alphabetical sequence.
  - (3) Retighten all bolts to 69 N·m (7.0 kgf-m, 51 ft-lb) in alphabetical sequence.
  - (4) Back off all bolts by 180° first, then back them off a further 180°, in the reverse sequence they were tightened.
  - (5) Tighten all bolts to 39 N·m (4.0 kgf-m, 29 ft-lb) in alphabetical sequence.
  - (6) Tighten all bolts 80 — 90° in alphabetical sequence.
  - (7) Tighten all bolts a further 40 — 45° in alphabetical sequence.

#### NOTE:

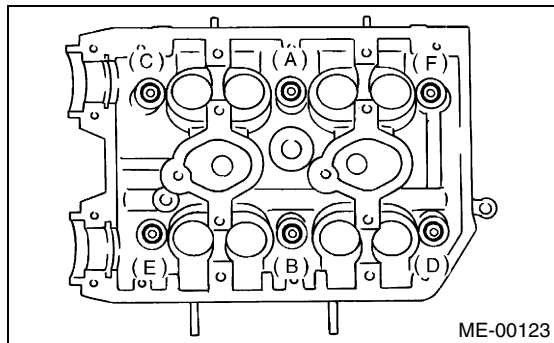
Do not tighten bolts for more than 45°.



(8) Tighten bolt (A) and (B) a further 40 — 45°.

**NOTE:**

Make sure the sum of retightening angles in previous steps has not exceeded 90°.



3) Install the camshaft. <Ref. to ME(H4DOTC)-60, INSTALLATION, Camshaft.>

4) Install the A/C compressor bracket on cylinder head.

5) Install the intake manifold. <Ref. to FU(H4DOTC)-18, INSTALLATION, Intake Manifold.>

6) Install the camshaft sprocket. <Ref. to ME(H4DOTC)-57, INSTALLATION, Camshaft Sprocket.>

7) Install the timing belt assembly. <Ref. to ME(H4DOTC)-50, INSTALLATION, Timing Belt Assembly.>

8) Install the belt cover. <Ref. to ME(H4DOTC)-47, INSTALLATION, Belt Cover.>

9) Install the crankshaft pulley. <Ref. to ME(H4DOTC)-46, INSTALLATION, Crankshaft Pulley.>

10) Install the V-belt. <Ref. to ME(H4DOTC)-44, INSTALLATION, V-belt.>

## C: DISASSEMBLY

1) Remove the valve shims and valve lifters.

2) Compress the valve spring and remove the valve spring retainer key. Remove each valve and valve spring.

ST1 498267600 CYLINDER HEAD TABLE

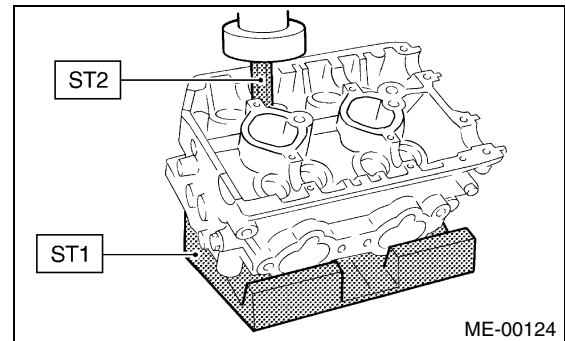
ST2 499718000 VALVE SPRING REMOVER

**CAUTION:**

- Keep the removed parts in order for re-installing in their original positions.

- Mark each valve to prevent confusion.

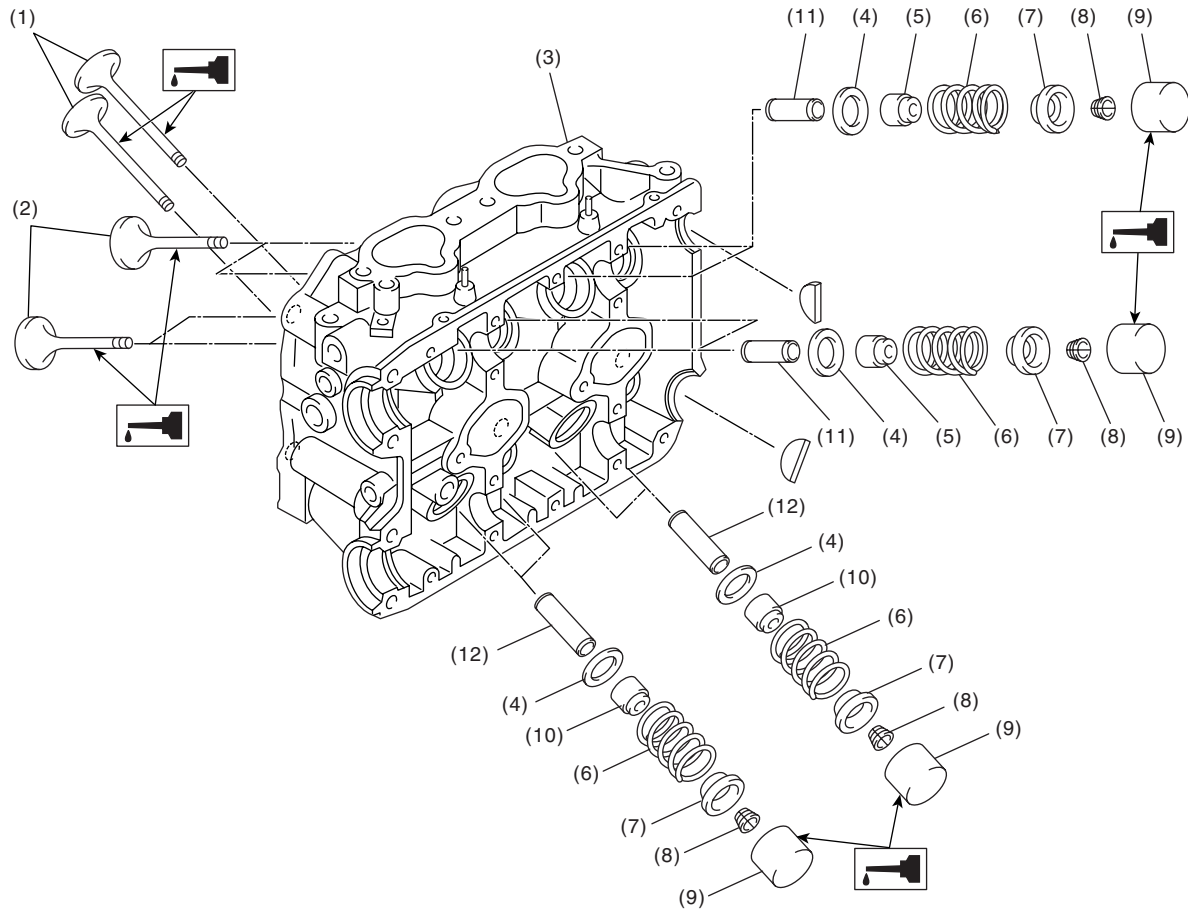
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



# CYLINDER HEAD ASSEMBLY

MECHANICAL

## D: ASSEMBLY



ME-00003

- |                           |                             |                          |
|---------------------------|-----------------------------|--------------------------|
| (1) Exhaust valve         | (6) Valve spring            | (11) Intake valve guide  |
| (2) Intake valve          | (7) Retainer                | (12) Exhaust valve guide |
| (3) Cylinder head         | (8) Retainer key            |                          |
| (4) Valve spring seat     | (9) Valve lifter            |                          |
| (5) Intake valve oil seal | (10) Exhaust valve oil seal |                          |

- 1) Installation of valve spring and valve:
  - (1) Coat the stem of each valve with engine oil and insert the valve into valve guide.

**CAUTION:**

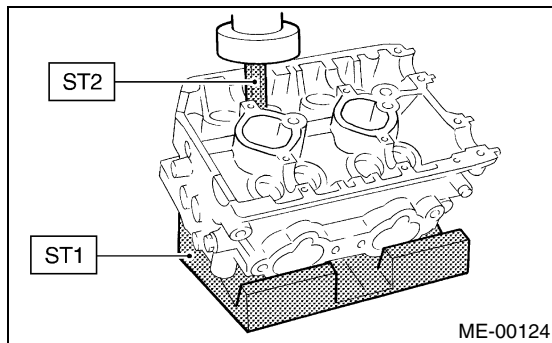
**When inserting the valve into valve guide, use special care not to damage the oil seal lip.**

- (2) Set the cylinder head on ST1.
- (3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE  
ST2 499718000 VALVE SPRING REMOVER

**CAUTION:**

**Be sure to install the valve springs with their close-coiled end facing the seat on the cylinder head.**



- (4) Compress the valve spring and fit the valve spring retainer key.
  - (5) After installing, tap the valve spring retainers lightly with wooden hammer for better seating.
- 2) Apply oil to the surface of the valve lifter and valve shim.
  - 3) Install the valve lifter and valve shim.

## E: INSPECTION

### 1. CYLINDER HEAD

- 1) Make sure that no crack or other damage exists. In addition to visual inspection, inspect the important areas by means of red check.
  - 2) Measure the warping of the cylinder head surface that mates with crankcase by using a straight edge (A) and thickness gauge (B).
- If the warping exceeds 0.05 mm (0.0020 in), re-grind the surface with a surface grinder.

**Warping limit:**

**0.05 mm (0.0020 in)**

**Grinding limit:**

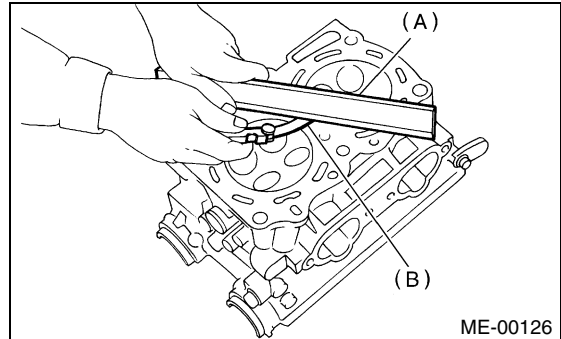
**0.3 mm (0.012 in)**

**Standard height of cylinder head:**

**127.5 mm (5.02 in)**

**CAUTION:**

**Uneven torque for the cylinder head nuts can cause warping. When reassembling, pay special attention to the torque so as to tighten evenly.**



### 2. VALVE SEAT

Inspect the intake and exhaust valve seats, and correct the contact surfaces with valve seat cutter if they are defective or when valve guides are replaced.

**Valve seat width: W**

**Intake**

**Standard**

**1.0 mm (0.039 in)**

**Limit**

**1.7 mm (0.067 in)**

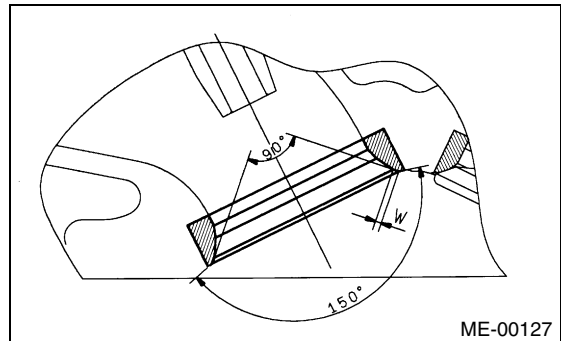
**Exhaust**

**Standard**

**1.5 mm (0.059 in)**

**Limit**

**2.2 mm (0.087 in)**



# CYLINDER HEAD ASSEMBLY

## MECHANICAL

### 3. VALVE GUIDE

1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outside diameter of valve stem and the inside diameter of valve guide with outside and inside micrometers respectively.

**Clearance between the valve guide and valve stem:**

**Standard**

**Intake**

**0.030 — 0.057 mm (0.0012 — 0.0022 in)**

**Exhaust**

**0.040 — 0.067 mm (0.0016 — 0.0026 in)**

**Limit**

**0.15 mm (0.0059 in)**

2) If the clearance between valve guide and stem exceeds the limit, replace the valve guide or valve itself whichever shows greater amount of wear. See the following procedure for valve guide replacement.

**Valve guide inner diameter:**

**6.000 — 6.012 mm (0.2362 — 0.2367 in)**

**Valve stem outer diameters:**

**Intake**

**5.955 — 5.970 mm (0.2362 — 0.2367 in)**

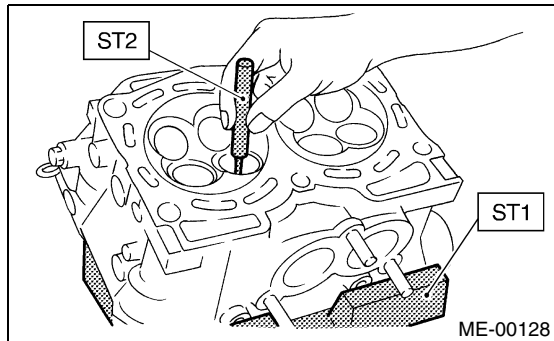
**Exhaust**

**5.945 — 5.960 mm (0.2341 — 0.2346 in)**

(1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides enter the holes in ST1.

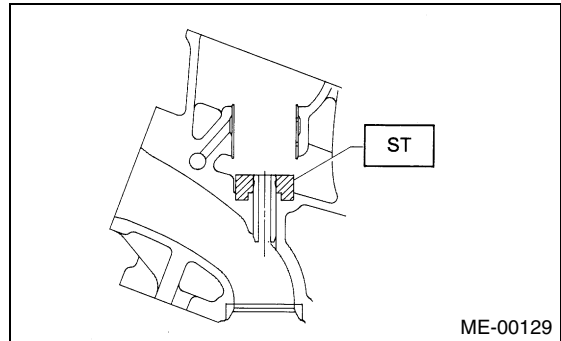
(2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE  
ST2 499767200 VALVE GUIDE REMOVER



(3) Turn the cylinder head upside down and place ST as shown in the figure.

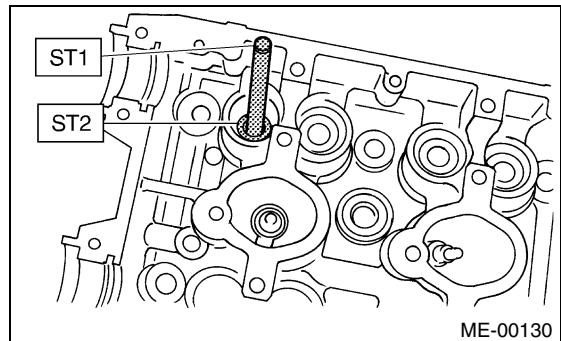
ST 18251AA020 VALVE GUIDE ADJUSTER



(4) Before installing a new valve guide, make sure that neither scratches nor damages exist on the inside surface of the valve guide holes in cylinder head.

(5) Put a new valve guide, coated with sufficient oil, in cylinder, and insert ST1 into valve guide. Press in until the valve guide upper end is flush with the upper surface of ST2.

ST1 499767200 VALVE GUIDE REMOVER  
ST2 18251AA020 VALVE GUIDE ADJUSTER



(6) Check the valve guide protrusion.

**Valve guide protrusion: L**

**15.8 — 16.2 mm (0.622 — 0.638 in)**

(7) Ream the inside of valve guide with ST. Gently rotate the reamer clockwise while pressing it lightly into the valve guide, and return it also rotating clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

**CAUTION:**

- Apply engine oil to the reamer when reaming.
- If the inner surface of the valve guide is torn, the edge of the reamer should be slightly ground with an oil stone.
- If the inner surface of the valve guide becomes lustrous and the reamer does not chips, use a new reamer or remedy the reamer.

(8) Recheck the contact condition between valve and valve seat after replacing the valve guide.

#### 4. INTAKE AND EXHAUST VALVE

1) Inspect the flange and stem of valve, and replace if damaged, worn, or deformed, or if "H" is less than the specified limit.

**H:**

**Intake**

**Standard**

**1.2 mm (0.047 in)**

**Limit**

**0.8 mm (0.031 in)**

**Exhaust**

**Standard**

**1.5 mm (0.059 in)**

**Limit**

**0.8 mm (0.031 in)**

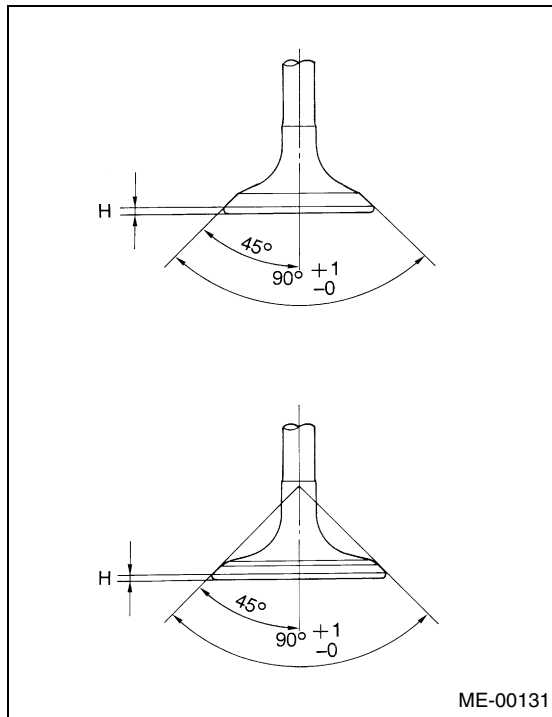
**Valve overall length:**

**Intake**

**104.4 mm (4.110 in)**

**Exhaust**

**104.7 mm (4.122 in)**

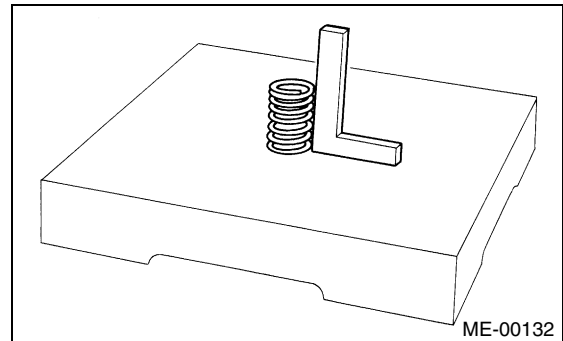


#### 5. VALVE SPRINGS

1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within specifications presented in the table.

2) To measure the squareness of the valve spring, stand the spring on a surface plate and measure its deflection at the top using a try square.

	Valve spring
Free length	44.67 mm (1.7587 in)
Tension/spring height	220.7±15.7 N (22.5 ± 1.6 kgf, 49.6±3.5 lb)/36.0 mm (1.417 in)
	510.9±25.5 N (52.1±2.6 kgf, 114.9±5.7 lb)/26.6 mm (1.047 in)
Squareness	2.5°, 2.0 mm (0.079 in)



2) Put a small amount of grinding compound on the seat surface and lap the valve and seat surface. Install a new intake valve oil seal after lapping.

# CYLINDER HEAD ASSEMBLY

## MECHANICAL

### 6. INTAKE AND EXHAUST VALVE OIL SEAL

Replace the oil seal with a new one, if the lip is damaged or spring out of place, or when the surfaces of intake valve and valve seat are reconditioned or intake valve guide is replaced.

- 1) Place the cylinder head on ST1.
  - 2) Press in the oil seal to the specified dimension indicated in the figure by using ST2.
- ST1 498267600 CYLINDER HEAD TABLE  
ST2 498857100 VALVE GUIDE REMOVER

#### CAUTION:

- Apply engine oil to oil seal before force-fitting.
- Differentiate between the intake valve oil seal and exhaust valve oil seal by noting their difference in color.

#### Color of rubber part:

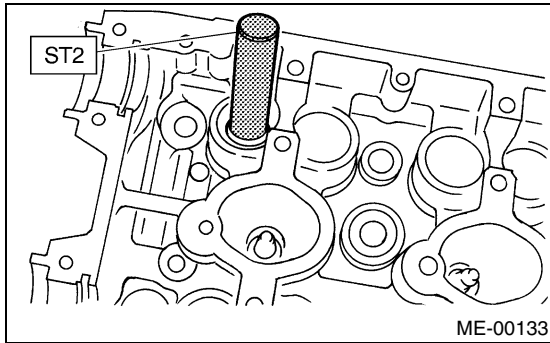
Intake [Black]

Exhaust [Brown]

#### Color of spring part:

Intake [Silver]

Exhaust [Silver]

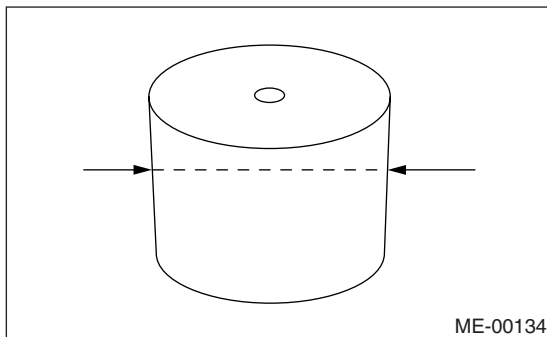


### 7. VALVE LIFTER

- 1) Check the valve lifter visually.
- 2) Measure the outer diameter of valve lifter.

#### Outer diameter:

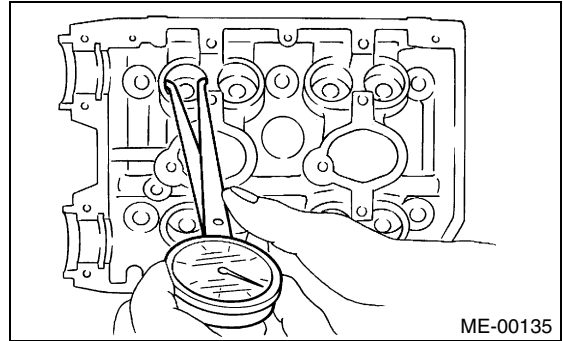
**34.959 — 34.975 mm (1.3763 — 1.3770 in)**



- 3) Measure the inner diameter of valve lifter mating part on cylinder head.

#### Inner diameter:

**34.994 — 35.016 mm (1.3777 — 1.3786 in)**



#### CAUTION:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the limit, replace the cylinder head.

#### Standard:

**0.019 — 0.057 mm (0.0007 — 0.0022 in)**

#### Limit:

**0.100 mm (0.0039 in)**