

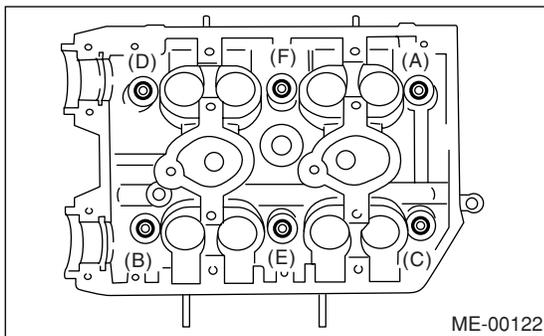
Cylinder Head

MECHANICAL

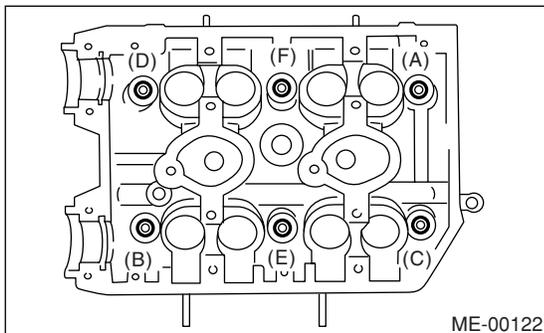
19. Cylinder Head

A: REMOVAL

- 1) Remove the V-belts. <Ref. to ME(H4DOTC)-37, REMOVAL, V-belt.>
- 2) Remove the crank pulley. <Ref. to ME(H4DOTC)-39, REMOVAL, Crank Pulley.>
- 3) Remove the timing belt cover. <Ref. to ME(H4DOTC)-40, REMOVAL, Timing Belt Cover.>
- 4) Remove the timing belt. <Ref. to ME(H4DOTC)-41, REMOVAL, Timing Belt.>
- 5) Remove the cam sprocket. <Ref. to ME(H4DOTC)-49, REMOVAL, Cam Sprocket.>
- 6) Remove the intake manifold. <Ref. to FU(H4DOTC)-12, 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)-51, REMOVAL, Camshaft.>
- 9) Remove the cylinder head bolts in alphabetical sequence shown in the figure. Leave the 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 cylinder head.



- 11) Remove the cylinder head gasket.

CAUTION:

Be careful not to scratch the mating surface of cylinder head and cylinder block.

- 12) Similarly, remove the cylinder head (RH).

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, 21.4 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° in the reverse order of installation, and back them off again by 180°.
 - (5) Tighten all bolts to 49 N·m (5.0 kgf-m, 36 ft-lb) in alphabetical sequence.
 - (6) Tighten all bolts by 80 — 90° in alphabetical sequence.
 - (7) Tighten all bolts by 40 — 45° in alphabetical sequence.

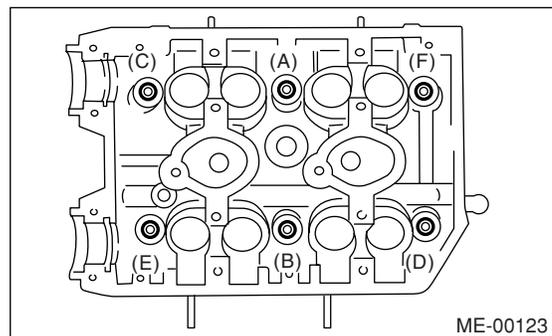
CAUTION:

Do not tighten the bolts more than 45°.

- (8) Further tighten the bolts (A) and (B) by 40 — 45°.

CAUTION:

Ensure the total “re-tightening angle” [in the former two steps], do not exceed 90°.



- 3) Install the camshaft. <Ref. to ME(H4DOTC)-52, INSTALLATION, Camshaft.>
- 4) Install the A/C compressor bracket on cylinder head.
- 5) Install the intake manifold. <Ref. to FU(H4DOTC)-14, INSTALLATION, Intake Manifold.>

- 6) Install the cam sprocket.
<Ref. to ME(H4DOTC)-49, INSTALLATION, Cam Sprocket.>
- 7) Install the timing belt.
<Ref. to ME(H4DOTC)-42, INSTALLATION, Timing Belt.>
- 8) Install the timing belt cover.
<Ref. to ME(H4DOTC)-40, INSTALLATION, Timing Belt Cover.>
- 9) Install the crank pulley.
<Ref. to ME(H4DOTC)-39, INSTALLATION, Crank Pulley.>
- 10) Install the V-belts. <Ref. to ME(H4DOTC)-37, INSTALLATION, V-belt.>

C: DISASSEMBLY

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

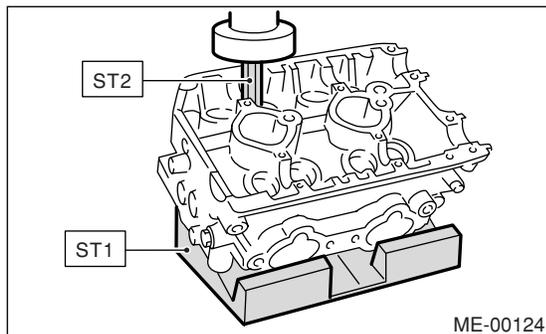
ST1 498267600 CYLINDER HEAD TABLE
ST2 499718000 VALVE SPRING REMOVER

NOTE:

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

CAUTION:

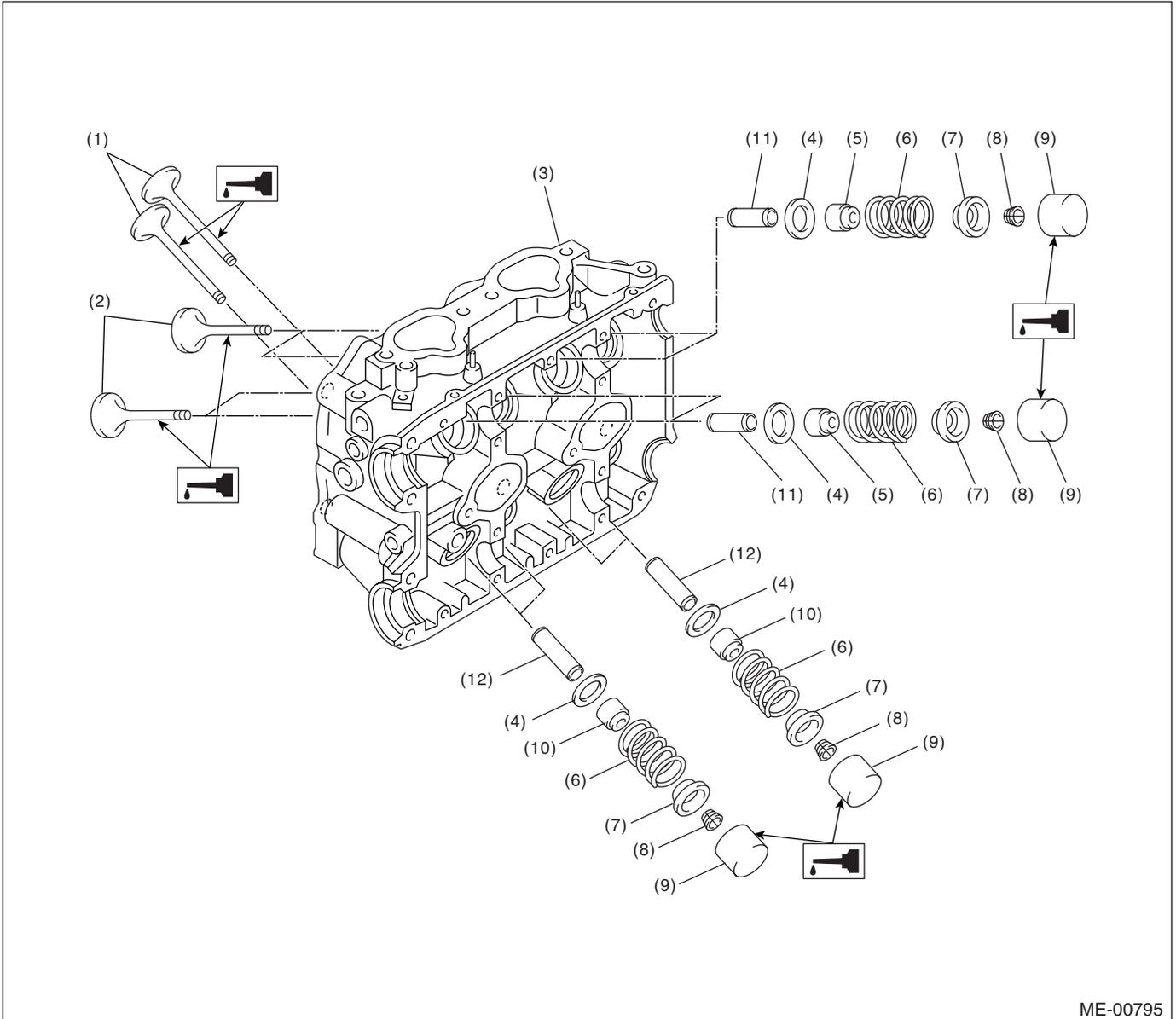
- Mark each valve to prevent confusion.
- Use extreme care not to damage the lips of the intake valve oil seals and exhaust valve oil seals.



Cylinder Head

MECHANICAL

D: ASSEMBLY



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

1) Installation of valve spring and valve:

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

NOTE:

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

(2) Set the cylinder head on ST1.

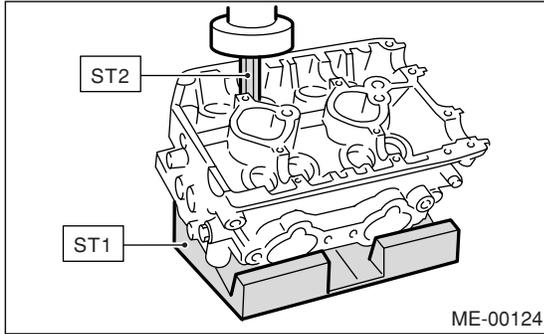
(3) Install the valve spring and retainer using ST2.

ST1 498267600 CYLINDER HEAD TABLE

ST2 499718000 VALVE SPRING REMOVER

NOTE:

Be sure to install the valve spring 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 a wooden hammer for better seating.
- 2) Apply oil to the surfaces of the valve lifter.
- 3) Install the valve lifter.

E: INSPECTION

1. CYLINDER HEAD

- 1) Make sure that cracks or other damages do not exist. In addition to visual inspection, inspect important areas by means of red lead check.
- 2) Measure the warping of the cylinder head surface that mates with crankcase using a straight edge (A) and thickness gauge (B). If the warping exceeds the limit, grind the surface with a surface grinder.

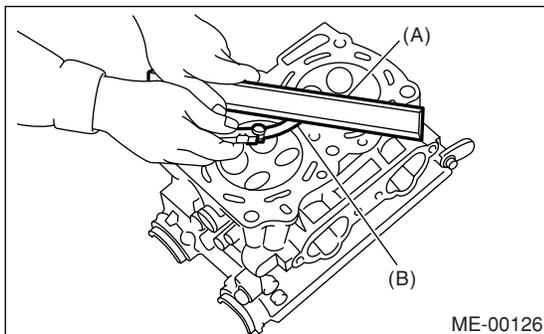
Warping limit:
0.035 mm (0.0014 in)

Grinding limit:
0.3 mm (0.012 in)

Standard height of cylinder head:
127.5 mm (5.02 in)

NOTE:

Uneven torque for the cylinder head nuts can cause warping. When reinstalling, 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 a valve seat cutter if they are defective or when valve guides are replaced.

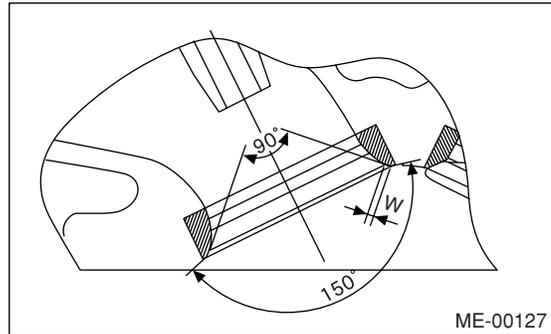
Valve seat width W:

Intake

Standard
0.6 — 1.4 mm (0.024 — 0.055 in)

Exhaust

Standard
1.2 — 1.8 mm (0.047 — 0.071 in)



3. VALVE GUIDE

- 1) Check the clearance between valve guide and stem. The clearance can be checked by measuring the outer diameter of valve stem and inner diameter of valve guide respectively with a micrometer.

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)

- 2) If the clearance between valve guide and stem exceeds the standard value, replace the valve guide or valve itself whichever shows greater amount of wear or has abnormality such as scratch. 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 (0.2344 — 0.2350 in)

Exhaust
5.945 — 5.960 mm (0.2341 — 0.2346 in)

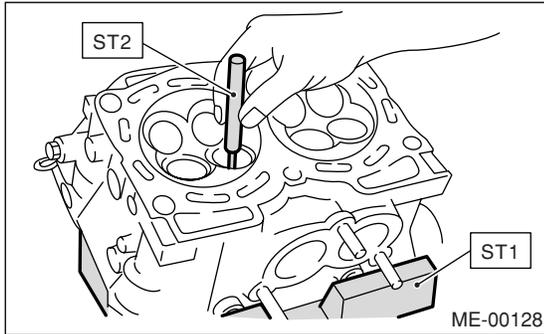
- (1) Place the cylinder head on ST1 with the combustion chamber upward so that valve guides fit the holes in ST1.

Cylinder Head

MECHANICAL

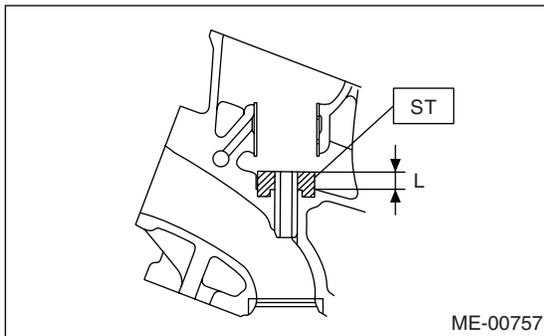
- (2) Insert the ST2 into valve guide and press it down to remove the valve guide.

ST1 498267600 CYLINDER HEAD TABLE
ST2 499767200 VALVE GUIDE REMOVER



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

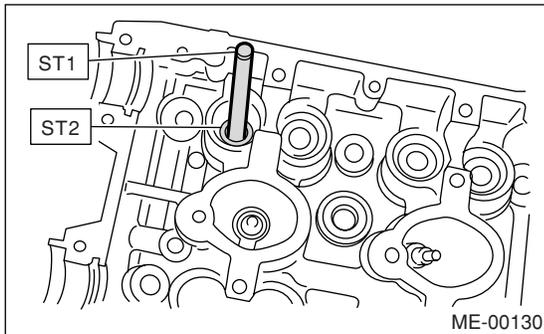
ST 18251AA020 VALVE GUIDE ADJUSTER



- (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 the 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 using ST. Put the reamer in valve guide, and rotate the reamer slowly clockwise pushing it lightly. Bring the reamer back while rotating it clockwise. After reaming, clean the valve guide to remove chips.

ST 499767400 VALVE GUIDE REAMER

NOTE:

- 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 chip, 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 them if damaged, worn, deformed or if "H" is exceed the standard value or if they have partial wear.

H:

Standard (Intake)

1.0 — 1.4 mm (0.039 — 0.055 in)

Standard (Exhaust)

1.3 — 1.7 mm (0.051 — 0.067 in)

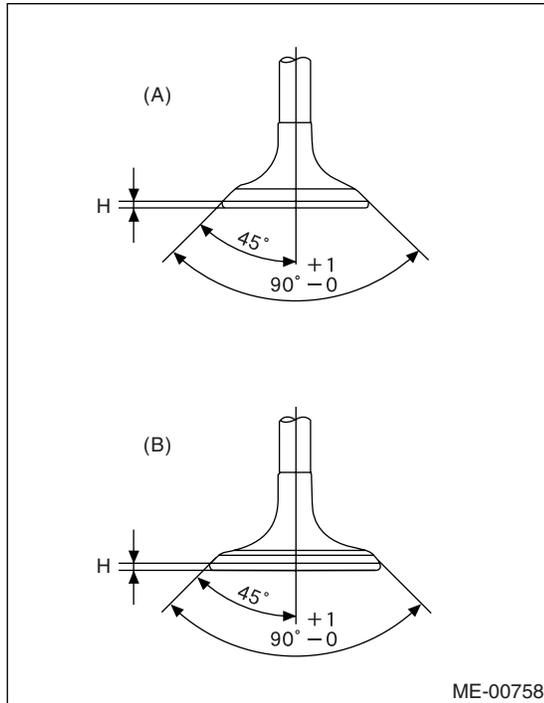
Valve overall length:

Intake

104.4 mm (4.110 in)

Exhaust

104.65 mm (4.1201 in)



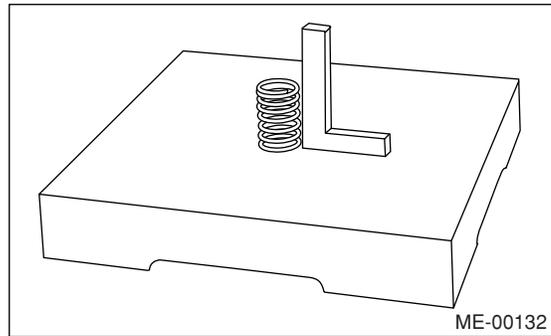
(A) Intake
(B) Exhaust

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.

5. VALVE SPRINGS

- 1) Check the valve springs for damage, free length, and tension. Replace the valve spring if it is not within the standard value 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 of spring using a try square.

Free length	mm (in)	47.32 (1.863)
Tension/spring height N (kgf, lb)/mm (in)	Set	205 — 235 (20.9 — 24.0, 46.1 — 52.8)/36.0 (1.417)
	Lift	426 — 490 (43.4 — 50.0, 95.8 — 110)/26.50 (1.041)
Squareness		2.5°, 2.1 mm (0.083 in)



6. INTAKE AND EXHAUST VALVE OIL SEAL

In the following case, pinch and remove the oil seal from valve using pliers, and then replace it with a new one.

- When the lip is damaged.
 - When the spring is out of the specified position.
 - When readjusting the surfaces of valve and valve sheet.
 - When replacing the valve guide.
- 1) Place the cylinder head on ST1.
 - 2) Using ST2, press-fit the oil seal.

NOTE:

- Apply engine oil to oil seal before press-fitting.
- When press-fitting the oil seal, do not use a hammer or strike in.

ST1 498267600 CYLINDER HEAD TABLE
ST2 498857100 VALVE OIL SEAL GUIDE

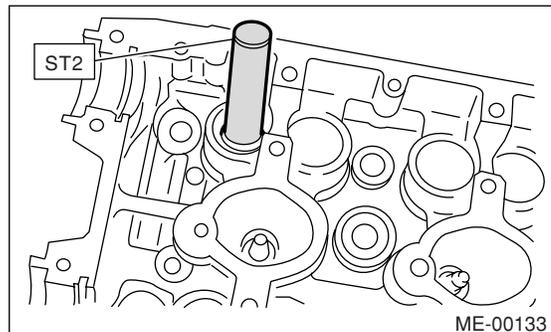
CAUTION:

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]



Cylinder Head

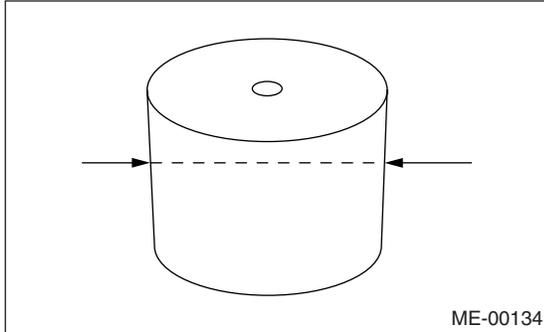
MECHANICAL

7. VALVE LIFTER

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

Outer diameter:

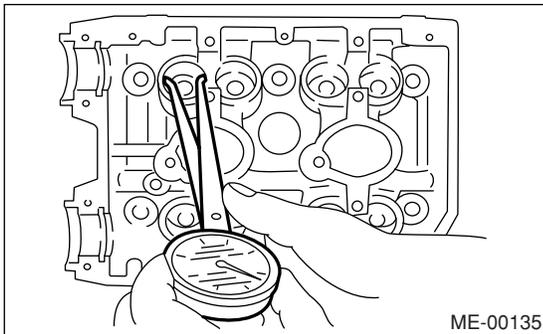
34.959 — 34.975 mm (1.3763 — 1.3770 in)



- 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)



NOTE:

If difference between outer diameter of valve lifter and inner diameter of valve lifter mating part is over the standard or has partial wear in inner surface, replace the cylinder head.

Standard:

0.019 — 0.057 mm (0.0007 — 0.0022 in)

F: DISPOSAL

CAUTION:

- Metallic sodium is enclosed in the exhaust valve. Metallic sodium is extremely alkaline and may produce severe chemical reactions. Full consideration must therefore be given to the following points when handling or disposing of the valve.
- Since metallic sodium may cause blindness if contacted with the eyes, burns if contacted with the skin, and fire, do not deliberately take the valve apart.

- 1) If the valve is damaged, remove the valve and neutralize it by immersing it in water, and dispose of it in the same way that general steel materials are disposed of. The disposal method is described in the following.

- (1) Wearing rubber gloves, remove the damaged valve from the cylinder head.

- (2) Prepare a large receptacle (bucket or other container) in a well ventilated location, and fill the receptacle with water (at least 10 liters).

- (3) Immerse the damaged valve in the receptacle.

CAUTION:

A severe reaction may occur, so stand at least 2 — 3 m from the receptacle. Because the reaction will produce hydrogen gas, moreover, keep the receptacle away from sparks or flames.

- (4) Once the reaction is completed (about 4 — 5 hours have elapsed), carefully remove the valve using large pincers so that the reaction liquid does not contact your skin, and dispose of it with other parts that are being disposed of.

- (5) The reaction liquid is a strong alkaline solution, so it must be disposed of in accordance with local regulations.

CAUTION:

Make sure the reaction liquid does not contact your skin. If contact with skin occurs, immediately wash the affected area with large quantities of water.

