

ENGINE

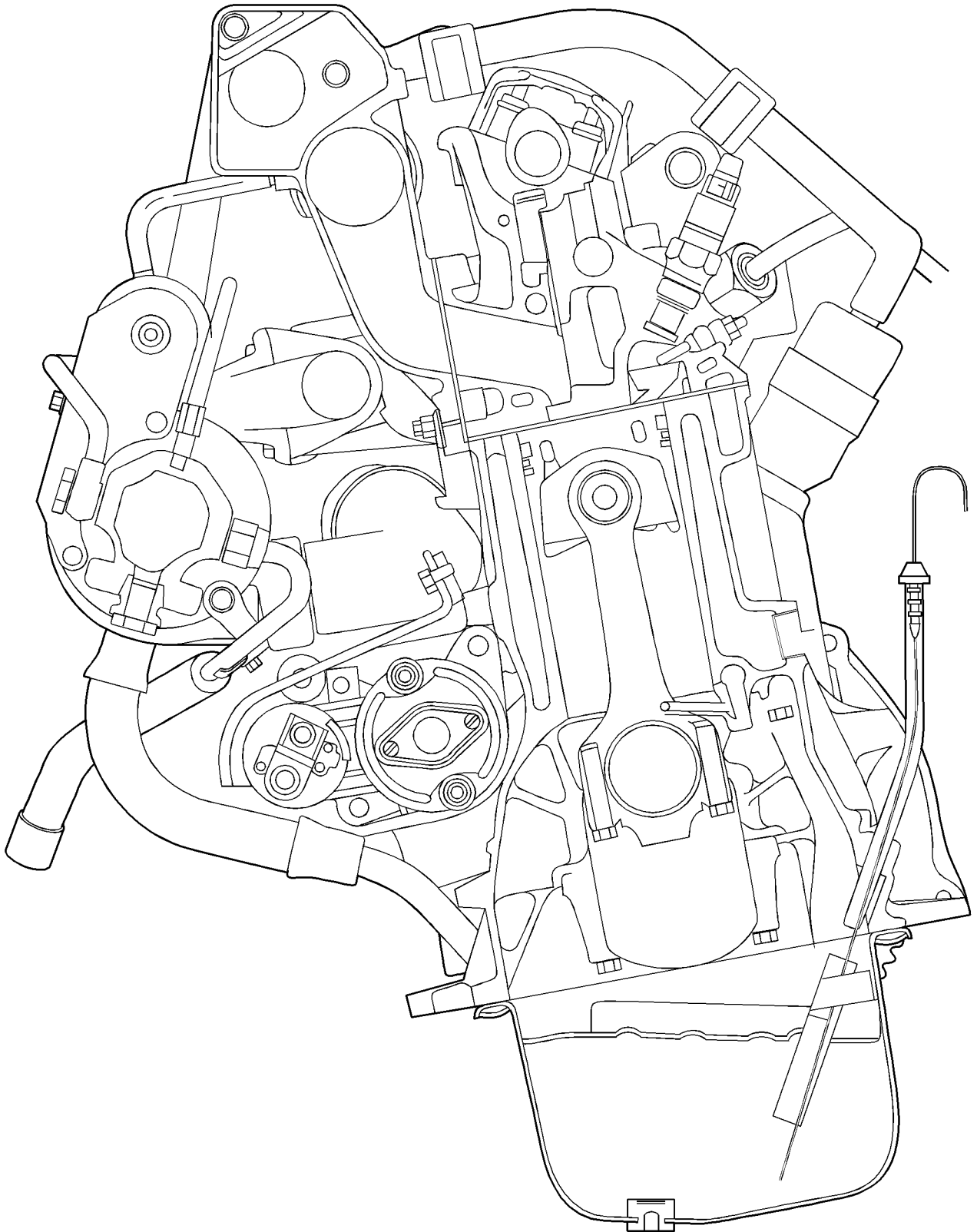
F8QT SERIES

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SECTIONAL VIEW OF ENGINE

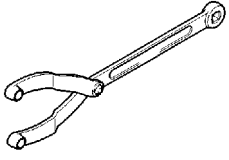
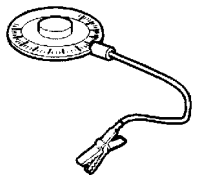
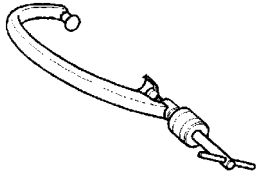
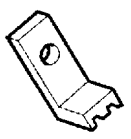
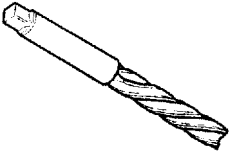

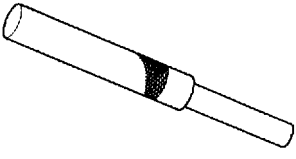
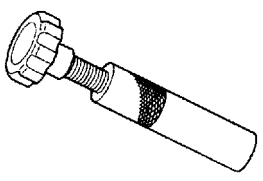
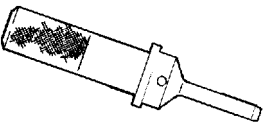


Description		Specifications
Type		F8QT diesel engine
Number and arrangement of cylinders		4 in-line
Combustion chamber		Swirl chamber
Total displacement		1870 cm ³
Cylinder bore × stroke		80 × 93 mm
Compression ratio		21
Valve mechanism		Single overhead camshaft
Number of valves	Intake	4
	Exhaust	4
Valve timing	Intake opening	0° BTDC
	Intake closing	18° ABDC
	Exhaust opening	41° BBDC
	Exhaust closing	0° ATDC
Turbocharger		Exhaust gas turbocharger
Intercooler (charge cooling)		Air-cooled
Fuel injection pump		Electric with immobilizer

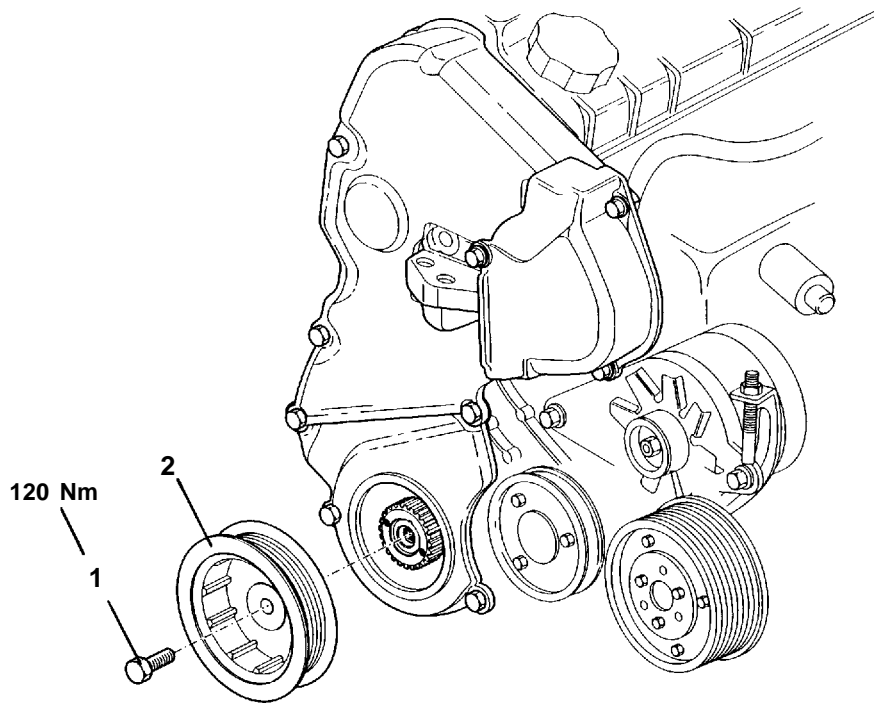
TORQUE SPECIFICATIONS

Items	Nm
Crankshaft pulley	
Crankshaft pulley bolt	120
Timing belt	
Camshaft sprocket bolt	50
Water pump	
Water pump pulley bolt	20
Water pump bolt	12.5
Thermostat	
Thermostat cover bolt	10
Thermostat housing bolt	10
Bleedscrew	0.6
Glow plugs	
Glow plug	22.5
Glow plug nut	5
Turbocharger	
Turbocharger nut	45
Exhaust downpipe connector nut	45
Oil supply pipe union nut	35
Oil return pipe union nut	25
Coolant supply pipe banjo bolt	25
Coolant supply pipe retaining nut	28.7
Coolant discharge pipe union nut	25
Coolant discharge pipe retaining nut	8
Intake and exhaust manifolds	
EGR valve	19.5
EGR pipe	19.5
Oil pipe union nut	30
Oil pipe retaining nut	8
Manifold nut	25

2. SPECIAL TOOLS

Tool	Number	Name	Use
	MB990767	Camshaft sprocket holder	Removal of camshaft sprocket
	MB991614	Angle gauge	Tightening cylinder head bolts
	MB996014	Valve spring compressor	Removal of valve spring split cones
	MB996015	Flywheel stopper	Locking the flywheel
	MB996016	Reamer	Reaming valve guides
	MB996018	Slip gauge	Measuring the crankshaft end play
	MB996020	Valve guide remover	Pressing in valve guides
	MB996021	Valve stem seal remover	Removal of valve guide seal
	MB996022	Valve seat installer	Pressing in intake valve seat

3. CRANKSHAFT PULLEY

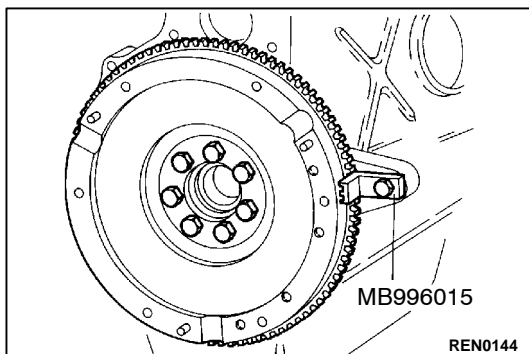


REN0143

Removal steps



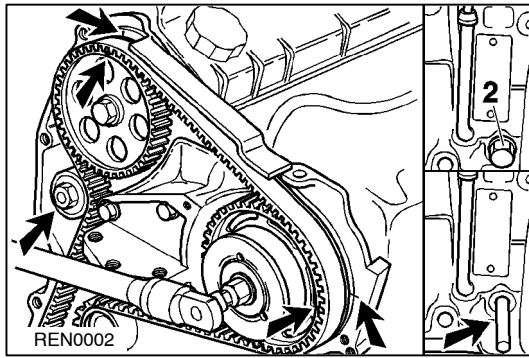
1. Crankshaft pulley bolt
2. Crankshaft pulley



REMOVAL SERVICE POINT

◀A▶ CRANKSHAFT PULLEY BOLT REMOVAL

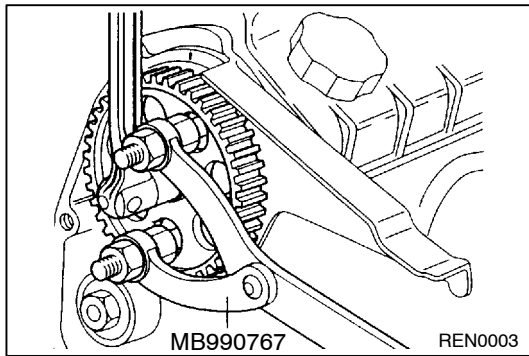
Use special tool MB996015 to hold the flywheel during removal.



REMOVAL SERVICE POINTS

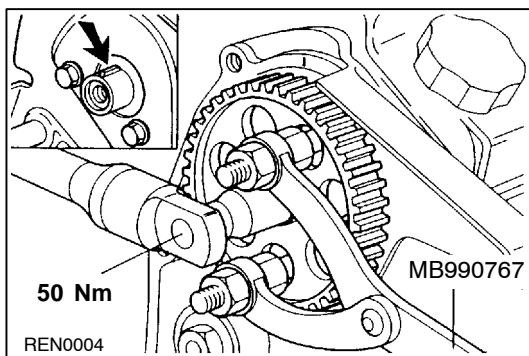
◀A▶ TIMING BELT REMOVAL

- (1) Turn the crankshaft clockwise so that the piston of No. 1 cylinder (flywheel end) is at TDC, with the following marks in line with each other:
 - flywheel/clutch housing;
 - rear guard plate/camshaft sprocket.
 Scribe a mark on the injection pump mounting bracket.
- (2) Insert an 8 mm diameter locking pin in the threaded hole of torx bolt 2 so that it engages the recess in the crankshaft web.
- (3) Slacken the lock nut of the timing belt tensioner. Remove the timing belt.



◀B▶ CAMSHAFT SPROCKET BOLT REMOVAL

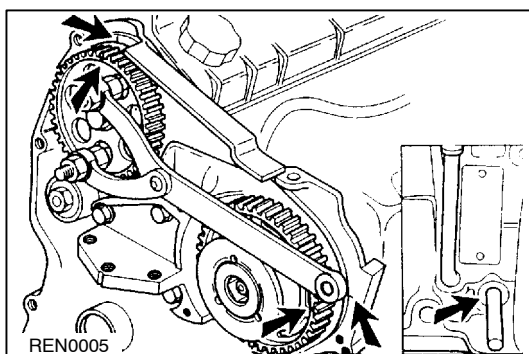
- (1) Use special tool MB990767, camshaft sprocket holder with pin MD998715 and remove the retaining bolt.



INSTALLATION SERVICE POINTS

▶A▶ CAMSHAFT SPROCKET BOLT INSTALLATION

- (1) Smear the retaining bolt with a locking agent. Use special tool MB990767, camshaft sprocket holder with pin MD998715 to stop the sprocket turning and then tighten the camshaft sprocket retaining bolt to 50 Nm.

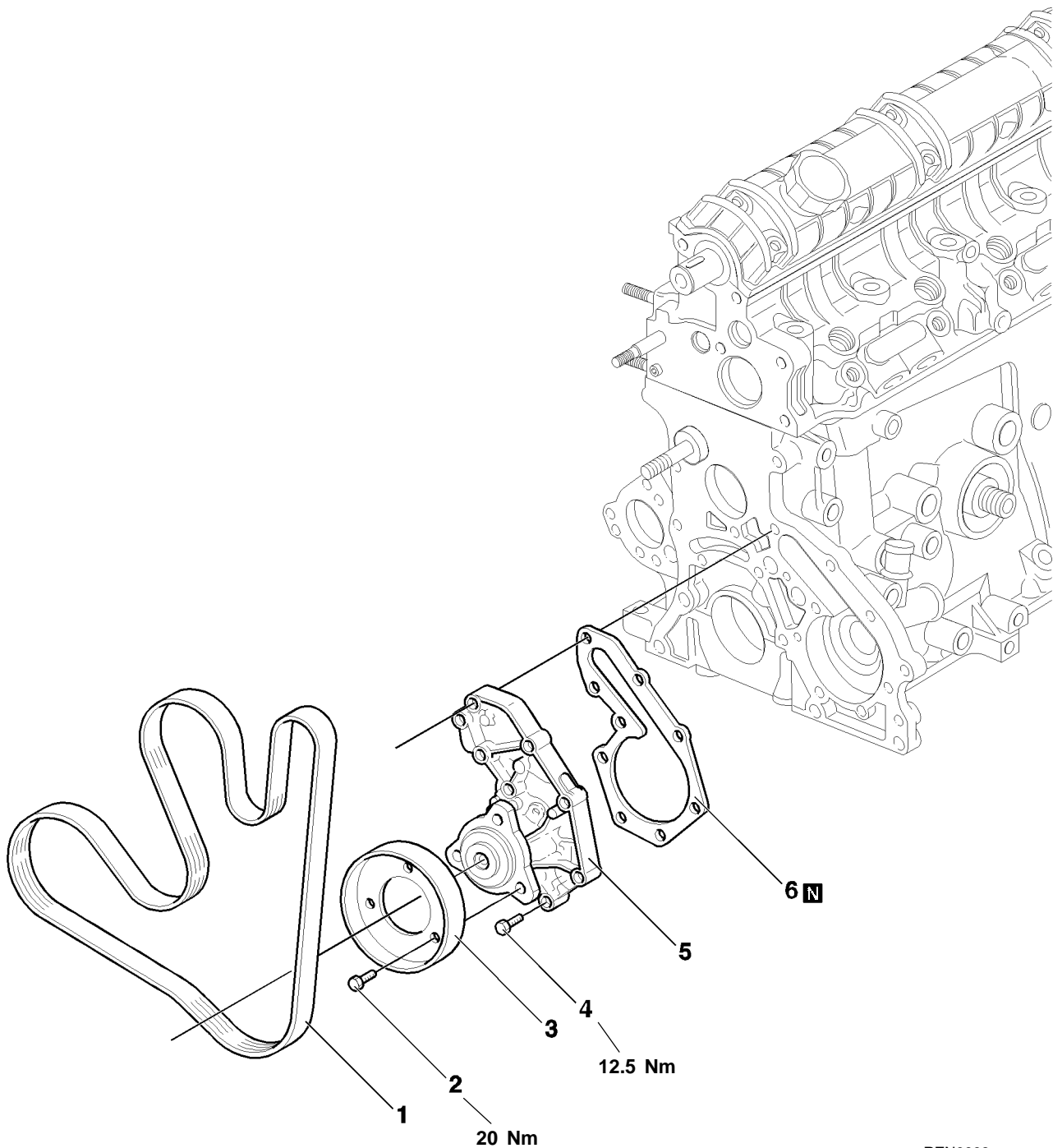


▶B▶ TIMING BELT INSTALLATION

- (1) Turn the camshaft clockwise with special tool MB990767 until the mark on the camshaft sprocket is opposite the mark on the guard plate.
- (2) Turn the crankshaft 1/4 revolution counter-clockwise from the TDC position of No. 1 cylinder and insert the 8 mm diameter locking pin in the recess in the crankshaft web.
- (3) Align the mark on the injection pump sprocket with the mark on the mounting bracket (turn clockwise).

5. WATER PUMP

REMOVAL AND INSTALLATION



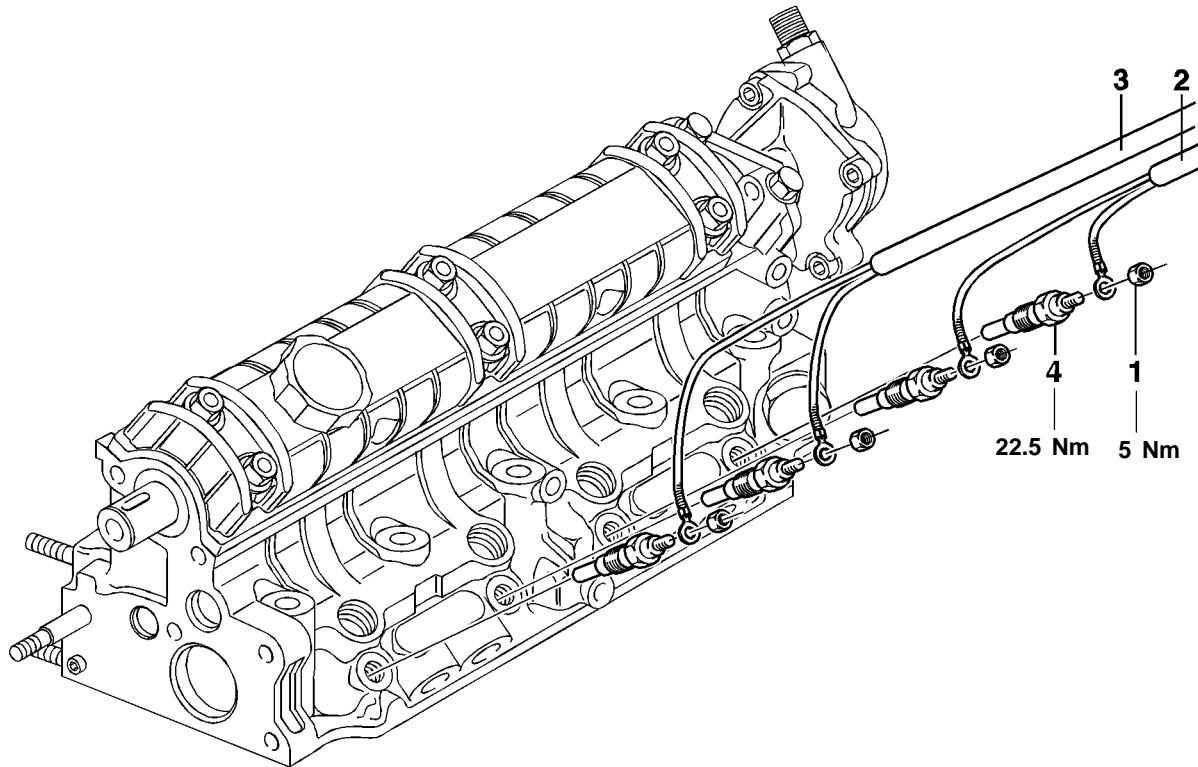
REN0009

Removal steps

1. V-ribbed belt (alternator & others)
2. Bolt
3. Water pump pulley
4. Bolt
5. Water pump
6. Water pump gasket

9. GLOW PLUGS

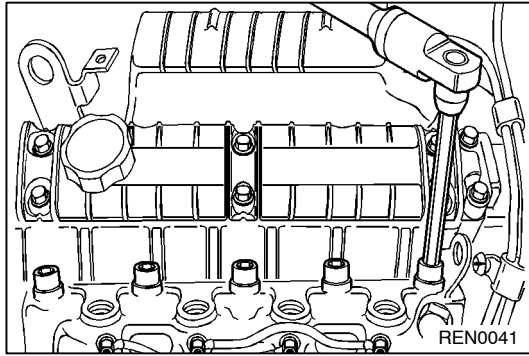
REMOVAL AND INSTALLATION



REN0037

Removal steps

1. Nut
2. Glow plug leads, Nos. 1 and 2
3. Glow plug leads, Nos. 3 and 4
4. Glow plug



REMOVAL SERVICE POINTS

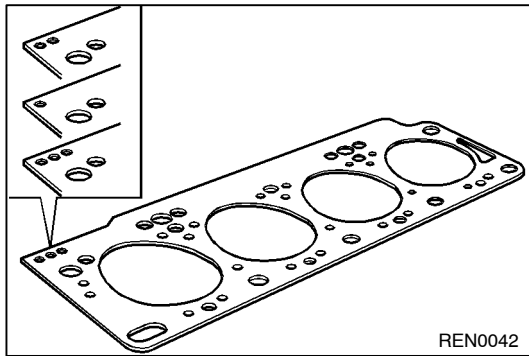
◀A▶ CYLINDER HEAD REMOVAL

- (1) Release and then remove the cylinder head bolts.
- (2) Lift the cylinder head straight up over the locating dowels and then remove the cylinder head.

◀B▶ CYLINDER HEAD GASKET REMOVAL

Caution

- When removing the cylinder head gasket, take care not to scratch the cylinder head or cylinder block gasket faces.



INSTALLATION SERVICE POINTS

▶A◀ CYLINDER HEAD GASKET INSTALLATION

- (1) Select a cylinder head gasket of the correct thickness according to the projecting height of the pistons. The available cylinder head gaskets are shown in the table below. The thickness of the gasket is indicated by the number of holes near the end of the gasket (see the illustration). Measure the projecting height of the pistons and calculate the average height. Then select a cylinder head gasket of the correct thickness from the table shown below.

Piston height above cylinder block mm	Number of holes	Gasket thickness mm
- 0.073	2	1.40
0.073 - 0.206	1	1.50
0.206 -	3	1.60

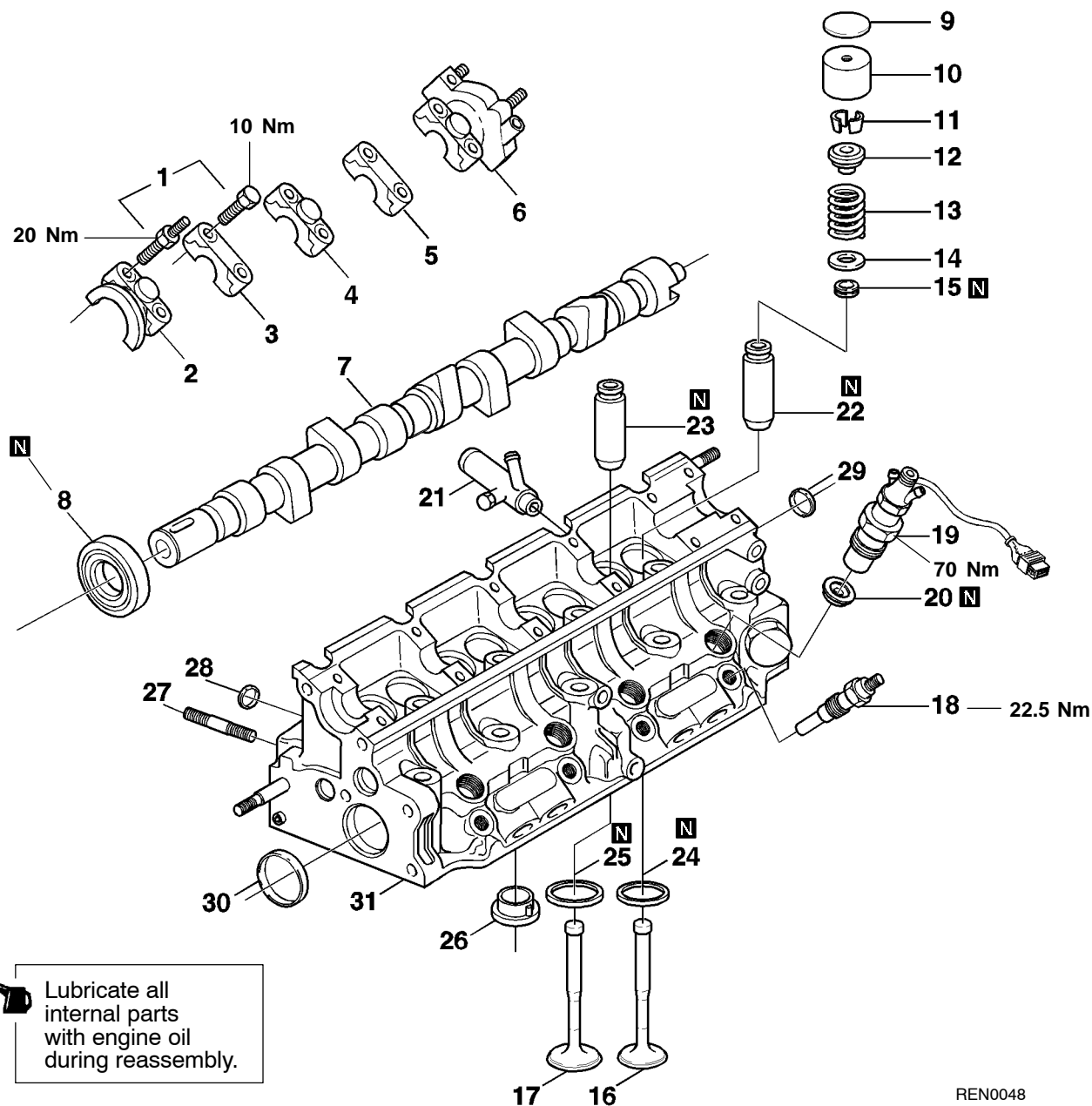
When only the gasket is to be replaced, check the hole pattern on the old gasket and select a gasket with the same number of holes.


Caution

- If a piston or connecting rod, etc. has been replaced, always measure the projecting height of the pistons because this may have changed after replacing these parts.

13. CAMSHAFT, INTAKE AND EXHAUST VALVES

REMOVAL AND INSTALLATION

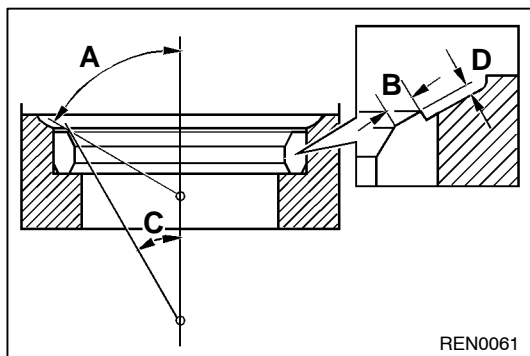


 Lubricate all internal parts with engine oil during reassembly.

REN0048

Removal steps

- | | | | |
|---------|-------------------------------|-----|-------------------------|
| | 1. Bolt | | 17. Exhaust valve |
| ◀F▶ | 2. No. 1 camshaft bearing cap | ◀C▶ | 18. Glow plug |
| ◀F▶ | 3. No. 2 camshaft bearing cap | ◀C▶ | 19. Injection nozzle |
| ◀F▶ | 4. No. 3 camshaft bearing cap | ◀D▶ | 20. Shield |
| ◀F▶ | 5. No. 4 camshaft bearing cap | ◀D▶ | 21. Water pipe |
| ◀F▶ | 6. No. 5 camshaft bearing cap | ◀E▶ | 22. Intake valve guide |
| | 7. Camshaft | ◀B▶ | 23. Exhaust valve guide |
| ▶H▶ | 8. Oil seal | ◀B▶ | 24. Intake valve seat |
| | 9. Tappet pad | ◀G▶ | 25. Exhaust valve seat |
| | 10. Tappet | | 26. Swirl camber |
| ◀A▶ ▶E▶ | 11. Retainer locks | | 27. Stud |
| | 12. Valve spring retainer | ◀A▶ | 28. Sealing plug |
| | 13. Valve spring | ◀A▶ | 29. Sealing plug |
| | 14. Valve spring collar | ◀A▶ | 30. Sealing plug |
| ◀B▶ ▶D▶ | 15. Valve stem seal | | 31. Cylinder head |
| | 16. Intake valve | | |



VALVE SEAT

Valve seat width

- (1) Replace the valve seat **24, 25** if the limit value is exceeded.

Angle **A**: intake valve seat: 60°
 exhaust valve seat: 45°

The contact surface **B** must be 1.7 ± 0.1 mm.
 If the contact surface is too wide, correct this with a valve seat cutter.

Cutter angle:

Angle **C**: intake valve seat: 45°
 exhaust valve seat: 30°

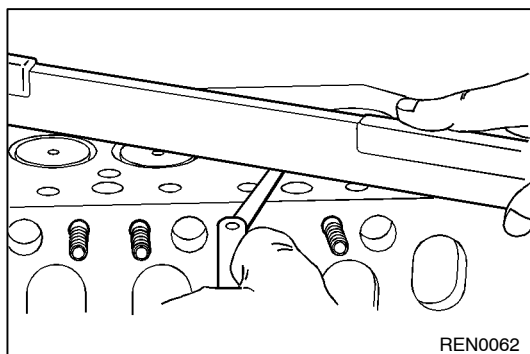
Caution

- The outside diameter of the cutter for the valve seat must not be more than:
 intake valve seat: 37.0 mm
 exhaust valve seat: 32.1 mm

After cutting, the dimension **D** must be 0.125 ± 0.025 mm.

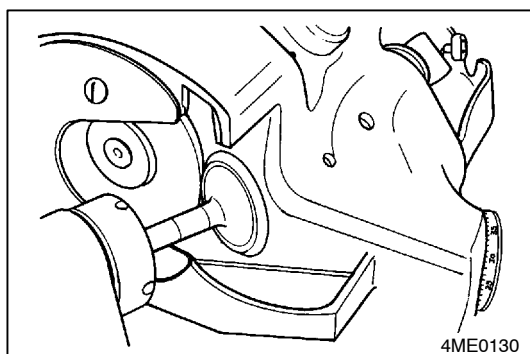
NOTE

After correcting or replacing the valve seat **24, 25**, the valve seat and the valve **16, 17** should be matched by grinding them together in order to obtain correct seating.



CYLINDER HEAD

- (1) Check the cylinder head gasket surface **31** for distortion.
 Fit a new cylinder head if the limit value is exceeded.



CORRECTION

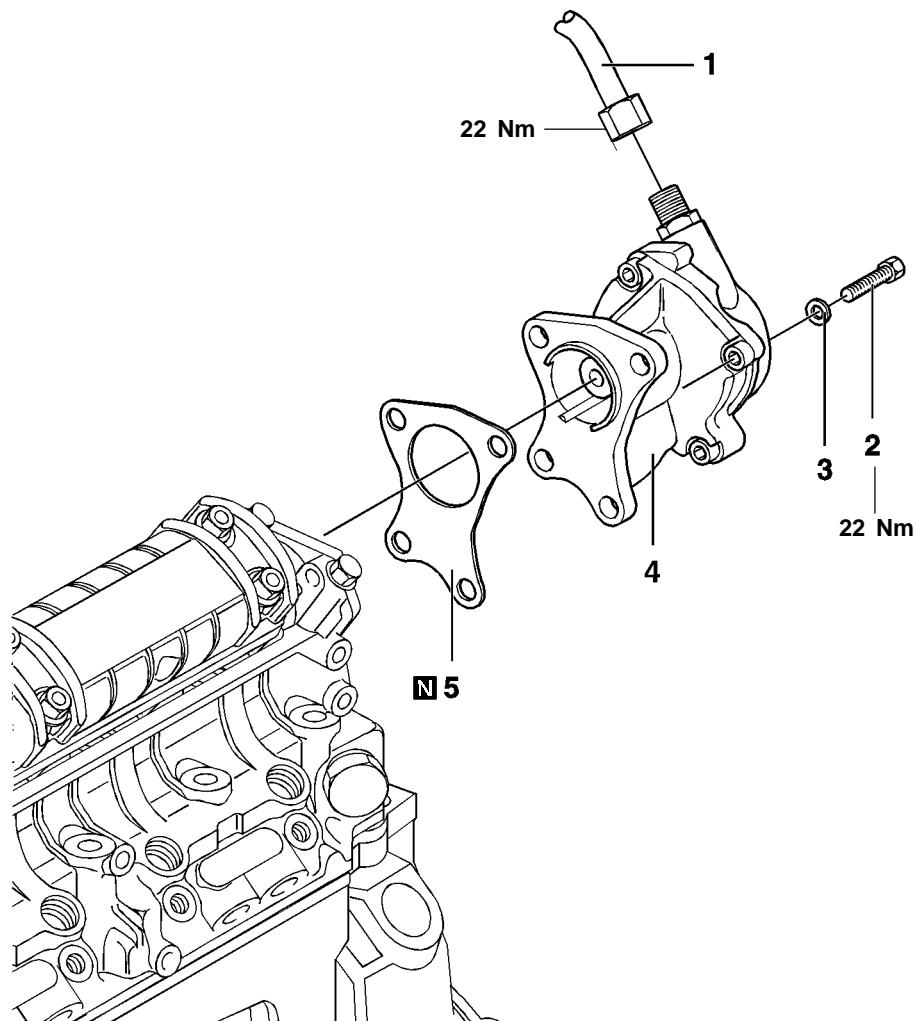
INTAKE VALVE AND EXHAUST VALVE

Caution

- The amount of material removed by grinding should be restricted to a minimum.
- Replace the valve **16, 17** if the margin of the valve seat after grinding is smaller than the limit value.
- After the grinding operation, the valve **16, 17** should be matched with the valve seat **24, 25** by lapping them together in order to obtain correct seating.

14. VACUUM PUMP

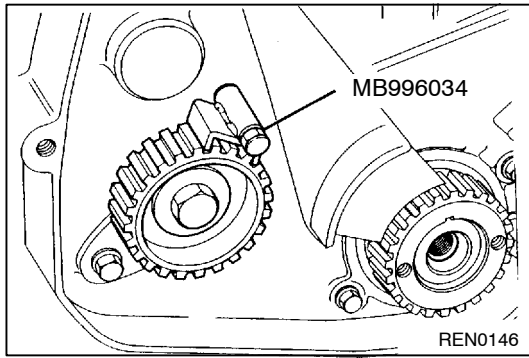
REMOVAL AND INSTALLATION



REN0083

Removal steps

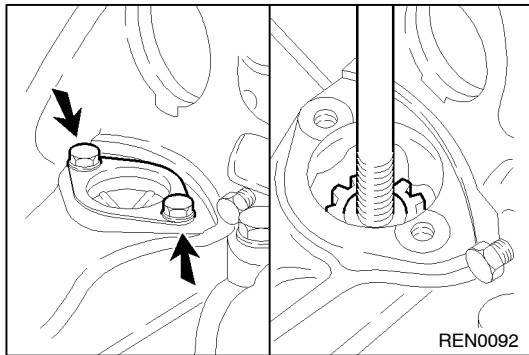
1. Vacuum hose
2. Bolt
3. Washer
4. Vacuum pump
5. Gasket



REMOVAL SERVICE POINTS

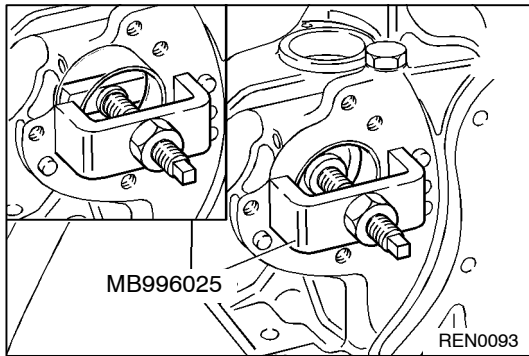
◀A▶ INTERMEDIATE SHAFT SPROCKET REMOVAL

- (1) Use sprocket stopper MB996034 to hold the sprocket during removal.
- (2) Remove the sprocket and the sprocket key.



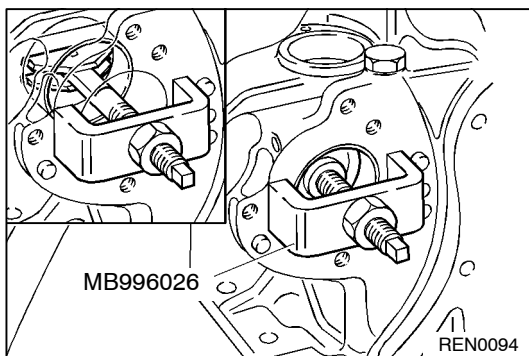
◀B▶ OIL PUMP DRIVE GEAR REMOVAL

- (1) Remove the oil pump drive gear 7 with the aid of an M12 bolt.



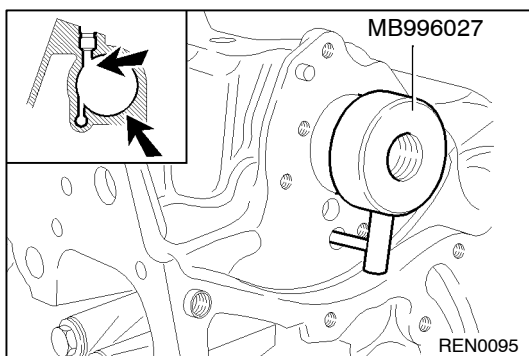
◀C▶ OUTER BEARING REMOVAL

- (1) Remove the outer bearing 14 with bearing puller MB996025.



◀D▶ INNER BEARING REMOVAL

- (1) Remove the inner bearing 15 with bearing puller MB996026.



INSTALLATION SERVICE POINTS

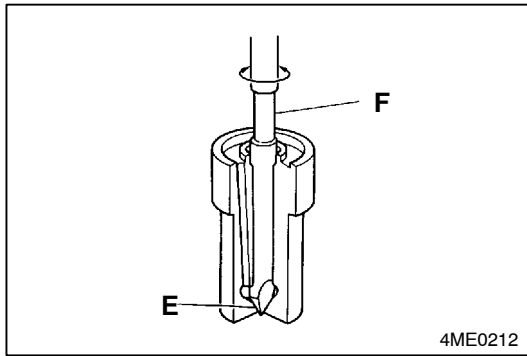
▶A◀ INNER BEARING INSTALLATION

- (1) Install the inner bearing with the aid of bearing installer MB996027.
The pin of the installer must engage the oil return passage of the intermediate shaft 13.

NOTE

Position the inner bearing with the opening at the mark on the installer.

- (2) Check with a piece of wire (1.2 mm diameter) that the oil hole is aligned with the drilling in the bearing.

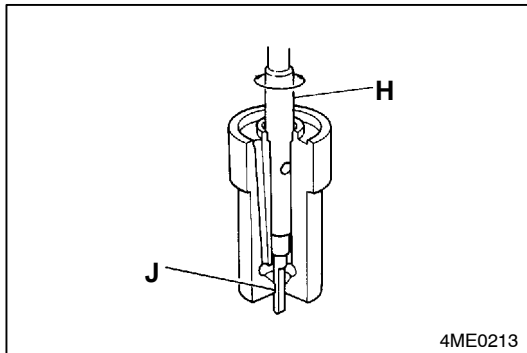


- (c) Clean the seating **E** of the nozzle tip **11** with the special scraper tool **F**.

Caution

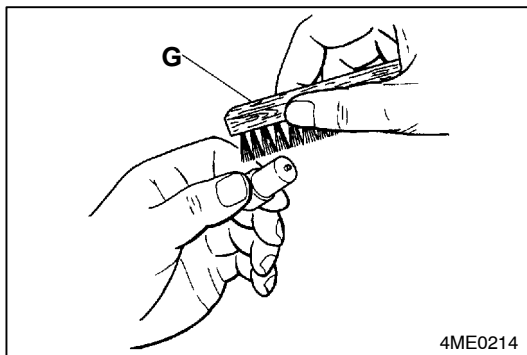
- Take care not to damage the seating face.

- (d) Use Fuso carbon deposit cleaning agent to remove encrusted carbon deposits.

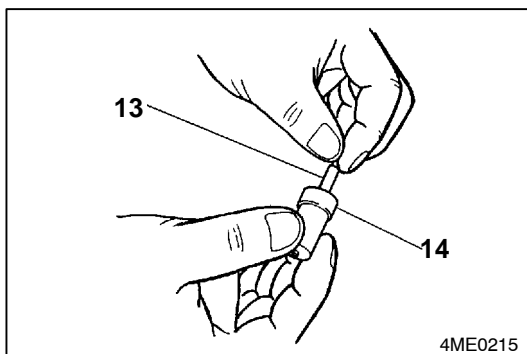


- (e) Remove the carbon deposits in the injection hole of the nozzle tip **11** by rotating the needle cleaner **H** (special tool) in the injection hole **J**.

Diameter of cleaning needle: less than 1.0 mm



- (f) Remove the carbon deposits on the outside of the nozzle tip **11** with the wire brush **G** (special tool).



INSPECTION

NEEDLE VALVE/NOZZLE TIP

- (1) Wash the needle valve **10** and nozzle tip **11** in clean paraffin (clean oil) before reassembly.
- (2) Pull out the needle valve **10** about 1/3 of its total length, release it and check whether the needle valve slides back in under the action of gravity. (Repeat this procedure several times and rotate the needle valve slightly each time.)
- (3) If the needle valve **10** does not slide back in, wash it again and repeat the test. If necessary, replace the needle valve **10** and nozzle tip **11** as a set.

INSTALLATION SERVICE POINTS

►A◄ FUEL INJECTION NOZZLE INSTALLATION

Fit new heat shields in the cylinder head with the raised edge facing towards the swirl chamber.

Fit the fuel injection nozzle and tighten them to 70 Nm.

Fit the fuel return hoses on the fuel injection nozzle.

