

ENGINE MECHANICAL

SERVICE DATA

SS0ZE-01

Compression pressure	STD 1HZ 1HD-T, 1HD-FTE Minimum 1HZ 1HD-T, 1HD-FTE Difference between each cylinder	3,628 kPa (37.0 kgf/cm ² , 526 psi) or more 3,432 kPa (35.0 kgf/cm ² , 498 psi) or more 2,648 kPa (27.0 kgf/cm ² , 384 psi) 2,452 kPa (25.0 kgf/cm ² , 356 psi) 490 kPa (5.0 kgf/cm ² , 71 psi) or less
Valve clearance (1HZ, 1HD-T)	at cold Intake Exhaust Adjust shim thickness No. 709 No. 704 No. 710 No. 01 No. 42 No. 06 No. 43 No. 11 No. 44 No. 16 No. 45 No. 21 No. 46 No. 26 No. 47 No. 31 No. 48 No. 36 No. 49 No. 41	0.15 - 0.25 mm (0.006 - 0.010 in.) 0.35 - 0.45 mm (0.014 - 0.018 in.) 2.35mm (0.0925 in.) 2.40 mm (0.0945 in.) 2.45 mm (0.0965 in.) 2.50 mm (0.0984 in.) 2.55 mm (0.1004 in.) 2.60 mm (0.1024 in.) 2.65 mm (0.1043 in.) 2.70 mm (0.1063 in.) 2.75 mm (0.1083 in.) 2.80 mm (0.1102 in.) 2.85 mm (0.1122 in.) 2.90 mm (0.1142 in.) 2.95 mm (0.1161 in.) 3.00 mm (0.1181 in.) 3.05 mm (0.1201 in.) 3.10 mm (0.1220 in.) 3.15 mm (0.1240 in.) 3.20 mm (0.1260 in.) 3.25 mm (0.1280 in.) 3.30 mm (0.1299 in.)
Valve clearance (1HD-FTE)	at cold Intake Exhaust	0.17 - 0.23 mm (0.007 - 0.009 in.) 0.47 - 0.53 mm (0.099 - 0.021 in.)
Injection timing (1HZ, 1HD-T)	Plunger stroke 1HZ w/ ACSD w/o ACSD 1HD-T	0.65 - 0.71 mm (0.0256 - 0.0280 in.) 0.85 - 0.91 mm (0.0335 - 0.0358 in.) 1.18 - 1.24 mm (0.0465 - 0.0488 in.)
Idle speed (1HZ, 1HD-T)	1HZ M/T A/T 1HD-T M/T A/T	650 ± 50 rpm 710 ± 50 rpm 650 ± 50 rpm 700 - 800 rpm
Idle speed (1HD-FTE)		550 - 650 rpm
Maximum speed (1HZ, 1HD-T)	1HZ 1HD-T	4600 ± 100 rpm 4400 ± 100 rpm
Maximum speed (1HD-FTE)		4300 - 4500 rpm
A/C idle-up speed (1HZ, 1HD-T)		725 - 850 rpm
A/C idle-up speed (1HD-FTE)		725 - 850 rpm
VSV for intake shutter (1HD-FTE)	Resistance at 20 °C (68°F)	33 - 39 Ω
Timing belt tensioner	Protrusion from husing end	9.0 - 9.8 mm (0.354 - 0.386 in.)

1HZ, 1HD-T, 1HD-FTE ENGINE (RM617E)

Timing gear	Idler gear thrust clearance	STD	0.05 – 0.15 mm (0.0020 – 0.0059 in.)
		Maximum	0.030 mm (0.0118 in.)
	Idler gear inside diameter		45.000 – 45.025 mm (1.7717 – 1.7726 in.)
	Idler gear shaft diameter		44.950 – 44.975 mm (1.7697 – 1.7707 in.)
	Idler gear oil clearance	STD	0.025 – 0.075 mm (0.0010 – 0.0030 in.)
		Maximum	0.20 mm (0.0079 in.)
Cylinder head (1HZ, 1HD-T)	Gear backlash	STD	0.05 – 0.15 mm (0.0020 – 0.0059 in.)
		Maximum	0.30 mm (0.0118 in.)
	Warpage	Maximum	0.20 mm (0.0079 in.)
	Valve seat		
	Refacing angle	Intake	25° 45° 70°
		Exhaust	25° 45° 60°
	Contacting angle		45°
	Contacting width	Intake	1.5 – 1.9 mm (0.059 – 0.075 in.)
		Exhaust	1.8 – 2.2 mm (0.071 – 0.087 in.)
	Cylinder head bolt outer diameter	STD	10.800 – 11.000 mm (0.4252 – 0.4331 in.)
Cylinder head (1HD-FTE)		Minimum	10.55 mm (0.4154 in.)
	New cylinder head gasket thickness		
	Cut number "1"		1.15 – 1.25 mm (0.0453 – 0.0492 in.)
	Cut number "3"		1.25 – 1.35 mm (0.0492 – 0.0531 in.)
	Cut number "5"		1.35 – 1.45 mm (0.0531 – 0.0571 in.)
Cylinder head (1HD-FTE)	Warpage	Maximum	0.20 mm (0.079 in.)
	Valve seat		
	Refacing angle	Intake	25° 45° 70°
		Exhaust	25° 45° 65°
	Contacting angle		45°
	Contacting width	Intake	1.4 – 1.8 mm (0.055 – 0.071 in.)
		Exhaust	1.6 – 2.0 mm (0.063 – 0.079 in.)
	Cylinder head bolt outer diameter	STD	10.800 – 11.000 mm (0.4252 – 0.4331 in.)
		Minimum	10.550 mm (0.4154 in.)
	New cylinder head gasket thickness		
Valve guige bushing			
	Inside diameter	1HZ, 1HD-T	8.010 – 8.030 mm (0.3154 – 0.3164 in.)
		1HD-FTE	7.010 – 7.030 mm (0.2760 – 0.2768 in.)
Valve (1HZ, 1HD-T)	Valve overall length	STD Intake	103.49 mm (4.0744 in.)
		Exhaust	103.34 mm (4.0685 in.)
		Minimum Intake	102.79 mm (4.0468 in.)
		Exhaust	102.64 mm (4.0409 in.)
	Valve face angle		44.5°
	Stem diameter	Intake	7.975 – 7.990 mm (0.3140 – 0.3146 in.)
		Exhaust	7.960 – 7.975 mm (0.3134 – 0.3140 in.)
	Stem oil clearance	STD Intake	0.020 – 0.055 mm (0.0008 – 0.0022 in.)
		Exhaust	0.035 – 0.070 mm (0.0014 – 0.0028 in.)
		Maximum Intake	0.08 mm (0.0031 in.)
		Exhaust	0.10 mm (0.0394 in.)
	Margin thickness	STD	1.00 mm (0.0394 in.)
		Minimum	0.83 mm (0.0327 in.)

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Valve (1HD-FTE)	Valve overall length	STD Intake	126.85 – 127.45 mm (4.9941 – 5.0177 in.)
		Exhaust	126.83 – 127.43 mm (4.9933 – 5.0169 in.)
	Stem diameter	Mimimum Intake	126.85 mm (4.9941 in.)
		Exhaust	126.83 mm (4.9933 in.)
	Stem oil clearance	Intake	6.970 – 6.985 mm (0.2744 – 0.2750 in.)
		Exhaust	6.960 – 6.975 mm (0.2740 – 0.2746 in.)
		STD Intake	0.025 – 0.060 mm (0.0010 – 0.0024 in.)
		Exhaust	0.035 – 0.070 mm (0.0014 – 0.0028 in.)
Margin thickness	Maximum Intake	0.08 mm (0.0031 in.)	
	Exhaust	0.10 mm (0.0039 in.)	
	STD	1.00 mm (0.394 in.)	
	Minimum	0.083 mm (0.0327 in.)	
Valve spring (1HZ, 1HD-T)	Free length	46.20 mm (1.8189 in.)	
	Install tension at 37.0 mm (1.457 in.)	301 – 322 N (30.7 – 33.9 kgf, 67.7 – 74.7 lbf)	
	Deviation Maximum	2.0 mm (0.079in.)	
Valve spring (1HD-FTE)	Free length	49.60 mm (1.9527 in.)	
	Install tension at 39.5 mm (1.555 in.)	237 – 263 N (24.2 – 26.8 kgf, 53.4 – 59.1 lbf)	
	Deviation Maximum	2.0 mm (0.079in.)	
Valve rocker arm and shaft (1HD-FTE)	Valve rocker arm inside diameter	20.012 – 20.033 mm (0.7879 – 0.7887 in.)	
	Valve rocker shaft diameter	19.972 – 19.993 mm (0.7879 – 0.7887 in.)	
	Oil clearance STD	0.019 – 0.061 mm (0.0007 – 0.0024 in.)	
	Maximum	0.10 mm (0.0039 in.)	
Camshaft (1HZ, 1HD-T)	Thrust clearance	STD	0.10 – 0.20 mm (0.0039 – 0.0079 in.)
		Maximum	0.30 mm (0.0118 in.)
	Standard oil clearance	STD No.1	0.022 – 0.074 mm (0.0009 – 0.0029 in.)
		Other	0.030 – 0.066 mm (0.0012 – 0.0026 in.)
	Journal diameter	Maximum	0.100 mm (0.0039 in.)
		No.1	34.969 – 34.985 mm (1.3767 – 1.3774 in.)
	Cam lobe height	Other	27.986 – 28.002 mm (1.1018 – 1.1024 in.)
		STD Intake 1HZ	55.090 – 55.110 mm (2.1689 – 2.1697 in.)
		1HD-T	54.440 – 54.460 mm (2.1433 – 2.1441 in.)
		Exhaust	55.940 – 55.960 mm (2.2024 – 2.2031 in.)
		Minimum Intake 1HZ	54.59 mm (2.1492 in.)
		1HD-T	53.94 mm (2.1236 in.)
		Exhaust	55.44 mm (2.1827 in.)
Circle runout	0.10 mm (0.0039 in.)		
Camshaft (1HD-FTE)	Thrust clearance	STD	0.10 – 0.20 mm (0.0039 – 0.00 in.)
		Maximum	0.30 mm (0.0118 in.)
	Standard oil clearance	STD No.1	0.022 – 0.074 mm (0.0009 – 0.0029 in.)
		Other	0.023 – 0.075 mm (0.0009 – 0.0030 in.)
	Journal diameter	Maximum	0.10 mm (0.0039 in.)
		No.1	34.969 – 34.985 mm (1.3767 – 1.3774 in.)
	Cam lobe height	Other	27.986 – 28.002 mm (1.1018 – 1.1024 in.)
		STD Intake	48.203 – 48.303 mm (1.8978 – 1.9017 in.)
		Exhaust	50.734 – 50.834 mm (1.9974 – 2.0013 in.)
		Minimum Intake	47.998 mm (1.8897 in.)
	Exhaust	50.234 mm (1.9777 in.)	
	Circle runout	0.10 mm (0.0039 in.)	
Valve lifter (1HZ, 1HD-T)	Lifter diameter	40.892 – 40.902 mm (1.6099 – 1.6103 in.)	
	Cylinder head lifter bore diameter	40.960 – 40.980 mm (1.6126 – 1.6134 in.)	
	Oil clearance STD	0.058 – 0.083 mm (0.0023 – 0.0033 in.)	
	Maximum	0.10 mm (0.0039 in.)	
Manifold	Warpage Maximum	0.40 mm (0.0157 in.)	
Combustion chamber (1HZ)	Protrusion	Minus 0.04 – Plus 0.04 mm (Minus 0.0016 – Plus 0.0016 in.)	
	Shim thickness	0.03 mm (0.0012 in.)	

Cylinder block	Cylinder head surface warpage	Maximum	0.20 mm (0.0079 in.)
	Cylinder bore diameter	STD Mark "1"	94.000 – 94.010 mm (3.7001 – 3.7012 in.)
		Mark "2"	94.010 – 94.020 mm (3.7012 – 3.7016 in.)
		Mark "3"	94.020 – 94.030 mm (0.37016 – 3.7020 in.)
		Maximum STD O/S 0.50	94.23 mm (3.7098 in.) 94.73 mm (3.7295 in.)
	Main bearing cap stud bolt		
	Tension portion diameter	STD Minumum	11.80 – 12.00 mm (0.4646 – 0.4724 in.) 11.50 mm (0.4528 in.)
Piston and piston ring	Piston diameter	STD Mark "1" 1HZ	93.885 – 93.895 mm (3.69625 – 3.69665 in.)
		1HD-T	93.950 – 93.951 mm (3.69881 – 3.69885 in.)
		1HD-FTE	93.870 – 93.880 mm (3.69566 – 3.69606 in.)
		Mark "2" 1HZ	93.895 – 93.905 mm (3.69665 – 3.69704 in.)
		1HD-T	93.960 – 93.961 mm (3.69921 – 3.69924 in.)
		1HD-FTE	93.880 – 93.890 mm (3.69606 – 3.69645 in.)
		Mark "3" 1HZ	93.905 – 93.915 mm (3.69704 – 3.69743 in.)
		1HD-T	93.970 – 93.971 mm (3.69960 – 3.69964 in.)
		1HD-FTE	93.890 – 93.900 mm (3.69645 – 3.69684 in.)
		O/S 0.50 1HZ	94.385 – 94.415 mm (3.71594 – 3.71712 in.)
		1HD-T	94.450 – 94.471 mm (3.71850 – 3.71932 in.)
		1HD-FTE	94.370 – 94.400 mm (3.71535 – 3.71653 in.)
	Piston oil clearance	STD 1HZ	0.105 – 0.125 mm (0.0041 – 0.0049 in.)
		1HD-T	0.040 – 0.060 mm (0.0016 – 0.0024 in.)
		1HD-FTE	0.070 – 0.090 mm (0.0028 – 0.0035 in.)
		Maximum 1HZ	0.125 mm (0.0049 in.)
		1HD-T	0.060 mm (0.0024 in.)
	Piston ring groove clearance	1HD-FTE	0.090 mm (0.0035 in.)
		No.1 STD 1HZ, 1HD-T	0.054 – 0.095 mm (0.0021 – 0.0037 in.)
		1HD-FTE	0.070 – 0.110 mm (0.0028 – 0.0043 in.)
		Maximum	0.20 mm (0.0079 in.)
		No.2 STD 1HZ, 1HD-T	0.060 – 0.100 mm (0.0024 – 0.0039 in.)
		1HD-FTE	0.040 – 0.080 mm (0.0016 – 0.0031 in.)
		Maximum	0.20 mm (0.0079 in.)
	Piston ring end gap	Oil ring STD	0.030 – 0.070 mm (0.0012 – 0.0028 in.)
		Maximum	0.20 mm (0.0079 in.)
		No.1 STD 1HZ, 1HD-T	0.270 – 0.370 mm (0.0106 – 0.0146 in.)
		1HD-FTE	0.270 – 0.330 mm (0.0106 – 0.0130 in.)
		Maximum	0.850 mm (0.0335 in.)
		No.2 STD	0.400 – 0.550 mm (0.0157 – 0.0119 in.)
		Maximum	0.900 mm (0.0354 in.)
		Oil ring STD	0.200 – 0.500 mm (0.0079 – 0.0157 in.)
		Maximum	0.880 mm (0.0346 in.)

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Connecting rod	Thrust clearance	STD	0.100 – 0.200 mm (0.0039 – 0.0079 in.)
		Maximum	0.300 mm (0.0118 in.)
	Connecting rod oil clearance	STD	0.036 – 0.054 mm (0.0014 – 0.0021 in.)
		U/S 0.25 and U/S 0.50	0.037 – 0.077 mm (0.0015 – 0.0030 in.)
		Maximum	0.100 mm (0.0039 in.)
	Connecting rod bearing center wall thickness (Reference)	STD Mark "2"	1.486 – 1.489 mm (0.0585 – 0.0586 in.)
		Mark "3"	1.489 – 1.492 mm (0.0586 – 0.0587 in.)
		Mark "4"	1.492 – 1.495 mm (0.0587 – 0.0589 in.)
		Mark "5"	1.495 – 1.498 mm (0.0589 – 0.0590 in.)
		Mark "6"	1.498 – 1.501 mm (0.0590 – 0.0591 in.)
	Rod bend maximum per 100 mm (3.94 in.)		0.03 mm (0.0012 in.)
	Rod twist maximum per 100 mm (3.94 in.)		0.15 mm (0.0059 in.)
	Bushing inside diameter		33.008 – 33.020 mm (1.2995 – 1.3000 in.)
	Piston pin diameter		33.000 – 33.012 mm (1.2992 – 1.2997 in.)
Crankshaft	Bushing oil clearance	STD	0.004 – 0.012 mm (0.0002 – 0.0005 in.)
		Maximum	0.030 mm (0.0012 in.)
	Connecting rod bolt tension portion diameter	STD	8.300 – 8.400 mm (0.3268 – 0.3307 in.)
		Maximum	7.950 mm (0.3130 in.)
	Thrust clearance	STD	0.040 – 0.240 mm (0.0016 – 0.0094 in.)
		Maximum	0.300 mm (0.0118 in.)
	Thrust washer thickness		2.930 – 2.980 mm (0.1154 – 0.1173 in.)
	Main journal oil clearance	STD	0.030 – 0.042 mm (0.00118 – 0.00165 in.)
		U/S 0.25 and U/S 0.50	0.031 – 0.053 mm (0.00122 – 0.00208 in.)
		Maximum	0.100 mm (0.0039 in.)
	Main journal diameter	STD	66.982 – 67.000 mm (2.6371 – 2.6378 in.)
		U/S 0.25	66.745 – 66.755 mm (2.6278 – 2.6281 in.)
		U/S 0.50	66.495 – 66.505 mm (2.6179 – 2.6183 in.)
	Main bearing center wall thickness (Reference)	Mark "3"	1.982 – 1.985 mm (0.07803 – 0.07815 in.)
		Mark "4"	1.985 – 1.988 mm (0.07815 – 0.07827 in.)
		Mark "5"	1.988 – 1.991 mm (0.07827 – 0.07839 in.)
		Mark "6"	1.991 – 1.994 mm (0.07839 – 0.07850 in.)
		Mark "7"	1.994 – 1.997 mm (0.07850 – 0.07862 in.)
		Mark "8"	1.997 – 2.000 mm (0.07862 – 0.07874 in.)
	Crank pin diameter	STD	58.982 – 59.000 mm (2.3221 – 2.3228 in.)
		U/S 0.25	58.745 – 58.755 mm (2.3128 – 2.3132 in.)
		U/S 0.50	58.495 – 58.505 mm (2.3029 – 2.3033 in.)
	Circle runout		0.06 mm (0.0024 in.)
	Main journal taper and out-of-round		0.02 mm (0.0008 in.)