ISUZU

2013MY LV-SERIES

WORKSHOP MANUAL

ENGINE

(6WG1 model)

Valve clearance adjustment table

	Cylinder #	1		2		3		4		5		6	
Condition	Arrangement of valves	EXH	IN	EXH	IN	EXH	IN	EXH	IN	EXH	IN	EXH	IN
Valve to be adjusted	When the #1 cylinder is set at the compression top dead center	○	○		○	○			○	○			
	When the #6 cylinder is set at the compression top dead center			○			○	○			○	○	○

Injection sequence (1 - 5 - 3 - 6 - 2 - 4)

Special tools

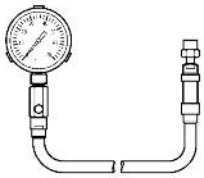
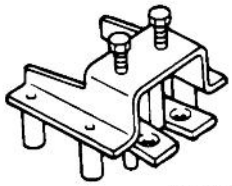
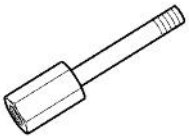
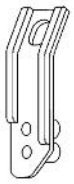
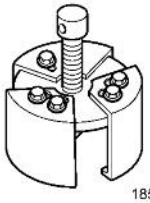
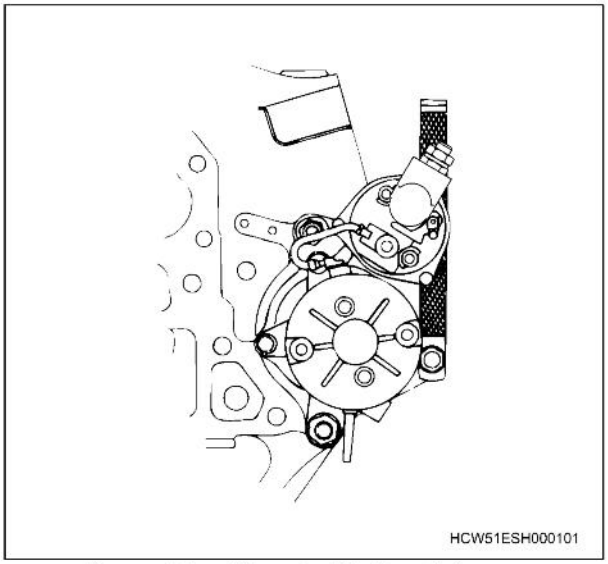
Illustration	Tool Number/ Description
 5853170010	5-8531-7001-0 Compression gauge adapter
 5884026750	5-8840-2675-0 Compression gauge
 1852350130	1-8523-5013-0 Valve spring replacer
 9852312020	9-8523-1202-0 Valve guide replacer
 9852213240	9-8522-1324-0 Bridge guide installation tool
 1852211840	1-8522-1140-1 Valve seal installation tool (for inlet)

Illustration	Tool Number/ Description
 1852211840	1-8522-1184-0 Valve seal installation tool (for exhaust)
 5884028260	5-8840-2826-0 Injector remover
 5884000190	5-8840-0019-0 Sliding hammer small
 8976154710	8-9761-5471-0 Engine hanger front
 8976142760	8-9761-4276-0 Engine hanger rear(LH)
 1852100270	1-8521-0027-0 Slinger replacer

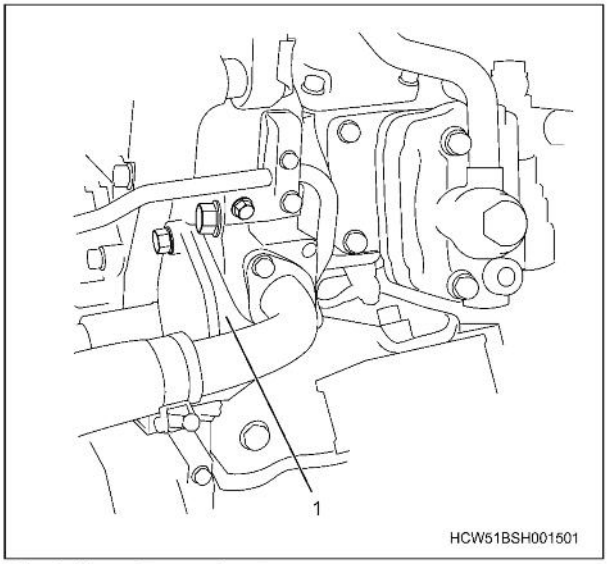


- Connect the S-terminal to the starter.
- Connect the B-terminal to the starter.
- Connect the ground cable to the starter.

Tightening torque	19 N·m (1.9 kgf·m / 14 lb·ft)

46. Inspect the power steering oil pump.

Tightening torque	39 N·m (4.0 kgf·m / 29 lb·ft)

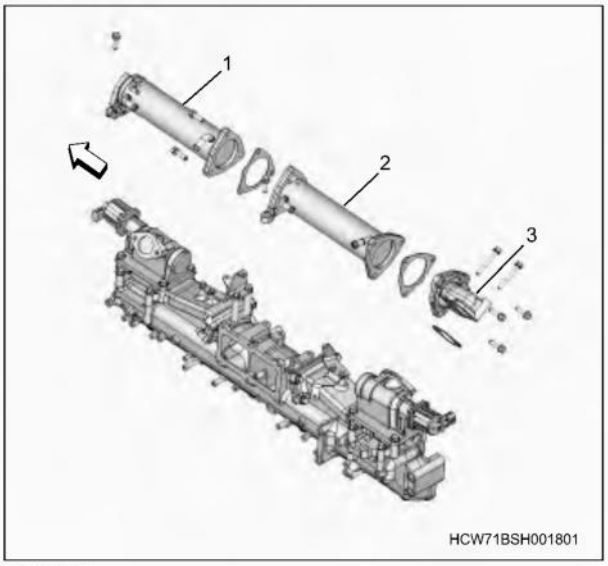


47. Add engine coolant.
    Refer to "Radiator" in Section 1C.
48. Install the exhaust pipe.
    Refer to "Exhaust pipe" in Section 1G.
49. Connect the battery cable.

Inspections after installation

- Engine oil level
- Coolant amount
- Items around the engine that may get caught
- Abnormal sounds
- Abnormal vibrations
- Fuel leakage
- Oil leakage
- Water leakage
- Air leakage
- Exhaust gas leakage
- Exhaust gas color

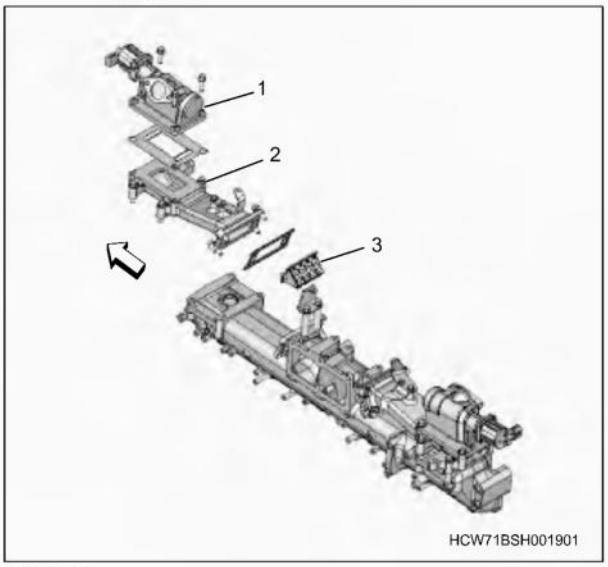
16. EGR cooler A (Ft), D and EGR cooler to EGR valve duct (Rr)



Legend

1. EGR cooler A (Ft)
2. EGR cooler D
3. EGR cooler to EGR valve duct (Rr)

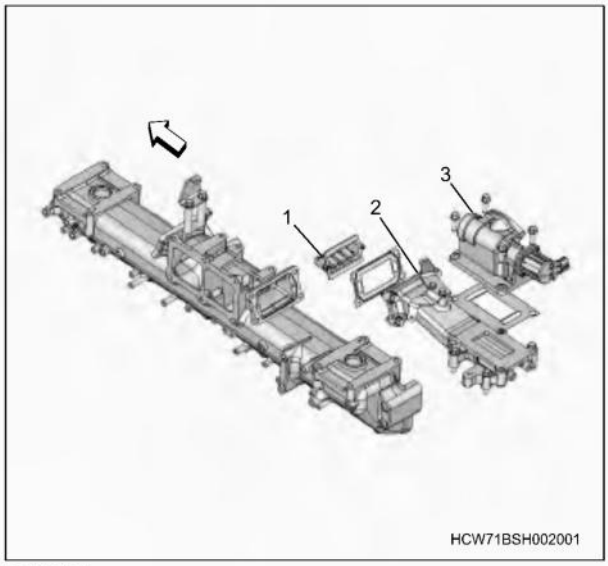
17. EGR valve (Ft), EGR valve duct (Ft), and Reed valve (Ft)



Legend

1. EGR valve (Ft)
2. EGR valve duct (Ft)
3. Reed valve (Ft)

18. EGR valve (Rr), EGR valve duct (Rr), and Reed valve (Rr)



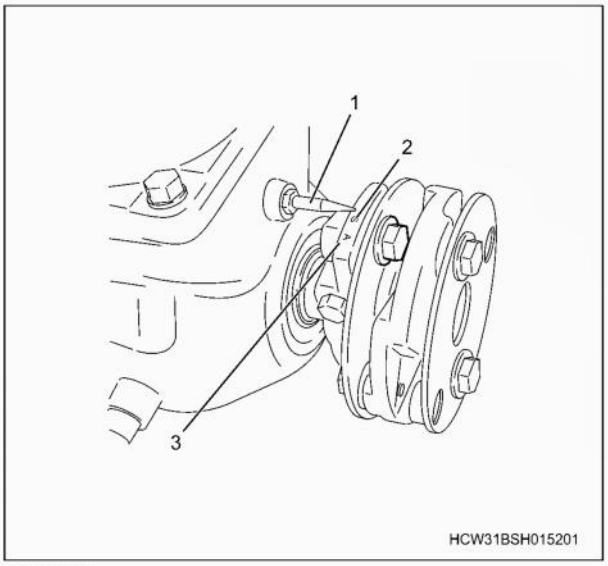
Legend

1. Reed valve (Rr)
2. EGR valve duct (Rr)
3. EGR valve (Rr)

19. Fuel temperature sensor
20. Fuel pipe
    - A small amount of fuel will gush out so hold a rag against the pipe when removing the pipe.

NOTE:
Seal the mounting parts of the removed pipe to prevent contamination with foreign matter.

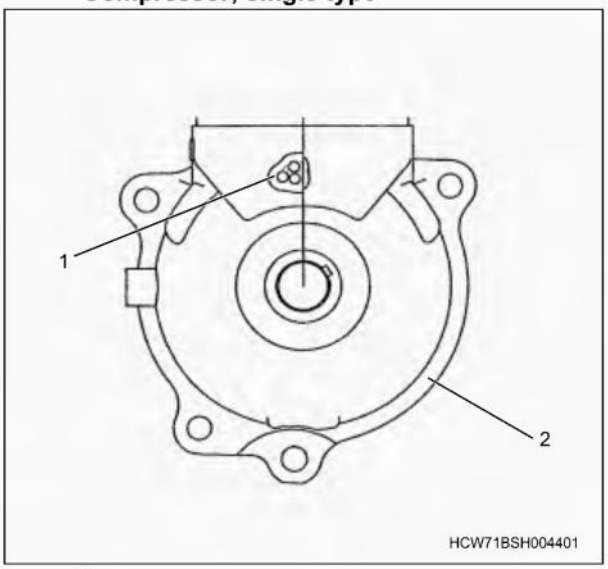
- Fit the O-ring into the gear case mounting flange area.



Legend

1. Pointer
2. "S" mark (engraved)
3. "A" mark (engraved)

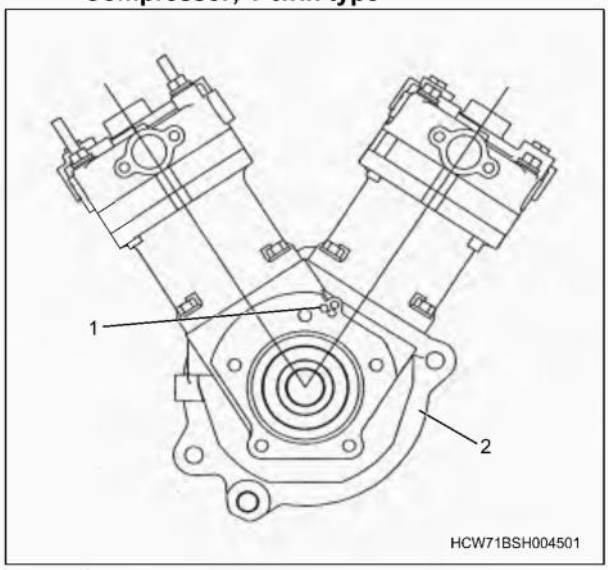
Compressor; single type



Legend

1. Pointer
2. Air compressor

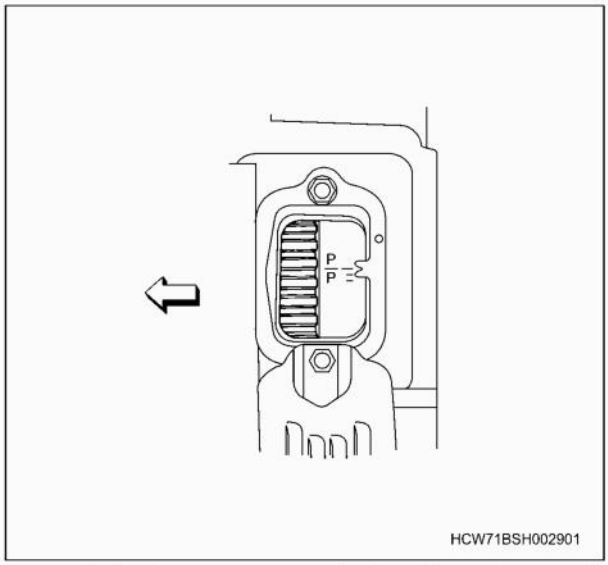
Compressor; V-twin type



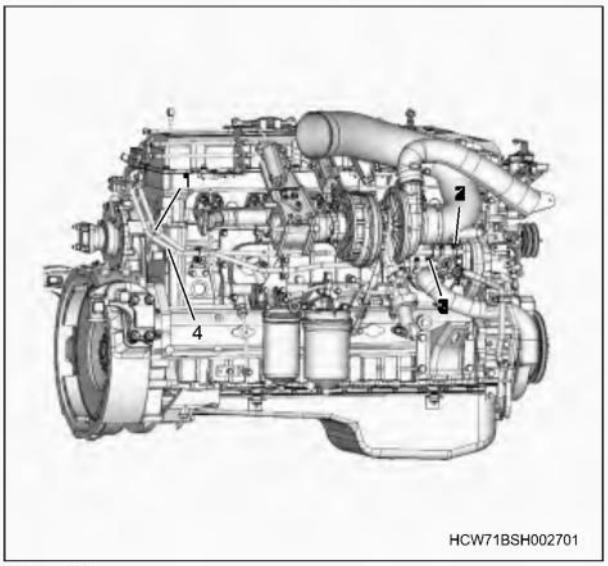
Legend

1. Pointer
2. Air compressor

- Turn the crankshaft in the forward direction, and align the engraved line on the flywheel with the timing pointer in such a way that the #1 cylinder is set at the compression top dead center. At this point, check that there is a clearance between the inlet and exhaust valves of the #1 cylinder.



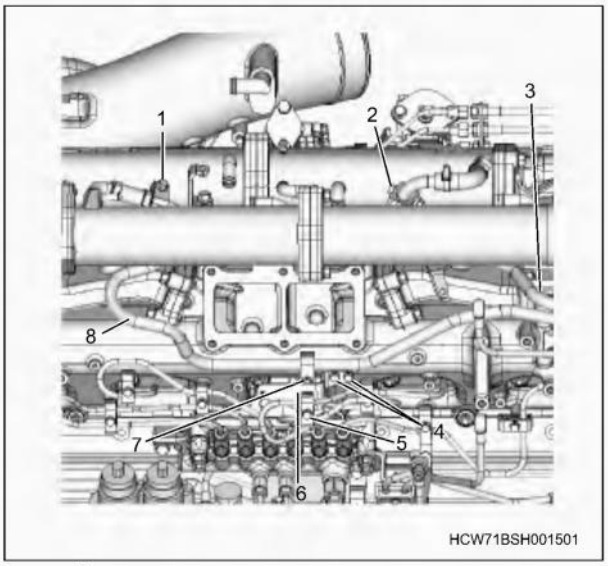
- Using the gear case stud as the guide, gently push the air compressor in until it strike the idle gear inside the gear case.



Legend

1. EGR cooler water return pipe (Ft. 2)
2. Water hose clip
3. Water hose clip
4. EGR cooler water return pipe (Rr. 2)

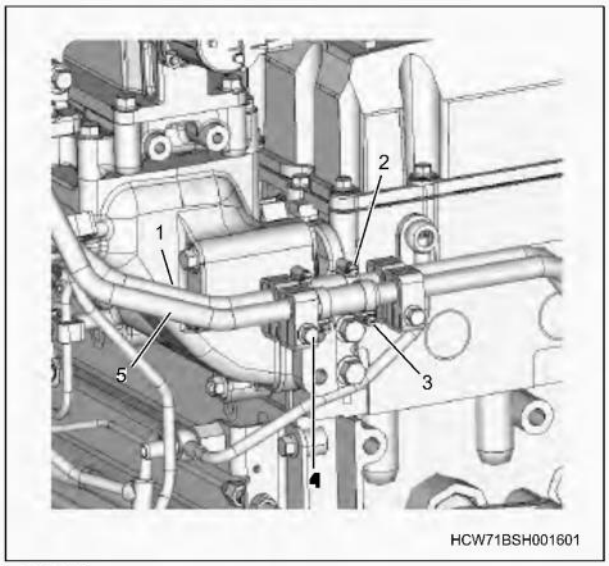
34. EGR cooler water return pipe (Ft. 1), (Rr. 1)
    - Mount the water pipe clip bracket.
    - Mount the fuel feed pipe clip.



Legend

1. Clip
2. Clip
3. EGR cooler water return pipe (Rr. 1)
4. Bolt
5. Clip
6. Bracket
7. Clip
8. EGR cooler water return pipe (Ft.1)

NOTE:
A water hose clip is attached horizontally.

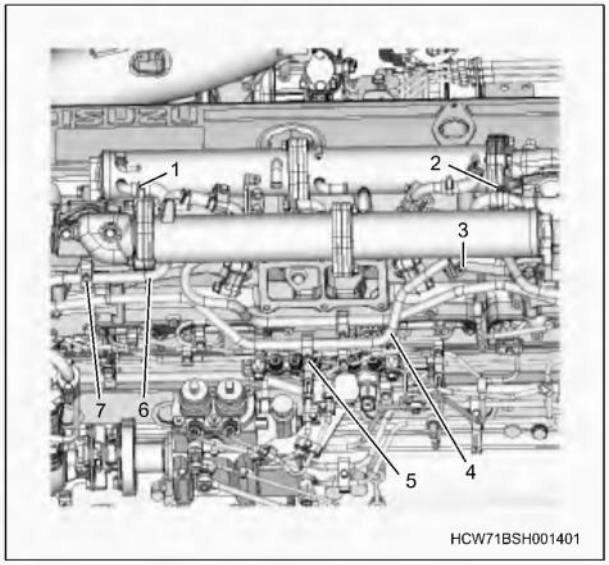


Legend

1. EGR cooler water return pipe (Ft. 1)
2. Water hose clip
3. Water hose clip
4. Clip
5. EGR cooler water return pipe (Rr. 1)

35. EGR cooler water feed pipe (Ft. 2), (Rr. 1)

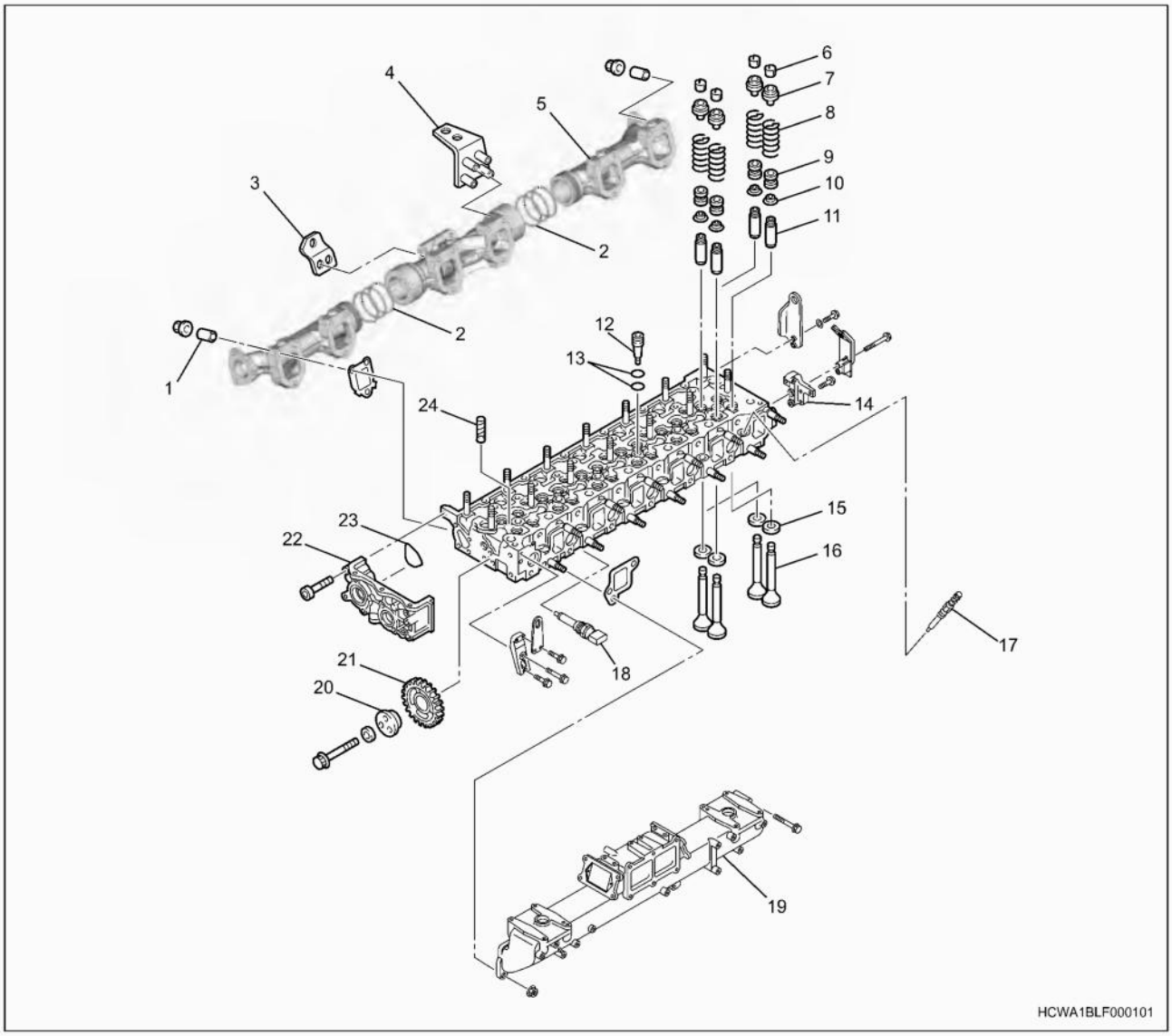
NOTE:
A water hose clip is turned to an engine upper part side.



Legend

1. Water hose clip
2. Water hose clip
3. Clip
4. EGR cooler water feed pipe (Rr. 1)
5. Clip
6. EGR cooler water feed pipe (Ft. 2)
7. Clip

Disassembly



Legend

1. Distance tube
2. Seal ring
3. Air duct bracket
4. Exhaust duct bracket
5. Exhaust manifold assembly
6. Split collar
7. Spring seat (upper)
8. Valve spring
9. Valve oil seal
10. Spring seat (lower)
11. Valve guide
12. Injector sleeve
13. O-ring
14. Inlet manifold bracket
15. Valve seat insert
16. Valve
17. Dummy glow plug
18. Engine coolant temperature sensor
19. Inlet manifold
20. Idle gear shaft C
21. Idle gear C
22. Gear case
23. O-ring
24. Bridge guide

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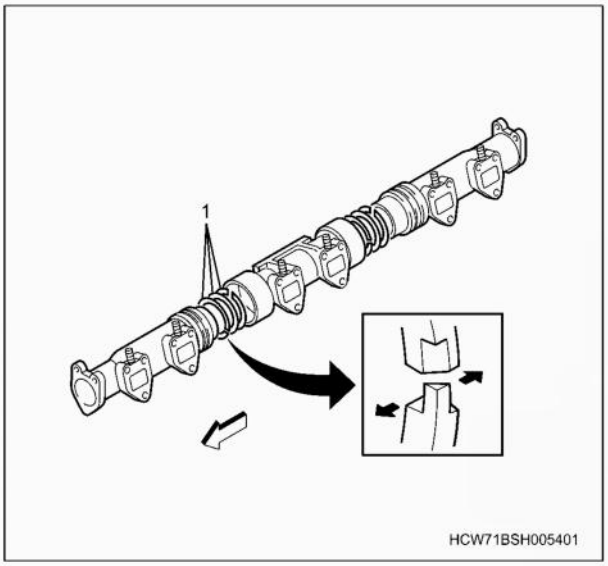
1. Dummy glow plug
2. Engine coolant temperature sensor
3. Gear case
4. O-ring

NOTE:
Ensure that seal rings (1) are installed with the right side up.

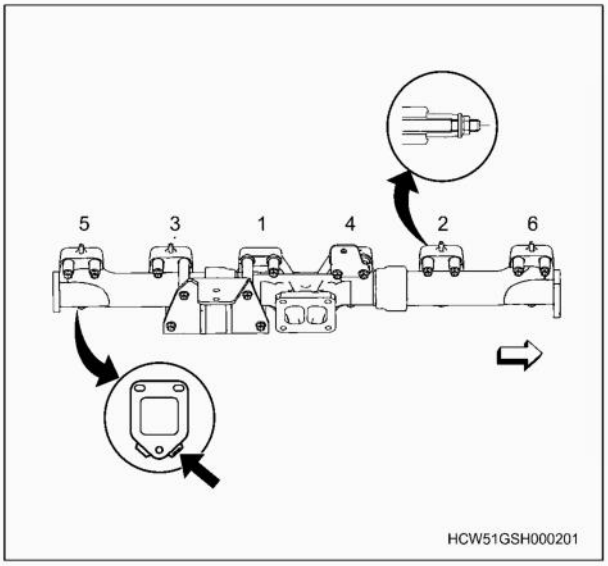


- Install the manifold in the cylinder head, and tighten up the parts in the numerical sequence shown in the illustration.
  (Tighten up the flanges in the clockwise direction starting with the one at the bottom.)

Tightening torque	47 N·m (4.8kgf·m/35lb·ft)

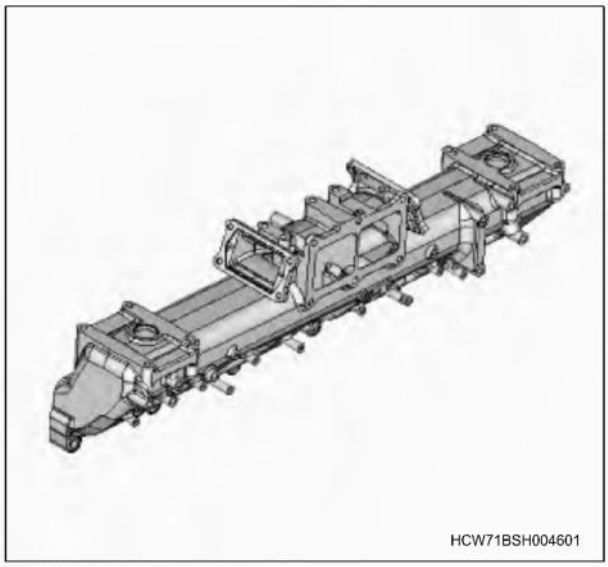
NOTE:

- Install it in such a way that the distance tube is facing the nut side.
- It must be assembled so that the engraved mark on the gasket is positioned at the bottom right.



14. Engine hanger (front)
15. Exhaust pipe bracket
16. Air duct bracket
17. Inlet manifold
    - Install the inlet manifold.

Tightening torque	20N·m (2.0kgf·m/14lb·ft)

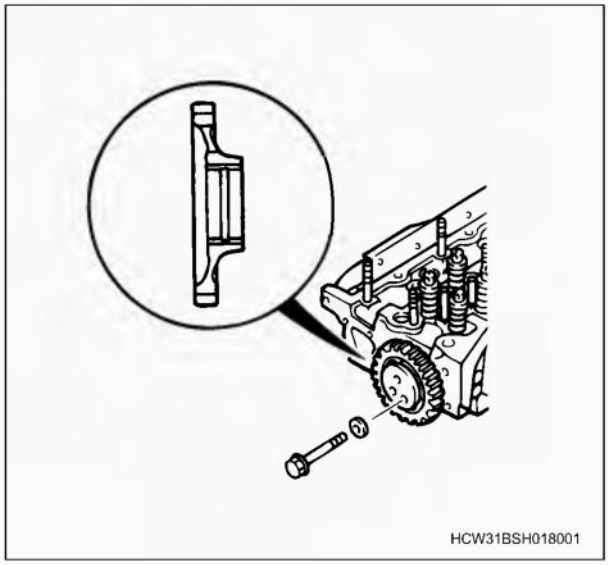


18. Idle gear C
19. Idle gear shaft C
    - Apply some engine oil to the idle gear shaft. Next, assemble the idle gear into the cylinder, and tighten the shaft.

NOTE:

- Check that the gear rotates smoothly.
- Take care not to damage the gear teeth surfaces since the teeth protrude beyond the cylinder head.

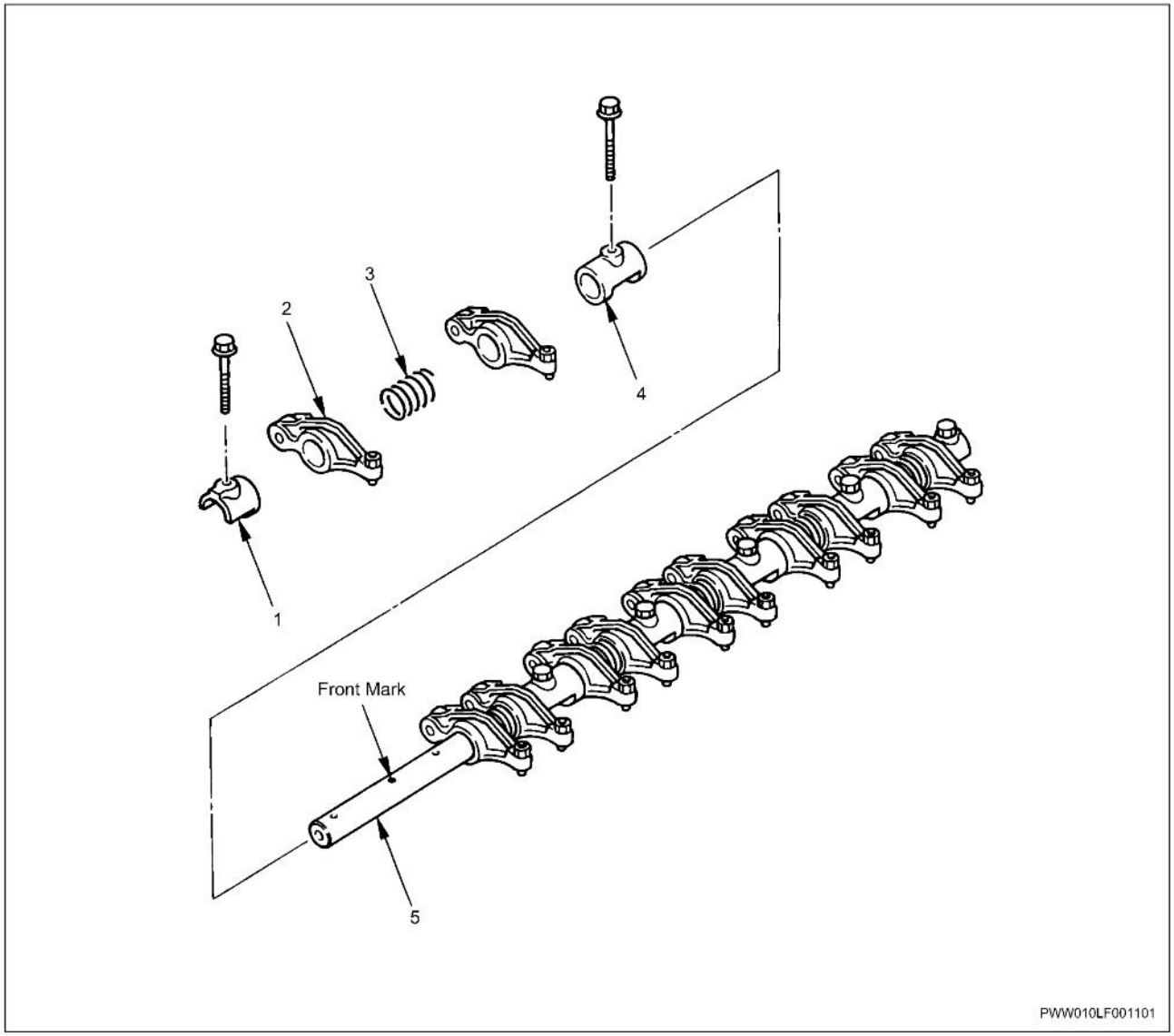
Tightening torque	40N·m (4.1kgf·m/30lb·ft)



20. O-ring

Rocker arm

Component parts



Legend

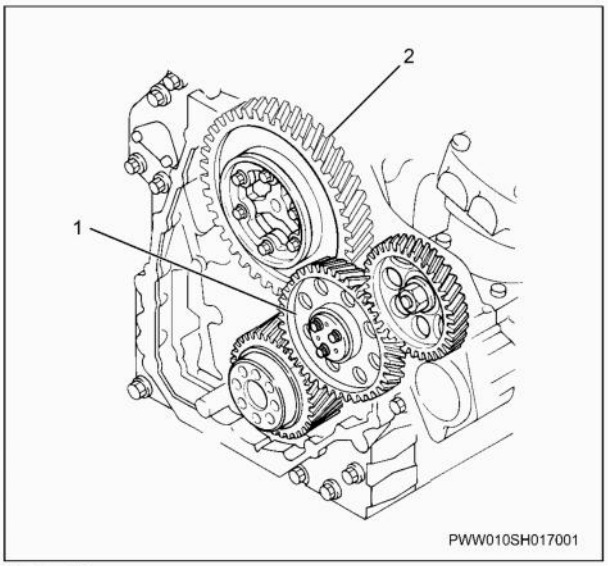
1. Bracket (front)
2. Rocker arm
3. Spring
4. Bracket (center)
5. Rocker arm shaft

Disassembly

1. Bracket (front)
2. Rocker arm
3. Spring
4. Bracket (center)
5. Rocker arm shaft
   - While pressing down on the bracket of the rocker arm shaft, draw out the tightening bolts (1) of the bracket (2), and remove the rocker arm, spring and bracket.

NOTE:

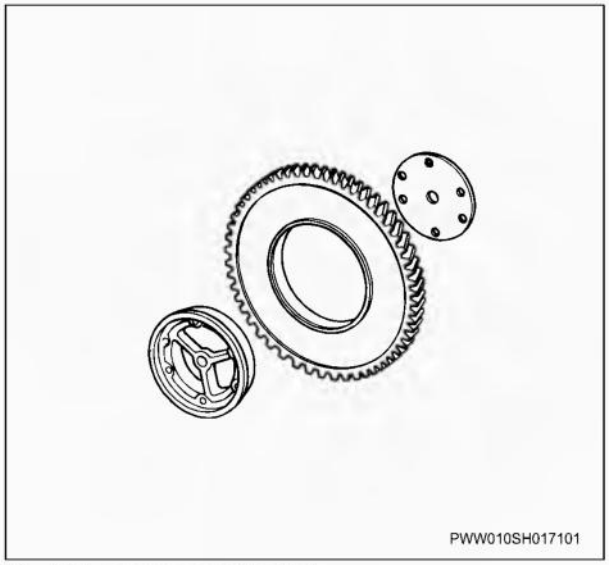
- When the tightening bolts of the bracket are drawn out, the force exerted by the spring will cause the rocker arm and other parts to pop out.
- All the bolts must be loosened uniformly a little at a time.



Legend

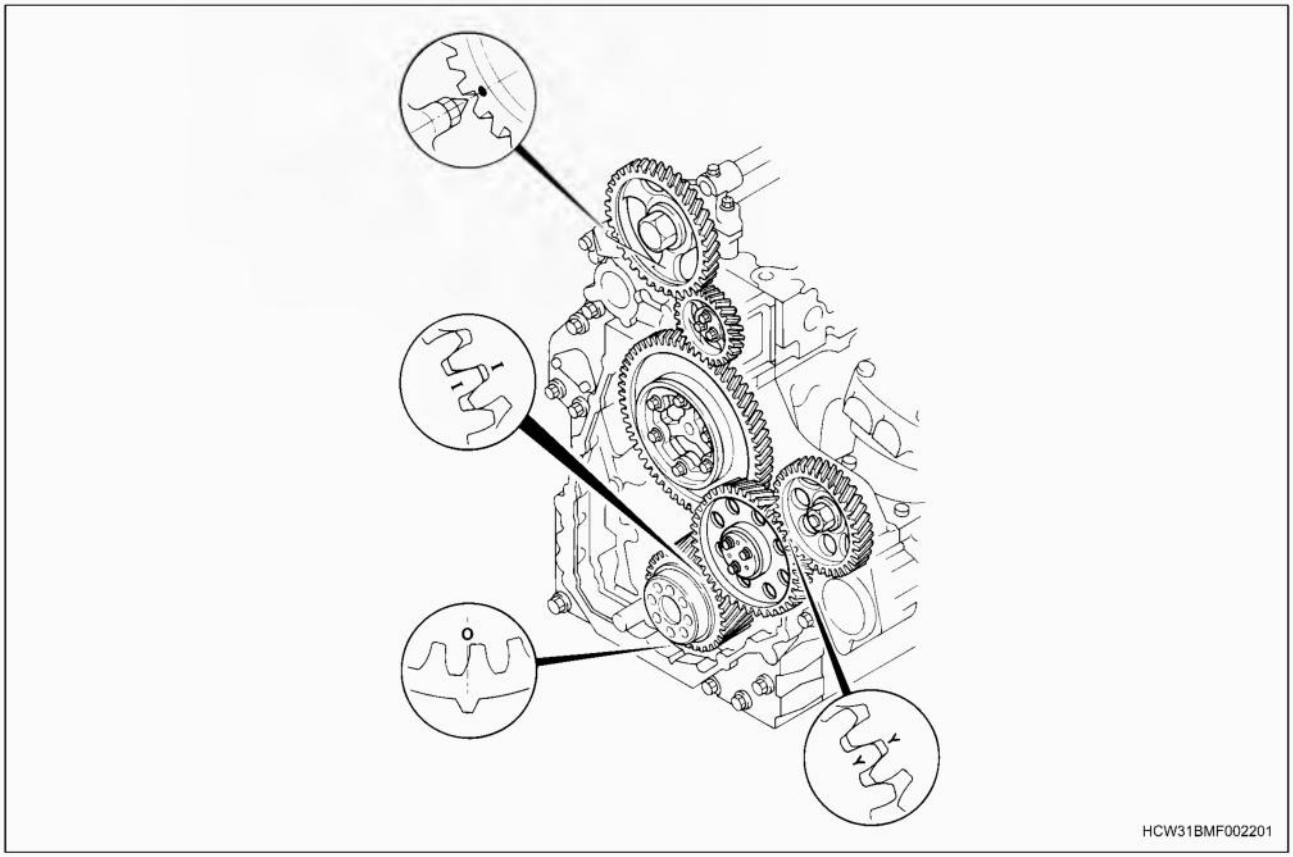
1. Idle gear A
2. Idle gear B

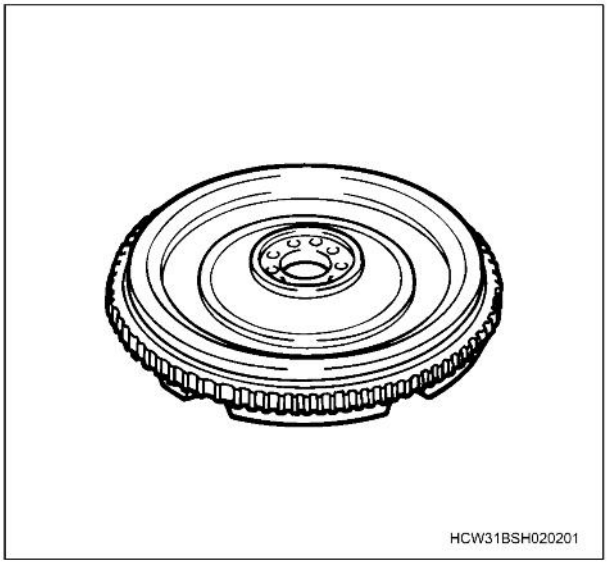
- Remove idle gear A and idle gear B
  The idle gears and thrust plate have a front and back so make identifying marks on them before removing them.



11. A/C compressor bracket
12. Timing gear case

Inspections




HCW31BSH020201

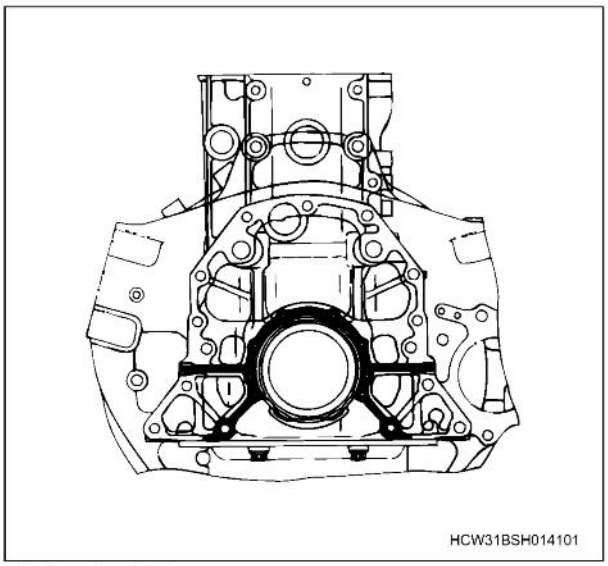
Installation

1. Flywheel housing
   - After applying some liquid gasket LOCTITE FMD-127 with a thickness of about 0.3 mm (0.0118 in) and a width of about 4 mm (0.1575 in), install the flywheel housing without delay.

Tightening torque	158N·m (16.1kgf·m/116lb·ft)

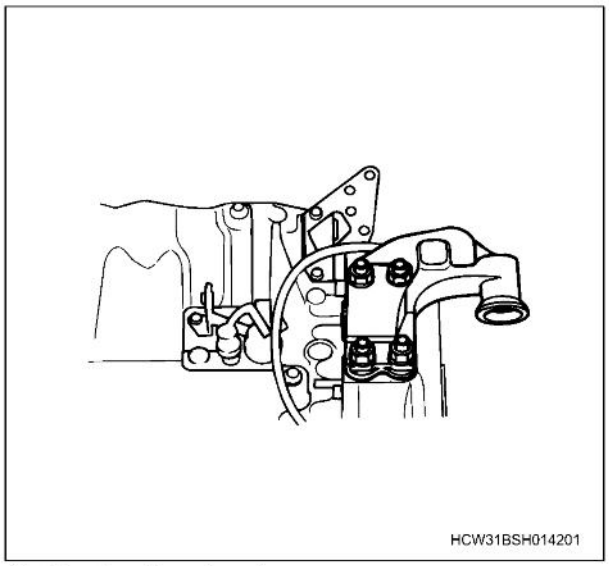
NOTE:

- Also apply a sufficient amount of the liquid gasket to the surface where the cylinder block and crankcase are joined.
- Ensure that none of the liquid gasket gets into the bolt holes.
- Tighten up the bolt by the knock pin first.


HCW31BSH014101

2. Engine foot rear
   - Apply some molybdenum-disulfide to the threaded areas and seating surfaces of the nuts, and start tightening the nuts from the place where the dowels are provided.

Tightening torque	147N·m (15.0kgf·m/108lb·ft) →275N·m (28.0kgf·m/203lb·ft)


HCW31BSH014201

3. Flywheel housing stay
   - Install the flywheel housing stay.

Tightening torque	113N·m (11.5kgf·m/83lb·ft)

4. Oil seal
   - Apply a thin film of engine oil to the outer circumference of the oil seal.
   - When honing delivered the oil seal, the lip of the oil seal was had spread with engine oil.
   - Using the installation tool, install the oil seal and slinger (gray color) at the same time.
   - Tighten the center bolt until the sleeve touches the adapter.

     Oil seal installation tool: 8-9819-4608-0

   - Upon completion of the press-fitting, clean up any oil stains.
   - After installing the oil seal, measure the distance from the crank end to the seal surface.

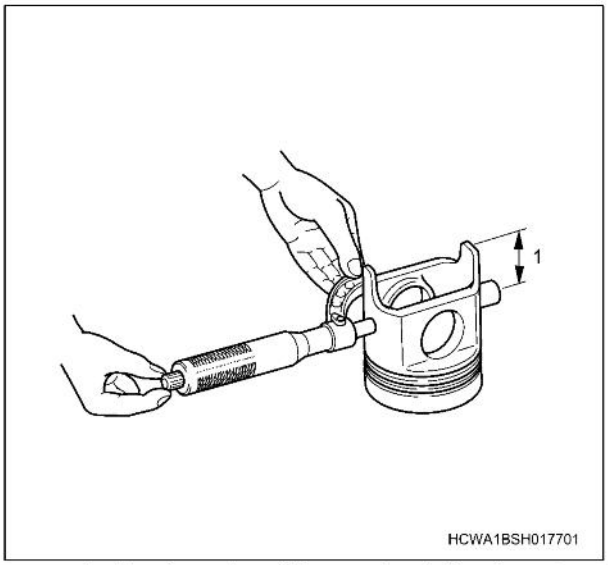
Reference dimension	6.7 to7.3 mm (0.2638 to 0.2874 in)

NOTE:

- Be absolutely sure to replace the slinger and oil seal together as a pair.

- Measurement method
  Measure the outside diameter of the piston at the grade position. Clean off any carbon and other foreign matter on the liner, measure the average maximum and minimum values (in the lateral direction of the cylinder block) at 130 mm (5.1181 in) from the top of the liner, and check whether the clearance between the piston and liner is within the reference value.
- When replacing only the liner, select it by grade.

Grade selection measurement position (from bottom of piston skirt in direction of the longer diameter)(1)	30 mm (1.1811 in)

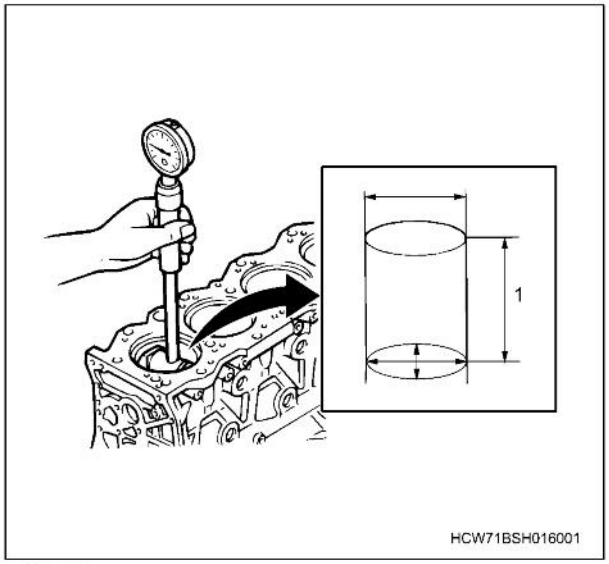


- Inside diameter of liner and outside diameter of piston

Grade symbol	Inside diameter of liner mm (in)	Outside diameter of piston mm (in)
A	147.000 to 147.010 (5.7874 to 5.7878)	146.850 to 146.879 (5.7815 to 5.7826)
B	147.011 to 147.020 (5.7878 to 5.7882)	146.860 to 146.890 (5.7819 to 5.7831)
C	147.021 to 147.030 (5.7882 to 5.7886)	146.871 to 146.900 (5.7823 to 5.7835)

Clearance between piston and liner (in direction of the longer diameter)

Standard	0.121 to 0.160 mm (0.0048 to 0.0063 in)



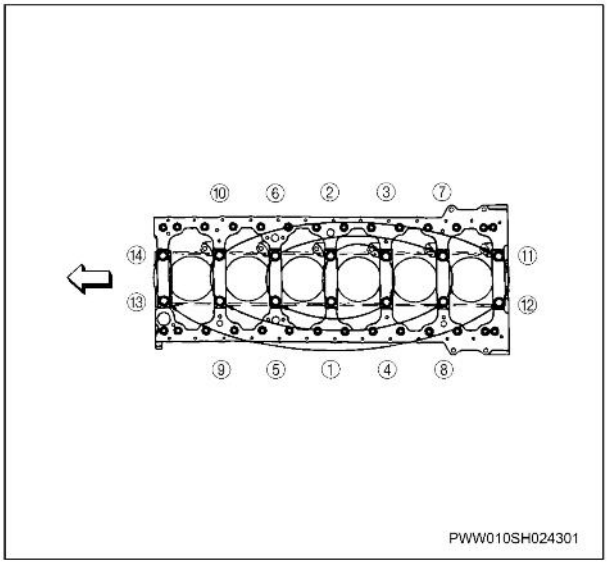
Legend
1. 130 mm (5.1181 in)

(Reference) Liner replacement

- The grade must be the same for both the inside diameter of the cylinder block bore and outside diameter of the liner.
- Select 1X for 1 or 3X for 2 and 3 according to the number engraved on the right side of the cylinder block, and assemble.

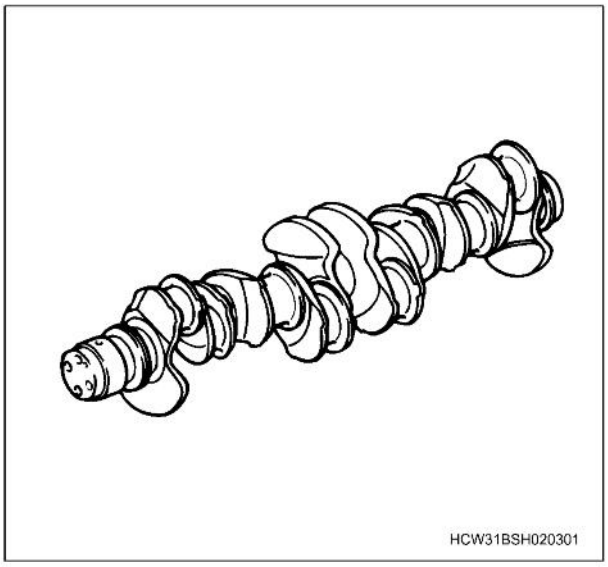
Cylinder block and liner combinations

Grade symbol	Cylinder block mm (in)		Outside diameter of liner mm (in)
1	151.600 to 151.610 (5.9685 to 5.9689)	1X	151.590 to 151.599 (5.9681 to 5.9685)
2	151.611 to 151.620 (5.9689 to 5.9693)	3X	151.600 to 151.610 (5.9685 to5.9689
3	151.621 to 151.630 (5.9693 to 5.9697)		

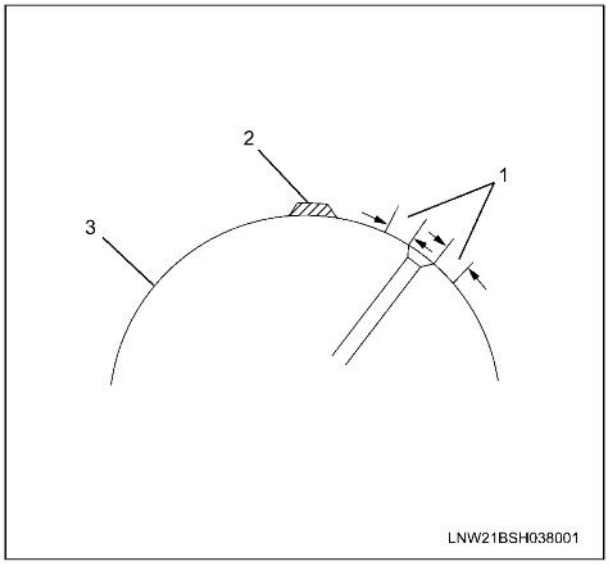


Presence/absence of nitro carburized zone

- Washing of crankshaft
  Wash the crankshaft. Remove the oil and grease particularly at the test locations (but not within 10 mm (0.3937 in) around the oil holes) using an organic solvent or other such agent.



- Inspection of nitro carburized zone
  Using a dropper or glass rod, drip the test solution onto the test area. At this point, hold the drip area horizontal so that the test solution will not run down.
  * Test solution: Cupric ammonium chloride dissolved in distilled water to form a 5% to 10% solution



Legend

1. Do not test within 10 mm (0.3937 in) around the oil holes.
2. Test solution
3. Crankshaft

- Judgment
  Crankshaft is re-usable: No changes at all are apparent after 30 to 40 seconds.
  Crankshaft cannot be re-used: After 30 to 40 seconds, the test solution (a light blue color) turns transparent, and the place onto which it has dripped changes to a copper color.
- Steps to be taken after testing
  The test solution (1) is highly corrosive so use a cloth to wipe it up immediately after the test, and wash the places which were exposed to it with water or steam, etc.

CAUTION:

- Do not allow the test solution to come into contact with your eyes, hands, clothing, etc. If some solution should get into your eyes, rinse them immediately with large quantities of pure water, and seek medical assistance.

Cooling System

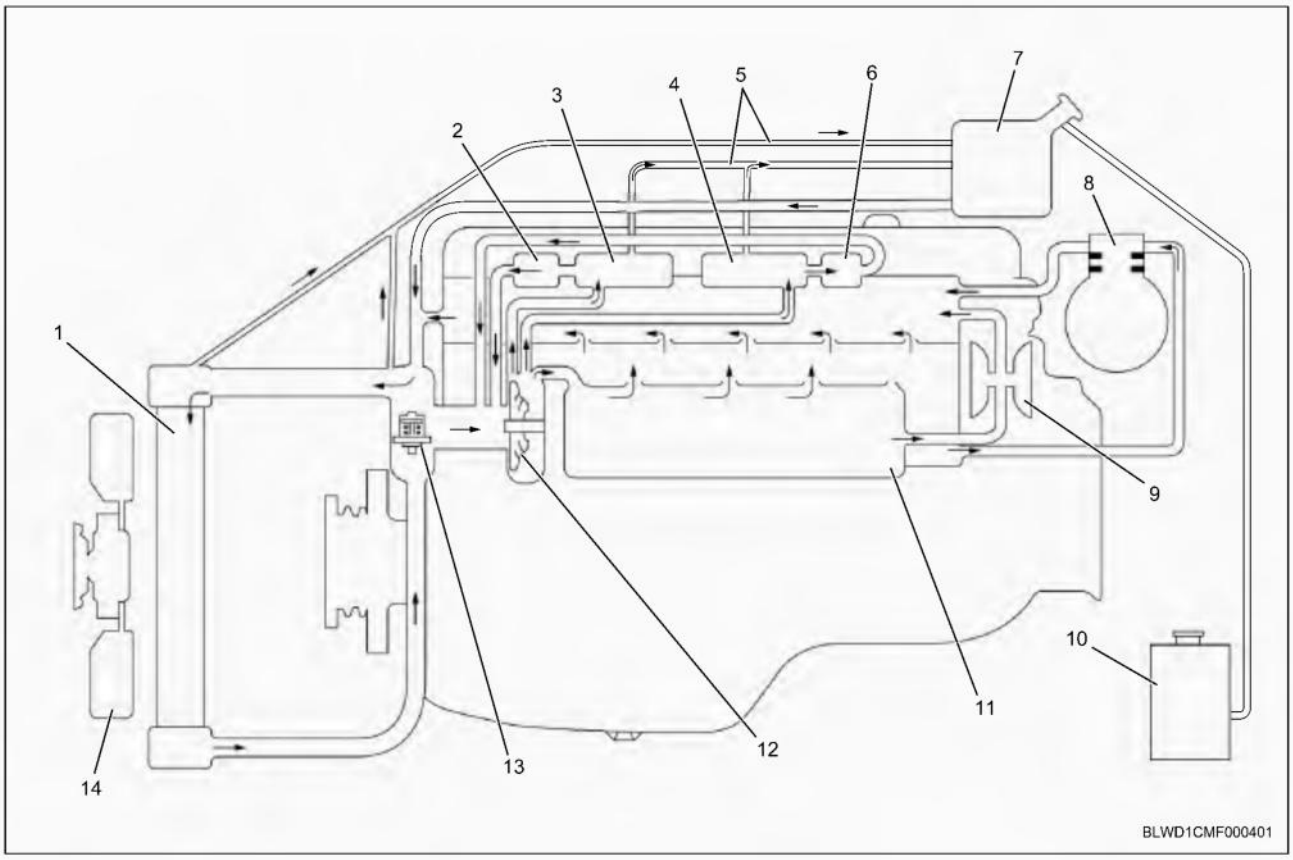
Maintenance precautions

WARNING:
Do not loosen or remove radiator cap when coolant is hot. Steam or hot water may escape from the radiator and can cause burns. When opening the radiator cap, make sure the coolant has cooled off, cover the cap with a thick cloth and release pressure by turning slowly and then remove the cap.

Description of functions and operation

Cooling system

The cooling system has forced circulation and the main components are a water pump, thermostat and a radiator.



Legend

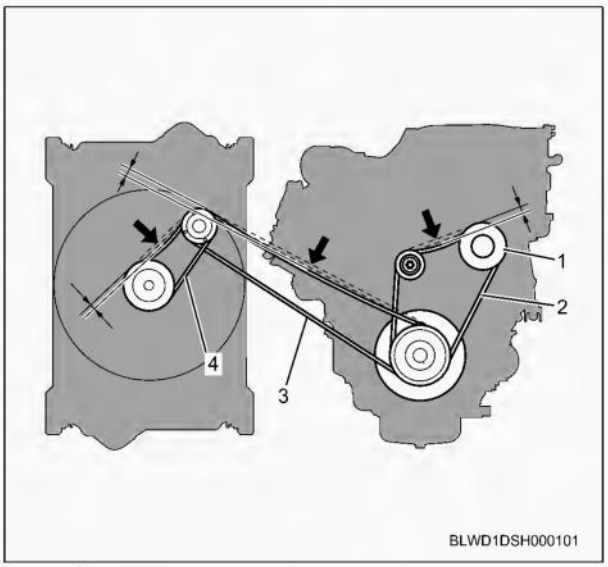
1. Radiator
2. EGR cooler
3. EGR cooler
4. EGR cooler
5. Air removal pipe
6. EGR cooler
7. Sub tank
8. Air compressor
9. Turbocharger
10. Reserve tank
11. Oil cooler
12. Water pump
13. Thermostat
14. Cooling fan

Fan drive belt

Adjustment

1. Adjust the fan drive belt.
   - Adjust the amount of flex to the specified value by pressing the center of the belt with the a load of 98 N (10.0 kgf).
   - Adjust the vibration frequency to the specified value using a sonic tension meter.

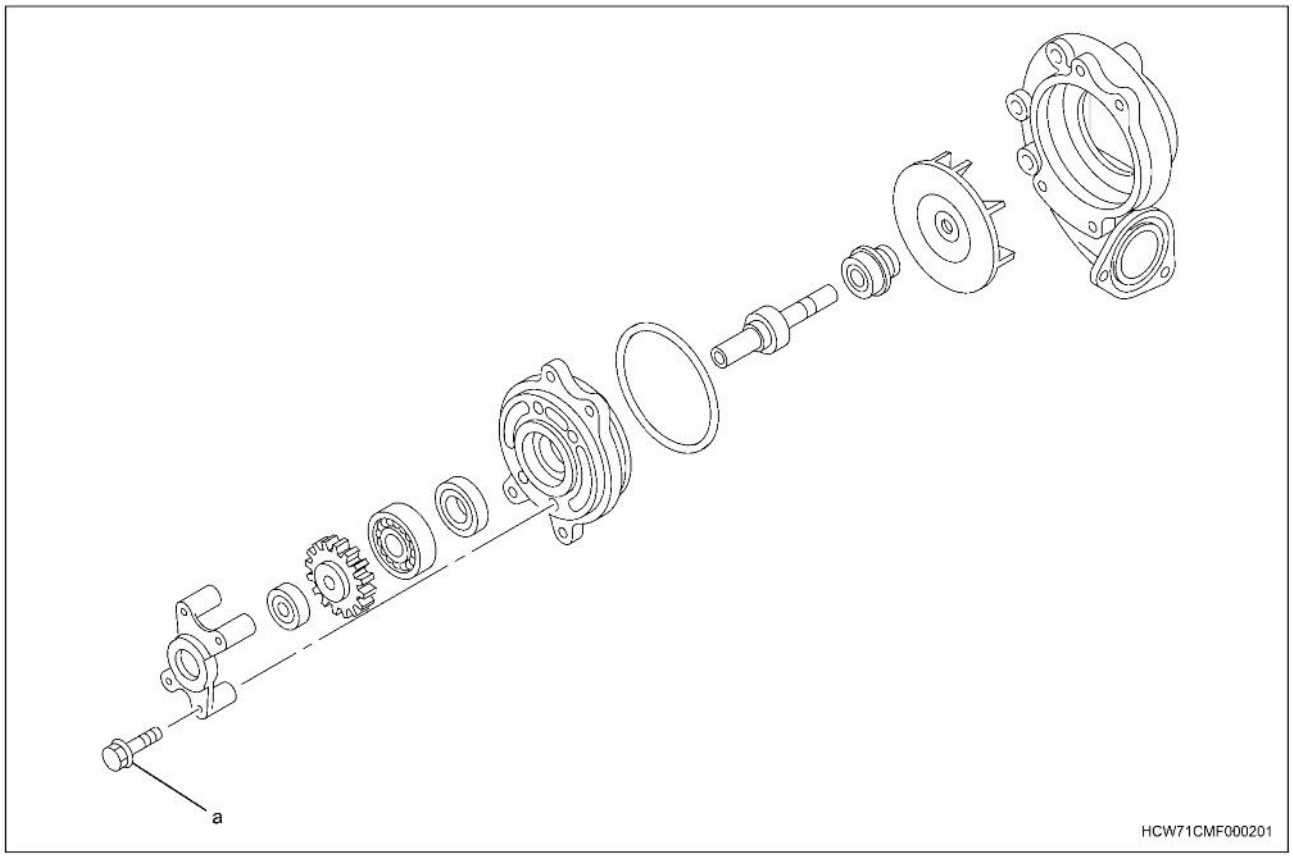
Standard value (amount of deflection)		
Generator belt	New belt	5 - 6 mm
	Used belt	7 - 8 mm
Fan drive belt		20 mm
Cooling fan belt		10 mm
Standard value (vibration frequency)		
Generator belt	New belt	99 - 115 Hz
	Used belt	85 - 96 Hz



Legend

1. Generator
2. Generator belt
3. Fan drive belt
4. Cooling fan belt

Tightening torque table



(a) 28 N·m (2.9 kgf·m / 21 lb·ft)

Symptom: Insufficient output

Condition	Possible Cause	Correction
Insufficient output	Clogging of fuel tank breather	Clean the fuel tank breather
	Air has found its way inside the fuel system	Remove air in fuel system
	Leak or blockage in fuel system	Repair or replace the fuel system
	Water has found its way inside the fuel system	Replace fuel
	Fuel filter element is clogged	Replace the element
	Adherence of injector nozzle	Replace the injector
	Engine control system failure	Diagnose the engine control system

Reassembly

NOTE:
Drain out water, when fuel filter will be covered with water. If driving is continued not draining, there is a possibility of damaging a fuel injection system.
In addition, surely use the genuine filter for engine at the time of element exchange.

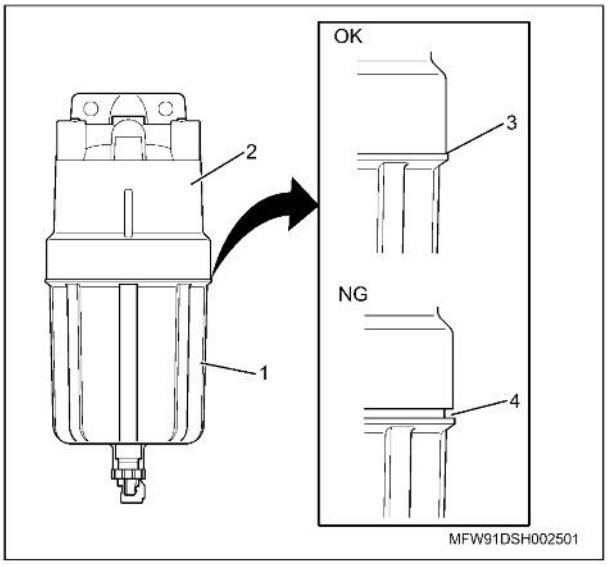
1. Install the new O-ring to the clear element case.

NOTE:
Use care not to damage the O-ring.

2. Install the filter element.
   - After light coating the gasket of the new filter element with diesel fuel, place the element until it touches the filter body.
3. Install the clear element case to the filter body.
   - After light coating the O-ring of element case with diesel fuel, slowly turn the clear element case clockwise.

NOTE:
Be careful not to let the O-ring catch in the screw threads.

   - Slowly tighten the clear element case with a filter wrench until it touches the filter body.



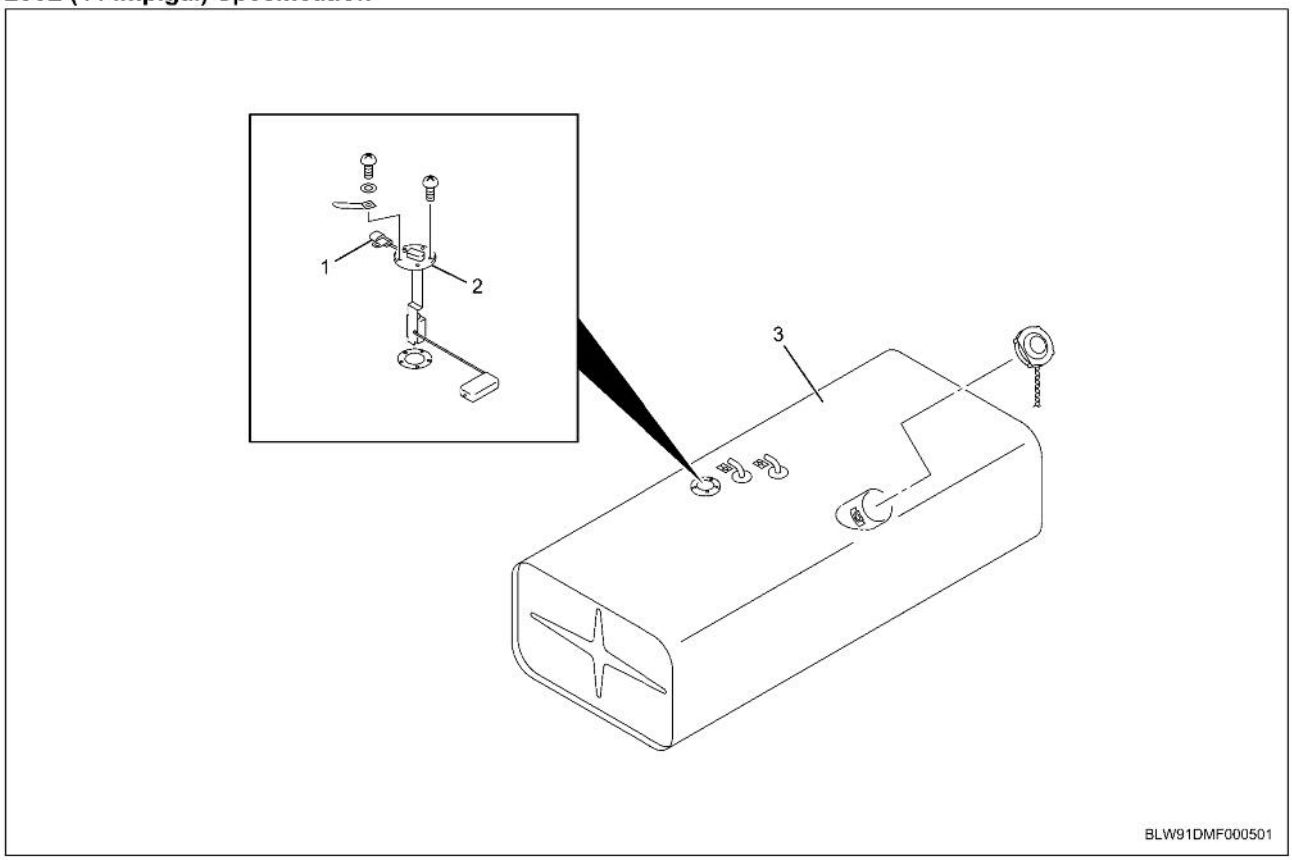
Legend
1. Clear element case
2. Filter body
3. No gap
4. Gap

4. Tighten the drain plug and connect the water separator switch connector, then bleed the fuel system.

Fuel Tank Unit

Component parts

200L (44 Imp.gal) Specification



Legend

1. Fuel tank unit connector
2. Fuel tank unit
3. Fuel tank

Removal

1. Remove the wiring connector from the fuel tank unit.
2. Remove the attachment screw, and remove the fuel tank unit.

NOTE:

- When removing and replacing the fuel gauge unit, make sure there is no interference around the perimeter, and be sure not to distort the shape of the arm.
- After removing the fuel tank unit, cover it to ensure debris does not enter the tank.

Inspection

The internal resistance is changed by the position of the float of the fuel tank unit (fuel level height), which in turn moves the fuel meter indicator needle.

1. Inspect the resistance value between connector terminal (1) – (2) while moving the float from “E” to “F”
2. Check that the remaining quantity warning indicator lamp lights when the float is in the “E” position.
   Replace the faulty parts if there are any abnormalities.

Symptom: The starter motor does not stop after the engine starts and the starter switch is released

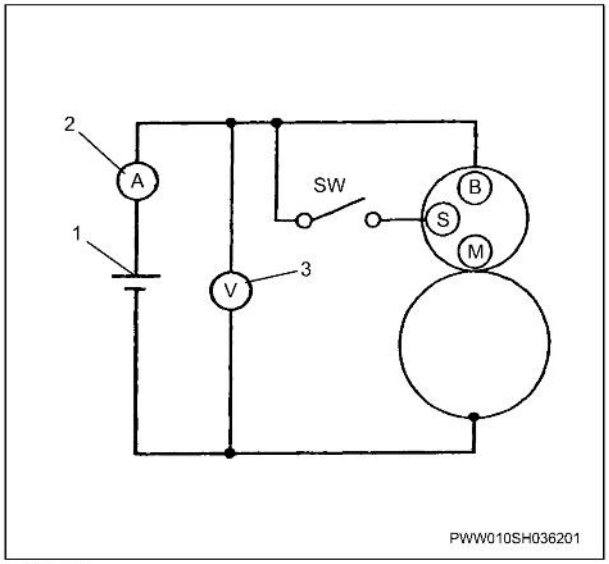
Condition	Possible Cause	Correction
The starter motor does not stop after the engine starts and the starter switch is released	The starter switch contact is not returning all the way	Replace the starter switch
	The starter relay contact is not returning all the way	Replace the starter relay
	The magnetic switch coil is shorted	Replace the magnetic switch

Main specifications

Model (Manufacturer)		Mitsubishi
Rating		
Voltage	V	24
Output	kW	7.0
Time	sec	30
Pinion teeth count		11
Rotational direction (see from pinion side)		Clockwise
Weight (approx.)	kg (lb)	12.7 (28.0035)
No-load characteristics		
Voltage/Current	V/A	Max. 23.5 / 125
Rotational speed	r/min	Min. 3000
Load characteristics		
Voltage/Current	V/A	15.8/600
Torque	N·m (kgf·m/lb·ft)	Min. 52 (5.3 / 38.3349)
Rotational speed	r/min	Min. 900
Locking characteristics		
Voltage/Current	V/A	Max. 5 / 1,600
Torque	N·m (kgf·m/lb·ft)	Min. 117 (11.9 / 86.0727)

- After adjusting the pinion protrusion position, connect the starter and measuring instruments as shown in the illustration.

NOTE:
Use wire of sufficient thickness and make sure connections are tight.



Legend
1. Battery
2. Ammeter
3. Voltmeter

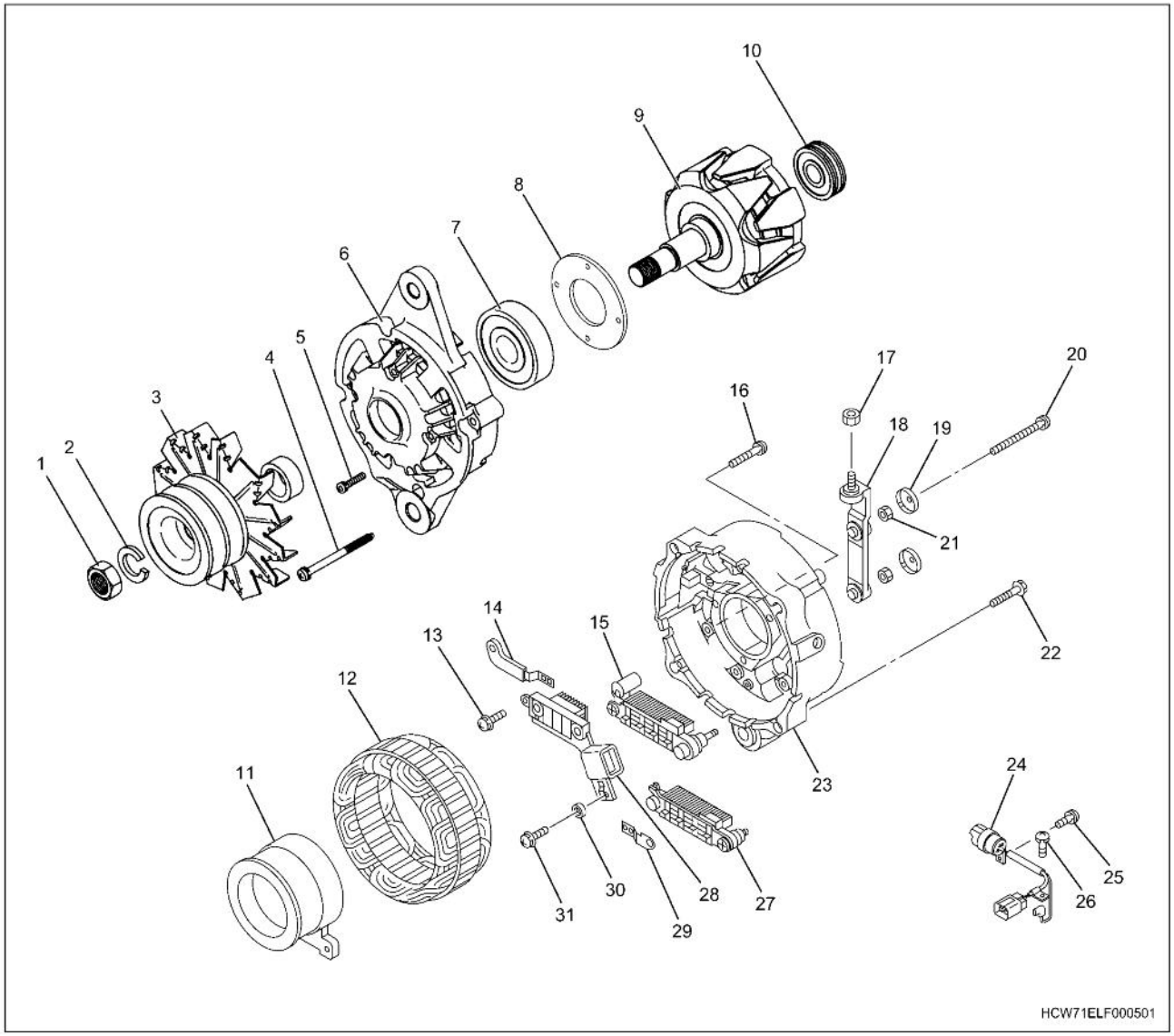
- Close the switch and read the rotational speed, current and voltage. Then, compare readings against specifications.
  If readings do not meet specifications, disassemble and inspect the starter again.

8. Specifications

Item			Standard/Limit
No-load characteristics	Voltage	V	23.5
	Current	A	Max. 125
	Rotational speed	r/min	Min. 3000
Commutator	Outer diameter	mm (in)	38.7 (1.5236)
	Wear limit	mm (in)	38.1 (1.5000)
Commutator	Undercut	mm (in)	0.8 (0.0315)
	Limit	mm (in)	0.2 (0.0079)
Brushes	Length	mm (in)	23 (0.9055)
	Wear limit	mm (in)	12 (0.4724)
Brush spring	Pressure	N (lbf)	33 – 45 (7.42 – 10.12)
	Limit	N (lbf)	20 (4.4969)
Pinion protrusion position		mm (in)	0.5 – 2.0 (0.0197 – 0.0787)

Generator

Component parts



Legend

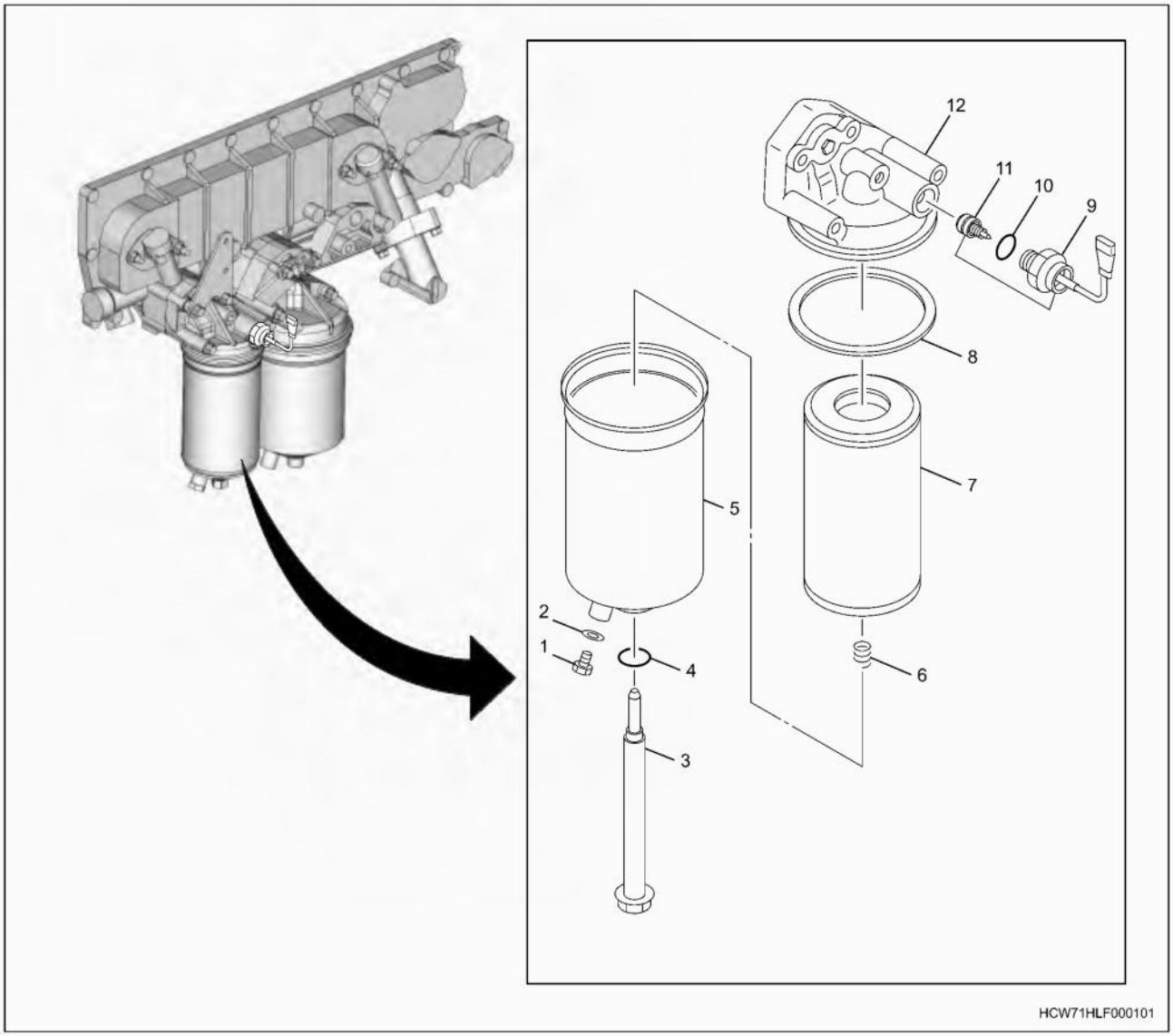
1. Nut
2. Spring washer
3. Pulley
4. Through bolt
5. Screw (for tightening retainer)
6. Front bracket
7. Front bearing
8. Retainer
9. Rotor
10. Rear bearing
11. Coil assembly
12. Stator
13. Screw (for tightening regulator)
14. Terminal B
15. Rectifier
16. Screw (for installing regulator)
17. Terminal B tightening nut
18. Terminal B bolt
19. Terminal B cap
20. Screw (for installing terminal B)
21. Terminal B nut (bolt)
22. Bolt (terminal E)
23. Rear bracket
24. Connector assembly
25. Screw (for installing connector)
26. Screw (for installing connector)
27. Rectifier
28. IC regulator
29. Plate (LH)
30. Spacer
31. Screw (for installing regulator)

Functional inspection:

- When inspecting or repairing the exhaust system, confirm that there is sufficient clearance between the floor and the body.
- Damage caused by overheating or vibration of body panels can lead to penetration of exhaust gas into the vehicle cabin.
- Inspect the connection for looseness and damage well as exhaust gas leakage.
- Inspect the clamps and rubber for deterioration, cracks, and damage.
- If pipes or the silencer are damaged or dented, repair or replace the damaged part(s).
- Inspect for dents, damage or holes and cracks caused by corrosion as well as abnormal noise during operation.

Oil filter

Component parts



Legend

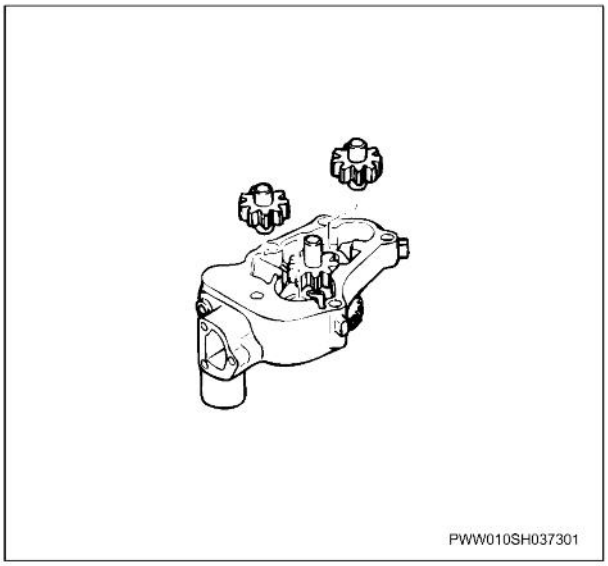
1. Drain plug
2. O-ring
3. Center bolt
4. O-ring
5. Oil filter case
6. Spring
7. Element
8. O-ring
9. Oil filter warning switch
10. Gasket
11. Valve
12. Bracket

Disassembly

1. Drain plug
2. O-ring
   - Loosen the drain plug and drain the oil from the filter.
3. Center bolt
4. O-ring
5. Oil filter case
6. Spring
7. Element
8. O-ring
   - Loosen the center bolt and detach the case, spring, element and O-rings.
   - Clean inside the case.

Reassembly

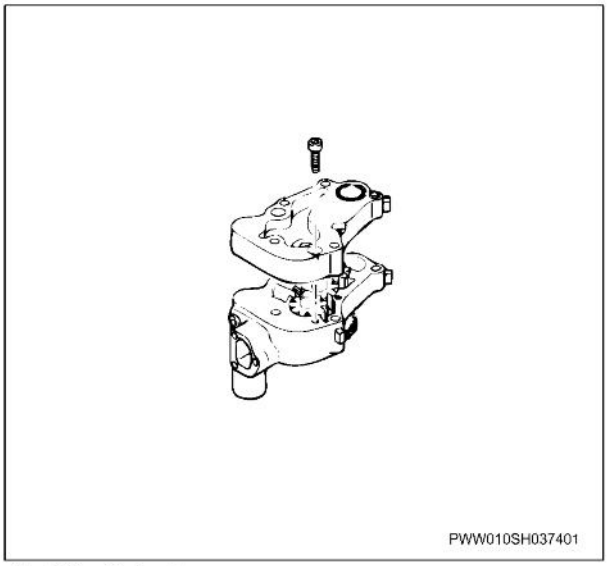
1. Oil pump body
2. Driven gear
   - Apply engine oil to the driven gear and install it on the pump body.



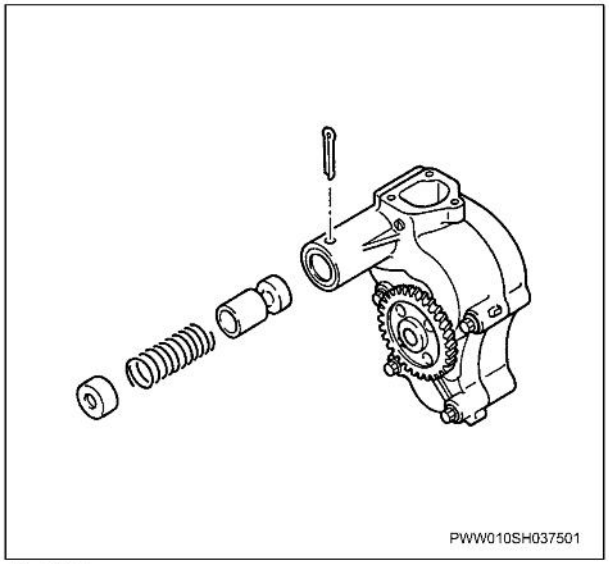
3. Oil pump cover
   - Install the oil pump cover.

Tightening torque

M10	39 N·m (4.0 kgf·m/29 lb·ft)
M8	18 N·m (1.8 kgf·m/13 lb·ft)



4. Oil relief valve
5. Spring
6. Spring seat
7. Split pin
   - Apply oil to the oil relief valve, spring and spring seat, install in the given order and lock in place with the split pin.

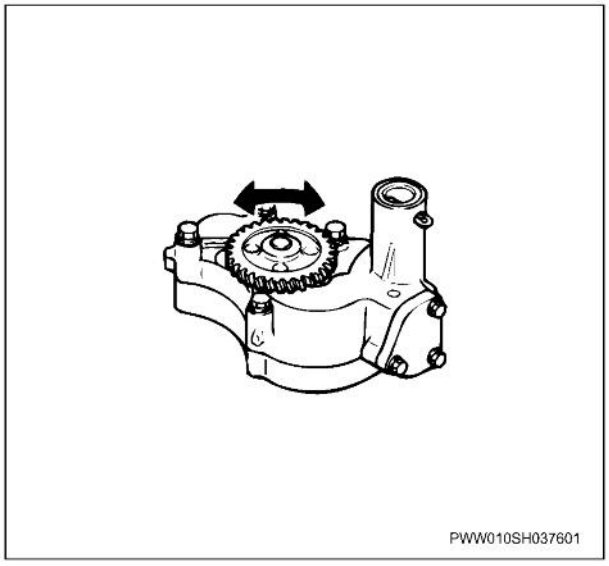


8. Ball
9. Cover

Tightening torque	18 N·m (1.8 kgf·m/13 lb·ft)

Oil pump operation test

- After the pump has been assembled, turn the drive gears by hand and check they rotate smoothly.



ENGINE

Induction
(6WG1)
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