# ENGINE MECHANICAL

## SERVICE DATA

SS0ZE–01

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

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| 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 – 00.0030 in.) |
| | | Maximum | 0.20 mm (0.0079 in.) |
| | Gear backlash | STD | 0.05 – 0.15 mm (0.0020 – 0.0059 in.) |
| | | Maximum | 0.30 mm (0.0118 in.) |
| Cylinder head (1HZ, 1HD–T) | 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.) |
| | | 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 | | |
| | | Cut number "1" | 0.85 – 0.95 mm (0.0335 – 0.0374 in.) |
| | | Cut number "3" | 0.95 – 1.05 mm (0.0374 – 0.0414 in.) |
| | | Cut number "5" | 1.05 – 1.15 mm (0.0414 – 0.0453 in.) |
| 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.) |
| | | Mimimum 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.) |
| | | Mimimum Intake | 126.85 mm (4.9941 in.) |
| | | Exhaust | 126.83 mm (4.9933 in.) |
| | Stem diameter | Intake | 6.970 – 6.985 mm (0.2744 – 0.2750 in.) |
| | | Exhaust | 6.960 – 6.975 mm (0.2740 – 0.2746 in.) |
| | Stem oil clearance | STD Intake | 0.025 – 0.060 mm (0.0010 – 0.0024 in.) |
| | | Exhaust | 0.035 – 0.070 mm (0.0014 – 0.0028 in.) |
| | | Maximum Intake | 0.08 mm (0.0031 in.) |
| | | Exhaust | 0.10 mm (0.0039 in.) |
| | Margin thickness | 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.) |
| | | Maximum | 0.100 mm (0.0039 in.) |
| | Journal diameter | No.1 | 34.969 – 34.985 mm (1.3767 – 1.3774 in.) |
| | | Other | 27.986 – 28.002 mm (1.1018 – 1.1024 in.) |
| | Cam lobe height | 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.) |
| | | Maximum | 0.10 mm (0.0039 in.) |
| | Journal diameter | No.1 | 34.969 – 34.985 mm (1.3767 – 1.3774 in.) |
| | | Other | 27.986 – 28.002 mm (1.1018 – 1.1024 in.) |
| | Cam lobe height | 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.) |

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| 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 | 94.23 mm (3.7098 in.) |
| | | O/S 0.50 | 94.73 mm (3.7295 in.) |
| | Main bearing cap stud bolt | | |
| | Tension portion diameter | STD | 11.80 – 12.00 mm (0.4646 – 0.4724 in.) |
| | | Minumum | 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 mm3.71850 – 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.) |
| | | 1HD–FTE | 0.090 mm (0.0035 in.) |
| | Piston ring grove clearance | 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.) |
| | | Oil ring STD | 0.030 – 0.070 mm (0.0012 – 0.0028 in.) |
| | | Maximum | 0.20 mm (0.0079 in.) |
| | Piston ring end gap | 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 | | |
| | (Referemce) | 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.) |
| | Busing inside diamater | | 33.008 – 33.020 mm (1.2995 – 1.3000 in.) |
| | Piston pin diameter | | 33.000 – 33.012 mm(1.2992 – 1.2997 in.) |
| | 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.) |
| Crankshaft | 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 runouit | | 0.06 mm (0.0024 in.) |
| | Main journal taper and out–of–round | | 0.02 mm (0.0008 in.) |