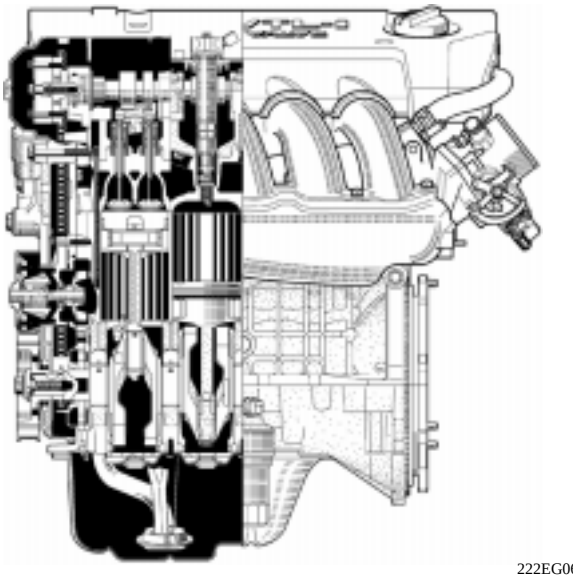
2ZZ-GE ENGINE

■DESCRIPTION

The VVTL-i (Variable Valve Timing and Lift-intelligent) system and the DIS (Direct Ignition System), have been used on this engine in order to achieve higher engine performance and lower fuel consumption and to reduce exhaust emissions.

The basic construction and operation are the same as 2ZZ-GE engine on the ’02 Celica. See page EG-51 for the major differences of this engine from the ’02 Celica.



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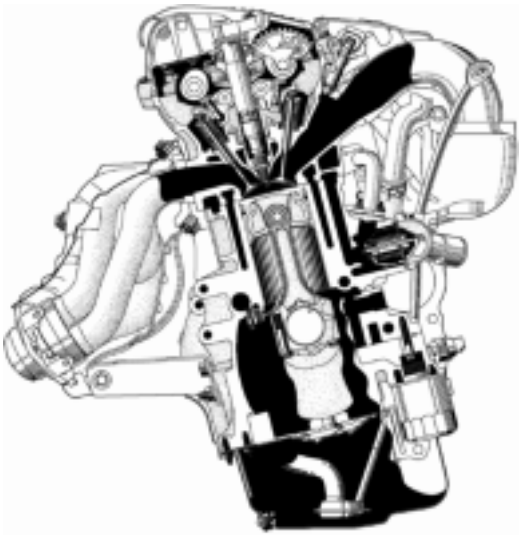

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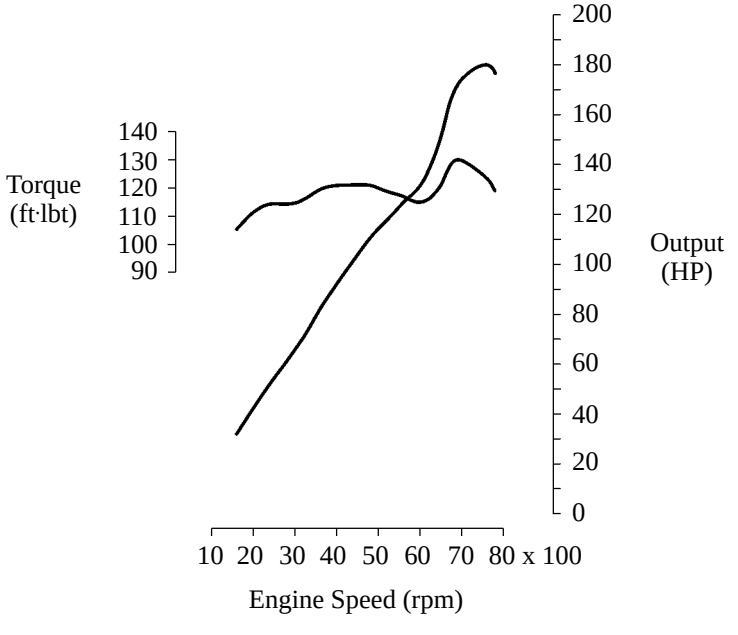
▶ Engine Specification ◀

Model				’03 Corolla Matrix	’02 Celica
No. of Cyls. & Arrangement				4-Cylinder, In-line	←
Valve Mechanism				16-Valve DOHC, Chain	←
Combustion Chamber				Pentroof Type	←
Manifolds				Cross-Flow	←
Fuel System				SFI	←
Displacement cm^3 (cu. in.)				1796 (109.7)	←
Bore x Stroke mm (in.)				82.0 x 85.0 (3.23 x 3.35)	←
Compression Ratio				11.5 : 1	←
Max. Output [SAE-NET]				134 kW @ 7600 rpm (180 HP @ 7600 rpm)	←
Max. Torque [SAE-NET]				176 N·m @ 6800 rpm (130 ft·lbf @ 6800 rpm)	←
Valve Timing	IN	LO & Medium Speed Range	Open	-10 ° ~ 33 ° BTDC	←
			Close	58 ° ~ 15 ° BTDC	←
		HI Speed Range	Open	15 ° ~ 58 ° ABDC	←
			Close	97 ° ~ 54 ° ABDC	←
	EX	LO & Medium Speed Range	Open	34 ° BBDC	←
			Close	14 ° ATDC	←
		HI Speed Range	Open	60 ° ATDC	←
			Close	36 ° ATDC	←
Valve Lift	IN	LO & Medium Speed Range		7.25 mm (0.29 in.)	←
		HI Speed Range		11.4 mm (0.45 in.)	←
	EX	LO & Medium Speed Range		7.25 mm (0.29 in.)	←
		HI Speed Range		10.0 mm (0.39 in.)	←
Firing Order				1 - 3 - 4 - 2	←
Octane Rating				91 or more*	←
Oil Grade				API SL-EC or ILSAC	API SJ- EC or ILSAC
Engine Service Mass kg (lb)				120 (265)	←

*: Use only premium unleaded gasoline

▶ Performance Curve ◀



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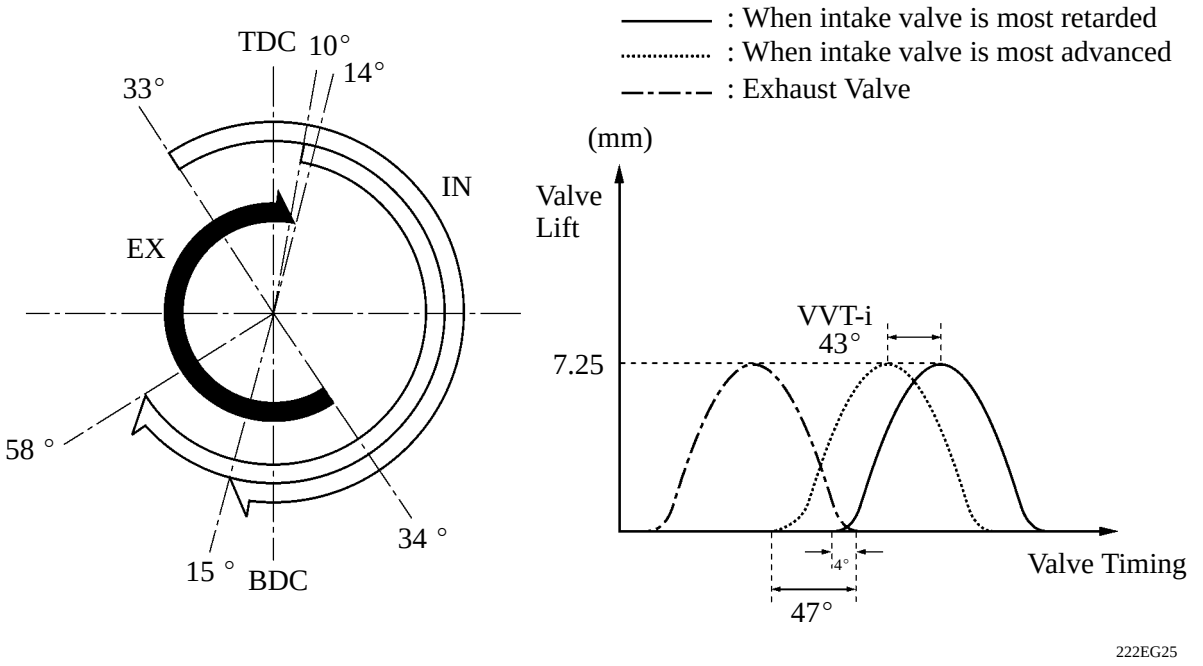
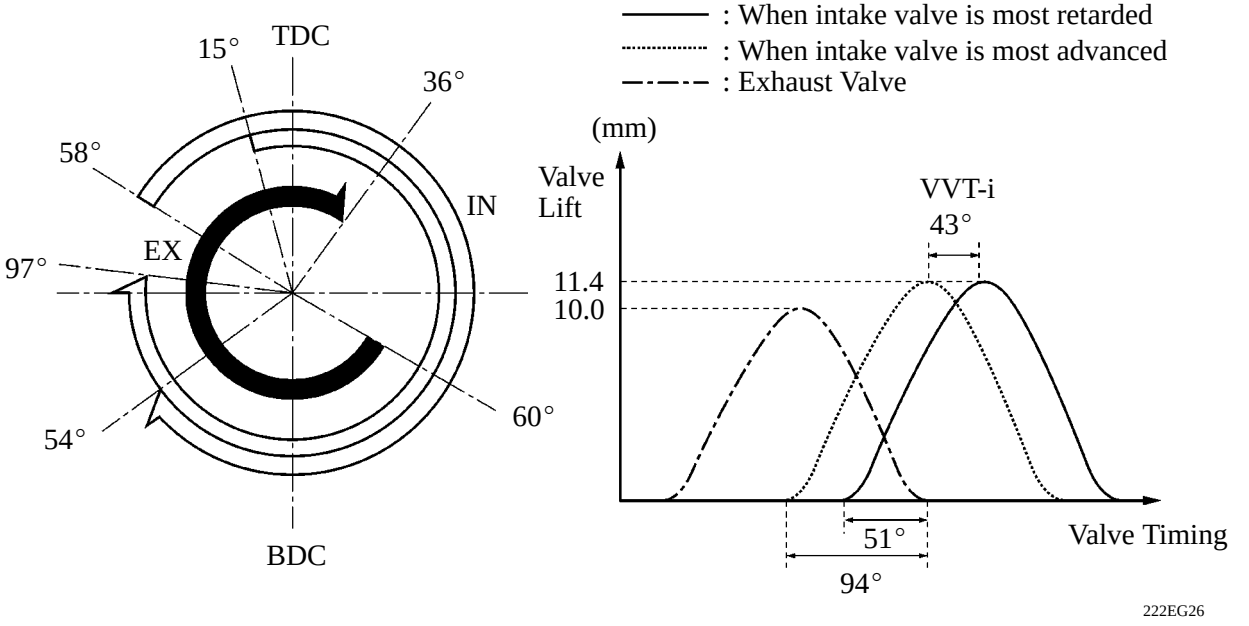
▶ Valve Timing and Lift ◀



for Low-and Medium-Speed Cam



for High-Speed Cam

■MAJOR DIFFERENCE (from '02 Celica)

Item	Outline
Intake and Exhaust System	Intake manifold shape changed due to installation differences.
Starting System (See page EG-22)	PS type starter has been adopted.
Engine Control System (See page EG-66)	● Adoption of the cooling fan control ● Adoption of 32-bit ECM

■FEATURES OF 2ZZ-GE ENGINE

The 2ZZ-GE engine has been able to achieve the following performance through the adoption of the items listed below.

(1) High performance and fuel economy

(2) Low noise and vibration

(3) Lightweight and compact design

(4) Good serviceability

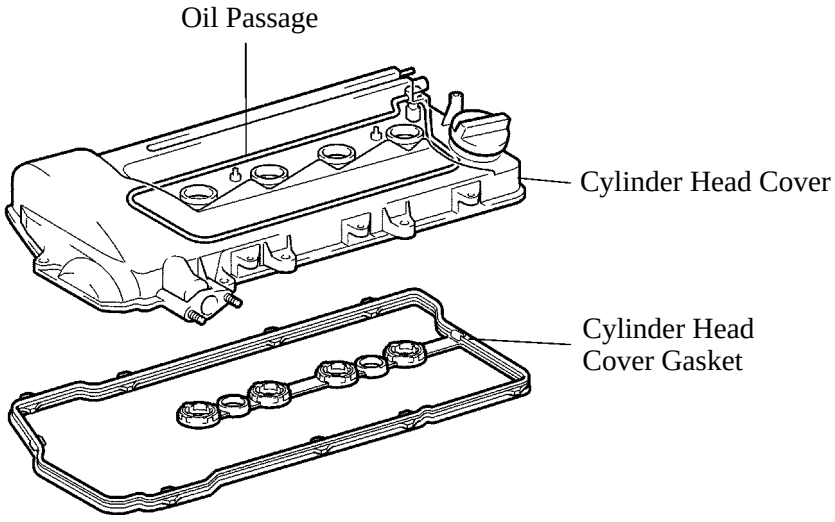
(5) Clean emission

Item	(1)	(2)	(3)	(4)	(5)
The VVTL-i system is used.	○				○
A cylinder block made of aluminum alloy has been used.			○		
The MMC (Metal Matrix Composite) material has been adopted for the cylinder walls.			○		
A stainless steel exhaust manifold is used.			○		
Iridium-tipped spark plugs have been used.				○	
The piston surface has been coated with iron and tin.	○	○			
The connecting rods are made of high-strength material.			○		
The forged crankshaft has 5 journals and 8 weights.	○	○			
Upright intake port has been used.	○				
The fuel returnless system has been used.					
A compression ratio of 11.5 : 1 has been used.	○				
Quick connectors are used to connect the fuel hose with the fuel pipe.				○	
A partition plate has been provided between the exhaust manifold and the exhaust front pipe to achieve a dual construction.	○				○
A rearward exhaust layout has been used to realize an early activation of the TWC.					○
4-hole type fuel injectors have been used.	○				○
ORVR (On-Board Refueling Vapor Recovery) system has been used.					○
The DIS (Direct Ignition System) makes ignition timing adjustment unnecessary.				○	
PS type starter has been adopted.			○		
A timing chain and chain tensioner have been used.				○	

■ENGINE PROPER

1. Cylinder Head Cover

- Lightweight yet high-strength aluminum die-cast cylinder head cover is used.
- The cylinder head cover gasket and the spark plug gasket have been integrated to reduce the number of parts.
- Acrylic rubber, which excels in heat resistance and reliability, has been adopted for the cylinder head cover gasket.
- Along with the adoption of the VVTL-i system, oil passages for spraying oil directly on the cams are provided in the cylinder head cover. This ensures the proper cooling and lubrication performance.



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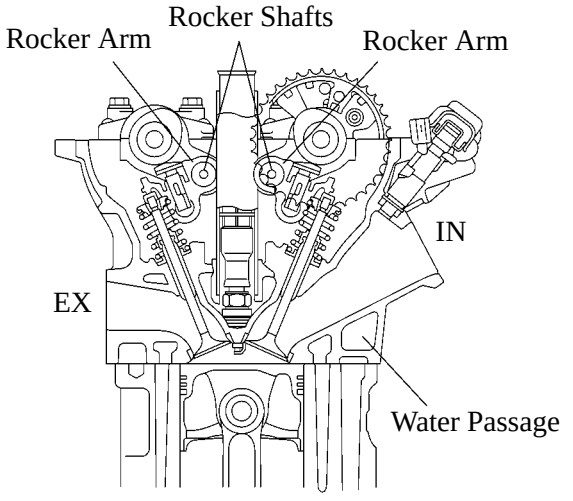
2. Cylinder Head

- Along with the adoption of the VVTL-i (Variable Valve Timing and Lift-intelligent) system, the cylinder head supports the installation of the rocker arm, rocker shaft, and oil control valve housing.
- Upright intake ports are used to increase intake efficiency.
- The injectors have been installed in the cylinder head to prevent the fuel from adhering onto the intake port walls, thus reducing exhaust emissions.
- A water bypass passage has been provided below the intake ports to reduce the number of parts and to reduce weight.



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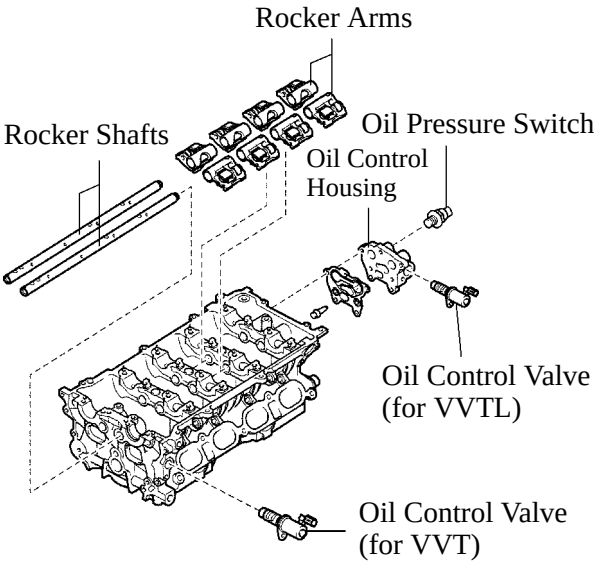

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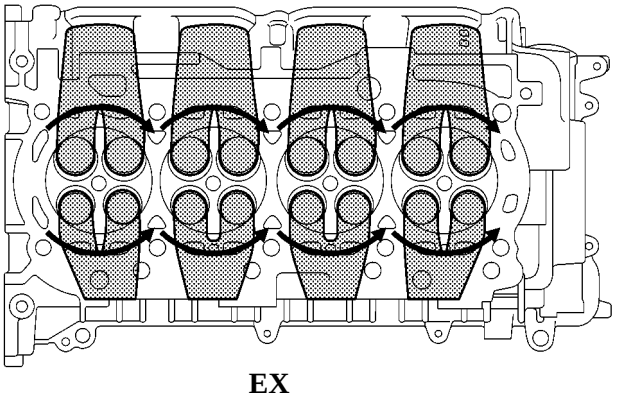
- The routing of the water jacket in the cylinder head has been optimized to achieve higher cooling performance.

: Water Passage

: Port Shape

IN



EX

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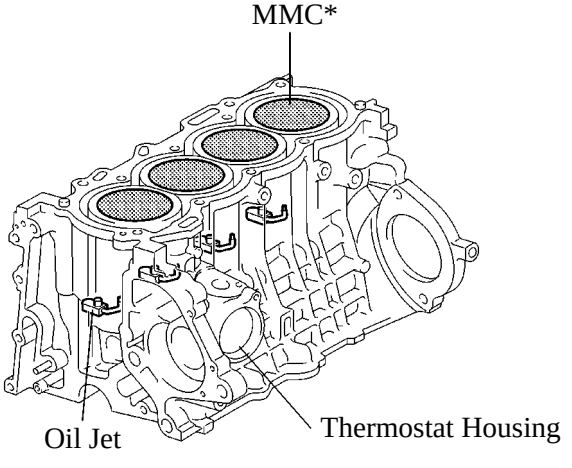
3. Cylinder Block

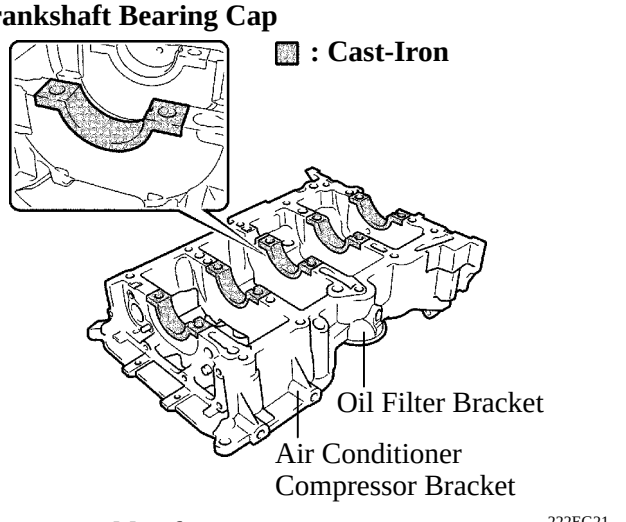
- Lightweight aluminum alloy is used for the cylinder block.
- The cylinder walls are made of MMC (Metal Matrix Composite)* to ensure wear resistance and achieve a linerless construction.

NOTICE

Never attempt to machine the cylinder because MMC.

- The crankshaft bearing caps with ladder-frame construction have been adopted to increase the rigidity, to reduce noise, and to increase the coupling rigidity with the transaxle.
- Cast-iron is adopted as a material for part of the bearing journal of crankshaft bearing cap and thus help prevent heat deformation. In addition, the oil filter bracket, the air conditioner compressor bracket, the water pump swirl chamber, the thermostat housing and the rear oil seal retainer have been integrated to reduce the number of parts.
- Oil jets are provided to ensure reliable cooling and lubrication of the pistons.



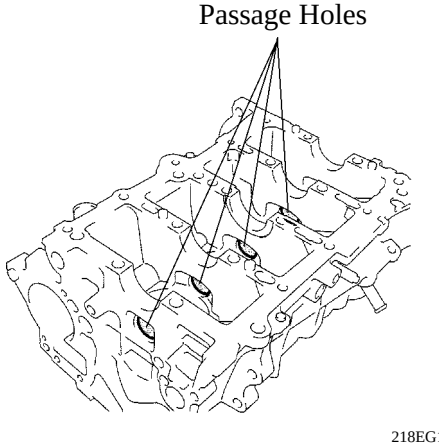


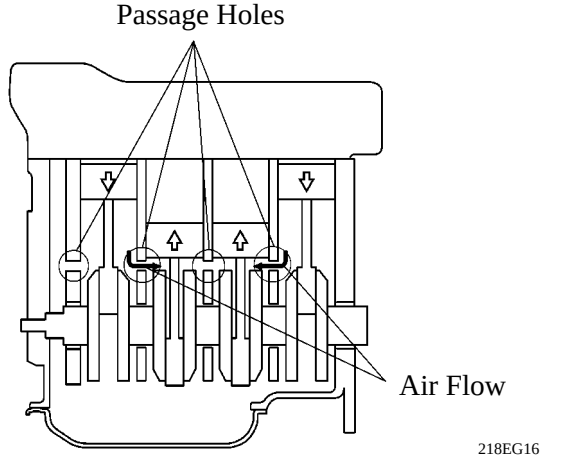
Ladder-frame Construction

**: MMC (Metal Matrix Composites)*

It is a type of composite material that is made of a metal matrix for the purpose of obtaining characteristics such as high strength, high elasticity, and low thermal expansion.

- 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.

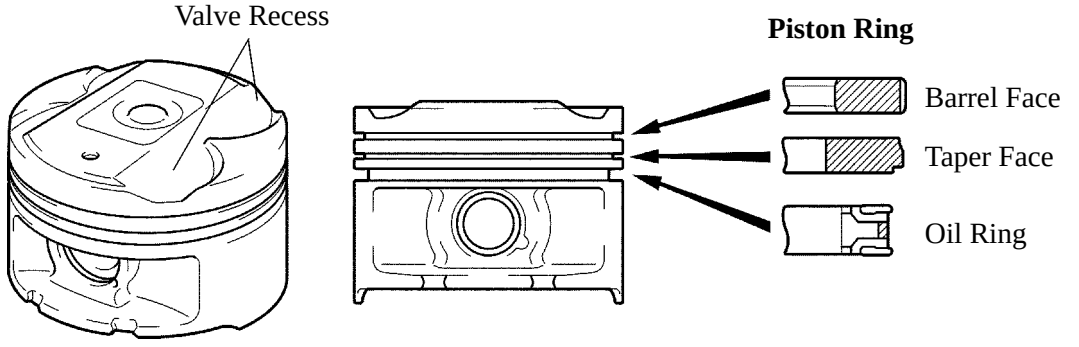




Air Flow During Engine Revolution

4. Piston

- The piston is made of aluminum alloy to be compact and lightweight.
- The piston surface is coated with iron and tin to reduce the sliding resistance friction between the piston and the cylinder wall.
- Full floating type piston pins are used.
- By increasing the machining precision of the cylinder bore diameter, only one size of piston is available.



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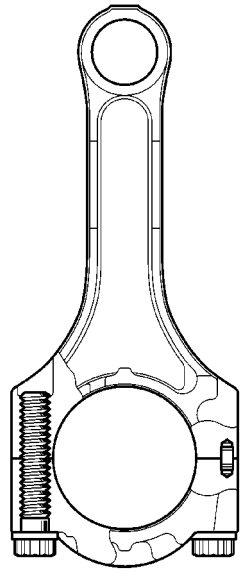
5. Connecting Rod

- The connecting rods are made of high-strength vanadium steel for weight reduction.
- The connecting rod bearings have been reduced in width to reduce friction.
- Nutless-type plastic region tightening bolts are adopted for a lighter design.



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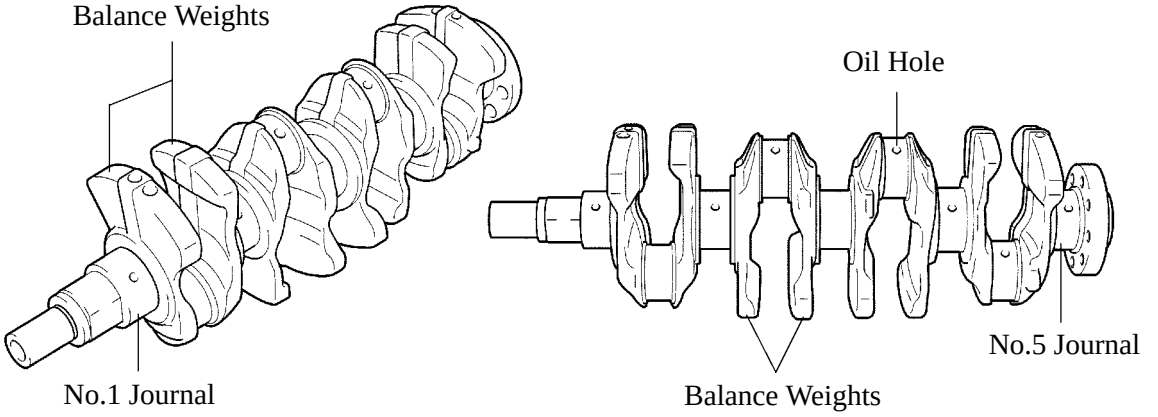
6. Crankshaft

- The forged crankshaft has 5 journals and 8 balance weights.
- The crankshaft bearings have been reduced in width to reduce friction.
- The pins and journals have been machined with increased precision and the surface roughness minimized to reduce friction.



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