

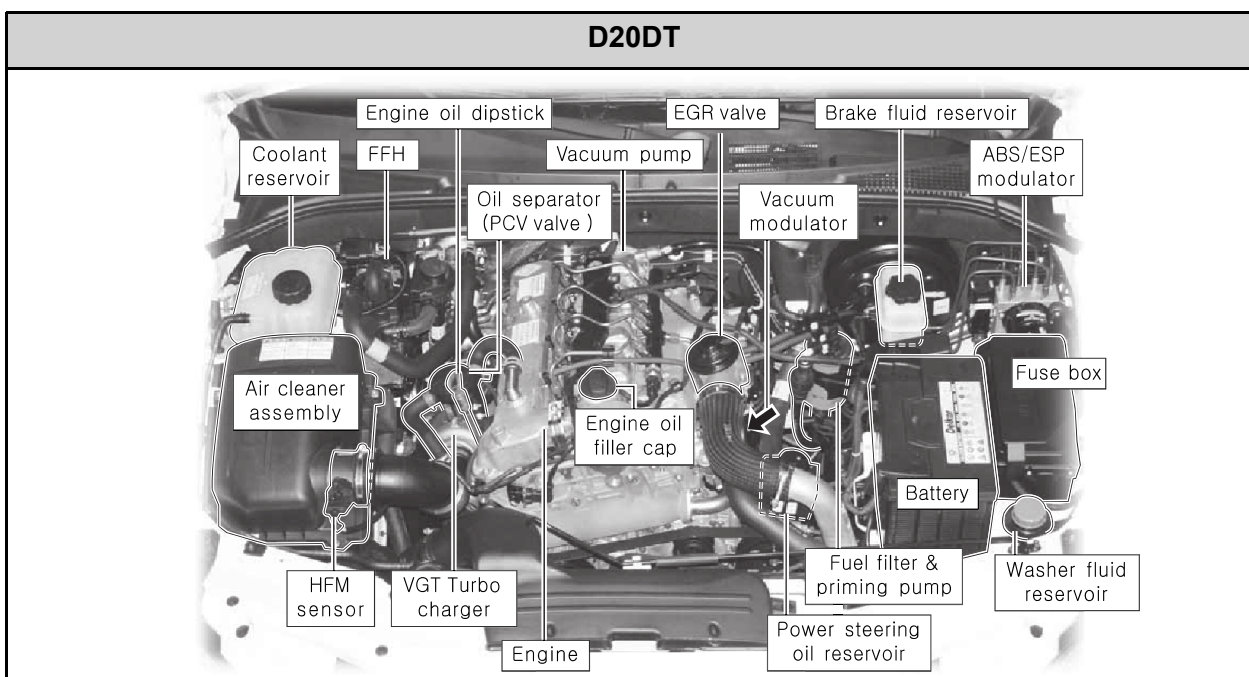
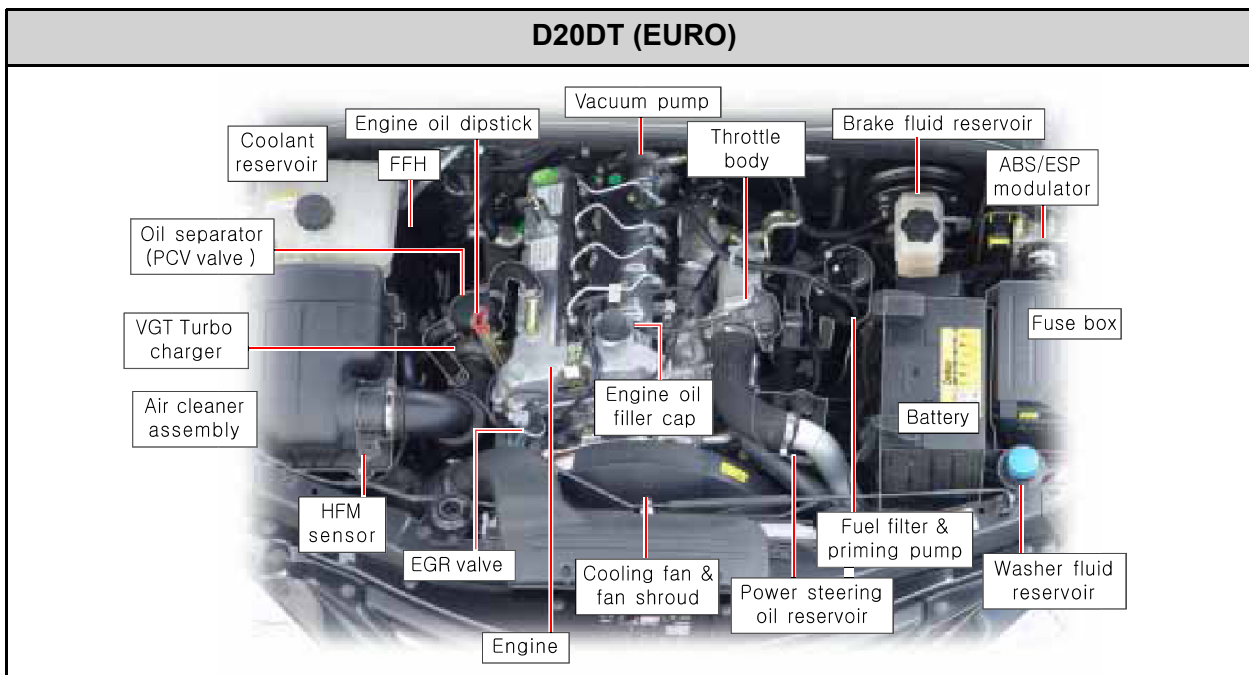
ENGINE ASSEMBLY

1114-00

GENERAL

1. MAJOR COMPONENTS IN ENGINE AND ENGINE COMPARTMENT

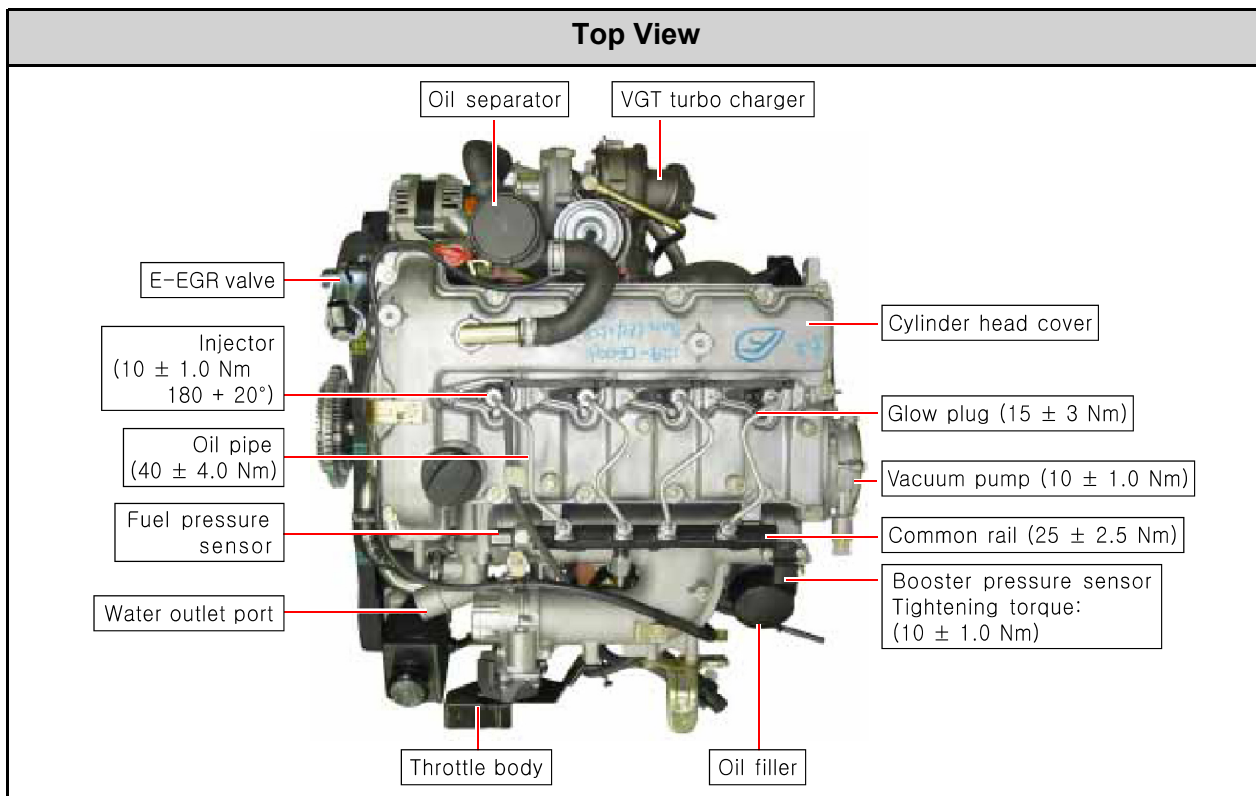
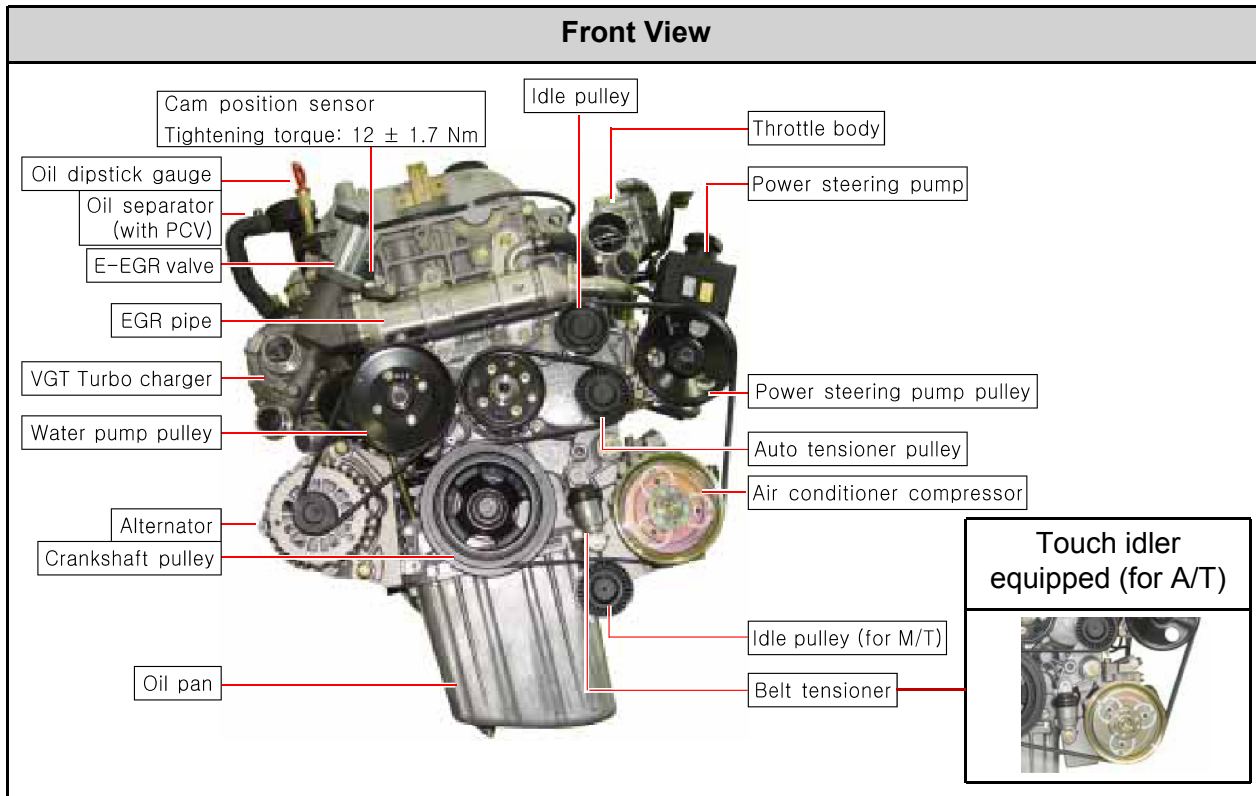
The electronically controlled advanced D20DT engine that has high pressure fuel system has been introduced to this vehicle. It satisfies the strict emission regulation and provides improved output and maximum torque.



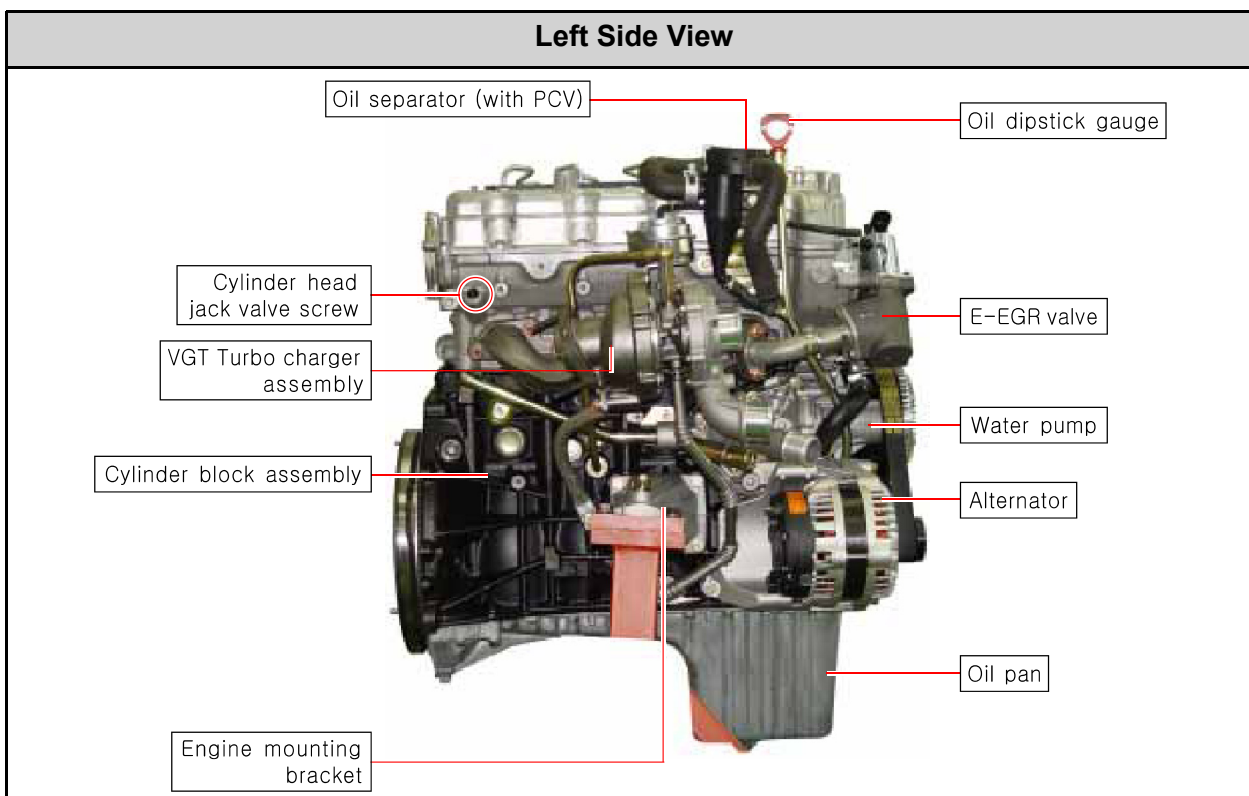
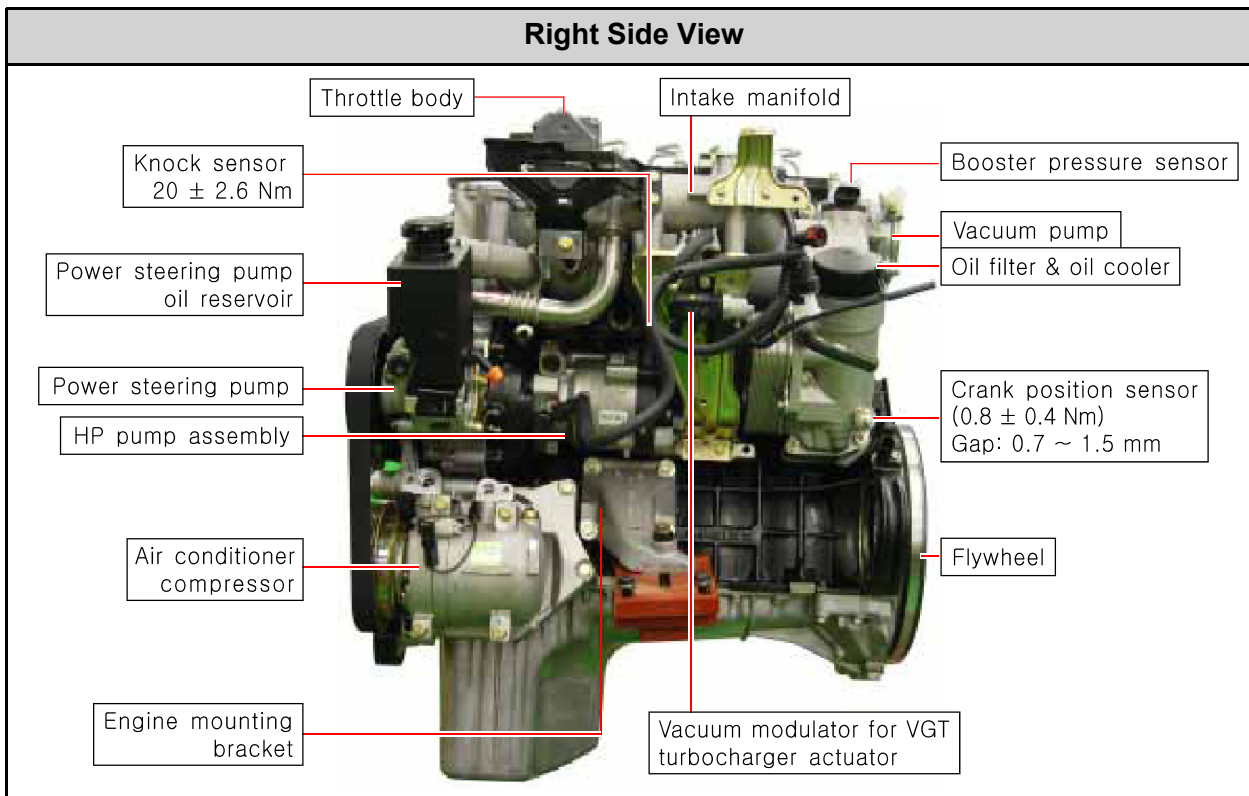
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| Modification basis | |
| Application basis | |
| Affected VIN | |

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1) Engine Assembly Structure



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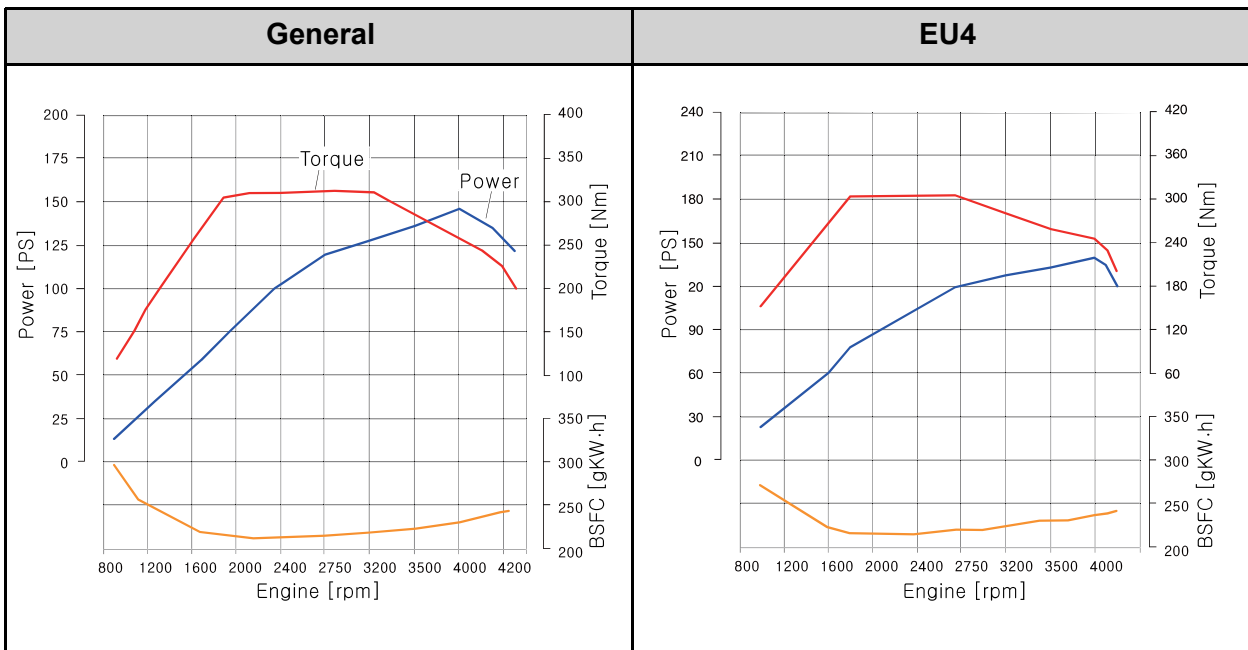
2. SPECIFICATIONS AND PERFORMANCE CURVE

1) Specifications

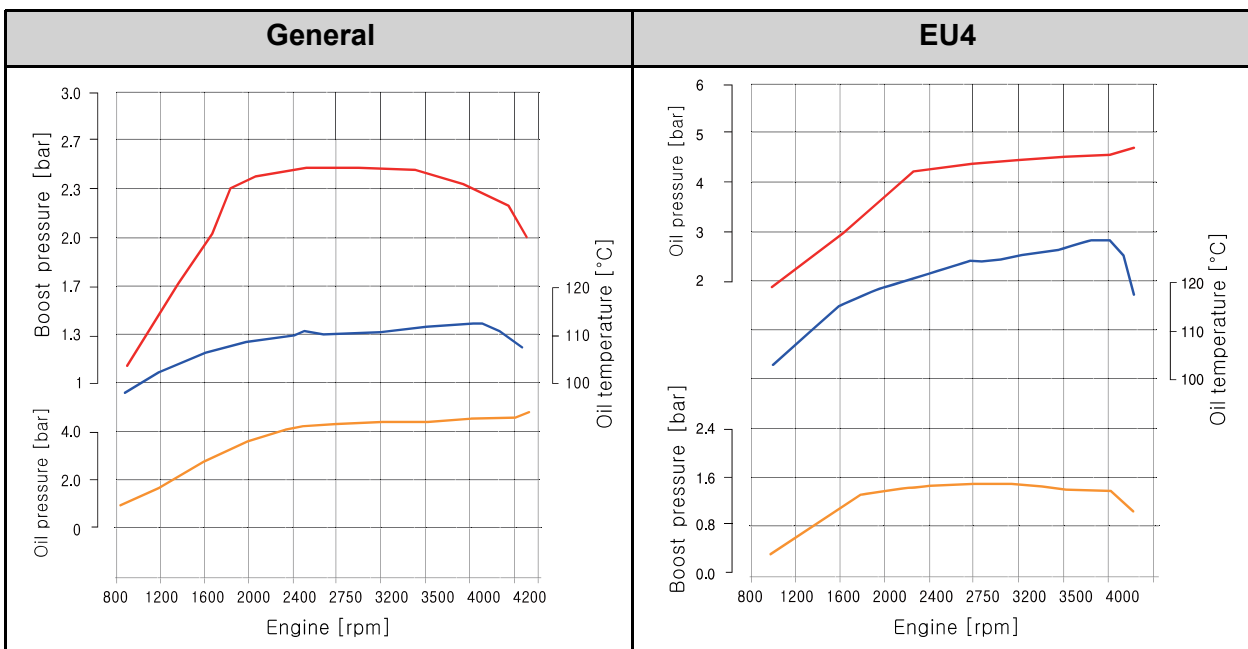
| Description | | D20DT (EURO 4) | D20DT | |
|--------------------|-----------------------------------|--|-----------------|---|
| Engine | Type/Number of cylinders | D20DT/4-cylinder | ← | |
| Cylinder | Inner diameter | 86.2 mm | ← | |
| | Stroke | 85.6 mm | ← | |
| Displacement | | 1998 cc | ← | |
| Compression ratio | | 17.5:1 | ← | |
| Maximum output | | 141 ps / 4,000 rpm | ← | |
| Maximum torque | | 310 Nm / 1,800 ~ 2,750 rpm | ← | |
| Idle speed | For Manual Transmission | 780 ± 50 rpm | ← | |
| | For Automatic Transmission | 780 ± 50 rpm | ← | |
| Valve | Intake | Opens (BTDC) | 9° | ← |
| | | Closes (ABDC) | 26° | ← |
| | Exhaust | Opens (BBDC) | 38° | ← |
| | | Closes (ATDC) | 16° | ← |
| Camshaft | Type | DOHC | ← | |
| Fuel system | Fuel type | Low sulfur diesel | ← | |
| | Fuel pump type | Vane pump in HP pump | ← | |
| | Fuel supply pressure | HP pump inlet port: max. 400 mbar HP pump outlet port (with IMV fully open): over 1,050 bar | ← | |
| | Water separation in fuel filter | at every 10,000 km | ← | |
| | Fuel tank capacity | 75 ℓ | ← | |
| Lubrication system | Oil specification | Quality class: Ssangyong genuine engine oil (Approved by MB Sheet 229.1 or 229.3) Viscosity: MB sheet No. 224.1 | ← | |
| | Lubrication type | Forced delivery | ← | |
| | Oil filter type | Full flow, filter element type | ← | |
| | Oil capacity | ≈ 7.5 ℓ | ← | |
| Cooling system | Cooling type | Water cooling type | ← | |
| | Cooling fan operation type | Belt operated type | ← | |
| | Thermostat (Fully Open: 100°C) | Opening temperature | 85 °C | ← |
| | | Type | WAX pellet type | ← |
| | Coolant capacity | ≈ 11.5 ℓ | ← | |

2) Engine Performance Curve

(1) Output and Torque



(2) Oil Temperature/Pressure and Boost Pressure



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| Modification basis | |
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3. TIGHTENING TORQUE

| Name | Bolt Size | Quantity | Tightening Torque (Nm) | |
|--|-----------------|----------|------------------------|----------------------|
| | | | D20DT (EURO 4) | D20DT |
| Main bearing cap | M11 x 67 | 10 | 55 ± 5 120° ± 10° | 55 ± 5 120° ± 10° |
| Connecting rod cap | M9 x 51 | 8 | 40 ± 5 90° ± 10° | 40 ± 5 90° ± 10° |
| Rear cover | M6 x 20 | 6 | 10 ± 1 | 10 ± 1 |
| Oil pump | M8 x 35SOC | 3 | 25 ± 2.5 | 25 ± 2.5 |
| T.G.C.C | M6 x 40 | 6 | 10 ± 1 | 10 ± 1 |
| | M6 x 60 | 3 | 10 ± 1 | 10 ± 1 |
| | M6 x 70 | 2 | 10 ± 1 | 10 ± 1 |
| Flywheel | M10 x 22 | 8 | 45 ± 5 90° ± 10° | 45 ± 5 90° ± 10° |
| Crankshaft hub | M20 x 85 | 1 | 200 180° ± 10° | 200 180° ± 10° |
| Oil pan | M6 x 20 | 20 | 10 ± 1 | 10 ± 1 |
| | M6 x 35 | 3 | 10 ± 1 | 10 ± 1 |
| | M6 x 85 | 3 | 10 ± 1 | 10 ± 1 |
| | M8 x 40 | 4 | 25 ± 2.5 | 25 ± 2.5 |
| High pressure pump mounting bolt | M8 x 55 | 3 | 25 ± 2.5 | 25 ± 2.5 |
| High pressure pump main nut (intershaft) | M14 x 1.5 | 1 | 65 ± 5 | 65 ± 5 |
| Cylinder head | M8 x 25 | 2 | 25 ± 2.5 | 25 ± 2.5 |
| | M8 x 50 | 2 | | |
| | M10 x 158 | 1 | 85 ± 5 | 85 ± 5 |
| | M10 x 177 | 9 | 270° ± 10° | 270° ± 10° |
| Camshaft sprocket (Intake) | M11 x 40 | 1 | 25 ± 2.5 | 25 ± 2.5 |
| Camshaft sprocket (Exhaust) | | 1 | 90° ± 10° | 90° ± 10° |
| Chain tensioner | M24 | 1 | 65 ± 5 | 65 ± 5 |
| Auto tensioner | M12 x 90 (UP) | 1 | 82 ± 6 | 82 ± 6 |
| | M8 x 45 (LOWER) | 1 | 32 ± 3 | 32 ± 3 |
| Water pump assembly | M6 x 50 | 7 | 10 ± 1 | 10 ± 1 |
| Water pump pulley | M6 x 10 | 4 | 10 ± 1 | 10 ± 1 |
| Hot water inlet pipe assembly | M6 x 12 | 2 | 10 ± 1 | 10 ± 1 |
| Alternator bracket | M8 x 80 | 1 | 25 ± 2.5 | 25 ± 2.5 |
| | M8 x 34 | 2 | 25 ± 2.5 | 25 ± 2.5 |
| | M8 x 30 | 2 | 25 ± 2.5 | 25 ± 2.5 |
| Alternator | M10 x 90 | 1 | 46 ± 4.6 | 46 ± 4.6 |
| | M10 x 116 | 1 | 46 ± 4.6 | 46 ± 4.6 |

| Name | Bolt Size | Quantity | Tightening Torque (Nm) | |
|---|-------------------------------|----------|------------------------|----------|
| | | | D20DT (EURO 4) | D20DT |
| Air conditioner compressor bracket assembly | M8 x 25 | 1 | 25 ± 2.5 | 25 ± 2.5 |
| | M8 x 60 | 3 | 25 ± 2.5 | 25 ± 2.5 |
| Air conditioner compressor sub bracket assembly | M6 x 16 | 1 | 10 ± 1.0 | 10 ± 1.0 |
| | M8 x 20 | 1 | 25 ± 2.5 | 25 ± 2.5 |
| Intake manifold | M8 x 50 | 5 | 25 ± 2.5 | 25 ± 2.5 |
| | M8 x 133 | 5 | 25 ± 2.5 | 25 ± 2.5 |
| Acoustic cover bracket | M6 x 16 | 2 | 25 ± 2.5 | 25 ± 2.5 |
| | M8 x 105 | 1 | 25 ± 2.5 | 25 ± 2.5 |
| Knock sensor | M8 x 28 | 1 | 20 ± 2.6 | 20 ± 2.6 |
| Camshaft position sensor | M8 x 14 | 1 | 12 ± 1.7 | 12 ± 1.7 |
| Booster pressure sensor | M6 x 20 | 2 | 10 ± 1.0 | 10 ± 1.0 |
| Exhaust manifold stud bolt | M8 x 46 | 8 | 15 ± 1.5 | 15 ± 1.5 |
| | M8 x 35 | 2 | 15 ± 1.5 | 15 ± 1.5 |
| Exhauster manifold nut | M8 | 8 | 40 ± 4.0 | 40 ± 4.0 |
| Turbo charger assembly | M8 | 3 | 25 ± 2.5 | 25 ± 2.5 |
| Turbocharger hollow bolt | M10 x 1.0 | 1 | 18 ± 1.8 | 18 ± 1.8 |
| Turbocharger oil feed pipe | M16 (Cylinder block side) | 1 | 25 ± 2.5 | 25 ± 2.5 |
| Turbocharger support bar (nut) | M8 | 1 | 23 ± 2.3 | 23 ± 2.3 |
| Turbocharger support bar (bolt) | M8 x 20 | 1 | 25 ± 2.5 | 25 ± 2.5 |
| Turbocharger return pipe | M6 x 16 (T/C side) | 2 | 10 ± 1.0 | 10 ± 1.0 |
| | M6 x 16 (Cylinder block side) | 2 | 10 ± 1.0 | 10 ± 1.0 |
| EGR valve assembly | M6 x 25 | 4 | 10 ± 1.0 | 10 ± 1.0 |
| EGR-LH pipe nut | M8 | 2 | 35 ± 3.5 | 35 ± 3.5 |
| EGR-RH pipe nut | M6 x 16 | 2 | 10 ± 1.0 | 10 ± 1.0 |
| EGR center bolt | M6 x 16 | 4 | 10 ± 1.0 | 10 ± 1.0 |
| EGR center pipe | M8 x 25 | 2 | 25 ± 2.5 | 25 ± 2.5 |
| | M8 x 30 | 2 | 25 ± 2.5 | 25 ± 2.5 |
| Glow plug | M5 | 5 | 15 ± 3.0 | 15 ± 3.0 |
| Vacuum pump | M6 x 20 | 3 | 10 ± 1.0 | 10 ± 1.0 |
| | M6 x 25 | 5 | 10 ± 1.0 | 10 ± 1.0 |
| Cooling fan bracket assembly | M6 x 55 | 1 | 10 ± 1.0 | 10 ± 1.0 |
| | M6 x 85 | 3 | 10 ± 1.0 | 10 ± 1.0 |
| Cylinder head cover | M6 x 35 | 18 | 10 ± 1.0 | 10 ± 1.0 |
| Vacuum modulator | M6 x 16 | 4 | 10 ± 1.0 | 10 ± 1.0 |

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| Name | Bolt Size | Quantity | Tightening Torque (Nm) | |
|----------------------------|-----------|----------|------------------------|------------------|
| | | | D20DT (EURO 4) | D20DT |
| Oil dipstick tube | M6 x 16 | 1 | 10 ± 1.0 | 10 ± 1.0 |
| | M8 x 35 | 1 | 25 ± 2.5 | 25 ± 2.5 |
| Oil filter assembly | M8 x 55 | 2 | 25 ± 2.5 | 25 ± 2.5 |
| | M8 x 125 | 1 | 25 ± 2.5 | 25 ± 2.5 |
| Fuel rail assembly | M8 x 35 | 2 | 25 ± 2.5 | 25 ± 2.5 |
| Injector | M6 x 60 | 4 | 10 ± 1.0 | 10 ± 1.0 |
| | | | 180° + 20° | 180° + 20° |
| Fuel pipe clip (H-C) | M14 | 2 | 40 ± 4.0 | 40 ± 4.0 |
| Fuel pipe clip (C-I) | M14 | 8 | 40 ± 4.0 | 40 ± 4.0 |
| Crankshaft position sensor | M6 x 14 | 1 | 0.8 ± 0.4 | 0.8 ± 0.4 |
| | GAP | - | 0.7 ± 1.5 mm | 0.7 ± 1.5 mm |
| Power steering pump | M8 x 100 | 2 | 25 ± 2.5 | 25 ± 2.5 |
| Head screw plug | - | 1 | 25 ± 2.5 | 25 ± 2.5 |
| Cam shaft cap bolt | M8 x 60 | 20 | 25 ± 2.5 | 25 ± 2.5 |
| Piston topping | - | - | 0.765 ~ 1.055 mm | 0.765 ~ 1.055 mm |
| Connecting rod end play | - | - | 0.500 ~ 1.500 mm | 0.500 ~ 1.500 mm |
| Cam shaft end play | - | - | 0.100 ~ 0.350 mm | 0.100 ~ 0.350 mm |
| Crank shaft end play | - | - | 0.100 ~ 0.254 mm | 0.100 ~ 0.254 mm |

1) Engine Head Bolt Tightening Torque

Head bolt wrench and tightening torque according to the cylinder head bolt changes of the DI engine (D20DT)



Cylinder head bolt wrench

W9912 003 0B

I.D. of head bolt head: 14.5 mm
O.D. of head bolt wrench: 13.3 mm



Tightening Torque










- A. Removal order
: Remove the bolts in the order as shown in the figure.
- B. Installation order (Based on the number in the picture)
: 10 → 9 → 8 → 7 → 6 → 5 → 4 → 3 → 2 → 1 → 14 → 13 → 12 → 11
(Reverse order of removal)

| Size | Tightening torque | Bolt No. (Quantity) |
|-----------|-------------------|---------------------|
| M8 x 25 | 25 ± 2.5 Nm | 11, 12 (2) |
| M8 x 50 | 25 ± 2.5 Nm | 13, 14 (2) |
| M10 x 158 | 85 ± 5 Nm | 4 (1) |
| M10 x 127 | 270° ± 10° | 1 ~ 10 (9) |

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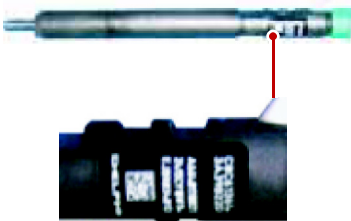




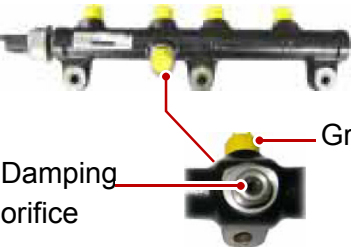
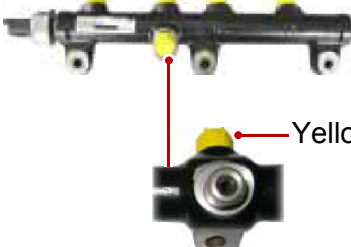


4. MAJOR CHANGES IN D20DT (EURO IV) ENGINE (COMPARED TO D20DT)

1) Engine Assembly




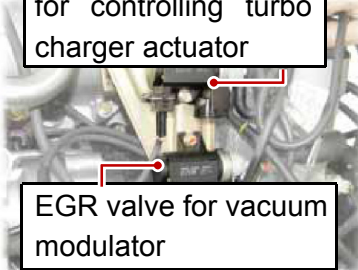

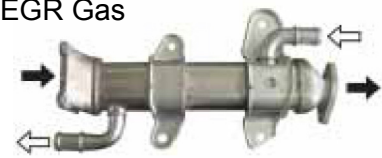

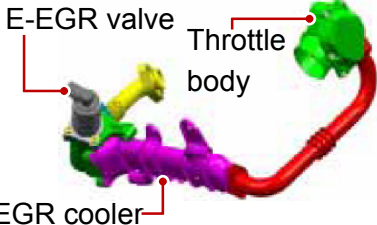

| D20DT (EURO 4) Engine | D20DT Engine |
|--|--|
| <p>Front Side View</p> <div> <p>Touch idler equipped (for A/T)</p>  </div>  |  |
| <p>Top Side View</p>  |  |
| <p>Right Side View</p>  |  |
| <p>Left Side View</p>  |  |

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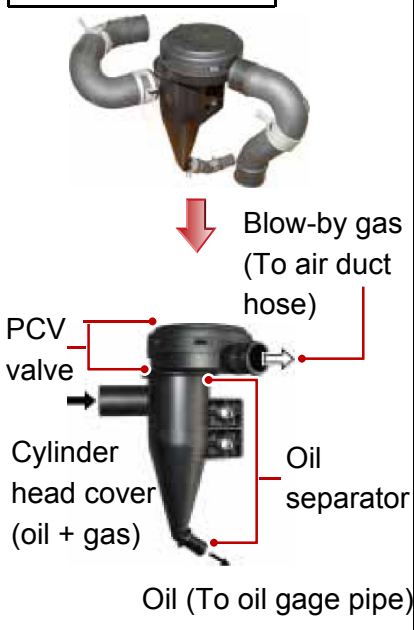
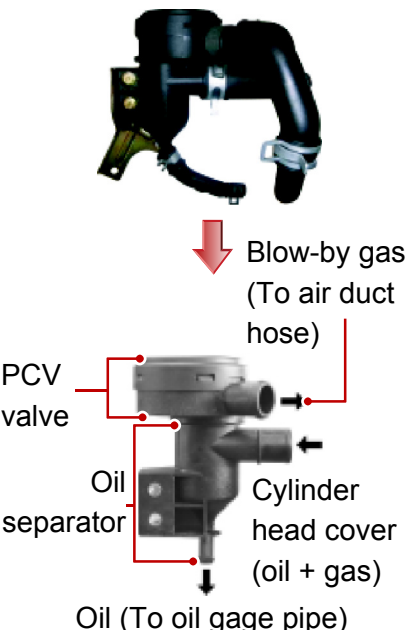






2) Major Changes and Summary

| D20DT (EURO 4) Engine | D20DT Engine | Remarks |
|---|---|---|
| <p>Injector</p>  <p>C31 Label</p> |  <p>C2I Label</p> | <p>* Injector label</p> <ul style="list-style-type: none"> - D20DT: Green (Cap) (16 digits: C2I value) - D20DT (EURO 4): Red (Cap) (20 digits: C3I value) |
| <p>Fuel pipe</p>  |  | <p>* Diameter increased</p> <ul style="list-style-type: none"> - D20DT: ID (2.4 mm), OD (6.0 mm) - D27DT (EURO 4): ID (3 mm), OD (6.35 mm) |
| <p>Fuel high pressure pipe</p>  |  | <p>* Diameter expanded due to the increased capacity.</p> |
| <p>Common rail</p>  <p>Damping orifice</p> <p>Green</p> |  <p>Yellow</p> | <p>* D20DT (EURO4): Added damping orifice. (Orifice is added to fuel inlet/outlet ports in order to dampen the pulsation in fuel flow caused by multi-injections.)</p> |
| <p>Electric controlled E-EGR valve</p>  | <p>EGR valve</p>  | <p>* E-EGR valve: ECU controls the EGR valve directly without any media. It provide more precise EGR control by transmitting the electric signal of EGR valve operating position.</p> |

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| D20DT (EURO 4) Engine | D20DT Engine | Remarks |
|--|--|---|
| <p>HFM 6.0</p>  | <p>HFM 5.0</p>  | <p>* Version up - D27DT: HFM5-CI (Analog signal) - D27DTP: HFM6-ID (Digital signal added)</p> |
| <p>Vacuum modulator</p>  <p>VGT turbo charger control</p> | <p>Vacuum modulator for controlling turbo charger actuator</p>  <p>EGR valve for vacuum modulator</p> | <p>* D20DT (EURO4) engine uses electric ally controlled E-EGR valve. Thus, the vacuum modulator for controlling EGR valve has been deleted.</p> |
| <p>Throttle body</p>  | <p>N/A</p> | <p>* Throttle body is for future regulation requiring emission reductions. Currently, it is used to prevent the engine from turning off with fluttering noise at the moment the air to intake manifold is blocked by closed flap when the engine is switched off.</p> |
| <p>EGR cooler</p>  <p>EGR Gas</p> <p>Coolant</p> | <p>EGR center pipe</p>  <p>EGR Gas</p> | <p>* To enhance EGR function, coolant EGR cooler is adopted to reduce the temperature of exhaust gas into the intake manifold.</p> |
| <p>E-EGR system layout</p>  <p>E-EGR valve</p> <p>Throttle body</p> <p>EGR cooler</p> | <p>EGR system layout</p>  <p>EGR center pipe</p> <p>EGR valve</p> | <p>* Reason of changes - To satisfy the emission regulation, E-EGR valve and EGR cooler are adopted. And the layout also has a great difference from D27DT.</p> |

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| D20DT (EURO 4) Engine | D20DT Engine | Remarks |
|---|--|--|
| <p>PCV oil separator</p>  |  | <p>* Increase of Oil separator capacity (approx. 10%)</p> <ul style="list-style-type: none"> - D20DT (EURO 4): 160 /min - D20DT: 120 /min |
| <p>Intake manifold</p>  |  | <p>* The appearance of intake manifold is changed to the round type due to the throttle body. Also, the mounting location of booster pressure sensor is changed.</p> |
| <p>Water pump</p>  |  | <p>* For D20DT (EURO4) engine: Additional connecting port for EGR cooler hose</p> |
| <p>Coolant outlet port</p>  |  | <p>* For D20DT (EURO4) engine: Additional port for coolant of EGR cooler</p> |

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