ISUZU
WORKSHOP MANUAL
INDUSTRIAL
DIESEL ENGINE
6RB1·6RB1T
MODELS

FOREWORD

This Workshop Manual is designed to help you perform necessary maintenance, service, and repair procedures on applicable Isuzu industrial engines.

Information contained in this Workshop Manual is the latest available at the time of publication.

Isuzu reserves the right to make changes at any time without prior notice.

The Table of Contents at the right hand side of this page shows you the general arrangement of the material in this Workshop Manual. A more detailed Table of Contents precedes each individual section.

The black spot at the right hand side of some pages indicates the first page of a given section.

This Workshop Manual is applicable to 1987 and earlier models.

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MAIN DATA AND SPECIFICATIONS

Item \ Engine Model		6RB1	6RB1T
Engine type		Water cooled, four cycle, vertical in-line, overhead valve	
Combustion chamber type		Direct injection	
Cylinder liner type		Dry	
No. of cylinders — bore × stroke	mm(in)	6 — 135 × 160 (5.31 × 6.30)	
Total piston displacement	$cm^3(in^3)$	13,741 (838)	
Compression ratio (To 1)		16.5	
*Engine dimensions Length × width × height	mm(in)	1,471 × 773 × 1,027 (57.9 × 30.4 × 40.4)	1,471 × 885 × 1,267 (57.9 × 34.8 × 49.9)
*Engine weight (Dry)	kg(lb)	980 (2,163)	1,076 (2,375)
Fuel injection order		1 — 4 — 2 — 6 — 3 — 5	
*Fuel injection timing (BTDC)	degrees	22	17
Specified fuel		Diesel fuel (ASTM D975 No. 2D)	
Injection pump		In-line plunger, Bosch P type	
Governor		Mechanical, RSV type	
*Low idle speed	rpm	650 — 750	
Injection nozzle		Hole type (with multi orifices)	
*Injection starting pressure	kg/cm^3(psi/kPa)	200 (2,844/19,620) or 225 (3,195/22,073)	
Fuel filter type		Center bolt or cartridge (spin-on)	
Water sedimentor		Optional equipment	
Compression pressure (At warm)	kg/cm^2(psi/kPa)	29 (412/2,842) at 220 rpm at sea level	
Valve clearances (At cold)	Intake mm(in)	0.60 (0.024)	
	Exhaust mm(in)	0.60 (0.024)	
Lubrication method		Pressurized circulation	
Oil pump		Gear type	
Main oil filter type		Center bolt, full flow or cartridge (spin-on)	
Partial oil filter		Centrifugal type	
*Lubricating oil capacity	lit(US/UK gal)	19 (5.0/3.5)	45 (11.9/9.9)

TIGHTENING TORQUE SPECIFICATIONS

STANDARD BOLTS

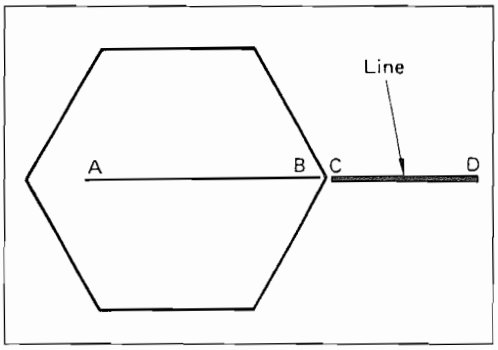
The torque values given in the following table should be applied where a particular torque is not specified.

kg·m(lb.ft/N·m)

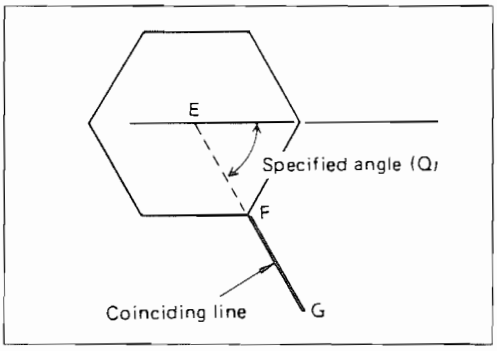
Bolt identification / Material / Bolt diameter x pitch (mm)	4	7	9
	4T (Low carbon steel)	7T (High carbon steel)	9T (Alloy steel)
M 6 × 1.0	0.6 ±0.2 (4.4± 1.4/ 5.88± 1.96)	0.75± 0.2 (5.43± 1.43/ 7.35± 1.96)	—
M 8 × 1.25	1.3 ±0.5 (0.4± 3.4/ 12.74± 4.90)	1.75± 0.5 (12.66± 3.00/ 17.15± 4.90)	2.0 ± 0.7 (17.36± 5.36/ 19.60± 6.86)
M10 × 1.25	2.8 ±0.7 (20.3± 5.2/ 27.44± 6.86)	3.75± 0.9 (27.20± 7.2 / 36.75± 8.82)	5.0 ± 1.3 (36.88± 9.88/ 49.00± 12.74)
M12 × 1.25	6.25±1.2 (45.2± 9.2/ 61.25±11.76)	7.75± 1.5 (56.03± 11.03/ 75.95± 14.70)	9.65± 1.9 (69.77± 13.77/ 94.57± 18.62)
M14 × 1.5	8.75±1.9 (70.5±14.5/ 85.75±18.62)	11.85± 2.3 (85.67± 16.6 /116.13± 22.54)	14.50± 2.9 (104.84± 20.83/142.1 ± 28.42)
M16 × 1.5	13.3 ±2.7 (94.0±17.0/130.34±26.46)	17.30± 3.5 (125.07± 25.07/169.54± 34.30)	20.40± 4.1 (147.5 ± 29.49/199.92± 40.18)
M18 × 1.5	19.2 ±3.8 (138.9±27.9/188.16±37.24)	24.90± 5.0 (180.03± 36.3 /244.02± 4.90)	29.30± 5.9 (211.84± 42.83/287.14± 57.82)
M20 × 1.5	26.3 ±5.3 (190.2±38.2/257.74±51.94)	34.40± 6.9 (248.72± 49.7 /337.12± 67.62)	40.40± 8.1 (292.10± 58.09/395.92± 79.38)
M22 × 1.5	33.0 ±8.3 (245.1±60.1/323.40±81.34)	46.25± 9.2 (334.39± 66.38/453.25± 90.16)	54.10±10.8 (391.15± 78.14/530.18±105.84)
M24 × 2.0	45.8 ±9.2 (331.2±60.2/448.84±90.16)	58.20±14.0 (420.70±102.78/570.36±137.20)	70.60±14.1 (510.44±101.44/691.88±138.18)
*M10 × 1.5	2.7 ±0.7 (19.6± 5.6/ 26.46± 6.86)	3.7 ± 0.9 (26.75± 6.7 / 36.26± 8.82)	4.9 ± 1.2 (35.43± 8.42/ 48.02± 11.76)
*M12 × 1.5	5.8 ±1.2 (42.0± 9.0/ 56.84±11.76)	7.2 ± 1.4 (52.02± 10.05/ 70.56± 13.72)	9.1 ± 1.8 (65.80± 12.80/ 89.18± 17.64)
*M14 × 2.0	9.1 ±1.8 (65.8±12.8/ 89.18±17.64)	11.2 ± 2.2 (80.97± 15.7 /109.76± 21.56)	13.6 ± 2.7 (98.33± 19.33/133.28± 26.46)
*M16 × 2.0	12.7 ±2.5 (91.9±17.9/124.46±24.5)	16.5 ± 3.3 (119.30± 24.3 /161.70± 32.34)	19.5 ± 3.9 (140.99± 27.99/191.1 ± 38.22)

Note:

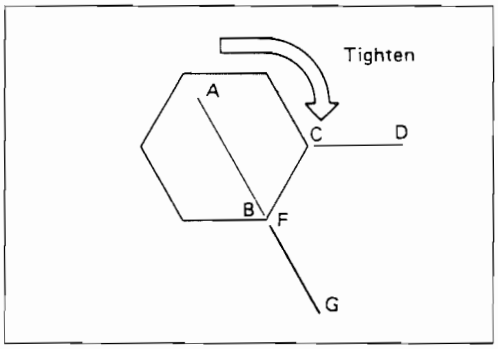
The asterisk (*) indicates that the bolts are used for female-threaded parts that are made of soft materials such as casting.



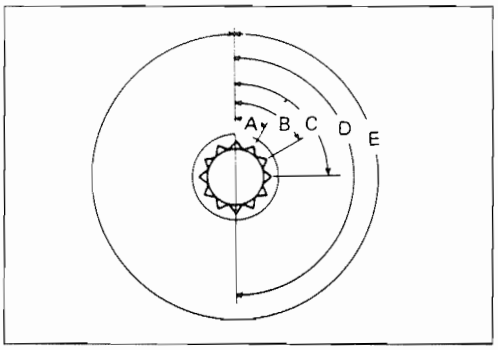
5. Draw another line [C-D] on the face of each of the parts to be clamped. This line should be an extension of the line [A-B].



6. Draw another line [F-G] on the face of each of the parts to be clamped. This line will be in the direction of the specified angle [Q] across the center [E] of the nut or bolt.



7. Use a socket wrench to tighten each nut or bolt to the point where the line [A-B] is aligned with the line [F-G].

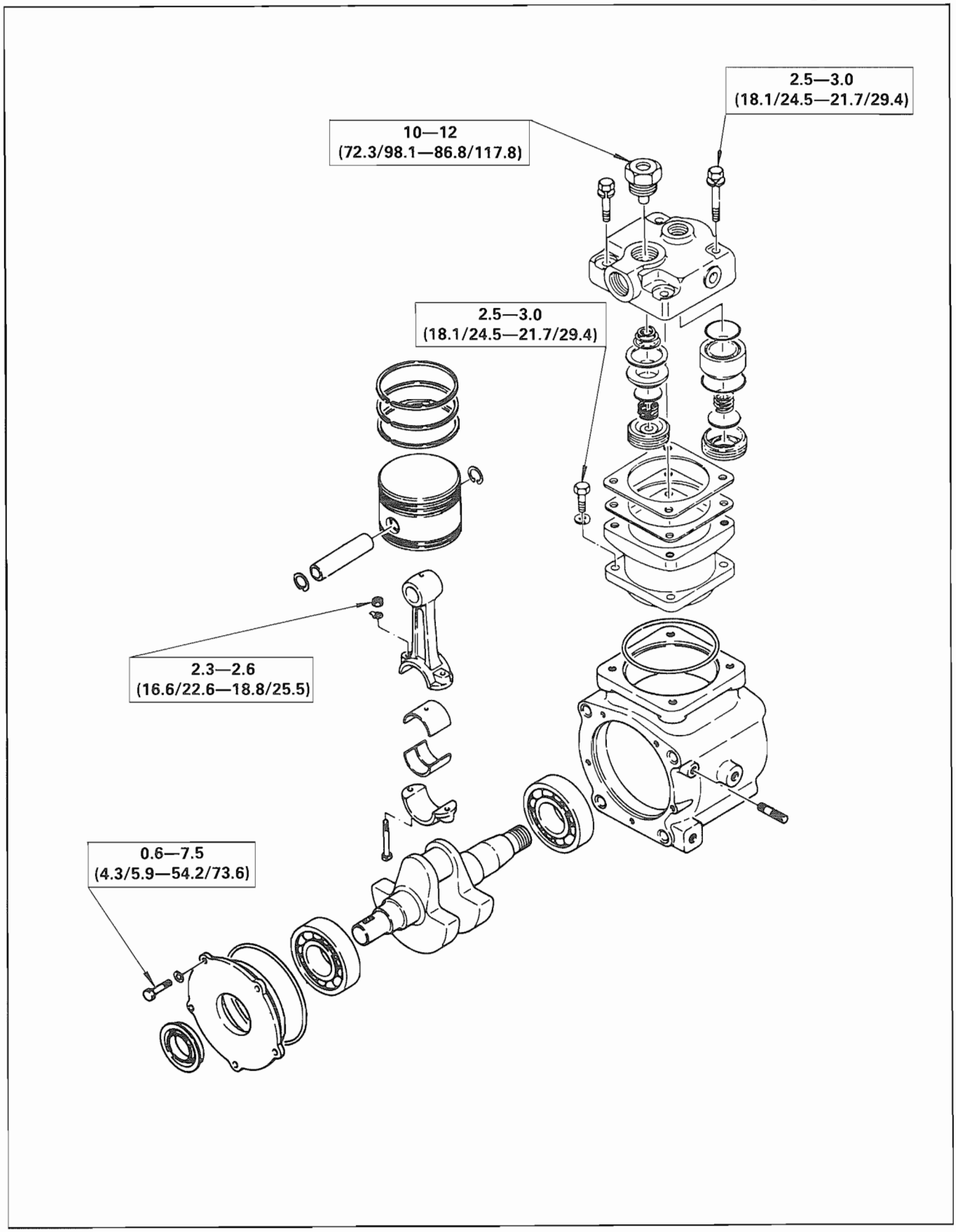


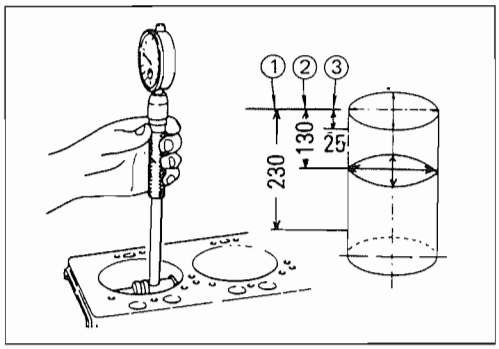
Example: Specified Angle and Tightening Rotation

A	30°	1/12 of a turn
B	60°	1/6 of a turn
C	90°	1/4 of a turn
D	180°	1/2 of a turn
E	360°	One full turn

Air Compressor

kg·m(lb.ft/N·m)





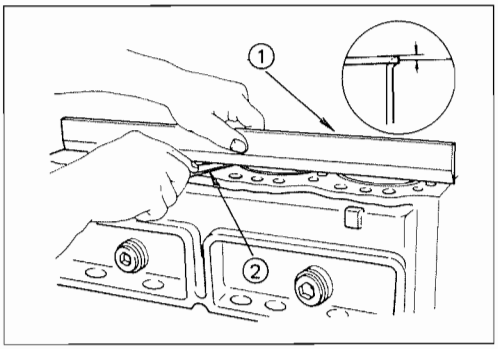
Cylinder Liner Bore Diameter mm(in)

Nominal	Limit
135.0 (5.319)	136.5 (5.378)

Note:

If the cylinder liner bore is scored or scorched, the cylinder liner must be replaced.

If the measured value exceeds the specified limit, the cylinder liner must be replaced.



Cylinder Liner Projection Inspection

1. Hold a straight edge ① along the top edge of the cylinder liner to be measured.

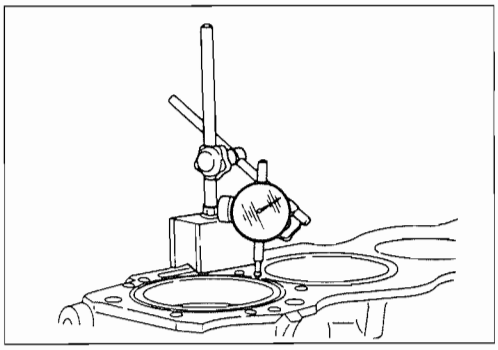
   Or, use a dial indicator to measure the cylinder liner projection.

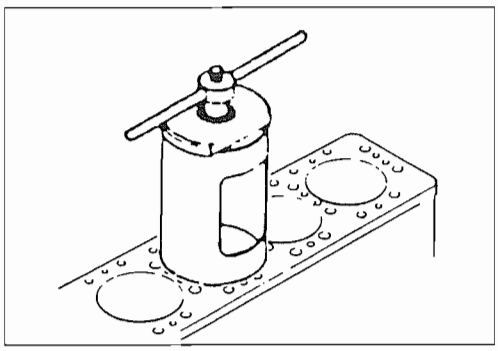
2. Use a feeler gauge ② to measure each cylinder liner projection.

Cylinder Liner Projection mm(in)

Standard
0.05 — 0.10 (0.002 — 0.0039)

The difference in the cylinder liner projection height between any two adjacent cylinders must not exceed 0.02 mm (0.0008 in).





Cylinder Liner Replacement

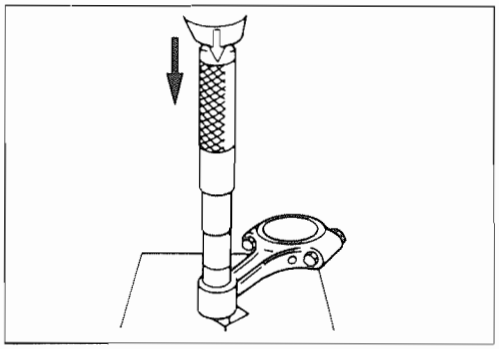
Cylinder Liner Removal

1. Set the cylinder liner remover to the cylinder liner.
2. Check that the remover shaft ankle is firmly gripping the cylinder liner bottom edge.
3. Slowly turn the remover shaft handle counterclockwise to pull the cylinder liner free.

   Cylinder Liner Remover : 9-8523-1186-0

Note:

Take care not to damage the cylinder body upper face during the cylinder liner removal procedure.



Connecting Rod Bushing Installation

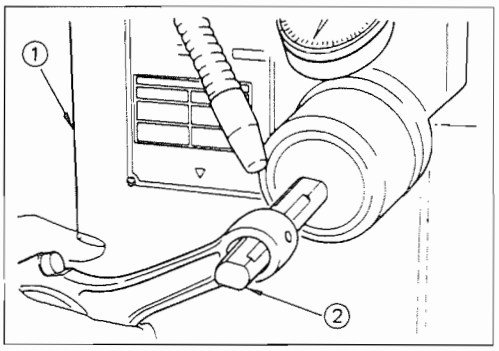
Use the connecting rod bushing installer to install the connecting rod bushing.

Connecting Rod Bushing Installer : 9-8522-0042-0

Note:

The Connecting rod bushing oil port must be aligned with the connecting rod oil port.

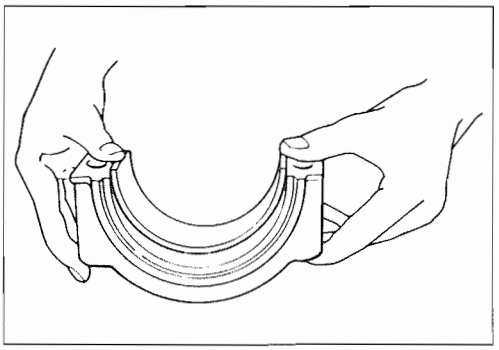
Use a piston pin hole grinder ① fitted with a reamer ② or an adjustable pilot reamer to ream the piston pin hole.



mm(in)

	Mating Piston Type	Standard
Connecting Rod Bushing Inside Diameter	A	50.020 — 50.032 (1.9708 — 1.9713)
	B	52.020 — 52.032 (2.0496 — 2.0501)

Refer to the description in the page 4-19 on the Piston Type A and B.



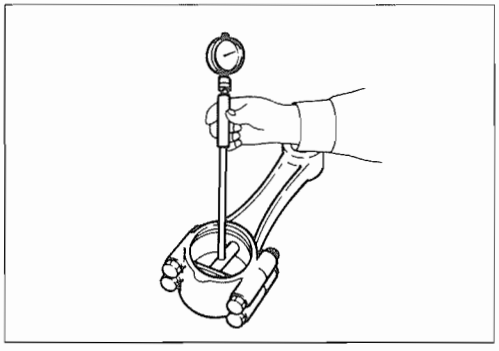
Connecting Rod Bearing Inspection

1. Inspect the connecting rod bearing for excessive wear and damage.
2. Fit the connecting rod bearing lower half into the connecting rod bearing cap.
3. Check the connecting rod bearing lower half tension.

   If the tension is insufficient, the bearing must be replaced.
4. Tighten the connecting rod and the bearing cap to the specified torque.

kg·m(lb.ft/N·m)

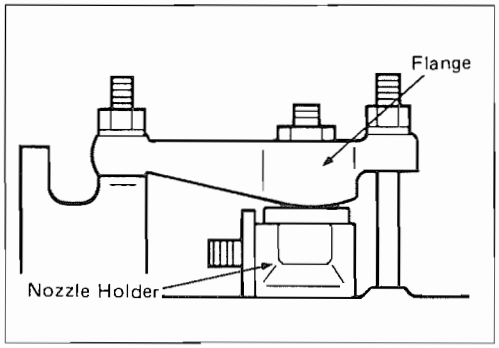
	1st Step	2nd Step
Connecting Rod and Bearing Cap Bolt Tightening Torque	7 (50.6/68.6)	10 ± 0.5 (72.3 ± 3.6/ 98.1 ± 4.9)



5. Use an inside dial indicator to measure the connecting rod inside diameter.

mm(in)

Connecting Rod Bearing Nominal Diameter	89.96 — 90.00 (3.5444 — 3.5460)



kg·m(lb.ft/N·m)

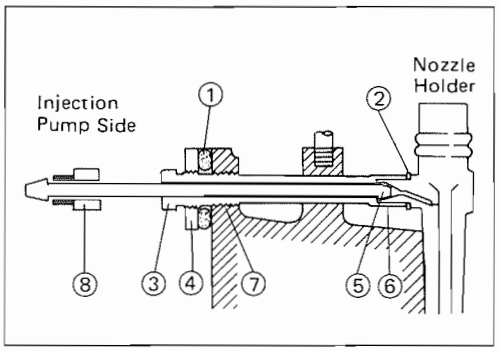
Nozzle Holder Flange Fixing Nut Torque	ϕ10 Bolt	2.8 ± 0.3 (20.2 ± 2.2/27.4 ± 2.9)
	ϕ 8 Bolt	1.2 ± 0.2 (8.6 ± 1.4/11.8 ± 2.0)

Injection Pump Side — kg·m(lb.ft/N·m)

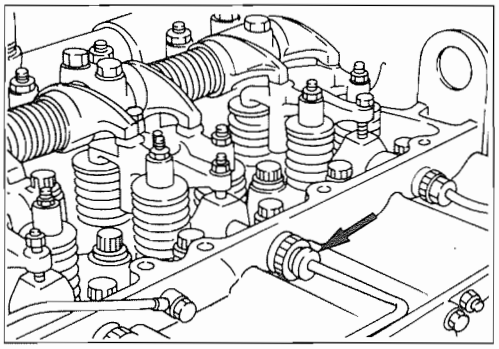
Injection Pipe Sleeve Nut Torque	3.3 ± 0.2 (24.0 ± 1.4/32.4 ± 2.0)

Nozzle Holder Side — kg·m(lb.ft/N·m)

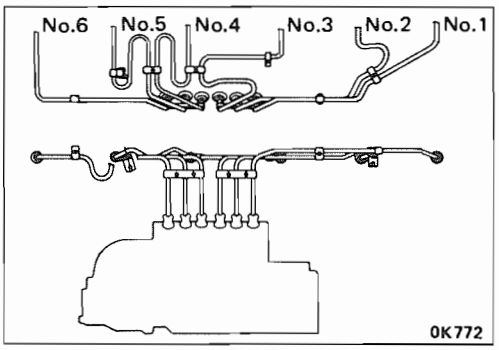
Injection Pipe Sleeve Nut Torque	2.8 ± 0.2 (20.2 ± 1.4/27.4 ± 2.0)



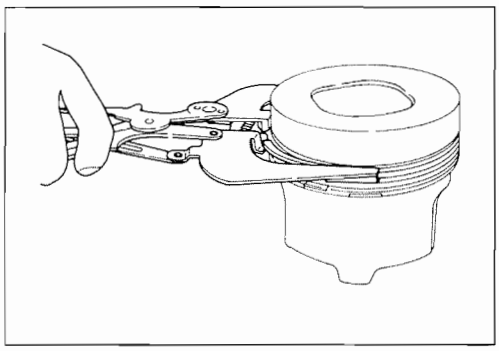
The gasket ① acts to seal the oil in the cylinder head cavity and, the nozzle holder gasket ② acts to seal the fuel leakage.



9) Finger tighten the knurled nut ④ to retain the gasket ①.



10) Install the injection pipe clips on the position illustrated.



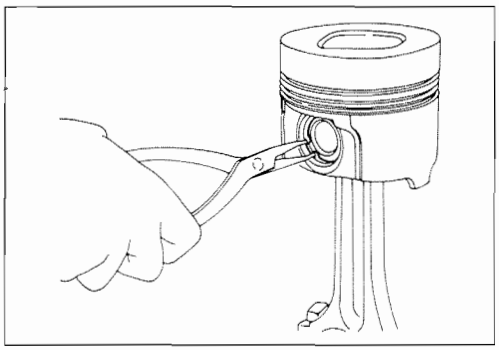
Important Operations

1. Piston Rings

Use a piston ring remover to remove the piston rings.

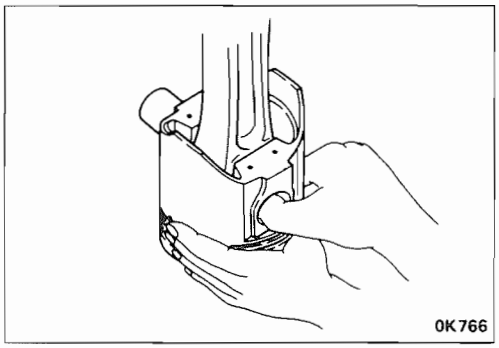
Do not attempt to use some other tool. Piston ring stretching will result in reduced piston ring tension.

Piston ring replacer : 1-85221-025-0



2. Snap Ring

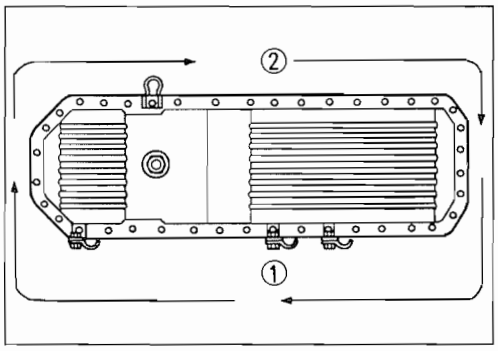
Use a pair of snap ring pliers to remove the snap ring.



3. Piston Pin

Use your thumb to push out the piston pin.

Piston heating is unnecessary in this engine.





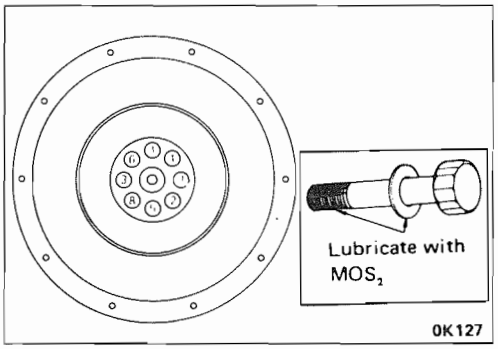



4. Oil Pan

1) Wipe the crankcase oil pan mounting flange surface and oil pan flange surface to clean the surfaces before the liquid gasket coating.
2) Apply a coat of liquid gasket on the crankcase side flange surface in 1.5 mm (0.06 in) thick and 5.0 to 10 mm (0.2 to 0.4 inch) width.
3) Affix the oil pan gasket and install the oil pan.
4) Tighten the oil pan bolts to the specified torque starting from ① and ② alternately, as shown in the illustration and, work out toward arrow direction.

kg·m(lb.ft/N·m)

Oil Pan Bolt Torque	4.0 ± 0.5 (28.9 ± 3.6/39.2 ± 4.9)



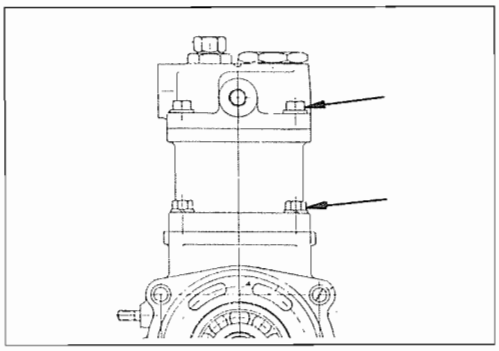



5. Flywheel

1) Apply a molybdenum disulfide grease to the flywheel bolt threads and setting faces.
2) Install the flywheel with aligning the dowel.
3) Tighten the flywheel bolts by the Angular Tightening Method in the numerical order as illustrated.

kg·m(lb.ft/N·m)

	1st Step	2nd Step	Final Step
Flywheel Bolt Torque	Apply MoS_2 8.0 ± 1.0 (57.8±7.2/78.5±9.8)	$60°^{+15°}_{0°}$	$30°^{+15°}_{0°}$



8. Cylinder Body

1) Fit the O-ring to the crankcase bore edge.
2) Install the piston into the cylinder.
3) Insert the piston into the cylinder bore until the cylinder body securely come into contact the crankcase.
4) Tighten the cylinder body fixing bolts to the specified torque evenly.

kg·m(lb.ft/N·m)

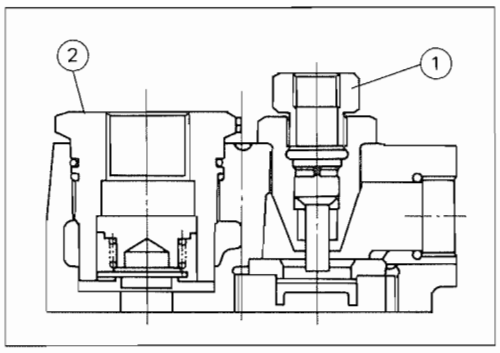
Cylinder Body Fixing Bolt Torque	2.8 ± 0.2 (19.6 ± 1.4/27.4 ± 2.0)

9. Cylinder Head Assembly

1) Fit The O-ring into the cylinder body top O-ring groove.
2) Place the cylinder head on the cylinder body.
3) Tighten the cylinder head bolt evenly to the specified torque.

kg·m(lb.ft/N·m)

Cylinder Head Bolt Torque	2.8 ± 0.2 (19.6 ± 1.4/27.4 ± 2.0)



kg·m(lb.ft/N·m)

① Unloader Valve Tightening Torque	11.0 ± 1.0 (79.2 ± 7.2/107.8 ± 9.8)
② Discharge Valve Tightening Torque	11.0 ± 1.0 (79.2 ± 7.2/107.8 ± 9.8)

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