ENGINE MECHANICAL

Specifications

Engine tune-up	Engine coolant capacity				
	w/o Heater	M/T	8.0 liters	8.5 US qts	7.0 Imp. qts
		A/T	7.7 liters	8.1 US qts	6.8 Imp. qts
	w/ Front heater	M/T	9.0 liters	9.5 US qts	7.9 Imp. qts
		A/T	8.7 liters	9.2 US qts	7.7 Imp. qts
	w/ Front and rear heater	M/T	10.0 liters	10.6 US qts	8.8 Imp. qts
		A/T	9.7 liters	10.3 US qts	8.5 Imp. qts
	Engine oil capacity				
	Dry fill		5.2 liters	5.5 US qts	4.6 Imp. qts
	Drain and refill				
	w/o Oil filter change		3.6 liters	3.8 US qts	3.2 Imp. qts
	w/ Oil filter change		4.1 liters	4.3 US qts	3.6 Imp. qts
	Battery specific gravity		1.25 – 1.27 when fully charged at 20°C (68°F)		
	High-tension cord resistance		25 kΩ per cord		
	Spark plug				
	Type 1RZ (Europe, Singapore)	ND	W16EXR-U		
		NGK	BPR5EY		
	1RZ (Others), 2RZ	ND	W16EX-U		
		NGK	BP5EY		
	2RZ-E	ND	P16R		
		NGK	BPR5EP 11		
	Gap 1RZ and 2RZ		0.8 mm	0.031 in.	
	2RZ-E		1.1 mm	0.043 in.	
	Drive belt deflection with 10 kg	New belt	5 – 7 mm	0.20 – 0.28 in.	
	(22.1 lb, 98 N)	Used belt	7 – 8 mm	0.28 – 0.31 in.	
	Drive belt tension	New belt	70 – 80 kg		
		Used belt	30 – 45 kg		
	Valve clearance (cold)	Intake	0.20 – 0.30 mm	0.008 – 0.012 in.	
		Exhaust	0.25 – 0.35 mm	0.010 – 0.014 in.	
	Ignition timing				
	1RZ and 2RZ	Chaina	0° BTDC @ Max. 950 rpm		
		Ex. Chaina	5° BTDC @ Max. 950 rpm		
	2RZ-E		5° BTDC @ idle		
	Idle speed 1RZ and 2RZ	M/T	750 rpm		
		A/T	800 rpm		
	2RZ-E		800 rpm		
	Fast idle speed (Ex. 2RZ-E)				
	1RZ		2,600 rpm		
	2RZ		2,400 rpm		
	Dash Pot (DP) Setting Speed				
	1RZ and 2RZ		2,300 rpm		
	2RZ-E		2,000 rpm		
Intake manifold vacuum		at idle speed	More than 400 mmHg (15.75 in.Hg, 53.3 kPa)		
Compression pressure		STD	12.5 kg/cm^2	178 psi	1,226 kpa
		Limit	9.0 kg/cm^2	128 psi	883 kPa
	Differential of pressure between each cylinder		Less than 1.0 kg/cm^2 (14 psi, 98 kPa)		

Specifications (Cont'd)

Cylinder head	Head surface warpage		Limit	0.15 mm	0.0059 in.
	Manifold surface warpage		Limit	0.20 mm	0.0079 in.
	Valve seat Refacing angle		Intake	30°, 45°, 60°	
			Exhaust	30°, 45°, 60°	
	Contacting angle			45°	
	Contacting width			1.2 – 1.6 mm	0.0047 – 0.063 in.
Valve guide	Inner diameter			8.01 – 8.03 mm	0.3154 – 0.3161 in.
	Outer diameter	STD		13.040 – 13.051 mm	0.5134 – 0.5138 in.
		O/S	0.05	13.090 – 13.091 mm	0.5154 – 0.5154 in.
	Protrusion height			18.2 – 18.6 mm	0.717 – 0.732 in.
	Replacing temperature (Cylinder head side)			Approx. 90°C (194°F)	
Valve	Valve overall length	STD	Intake	102.00 mm	4.0157 in.
			Exhaust	102.25 mm	4.0256 in.
		Limit	Intake	101.50 mm	3.996 in.
			Exhaust	101.75 mm	4.0059 in.
	Valve face angle			44.5°	
	Stem diameter	STD	Intake	7.970 – 7.985 mm	0.3138 – 0.3144 in.
			Exhaust	7.965 – 7.980 mm	0.3136 – 0.3142 in.
	Stem oil clearance	STD	Intake	0.025 – 0.060 mm	0.0010 – 0.0024 in.
			Exhaust	0.030 – 0.065 mm	0.0012 – 0.0026 in.
		Limit	Intake	0.08 mm	0.0031 in.
			Exhaust	0.10 mm	0.0039 in.
	Valve head edge thickness	Limit	Intake	0.5 mm	0.020 in.
			Exhaust	0.8 mm	0.031 in.
Valve spring	Free length		STD	47.31 mm	1.8626 in.
	Installed height		STD	40.3 mm	1.586 in.
	Installed tension		STD	27.0 kg 60.1 lb	226 N
			Limit	24.3 kg 53.6 lb	238 N
	Squareness		Limit	2.0 mm	0.079 in.
Camshaft	Thrust clearance		STD	0.08 – 0.18 mm	0.0031 – 0.0071 in.
			Limit	0.25 mm	0.0098 in.
	Journal oil clearance		STD	0.025 – 0.066 mm	0.0010 – 0.0026 in.
			Limit	0.10 mm	0.0039 in.
	Journal diameter		STD	33.959 – 33.975 mm	1.3370 – 1.3376 in.
	Circle runout		Limit	0.06 mm	0.0024 in.
	Cam lobe hight		STD	47.84 – 47.94 mm	1.8835 – 1.8874 in.
Valve lifter	Outer diameter		STD	37.922 – 37.932 mm	1.4930 – 1.4934 in.
	Oil clearance		STD	0.028 – 0.053 mm	0.0011 – 0.0021 in.
			Limit	0.1 mm	0.004 in.
Intake and exhaust manifold	Manifold surface	Limit	Intake	0.2 mm	0.008 in.
			Exhaust	0.7 mm	0.028 in.
Chain and sprocket	Elongation at 16 links		Limit	146.6 mm	5.772 in.
	Crankshaft sprocket wear		Limit	59.4 mm	2.339 in.
	Camshaft sprocket wear		Limit	113.8 mm	4.480 in.
Damper and slipper	Damper wear		Limit	1.0 mm	0.039 in.
	Slipper wear		Limit	1.0 mm	0.039 in.

Specifications (Cont'd)

Cylinder block	Cylinder head surface warpage	Limit	0.05 mm	0.0020 in.
	Cylinder bore	STD 1RZ	85.99 – 86.00 mm	33.854 – 33.858 in.
		2RZ, 2RZ-E	94.99 – 95.00 mm	3.7398 – 3.7402 in.
	Cylinder bore wear			
	On standard sized piston			
		Limit 1RZ	86.06 mm	3.3882 in.
		2RZ, 2RZ-E	95.06 mm	3.7425 in.
	On oversized piston 0.50			
		Limit 1RZ	86.56 mm	3.479 in.
		2RZ, 2RZ-E	95.56 mm	3.7622 in.
	Taper and out-of-round			
		Limit	0.01 mm	0.004 in.
	Cylinder block main journal bore			
		STD No. 1	64.000 – 64.008 mm	2.5197 – 2.5200 in.
		No. 2	64.009 – 64.016 mm	2.5200 – 2.5203 in.
		No. 3	64.017 – 64.024 mm	2.5203 – 2.5206 in.
		U/S 0.25	64.000 – 64.024 mm	2.5197 – 2.5206 in.
Piston and piston ring	Piston diameter	STD 1RZ	85.95 – 85.96 mm	3.3839 – 3.3842 in.
		2RZ, 2RZ-E	94.95 – 94.96 mm	3.7382 – 3.7386 in.
		O/S 0.50 1RZ	86.45 – 86.46 mm	3.4035 – 3.4039 in.
		2RZ, 2RZ-E	95.45 – 95.46 mm	3.7579 – 3.7583 in.
	Piston to cylinder clearance			
		STD	0.03 – 0.05 mm	0.0012 – 0.0020 in.
	Piston ring end gap	STD No. 1 1RZ	0.22 – 0.35 mm	0.0087 – 0.0138 in.
		2RZ, 2RZ-E	0.30 – 0.43 mm	0.0118 – 0.0169 in.
		No. 2	0.45 – 0.60 mm	0.0177 – 0.0236 in.
		Oil	0.13 – 0.38 mm	0.0051 – 0.0150 in.
		Limit No. 1 1RZ	0.95 mm	0.0374 in.
		2RZ, 2RZ-E	1.03 mm	0.0406 in.
		No. 2	1.20 mm	0.0472 in.
		Oil	0.98 mm	0.0386 in.
	Ring to ring groove clearance	STD No. 1	0.03 – 0.08 mm	0.0012 – 0.0031 in.
	(New piston ring)	No. 2	0.03 – 0.07 mm	0.0012 – 0.0028 in.
		Limit	0.2 mm	0.008 in.
	Piston pin installing temperature		Approx. 80°C (176°F)	
Connecting rod and bearing	Thrust clearance	STD	0.160 – 0.312 mm	0.0063 – 0.0123 in.
		Limit	0.35 mm	0.014 in.
	Big end inner diameter			
		STD No. 1	56.000 – 56.008 mm	2.2047 – 2.2050 in.
		No. 2	56.009 – 56.016 mm	2.2051 – 2.2053 in.
		No. 3	56.017 – 56.024 mm	2.2054 – 2.2057 in.
		U/S 0.25	56.000 – 56.024 mm	2.2047 – 2.2057 in.
	Connecting rod bearing center wall thickness			
		STD No. 1	1.481 – 1.485 mm	0.0583 – 0.0585 in.
		No. 2	1.486 – 1.489 mm	0.0585 – 0.0586 in.
		No. 3	1.490 – 1.493 mm	0.0587 – 0.0588 in.
		U/S 0.25	1.601 – 1.607 mm	0.0630 – 0.0633 in.
	Bearing oil clearance	STD	0.030 – 0.059 mm	0.0012 – 0.0023 in.
		Limit	0.1 mm	0.004 in.
	Pin to bushing oil clearance	STD	0.005 – 0.011 mm	0.0002 – 0.0004 in.
		Limit	0.015 mm	0.0006 in.

Specifications (Cont'd)

Connecting rod and bearing	Piston pin diameter	STD	24.000 – 24.009 mm	0.9449 – 0.9452 in.
	Bushing inside diameter	STD	24.008 – 24.017 mm	0.9452 – 0.9455 in.
	Rod bend per 100 mm (3.94 in.)	Limit	0.05 mm	0.0020 in.
	Rod twist per 100 mm (3.94 in.)	Limit	0.15 mm	0.0059 in.
Crankshaft	Thrust clearance	STD	0.02 – 0.22 mm	0.0008 – 0.0087 in.
		Limit	*0.3 mm*	*0.0012 in.*
	Thrust washer thickness	STD	2.400 – 2.440 mm	0.0945 – 0.0961 in.
	Main journal oil clearance	STD	0.020 – 0.049 mm	0.0008 – 0.0019 in.
		Limit	0.1 mm	0.004 in.
	Main journal diameter	STD	59.987 – 60.000 mm	2.3617 – 2.3622 in.
	Main journal finished diameter U/S	0.25	59.745 – 59.755 mm	2.3522 – 2.3526 in.
	Main bearing center wall thickness			
	STD	No. 1	1.986 – 1.990 mm	0.0782 – 0.0783 in.
		No. 2	1.991 – 1.994 mm	0.0784 – 0.0785 in.
		No. 3	1.995 – 1.998 mm	0.0785 – 0.0787 in.
	U/S	0.25	1.601 – 1.607 mm	0.0630 – 0.0633 in.
	Crank pin diameter STD		52.987 – 53.000 mm	2.0861 – 2.0866 in.
	Crank pin finished diameter U/S	0.25	52.745 – 52.755 mm	2.0766 – 2.0770 in.
	Circle runout	Limit	0.03 mm	0.0012 in.
	Main journal taper and out-of round	Limit	0.005 mm	0.0002 in.
	Crank pin journal taper and out-of round			
		Limit	0.005 mm	0.0002 in.
Flywheel	Runout	Limit	0.1 mm	0.004 in.

Torque Specifications

Part tightened		kg-cm	ft-lb	N·m
Cylinder head x Camshaft bearing cap		160	12	16
Cylinder head x Chain tensioner		210	15	21
Cylinder head x Spark plug		180	13	18
Cylinder head x Exhaust manifold		500	35	49
Cylinder head x Fuel pump		200	14	20
Cylinder block x Oil filter bracket	Nut	120	9	12
	Union bolt	700	51	67
Cylinder block x Drain cock		150	11	25
Cylinder block x Cylinder head	1st	400	33	44
	2nd	90° turns		
	3rd	90° turns		
Cylinder block x Crankshaft bearing cap	1st	400	33	44
	2nd	90° turns		
Connecting Rod x Connecting rod cap	1st	300	22	29
	2nd	90° turns		
Crankshaft x Crankshaft pulley		2,500	181	245
Camshaft x Distributor drive gear		750	54	74
Crankshaft x Flywheel		900	65	88
Crankshaft x Drive plate		750	54	74
Oil pan x Drain plug		250	18	25
Alternator x Alternator bracket		600	43	59
Engine mounting insulator x Engine mounting bracket		400	33	44
Intake manifold x TVSV		250	18	25
Water by-pass flange x Thermostat valve		250	18	25
EGR valve x Intake manifold		200	14	20
EGR valve x EGR pipe		200	14	20
Exhaust manifold x EGR pipe		200	14	20