
ENGINE MECHANICAL

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ENGINE MECHANICAL SYSTEM PRECAUTION

1. Read this manual carefully before preceding with any service, to avoid unnecessary loss caused by improper operation.
2. During servicing, follow the procedure described in the manual to avoid technical errors and ensure safety and efficiency.
3. Before the servicing, prepare a fire extinguisher in a specified place if necessary, for emergency use.
4. Before the servicing, the mechanic shall wear necessary protective shoes, gloves and goggles, to ensure personal safety.
5. Before the servicing, ensure the vehicle is properly protected, such as the protective covers for seating, steering wheel, floor and engine compartment.
6. Before lifting the vehicle, check whether the lifting system is working properly, whether the vehicle is appropriately parked and whether the connection points between the lifting arm and the vehicle are optimally adjusted. Before lifting or lowering the vehicle, ensure the space beneath the vehicle is clear.
7. If any fuel/power shutdown or pressure discharge is required during the servicing, follow the standard procedures. For example, disconnect the fuel system and release the pressure before removing the fuel rail, or disconnect the battery negative cable before removing the electrical parts. Or it may cause vehicle damage or personal injury.
8. Once the pipe or fitting is disconnected, make proper protection to prevent contamination or foreign objects from entering.
9. When servicing the interior of the engine, follow the specified procedure and carefully handle with the fragile parts.
10. Use the specified torque, sequence, direction or angle when tightening the bolts and nuts, without exceed force.
11. During engine overhaul, such as the inspection on crank, pistol and cylinder head, thoroughly clean and lubricate the parts before installation.
12. When servicing the engine, if it is necessary to clear the previous sealant before installing the oil tray, ensure the sealant interface is even and smooth, install a new seal gasket and apply a proper amount of sealant.
13. Check the battery grounding polarity (negative grounding in this diesel engine).
14. Do not adjust the electronic throttle pedal , or it may change the closing angle of the throttle valve and the engine may not work properly.
15. Do not pull up the injector cable when the engine is running. In any case, cylinder failure will cause burning corrosion by injecting the unburnt mixture into the postprocessing preheat diesel oxidation catalyst. If necessary, remove the postprocessing preheat diesel oxidation catalyst.
16. Use the engine oil with rated grade and velocity. Otherwise it will exacerbate engine wear.

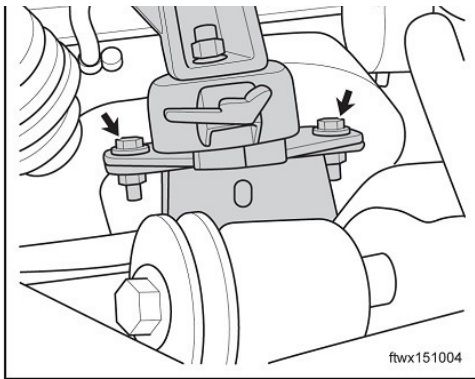
	Faulty electronic throttle valve	Check electronic throttle valve and replace it if necessary
	Faulty the fuel injector	Check harness and replace the fuel injector if necessary
	Other electrical parts are faulty	Check the electrical parts and replace them if necessary
Engine loss of power	Faulty turbocharger and turbocharger actuator	Check the turbocharger and turbocharger actuator and replace them if necessary



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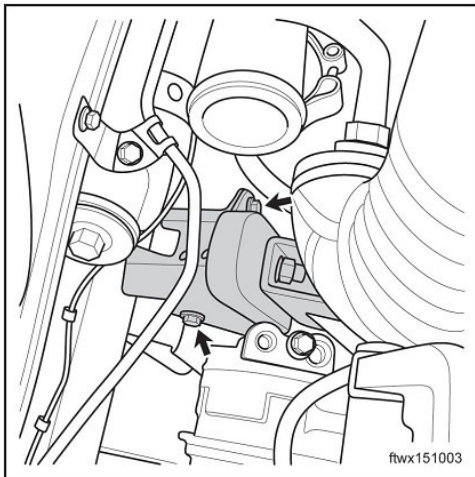
ENGINE MECHANICAL - ENGINE MECHANICAL SYSTEM

Defect	Possible Cause	Recommended Solution
	Fuel filter blocked, contaminated fuel system	Clean fuel system and replace fuel filter
	Incorrect valve timing	Reinstall and adjust toothed timing belt
	Cylinder gasket leakage	Replace cylinder gasket
	Cylinder pressure (low)	Measure cylinder pressure and overhaul if necessary
	Valve not airtight	Check valve and valve seat and replace them if necessary
	Postprocessing preheat diesel oxidation catalyst (DOC) blocked	Replace high qualified fuel and replace postprocessing preheat diesel oxidation catalyst (DOC)
	Postprocessing Diesel Particulate Filter (DPF) blocked	Replace high qualified fuel and replace postprocessing Diesel Particulate Filter (DPF)
	Pipe leakage of the fuel system	Check fuel system
	Poor performance of fuel injector	Replace fuel filter, clean injector and replace it if necessary
	Exhaust system blocked	Check exhaust system
	Air inlet system insufficient	Check air inlet system
	Faulty the fuel pump	Check the fuel pump
	Other electrical parts are faulty	Check the electrical parts and replace them if necessary

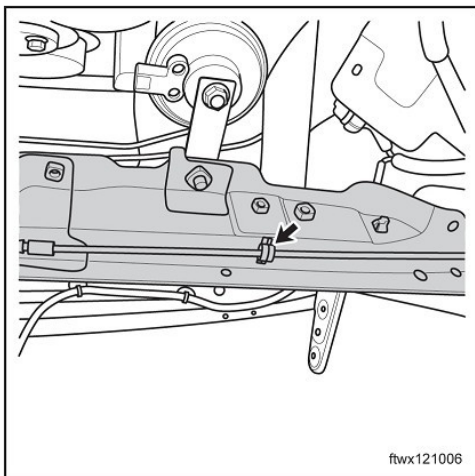


- 44 . Tighten the right suspension fixing bolts and nuts.**

Torque: 45~55 N•m

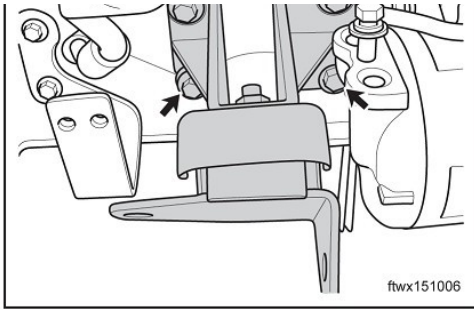


- 45 . Refit the transmission assembly. (refer to "Chapter 41 Transmission (JC538) - transmission assembly, Replacement).**
- 46 . Install condenser assembly. (Refer to "Chapter 61 heating & A/C - condenser , overhaul")**



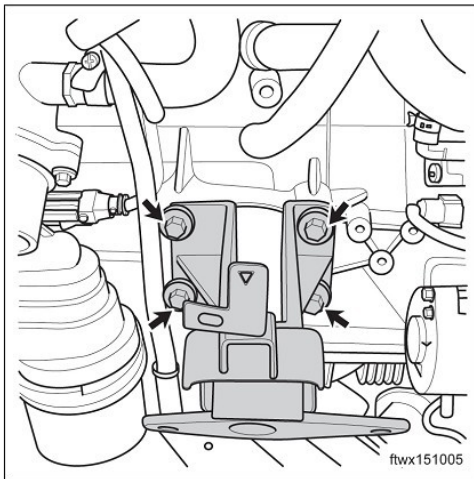
- 47 . Mount the fixing clip of the water tank upper beam and the engine hood lock stay wire.**





ENGINE MECHANICAL - ENGINE MOUNTING

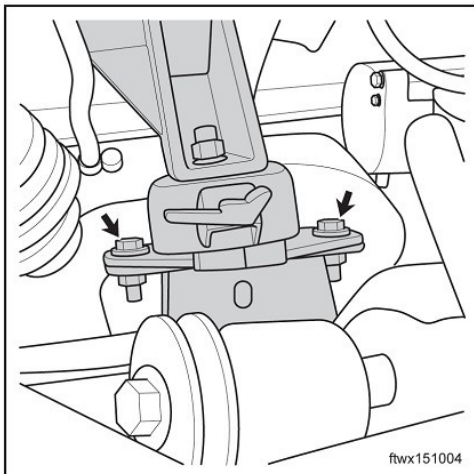
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- 8 . Install the left suspension assembly, tighten the fixing bolts.

Torque: 73~89 N•m

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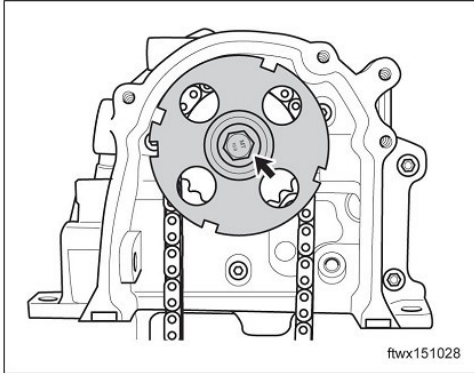
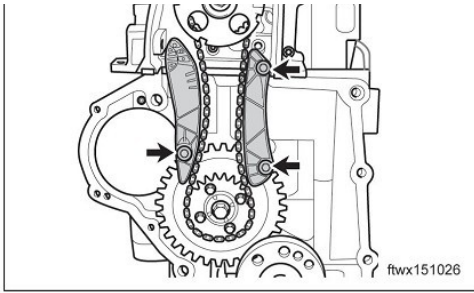


- 9 . Put the power assembly in place, tighten the left suspension fixing bolts and nuts.

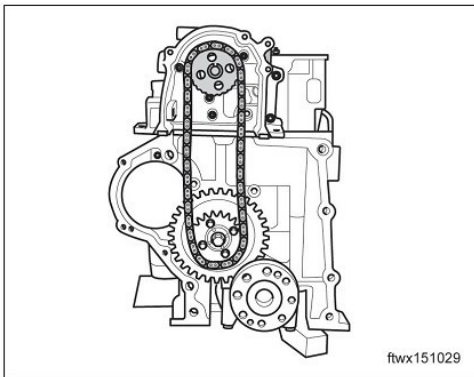
Torque: 45~55 N•m



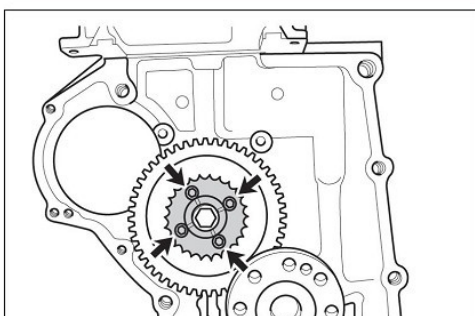
- 10 . Tighten the right suspension fixing bolts and nuts.



5. Fix the camshaft signal wheel with a special tool, screw out the fixing bolts, and take off the signal wheel.



6. Take off the camshaft timing sprocket and timing chain.

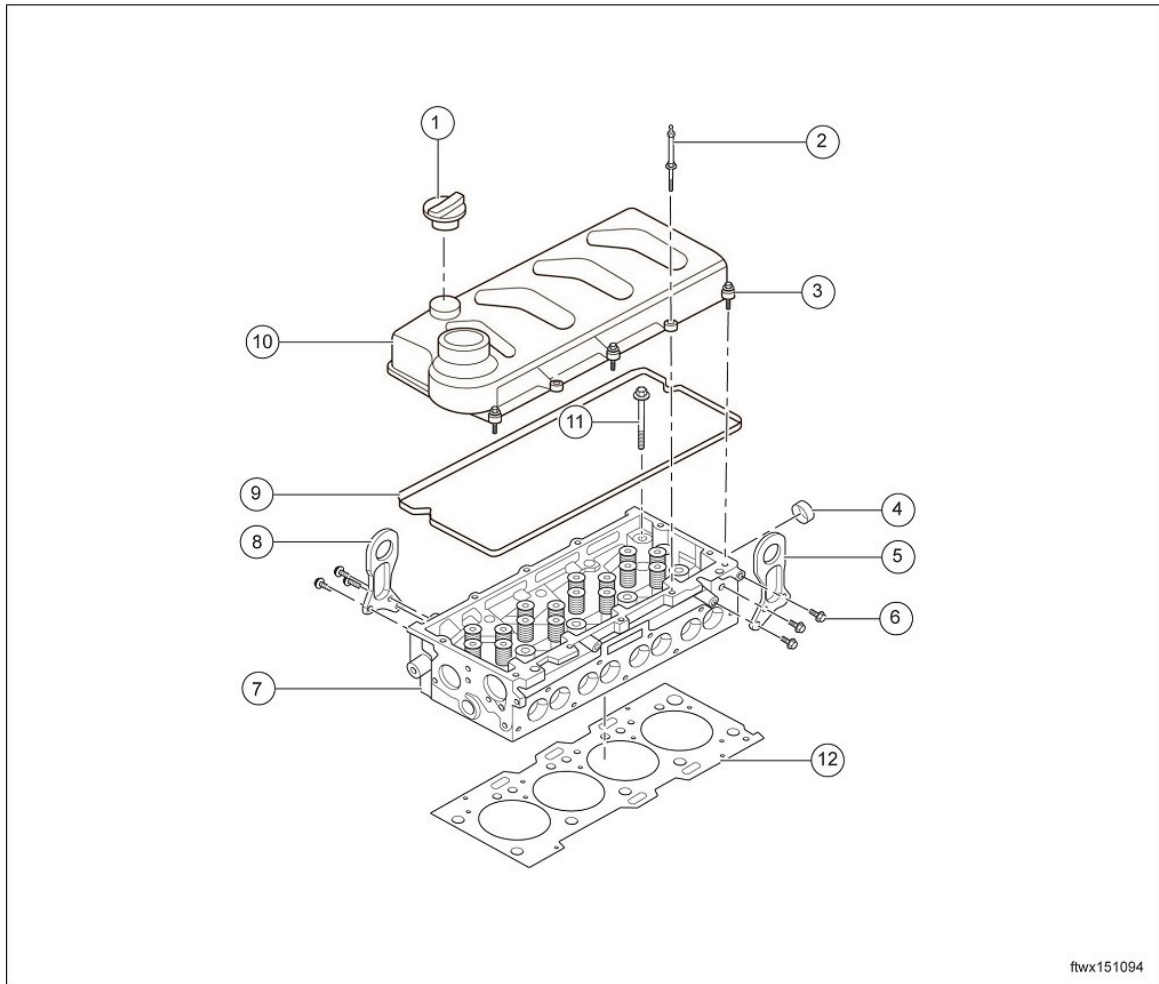


7. Screw out the fixing bolts, take off the inertia sprocket.



ENGINE MECHANICAL - ROCK ARM CHAMBER, ROCK ARM , ROCK ARM CUSHION BLOCK, ROCK ARM BRACKET & CAMSHAFT **15-39**

ROCK ARM CHAMBER, ROCK ARM , ROCK ARM CUSHION BLOCK, ROCK ARM BRACKET & CAMSHAFT COMPONENTS

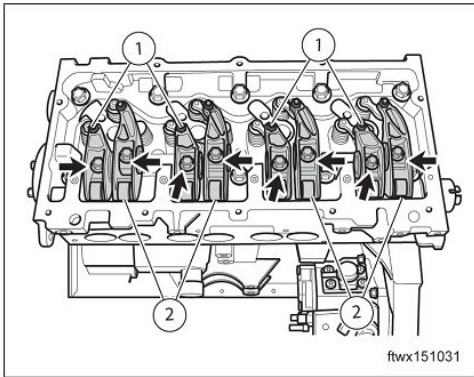


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1	Oil Filler Cap
2	Rocker Chamber Cover Fixing Bolt
3	Rocker Chamber Cover Fixing Bolt
4	Bushing
5	Engine Rear Lug
6	Engine Lug Fixing Bolt

7	Cylinder Cover
8	Engine Front Lug
9	Rocker Chamber Cover Gasket
10	Rocker Chamber Cover
11	Cylinder Cover Fixing Bolt
12	Cylinder Gasket

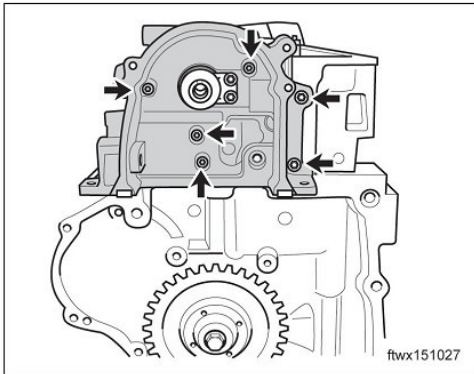


36 . Tighten the intake rock arm 1 and exhaust rock arm 2.

Torque: 36 Nm

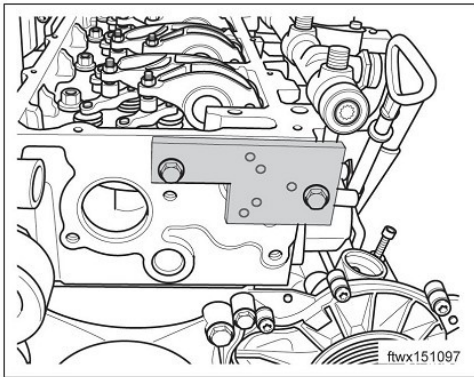
⚠ CAUTION

- **If the intake and exhaust rock arm are worn within the standard range, they shall be installed according to the disassembly mark. Otherwise, replace new rock arms.**



37 . Tighten the fixing bolt of overhead camshaft sprocket housing.

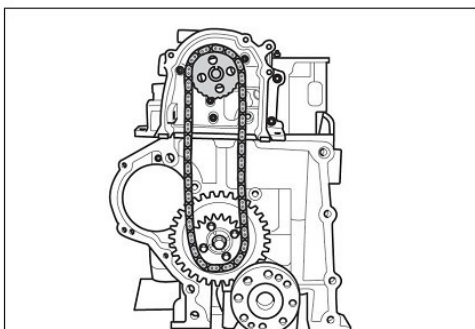
Torque:10 Nm



38 . Fix the camshaft with special tools.



ENGINE MECHANICAL - ROCK ARM CHAMBER, ROCK ARM , ROCK ARM CUSHION BLOCK, ROCK ARM BRACKET & CAMSHAFT **15-53**



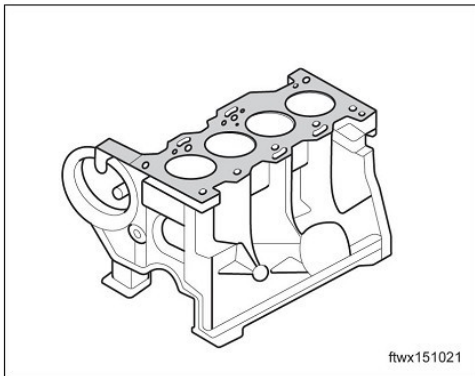
39 . Install the camshaft timing sprocket and timing chain.

⚠ CAUTION

- **When installing, do necessary check and adjustment. (Refer to "Chapter 15 Engine Mechanical - Timing Device, Timing check and adjust")**

ENGINE MECHANICAL - CYLINDER HEAD, VALVE

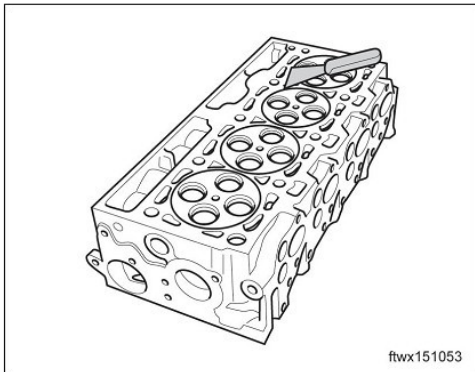
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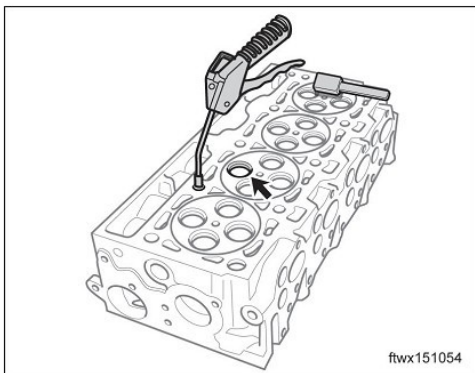
8 . Take off the cylinder head gasket.

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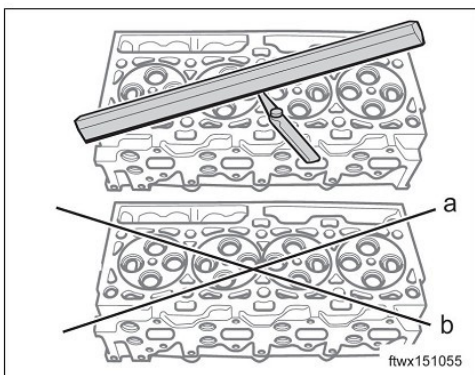
9 . Remove the valve module. (Refer to "Chapter 15 Engine mechanical system - Cylinder Head, Valve, Valve Overhaul")



10 . Clean the cylinder head and check whether there is crack or serious damage. Replace it if necessary.



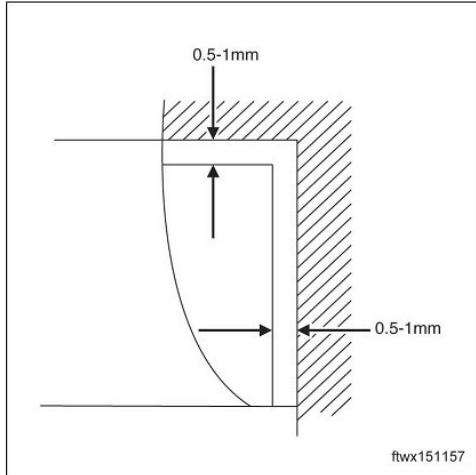
11 . Blow off the residual oil and water in the thread hole of cylinder block with high-pressure air guns.



12 . Check the evenness of the cylinder head bottom with a ruler and a feeler blade. In case of excessive deformation, polish it (both cylinder head and body) or replace it.

Flatness Limit: 0.15 mm

- (d) Once finished, polish the valve and the valve seat together with abrasive. Then measure the protruded height of the valve rod.



12 . Replace the valve seat:

- (a) Cut part of the valve seat to replace from inside and remove it.
 (b) Finish the valve seat hole on the cylinder head subject to the outer diameter of the larger valve seat.

Inner diameter of valve seat insert hole of cylinder head

Standard value of inside diameter (exhaust valve) of cylinder cap insert ring: 0.922~30.948mm

Standard value of inside diameter (intake valve) of cylinder cap insert ring: 33.485~33.485mm

- (c) Before installing the valve seat, heat the cylinder head to 250°C, or chill the seat in



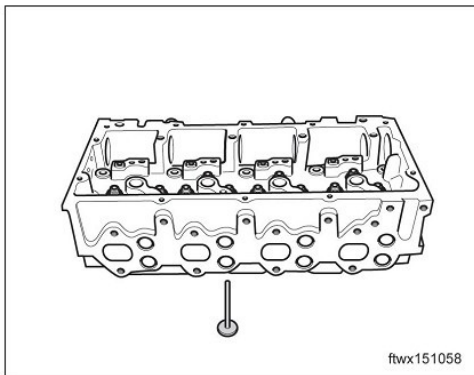
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ENGINE MECHANICAL - CYLINDER HEAD, VALVE

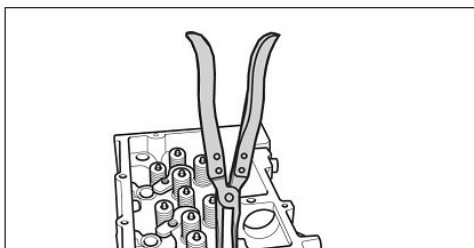
liquid nitrogen, to avoid possible blockage inside the cylinder head.

- (d) With a valve seat miller, finish the seat to rated width and angle.

13 . Install the valve as marked during removal.

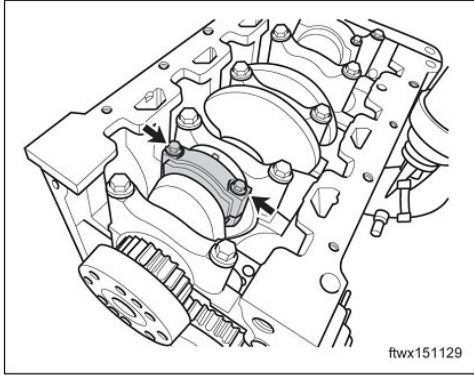


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14 . Install a new valve oil seal with a tool.

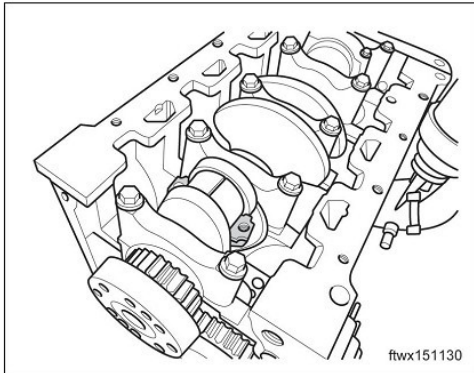
- The following pistons and connecting rod disassembly take the fourth cylinder as an example. Other cylinder disassembly method is the same.
1. Remove the engine assembly. (Refer to "Chapter 15 Engine mechanical system - engine assembly, replacement(MT/AT)")
 2. Remove the Cylinder Head. (Refer to "Chapter 15 Engine mechanical system - Cylinder Head, Valve, Cylinder Head Overhaul")
 3. Remove the oil tray. (Refer to "Chapter 18 Lubrication - oil try, replacement")
 4. Remove piston connecting rod assembly:



- (a) Screw out the fixing bolt, and take off the connecting rod bearing cap.

CAUTION

- Connecting rod bolt shall not be reused and must be replaced.



- (b) Push piston and connecting rod assembly to the side of the cylinder head.

CAUTION

- After disassembling the piston rod, assemble the components so as not to mess up other parts of the piston connecting rod assembly.

- (c) Separate connecting rod bearing.

5. Use tool to remove piston pin:



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ENGINE MECHANICAL - PISTON & CONNECTING ROD ASSEMBLY

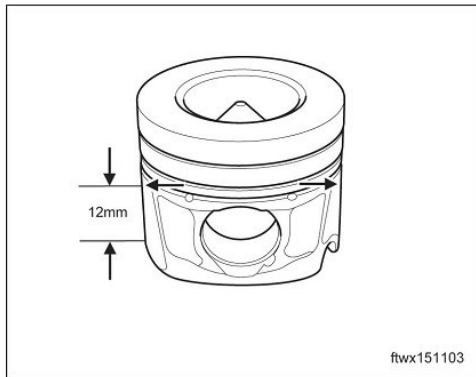
CAUTION

- Put down the piston, the piston pin and the connecting rod in the order of cylinder number, to avoid confusion.



- (a) Pry out the piston pin circlip with a tool.

CAUTION



- (a) Use an outside micrometer to measure the diameter in the vertical direction of the piston pin center line and upward from the bottom to the 12mm.

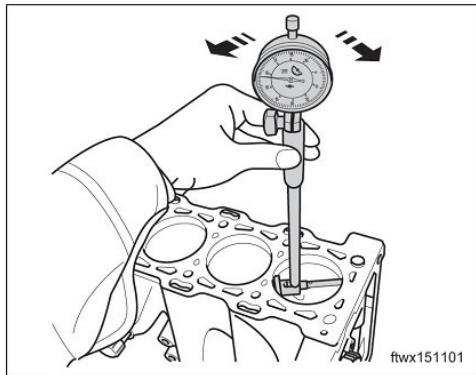
Piston diameter standard value:

Minimum: 93.901mm

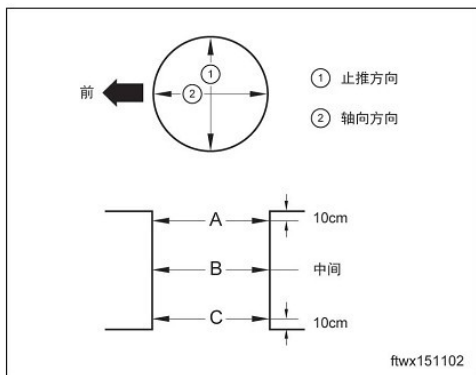
Maximum: 93.919mm

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11. Measure the diameter along the thrust direction of the cylinder:



- (a) Measure cylinder internal diameter with an inside micrometer.



- (b) Measure the internal diameter along the thrust direction in the A, B and C position.

Cylinder hold standard bore:

Minimum: 93.99mm

Maximum: 94.01mm

- (c) The measured cylinder diameter minus the piston diameter to calculate the piston oil film clearance.

⚠ CAUTION

- If the piston oil film clearance exceeds the maximum value, replace 4 pistons, or replace the cylinder if necessary.

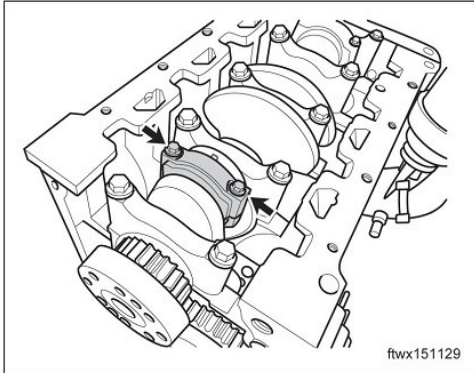
12. Check piston ring groove clearance:



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ENGINE MECHANICAL - PISTON & CONNECTING ROD ASSEMBLY

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- (d) Fit connecting rod bearing and connecting rod bearing cap and tighten fixing bolt.

Bolt tightening torque:

Level 1 tightening: 34Nm

Level 2 tightening: rotate 60 degrees counterclockwise

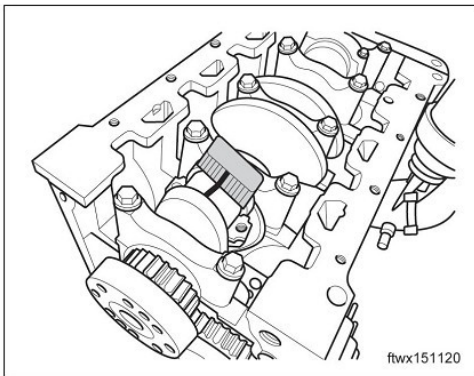
Level 3 tightening: 34Nm

Level 4 tightening: rotate 60 degrees clockwise

- (e) Remove the connecting rod bearing cap retaining bolt, remove the connecting rod bearing cap.

⚠ CAUTION

- **The crankshaft must not be turned when removing and installing the connecting rod bearing cap.**



- (f) Measure the width of the widest point with a plastic gauge.

Standard oil film clearance:

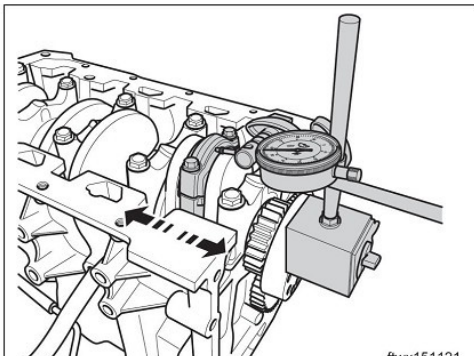
Minimum: 0.030mm

Maximum: 0.070mm

⚠ CAUTION

- **If the oil film clearance is greater than the maximum value, replace the connecting rod bearing and grind the crankshaft connecting rod journal or replace the crankshaft as required.**

16 . Connecting rod thrust clearance check:



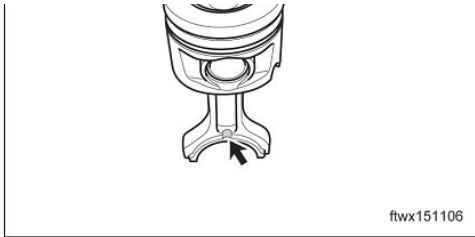
- (a) Dial gauge rod head vertically hold out against the connecting rod big end front plane, and adjust the dial gauge to zero.

- (b) Push the connecting rod big end along the direction of the arrow to measure the thrust clearance.

Standard thrust clearance:

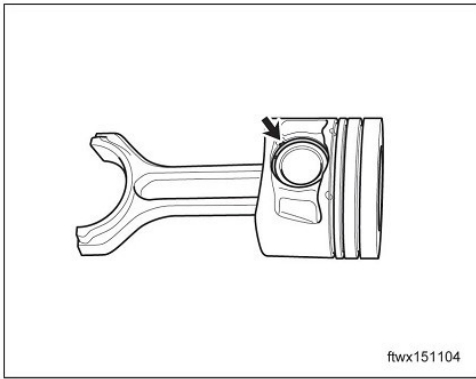
Minimum: 0.100mm

Maximum: 0.35mm



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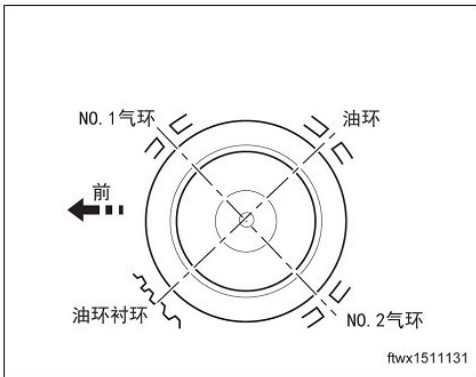


(e) Install a new piston pin circlip.

20 . Fit piston connecting rod assembly:

⚠ CAUTION

- Before installing the piston, clean piston connecting rod, cylinder and crankshaft journal, lubricate surface with clean engine oil.



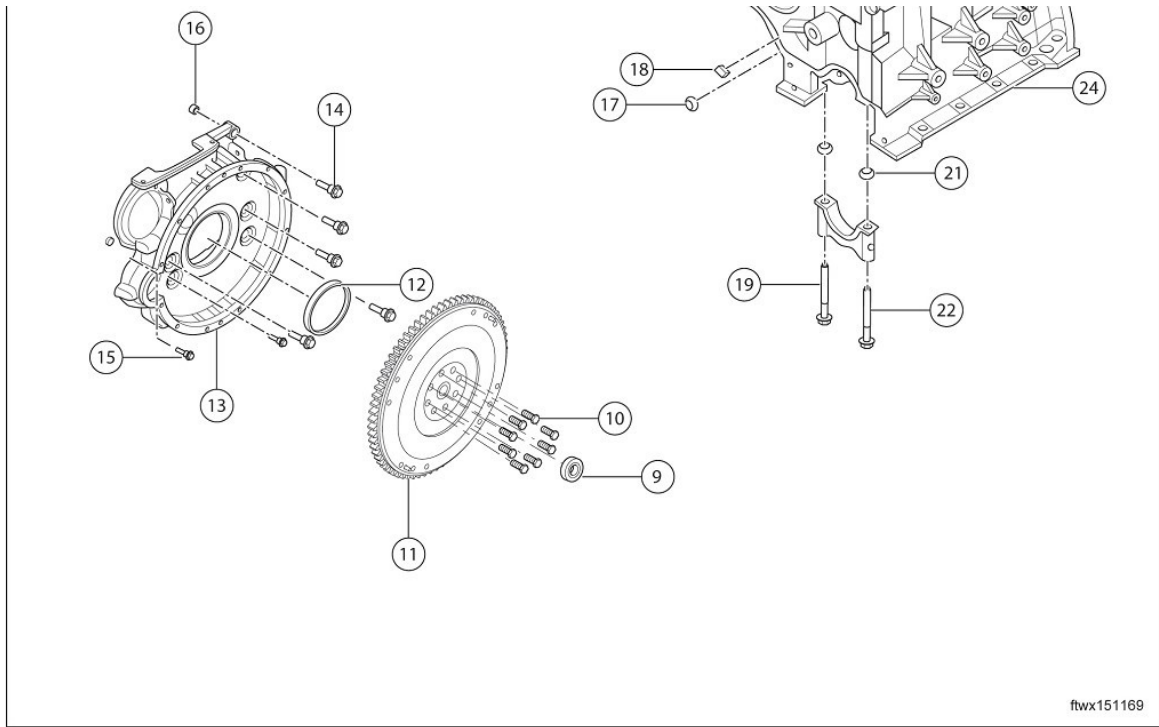
(a) Adjust the openings of piston rings to the position shown.

(b) Assemble the connecting rod bearing.

(c) Confirm the mark during the disassembly, do not mix the cylinders pistons, and connecting rod components.



(d) When installing, put the lug on the connecting rod toward the front of the engine.



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15-86 ENGINE MECHANICAL - FLYWHEEL, FLYWHEEL HOUSING, CYLINDER BLOCK & CRANKSHAFT

1	Crankshaft Pulley Bolt
2	Crankshaft Pulley Plate
3	Crankshaft Pulley
4	Crankshaft
5	Upper Crankshaft Bearing
6	Lower Crankshaft Bearing
7	Crankshaft Thrust Washer
8	Dowel Pin
9	Bearing
10	Flywheel Bolt
11	Flywheel
12	Crankshaft Rear Oil Seal

13	Flywheel Housing
14	Flywheel Housing Fixing Bolt
15	Flywheel Housing Fixing Bolt
16	Dowel Pin
17	Dowel Pin
18	Dowel Block
19	Crankshaft Bolt
20	Dowel Pin
21	Dowel Pin
22	Crankshaft Bolt
23	Dowel Pin
24	Cylinder Block