ENGINE MECHANICAL

SERVICE DATA

SS0B1–01

Idle CO	Concentration	1RZ:, 1RZ–E:	1.5 ± 0.5 %
		3RZ–F:, 3RZ–FE:	1.5 ± 0.5 %
Idle CO/HC	Concentration	2RZ–FE:	0 – 0.5 %
Compression pressure	at 250 rpm	STD 1RZ:, 1RZ–E:	1,230 kPa (12.5 kgf/cm^2, 178 psi) or more
		2RZ:, 3RZ–FE:	1,230 kPa (12.5 kgf/cm^2, 178 psi) or more
		3RZ–F:	1,127 kPa (11.5 kgf/cm^2, 168 psi) or more
		Minimum	880 kPa (9.0 kgf/cm^2, 127 psi)
	Difference of pressure between each cylinder		98 kPa (1.0 kgf/cm^2, 14 psi) or less
Valve Clearance	at cold Intake	1RZ:, 1RZ–E:	0.20 – 0.30 mm (0.008 – 0.012 in.)
		2RZ–FE:, 3RZ–F:, 3RZ–FE:	0.15 – 0.25 mm (0.006 – 0.010 in.)
	Exhaust		0.25 – 0.35 mm (0.010 – 0.014 in.)
Ignition timing		1RZ:, 3RZ–F:	5° BTDC@ Max. 850 rpm Sub–Advance Cut
		1RZ–E:, 2RE–FE:, 3RE–FE:	5° BTDC@ idle w/ Terminals TE1 and E1 of check Connector connected
Idle speed		1RZ:, 1RZ–E:,	700 – 800 rpm
		3RZ–F:	750 – 850 rpm
		2RZ–FE:, 3RZ–FE:	650 – 750 rpm
Cylinder head (1RZ:, 1RZ–E:)	Warpage		
	Cylinder block side	Maximum	0.15 mm (0.0059 in.)
	Manifold side	Maximum	0.20 mm (0.0079 in.)
	Valve seat		
	Refacing angle	Intake	30°, 45°, 60°
	Contacting angle	Exhaust	45°
	Contacting width		1.0 – 1.4 mm (0.039 – 0.055 in.)
	Cylinder head bolt thread outside diameter	STD	10.760 – 10.970 mm (0.4236 – 0.4319 in.)
		Minimum	10.40 mm (0.4094 in.)
Cylinder head (2RZ–FE:, 3RZ–F:, 3RZ–FE:)	Warpage		
	Cylinder block side	Maximum	0.05 mm (0.0020 in.)
	Manifold side	Maximum	0.10 mm (0.0390 in.)
	Valve seat		
	Refacing angle	Intake	30°, 45°, 60°
		Exhaust	45° 60°
	Contacting angle		45°
	Contacting width		0.9 – 1.9 mm (0.035 – 0.075 in.)
	Cylinder head bolt outside diameter	STD	10.76 – 10.97 mm (0.4236 – 0.4319 in.)
		Minimum	10.40 mm (0.4094 in.)
Valve guide bushing (1RZ:, 1RZ–E:)	Inside diameter		8.010 – 8.030 mm (0.3154 – 0.3161 in.)
	Outside diameter (for repair part)	STD	13.040 – 13.051 mm (0.5134 – 0.5138 in.)
		O/S 0.05	13.090 – 13.101 mm (0.5154 – 0.5158 in.)
Valve guide bushing (2RZ–FE:, 3RZ–F:, 3RZ–FE:)	Inside diameter		6.010 – 6.030 mm (0.2366 – 0.2374 in.)
	Outside diameter (for repair part)	STD	11.000 – 11.027 mm (0.4331 – 0.4341 in.)
		O/S 0.05	11.050 – 11.077 mm (0.4350 – 0.4361 in.)
	Protrusion height		8.2 – 8.6 mm (0.323 – 0.339 in.)
	Replacing temperature (Cylinder head side)		80 – 100°C (176 – 212°F)

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Valve (1RZ:, 1RZ–E:)	Valve overall length	STD Intake	101.70 – 102.30 mm(4.0039 – 4.0278 in.)
		Exhaust	102.05 – 102.45 mm (4.0177 – 4.0335 in.)
		Minimum intake	101.50 mm (3.9961 in.)
		Exhaust	101.75 mm (4.0059 in.)
	Valve face angle		44.5°
	Stem diameter	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.)
		Maximum Intake	0.08 mm (0.0031 in.)
		Exhaust	0.10 mm (0.0039 in.)
	Margin thickness	STD Intake	1.00 – 1.40 mm (0.0394 – 0.0551 in.)
		Exhaust	1.30 – 1.70 mm (0.0512 – 0.0669 in.)
		Minimum Intake	0.70 mm (0.0276 in.)
		Exhaust	1.00 mm (0.0394 in.)
Valve (2RZ–FE:)	Valve overall length	STD Intake	103.45 mm (4.0728 in.)
		Exhaust	103.60 mm (4.0787 in.)
		Minimum Intake	102.95 mm (4.0531 in.)
		Exhaust	103.10 mm (4.0590 in.)
	Valve face angle		44.5°
	Stem diameter	Intake	5.970 – 5.985 (0.2350 – 0.2356 in.)
		Exhaust	5.965 – 5.980 (0.2348 – 0.2354 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.)
		Maximum Intake	0.08 mm (0.0031 in.)
		Exhaust	0.10 mm (0.0039 in.)
	Margin thickness	STD	1.0 mm (0.039 in.)
		Minimum	0.5 mm (0.020 in.)
Valve (3RZ–F:, 3RZ–FE:)	Valve overall length	3RZ–F: STD Intake	103.95 mm (4.0925 in.)
		Exhaust	103.90 mm (4.0905 in.)
		3RZ–FE: STD Intake	103.45 mm (4.0728 in.)
		Exhaust	103.60 mm (4.0787 in.)
		3RZ–F: Minimum Intake	103.45 mm (4.0728 in.)
		Exhaust	103.45 mm (4.0728 in.)
		3RZ–FE: Minimum Intake	102.95 mm (4.0531 in.)
		Exhaust	103.10 mm (4.0590 in.)
	Valve face angle		44.5°
	Stem diameter	Intake	5.970 – 5.985 mm (0.2350 – 0.2356 in.)
		Exhaust	5.965 – 5.980 mm (0.2348 – 0.2354 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.)
		Maximum Intake	0.08 mm (0.0031 in.)
		Exhaust	0.10 mm (0.0039 in.)
	Margin thickness	3RZ–F: STD Intake	1.5 mm (0.0591 in.)
		Exhaust	1.3 mm (0.0512 in.)
		Minimum Intake	1.0 mm (0.039 in.)
		Exhaust	0.8 mm (0.031 in.)
		3RZ–FE: STD	1.0 mm (0.039 in.)
		Minimum	0.5 mm (0.020 in.)
Valve spring (1RZ:, 1RZ–E:)	Deviation	Maximum	2.0 mm (0.079 in.)
	Free length		47.70 mm (1.8779 in.)
	Installed tension	at 40.30 mm(1.5866 in.)	252 – 278 N (25.7 – 28.4 kgf, 56.7 – 62.6 lbf)
Valve spring (2RZ–FE,: 3RZ–F:, 3RZ–FE:)	Deviation	Maximum	2.0 mm (0.079 in.)
	Free length		47.70 mm (1.878 in.)
	Installed tension	at 40.3 mm (1.586 in.)	162 – 190 N (16.5 – 19.4 kgf, 36.4 – 42.8 lbf)

Camshaft (1RZ:, 1RZ–E:)	Thrust clearance	STD	0.080 – 0.155 mm (0.0031 – 0.0061 in.)
		Maximum	0.25 mm (0.0098 in.)
	Journal oil clearance	STD	0.0025 – 0.066 mm (0.0010 – 0.0026 in.)
		Maximum	0.10 mm (0.0039 in.)
	Journal diameter		33.959 – 33.975 mm (1.3370 – 1.3376 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Cam lobe height	STD	47.840 – 47.940 mm (1.8835 – 1.8874 in.)
		Minimum	47.44 mm (1.8677 in.)
Camshaft (2RZ–FE:, 3RZ–F:, 3RZ–FE:)	Thrust clearance	STD	0.040 – 0.095 mm (0.0016 – 0.0037 in.)
		Maximum	0.12 mm (0.0047 in.)
	Journal oil clearance	STD	0.025 – 0.062 mm (0.0010 – 0.0024 in.)
		Maximum	0.08 mm (0.0031 in.)
	Journal diameter		26.959 – 26.975 mm (1.0614 – 1.0620 in.)
	Circle runout	Maximum	0.06 mm (0.0024 in.)
	Cam lobe height	Intake	45.31 – 45.41 mm (1.7839 – 1.7878 in.)
		Exhaust	45.06 – 45.16 mm (1.7740 – 1.7779 in.)
	Camshaft gear backlash	STD	0.020 – 0.200 mm (0.0008 – 0.0079 in.)
		Maximum	0.30 mm (0.0188 in.)
	Camshaft gear spring end free distance		22.5 – 22.9 mm (0.886 – 0.902 in.)
Valve lifter (1RZ:, 1RZ–E:)	Lifter diameter		37.922 – 37.932 mm (1.4930 – 1.4934 in.)
	Lifter bore diameter		37.960 – 37.975 mm (1.4955 – 1.4951 in.)
	Oil clearance	STD	0.028 – 0.053 mm (0.0011 – 0.0021 in.)
		Maximum	0.10 mm (0.0039 in.)
Valve lifter (2RZ–FE:, 3RZ–F:, 3RZ–FE:)	Lifter diameter		30.969 – 30.976 mm (1.1578 – 1.2195 in.)
	Lifter bore diameter		31.000 – 31.016 mm (1.2205 – 1.2211 in.)
	Oil clearance	STD	0.024 – 0.050 mm (0.0009 – 0.0020 in.)
		Maximum	0.07 mm (0.0028 in.)
Manifold (1RZ:, 1RZ–E:)	Warpage	Maximum Intake	0.20 (0.0079 in.)
		Exhaust	0.70 (0.00276 in.)
Manifold (2RZ–FE:, 3RZ–F:, 3RZ–FE:)	Warpage	Maximum Intake	0.20 mm (0.0078 in.)
		Exhaust	0.50 mm (0.0197 in.)
Chain and timing gear (1RZ:, 1RZ–E:)	Chain elongation at 16 links	Maximum	146.6 mm (5.772 in.)
	Gear diameter (w/ chain)	Minimum Camshaft	113.8 mm(4.480 in.)
		Crankshaft	59.4 mm (2.339 in.)
Chain and timing gear (2RZ–FE: 3RZ–F:)	Chain length at 16 links	Maximum	147.5 mm (5.802 in.)
	Camshaft timing gear wear (w/ chain)	Minimum	113.8 mm (4.480 in.)
	Crankshaft timing gear wear (w/ chain)	Minimum	59.4 mm (2.339 in.)
Chain and timing gear (3RZ–FE:)	Chain length at 16 links	Maximum (No.1)	147.5 mm (5.807 in.)
		(No.2)	123.6 mm (4.866 in.)
	Camshaft timing gear wear (w/ chain)	Minimum	113.8 mm (4.480 in.)
	Crankshaft timing gear wear (w/ chain)	Minimum	59.4 mm (2.339 in.)
	Balance shaft drive gear wear (w/ chain)	Minimum	75.9 mm(2.988 in.)
	No.2 crankshaft timing sprocket wear (w/ chain)	Minimum	96.7 mm (3.807 in.)
Spark plug tube (2RZ–FE:, 3RZ–FE:)	Protrusion		47.0 mm (1.850 in.)

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Chain tensioner Slipper and Vibration dumper	Wear	Maximum	1.0 mm (0.039 in.)
Cylinder block (1RZ:, 1RZ–E:)	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD	85.990 – 86.003 mm (3.3854 – 3.3859 in.)
		Maximum	86.203 mm (3.3938 in.)
		O/S 0.50	86.703 mm (3.4135 in.)
	Main bearing cap bolt outside diameter	STD	10.760 – 10.970 mm (0.4236 – 0.4319 in.)
		Minimum	10.40 mm (0.4094 in.)
Cylinder block (2RZ–FE:)	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD	94.990 – 95.003 mm (3.7400 – 3.7403 in.)
		Maximum	95.06 mm (3.7425 in.)
	Main bearing bolt outside diameter	STD	10.76 – 10.97 mm(0.4236 – 0.4319 in.)
		Minimum	10.40 mm (0.4094 in.)
	Cylinder block main journal bore diameter		
		STD Mark 1	64.004 – 64.010 mm (2.5198 – 2.5201 in.)
		Mark 2	64.011 – 64.016 mm (2.5201 – 2.5203 in.)
		Mark 3	64.017 – 64.022 mm (2.5203 – 2.5205 in.)
		U/S 0.25	64.000 – 64.024 mm (2.5197 – 2.5206 in.)
Cylinder block (3RZ–F:, 3RZ–FE:)	Cylinder head surface warpage	Maximum	0.05 mm (0.0020 in.)
	Cylinder bore diameter	STD	94.990 – 95.003 mm (3.7400 – 3.7403 in.)
		Maximum	95.06 mm (3.7425 in.)
	Main bearing bolt outside diameter	STD	10.76 – 10.97 mm(0.4236 – 0.4319 in.)
		Minimum	10.40 mm (0.4094 in.)
	Cylinder block main journal bore diameter		
		STD Mark 1	64.004 – 64.010 mm (2.5198 – 2.5201 in.)
		Mark 2	64.011 – 64.016 mm (2.5201 – 2.5203 in.)
		Mark 3	64.017 – 64.022 mm (2.5203 – 2.5205 in.)
		U/S 0.25	64.000 – 64.024 mm (2.5197 – 2.5206 in.)
Piston and piston ring (1RZ:, 1RZ–E:)	Piston diameter	STD	85.933 – 85.923 mm (3.3832 –3.3828 in.)
		O/S 0.50	86.450 – 86.460 mmn (3.4035 – 3.4039 in.
	Piston oil clearance	STD	0.030 – 0.053 mm (0.0012 – 0.0021 in.)
		Maximum	0.073 mm (0.0029 in.)
	Piston ring groove clearance	No.1	0.030 – 0.0080 mm (0.0012 – 0.0031 in.)
		No.2	0.040 – 0.080 mm (0.0016 – 0.0031 in.)
	Piston ring end gap	STD No.1	0.220 – 0.350 mm (0.0087 – 0.0138 in.)
		No.2	0.450 – 0.600 mm (0.0177 – 0.0236 in.)
		Oil	0.130 – 0.380 mm (0.0051 – 0.0150 in.)
		Maximum No.1	0.95 mm (0.0374 in.)
		No..2	1.20 mm (0.0472 in.)
		Oil	0.98 mm (0.0386 in.)
Piston and piston ring (2RZ–FE:)	Piston diameter	STD	94.923 – 94.933 mm (3.7371 – 3.7375 in.)
		O/S 0.50	95.423 – 95.433 mm (3.7568 – 3.7572 in.
	Piston oil clearance	STD	0.057 – 0.080 mm (0.0022 – 0.0031 in.)
		Maximum	
	Piston ring groove clearance	No.1	0.020 – 0.070 mm (0.0008 – 0.0028 in.)
		No.2	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
	Piston ring end gap	No.1	0.300 – 0.400 mm (0.0118 – 0.0157 in.)
		No.2	0.400 – 0.500 mm (0.0157 – 0.0197 in.)
		Oil	0.13 – 0.38 mm (0.005 – 0.015 in.)
	Piston pin installing temperature		80 – 90°C (176 – 194°F)

Piston and piston ring (3RZ–F:, 3RZ–EF:)	Piston diameter	STD	94.933 – 94.943 mm (3.7375 – 3.7379 in.)
		O/S 0.50	95.433 – 95.443 mm (3.7572 – 3.7576 in.)
	Piston oil clearance	STD	0.047 – 0.070 mm (0.0019 – 0.0028 in.)
		Maximum	
	Piston ring groove clearance	3RZ–FE: NO.1	0.020 – 0.070 mm (0.0008 – 0.0028 in.)
		NO.2	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
	Piston ring end gap	3RZ–FE: No.1	0.300 – 0.400 mm (0.0118 – 0.0157 in.)
		No.2	0.400 – 0.500 mm (0.0157 – 0.0197 in.)
	Piston ring groove clearance	3RZ–F: No.1	0.030 – 0.080 mm (0.0012 – 0.0031 in.)
		No.2	0.040 – 0.080 mm (0.0016 – 0.0031 in.)
	Piston ring end gap	3RZ–F: No.1	0.300 – 0.430 mm (0.0118 – 0.0169 in.)
		No..2	0.450 – 0.600 mm (0.0177 – 0.0236 in.)
		Oil	0.18 – 0.38 mm (0.0071 – 0.015 in.)
	Piston pin installing temperature		80 – 90°C (176 – 194°F)
Connecting rod (1RZ:, 1RZ–E:)	Thrust clearance	STD	0.160 – 0.312 mm (0.0063 – 0.0123 in.)
		Maximum	0.35 mm (0.0138 in.)
	Connecting rod bearing center wall thickness		
	(Reference)	STD Mark 4	1.482 – 1.485 mm (0.0583 – 0.0585 in.)
		Mark 5	1.485 – 1.488 mm (0.0585 – 0.0586 in.)
		Mark 6	1.488 – 1.491 mm (0.0586 – 0.0587 in.)
	Connecting rod oil clearance	STD STD	0.030 – 0.055 mm (0.0012 – 0.0022 in.)
		U/S 0.25	0.031 – 0.071 mm (0.0012 – 0.0028 in.)
		Maximum	0.08 mm (0.0031 in.)
	Rod bend	Maximum per 100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Maximum per 100 mm (3.94 in.)	0.15 mm (0.0059 in.)
	Bushing inside diameter		24.008 – 24.017 mm (0.9452 – 0.9455 in.)
	Piston pin diameter		24.000 – 24.009 mm (0.9449 – 0.9452 in.)
	Piston pin oil clearance	STD	0.005 – 0.011 mm (0.0002 – 0.0004 in.)
		Maximum	0.05 mm (0.0020 in.)
	Connecting rod bolt tension portion diameter	STD	7.800 – 7.900 mm (0.3071 – 0.3110 in.)
		Minimum	7.50 mm (0.2953 in.)
Connecting rod (2RZ–FE:)	Thrust clearance	STD	0.160 – 0.312 mm (0.0063 – 0.0123 in.)
		Maximum	0.35 mm (0.0138 in.)
	Connecting rod bearing center wall thickness		
		STD Mark 4	1.482 – 1.485 mm (0.0583 – 0.0585 in.)
		Mark 5	1.485 – 1.488 mm (0.0585 – 0.0586 in.)
		Mark 6	1.488 – 1.491 mm (0.0586 – 0.0587 in.)
		U/S 0.25	1.601 – 1.607 mm (0.0630 – 0.0633 in.)
	Connecting rod big end inside diameter		
		STD Mark 4	56.000 – 56.006 mm (2.2047 – 2.2050 in.)
		Mark 5	56.006 – 56.012 mm (2.2050 – 2.2052 in.)
		Mark 6	56.012 – 56.018 mm (2.2052 – 2.2054 in.)
		U/S 0.25	56.000 – 56.018 mm (2.2047 – 2.2054 in.)
	Connecting rod oil clearance	STD	0.030 – 0.055 mm (0.0012 – 0.0022 in.)
		U/S 0.25	0.031 – 0.071 mm (0.0012 – 0.0026 in.)
		Maximum	0.10 mm (0.0039 in.)
	Rod out–of–alignment		
		Maximum per 100 mm (3.94 in.)	0.05 mm (0.0020 in.)
	Rod twist	Maximum per 100 mm (3.94 in.)	0.15 mm (0.0059 in.)
	Bushing inside diameter		24.008 – 24.017 mm (0.9452 – 0.9455 in.)
	Piston pin diameter		24.000 – 24.009 mm (0.9449 – 0.9452 in.)
	Piston pin oil clearance	STD	0.005 – 0.011 mm (0.0002 – 0.0004 in.)
		Maximum	0.015mm (0.0006 in.)
	Connecting rod bolt outside diameter	STD	7.80 – 7.90 mm (0.3071 – 0.3110 in.)
		Minimum	7.60 mm (0.2992 in.)

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Connecting rod (3RZ–F:, 3RZ–FE:)	Thrust clearance	STD	0.160 – 0.312 mm (0.0063 – 0.0123 in.)
		Maximum	0.35 mm (0.0138 in.)
	Connecting rod bearing center wall thickness		
		STD Mark 4	1.482 – 1.485 mm (0.0583 – 0.0585 in.)
		Mark 5	1.485 – 1.488 mm (0.0585 – 0.0586 in.)
		Mark 6	1.488 – 1.491 mm (0.0586 – 0.0587 in.)
		U/S 0.25	1.601 – 1.607 mm (0.0630 – 0.0633 in.)
	Connecting rod big end inside diameter		
		STD Mark 4	56.000 – 56.006 mm (2.2047 – 2.2050 in.)
		Mark 5	56.006 – 56.012 mm (2.2050 – 2.2052 in.)
		Mark 6	56.012 – 56.018 mm (2.2052 – 2.2054 in.)
		U/S 0.25	56.000 – 56.018 mm (2.2047 – 2.2054 in.)
	Connecting rod oil clearance	STD	0.030 – 0.055 mm (0.0012 – 0.0022 in.)
		U/S 0.25	0.031 – 0.071 mm (0.0012 – 0.0026 in.)
		Maximum	0.10 mm (0.0039 in.)
	Rod out–of–alignment		
	Maximum per 100 mm (3.94 in.)		0.05 mm (0.0020 in.)
	Rod twist Maximum per 100 mm (3.94 in.)		0.15 mm (0.0059 in.)
	Bushing inside diameter		24.008 – 24.017 mm (0.9452 – 0.9455 in.)
	Piston pin diameter		24.000 – 24.009 mm (0.9449 – 0.9452 in.)
	Piston pin oil clearance	STD	0.005 – 0.011 mm (0.0002 – 0.0004 in.)
		Maximum	0.015mm (0.0006 in.)
	Connecting rod bolt outside diameter	STD	7.80 – 7.90 mm (0.3071 – 0.3110 in.)
		Minimum	7.60 mm (0.2992 in.)
Crankshaft (1RZ:, 1RZ–E:)	Thrust clearance	STD	0.020 – 0.220 mm(0.0008 – 0.0087 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness		2.440 – 2.490 mm (0.0961 – 0.0980 in.)
	Main journal oil clearance	STD No.3	0.030 – 0.055 mm (0.0012 – 0.0022 in.)
		Others	0.024 – 0.049 mm (0.0009 – 0.0019 in.)
		U/S 0.25 No.3	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
		Others	0.025 – 0.065 mm (0.0010 – 0.0026 in.)
		Maximum	0.08 mm (0.0031 in.)
	Main journal diameter	STD No.3	59.981 – 59.994 mm (2.3615 – 2.3620 in.)
		Others	59.987 – 60.000 mm (2.3617 – 2.3622 in.)
		U/S 0.25 No.3	59.740 – 59.750 mm (2.3520 – 2.3524 in.)
		Others	59.745 – 59.755 mm (2.3522 – 2.3526 in.)
	Main bearing center wall thickness	STD Mark 1	1.987 – 1.990 mm (0.0782 – 0.0783 in.)
	(Reference)	Mark 2	1.990 – 1.993 mm (0.0783 – 0.0785 in.)
		Mark 3	1.993 – 1.996 mm (0.0785 – 0.0786 in.)
	Crank pin diameter	STD	52.987 – 53.000 mm (2.0861 –2.0866 in.)
		U/S 0.25	52.745 – 52.755 mm (2.0766 – 2.0770 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Main journal taper and out –of–round	Maximum	0.02 mm (0.0008 in.)
	Crank pin taper and out–of–round	Maximum	0.02 mm (0.0008 in.)

Crankshaft (2RZ–FE:)	Thrust clearance	STD	0.020 – 0.0220 mm (0.0008 – 0.0087 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness		2.440 – 2.490 mm (0.0961 – 0.0980 in.)
	Main journal oil clearance	STD No.3	0.030 – 0.055 mm (0.0012 – 0.0022 in.)
		Others	0.024 – 0.049 mm (0.0009 – 0.0019 in.)
		U/S 0.25 No.3	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
		Others	0.025 – 0.065 mm (0.0010 – 0.0026 in.)
		Maximum	0.10 mm (0.0039 in.)
	Main journal diameter	STD No.3	59.981 – 59.994 mm (2.2615 – 2.3620 in.)
		Others	59.987 – 60.000 mm (2.3617 – 2.3622 in.)
		U/S 0.25 No.3	59.740 – 59.750 mm (2.3520 – 2.3524 in.)
		Others	59.745 – 59.755 mm (2.3522 – 2.3526 in.)
	Main bearing center wall thickness		
		STD Mark 1	1.987 – 1.990 mm (0.0782 – 0.0783 in.)
		Mark 2	1.991 – 1.993 mm (0.0784 – 0.0785 in.)
		Mark 3	1.994 – 1.996 mm (0.0785 – 0.0786 in.)
		U/S 0.25	2.106 – 2.112 mm (0.0829 – 0.0831 in.)
	Crank pin diameter	STD	52.987 – 53.000 mm (2.0861 –2.0866 in.)
		U/S 0.25	52.745 – 52.755 mm (2.0766 – 20.770 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Main journal taper and out –of–round	Maximum	0.005 mm (0.0002 in.)
	Crank pin taper and out–of–round	Maximum	0.005 mm (0.0002 in.)
Crankshaft (3RZ–F:, 3RZ–FE:)	Thrust clearance	STD	0.020 – 0.0220 mm (0.0008 – 0.0087 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness		2.440 – 2.490 mm (0.0961 – 0.0980 in.)
	Main journal oil clearance	STD No.3	0.030 – 0.055 mm (0.0012 – 0.0022 in.)
		Others	0.024 – 0.049 mm (0.0009 – 0.0019 in.)
		U/S 0.25 No.3	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
		Others	0.025 – 0.065 mm (0.0010 – 0.0026 in.)
		Maximum	0.10 mm (0.0039 in.)
	Journal diameter	STD No.3	59.981 – 59.994 mm (2.2615 – 2.3620 in.)
		Others	59.987 – 60.000 mm (2.3617 – 2.3622 in.)
		U/S 0.25 No.3	59.740 – 59.750 mm (2.3520 – 2.3524 in.)
		Others	59.745 – 59.755 mm (2.3522 – 2.3526 in.)
	Main bearing center wall thickness		
		STD Mark 1	1.987 – 1.990 mm (0.0782 – 0.0783 in.)
		Mark 2	1.991 – 1.993 mm (0.0784 – 0.0785 in.)
		Mark 3	1.994 – 1.996 mm (0.0785 – 0.0786 in.)
		U/S 0.25	2.106 – 2.112 mm (0.0829 – 0.0831 in.)
	Crank pin diameter	STD	52.987 – 53.000 mm (2.0861 –2.0866 in.)
		U/S 0.25	52.745 – 52.755 mm (2.0766 – 20.770 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Main journal taper and out –of–round	Maximum	0.005 mm (0.0002 in.)
	Crank pin taper and out–of–round	Maximum	0.005 mm (0.0002 in.)
Balance shaft (3RZ–FE:)	Thrust clearance	STD	0.07 – 0.13 mm (0.0027 – 0.0051 in.)
		Maximum	0.20 mm (0.0079 in.)
	Bearing inside diameter	No.1	38.025 – 38.045 mm (1.4970 – 1.4978 in.)
		No.2	37.525 – 37.545 mm (1.4774 – 1.4781 in.)
	Journal diameter	No.1	37.969 – 37.985 mm (1.4948 – 1.49554 in.)
		No.2	37.449 – 37.465 mm (1.4744 – 1.4750 in.)
	Journal oil clearance	STD No.1	0.040 – 0.076 mm (0.0016 – 0.0031 in.)
		No.2	0.060 – 0.096 mm (0.0024 – 0.0038 in.)
		Maximum	0.15 mm (0.0059 in.)

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SS052-01

TORQUE SPECIFICATION

1RZ:, 1RZ–E:

Part tightened		N·m	kgf·cm	ft·lbf
Distributor x Cylinder head		20	200	14
Camshaft bearing cap x Cylinder head		15	160	11
Cylinder head rear plate x Cylinder head		18	185	13
Plug plate, Water outlet x Cylinder head		20	200	15
Intake manifold x Cylinder head		29	300	21
Exhaust manifold x Cylinder head		49	500	36
Cylinder head x Cylinder block	1 st 2nd 3rd	39 Turn 90° Turn 90°	400 Turn 90° Turn 90°	29 Turn 90° Turn 90°
Cylinder head x Timing chain cover		21	210	15
Camshaft timing gear x Camshaft		73	750	54
Chain tensioner x Cylinder head		21	210	15
Fuel inlet pips x Delivery pipe, Fuel filter		29.5	300	22
Intake manifold stay x Intake manifold, LH engine mounting bracket		37	380	27
Cylinder head cover x Cylinder head		5.0	55	44 in.·lbf
Oil jet x Cylinder block		18	185	13
Chain tensioner slipper x Cylinder block		27	270	20
Chain vibration damper x Cylinder block		29	300	21
Timing chain cover x Cylinder bolck 12 mm head for 35 mm (1.38 in.) length bolt 12 mm head for except 35 mm (1.38 in.) length bolt 14 mm head		 18 20 39	 185 200 440	 13 15 29
Water bypass pipe x Thermostat guide plate		19.5	200	14
Alternator drive belt adjusting bar x Cylinder block		63.7	650	47
Crankshaft pulley x Crankshaft		259	2,650	191
Fluid coupling x Water pump		20.5	210	15
Alternator drive belt adjusting bar x Alternator		19	195	14
Alternator x Alternator bracket		59	600	44
Main bearing cap x Cylinder block	1 st 2 nd	39 Turn 90°	400 Turn 90°	29 Turn 90°
Connecting rod cap x Connecting rod	1 st 2 nd	45 Turn 90°	460 Turn 90°	33 Turn 90°
Rear oil seal retainer x Cylinder block		13	135	10
Engine coolant drain union x Cylinder block		24.5	250	18
Oil filter bracket x Cylinder block	Union bolt Nut	68.5 12	700 120	51 9
Engine mounting bracket x Clinder block		51	520	38
Fuel filter x Cylinder block		20	200	15
Alternator bracket x Cylinder block		74.5	760	55
Rear end plate x Cylinder block		18	185	13
Flywheel x Crankshaft		88	900	65
Intake manifold x TVSV	(1RZ)	250	18	25
Water by–pass flange x Thermostat valve	(1RZ)	250	18	25
Puel pump x Cylinder head	(1RZ)	200	14	20

2RZ–FE:

Part tightened		N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head		18	180	13
Cylinder head x Cylinder block	1 st	39	400	29
	2nd	Turn 90°	Turn 90°	Turn 90°
	3rd	Turn 90°	Turn 90°	Turn 90°
Camshaft bearing cap x Cylinder head		16	160	12
Ignition coil x Cylinder head		10	100	7
Camshaft position sensor x Cylinder head		5.4	55	48 in.·lbf
Chain tensioner x Cylinder head		21	210	15
Engine hanger x Cylinder head		20	200	14
Cylinder head rear plate x Cylinder head		18	185	13
Water outlet x Cylinder head		20	200	14
Exhaust manifold x Cylinder head		49	500	36
Heat insulator x Exhaust manifold		11.5	115	8
Intake manifold x Cylinder head		29	300	22
Fuel inlet pipe x Fuel filter		29	300	22
Fuel inlet pipe x Delivery pipe		29	300	22
Intake manifold stay x Intake manifold, LH engine mounting bracket		37	380	27
Oil jet x Cylinder block		18	185	13
Vibration damper x Cylinder block		29	300	22
Timing chain tensioner slipper x Cylinder block		27	270	20
Timing chain case x Cylinder block	14 mm head bolt	64	650	47
	12 mm head bolt A and nut	20	200	14
	Bolt B	44	440	32
Timing chain case mounting bolt		18	185	13
Water bypass pipe mounting nut		20	200	14
Crankshaft pulley x crankshaft		260	2,650	192
Oil strainer x Cylinder block		18	185	13
Oil pan x Cylinder block		13	130	9
Alternator bracket x Cylinder block		74.5	760	55
connecting rod cap x Connecting rod	1 st	45	460	33
	2 nd	Turn 90°	Turn 90°	Turn 90°
Main bearing cap x Cylinder bolck	1 st	39	400	29
	2 nd	Turn 90°	Turn 90°	Turn 90°
Rear oil seal retainer x Cylinder block		13	135	9.7
Engine mounting bracket x Cylinder block		51	520	38
Engine coolant drain plug x Cylinder block		24.5	250	18
Oil filter bracket x Cylinder block	Nut	12	120	8.9
	Union bolt	68.5	700	51
Kock sensor x Cylinder block		44	450	33
Fuel filter x Cylinder block		20	200	14
Rear end plate x Cylinder block		18	185	13
Flywheel x Crankshaft		88	900	65
Drive plate x Crankshaft		74	750	54

3RZ–F:, 3RZ–FE:

Part tighttened		N·m	kgf·cm	ft·lbf
Spark plug x Cylinder head		19	200	14
Cylinder head x Vacuum pipe		8.5	85	74 in.·lbf
Cylinder head x Cylinder block	1 st 2 nd 3 rd	39 Turn 90° Turn 90°	400 Turn 90° Turn 90°	29 Turn 90° Turn 90°
Cylinder head x Timing chain cover		21	210	15
Camshaft bearing cap x Cylinder head		15.5	160	12
Camshaft timing gear x Intake camshaft		73.5	750	54
Ignition coil x Cylinder head (3RZ–FE:)		10	100	7
Camshaft position sensor x Cylinder head (3RZ–FE:)		5.4	55	48 in.·lbf
No.1 chain tensioner x Cylinder head		21	210	15
Front engine hanger x Cylinder head		42	420	30
Intake manifold x Water bypasss flange (3RZ–F:)		9.0	90	78 in.·lbf
Intake manifold x Accelerator cable		21	210	15
Intake manifold x Vacuum pipe		8.5	85	74 in.·lbf
Cylinder head rear cover x Cylinder head		13.5	135	10
Water outlet x Cylinder head		20	200	14
Exhaust manifold x Cylinder head		49	500	36
Heat insulator x Exhaust manifold		5.5	55	48 in.·lbf
Intake manifold x Cylinder head		29	300	22
Fuel inlet pipe x Fuel filter (3RZ–FE:)		29	300	22
Air intake chamber (3RZ–FE:) x Intake manifold		21	210	15
Fuel inlet pipe x Delivery pipe (3RZ–FE:)		29	300	22
Intake chamber stay x Air intake chamber (3RZ–FE:)		20	200	15
Intake manifold stay x LH engine mounting bracket (3RZ–FE:)		20	200	15
Intake manifold stay x Intake manifold, LH mounting bracket		20	200	15
Intake air connector x Cylinder head		18	185	13
Balance shaft drive gear x Balance shaft (3RZ–FE:)		25	250	18
No.2 chain tensioner, No.3 vibration damper x Cylinder block (3RZ–FE:)		18	185	13
No.2 vibration damper x Cylinder block (3RZ–FE:)		27	270	20
No.1 vibration damper x Cylinder block		29	300	22
No.1 timing chain tensioner slipper x Cylinder block		27	270	20
Timing chain cover x Cylinder block	12 mm head bolt A bolt B 14 mm head bolt Nut	20 24.5 44 20	200 250 440 200	14 18 32 14
Timing chain cover mounting bolt		18	185	13
Water bypass pipe mounting nut		20	200	14
Crankshaft pulley x Crankshaft		260	2,650	193
No.2 crankshaft pulley, No.3 crankshaft pulley x Crankshaft pulley		25	250	18
Oil strainer x Cylinder block		18	185	13
Oil pan x Cylinder block		12.5	130	9
Timing chain cover x Crankshaft position sensor		8.5	85	74 in.·lbf
Connecting rod cap x Connecting rod	1 st 2 nd	45 Turn 90°	460 Turn 90°	33 Turn 90°

Main bearing cap x Cylinder block	1 st 2 nd	39 Turn 90°	400 Turn 90°	29 Turn 90°
No.1 balance shaft, No.2 balance chaft x Timing gear (3RZ–FE:)		36	365	26
Balance shaft thrust plate x Cylinder block (3RZ–FE:)		18	185	13
Rear oil seal retainer x Cylinder block		13.5	135	9.7
Engine mounting bracket x Cylinder block		51	520	38
Engine coolant drain plug x Cylinder block		24.5	250	18
Oil filter bracket union x Cylinder block		25	250	18
Oil filter bracket x Cylinder block		28	290	21
Water bypass pipe x Cylinder block		20	200	14
Knock sensor (3RZ–FE) x Cylinder block		37	380	27
Fuel filter (3RZ–FE) x Cylinder block		20	200	14
Rear end plate x Cylinder block		18	185	13
Rear end plate x Water bypass pipe		20	200	14
Flywheel x Crankshaft	1 st 2 nd	26.5 Turn 90°	270 Turn 90°	19 Turn 90°
Drive plate x Crankshaft		74	750	54
Ffuel pump x Cylinder head (3RZ–F)		28	280	21
Accelerator bracket x Cylinder head (3RZ–F)		21	210	15