

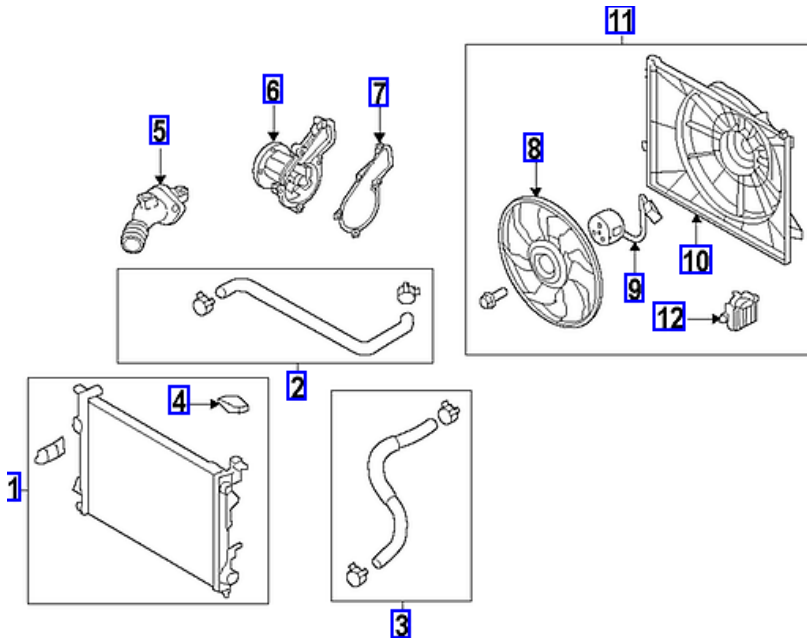
Component Procedures: Cooling System

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Component Procedures: Cooling System

Cooling System (Article 80010)



Parts and Labor (itype_189)

Parts

Qualifier	Part #	Name	Price	Note
Radiator > Lower Hose	25415F2100	3 - Lower Hose	48.27	
Radiator > Radiator	25310F2000	1 - Radiator	475.67	
Radiator > Radiator Cap	25330B1000	4 - Radiator Cap	19.16	
Radiator > Upper Hose	25414F2100	2 - Upper Hose	31.63	
Water Pump > Gasket	251242E000	7 - Gasket	8.85	
Water Pump > Water Pump	251002E020	6 - Water Pump	150.48	
Cooling Fan > Fan Assembly	25380F2000	11 - Fan Assembly	486.63	
Cooling Fan > Fan Blade	25231F2000	8 - Fan Blade	73.32	
Cooling Fan > Fan Motor	25386F2000	9 - Fan Motor	246.82	
Cooling Fan > Fan Shroud	25350F2000	10 - Fan Shroud	185.97	
Cooling Fan > Resistor	25385F2000	12 - Resistor	76.68	
Cooling System > Thermostat	255002E085	5 - Thermostat	143.23	

Labor

Operation	Qualifier Path	Skill	Std Hrs	Wty Hrs
Remove & Replace	Cooling Fan > Fan Assembly, R&R	B	1.4	0.0
Remove & Replace	Cooling Fan > Fan Blade, R&R	B	1.4	0.0
Remove & Replace	Cooling Fan > Fan Motor, R&R	B	1.4	0.0
Remove & Replace	Cooling System > Block Heater, R&R	B	0.5	0.0
Remove & Replace	Cooling System > By-Pass Hose, R&R	C	1.9	0.0
Remove & Replace	Cooling System > Expansion Plug, R&R > One	B	0.5	0.0
Remove & Replace	Cooling System > Expansion Plug, R&R > Each A?	B	0.4	0.0
Remove & Replace	Cooling System > Expansion Tank, R&R	C	0.3	0.0
Remove & Replace	Cooling System > Thermostat Gasket, R&R	B	1.2	0.0
Remove & Replace	Cooling System > Thermostat, R&R	B	1.2	0.0
Remove & Replace	Radiator > Lower Hose, R&R	C	1.0	0.0
Remove & Replace	Radiator > Radiator, R&R	B	3.3	0.0
Remove & Replace	Radiator > Upper Hose, R&R	C	0.7	0.0
Remove & Replace	Water Pump > Water Pump, R&R	B	1.6	0.0
Test	Cooling System > Cooling System Pressure, Test	C	0.3	0.0

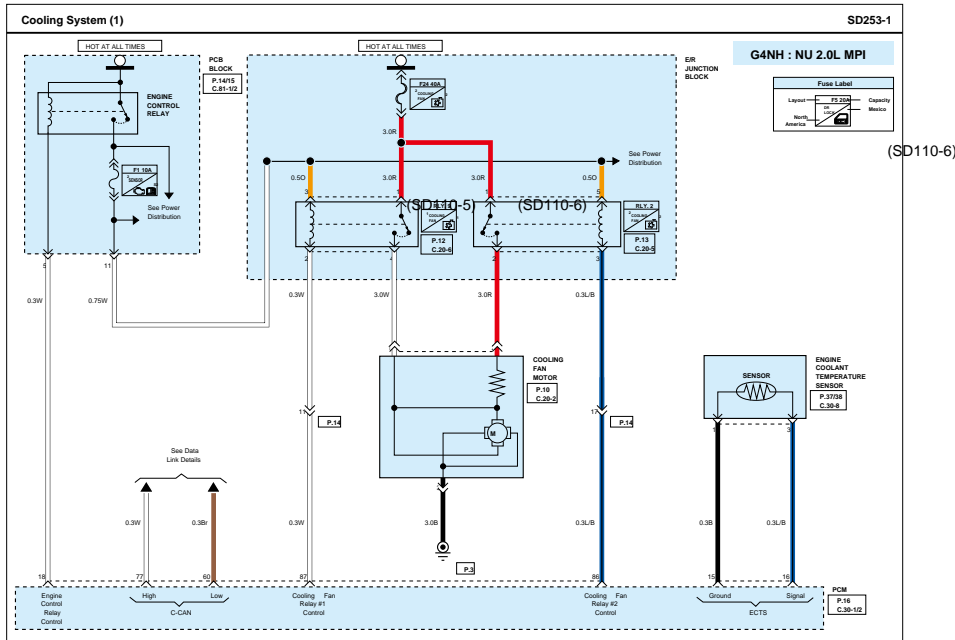
Specifications Quick Reference (itype_439)

Quick Specifications
- item

Cooling System - Service Tips (Article 42636)

Cooling System	Service Tips (1)
<p>Circuit Description</p> <p>Depending on engine type, each circuit operates differently through the following path.</p> <p>1. KAPPA 1.4L T-GDI</p> <p>Constant power is supplied to engine control relay, and engine control relay is controlled by ECM (No. 51). When the ignition switch turns on, the engine control relay is turned on by ECM. Then, constant power passes through the engine control relay and it is supplied to the input terminal of the cooling fan #1 relay coil, then the cooling fan #1 relay is turned on.</p> <p>Cooling fan speed is controlled by PWM (Pulse Width Modulation). ECM detects air-conditioner activation, engine coolant temperature and vehicle speed. ECM sends duty signal to cooling fan controller, and it controls cooling fan motor speed according to vehicle condition and air-conditioner load condition to improve cooling function. If engine coolant temperature sensor is malfunction, outputs 100% duty signals to operate cooling fan continually. If engine coolant temperature is over 115 °C, air-conditioner turns off.</p> <p>2. NU 2.0L MPI</p> <p>Constant power is supplied to the engine control relay. And the engine control relay is controlled by PCM (No. 18). When the ignition switch turns on, the engine control relay is turned on by PCM. Then, constant power is passed through the engine control relay and waits in the input terminal of the cooling fan (Low/High) relay coil in E/R junction block. Depending on the engine coolant temperature sensor and air conditioner operation, PCM controls cooling fan by supplying the power to the cooling fan motor through cooling fan (Low/High) relay in the E/R junction block.</p>	<p>1) Cooling Fan In Low Speed</p> <p>The terminal No. 3 of the cooling fan (Low) relay is grounded through the terminal No. 86 of the PCM. The relay coil is magnetized to pull the cooling fan (Low) relay switch (No. 1 and 2). Then, constant power passes through the relay and supplies the power to the cooling fan motor (No. 2).</p> <p>As the power is supplied to the motor via the internal resistance of the cooling fan motor, the motor is operated at low speed due to voltage drop.</p> <p>2) Cooling Fan In High Speed</p> <p>The terminal No. 2 of the cooling fan (High) relay is grounded through the terminal No. 87 of the PCM. The relay coil is magnetized to pull the cooling fan (High) relay switch (No. 1 and 4). Then, constant power passes through the relay and supplies the power to the cooling fan motor (No. 1).</p> <p>Since the cooling fan motor receives power without any resistance, it is operated at high speed.</p> <p>■ Engine Coolant Temperature Sensor (ECTS)</p> <p>This sensor measures engine coolant temperature. This thermistor has a Negative Temperature Coefficient (NTC) and its resistance is in inverse proportion to the temperature.</p> <p>The Engine Coolant Temperature Sensor (ECTS) detects the engine coolant temperature. The ECTS uses a thermistor whose resistance changes with the temperature. When the resistance value of the thermistor in the ECTS changes according to the engine coolant temperature, the output voltage also changes. During cold engine operation the ECM(PCM) increases the fuel injection duration and controls the ignition timing using the information of engine coolant temperature to avoid engine stalling and improve driveability.</p>

Cooling System - Schematic Diagrams (Article 42635)



Engine Mechanical System - Specifications (Article 45304)

- Specifications
- Description Specifications Limit
- General
- Type In-line, DOHC
- Number of cylinders 4
- Bore 81.0 mm (3.1890 in.)

Stroke 97.0 mm (3.8189 in.)

Total displacement 1999 cc (121.99 cu.in.)

Compression ratio 12.5 ± 0.2 : 1

Firing order 1-3-4-2

Valve timing

Intake valve Open [BTDC 38° - ATDC 2°(initial position)] - [ATDC 42°]

Close [ABDC 43° - ABDC 83°(initial position)] - [ABDC 123°]

Exhaust valve Open BBDC 54° - ABDC 6°

Close ATDC 1° - ATDC 61°

Camshaft

Cam height Intake 39.0 mm (1.5354 in.)

Exhaust 38.66 mm (1.5220 in.)

Journal outer diameter Intake No.1 : 35.959 - 35.975 mm (1.41571 - 1.41634 in.)

No.2,3,4,5 : 22.959 - 22.975 mm (0.90390 - 0.90453 in.)

Exhaust No.1 : 35.959 - 35.975 mm (1.41571 - 1.41634 in.)

Bearing oil clearance Intake No.1 : 0.032 - 0.062 mm (0.00126 - 0.00244 in.)

No.2,3,4,5 : 0.032 - 0.062 mm (0.00126 - 0.00244 in.)

Exhaust No.1 : 0.032 - 0.062 mm (0.00126 - 0.00244 in.)

End play 0.10 - 0.19 mm (0.0039 - 0.0075 in.)

Valve

Valve length Intake 102.22 mm (4.0244 in.) 101.97 mm (4.0146 in.)

Exhaust 104.04 mm (4.0961 in.) 103.79 mm (4.0862 in.)

Stem outer diameter Intake 5.465 - 5.480 mm (0.21516 - 0.21575 in.)

Exhaust 5.458 - 5.470 mm (0.21488 - 0.21535 in.)

Face angle 45.25° - 45.75°

Thickness of valve head (margin) Intake 1.41 - 1.71 mm (0.0555 - 0.0673 in.)

Exhaust 1.55 - 1.85 mm (0.0610 - 0.0728 in.)

Valve stem to valve guide clearance Intake 0.020 - 0.047 mm (0.00079 - 0.00185 in.)

Exhaust 0.030 - 0.054 mm (0.00118 - 0.00213 in.)

Valve guide

Length Intake 43.8 - 44.2 mm (1.7244 - 1.7402 in.)

Exhaust 43.8 - 44.2 mm (1.7244 - 1.7402 in.)

Inner diameter Intake 5.500 - 5.512 mm (0.21654 - 0.21701 in.)

Exhaust 5.500 - 5.512 mm (0.21654 - 0.21701 in.)

Valve seat

Width of seat contact Intake 1.05 - 1.35 mm (0.0413 - 0.0532 in.)

Exhaust 1.35 - 1.65 mm (0.0532 - 0.0650 in.)

Seat angle Intake 44° 45' - 45° 6'

Exhaust 44° 45' - 45° 6'

Valve spring

Free length 45.93 mm (1.8083 in.)

Load 19.6 ± 1.0 kg / 37.0 mm (43.21 ± 2.20 lb / 1.4567 in.)

45.7 ± 1.8 kg / 27.0 mm (100.75 ± 3.97 lb / 1.0630 in.)

Out of squareness Less than 1.5°

Cylinder head

Flatness of gasket surface Less than 0.05 mm (0.0020 in.) for total area

Less than 0.02 mm (0.0008 in.) for a section of 100 mm (3.9370 in.) x 100 mm (3.9370 in.)

Flatness of manifold mounting surface Intake Less than 0.10 mm (0.0039 in.)

Exhaust Less than 0.10 mm (0.0039 in.)

Piston

Piston outer diameter 80.97 - 81.00 mm (3.1878 - 3.1890 in.)

Piston to cylinder clearance 0.02 - 0.04 mm (0.0008 - 0.0016 in.)

Ring groove width No. 1 ring 1.030 - 1.050 mm (0.04055 - 0.04134 in.)

No. 2 ring 1.230 - 1.250 mm (0.04843 - 0.04921 in.)

Oil ring 2.010 - 2.025 mm (0.07913 - 0.07972 in.)

Piston ring

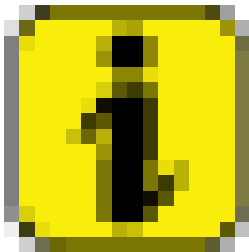
Side clearance No. 1 ring 0.040 - 0.080 mm (0.00157 - 0.00315 in.)

No. 2 ring 0.040 - 0.080 mm (0.00157 - 0.00315 in.)

Oil ring 0.020 - 0.055 mm (0.00079 - 0.00216 in.)

End gap No. 1 ring 0.15 - 0.30 mm (0.0059 - 0.0118 in.)

No. 2 ring 0.30 - 0.45 mm (0.0118 - 0.0177 in.)
 Oil ring 0.20 - 0.40 mm (0.0079 - 0.0157 in.)
 Piston pin
 Piston pin outer diameter 19.997 - 20.000 mm (0.78728 - 0.78740 in.)
 Piston pin hole inner diameter 20.004 - 20.009 mm (0.78756 - 0.78775 in.)
 Piston pin hole clearance 0.004 - 0.012 mm (0.00016 - 0.00047 in.)
 Connecting rod small end hole inner diameter 20.007 - 20.015 mm (0.78768 - 0.78799 in.)
 Piston pin-to-connecting rod bushing oil clearance 0.007 - 0.018 mm (0.00028 - 0.00071 in.)
 Connecting rod
 Connecting rod big end inner diameter 48.000 - 48.018 mm (1.88976 - 1.89047 in.)
 Connecting rod bearing oil clearance 0.024 - 0.042 mm (0.00094 - 0.00165 in.)
 Side clearance 0.10 - 0.25 mm (0.0039 - 0.0098 in.)
 Crankshaft
 Main journal outer diameter 54.942 - 54.960 mm (2.16307 - 2.16378 in.)
 Pin journal outer diameter 44.954 - 44.972 mm (1.76984 - 1.77055 in.)
 Main bearing oil clearance 0.016 - 0.034 mm (0.00063 - 0.00134 in.)
 End play 0.07 - 0.25 mm (0.0028 - 0.0098 in.)
 Cylinder block
 Cylinder bore 81.00 - 81.03 mm (3.1890 - 3.1902 in.)
 Engine oil
 Oil quantity Total 4.5 L (1.19 U.S.gal., 4.76 U.S.qt., 3.96 Imp.qt.) When replacing a short engine or block assembly
 Oil pan 3.7 L (0.98 U.S.gal., 3.91 U.S.qt., 3.26 Imp.qt.)
 Drain and refill 4.0 L (1.06 U.S.gal., 4.23 U.S.qt., 3.52 Imp.qt.) Including oil filter
 Oil grade Specifications 5W-20 / API SM& ILSAC GF-4 (or above) / ACEA A5 (or above) API SL, ILSAC GF-3, ACEA A3 Class engine oil can be used if the recommended engine oil is not available. Refer to the "Lubrication System" for recommended SAE viscosity number.
 API SL, ILSAC GF-3, ACEA A3 Class engine oil can be used if the recommended engine oil is not available. Refer to the "Lubrication System" for recommended SAE viscosity number.



Information

- API SL, ILSAC GF-3, ACEA A3 Class engine oil can be used if the recommended engine oil is not available.
- Refer to the "Lubrication System" for recommended SAE viscosity number.

Oil pressure (at 1,000rpm) 90.22 kPa (0.92 kgf/cm², 13.09 psi) or above Oil temperature (oil pan): 110 ± 2°C (230 ± 35.6°F)

Oil Pump

Relief valve opening pressure 500.14 - 600.16 kPa (5.10 - 6.12 kgf/cm², 72.54 - 87.05 psi) (5-6bar)

Side clearance 0.040 - 0.090 mm (0.00157 - 0.00354 in.)

Body clearance 0.200 - 0.292 mm (0.00787 - 0.01149 in.)

Guide clearance 0.030 - 0.075 mm (0.00118 - 0.00295 in.)

Cooling system

Cooling method Forced circulation with cooling fan

Coolant quantity Approx. 6.6 L (1.66 U.S.gal., 6.97 U.S.qt., 5.81 Imp.qt.)

Electric thermostat (ECT) Type Wax pellet type

Opening temperature 100 ± 2°C (212 ± 3.6°F)

Full opening valve lift / temperature More than 8 mm (0.3 in.) / 115°C (239°F)

Radiator cap Main valve opening pressure 93.16 - 122.58 kPa (0.95 - 1.25 kgf/cm², 13.51 - 17.78 psi)

Vacuum valve opening pressure 0 - 6.86 kPa (0 - 0.07 kgf/cm², 0 - 1.00 psi)

- Liquid Gasket

Location Product

Mating surface of timing chain cover Threebond 1217H or equivalent

Front area of mating surface between cam carrier and cylinder head
 Front area of mating surface between cylinder block and head
 Upper area of mating surface between timing chain cover and cam carrier
 Front upper area of cylinder block
 Front upper area of cylinder head gasket
 Lower area of cam carrier
 Lower area of cylinder block
 Mating surface of oil pan
 Mating surface of oil pressure switch THREEBOND 2403
 - Tightening Torques
 Item N.m kgf.m lb-ft
 Engine mounting
 Engine mounting bracket to body fixing bolt 49.0 - 63.7 5.0 - 6.5 36.2 - 47.0
 Engine mounting support bracket to engine mounting insulator fixing nut 88.3 - 107.9 9.0 - 11.0 65.1 - 79.6
 Engine mounting support bracket to engine support bracket fixing bolt 58.8 - 73.5 6.0 - 7.5 43.4 - 54.2
 Engine mounting support bracket to engine support bracket fixing nut 58.8 - 73.5 6.0 - 7.5 43.4 - 54.2
 Transaxle mounting bracket to body fixing bolt 49.0 - 63.7 5.0 - 6.5 36.2 - 47.0
 Transaxle mounting bracket to transaxle mounting support bracket fixing bolt 88.3 - 107.9 9.0 - 11.0 65.1 - 79.6
 Roll rod bracket to sub frame fixing bolt 49.0 - 63.7 5.0 - 6.5 36.2 - 47.0
 Roll rod bracket to roll rod support bracket fixing bolt & nut 107.9 - 127.5 11.0 - 13.0 79.6 - 94.0
 Timing system
 Crankshaft pulley bolt 196.1 - 205.9 20.0 - 21.0 144.7 - 151.9
 Timing chain cover service plug bolt 29.4 - 39.2 3.0 - 4.0 21.7 - 28.9
 Timing chain cover bolt (M10x55) 39.2 - 49.0 4.0 - 5.0 28.9 - 36.2
 Timing chain cover bolt (M10x85) 39.2 - 49.0 4.0 - 5.0 28.9 - 36.2
 Timing chain cover bolt - Seal bolt (M6x38) 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Timing chain cover bolt - Seal bolt (M8x50) 19.6 - 23.5 2.0 - 2.4 14.5 - 17.4
 Timing chain cover bolt (M8x50) 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Timing chain cover bolt (M8x28) 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Timing chain tensioner bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Timing chain tensioner arm bolt 18.6 - 22.6 1.9 - 2.3 13.7 - 16.6
 Timing chain guide bolt 18.6 - 22.6 1.9 - 2.3 13.7 - 16.6
 Engine cover mounting bolt 7.8 - 9.8 0.8 - 1.0 5.8 - 7.2
 Ignition coil bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Cylinder head cover bolt [3.9 - 5.9] + [7.8 - 9.8] [0.4 - 0.6] + [0.8 - 1.0] [2.9 - 4.3] + [5.8 - 7.2]
 Injector & rail assembly bolt 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 CVVT bolt (LH/RH) 64.7 - 76.5 6.6 - 7.8 47.7 - 56.4
 Camshaft bearing cap bolt (M6) 11.8 - 13.7 1.2 - 1.4 8.7 - 10.1
 Camshaft bearing cap bolt (M8) 18.6 - 22.6 1.9 - 2.3 13.7 - 16.6
 Cam carrier bolt 18.6 - 22.6 1.9 - 2.3 13.7 - 16.6
 Cylinder head bolt [32.4 - 36.3] + [90 - 95°] + [90 - 95°] [3.3 - 3.7] + [90 - 95°] + [90 - 95°] [23.9 - 26.8]
 + [90 - 95°] + [90 - 95°]
 Engine hanger bolt (Front/Rear) 34.3 - 39.2 3.5 - 4.0 25.3 - 28.9
 Camshaft position sensor (LH/RH) 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Oil control valve (OCV) bolt (LH/RH) 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Drive plate bolt 117.7 - 127.5 12.0 - 13.0 86.8 - 93.9
 Connecting rod bearing cap bolt [17.7 - 21.6] + [103 - 107°] [1.8 - 2.2] + [103 - 107°] [13.0 - 15.9] + [103 - 107°]
 Lower crankcase bolt 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Main bearing cap bolt [27.5 - 31.4] + [120 - 125°] [2.8 - 3.2] + [120 - 125°] [20.3 - 23.1] + [120 - 125°]
 Crankshaft position sensor bolt 10.8 - 11.8 1.1 - 1.2 8.0 - 8.7
 Knock sensor 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Lubrication system
 Oil drain plug 34.3 - 44.1 3.5 - 4.5 25.3 - 32.5
 Oil filter 11.8 - 15.7 1.2 - 1.6 8.7 - 11.6
 Oil pan bolt 11.8 - 13.7 1.2 - 1.4 8.7 - 10.1
 Oil screen bolt 19.6 - 26.5 2.0 - 2.7 14.5 - 19.5
 Oil screen nut 11.8 - 13.7 1.2 - 1.4 8.7 - 10.1
 Oil pressure switch 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7

Water pump pulley bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Water pump bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Water inlet fitting nut 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Water temperature control assembly bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Heater pipe bolt 19.6 - 23.5 2.0 - 2.4 14.5 - 17.4
 Intake and exhaust system
 Air intake hose clamp bolt 2.9 - 4.9 0.3 - 0.5 2.2 - 3.6
 Air cleaner assembly bolt 7.8 - 9.8 0.8 - 1.0 5.8 - 7.2
 Electronic throttle control (ETC) module bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Intake manifold stay bolt 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Intake manifold bolt 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Intake manifold nut 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Exhaust manifold heat protector bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Exhaust manifold stay bolt 39.2 - 49.0 4.0 - 5.0 28.9 - 36.2
 Exhaust manifold nut 34.3 - 39.2 3.5 - 4.0 25.3 - 28.9
 Muffler nut 39.2 - 58.8 4.0 - 6.0 28.9 - 43.4

Engine Mechanical System - Specifications (Article 45305)

- Specifications

Description Specifications Limit

General

Type In-line, DOHC

Number of cylinders 4

Bore 81.0 mm (3.1890 in.)

Stroke 97.0 mm (3.8189 in.)

Total displacement 1999 cc (121.99 cu.in.)

Compression ratio 12.5 ± 0.2 : 1

Firing order 1-3-4-2

Valve timing

Intake valve Open [BTDC 38° - ATDC 2°(initial position)] - [ATDC 42°]

Close [ABDC 43° - ABDC 83°(initial position)] - [ABDC 123°]

Exhaust valve Open BBDC 54° - ABDC 6°

Close ATDC 1° - ATDC 61°

Camshaft

Cam height Intake 39.0 mm (1.5354 in.)

Exhaust 38.66 mm (1.5220 in.)

Journal outer diameter Intake No.1 : 35.959 - 35.975 mm (1.41571 - 1.41634 in.)

No.2,3,4,5 : 22.959 - 22.975 mm (0.90390 - 0.90453 in.)

Exhaust No.1 : 35.959 - 35.975 mm (1.41571 - 1.41634 in.)

Bearing oil clearance Intake No.1 : 0.032 - 0.062 mm (0.00126 - 0.00244 in.)

No.2,3,4,5 : 0.032 - 0.062 mm (0.00126 - 0.00244 in.)

Exhaust No.1 : 0.032 - 0.062 mm (0.00126 - 0.00244 in.)

End play 0.10 - 0.19 mm (0.0039 - 0.0075 in.)

Valve

Valve length Intake 102.22 mm (4.0244 in.) 101.97 mm (4.0146 in.)

Exhaust 104.04 mm (4.0961 in.) 103.79 mm (4.0862 in.)

Stem outer diameter Intake 5.465 - 5.480 mm (0.21516 - 0.21575 in.)

Exhaust 5.458 - 5.470 mm (0.21488 - 0.21535 in.)

Face angle 45.25° - 45.75°

Thickness of valve head (margin) Intake 1.41 - 1.71 mm (0.0555 - 0.0673 in.)

Exhaust 1.55 - 1.85 mm (0.0610 - 0.0728 in.)

Valve stem to valve guide clearance Intake 0.020 - 0.047 mm (0.00079 - 0.00185 in.)

Exhaust 0.030 - 0.054 mm (0.00118 - 0.00213 in.)

Valve guide

Length Intake 43.8 - 44.2 mm (1.7244 - 1.7402 in.)

Exhaust 43.8 - 44.2 mm (1.7244 - 1.7402 in.)

Inner diameter Intake 5.500 - 5.512 mm (0.21654 - 0.21701 in.)

Exhaust 5.500 - 5.512 mm (0.21654 - 0.21701 in.)

Valve seat

Width of seat contact Intake 1.05 - 1.35 mm (0.0413 - 0.0532 in.)

Exhaust 1.35 - 1.65 mm (0.0532 - 0.0650 in.)

Seat angle Intake 44° 45' - 45° 6'

Exhaust 44° 45' - 45° 6'

Valve spring

Free length 45.93 mm (1.8083 in.)

Load 19.6 ± 1.0 kg / 37.0 mm (43.21 ± 2.20 lb / 1.4567 in.)

45.7 ± 1.8 kg / 27.0 mm (100.75 ± 3.97 lb / 1.0630 in.)

Out of squareness Less than 1.5°

Cylinder head

Flatness of gasket surface Less than 0.05 mm (0.0020 in.) for total area

Less than 0.02 mm (0.0008 in.) for a section of 100 mm (3.9370 in.) x 100 mm (3.9370 in.)

Flatness of manifold mounting surface Intake Less than 0.10 mm (0.0039 in.)

Exhaust Less than 0.10 mm (0.0039 in.)

Piston

Piston outer diameter 80.97 - 81.00 mm (3.1878 - 3.1890 in.)

Piston to cylinder clearance 0.02 - 0.04 mm (0.0008 - 0.0016 in.)

Ring groove width No. 1 ring 1.030 - 1.050 mm (0.04055 - 0.04134 in.)

No. 2 ring 1.230 - 1.250 mm (0.04843 - 0.04921 in.)

Oil ring 2.010 - 2.025 mm (0.07913 - 0.07972 in.)

Piston ring

Side clearance No. 1 ring 0.040 - 0.080 mm (0.00157 - 0.00315 in.)

No. 2 ring 0.040 - 0.080 mm (0.00157 - 0.00315 in.)

Oil ring 0.020 - 0.055 mm (0.00079 - 0.00216 in.)

End gap No. 1 ring 0.15 - 0.30 mm (0.0059 - 0.0118 in.)

No. 2 ring 0.30 - 0.45 mm (0.0118 - 0.0177 in.)

Oil ring 0.20 - 0.40 mm (0.0079 - 0.0157 in.)

Piston pin

Piston pin outer diameter 19.997 - 20.000 mm (0.78728 - 0.78740 in.)

Piston pin hole inner diameter 20.004 - 20.009 mm (0.78756 - 0.78775 in.)

Piston pin hole clearance 0.004 - 0.012 mm (0.00016 - 0.00047 in.)

Connecting rod small end hole inner diameter 20.007 - 20.015 mm (0.78768 - 0.78799 in.)

Piston pin-to-connecting rod bushing oil clearance 0.007 - 0.018 mm (0.00028 - 0.00071 in.)

Connecting rod

Connecting rod big end inner diameter 48.000 - 48.018 mm (1.88976 - 1.89047 in.)

Connecting rod bearing oil clearance 0.024 - 0.042 mm (0.00094 - 0.00165 in.)

Side clearance 0.10 - 0.25 mm (0.0039 - 0.0098 in.)

Crankshaft

Main journal outer diameter 54.942 - 54.960 mm (2.16307 - 2.16378 in.)

Pin journal outer diameter 44.954 - 44.972 mm (1.76984 - 1.77055 in.)

Main bearing oil clearance 0.016 - 0.034 mm (0.00063 - 0.00134 in.)

End play 0.07 - 0.25 mm (0.0028 - 0.0098 in.)

Cylinder block

Cylinder bore 81.00 - 81.03 mm (3.1890 - 3.1902 in.)

Engine oil

Oil quantity Total 4.5 L (1.19 U.S.gal., 4.76 U.S.qt., 3.96 Imp.qt.) When replacing a short engine or block assembly

Oil pan 3.7 L (0.98 U.S.gal., 3.91 U.S.qt., 3.26 Imp.qt.)

Drain and refill 4.0 L (1.06 U.S.gal., 4.23 U.S.qt., 3.52 Imp.qt.) Including oil filter

Oil grade Specifications 5W-20 / API SM& ILSAC GF-4 (or above) / ACEA A5 (or above) API SL, ILSAC GF-3, ACEA A3 Class engine oil can be used if the recommended engine oil is not available. Refer to the "Lubrication System" for recommended SAE viscosity number.

API SL, ILSAC GF-3, ACEA A3 Class engine oil can be used if the recommended engine oil is not available. Refer to the "Lubrication System" for recommended SAE viscosity number.



Information

- API SL, ILSAC GF-3, ACEA A3 Class engine oil can be used if the recommended engine oil is not available.

- Refer to the "Lubrication System" for recommended SAE viscosity number.

Oil pressure (at 1,000rpm) 90.22 kPa (0.92 kgf/cm², 13.09 psi) or above Oil temperature (oil pan): 110 ± 2°C (230 ± 35.6°F)

Oil Pump

Relief valve opening pressure 500.14 - 600.16 kPa (5.10 - 6.12 kgf/cm², 72.54 - 87.05 psi) (5-6bar)

Side clearance 0.040 - 0.090 mm (0.00157 - 0.00354 in.)

Body clearance 0.200 - 0.292 mm (0.00787 - 0.01149 in.)

Guide clearance 0.030 - 0.075 mm (0.00118 - 0.00295 in.)

Cooling system

Cooling method Forced circulation with cooling fan

Coolant quantity Approx. 6.6 L (1.66 U.S.gal., 6.97 U.S.qt., 5.81 Imp.qt.)

Electric thermostat (ECT) Type Wax pellet type

Opening temperature 100 ± 2°C (212 ± 3.6°F)

Full opening valve lift / temperature More than 8 mm (0.3 in.) / 115°C (239°F)

Radiator cap Main valve opening pressure 93.16 - 122.58 kPa (0.95 - 1.25 kgf/cm², 13.51 - 17.78 psi)

Vacuum valve opening pressure 0 - 6.86 kPa (0 - 0.07 kgf/cm², 0 - 1.00 psi)

- Liquid Gasket

Location Product

Mating surface of timing chain cover Threebond 1217H or equivalent

Front area of mating surface between cam carrier and cylinder head

Front area of mating surface between cylinder block and head

Upper area of mating surface between timing chain cover and cam carrier

Front upper area of cylinder block

Front upper area of cylinder head gasket

Lower area of cam carrier

Lower area of cylinder block

Mating surface of oil pan

Mating surface of oil pressure switch THREEBOND 2403

- Tightening Torques

Item N.m kgf.m lb-ft

Engine mounting

Engine mounting bracket to body fixing bolt 49.0 - 63.7 5.0 - 6.5 36.2 - 47.0

Engine mounting support bracket to engine mounting insulator fixing nut 88.3 - 107.9 9.0 - 11.0 65.1 - 79.6

Engine mounting support bracket to engine support bracket fixing bolt 58.8 - 73.5 6.0 - 7.5 43.4 - 54.2

Engine mounting support bracket to engine support bracket fixing nut 58.8 - 73.5 6.0 - 7.5 43.4 - 54.2

Transaxle mounting bracket to body fixing bolt 49.0 - 63.7 5.0 - 6.5 36.2 - 47.0

Transaxle mounting bracket to transaxle mounting support bracket fixing bolt 88.3 - 107.9 9.0 - 11.0 65.1 - 79.6

Roll rod bracket to sub frame fixing bolt 49.0 - 63.7 5.0 - 6.5 36.2 - 47.0

Roll rod bracket to roll rod support bracket fixing bolt & nut 107.9 - 127.5 11.0 - 13.0 79.6 - 94.0

Timing system

Crankshaft pulley bolt 196.1 - 205.9 20.0 - 21.0 144.7 - 151.9

Timing chain cover service plug bolt 29.4 - 39.2 3.0 - 4.0 21.7 - 28.9

Timing chain cover bolt (M10×55) 39.2 - 49.0 4.0 - 5.0 28.9 - 36.2

Timing chain cover bolt (M10×85) 39.2 - 49.0 4.0 - 5.0 28.9 - 36.2

Timing chain cover bolt - Seal bolt (M6×38) 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7

Timing chain cover bolt - Seal bolt (M8×50) 19.6 - 23.5 2.0 - 2.4 14.5 - 17.4

Timing chain cover bolt (M8×50) 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4

Timing chain cover bolt (M8x28) 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Timing chain tensioner bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Timing chain tensioner arm bolt 18.6 - 22.6 1.9 - 2.3 13.7 - 16.6
 Timing chain guide bolt 18.6 - 22.6 1.9 - 2.3 13.7 - 16.6
 Engine cover mounting bolt 7.8 - 9.8 0.8 - 1.0 5.8 - 7.2
 Ignition coil bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Cylinder head cover bolt [3.9 - 5.9] + [7.8 - 9.8] [0.4 - 0.6] + [0.8 - 1.0] [2.9 - 4.3] + [5.8 - 7.2]
 Injector & rail assembly bolt 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 CVVT bolt (LH/RH) 64.7 - 76.5 6.6 - 7.8 47.7 - 56.4
 Camshaft bearing cap bolt (M6) 11.8 - 13.7 1.2 - 1.4 8.7 - 10.1
 Camshaft bearing cap bolt (M8) 18.6 - 22.6 1.9 - 2.3 13.7 - 16.6
 Cam carrier bolt 18.6 - 22.6 1.9 - 2.3 13.7 - 16.6
 Cylinder head bolt [32.4 - 36.3] + [90 - 95°] + [90 - 95°] [3.3 - 3.7] + [90 - 95°] + [90 - 95°] [23.9 - 26.8]
 + [90 - 95°] + [90 - 95°]
 Engine hanger bolt (Front/Rear) 34.3 - 39.2 3.5 - 4.0 25.3 - 28.9
 Camshaft position sensor (LH/RH) 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Oil control valve (OCV) bolt (LH/RH) 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Drive plate bolt 117.7 - 127.5 12.0 - 13.0 86.8 - 93.9
 Connecting rod bearing cap bolt [17.7 - 21.6] + [103 - 107°] [1.8 - 2.2] + [103 - 107°] [13.0 - 15.9] + [103 - 107°]
 Lower crankcase bolt 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Main bearing cap bolt [27.5 - 31.4] + [120 - 125°] [2.8 - 3.2] + [120 - 125°] [20.3 - 23.1] + [120 - 125°]
 Crankshaft position sensor bolt 10.8 - 11.8 1.1 - 1.2 8.0 - 8.7
 Knock sensor 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Lubrication system
 Oil drain plug 34.3 - 44.1 3.5 - 4.5 25.3 - 32.5
 Oil filter 11.8 - 15.7 1.2 - 1.6 8.7 - 11.6
 Oil pan bolt 11.8 - 13.7 1.2 - 1.4 8.7 - 10.1
 Oil screen bolt 19.6 - 26.5 2.0 - 2.7 14.5 - 19.5
 Oil screen nut 11.8 - 13.7 1.2 - 1.4 8.7 - 10.1
 Oil pressure switch 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Water pump pulley bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Water pump bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Water inlet fitting nut 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Water temperature control assembly bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Heater pipe bolt 19.6 - 23.5 2.0 - 2.4 14.5 - 17.4
 Intake and exhaust system
 Air intake hose clamp bolt 2.9 - 4.9 0.3 - 0.5 2.2 - 3.6
 Air cleaner assembly bolt 7.8 - 9.8 0.8 - 1.0 5.8 - 7.2
 Electronic throttle control (ETC) module bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Intake manifold stay bolt 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Intake manifold bolt 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Intake manifold nut 18.6 - 23.5 1.9 - 2.4 13.7 - 17.4
 Exhaust manifold heat protector bolt 9.8 - 11.8 1.0 - 1.2 7.2 - 8.7
 Exhaust manifold stay bolt 39.2 - 49.0 4.0 - 5.0 28.9 - 36.2
 Exhaust manifold nut 34.3 - 39.2 3.5 - 4.0 25.3 - 28.9
 Muffler nut 39.2 - 58.8 4.0 - 6.0 28.9 - 43.4

All Technical Service Bulletins (itype_100)

Tsbs

- ENGINE THERMOSTAT REPLACEMENT DTC P0128 / P2181 (20-EM-002H, 2020/07/16)