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Main matched vehicle types

SUV



light-duty bus



Cross-country vehicle



Pickup



MPV



light-duty truck



discharging capabilities, thus reducing the starting torque to cause the difficulty in starting. Solutions to such a coldstart difficulty include:

- Introduction of proper diesel fuel.
- Introduction of proper engine oil.
- Selection of correct starter and battery.
- Preheating of diesel engine. The coolant may be replaced by boiled water to preheat the engine. Supply the radiator with a proper amount of boiled water, which shouldn't be let out until the water jacket has become cold. Add new hot water to start the engine and drain it when the engine gets warm, and then add the rustproof antifreeze.

d. In-service inspection

- Check if there is knocking, looseness or other unusual sound.
- Check if there is some abnormal burning odor sent out by an overheated electric device.
- Check if there is leakage in fuel, cooling and lubrication systems.
- Check if the readings (indications) for oil pressure, coolant temperature, electric current, fuel level and others are normal.
- The above cases, if any, should be settled promptly.

e. Engine cutoff

- A diesel engine under heavy load, if expected to stop working, should at first lower its speed and load to a min. zero-load speed, at which the engine should run for 3～5 minutes before its cutoff. A sudden cutoff is disallowed for the engine with overhigh water temperature and overweight load.
- If the cooling water fails to be antifreeze in a ＜5℃ environment, it should, after the engine cutoff, be totally drained out of engine so as to avoid the frost cracking of cylinder block.

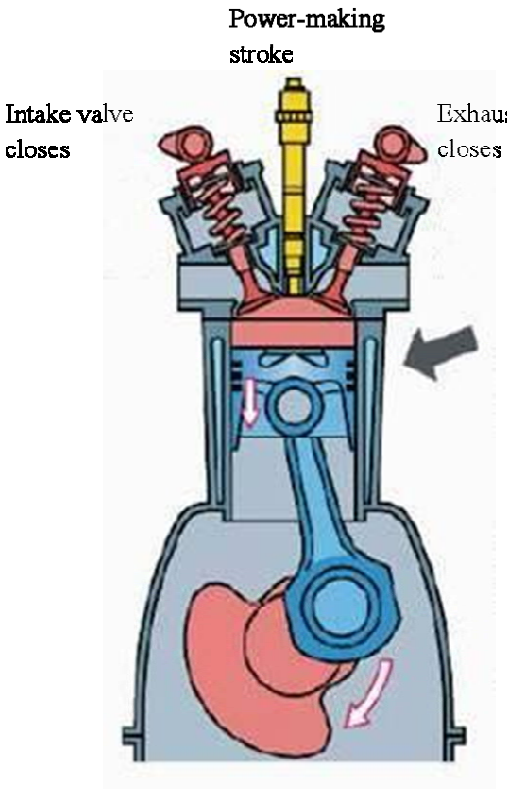
5. Running-in of engine

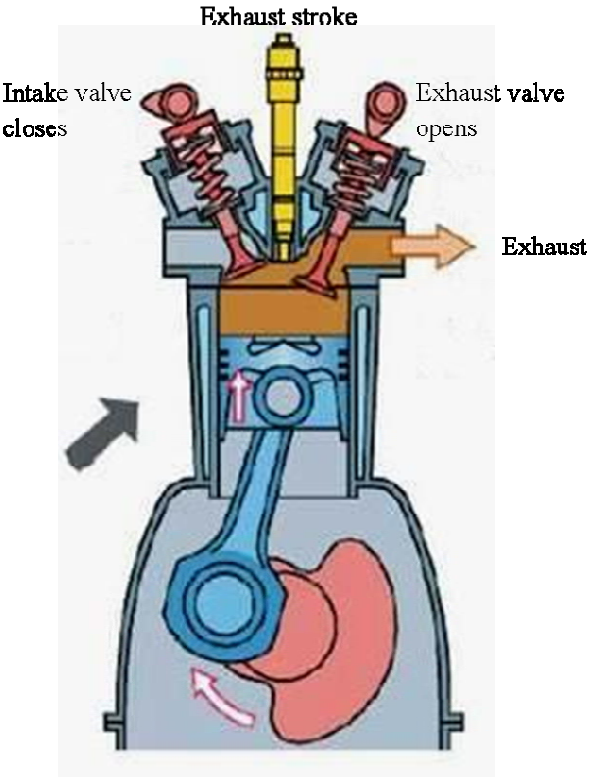
New or just overhauled engine must at first experience a running-in process featuring gradual increase in load (originally small) prior to its usage. Through this process, a sound fit can be achieved between surfaces of moving parts to avoid abnormal wear and damage. To a large extent, the service life, working reliability and economy of engine depend on the running-in result in the initial operation stage of engine. Hence the user should follow strictly the running-in specifications.

(a) Running-in

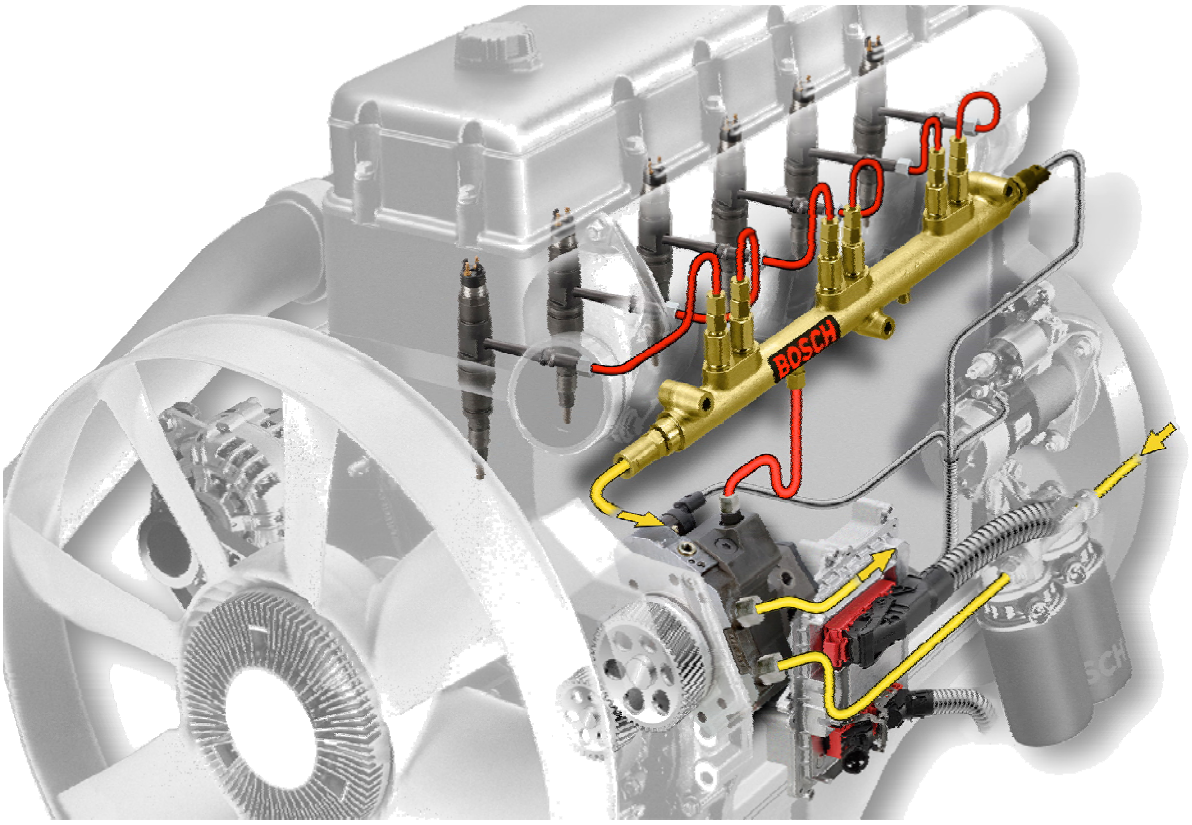
- A new engine should complete a 2000 km running-in period on an automobile as per the running-in specifications (see the following table).
- An engine, whose pistons, piston rings, cylinder liners, main bearing shells and connection-rod bearing shells have been changed in an overhaul, should complete its running-in period in 1/3 of various road hauls by automobile, as listed on Table 4-1. The running-in process also allows the further check on assembling quality of every engine part for necessary adjustment.

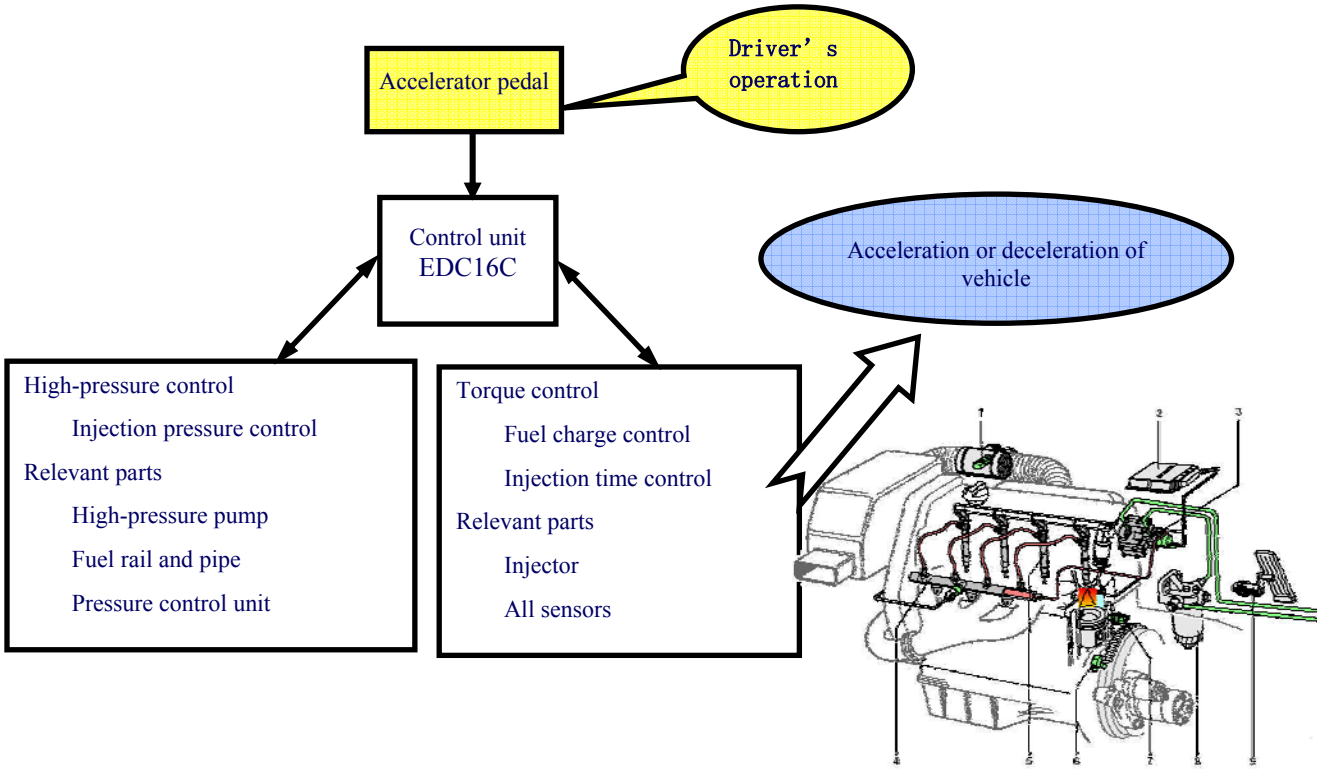
Road haul(km)	Load on automobile	Engine speed(r/min)
0～300	Zero	Not more than 50% rated speed of relevant engine
>300～1000	Not more than 25% rated load	Not more than 50% rated speed of relevant engine
>1000～1500	Not more than 50% rated load	Not more than 50% rated speed of relevant engine
>1500～2000	Not more than 75% rated load	Not more than the rated top speed of engine

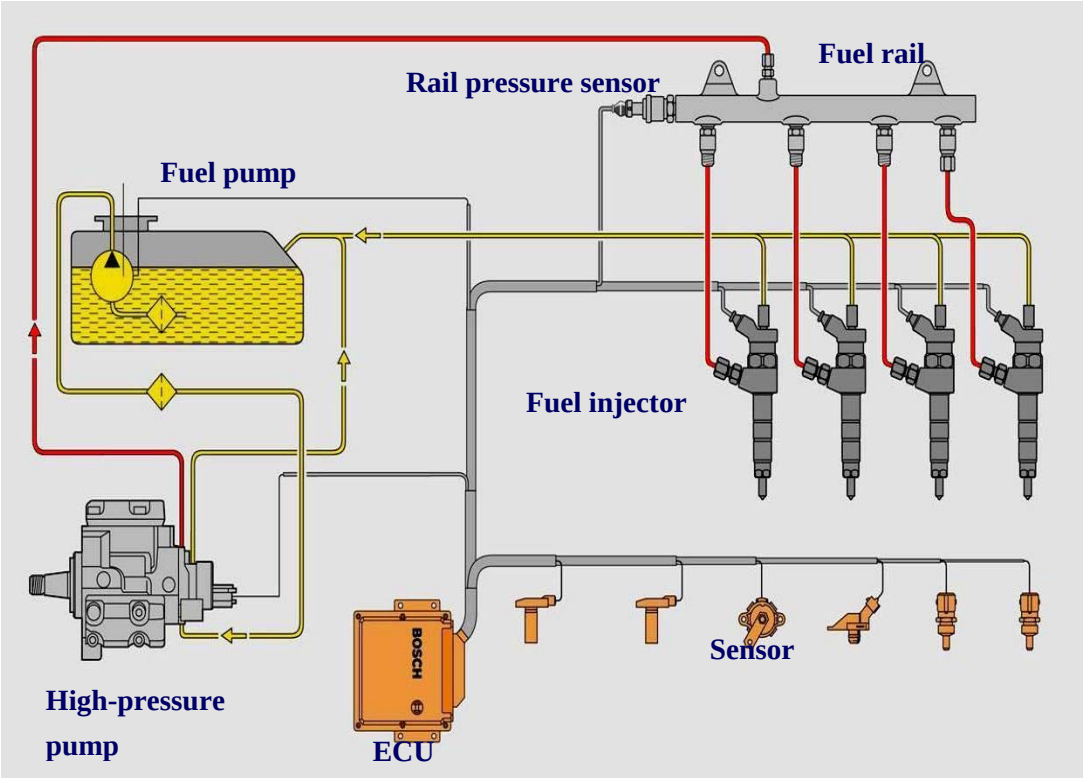




2. Overview of common-rail system



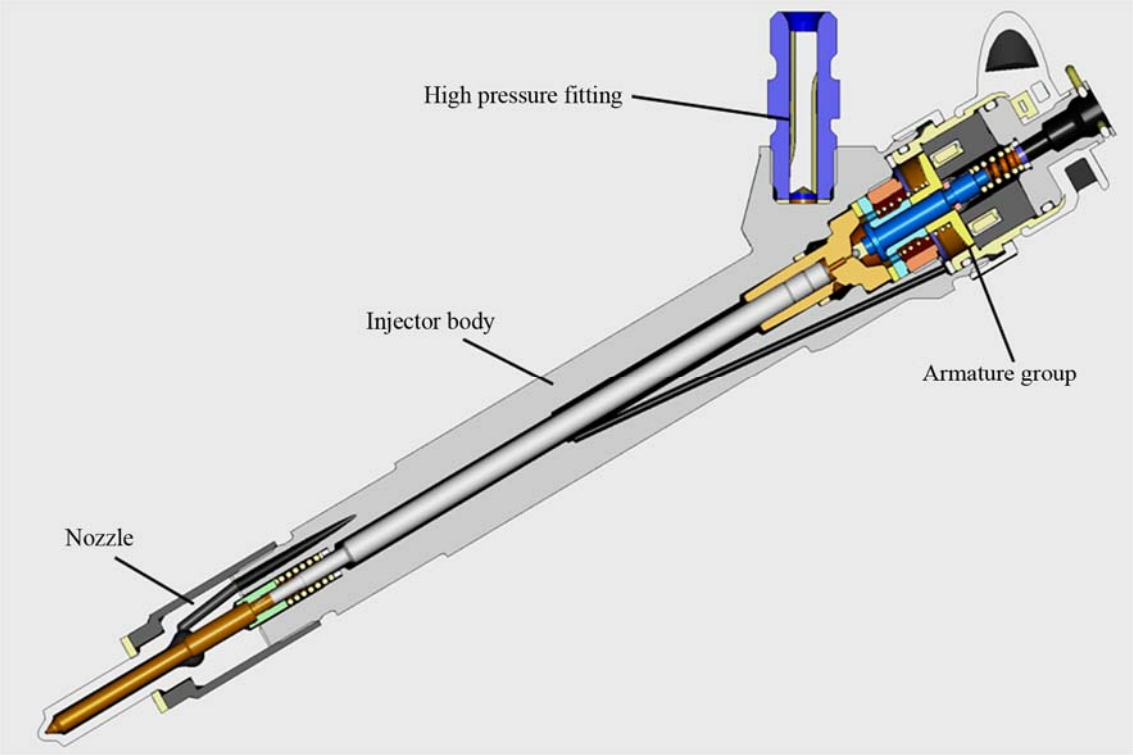


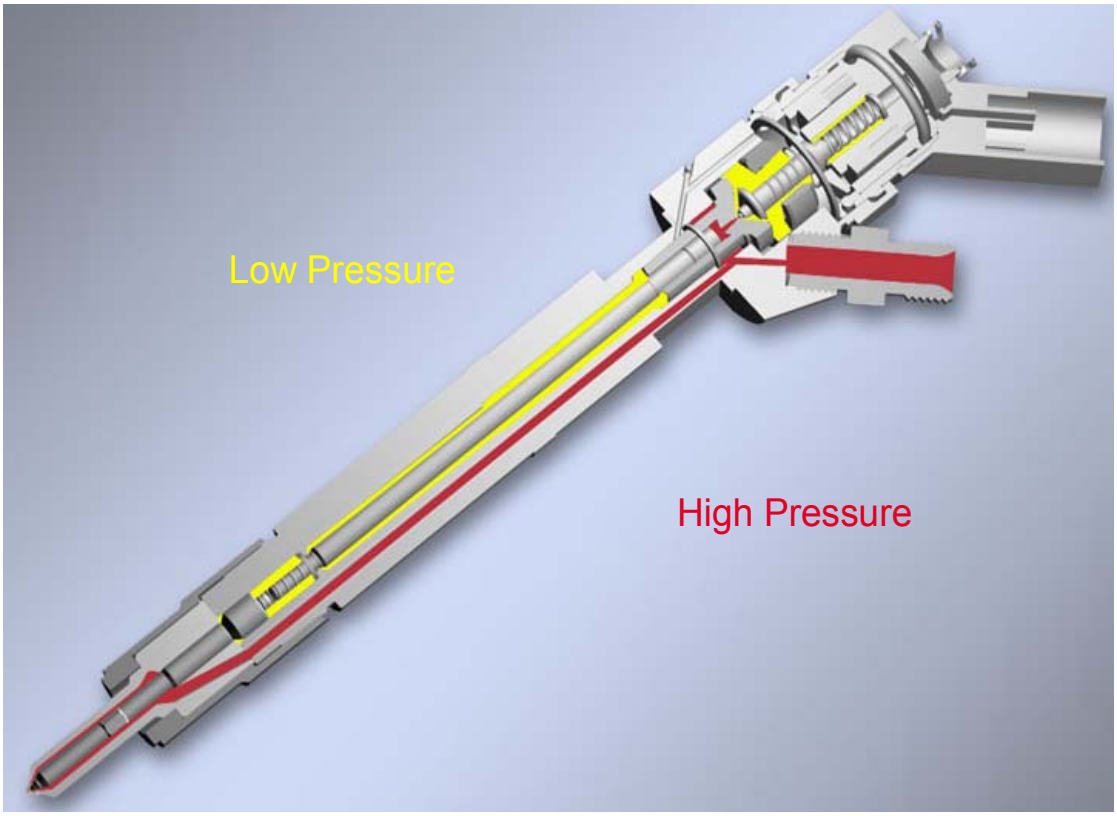


High-pressure loop

High-pressure pump → fuel rail → fuel injector

Low-pressure loop


High pressure fitting
Injector body
Armature group
Nozzle


Low Pressure
High Pressure



The common-rail 32-digit electric control unit (ECU), whose model is EDC16C39, can meet the Euro Ⅲ emission standard now and probably Euro Ⅳ in the future through functional expansion.

Main parameters：

Rated voltage：12V

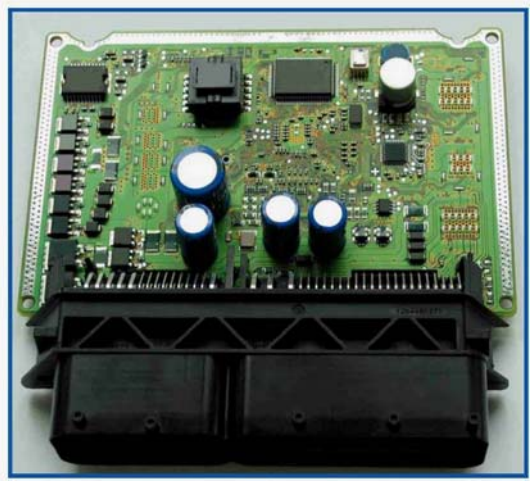
Power consumption：normally 12.5～18W

Working temperature：-40℃≤T≤$T_{\text{maximum environmental temperature}}$

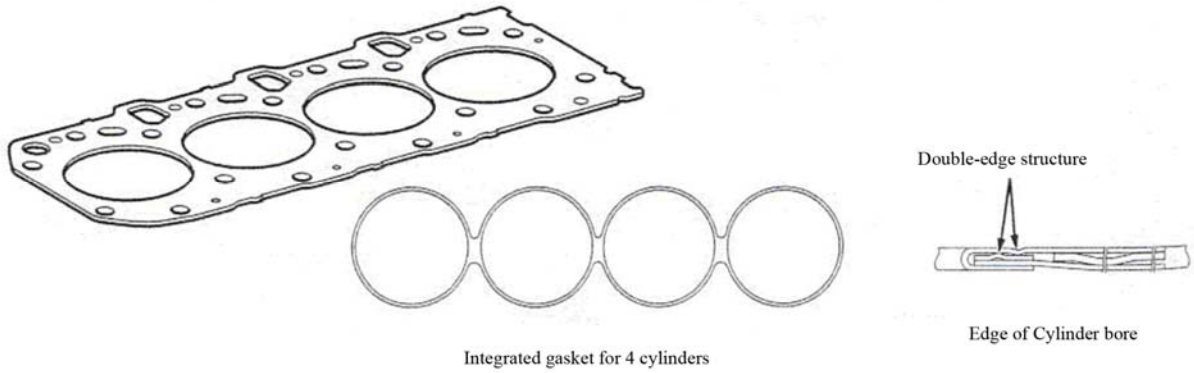
In the flowing air: $T_{\text{maximum environmental temperature}}$ =70℃

In the fixed air： $T_{\text{maximum environmental temperature}}$ =85℃

Basic software functions：

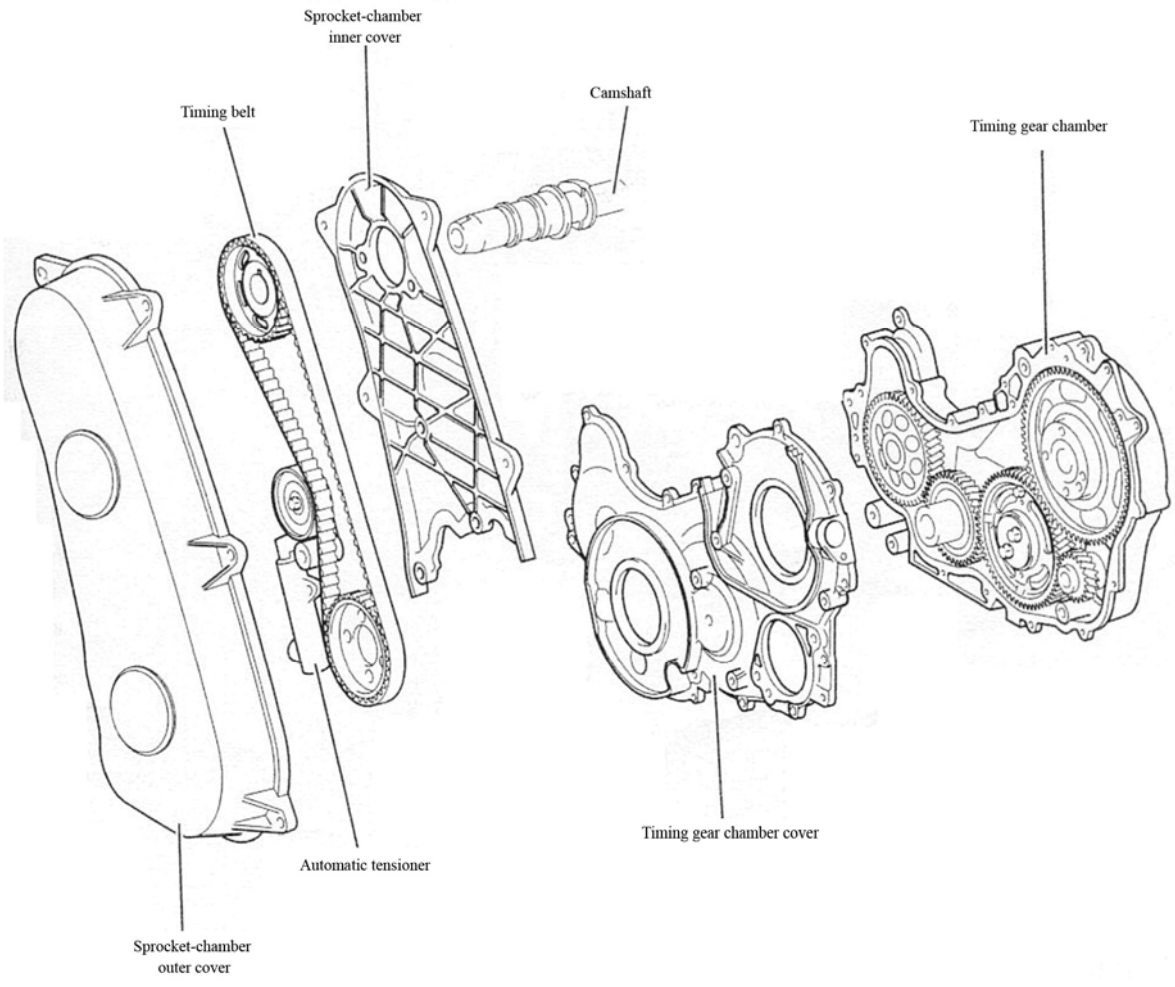


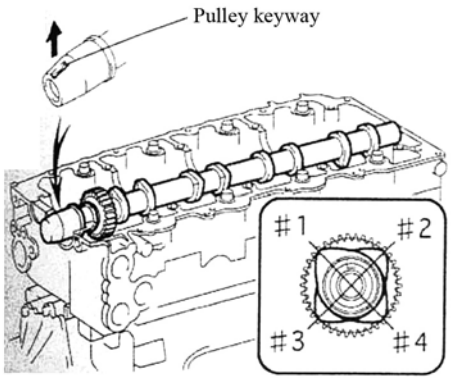
- Split injection control (pre-jet, major jet and post-jet）
- Fuel amount control: low idle controller and balance among all cylinders
- Fuel injection regulation of injector
- Fuel amount limitation and engine-start fuel control
- Accelerator-pedal signal filtering and drivability pulse spectrum
- Exhaust gas recirculation
- Supercharging pressure control
- Intake throttle control
- Viable swirl control
- Preheating-time control of heater plug
- Fan and AC (air conditioner) control
- Trouble shooting function
- CAN interface
- Procedure updating

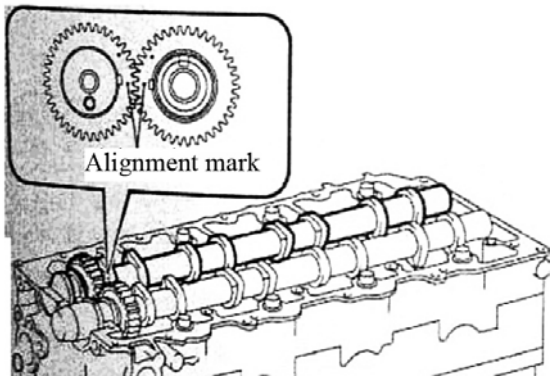


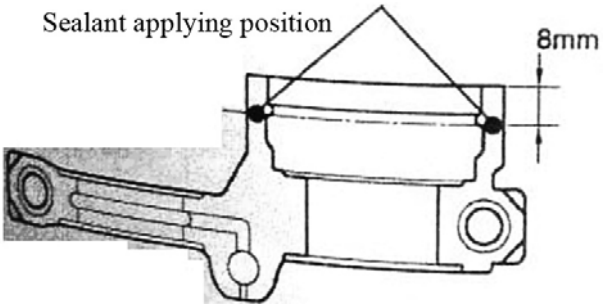
Camshaft timing system

- The camshaft timing system is composed of timing gear system and toothed belt, making the engine shorter and the change of belt easier.
- High-strength material adopted by timing belt has created more reliability.
- Hydraulic automatic tensioner can keep the belt tension constant.
- Gear chamber and gear covers are made of aluminum alloy. On the timing gear chamber cover is a crankshaft position sensor.
- Both inner and outer covers of sprocket chamber are made of resin. Sealing gaskets around the outer cover of sprocket chamber has reduced the engine vibration and noise. The camshaft seal is installed on the cylinder head.









(5) Align the camshaft bearing shell covers and fit them onto cylinder head, as shown in the picture.

(6) Tighten the camshaft bearing shell covers in the illustrated sequence.

※ **Standard value:** T=19N.m

(7) Check and adjust the valve clearances.

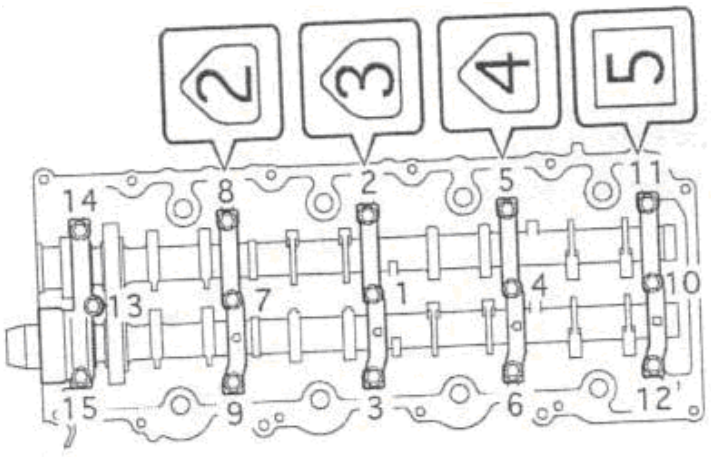
(a) Measure the valve clearances in the illustrated positions (in cold state).

※ **Reference:** intake: 0.20～0.30mm

Exhaust: 0.35～0.45mm

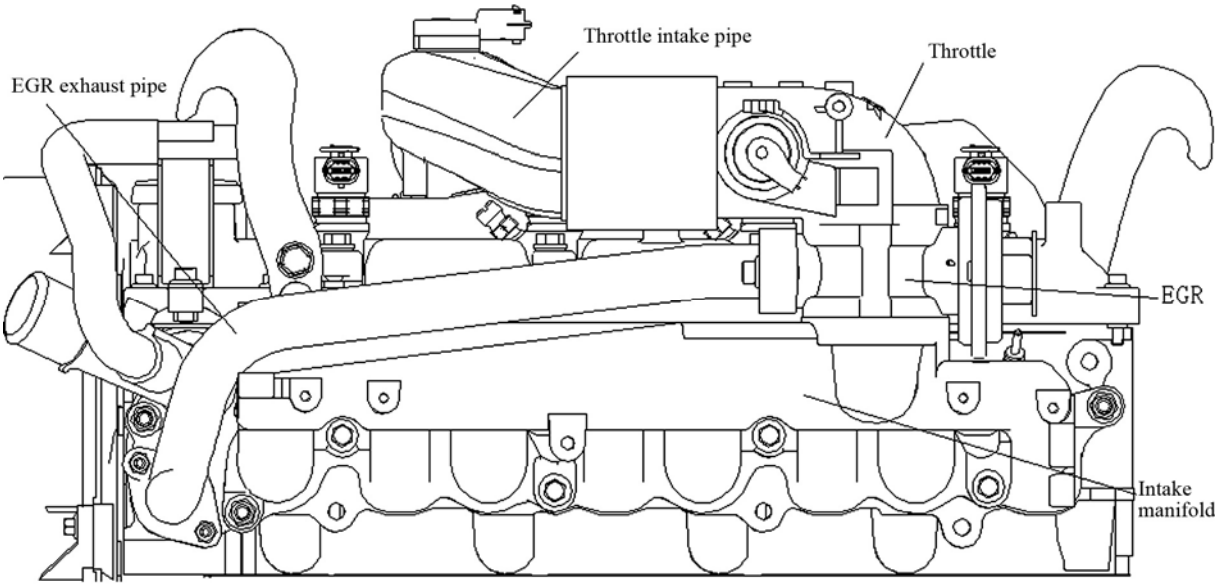
※ **Note:** Valve clearances need to be measured when the valves are in cold state.

(b) Rotate the camshaft to measure and record the valve clearances of other cylinders.



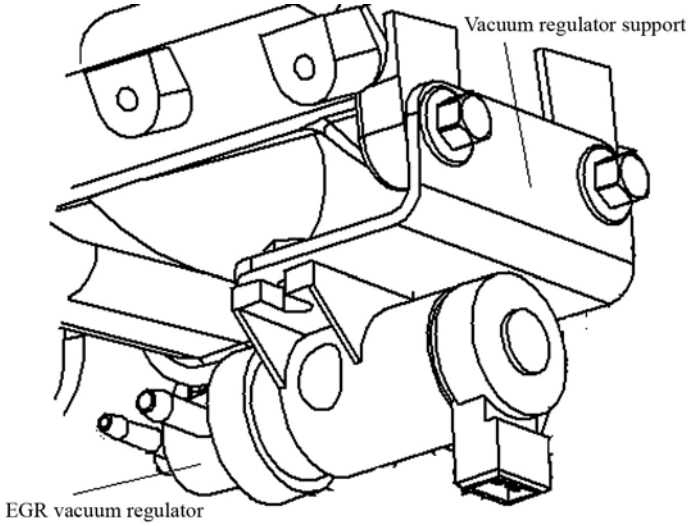
- Dismounting

1. Dismantle the throttle intake pipe.



2. Take down the throttle body.

3. Remove the EGR vacuum regulator and vacuum regulator support.

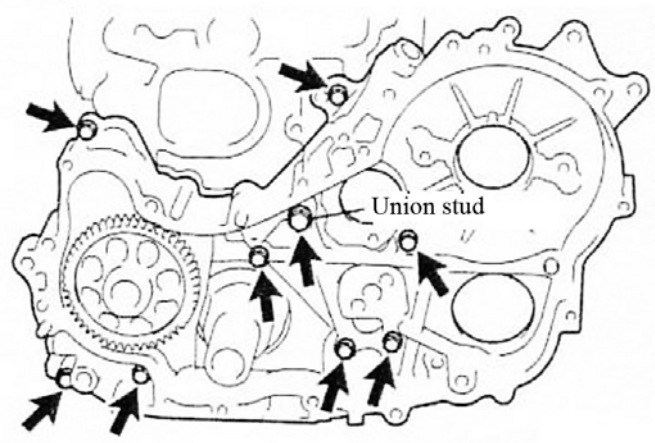


4. Unscrew two bolts and two nuts to remove the EGR exhaust pipe.

13. Dismount the timing gear chamber.

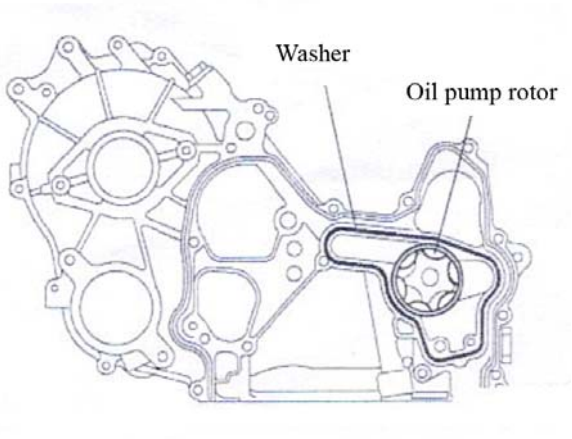
(1) Screw out bolts and union studs to dismount the timing gear chamber.

(2) Pry the illustrated position with a slotted screwdriver to take down the timing gear chamber.

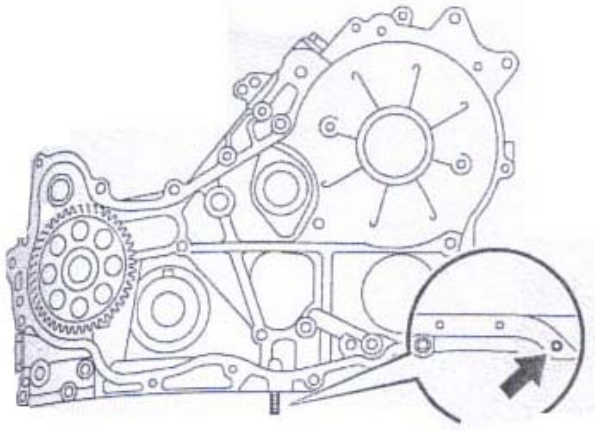


※ Note: Don't let the oil pump rotor inside the timing gear chamber slip.

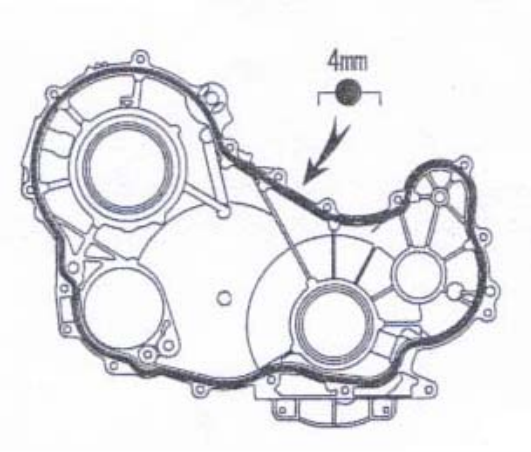
(3) Take down the oil pump rotor and washers.



(4) Dismount the bolts.

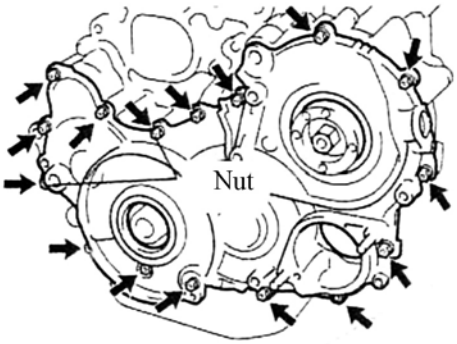


(5) Remove two O rings from cylinder block.



(5) Tighten the bolts and nuts.

Standard value: T=13N.m{133kgf.cm}

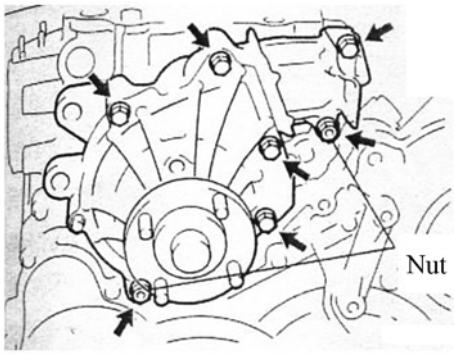


12. Install the water pump assembly.

(1) Mount new pump washers on cylinder block.

(2) Mount the water pump assembly with bolts and nuts.

※ Standard value: T=13N.m{133kgf.cm}



13. Install the sprocket chamber inner cover and other components.

II Cylinder block assembly

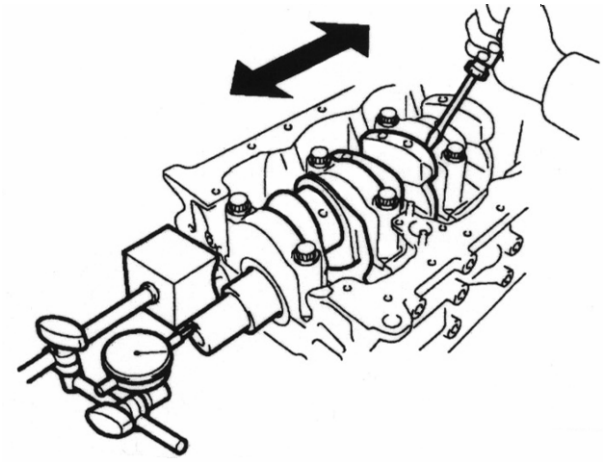
- Dismounting

1. Check the connection rod.

Key: Check its axial clearance.

※ Limit value: 0.30mm

Reference: The crankshaft thrust washer or crankshaft must be replaced if this clearance goes beyond the limit.

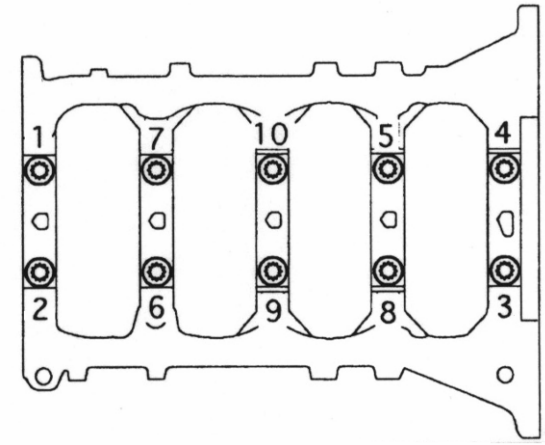


7. Dismount the crankshaft.

① Evenly loosen 10 main bearing cap bolts in 2～3 steps in the illustrated sequence and remove them.

② Remove the main bearing cap, main bearing shell and crankshaft thrust washer and then crankshaft.

Reference: Those dismounted components must be separately placed according to their mounting position.



8. Dismount the injection nozzle.

① Dismount the oil check valve. ② Remove the injection nozzle.

9. Dismount the screw plug.

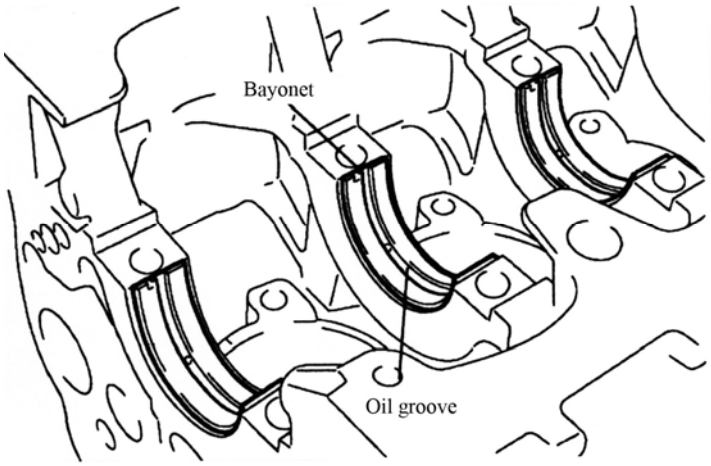
① Unscrew the bolts.

② Remove the screw plug.

21. Check the radial clearance of crankshaft

(1) Align the oil hole and block tongue, and mount the main bearing shell with oil groove onto cylinder block.

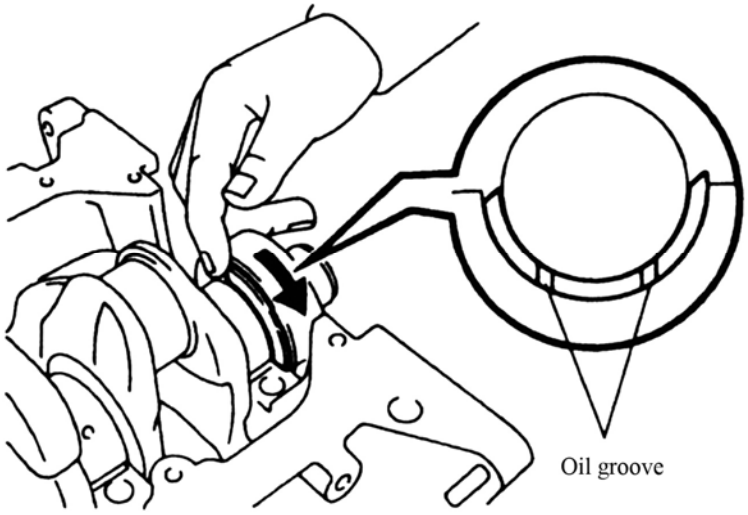
※ Note: Don't apply engine oil on the mounting surface and back of crankshaft bearing shell.



(2) Place the crankshaft on cylinder block.

(3) Crankshaft thrust pieces, after being spread with engine oil, should have their oil groove positioned outward, and then be mounted in front of and behind the 5# main journal.

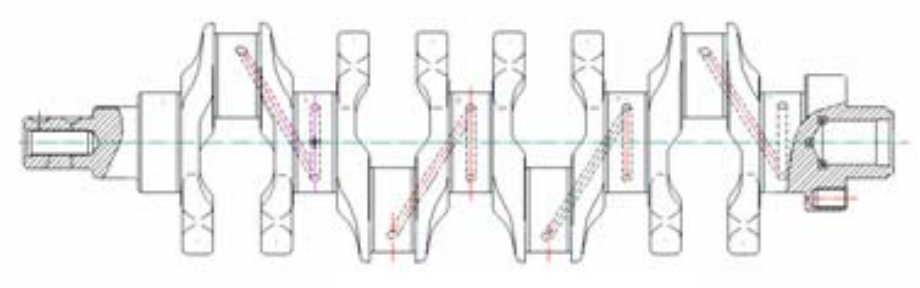
※ Reference: Push the crankshaft back and forth. Only when the mounting clearance of crankshaft thrust pieces has increased can the crankshaft be mounted.



(4) With block tongue aligned, mount the main bearing shell on main bearing cap.

※ Note: Don't apply engine oil on the mounting surface and back of crankshaft bearing shell.

flywheel, whose lifespan can therefore be lengthened. On the rim of flywheel is a toothed ring assisting the starter in starting the engine.

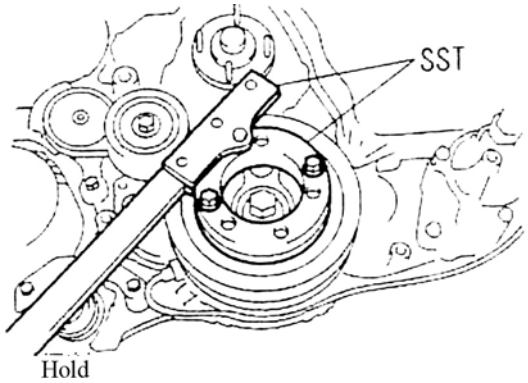


Dismounting

① Fasten the crankshaft with tools.

② Take down 8 bolts and then remove the flywheel.

③ Dismount the rear partition.



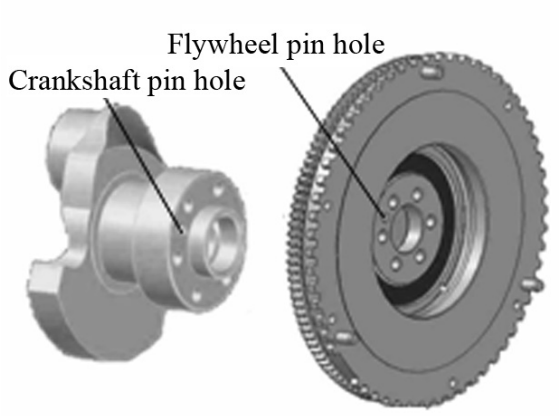
Install the flywheel

① Mount the rear partition with bolts.

※ Standard value: T=8.0N.m（82kgf.cm）

② Fasten the crankshaft with tools.

Apply sealant on the thread 2～3 pitch away from the top of locking bolt.



※ Note:

a. Clean and degrease the bolts and bolt holes.

b. The engine must not be started within 1h after this installation.

③ Align the pin hole on flywheel with pin hole or pin on crankshaft flywheel mounting surface.