

Specifications

Description		Specifications	Limit
General			
Type		In-line, DOHC	
Number of cylinders		4	
Bore		77.2mm (3.0394in)	
Stroke		84.5mm (3.3268in)	
Total displacement		1,582 cc (96.54 cu.in)	
Compression ratio		17.3 : 1	
Firing order		1-3-4-2	
Valve timing			
Intake valve	Opens (ATDC)	17°5' ±4°	
	Closes (ABDC)	14°6' ± 4°	
Exhaust valve	Opens (BBDC)	23°25' ± 4°	
	Closes (BTDC)	20° ± 4°	
Cylinder head			
Flatness of gasket surface		0.05mm (0.0020in) for all 0.03mm (0.0012in) for each cylinder 0.012mm (0.00047in) for 50mm x 50mm	
Flatness of manifold mounting surface	Intake	0.025mm (0.0010in) for width 0.160mm (0.0063in) for length 0.013mm (0.00051in) for 50mm x 50mm	
	Exhaust	0.025mm (0.0010in) for width 0.160mm (0.0063in) for length 0.013mm (0.00051in) for 50mm x 50mm	
Camshaft			
Cam height	LH camshaft	Intake	35.452 ~ 35.652mm (1.3957 ~ 1.4036in)
		Exhaust	35.700 ~ 35.900mm (1.4055 ~ 1.4134in)
	RH camshaft	Intake	35.537 ~ 35.737mm (1.3991 ~ 1.4070in)
		Exhaust	35.452 ~ 35.652mm (1.3957 ~ 1.4036in)
Journal outer Diameter	LH camshaft		20.944 ~ 20.960mm (0.8246 ~ 0.8252in)
			20.944 ~ 20.960mm (0.8246 ~

	RH camshaft	0.8252in)	
Bearing oil clearance		0.040 ~ 0.077mm (0.0016 ~ 0.0030in)	
End play		0.10 ~ 0.20mm (0.0039 ~ 0.0079in)	
Valve			
Valve length	Intake	93.0mm (3.6614in)	
	Exhaust	93.7mm (3.6890in)	
Stem outer diameter	Intake	5.455 ~ 5.470mm (0.2148 ~ 0.2154in)	
	Exhaust	5.435 ~ 5.450mm (0.2140 ~ 0.2146in)	
Face angle		45.5° ~ 45.75°	
Thickness of valve head (margin)	Intake	1.1mm (0.0433in)	
	Exhaust	1.2mm (0.0472in)	
Valve stem to valve guide clearance	Intake	0.030 ~ 0.057mm (0.0012 ~ 0.0022in)	
	Exhaust	0.050 ~ 0.077mm (0.0020 ~ 0.0030in)	
Valve guide			
Inner diameter	Intake	5.500 ~ 5.512mm (0.2165 ~ 0.2170in)	
	Exhaust	5.500 ~ 5.512mm (0.2165 ~ 0.2170in)	
Length	Intake	31.3 ~ 31.7mm (1.2323 ~ 1.2480in)	
	Exhaust	31.3 ~ 31.7mm (1.2323 ~ 1.2480in)	
Valve seat			
Width of seat contact	Intake	0.8 ~ 1.4mm (0.0315 ~ 0.0551in)	
	Exhaust	1.2 ~ 1.8mm (0.0472 ~ 0.0709in)	
Seat angle	Intake	45° ~ 45°30'	
	Exhaust	45° ~ 45°30'	
Valve spring			
Free length		44.9mm (1.7677in)	
Load		17.5±0.9kg/32.0mm(38.6±2.0 lb/1.2598in)	
		31.0±1.6kg/23.5mm(68.3±3.5 lb/0.9252in)	
Out of squareness		Less than 1.5°	
Cylinder block			
Cylinder bore		77.200 ~ 77.230mm (3.0394 ~ 3.0405in)	
Flatness of gasket surface		Less than 0.05mm (0.0020in)	

Piston			
Piston outer diameter		77.130 ~ 77.160mm (3.0366 ~ 3.0378in)	
Piston to cylinder clearance		0.060 ~ 0.080mm (0.0024 ~ 0.0031in)	
Ring groove width	No. 1 ring groove	1.83 ~ 1.85mm (0.0720 ~ 0.0728in)	
	No. 2 ring groove	1.82 ~ 1.84mm (0.0717 ~ 0.0724in)	
	Oil ring groove	3.02 ~ 3.04mm (0.1189 ~ 0.1197in)	
Piston ring			
Side clearance	No. 1 ring	0.09 ~ 0.13mm (0.0035 ~ 0.0051in)	
	No. 2 ring	0.08 ~ 0.12mm (0.0031 ~ 0.0047in)	
	Oil ring	0.03 ~ 0.07mm (0.0012 ~ 0.0028in)	
End gap	No. 1 ring	0.20 ~ 0.35mm (0.0079 ~ 0.0138in)	
	No. 2 ring	0.35 ~ 0.50mm (0.0138 ~ 0.0197in)	
	Oil ring	0.20 ~ 0.40mm (0.0079 ~ 0.0157in)	
Piston pin			
Piston pin outer diameter		27.995 ~ 28.000mm (1.1022 ~ 1.1024in)	
Piston pin hole inner diameter		28.004 ~ 28.010mm (1.1025 ~ 1.1028in)	
Piston pin hole clearance		0.004 ~ 0.015mm (0.0002 ~ 0.0006in)	
Connecting rod small end hole inner diameter		28.022 ~ 28.034mm (1.1032 ~ 1.1037in)	
Connecting rod small end hole clearance		0.022 ~ 0.039mm (0.0009 ~ 0.0015in)	
Connecting rod			
Connecting rod big end inner diameter		49.000 ~ 49.018mm (1.9291 ~ 1.9298in)	
Connecting rod bearing oil clearance		0.025 ~ 0.043mm (0.0010 ~ 0.0017in)	
Side clearance		0.050 ~ 0.302mm (0.0020 ~ 0.0119in)	0.4mm (0.0157in)
Crankshaft			
Main journal outer diameter		53.972 ~ 53.990mm (2.1249 ~ 2.1256in)	
Pin journal outer diameter		45.997 ~ 46.015mm (1.8109 ~ 1.8116in)	
Main bearing oil clearance		0.024 ~ 0.042mm (0.0009 ~ 0.0017in)	
End play		0.08 ~ 0.28mm (0.0031 ~ 0.110in)	
Flywheel			

Runout		0.1mm (0.0039in)	0.13mm (0.0051in)
Oil pump			
Side clearance	Inner rotor	0.040 ~ 0.085mm (0.0016 ~ 0.0033in)	
	Outer rotor	0.040 ~ 0.090mm (0.0016 ~ 0.0035in)	
Body clearance		0.255 ~ 0.350mm (0.0100 ~ 0.0138in)	
Relief valve opening pressure		490±49.0kPa (5±0.5kg/cm², 71±7.1psi)	
Engine oil			
Oil quantity	Total	5.7 L (1.51 U.S.gal., 6.02 U.S.qt., 5.01 Imp.qt.)	When replacing a short engine or a block assembly
	Oil pan	4.8 L (1.27 U.S.gal., 5.07 U.S.qt., 4.22 Imp.qt.)	
	Drain and refill	5.3 L (1.40 U.S.gal., 5.60 U.S.qt., 4.66 Imp.qt.)	Including oil filter
Oil grade	Classification	ACEA C3 (with DPF), ACEA B4 (without DPF)	
	SAE viscosity grade	Recommended SAE viscosity number	Refer to the "Lubrication System"
Oil pressure (at idle)		78.45kPa (0.8kg/cm², 11.38psi) or above	Oil temperature in oil pan : 80°C (176°F)
Cooling system			
Cooling method		Forced circulation with cooling fan	
Coolant quantity		6.3 L (1.66 U.S.gal., 6.66 U.S.qt., 5.54 Imp.qt.)	
Thermostat	Type	Wax pellet type	
	Opening temperature	90±1.5°C (194±34.7°F)	
	Pull opening temperature	100°C (212°F)	
Radiator cap	Main valve opening pressure	93.16 ~ 122.58kPa (0.95 ~ 1.25kg/cm², 13.51 ~ 17.78psi)	
	Vacuum valve opening pressure	MAX. 6.86 kPa(0.07kg/cm², 1.00 psi)	

Tightening Torques

Item	Quantity	N.m	kgf.m	lb-ft
Engine mounting				
Engine mounting bracket to body fixing bolt	2	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Engine mounting bracket to body fixing nut	1	49.0 ~ 63.7	5.0 ~ 6.5	
Engine mounting insulator to engine mounting				

support bracket fixing nut	1	63.7 ~ 83.4	6.5 ~ 8.5	47.0 ~ 61.5
Engine mounting support bracket to engine support bracket fixing bolt	1	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Engine mounting support bracket to engine support bracket fixing nut	2	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Transaxle mounting bracket to body fixing bolt	2	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Transaxle mounting bracket to body fixing nut	1	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Transaxle mounting bracket to transaxle mounting support bracket fixing bolt	2	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
Roll rod bracket to sub frame fixing bolt	2	49.0 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
Roll rod bracket to transaxle fixing bolt & nut	1	107.9 ~ 127.5	11.0 ~ 13.0	79.6 ~ 94.0
Cylinder block				
Piston cooling oil jet bolt	4	8.8 ~ 12.7	0.9 ~ 1.3	6.5 ~ 9.4
Drive belt auto tensioner bolt	2	25.5 ~ 30.4	2.6 ~ 3.1	18.8 ~ 22.4
Drive belt auto tensioner mounting bracket bolt	3	18.6 ~ 27.5	1.9 ~ 2.8	13.7 ~ 20.3
Main moving system				
Connecting rod cap bolt	8	12.7 + (87~93°)	1.3 + (87~93°)	9.4 + (87~93°)
Crankshaft main bearing cap bolt (long)	10	(22.6~26.5) + (90~94°)	(2.3~2.7) + (90~94°)	(16.6~19.5) + (90~94°)
Crankshaft main bearing cap bolt (short)	10	32.4 ~ 36.3	3.3 ~ 3.7	23.9 ~ 26.8
Flywheel bolt (M/T)	8	68.6 ~ 78.5	7.0 ~ 8.0	50.6 ~ 57.9
Timing chain				
Timing chain cover bolt (10 X 90)	4	42.2 ~ 53.9	4.3 ~ 5.5	31.1 ~ 39.8
Timing chain cover bolt (8 X 70)	5	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Timing chain cover bolt (8 X 70) - Washer seal	2	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Timing chain cover bolt (8 X 60)	2	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Timing chain cover bolt (6 X 65)	1	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain cover bolt (6 X 28)	5	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain case bolt (8 X 23.5)	4	24.5 ~ 30.4	2.5 ~ 3.1	18.1 ~ 22.4
Timing chain case bolt (8 X 32)	1	18.6 ~ 27.5	1.9 ~ 2.8	13.7 ~ 20.3
Timing chain case guide bolt	1	25.5 ~ 34.3	2.6 ~ 3.5	18.8 ~ 25.3
Engine hanger (front)	2	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Crankshaft pulley bolt	1	225.6 ~ 245.2	23.0 ~ 25.0	166.4 ~ 180.8
Camshaft chain sprocket bolt	2	68.6 ~ 73.5	7.0 ~ 7.5	50.6 ~ 54.2
High pressure pump chain sprocket nut	1	64.7 ~ 74.5	6.6 ~ 7.6	47.7 ~ 55.0
Timing chain guide (1) bolt	4	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain guide (2) bolt	2	9.8 ~ 13.7	1.0 ~ 1.4	7.2 ~ 10.1
Timing chain "A" auto tensioner bolt	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Timing chain "C" auto tensioner bolt	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7

Cylinder head				
Cylinder head cover bolt	13	(3.9~5.9)+ (8.8~10.8)	(0.4~0.6) + (0.9~1.1)	(2.9~4.3) + (6.5~8.0)
Camshaft bearing cap bolt (mark 10)	16	12.7 ~ 14.7	1.3 ~ 1.5	9.4 ~ 10.8
Camshaft bearing cap bolt (mark 9)	6	12.7 ~ 14.7	1.3 ~ 1.5	9.4 ~ 10.8
Engine hanger bolt (rear)	1	47.1 ~ 51.0	4.8 ~ 5.2	34.7 ~ 37.6
Cylinder head bolt	10	(47.1~51.0) + (88~92°) + (118~122°)	(4.8~5.2) + (88~92°) + (118~122°)	(34.7~37.6) + (88~92°) + (118~122°)
Cooling system				
Water pump pulley bolt	3	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Water pump bolt (8 X 50)	3	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Water pump bolt (8 X 28)	1	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Thermostat housing bolt	1	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Thermostat housing nut	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Water return pipe assembly bolt	2	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Engine coolant temperature sensor	1	24.5 ~ 34.3	2.5 ~ 3.5	18.1 ~ 25.3
Thermostat cover bolt	2	19.6 ~ 24.5	2.0 ~ 2.5	14.5 ~ 18.1
Lubrication system				
Oil filter assembly bolt	4	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Oil cooler assembly bolt	4	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil filter upper cap (Al body type)	1	22.5 ~ 27.5	2.3 ~ 2.8	16.6 ~ 20.2
Oil filter upper cap (Plastic body type)	1	31.5 ~ 38.5	3.2 ~ 3.9	23.2 ~ 28.4
Oil level gauge guide bolt	1	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Oil pan bolt (6 X 20)	16	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pan bolt (6 X 65)	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pan bolt (6 X 85)	2	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pan and transaxle fixing bolt	3	34.3 ~ 49.1	3.5 ~ 5.0	25.3 ~ 36.2
Oil drain plug	1	34.3 ~ 44.1	3.5 ~ 4.5	25.3 ~ 32.5
Oil screen bolt	1	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Oil screen nut	1	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pressure switch	1	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~ 15.9
Intake and exhaust system				
Intake manifold and cylinder head fixing nut	2	19.6 ~ 23.5	2.0 ~ 2.4	14.5 ~ 17.4
Intake manifold and cylinder head fixing bolt	7	19.6 ~ 23.5	2.0 ~ 2.4	14.5 ~ 17.4
Exhaust manifold and cylinder head fixing nut	8	29.4 ~ 34.3	3.0 ~ 3.5	21.7 ~ 25.3
Exhaust manifold heat protector bolt	3	14.7 ~ 19.6	1.5 ~ 2.0	10.8 ~ 14.5
DPF assembly fixing nut	1	49.1 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0
DPF assembly fixing bolt	2	49.1 ~ 63.7	5.0 ~ 6.5	36.2 ~ 47.0

Air cleaner lower cover fixing bolt	1	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Throttle body and surge tank fixing nut	4	6.9 ~ 10.8	0.7 ~ 1.1	5.1 ~ 8.0
DPF and front muffler fixing nut	2	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4
Front muffler and center pipe fixing nut	2	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4
Center pipe and main muffler fixing nut	2	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4