## 1. ENGINE INTAKE SPECIFICATIONS

1) Specifications

<table>
<thead>
<tr>
<th>Element Type</th>
<th>Dry-Element Type</th>
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<tbody>
<tr>
<td>Service Interval</td>
<td>- Initial cleaning: 5,000 km, Clean or change every 10,000 km as required. However, change every 30,000 km.</td>
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<td></td>
<td>- If the vehicle is operated under severe condition (short distance driving, extensive idling or driving in dusty condition): More frequent maintenance is required.</td>
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</tbody>
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OVERVIEW AND OPERATION PROCESS

1. INTAKE SYSTEM LAYOUT

1) Work Flow of Intake System

![Intake System Flowchart]

**HFM Sensor**

The HFM sensor is installed in the air intake passage between the air cleaner and the intake manifold. It measures the air volume supplied to the combustion chamber and the air temperature.

- It controls the EGR feedback.
- It controls the pressure control valve for the turbocharger booster.

**VGT Turbocharger**

- Turbocharger actuator
- Exhaust pipe (diesel catalytic converter)
- Intake (air cleaner)
- Compressed air (intercooler)

**Front Air Duct**

**Plug-in sensor**

**Temperature sensor**

**Protection grid**

**Component List**

1. Plug-in sensor
2. Cylinder housing
3. Protection grid
4. Hybrid cover
5. Measuring duct cover
6. Housing
7. Hybrid
8. Sensor
9. Mounting plate
10. O-ring
11. Temperature sensor

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ENGINE INTAKE SYSTEM

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The charging efficiency may be lowered or the knocking may happen as the intake air is heated and the density of air is lowered. The intercooler is the device which cools the supercharged air.
2) Layout

- Intake manifold
- Tightening torque (M6-nut): 35 ± 3.5 Nm
- EGR-RH pipe assembly
- EGR valve assembly
- Tightening torque (M6X25-4 EA): 10 ± 1.0 Nm
- EGR pipe gasket
- Tightening torque (M6X16-2 EA): 10 ± 1.0 Nm
- EGR-LH pipe assembly
- Tightening torque (M6X50/133-10 EA): 25 ± 2.5 Nm
- Tightening torque (M8X25/30-4 EA): 25 ± 2.5 Nm
- Tightening torque (M6X16-2 EA): 10 ± 1.0 Nm
3) Components

(1) Intake Manifold Assembly

The intake manifold assembly is built for the optimized mixture of the EGR gas in the intake chamber when the compressed air in the turbocharger is sent to the intake port. The intake port is composed of the dual port (tangential and helical port) which increases the swirl ratio in mid/low operating range, improves acceleration/fuel consumption and decreases particle materials. However, there are some differences in the form of the EGR valve and 4-cylinder engine.

⚠️ CAUTION

- The inlet port and coolant outlet port is integrated together. Therefore, be careful not to let the residual coolant in the manifold enter the inlet port when removing the intake manifold. Also, replace the gasket with a new one and tighten it to the specified torque (25 ± 2.5 Nm).
The SUS + Rubber coating is applied to the intake manifold gasket to prevent the air leakage and optimize the sealing effect.

**Intake Manifold**

1. EGR pipe (RH)  
2. EGR pipe (center)  
3. Coolant emission port  
4. Intake air (intercooler)  
5. Exhaust gas  
6. EGR pipe (LH)  
7. Vacuum modulator to the EGR valve

Incoming of intake air (No operation of EGR valve)  
Incoming of intake air and exhaust gas (Operation of EGR valve)
(2) Turbocharger Intercooler Assembly

The turbocharger is designed to improve the engine power by introducing more air (oxygen) into the engine. However, the intake air is heated during the compression process in the turbocharger compressor and the density is lowered. The intercooler is the device which cools (50 ~ 60°C) the air entering the engine from high temperature (100 ~ 110°C) to maintain the turbocharging efficiency. Thus, more air is entered the cylinder than the engine only with the turbocharger to give more power.

**CAUTION**

- For removal and installation procedures, refer to the "Cooling system" section in DI engine service manual.
2. AIR FLOWS

1) Work Flow of Intake System

Air Cleaner → HFM Sensor → Turbo Charger → Intercooler → Intake Manifold → Combustion Chamber in Engine