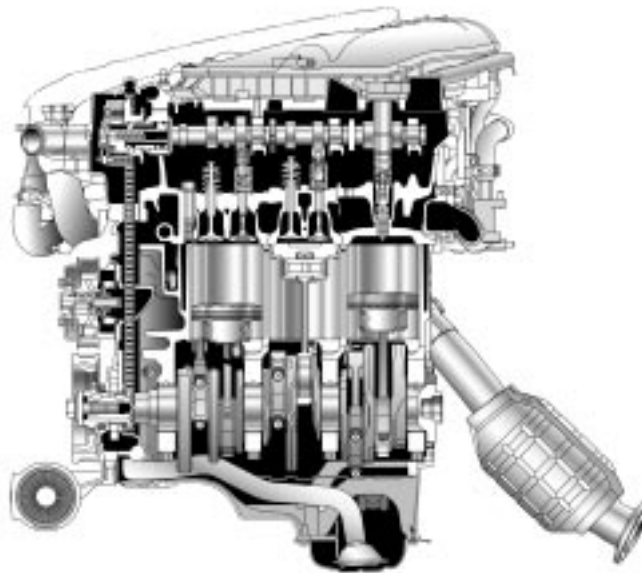


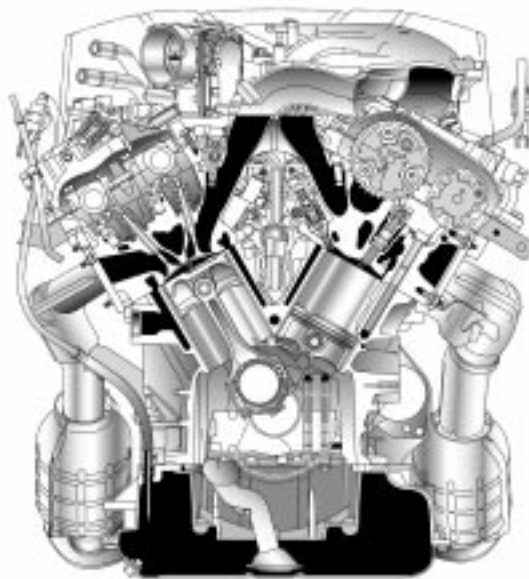
2GR-FSE ENGINE

■ DESCRIPTION

The newly developed 2GR-FSE is a 3.5-liter, 24-valve DOHC V6 engine. This engine adopts a D-4S (Direct injection 4-stroke gasoline engine Superior version) which uses both the direct injection and port injection systems. In addition, this engine uses a Dual VVT-i (Variable Valve Timing-intelligent) system, DIS (Direct Ignition System), and ETCS-i (Electronic Throttle Control System-intelligent). These control functions achieve improved engine performance, fuel economy, and clean emissions.



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► **Engine Specification** ◀

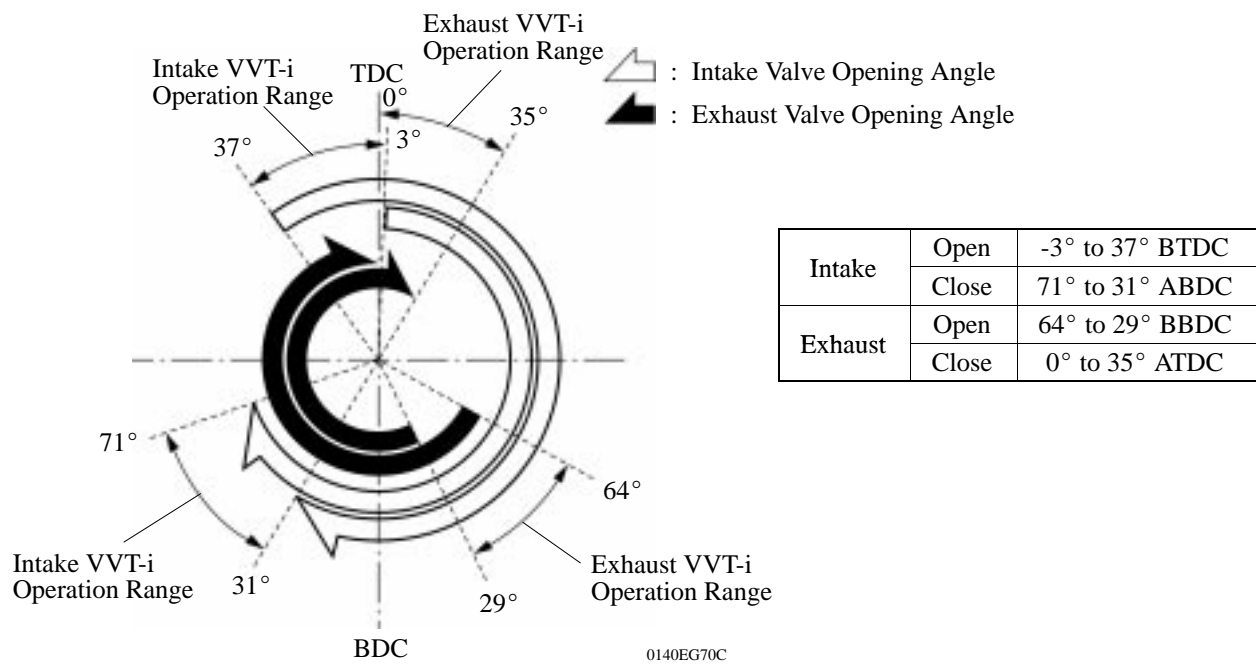
No. of Cyls. & Arrangement		6-Cylinder, V Type	
Valve Mechanism		24-Valve DOHC, Chain Drive (with Dual VVT-i)	
Combustion Chamber		Pentroof Type	
Manifolds		Parallel-Flow	
Fuel System		SFI D-4S	
Ignition System		DIS	
Displacement	cm ³ (cu. in.)	3456 (210.9)	
Bore × Stroke	mm (in.)	94.0 × 83.0 (3.70 × 3.27)	
Compression Ratio		11.8 : 1	
Max. Output (SAE-NET)* ¹		228 kW @ 6400 rpm (306 HP @ 6400 rpm)	
Max. Torque (SAE-NET)* ¹		375 N·m @ 4800 rpm (277 ft·lbf @ 4800 rpm)	
Oil Capacity	Dry	7.2 liters (7.6 US qts, 6.3 Imp. qts)	
	With Oil Filter	6.3 liters (6.7 US qts, 5.5 Imp. qts)	
	Without Oil Filter	5.9 liters (6.2 US qts, 5.2 Imp. qts)	
Oil Grade		ILSAC	
Engine Coolant	Type	TOYOTA Genuine Super Long Life Coolant or the Following* ²	
	Capacity	9.1 liters (9.6 US qts, 8.0 Imp. qts)	
Spark Plug	Type	DENSO	FK20HBR11 (Iridium)
	Plug Gap	mm (in.)	1.0 - 1.1 (0.0394 - 0.0433)
Firing Order		1 - 2 - 3 - 4 - 5 - 6	
Fuel Octane Rating		91 or higher	
Emission Regulation	Tailpipe	California	ULEVII, SFTP
		Except California	Tier2-Bin5, SFTP
	Evaporative	LEVII, ORVR	
Engine Service Mass* ³ (Reference)		kg (lb)	181 (399)

*¹: Maximum output and torque rating is determined by revised SAE J1394 standard.

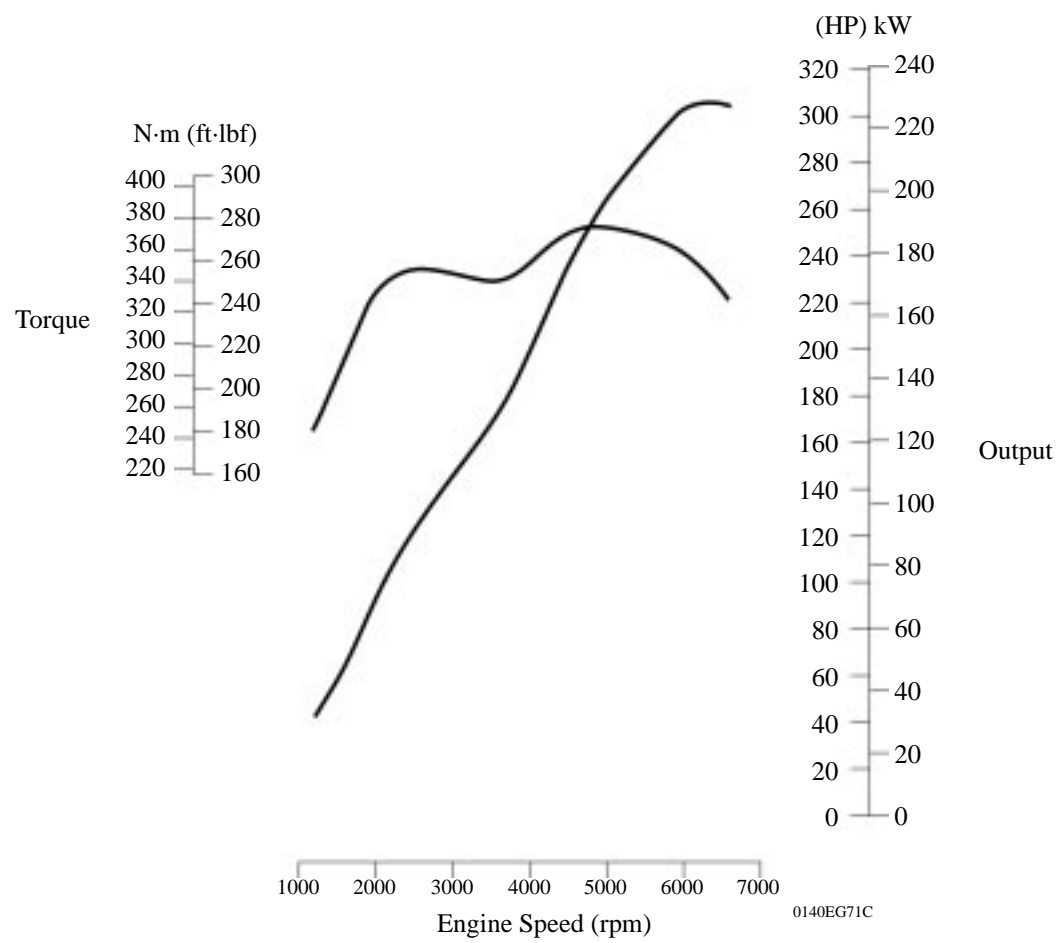
*²: Similar high quality ethylene glycol based non-silicate, non-amine, non-nitrite, and non-borate coolant with long-life hybrid organic acid technology. (Coolant with hybrid organic acid technology consists of the combination of low phosphates and organic acids.)

*³: Weight shows the figure with the oil and engine coolant fully filled.

► Valve Timing ◀



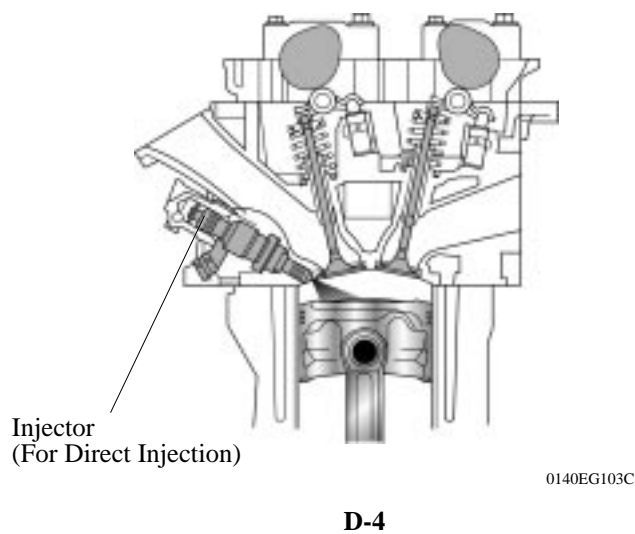
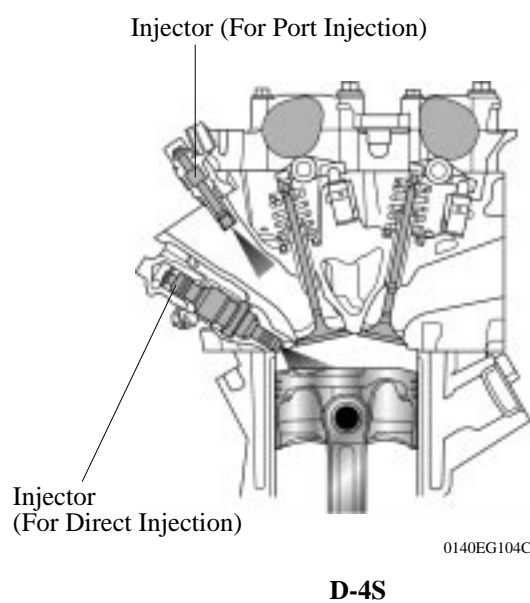
► Performance Curve ◀



— REFERENCE —

D-4S (Direct injection 4-stroke gasoline engine Superior version) System

- The D-4S system is a system which combines a direct injection system and a port injection system which injects fuel to the intake ports. This system optimally controls the two types of fuel injectors according to the driving conditions.
- When the engine is running under a medium or high load at lower speeds, both the direct and port injection systems are used. This control creates a homogeneous air-fuel mixture to stabilize combustion, improve fuel efficiency, and reduce emissions.
- When the engine is running under heavy load, direct injection system is used. This control achieves an intake cooling effect by injecting fuel directly to the combustion chamber, which improves the efficiency of each charge. This control also allows the compression ratio of the engine to be higher by reducing the tendency of the compressed mixture to preignite or detonate. The increased compression ratio improves engine output and performance.



- The double slit nozzle type injectors for direct injection atomize fuel so that the fuel spreads out widely and finely in a fan shape. Fuel is mixed with intake air efficiently and homogeneously, aiming at ideal combustion under any driving conditions.
- When the engine is cold, fuel is injected from the injectors (for port injection) to create a homogenous lean air-fuel mixture in the combustion chamber. Fuel is also injected from the injectors (for direct injection) during the latter half of the compression stroke to adjust the air-fuel mixture around the spark plug to allow stable combustion of under retarded ignition timing, thus increasing exhaust gas temperature. This promotes rapid warming of the catalysts and achieves cleaner emissions.