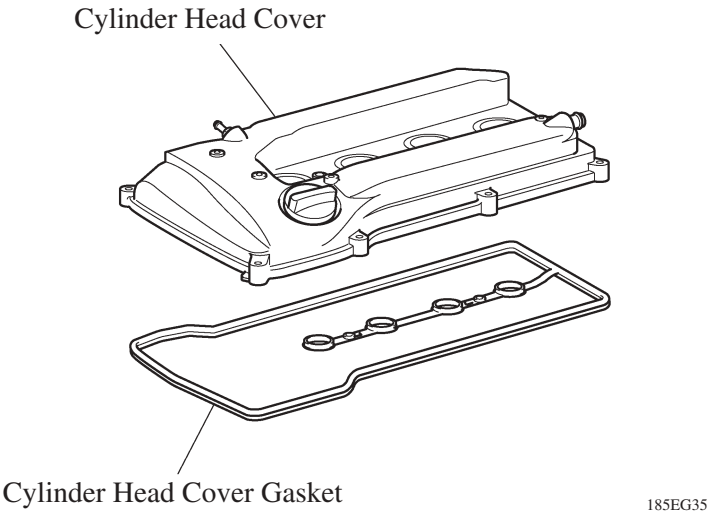
■ENGINE PROPER

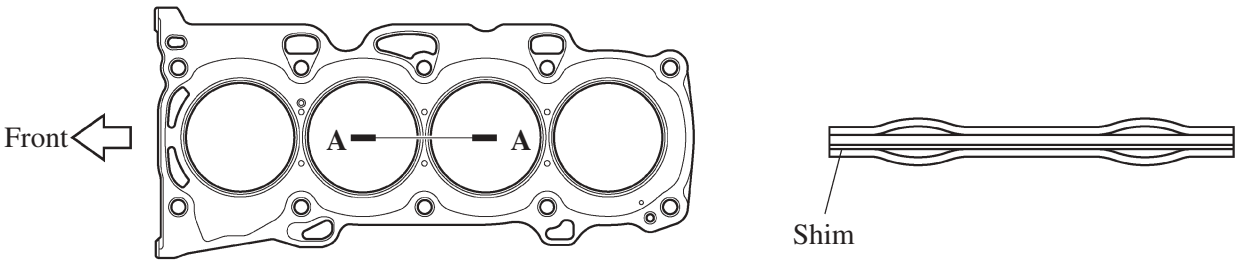
1. Cylinder Head Cover

- A lightweight magnesium alloy diecast cylinder head cover used.
- The cylinder head cover gasket and the spark plug gasket have been integrated to reduce the number of parts.

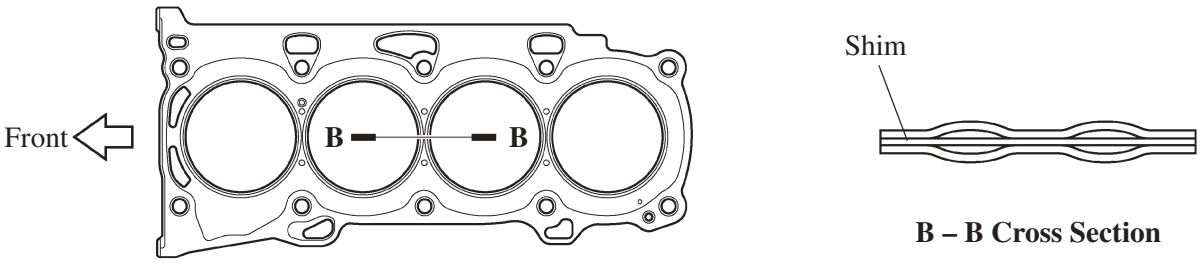


2. Cylinder Head Gasket

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



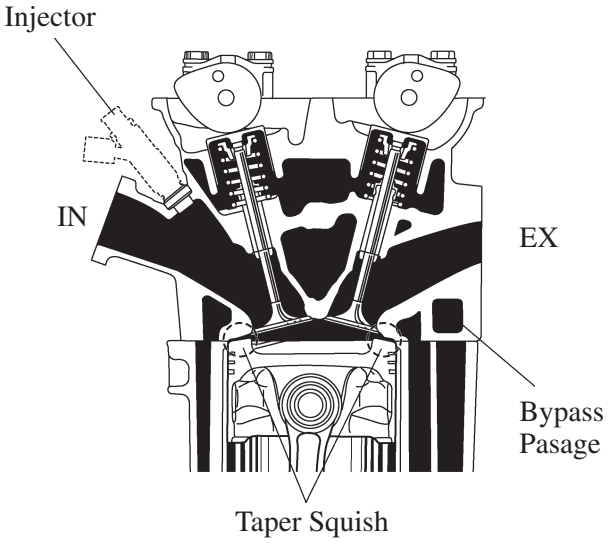
1AZ-FE Engine



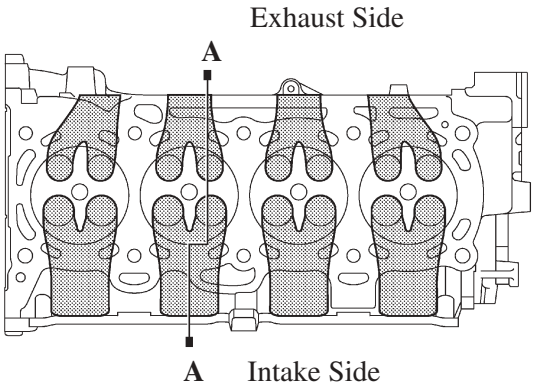
2AZ-FE Engine

3. Cylinder Head

- The taper squish combustion chamber is used to realize the engine's knocking resistance and fuel efficiency.
- An upright intake port has been used to achieve a highly efficient intake.
- Installing the injectors in the cylinder head enables the injectors to inject fuel as close as possible to the combustion chamber. This prevents the fuel from adhering to the intake port walls, which reduces HC exhaust emissions.
- The routing of the water bypass jacket in the cylinder head has been optimized for improved 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.



A – A Cross Section

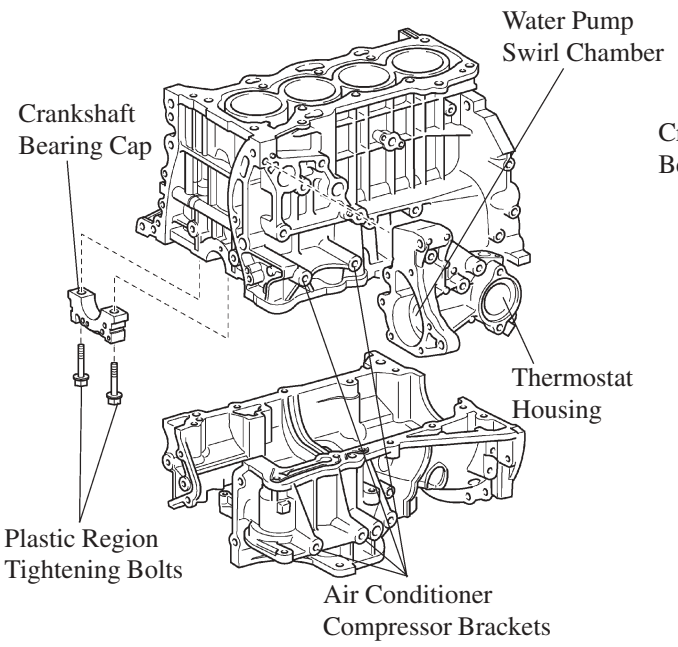


View from the Back Side

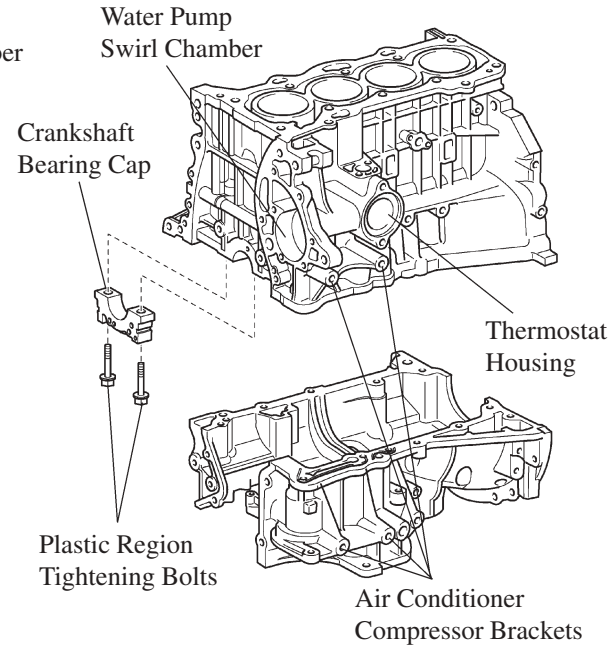
4. Cylinder Block

General

- Lightweight aluminum alloy is used for the cylinder block.
- By producing the thin cast-iron liners and cylinder block as a unit, compaction is realized. The spiny-type liners are used on 2AZ-FE engine models except for Australia and G.C.C. countries.
- The water jacket spacers are provided in the water jacket of the cylinder block, on 2AZ-FE engine models except for Australia and G.C.C. countries.
- Air 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 brackets are integrated into the crankcase. Also, the water pump swirl chamber and thermostat housing are integrated into the cylinder block, on models for Australia and G.C.C. countries.



2AZ-FE Engine
(Models except for Australia and G.C.C. Countries)



02KEG10Y

2AZ-FE Engine
(Models for Australia and G.C.C. Countries)

▶ Difference in Cylinder Block ◀

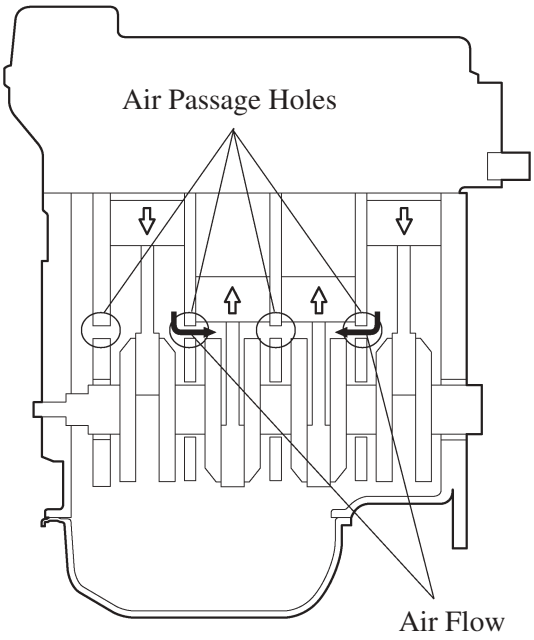
○: used —: not used

Engine Type	1AZ-FE	2AZ-FE	
		Models except for Australia and G.C.C. Countries	Models for Australia and G.C.C. Countries
Spiny-type Liner	—	○	—
Water Jacket Spacer	—	○	—
● Water Pump Swirl Chamber ● Thermostat Housing	Not incorporated into cylinder block	Not incorporated into cylinder block	Incorporated into cylinder block

NOTICE

Never attempt to machine the cylinder because it has a thin liner thickness.

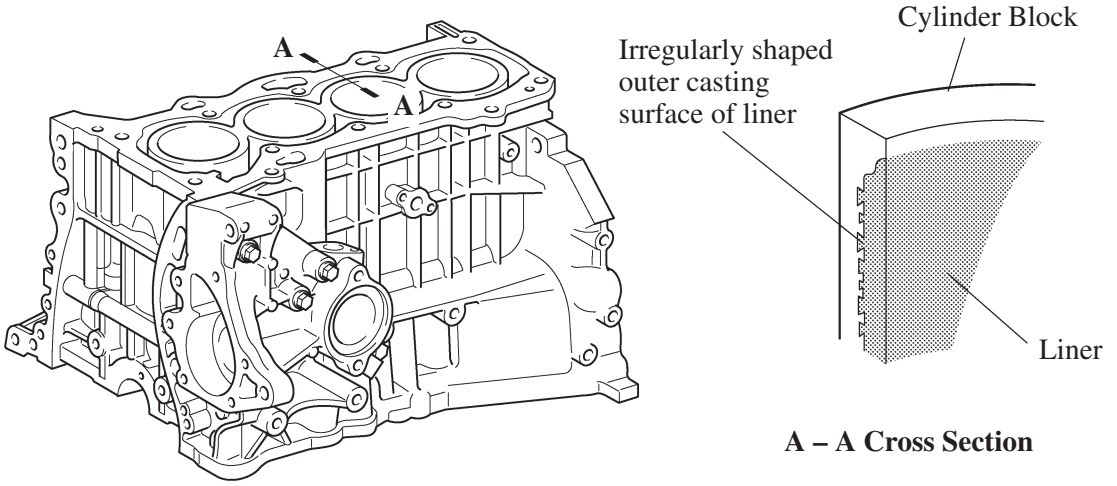
▶ Air Flow During Engine Revolution ◀



DR011EG22

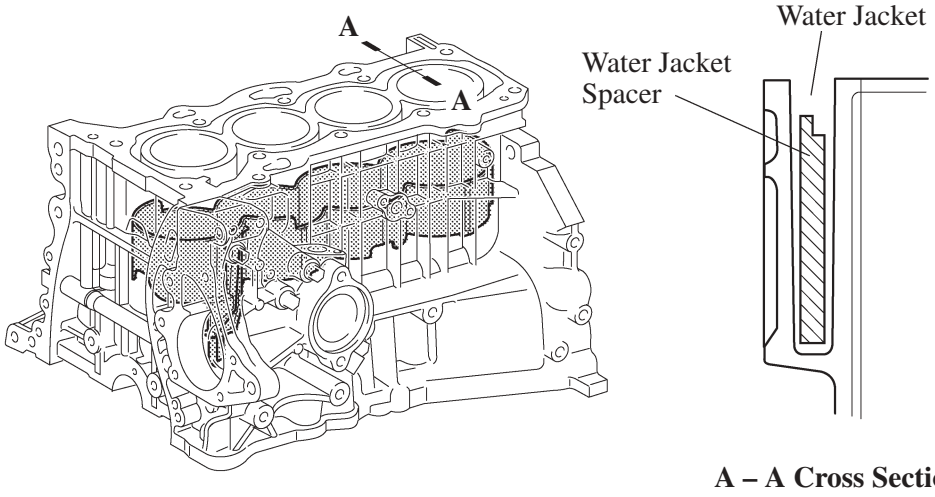
Spiny-type Liner

The liners are the spiny-type which have been manufactured so that their casting exteriors form large irregular surfaces in order to enhance the adhesion between the liners and the aluminum cylinder block. The enhanced adhesion helps heat dissipation, resulting in a lower overall temperature and heat deformation of the cylinder bores.



Water Jacket Spacer

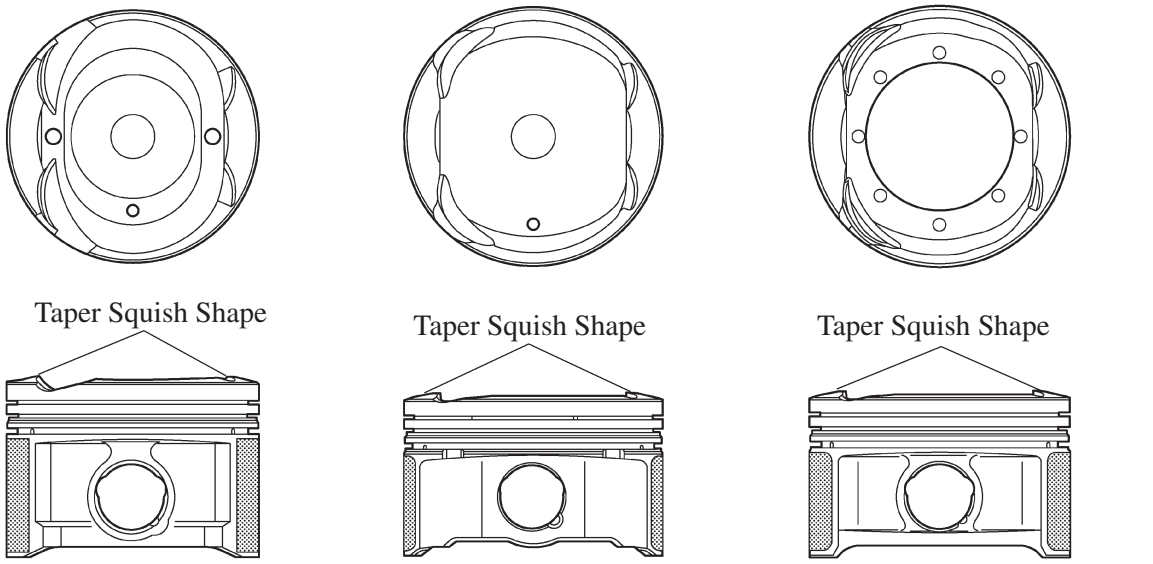
The water jacket spacers suppress the water flow in the center of the water jackets, guide the coolant above and below the cylinder bores, and ensure uniform temperature distribution. As a result, the viscosity of the engine oil that acts as a lubricant between the bore walls and the pistons can be lowered, thus reducing friction.



5. Piston

- The piston is made of aluminum alloy and skirt area is compact and lightweight.
- The piston head portion has a taper squish shape.
- The piston skirt has been coated with resin.
- Full floating type piston pins are used.
- By increasing the machining precision of the cylinder bore diameter, the outer diameter of the piston has been made into one type.

: Resin Coating



1AZ-FE Engine

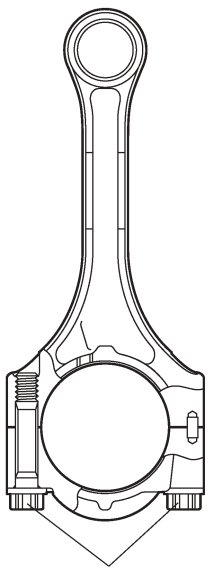
2AZ-FE Engine
Models except for Australia and G.C.C. Countries

2AZ-FE Engine
Models for Australia and G.C.C. Countries

02KEG13Y

6. Connecting Rod

- The connecting rods and caps are made of high strength steel for weight reduction.
- Nutless-type plastic region tightening bolts of the connecting rod are used for a lighter design.

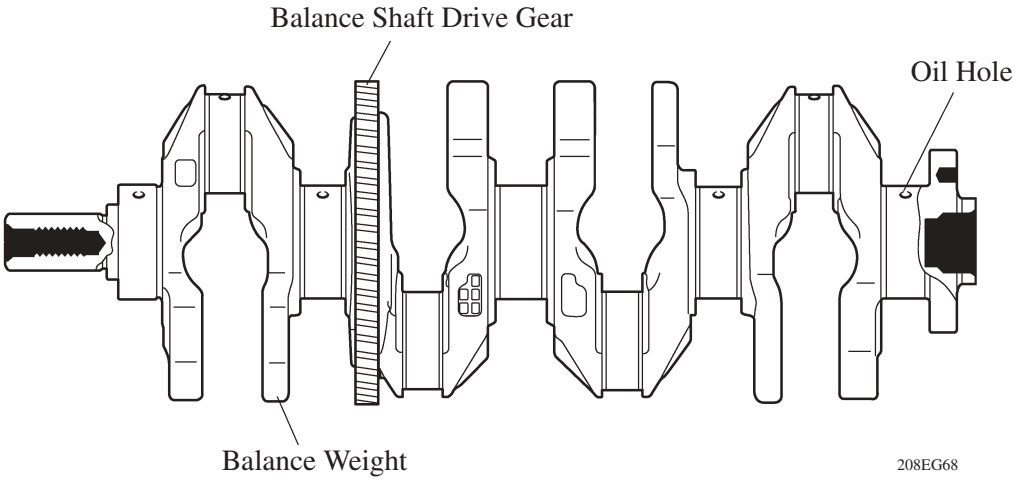


208EG61

Plastic Region Tightening Bolts

7. Crankshaft

- The crankshaft has 5 journals and 8 balance weights.
- The precision and surface roughness of the pins and journals have been realized to reduce friction.
- The balance shaft drive gear has been installed onto the crankshaft.
- The crankshaft is made of forged steel.



8. Balance Shaft

- The balance shaft is used in 1AZ-FE and 2AZ-FE engines to reduce vibrations.
- A direct-drive system is used which makes use of a gear that is installed onto the counterweight of crankshaft.
- In addition, a resin gear is used on the driven side to suppress noise and offer lightweight design.

