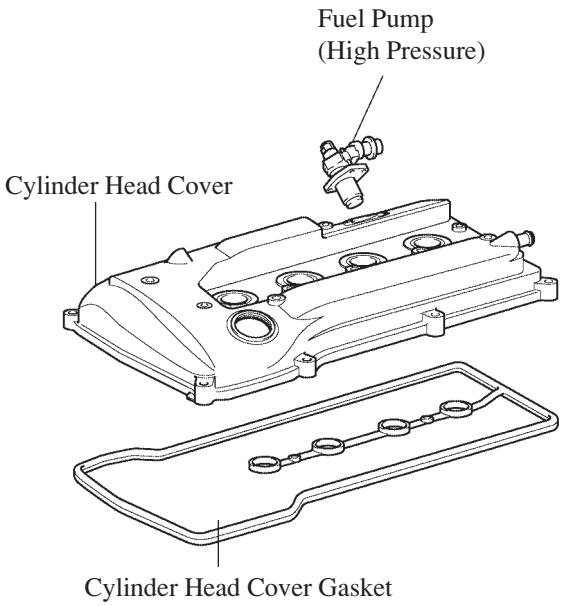
4. Engine Proper

1) Cylinder Head Cover

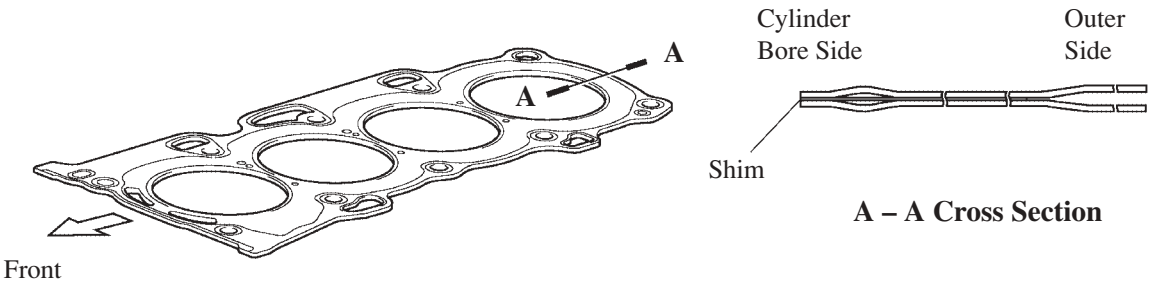
- A lightweight magnesium alloy diecast cylinder head cover is used.
- The fuel pump (high pressure) has been mounted on the cylinder head cover for compactness.
- Acrylic rubber, which excels in heat resistance and reliability, uses for the cylinder head cover gasket.



195EG10

2) Cylinder Head Gasket

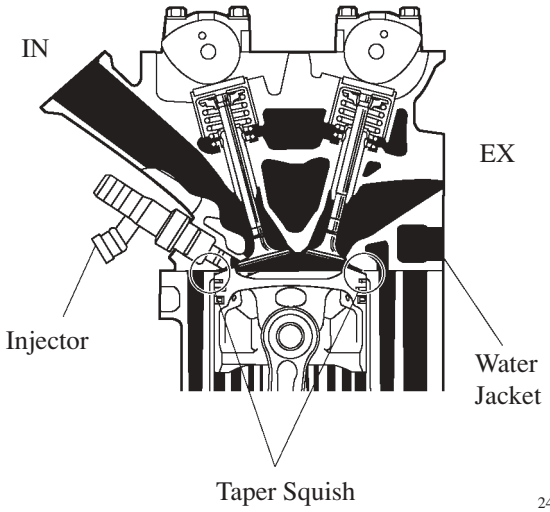
- A steel-laminate type cylinder head gasket has been adopted.
- A shim is used around the cylinder bore to increase the sealing surface, thus improving the sealing performance and durability.

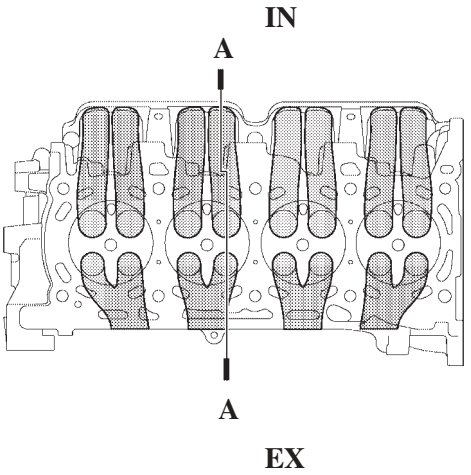


195EG11

3) Cylinder Head

- Through the adoption of the taper squish combustion chamber, the engine-knocking resistance and fuel efficiency have been improved.
- An upright intake port is used to improve the intake efficiency.
- The injectors are installed in the cylinder head.
- The routing of the water jacket in the cylinder head is optimized to improve the cooling performance. In addition, a water bypass passage has been provided below the exhaust ports to reduce the number of parts and to achieve weight reduction.
- The water outlet has been integrated to reduce the number of parts.

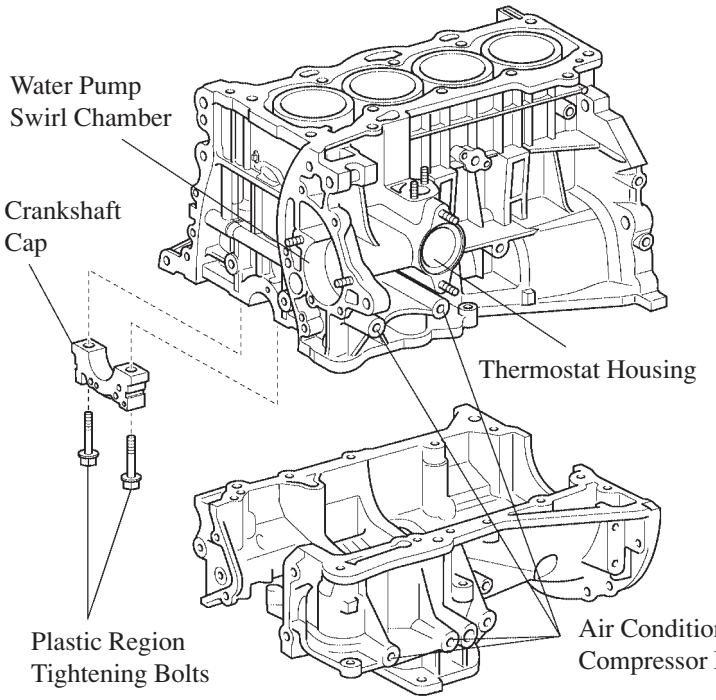




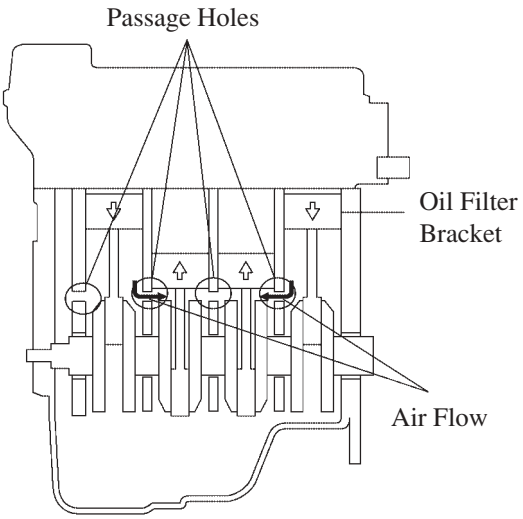
A – A Cross Section

4) Cylinder Block

- Lightweight aluminum alloy is used for the cylinder block.
- Rigidity of the cylinder block side has been improved by curving the skirt portion of the cylinder block and optimizing the rib position on the side.
- By producing the thin cast-iron liners and cylinder block as a unit, compaction is realized. This liner is thin, so that boring is not possible.
- Passage holes are provided in the crankshaft bearing area of the cylinder block. As a result, the air at the bottom of the cylinder flows smoother, and pumping loss (back pressure at the bottom of the piston generated by the piston's reciprocal movement) is reduced to improve the engine's output.
- The oil filter and the air conditioner compressor bracket are integrated the crankcase, also the water pump swirl chamber, the thermostat housing and the rear oil seal retainer integrated the cylinder block to reduce the number of parts.
- Through the adoption of the offset crankshaft, the bore center has been shifted 10 mm towards the exhaust in relation to the crankshaft center. Thus, the side force when the maximum pressure is applied has been reduced and fuel economy has been improved.
- Plastic region tightening bolts are used for tightening the crank caps.



195EG14

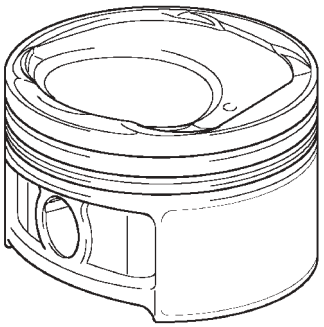


Air Flow During Engine Revolution

179EG04

5) Piston

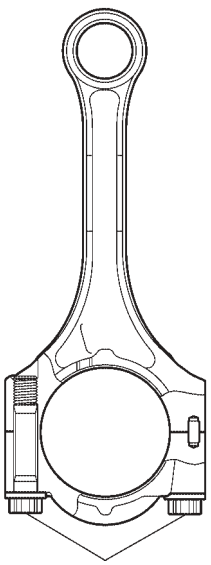
- To achieve uniform combustion through direct injection, an optimal piston head shape that promotes the mixing of the injected fuel and intake air has been adopted.
- The piston is made of aluminum alloy and skirt area is made compact and lightweight.
- Full floating type piston pins are used.
- The top ring groove is provided with anodic oxidation coating to improve its wear resistance.
- The piston skirt has been resin-coated to reduce frictional loss.
- By increasing the machining precision of the cylinder bore diameter, the outer diameter of the piston has been made into the one type.



258AE110

6) Connecting Rod

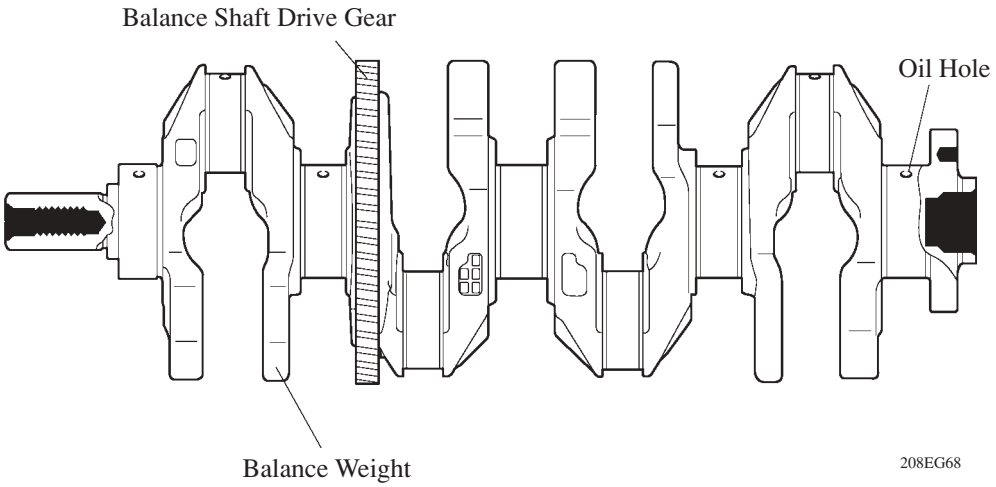
- The connecting rods and cap are made of high strength material for weight reduction.
- Nutless-type plastic region tightening bolts of the connecting rod are adopted for a lighter design.
- The connecting rod bearings have been reduced in width to reduce frictional loss.



Plastic Region Tightening Bolt 258AE124

7) Crankshaft

- The forged crankshaft has 5 journals and 8 balance weights.
- The crankshaft bearings have been reduced in width to reduce frictional loss.
- The balance shaft drive gear has been installed onto the crankshaft.
- The precision and surface roughness of the pins and journals have been improved to reduce friction.



8) Balance Shaft

- A balance shaft has been adopted to reduce vibrations.
- A direct-drive system has been adopted which makes use of gear that is installed onto the counterweight of crankshaft.
- In addition, a resin gear has been adopted on the driven side to suppress noise and offer lightweight design.