ENGINE

CONTENTS

Engine Mechanical 6A
Engine Cooling 6B
Engine Fuel 6C
Starting and Charging 6D3
Engine Lubrication 6G
Engine Induction 6J

ENGINE MECHANICAL

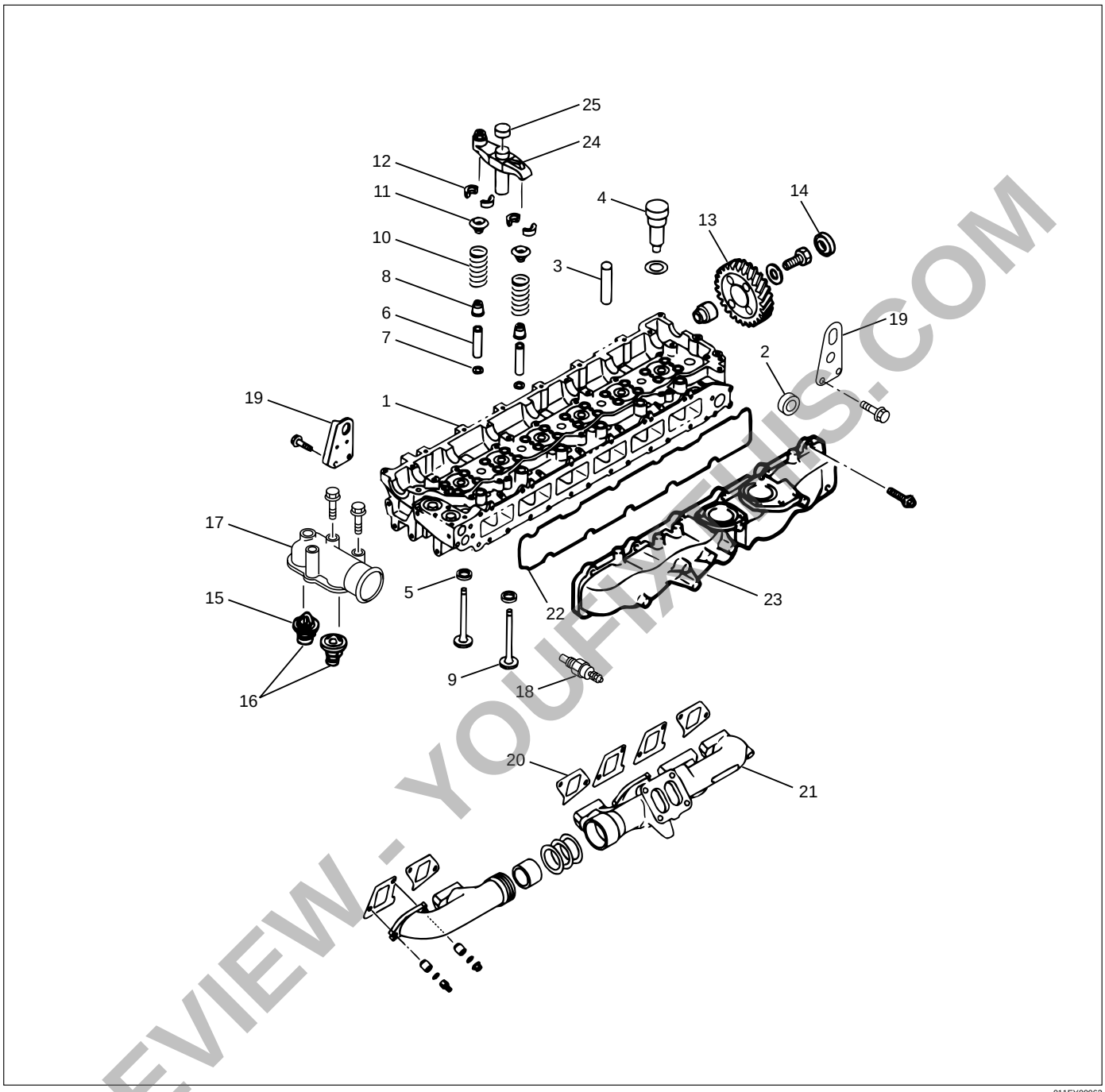
CONTENTS

Service Precautions 6A-2
General Description 6A-2
Engine Cleanliness and Care 6A-2
Engine Service 6A-2
Engine Components 6A-2
Turbocharger 6A-4
Removal 6A-4
Installation 6A-4
Exhaust Manifold 6A-5
Removal 6A-5
Installation 6A-5
Intake Cover 6A-7
Removal 6A-7
Installation 6A-7
Water Pump 6A-9
Removal 6A-9
Installation 6A-11
Alternator 6A-13
Removal 6A-13
Installation 6A-13
Injection Pump 6A-14
Removal 6A-14
Installation 6A-16
Bearing Case 6A-18
Removal 6A-18
Installation 6A-18
Oil Cooler 6A-20
Removal 6A-20
Installation 6A-20
Rocker Arm and Shaft Assembly 6A-23
Removal 6A-23
Installation 6A-24
Disassembly 6A-27
Inspection and Repair 6A-28
Reassembly 6A-31
Camshaft 6A-32
Removal 6A-32
Installation 6A-33
Disassembly 6A-36
Inspection and Repair 6A-37
Reassembly 6A-38
Cylinder Head 6A-39
Removal 6A-39
Installation 6A-41
Disassembly 6A-45
Inspection and Repair 6A-48
Reassembly 6A-54
Crank Pulley and Flywheel 6A-62
Removal 6A-62
Installation 6A-63
Disassembly 6A-64
Inspection and Repair 6A-64
Reassembly 6A-64
Timing Gears 6A-66
Removal 6A-66
Inspection and Repair 6A-67
Installation 6A-68
Flywheel Housing 6A-71
Removal 6A-71
Installation 6A-72
Oil Pan 6A-76
Removal 6A-76
Installation 6A-77
Front Cover 6A-78
Removal 6A-78
Installation 6A-79
Piston 6A-82
Removal 6A-82
Installation 6A-83
Disassembly 6A-85
Inspection and Repair 6A-86
Reassembly 6A-91
Crankshaft 6A-94
Removal 6A-94
Installation 6A-96
Disassembly 6A-100
Inspection and Repair 6A-101
Reassembly 6A-104
Cylinder Body 6A-106
Removal 6A-106
Installation 6A-107
Disassembly 6A-108
Inspection and Repair 6A-109
Reassembly 6A-112

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Disassembly



011EY00062

Legend

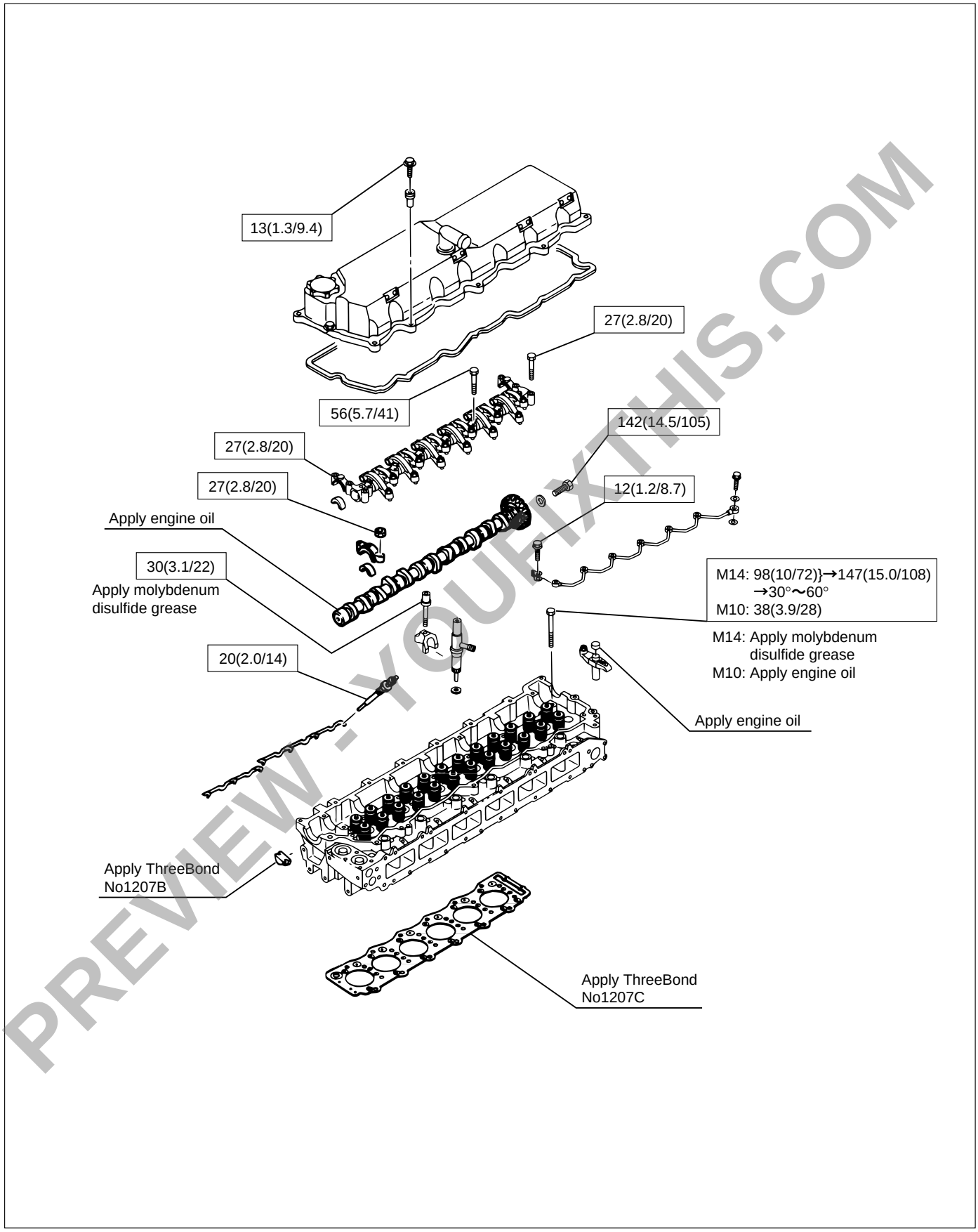
(1) Cylinder head cover
(2) Oil seal
(3) Bridge guide
(4) Nozzle sleeve
(5) Valve seat insert
(6) Valve guide
(7) Lower spring seat
(8) Valve stem seal
(9) Valve
(10) Valve spring
(11) Upper spring seat
(12) Split collar
(13) Idler gear C
(14) Idler gear cover
(15) Gasket
(16) Thermostat
(17) Water outlet pipe
(18) Overheat warning switch
(19) Hanger
(20) Gasket
(21) Exhaust manifold
(22) Gasket
(23) Inlet cover
(24) Bridge
(25) Bridge cap

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Cylinder Head

N·m (kgf·m/lb ft)



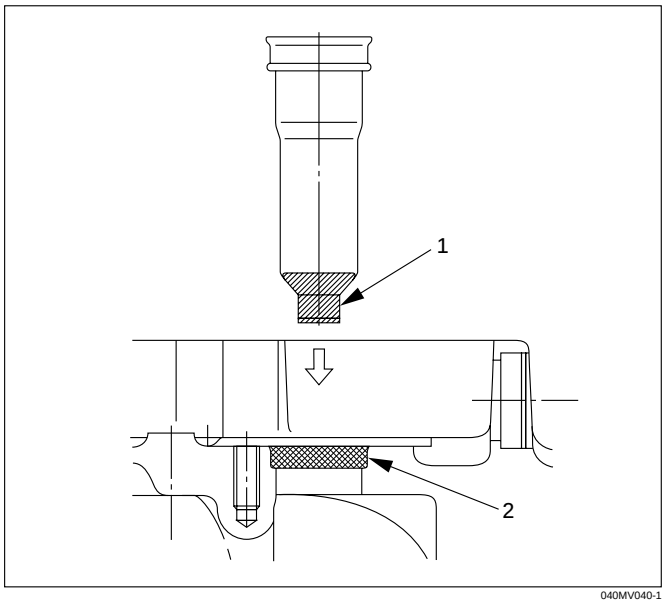
F06EY00143

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

4. Install the injection nozzle sleeves to the cylinder head.
   1. Install the gasket (2) to the nozzle sleeve and apply engine oil.
   2. Apply sealer to the tapered part (1) of the nozzle sleeve.

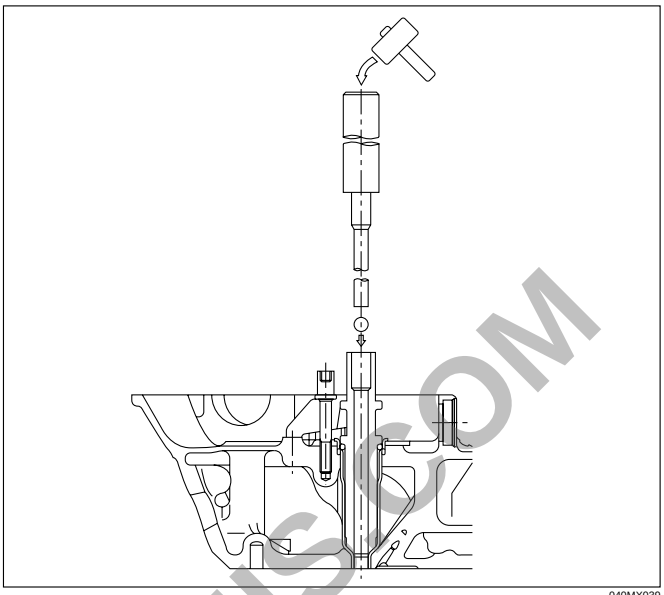
LOCKTITE No. TL290



040MV040-1

   3. Install the nozzle sleeve to the cylinder head and insert the guide sleeve.
   4. Push in the nozzle sleeve with the guide sleeve installer 5-8840-2624-0 so that the bottom surface of the cylinder head is reached.
   5. Insert the nozzle sleeve and fix it with the clamp and bolt.
   6. Press a 9.525 mm steel ball into the guide sleeve 5-8840-2624-0. Use a hammer and punch bar to drive the ball through the sleeve.

NOTE:
- Remove chips from the threaded part of the cylinder head.
- Keep the cylinder head raised so that the ball can escape from the bottom surface.

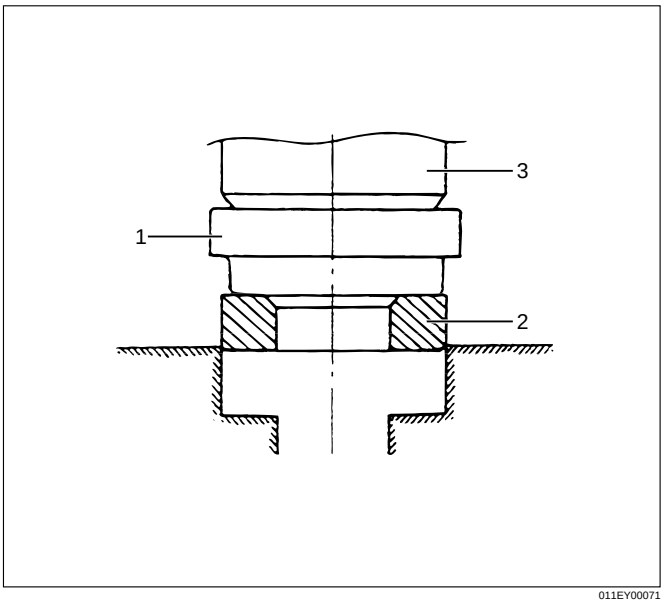

040MX039

5. Install the valve seat inserts into the cylinder head.
   1. Carefully place the attachment (1) (having a smaller outside diameter than the valve seat insert) on the valve seat insert (2).

NOTE: The smooth side of the attachment must contact the valve seat insert.

   2. Use a bench press (3) to gradually apply pressure to the attachment and press the valve seat insert into place.

CAUTION: Do not apply an excessive amount of pressure with the bench press. Damage to the valve seat insert will result.



011EY00071

   3. The valve should be lapped before final assembly to ensure a good valve seal.

      Refer to “Valve Seat Insert Correction” in this section.

6. Install the valve guides into the cylinder head.
   1. Apply engine oil to the valve guide outer circumference.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Troubleshooting

1. Hard starting

Condition	Possible Cause	Correction
Starter motor does not turn over	Loose battery cable terminals Poor battery connections due to rusting	Clean and/or retighten the battery cable terminals
	Battery discharged or weak	Recharge or replace the battery
	Fusible link shorted	Replace the fusible link
	Defective starter switch or starter relay	Replace the starter switch or starter relay
	Defective magnetic switch of starter motor or starter relay	Repair or replace the magnetic switch or starter relay
	Defective starter motor	Repair or replace the starter motor
Starter motor operates but engine does not turn over	Loose battery cable terminals Poor battery connections due to rusting	Clean and/or retighten the battery cable terminals
	Battery discharged or weak	Recharge or replace the battery
	Loose fan belt	Adjust the fan belt tension
	Defective starter motor pinion gear	Replace pinion gear
	Defective magnetic switch of the starter motor	Repair or replace the magnetic switch
	Worn starter motor Weak brush spring	Replace the brush and /or brush spring
	Piston,crank bearing seizure,or other damage	Repair or replace the related parts
Engine turns over but does not start	Air in the fuel system	Bleed air from the fuel system
	Defective engine stop mechanism	Replace the engine stop mechanism
	Control wire improperly adjusted	Adjust the control wire
	Fuel tank is empty	Fill the fuel tank
	Clogged or damaged fuel lines	Repair or replace the fuel lines
	Loose fuel line connections	Retighten the fuel line connections
	Clogged fuel filter element	Replace the fuel filter element or cartridge
	Fuel feed pump strainer is clogged	Clean the fuel pump strainer
	Defective feed pump	Repair or replace the feed pump
	Poor return of the engine stop button	Completely return the engine stop button
	Use of the wrong fuel	Use the recommended fuel
	Water particles in the fuel	Change fuel
	Air in the injection pump	Bleed air from the fuel system
	Injection nozzle sticking	Replace the injection nozzle
	Injection nozzle starting pressure too low Improper spray condition	Adjust or replace the injection nozzle
	Improper injection pump control rack operation	Repair or replace the injection pump control rack
	Injection pump plunger worn or stuck	Replace the injection pump plunger assembly
	Injection pump camshaft seizure or other damage	Replace the injection pump camshaft

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

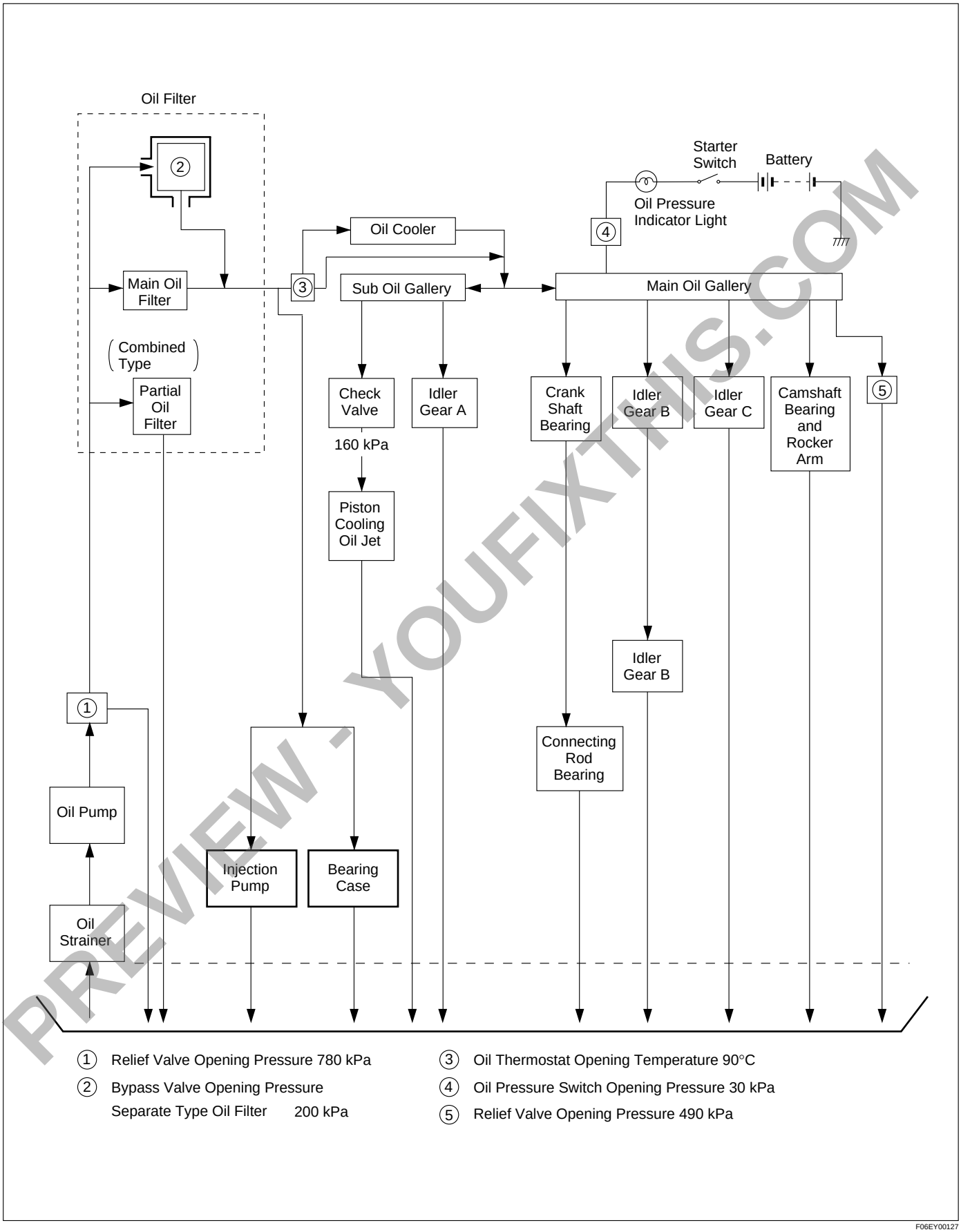
Main Data and Specifications

ITEMS	6HK1
Engine type	Four cycle, water cooled, in-line, overhead camshaft direct injection
Combustion chamber	Open type in piston crown
Cylinder liner	Dry
Timing drive system	Gear drive
No. of cylinders – bore × stroke mm (in)	6 – 115 × 125 (4.53 × 4.92)
No. of piston rings	Four rings (Compression rings: 3, Oil ring: 1)
Total piston displacement L (cid)	7.790 (475.4)
Compression ratio (to 1)	17.3
Compression pressure at 200 min^{-1} MPa (kg/cm^2/psi)	3.24 (33/469) or more
Engine dimensions* mm (in)	1,332 × 995 × 1,143 (52.4 × 39.2 × 45.0)
Engine weight (Dry)*	kg (lb) 650 (1,433)
Fuel injection order	1 – 5 – 3 – 6 – 2 – 4
Fuel injection timing (TDC)* deg	9
Specified fuel type	SAE No.2 diesel fuel
Idling speed* min^{-1}	1000
Valve clearances Intake mm (in)	0.40 (0.016)
Exhaust mm (in)	0.40 (0.016)
Intake valves Open at (BTDC) deg	15
Close at (ABDC) deg	44
Exhaust valves Open at (BBDC) deg	58
Close at (ATDC) deg	11
Injection pump	Bosch, in-line P-Type
Governor type*	Mechanical
Injection nozzles	Multi-hole
Injection nozzle opening pressure MPa (kg/cm^2/psi)	1st stage: 18.1 (185/2630) 2nd stage: 22.1 (225/3200)
Main fuel filter	Paper element
Lubrication system	
Lubrication method	Full flow pressure circulation
Specified engine oil (API grade)	CD
Oil pressure (at oil gallery) kPa (kg/cm^2/psi)/min^{-1}	290 – 490 (3.0 – 5.0/43–71)/2000 Condition: SAE 30 API CD grade engine oil at an oil temperature of 80°C (176°F)
Oil pump type	Gear (Timing gear drive)

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Lubricating Oil Flow



F06EY00127

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

ITEMS	SERVICE STANDARD	SERVICE LIMIT
Piston and Piston Ring		
Piston Grade	Non	
Cylinder Liner and Piston Clearance mm (in)	0.122 – 0.156 (0.0048 – 0.0061)	—
Piston Ring and Piston Ring Groove Clearance mm (in)		
1st Compression Ring	0.057 – 0.097 (0.0022 – 0.0038)	0.20 (0.008)
2nd and 3rd Compression Ring	0.085 – 0.120 (0.0033 – 0.0047)	0.2 (0.008)
Oil Ring	0.02 – 0.06 (0.0008 – 0.0024)	0.15 (0.006)
Piston Ring Gap mm (in)		
1st Compression Ring	0.18 – 0.28 (0.0071 – 0.0110)	1.20 (0.047)
2nd and 3rd Compression Ring	0.35 – 0.50 (0.0138 – 0.0197)	1.20 (0.047)
Oil Ring	0.15 – 0.35 (0.0059 – 0.0138)	1.20 (0.047)
Piston Pin		
Piston Pin Diameter mm (in)	35.995 – 36.000 (1.4171 – 1.4173)	35.95 (1.4154)
Piston Pin Hole Diameter mm (in)	36.004 – 36.012 (1.4175 – 1.4178)	
Piston Pin and Piston Pin Hole Clearance mm (in)	0.004 – 0.017 (0.00016 – 0.00067)	
Connecting Rod		
Connecting Rod Alignment mm (in)	0.05 (0.002) or less	0.20 (0.008)
Connecting Rod Small End Bushing Diameter mm (in)	36.012 – 36.022 (1.4178 – 1.4182)	
Piston Pin and Connecting Rod Small End Bushing Clearance mm (in)	0.012 – 0.027 (0.00047 – 0.00106)	0.05 (0.002)
Crankpin and Bearing Clearance mm (in)	0.037 – 0.076 (0.0015 – 0.0030)	0.10 (0.004)
Connecting Rod Big End and Crankpin Side Face Clearance mm (in)	0.17 – 0.30 (0.0067 – 0.0118)	0.35 (0.014)
Flywheel		
Flywheel Friction Surface Roughness mm (in)	Less than 0.05 (0.0020)	

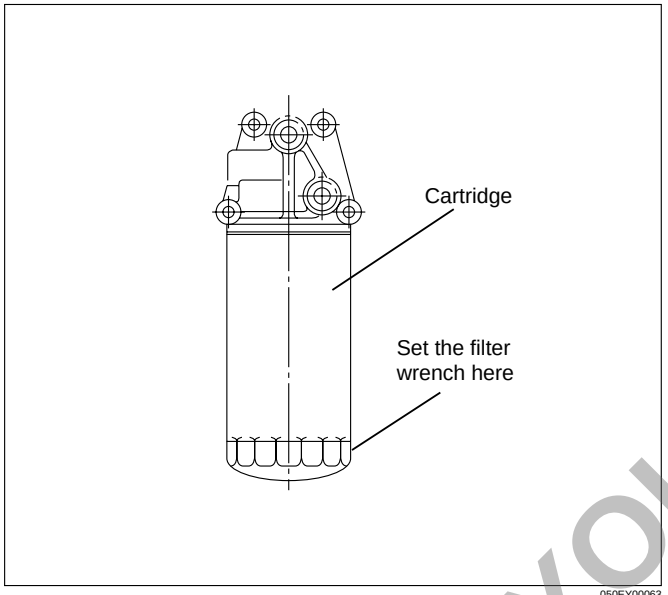
PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

Lubrication System

Oil filter replacement

1. Set a filter wrench to the cartridge and remove the oil filter.
   Discard the used cartridge.
2. Before installing the new oil filter, apply engine oil to the gasket of the cartridge.
3. Turn the oil filter until the filter gasket comes in contact with its sealed face.
4. Use the filter wrench to turn in the oil filter an additional one full turn.

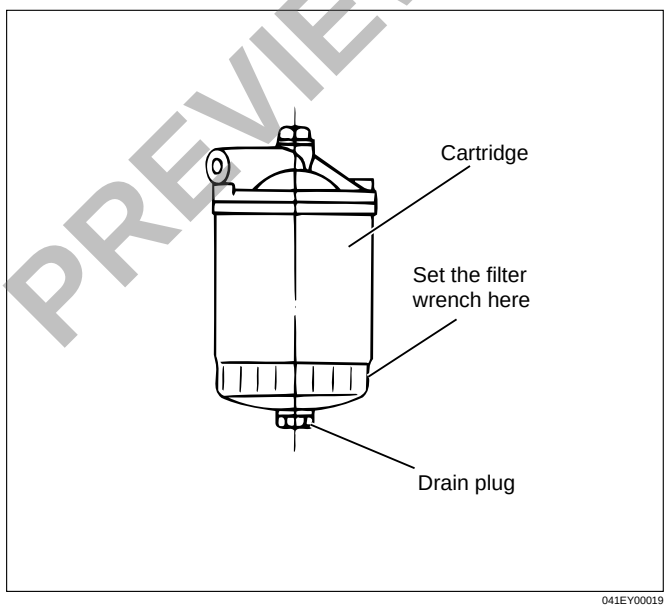


050EY00063

Fuel System

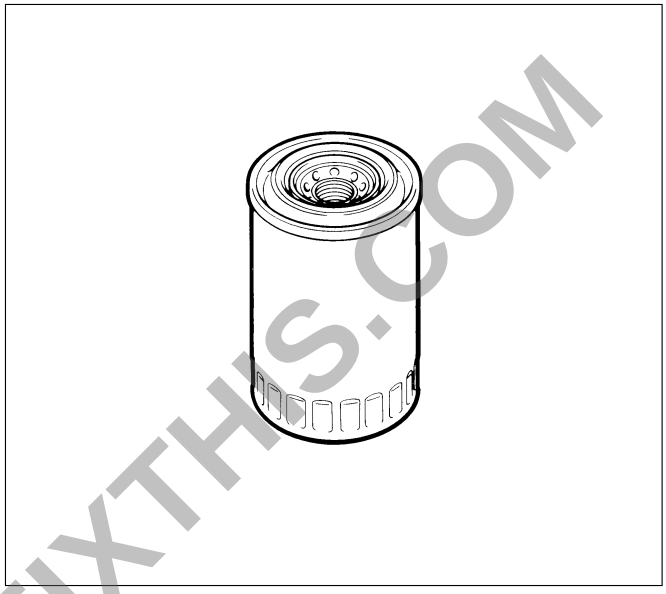
Fuel filter replacement procedure

1. Use a filter wrench to remove the cartridge.
   Discard the used cartridge.



041EY00019

2. Before installing a new fuel filter, apply fuel to the gasket of the cartridge.
3. Turn the fuel filter until the filter gasket comes in contact with the sealed face.
4. Use the filter wrench to turn in the fuel filter an additional 2/3 of a turn.

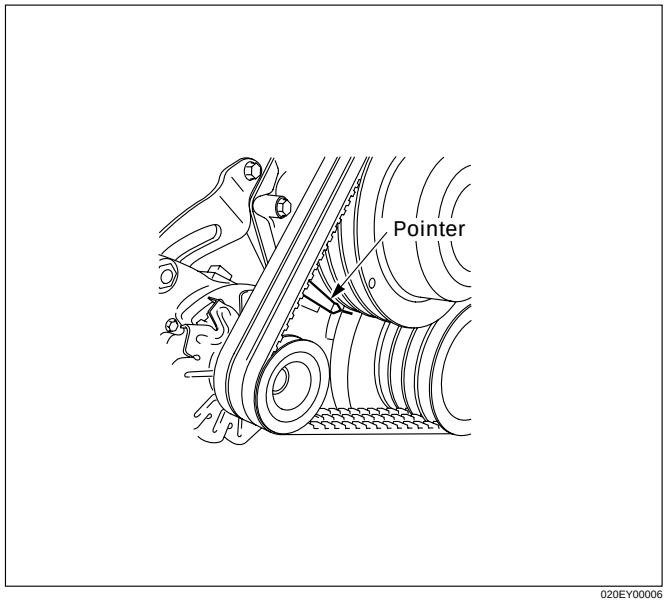


NOTE: Be careful not to spill the fuel remaining in the fuel filter when the filter is removed. After changing the fuel filter element, conduct fuel air bleeding and check for fuel leaks.

Injection Timing Adjustment

Injection Timing Inspection

1. Disconnect the negative battery cable.
2. Rotate the crankshaft in the normal direction of engine rotation to align the injection timing mark on the damper with the timing pointer on the front cover.
   - Injection Timing (Static-TDC): 9 degree



020EY00006

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

GENERAL INFORMATION

CONTENTS

General Information. 0A
Service Information 0B

GENERAL INFORMATION

CONTENTS

General Repair Instruction 0A-1
Illustration Arrows 0A-2
Abbreviations 0A-3
Nut and Bolt Angular Tightening Method. 0A-4
Standard Bolt Torque Specifications 0A-6
Recommended Thread Locking Agents 0A-8
Main Data and Specifications. 0A-9
Engine External View Drawing. 0A-11
Service Standard 0A-12
Torque Specifications 0A-16
Special Tools. 0A-24
Troubleshooting 0A-25
Lubricant Application 0A-35
Sealant Application 0A-35

General Repair Instruction

1. Before performing service operations, disconnect the ground cable from the battery to reduce the chance of cable damage and burning due to short circuiting.
2. Use a cover on body, seats and floor to protect them against damage and contamination.
3. Brake fluid and anti-freeze solution must be handled with care because they can cause paint damage.
4. The use of proper tools and special tools, where specified, is important for efficient and reliable performance of service repairs.
5. Use genuine Isuzu parts.
6. Used cotter pins, plastic clips, gaskets, O-rings oil seals, lock washers, and self-locking nuts should be discarded and new ones should be installed. Normal function of the parts cannot be maintained if these parts are reused.
7. To facilitate proper and smooth reassembly operation, keep disassembled parts neatly in groups. Keeping fixing nuts and bolts separate is very important, as they vary in hardness and design depending on position of installation.
8. Clean the parts before inspection or reassembly. Also clean oil ports, etc. using compressed air, and make certain they are free from restrictions.
9. Lubricate rotating and sliding faces of the parts with oil or grease before installation.
10. When necessary, use a sealer on gaskets to prevent leakage.
11. Carefully observe all specifications for nut and bolt torques.
12. When a service operation is completed, make a final check to be sure the service has been done properly and the problem has been corrected.
13. Allow the engine to cool before beginning any service procedure.

    This will eliminate the danger of fire and possible injury.
14. Hot steam under pressure may escape from the radiator if the coolant is drained while the engine is hot. This can result in serious burns. Allow the engine to cool before draining the coolant.
15. Hot engine oil can cause severe skin burns. Allow the engine to cool before draining the engine oil.
16. While working around a running engine, avoid contact with moving parts and hot surfaces to prevent injury.
17. Wear safety glasses when using compressed air. Flying particles may cause eye injury.
18. Always wear safety goggles when working with fuel to protect the eyes from fuel splash.
19. Test fluid from the injection nozzle tester will spray out of the injection nozzle under great pressure.

    It can easily puncture a person’s skin.

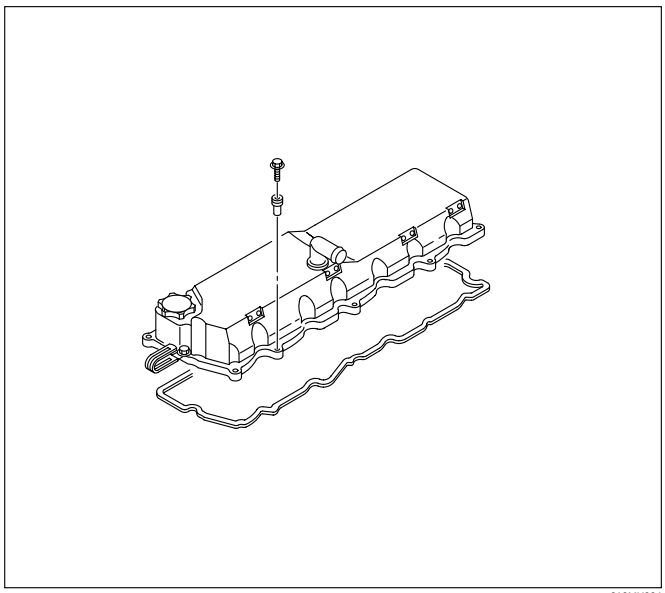
    Keep your hands away from the injection nozzle at all times.
20. Do not use your fingers to feel for fuel leaks at fittings. Fuel pressure is high enough to penetrate the skin.
21. Be careful when changing fuel system components: Diesel fuel is flammable. Be sure that the ignition key of OFF. Do not smoke or allow open flame in the area while changing fuel system components.

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

1. Remove the head cover.
2. Remove the cylinder head cover gasket.
   Discard the gasket.

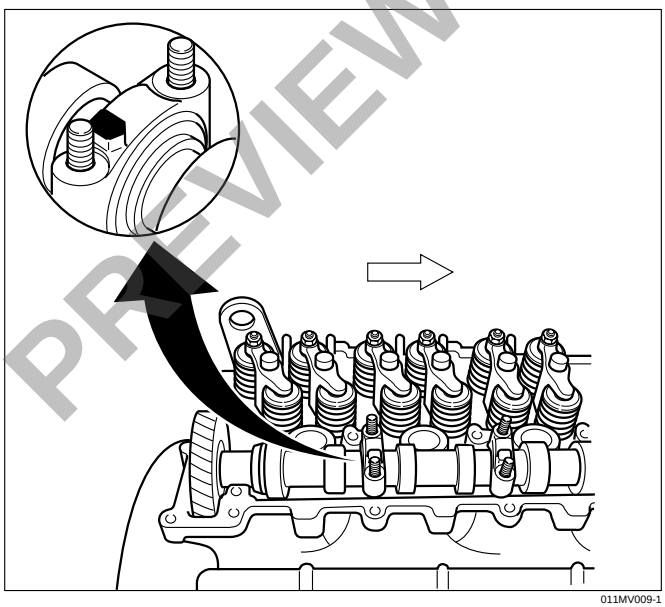
NOTE : Be careful not to lose the collars inserted into the cylinder head cover assembly.



010MX004

3. Remove the rubber plug.
4. Remove the rocker arm shaft assembly.
   Refer to “Rocker Arm Assembly Removal” in this manual.
5. Remove the camshaft bearing caps.
   - Loosen the camshaft bearing cap nuts and bolts evenly from the outside to the inside.

NOTE : If the camshaft bearings are to be reinstalled, keep them in order for installation to their original location.

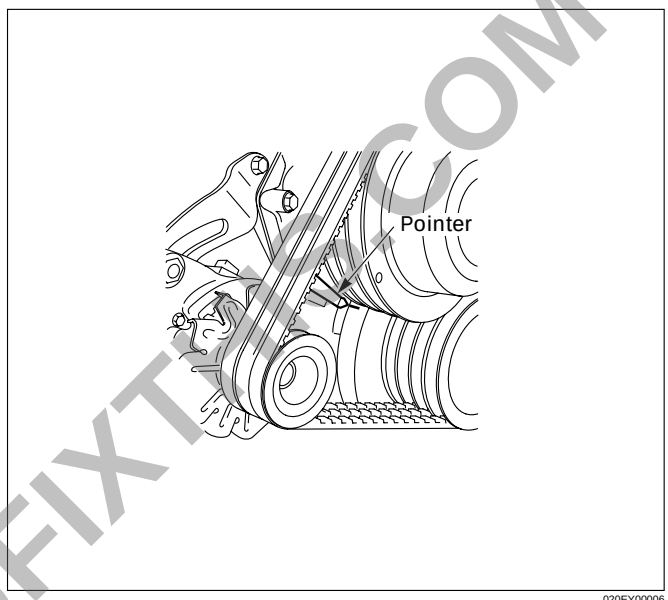


011MV009-1

6. Remove the camshaft with camshaft gear.

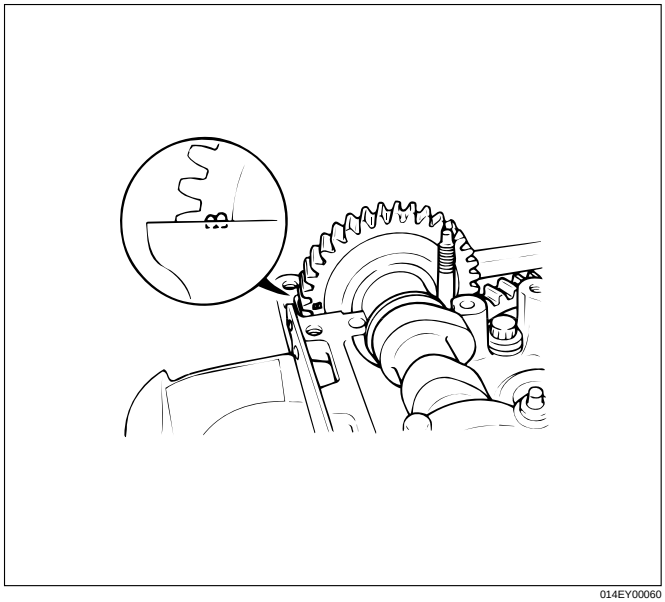
Installation

1. Install the camshaft with camshaft gear to the cylinder head.
   1. Align the crankshaft damper pulley TDC mark with the pointer by rotating the crankshaft in the normal direction of engine rotation. Check the position of the alignment timing mark on the injection pump for No. 1 piston of TDC.



020EY00006

   2. Install the camshaft bearings to the cylinder head bearing grooves and bearing caps.
   3. Apply engine oil to the camshaft bearing sliding surfaces before installing the camshaft.
   4. Install the camshaft with camshaft gear to the cylinder head.
   5. Carefully align the camshaft gear “B” mark and the upper cylinder head face as shown in the illustration.



014EY00060

PREVIEW - YOUFIXTHIS.COM

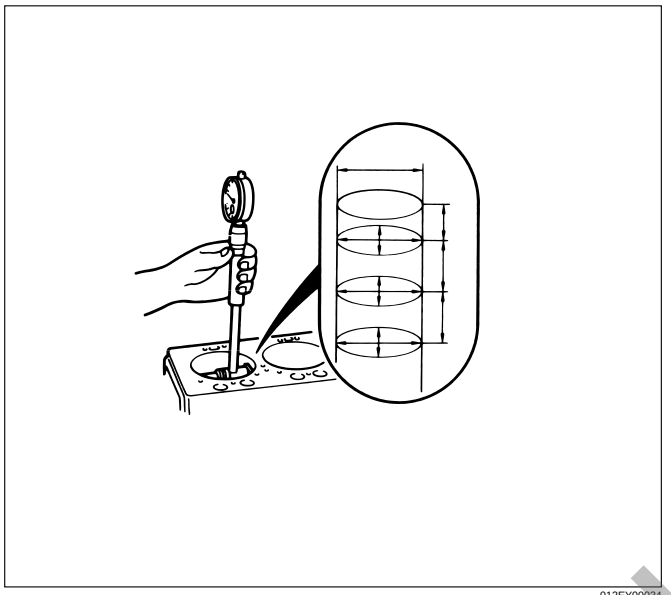
Download full manual at youfixthis.com

Cylinder Bore Measurement

If the marking is not clear, measure the cylinder bore inside diameter.

- Use a cylinder bore dial indicator to measure the cylinder bore in the thrust and axial direction of the crankshaft.

Measuring points: 20 mm (0.79 in)
110 mm (4.33 in)
190 mm (7.18 in)

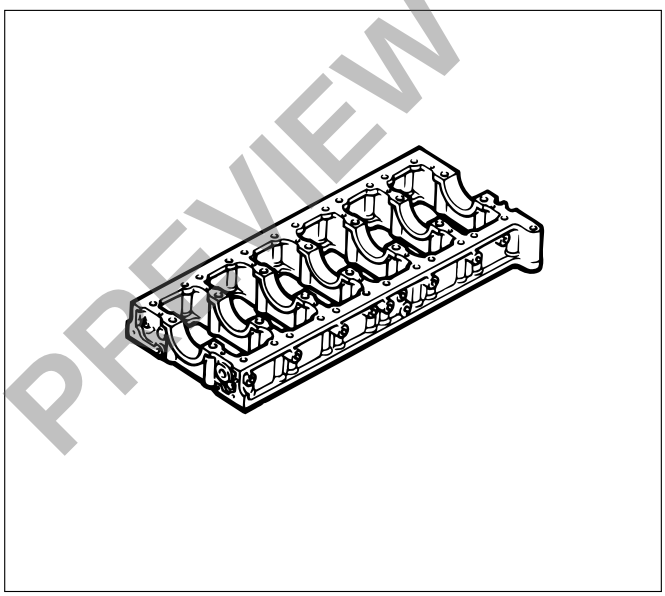


012EY00034

Lower Crankcase

Visually inspect the lower crankcase for cracking and damage.

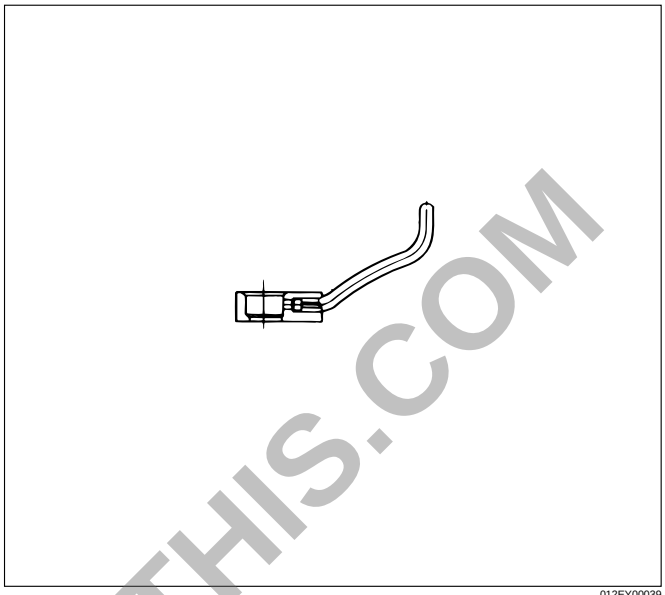
If possible, use dye penetrant flaw detector.



012EY00038

Oil Jet

Check the oil port on the oil jet for clogging.



012EY00039

Cylinder Liner Projection

- Use a dial indicator or a straight edge and feeler gauge to measure the cylinder liner projection.

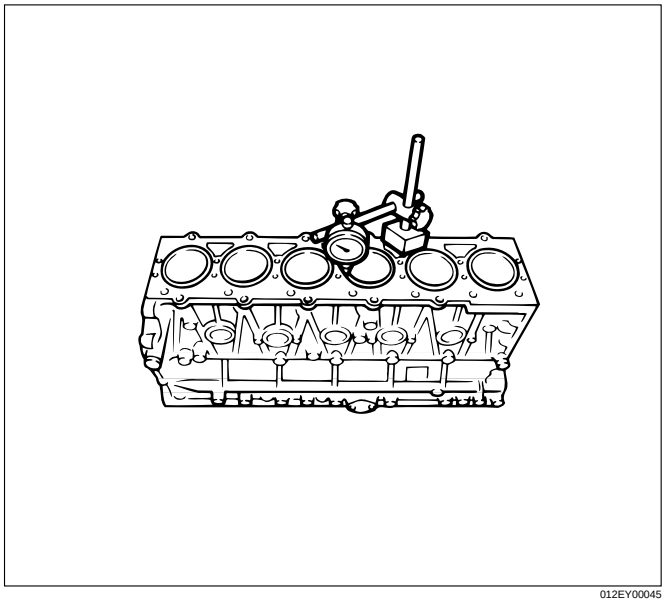
Cylinder liner projection

Standard: 0.06 – 0.10 mm (0.0024 – 0.0039 in.)

The difference in the cylinder liner projection height between any adjacent cylinders must not exceed the limit.

Projection height between adjacent cylinders:

0.03 mm (0.0012 in.) or less



012EY00045

PREVIEW - YOUFIXTHIS.COM

Download full manual at youfixthis.com

PREVIEW ONLY

You're viewing 12 of 241 pages

The full manual includes:

- All 241 pages, complete
- Searchable PDF (find any keyword)
- No watermarks
- Instant download
- Print-ready quality

GET FULL MANUAL NOW

Isuzu AA-6HK1T, BB-6HK1T Shop Manual

Scan or click anywhere
youfixthis.com

Click anywhere on this page to get the full manual