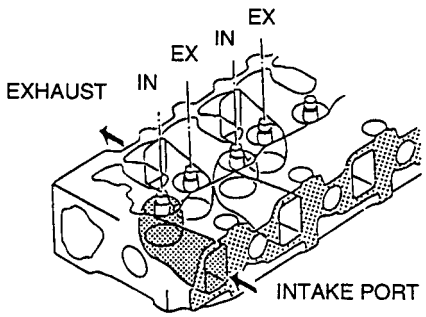
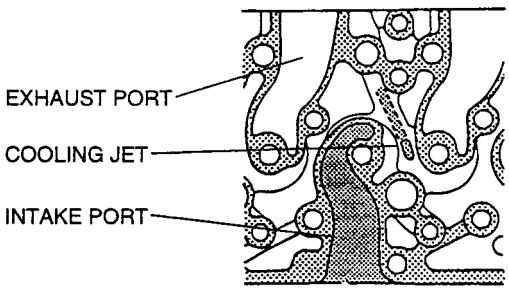
■W04D-J ENGINE PROPER

1. Cylinder Head

- The cylinder head is fabricated as a single unit of extremely hard cast iron and employs a cross-flow system that arranges intake and exhaust valves alternately for improved reliability at high speeds and high loads.
- The intake ports have a special structure as shown in the diagram. As stated previously, optimum mixing and swirls are generated within the cylinder for efficient combustion.

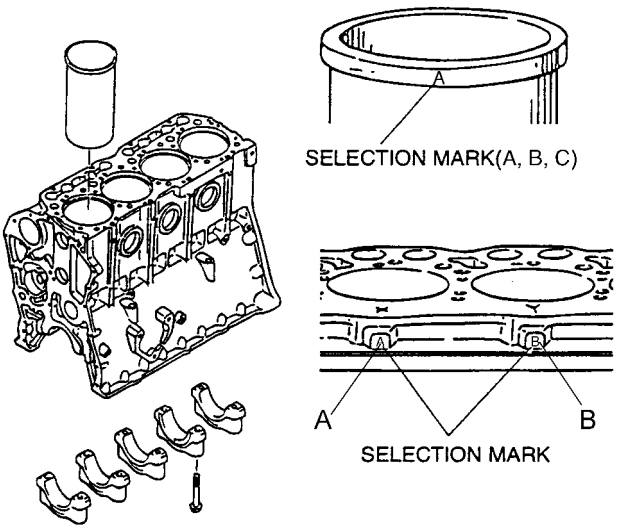


- Heat-resistant steel for the intake and sintered alloy inserts for the exhaust are used in the valve seats.
- A dry type of liner is employed in the nozzle sleeve, and the cooling among the head valves has ample durability as a cooling jet system.
- Valve cracking and nozzle scorching can be prevented by cooling with a cooling jet that has high cooling efficiency. Additionally, cooling efficiency is improved because slime is removed by the jet water flows.



2. Cylinder Block and Liner

- The cylinder block is fabricated from specialty cast iron and employs an extremely hard dry liner. Therefore, the wall thickness of the liner can be thinner than wet liners and the gaps between cylinders can be smaller. Additionally, the engine can be smaller and lighter because the dry liner structure allows greater hardness at the bore periphery and between cylinders.
- The cylinder liner is fabricated from specialty cast iron having high tensile strength for a fit with the cylinder block that maintains the proper clearance.
  The fit of the piston ring and cylinder block is improved through surface treatment of the inner and outer surfaces of the cylinder liner.
- The cylinder block and crankshaft main bearing have been fabricated as an integrated unit to prevent fitting mistakes.

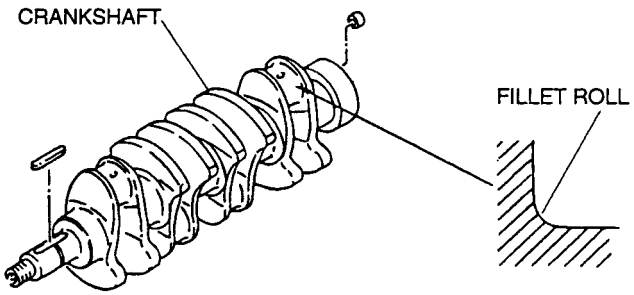


3. Piston and Piston Pin

- The piston is linked to the connecting rod through a piston pin and reciprocates within the cylinder liner to form an airtight chamber that alters the volume of the chamber.
  The piston receives the high-temperature gas pressure produced by combustion in this airtight chamber and rotates the crankshaft through the connecting rod.
- The piston uses a heat resisting aluminum alloy to form a specially shaped highly efficient combustion chamber in the top and improve combustion and lower fuel costs.
  The outer configuration of the piston is a barrel type that considers thermal expansion and piston oscillation. The upper portion is oval, and the intermediate ring area is multiple oval. The lower portion is finished with simple oval.
- The piston undergoes marked thermal expansion in the parts with thick walls, like the top portion of the piston and piston pin boss portion. Therefore, the piston is designed to be completely round at high temperatures.
- The piston pin is fabricated of case-hardened steel and employs a full-floating system that endures high load operation.

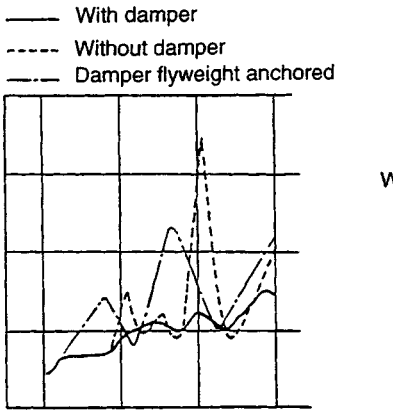
4. Crankshaft and Bearings

- The crankshaft is precisely forged from carbon steel. The induction hardening of the journal and pin portions is applied to roll processing of fillet roll area for excellent hardness and wear resistance.

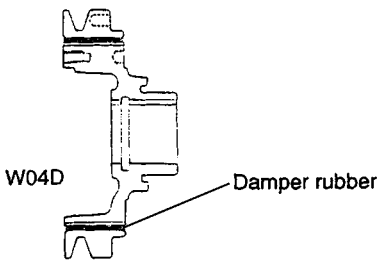


5. Crank Pulley and Torsional Damper

- The torque exerted on the crankshaft changes through fluctuation of maximum combustion pressure and reciprocating motion inertia. Resonance and torsional vibration occur when the vibration caused by these factors and the natural vibration of the crankshaft system are equal. A torsional damper, which integrates rubber, a flyweight, and a crank pulley, is mounted on the front end of the crankshaft as a mechanism to absorb this vibrational energy.

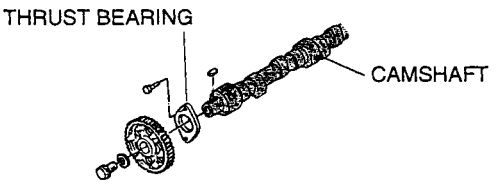


Damping Effect with Damper Installed Flywheel

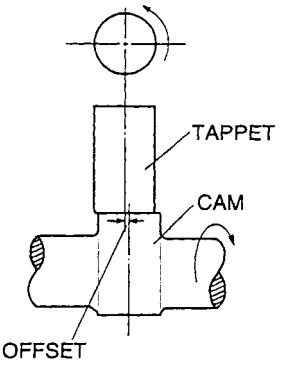


6. Valve Mechanism

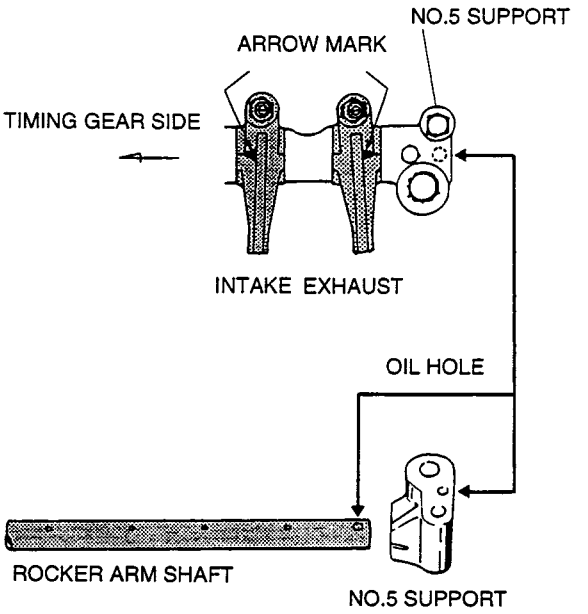
- The camshaft of this engine is fabricated from carbon steel and polished after the cam and journal surfaces are subjected to induction hardening.
  The cam profile improves intake efficiency by employing a special curvature.



- The tappet is fabricated from special cast iron resistant to pressure and wear because they move up and down by the cam.
  As shown in the diagram, the tappet is offset and rotated by the cam during operation to prevent abrasion.



- The rocker arm shaft is fabricated from carbon steel, subjected to surface hardening, and supported by five rocker supports. An oil hole is provided in the no. 5 support area, and uniform lubrication is supplied to each rocker arm. The oil is compressed from the main oil hole through the no. 5 cam journal, cylinder head, and no. 5 rocker arm support. Each rocker arm bush is supplied with oil through the inside of the rocker arm shaft to lubricate all valves and push rods.



7. Timing Gear

- The timing gear transmits the rotation of the crank gear through the idler gear to the injection pump drive gear and camshaft drive gear. Its function is to accurately transmit the valve opening and closing interval and fuel injection timing.
  The engine oil pump, air compressor, and power steering oil pump are also operating.
- Alignment marks are engrave on the gears, so be sure to align the marks during assembly.
- The gears employ helical gears which reduce noise and lengthen service life.

