

## Main Features of 3GR-FE

3GR-FE Engine Features List

| Item                                                     | High<br>Perform<br>ance/<br>Fuel<br>Econo<br>my | Compa<br>ct/<br>Lightwe<br>ight | Cleaner<br>Exhaust<br>Gas | Low<br>Noise/<br>Low<br>Vibrati<br>on | Reliabil<br>ity | Servicea<br>bility |
|----------------------------------------------------------|-------------------------------------------------|---------------------------------|---------------------------|---------------------------------------|-----------------|--------------------|
| Dual VVT-i(Dual Variable Valve Timing-intelligent)       | ○                                               |                                 | ○                         |                                       |                 |                    |
| Roller Rocker Arm                                        | ○                                               |                                 |                           |                                       |                 |                    |
| Lash Adjuster                                            | ○                                               |                                 |                           |                                       |                 | ○                  |
| Slanted Squish Combustion Chamber                        | ○                                               |                                 | ○                         |                                       |                 |                    |
| Cast Aluminum Alloy Hypereutectic Type Piston            | ○                                               | ○                               |                           |                                       | ○               |                    |
| High Precision Aluminum Alloy Cylinder Block             |                                                 | ○                               |                           | ○                                     |                 |                    |
| Spiny Surface Cylinder Liner                             | ○                                               | ○                               |                           |                                       |                 |                    |
| Water Jacket Spacer                                      | ○                                               |                                 |                           |                                       |                 |                    |
| Aluminum Alloy Oil Pan                                   |                                                 | ○                               |                           | ○                                     |                 |                    |
| Replaceable Element Oil Filter                           |                                                 |                                 |                           |                                       |                 | ○                  |
| Auxiliary Equipment Bracket Integrated with Engine Block |                                                 | ○                               |                           | ○                                     | ○               |                    |
| Single High-Strength Timing Chain Drive                  |                                                 | ○                               |                           |                                       | ○               |                    |
| Alternator Pulley with Clutch                            | ○                                               |                                 |                           |                                       | ○               |                    |
| Electronic ACIS (Acoustic Control Induction System)      | ○                                               |                                 |                           |                                       | ○               |                    |
| Plastic Surge Tank                                       | ○                                               | ○                               |                           |                                       |                 |                    |
| Single-Valve Electronically Controlled Throttle System   | ○                                               | ○                               |                           |                                       |                 |                    |
| Full Fabric Air Filter Element                           |                                                 | ○                               |                           |                                       |                 |                    |
| Compact Plug-In Type Hot-Wire Airflow Meter              | ○                                               | ○                               |                           |                                       |                 |                    |
| Exhaust Manifold Integrated Three-Way Catalyst           |                                                 |                                 | ○                         |                                       |                 |                    |
| Stainless Steel Exhaust Manifold                         |                                                 | ○                               | ○                         |                                       |                 |                    |
| Fuel Return Less System                                  |                                                 | ○                               |                           |                                       |                 |                    |
| Long-Reach Iridium Spark Plug                            | ○                                               |                                 | ○                         |                                       |                 |                    |
| DIS( Direct Ignition System)                             | ○                                               | ○                               | ○                         |                                       | ○               |                    |
| Liquid-Filled Double-Orifice Mount Insulator             |                                                 | ○                               |                           | ○                                     |                 |                    |
| Oil Level Sensor                                         |                                                 |                                 |                           |                                       | ○               |                    |
| Air-Fuel Ratio Sensor                                    | ○                                               |                                 | ○                         |                                       | ○               |                    |
| Diagnosis                                                |                                                 |                                 |                           |                                       | ○               |                    |

### High Performance/Fuel Economy

- Through the use of the Dual VVT-i system, optimal valve timing is set to suit the engine conditions in various speed ranges. Thus, high power output, high torque, and low emissions have been realized.
- The 4-valve DOHC cylinder head uses roller rocker arms, thus narrowing the angle between the intake and exhaust valves to 25.6 degrees. This results in a compact combustion chamber shape that offers a superior S/V\* ratio. Furthermore, long-reach iridium spark plugs are used, enabling an optimal placement of the water jacket in the cylinder head. As a result, the knock threshold has been improved.
- The shapes of the intake ports have been optimized and slanted squish combustion chambers are used to increase the intake air volume, thus improving engine performance. In addition, the combustion chambers generate a tumble flow that is optimal for improving combustion.
- A thin-wall, cast aluminum intake manifold is used. The diameter, length, and shape of the ports are optimized to achieve a high torque and fuel economy in all operating ranges. In addition, the manifold pressure loss is minimized to improve engine performance.
- By optimizing the exhaust port and using a stainless steel exhaust manifold, the torque in the low- to medium-speed range has been improved.
- An electronic ACIS (Acoustic Control Induction System) is used. The length of the intake manifold and the capacity of the surge tank have been changed to increase the torque in all speed ranges.
- A clutch is provided on the alternator pulley to lower the tension of the accessory belt and reduce friction, in order to improve fuel economy.
- To reduce the friction of the valve train and reciprocal movement parts, comprehensive measures have been taken: a roller rocker type of mechanism is used to open and close the valves, a new type of resin coat is applied to the pistons, low-tension piston rings are used, and a uniform bore wall temperature has been ensured by improving the roundness of the cylinder bore and using a water jacket spacer.

### ❖REFERENCE❖

\* : S/V = combustion chamber surface/volume ratio. The lower the S/V ratio, the lesser the cooling loss, enabling the effective use of fuel.

### Low Exhaust Emissions

- Each stainless steel (dual pipe) exhaust manifold has a built-in three-way catalyst. The warm-up performance of the catalyst has been improved by placing the catalyst directly below the engine and through the optimal use of precious metal. This improves exhaust emission performance immediately after the engine is started.

### Lightweight and Compact

- The cylinder block is made of aluminum alloy for weight reduction.
- A serpentine drive system, which uses a single belt to drive the accessories, is used in order to shorten the overall length of the engine.
- The brackets for the accessories are integrated with the engine in order to reduce the number of parts and achieve a compact construction.
- The exhaust manifold is made of stainless steel, and the portion that mounts to the cylinder head is made of thin-wall stamped steel for weight reduction.

### Low Vibration, Low Noise, and Quietness

- A highly rigid, aluminum alloy oil pan with integrated stiffeners is used. By improving the joining rigidity between the oil pan and the power plant, low vibration and low noise have been achieved.
- A high strength, highly rigid forged steel crankshaft that has 4 journals and 5 balance weights is used. In addition to weight reduction, this crankshaft has achieved low vibration and noise due to the optimal allocation of balance weights.
- A liquid-filled, double-orifice mount insulator is used in the front engine mount to reduce vibration and noise.

### Serviceability

- The maintenance interval has been extended through the use of iridium spark plugs.
- A replaceable element oil filter is used due to environmental concerns.
- Hydraulic lash adjusters are used, making valve clearance adjustments unnecessary.