# ENGINE MECHANICAL

## SERVICE DATA

SS06N-01

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| Compression pressure | | at 250 rpm STD 2L–T | 3,040 kPa (31.0 kgf/cm$^2$, 441 psi) or more |
| | | 2L, 3L, 5L | 3,138 kPa (32.0 kgf/cm$^2$, 455 psi) or more |
| | | Minimum | 1,961 kPa (20.0 kgf/cm$^2$, 284 psi) |
| | Difference of pressure between each cylinder | | 490 kPa (5.0 kgf/cm$^2$, 71 psi) or less |
| Valve clearance | | at cold Intake | 0.20 – 0.30 mm (0.008 – 0.012 in.) |
| | | Exhaust | 0.40 – 0.50 mm (0.016 – 0.020 in.) |
| | Adjusting shim thickness (for repair part) | 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.) |
| Injection timing | Plunger stroke | 2L w/ ACSD | 0.44 – 0.56 mm (0.0173 – 0.0220 in.) |
| | | w/o ACSD | 0.84 – 0.96 mm (0.0331 – 0.0378 in.) |
| | | 2L–T | 0.54 – 0.66 mm (0.0213 – 0.0260 in.) |
| | | 3L w/ ACSD | 0.54 – 0.66 mm (0.0213 – 0.0260 in.) |
| | | w/o ACSD | 0.84 – 0.96 mm (0.0331 – 0.0378 in.) |
| | | 5L w/ ACSD | 0.44 – 0.56 mm (0.0173 – 0.0220 in.) |
| | | w/o ACSD | 0.64 – 0.76 mm (0.0252 – 0.0299 in.) |
| Idle speed | | 2L, 2L–T, 3L | 650 – 750 rpm |
| | | 5L | 750 – 850 rpm |
| Maximum speed | | 2L Europe | 5,020 – 5,280 rpm |
| | | Others | 4,770 – 5,030 rpm |
| | | 2L–T | 4,670 – 4,930 rpm |
| | | 3L Malaysia | 4,270 – 4,530 rpm |
| | | others | 4,470 – 4,730 rpm |
| | | 5L | 4,470 – 4,730 rpm |
| A/C idle–up speed | – | | 900 – 1,000 rpm |
| VSV for intake shutter (5L) | | at 20°C (68°F) | 37 – 44 Ω |
| Idler pulley tension spring | Free length | | 44.4 – 45.4 mm (1.748 – 1.787 in.) |
| | Installed load at 52.1 mm (2.051 in.) | | 53 – 59 N (5.42 – 5.98 kgf, 11.9 – 13.2 lbf) |

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| Cylinder head | Warpage | Maximum | 0.20 mm (0.0079 in.) |
| | Valve seat | | |
| | Refacing angle | Intake | 20°, 45°, 70° |
| | | Exhaust | 20°, 45°, 75° |
| | 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 thread inside diameter | STD | 11.800 – 12.000 mm (0.4646 – 0.4724 in.) |
| | | Minimum | 11.60 mm (0.4567 in.) |
| | Cylinder head gasket thickness | Mark B | 1.40 – 1.50 mm (0.0551 – 0.0591 in.) |
| | | Mark D | 1.50 – 1.60 mm (0.0591 – 0.0630 in.) |
| | | Mark F | 1.60 – 1.70 mm (0.0630 – 0.0669 in.) |
| Valve guide bushing | 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 | Valve overall length | STD Intake 2L, 2L–T, 3L | 103.29 – 103.69 mm (4.0665 – 4.0823 in.) |
| | | 5L | 104.10 – 104.50 mm (4.0984 – 4.1142 in.) |
| | | Exhaust 2L, 2L–T, 3L | 103.14 – 103.54 mm (4.0606 – 4.0764 in.) |
| | | 5L | 103.95 – 104.35 mm (4.0925 – 4.1083 in.) |
| | | Minimum Intake 2L, 2L–T, 3L | 102.79 mm (4.0468 in.) |
| | | 5L | 103.60 mm (4.0787 in.) |
| | | Exhaust 2L, 2L–T, 3L | 102.64 mm (4.0409 in.) |
| | | 5L | 103.45 mm (4.0728 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 (0.0039 in.) |
| | Margin thickness | STD Intake | 1.6 mm (0.063 in.) |
| | | Exhaust | 1.7 mm (0.067 in.) |
| | | Minimum Intake | 1.1 mm (0.043 in.) |
| | | Exhaust | 1.2 mm (0.047 in.) |
| Valve spring | Deviation | Maximum | 2.0 mm (0.079 in.) |
| | Free length | Type A | 46.20 mm (1.8189 in.) |
| | | Type B | 48.54 mm (1.9110 in.) |
| | Installed tension at 37.0 mm (1.457 in.) | | 301 – 332 N (30.7 – 33.9 kgf, 67.7 – 74.7 lbf) |
| Valve lifter | Valve lifter inside 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 – 0.088 mm (0.0023 – 0.0035 in.) |
| | | Maximum | 0.10 mm (0.0039 in.) |
| Manifold | Warpage | Maximum | 0.40 mm (0.0157 in.) |

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| Camshaft | Circle runout | Maximum | 0.10 mm (0.0039 in.) |
| | Cam lobe height | STD Intake 2L | 53.850 – 53.870 mm (2.1201 – 2.1209 in.) |
| | | 2L–T | 53.450 – 53.470 mm (2.1043 – 2.1051 in.) |
| | | 3L, 5L | 54.290 – 54.310 mm (2.1374 – 2.1382 in.) |
| | | Exhaust | 54.990 – 55.010 mm (2.1650 – 2.1657 in.) |
| | | Minimum Intake 2L | 53.35 mm (2.1004 in.) |
| | | 2L–T | 52.49 mm (2.0665 in.) |
| | | 3L, 5L | 53.79 mm (2.1177 in.) |
| | | Exhaust | 54.49 mm (2.1453 in.) |
| | Journal diameter | STD No.1 | 34.969 – 34.985 mm (1.3767 – 1.3774 in.) |
| | | Others | 27.969 – 27.985 mm (1.1011 – 1.1018 in.) |
| | | U/S 0.125 No.1 | 34.844 – 34.860 mm (1.3718 – 1.3724 in.) |
| | | Others | 27.844 – 27.860 mm (1.0962 – 1.0968 in.) |
| | | U/S 0.250 No.1 | 34.719 – 34.735 mm (1.3669 – 1.3675 in.) |
| | | Others | 27.719 – 27.735 mm (1.0913 – 1.0919 in.) |
| | Journal oil clearance | STD | 0.022 – 0.074 mm (0.0009 – 0.0029 in.) |
| | | Maximum | 0.10 mm (0.0039 in.) |
| | Thrust clearance | STD | 0.080 – 0.280 mm (0.0031 – 0.0110 in.) |
| | | Maximum | 0.35 mm (0.0138 in.) |
| Combustion chamber | Protrusion | | ± 0.03 mm (0.0012 in.) |
| | Shim thickness | | 0.03 mm (0.0012 in.) |
| Connecting rod | Thrust clearance | STD | 0.080 – 0.300 mm (0.0031 – 0.0118 in.) |
| | | Maximum | 0.35 mm (0.0138 in.) |
| | Connecting rod oil clearance | STD STD | 0.036 – 0.064 mm (0.0014 – 0.0025 in.) |
| | | U/S 0.25, U/S 0.50, 2L | 0.023 – 0.073 mm (0.0009 – 0.0029 in.) |
| | | 2L–T, 3L, 5L | 0.033 – 0.079 mm (0.0013 – 0.0031 in.) |
| | | Maximum | 0.10 mm (0.0039 in.) |
| | Connecting rod bearing center wall thickness | | |
| | Reference | STD Mark 1 | 1.478 – 1.482 mm (0.0582 – 0.0583 in.) |
| | | Mark 2 | 1.482 – 1.486 mm (0.0583 – 0.0585 in.) |
| | | Mark 3 | 1.486 – 1.490 mm (0.0585 – 0.0587 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 | 2L | 27.008 – 27.020 mm (1.0633 – 1.0638 in.) |
| | | 2L–T, 3L, 5L | 29.008 – 29.020 mm (1.1420 – 1.1425 in.) |
| | Piston pin diameter | 2L | 27.000 – 27.012 mm (1.0630 – 1.0635 in.) |
| | | 2L–T, 3L, 5L | 29.000 – 29.012 mm (1.1417 – 1.1422 in.) |
| | Bushing oil clearance | STD | 0.004 – 0.012 mm (0.0002 – 0.0005 in.) |
| | | Maximum | 0.05 mm (0.0020 in.) |
| | Connecting rod bolt tension portion diameter | STD | 8.400 – 8.600 mm (0.3307 – 0.3386 in.) |
| | | Minimum | 8.20 mm (0.3228 in.) |

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| Cylinder block | Cylinder head surface warpage | Maximum | 0.20 mm (0.0079 in.) |
| | Cylinder bore diameter | STD 2L, 2L–T STD Mark 1 | 92.000 – 92.010 mm (3.6220 – 3.6224 in.) |
| | | Mark 2 | 92.010 – 92.020 mm (3.6224 – 3.6228 in.) |
| | | Mark 3 | 92.020 – 92.030 mm (3.6228 – 3.6232 in.) |
| | | 3L STD Mark 1 | 96.000 – 96.010 mm (3.7795 – 3.7799 in.) |
| | | Mark 2 | 96.010 – 96.020 mm (3.7799 – 3.7803 in.) |
| | | Mark 3 | 96.020 – 96.030 mm (3.7803 – 3.7807 in.) |
| | | 5L STD Mark 1 | 99.500 – 95.010 mm (3.9173 – 3.9177 in.) |
| | | Mark 2 | 99.510 – 95.020 mm (3.9177 – 3.9181 in.) |
| | | Mark 3 | 99.520 – 95.030 mm (3.9181 – 3.9185 in.) |
| | | Maximum 2L, 2L–T STD | 92.23 mm (3.6311 in.) |
| | | O/S 0.50 | 92.73 mm (3.6508 in.) |
| | | O/S 0.75 | 92.98 mm (3.6606 in.) |
| | | O/S 1.00 | 93.23 mm (3.6705 in.) |
| | | 3L STD | 96.23 mm (3.7886 in.) |
| | | O/S 0.50 | 96.73 mm (3.8083 in.) |
| | | 5L STD | 99.73 mm (3.9264 in.) |
| | | O/S 0.50 | 100.23 mm (3.9461 in.) |
| Piston and piston ring | Piston diameter | 2L, 2L–T STD Mark 1 | 91.940 – 91.950 mm (3.6197 – 3.6201 in.) |
| | | Mark 2 | 91.950 – 91.960 mm (3.6201 – 3.6205 in.) |
| | | Mark 3 | 91.960 – 91.970 mm (3.6205 – 3.6209 in.) |
| | | O/S 0.50 | 92.440 – 92.470 mm (3.6394 – 3.6405 in.) |
| | | O/S 0.75 | 92.690 – 92.720 mm (3.6492 – 3.6504 in.) |
| | | O/S 1.00 | 92.940 – 92.970 mm (3.6590 – 3.6602 in.) |
| | | 3L STD Mark 1 | 95.940 – 95.950 mm (3.7772 – 3.7776 in.) |
| | | Mark 2 | 95.950 – 95.960 mm (3.7776 – 3.7779 in.) |
| | | Mark 3 | 95.960 – 95.970 mm (3.7779 – 3.7783 in.) |
| | | O/S 0.50 | 96.440 – 96.470 mm (3.7968 – 3.7980 in.) |
| | | 5L STD Mark 1 | 99.450 – 99.460 mm (3.9153 – 3.9157 in.) |
| | | Mark 2 | 99.460 – 99.470 mm (3.9157 – 3.9161 in.) |
| | | Mark 3 | 99.470 – 99.480 mm (3.9161 – 3.9165 in.) |
| | | O/S 0.50 | 99.950 – 99.980 mm (3.9350 – 3.9362 in.) |
| | Piston oil clearance | STD 2L, 2L–T, 3L | 0.050 – 0.070 mm (0.0020 – 0.0028 in.) |
| | | 5L | 0.040 – 0.060 mm (0.0016 – 0.0024 in.) |
| | | Maximum 2L, 2L–T, 3L | 0.14 mm (0.0055 in.) |
| | | 5L | 0.13 mm (0.0051 in.) |
| | Piston ring groove clearance | STD No.1 2L | 0.031 – 0.079 mm (0.0012 – 0.0031 in.) |
| | | 2L–T | 0.061 – 0.109 mm (0.0024 – 0.0043 in.) |
| | | 3L | 0.031 – 0.075 mm (0.0012 – 0.0030 in.) |
| | | 5L | 0.057 – 0.101 mm (0.0022 – 0.0040 in.) |
| | | No.2 2L, 3L | 0.060 – 0.105 mm (0.0024 – 0.0041 in.) |
| | | 2L–T | 0.070 – 0.115 mm (0.0028 – 0.0045 in.) |
| | | 5L | 0.060 – 0.100 mm (0.0024 – 0.0039 in.) |
| | | Oil | 0.030 – 0.070 mm (0.0012 – 0.0028 in.) |
| | | Maximum | 0.20 mm (0.0079 in.) |
| | Piston ring end gap | STD No.1 | 0.350 – 0.590 mm (0.0138 – 0.0232 in.) |
| | | No.2 2L, 2L–T | 0.450 – 0.720 mm (0.0177 – 0.0283 in.) |
| | | 3L | 0.400 – 0.670 mm (0.0157 – 0.0264 in.) |
| | | 5L | 0.470 – 0.720 mm (0.0185 – 0.0283 in.) |
| | | Oil | 0.200 – 0.520 mm (0.0079 – 0.0205 in.) |
| | | Maximum No.1 | 1.29 mm (0.0508 in.) |
| | | No.2 2L, 2L–T, 5L | 1.42 mm (0.0559 in.) |
| | | 3L | 1.37 mm (0.0539 in.) |
| | | Oil | 1.22 mm (0.0480 in.) |
| | Piston protrusion from cylinder block | | 0.68 – 0.97 mm (0.0268 – 0.0382 in.) |

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| Crankshaft | Thrust clearance | STD | 0.040 – 0.250 mm (0.0016 – 0.0098 in.) |
| | | Maximum | 0.30 mm (0.0118 in.) |
| | Thrust washer thickness | STD | 2.430 – 2.480 mm (0.0957 – 0.0976 in.) |
| | | O/S 0.125 | 2.493 – 2.543 mm (0.0981 – 0.1001 in.) |
| | | O/S 0.250 | 2.555 – 2.605 mm (0.1006 – 0.1026 in.) |
| | Main journal oil clearance | STD STD | 0.034 – 0.065 mm (0.0013 – 0.0026 in.) |
| | | U/S 0.25, 0.50 | 0.033 – 0.079 mm (0.0013 – 0.0031 in.) |
| | | Maximum | 0.10 mm (0.0039 in.) |
| | Main journal diameter | STD | 61.985 – 62.000 mm (2.4403 – 2.4409 in.) |
| | | U/S 0.25 | 61.475 – 61.755 mm (2.4309 – 2.4413 in.) |
| | | U/S 0.50 | 61.495 – 61.505 mm (2.4211 – 2.4215 in.) |
| | Main bearing center wall thickness | | |
| | Reference | STD Mark 1 | 1.979 – 1.983 mm (0.0779 – 0.0781 in.) |
| | | Mark 2 | 1.983 – 1.987 mm (0.0781 – 0.0782 in.) |
| | | Mark 3 | 1.987 – 1.991 mm (0.0782 – 0.0784 in.) |
| | Crank pin diameter | 2L STD | 52.988 – 53.000 mm (2.0861 – 2.0866 in.) |
| | | U/S 0.25 | 52.475 – 52.755 mm (2.0766 – 2.0770 in.) |
| | | U/S 0.50 | 52.495 – 52.505 mm (2.0667 – 2.0671 in.) |
| | | 2L–T, 3L, 5L STD | 54.988 – 55.000 mm (2.1649 – 2.1654 in.) |
| | | U/S 0.25 | 54.745 – 54.755 mm (2.1553 – 2.1557 in.) |
| | | U/S 0.50 | 54.495 – 54.505 mm (2.1455 – 2.1459 in.) |
| | Circle runout | Maximum | 0.06 mm (0.0024 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.) |

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# TORQUE SPECIFICATION

| Part tightened | | N·m | kgf·cm | ft·lbf |
|---|---|---|---|---|
| Injection pump x Timing belt case | | 20.5 | 210 | 15 |
| Injection pump x Injection pump stay | | 18 | 185 | 13 |
| Injection pipe x Injection pump | | 24.5 | 250 | 18 |
| Plug bolt x Distributive head plug on injection pump | | 17 | 170 | 13 |
| Intake flange x Intake manifold | | 12 | 120 | 9 |
| No.2 idler pulley x Cylinder block | | 33 | 340 | 24 |
| Injection pump drive pulley x Injection pump | | 64 | 650 | 47 |
| Camshaft timing pulley x Camshaft | | 98 | 1,000 | 72 |
| No.1 idler pulley x Cylinder block | 12 mm head | 19 | 195 | 14 |
| | 14 mm head | 44 | 450 | 33 |
| Cylinder head x Cylinder block | 1st | 78 | 800 | 58 |
| | 2nd | Turn 90° | Turn 90° | Turn 90° |
| | 3rd | Turn 90° | Turn 90° | Turn 90° |
| Cylinder head cover x Cylinder head | | 12 | 120 | 9 |
| No.2 cylinder head cover x Cylinder head cover | | 12 | 120 | 9 |
| Exhaust manifold x Cylinder head | | 52 | 530 | 38 |
| Exhaust manifold heat insulator x Exhaust manifold | | 12 | 120 | 9 |
| Exhaust manifold heat insulator x Oil filter bracket | | 19 | 195 | 14 |
| Intake manifold x Cylinder head | | 23.5 | 240 | 17 |
| Engine hanger x Cylinder head | LH | 59 | 600 | 44 |
| | RH (Reference) | 37 | 380 | 27 |
| Water outlet housing x Cylinder head | | 19 | 195 | 14 |
| No.2 timing belt cover x Cylinder head | | 18 | 185 | 13 |
| Glow plug x Cylinder head | | 13 | 130 | 10 |
| Glow plug connector x Glow plug | | 1.0 | 10 | 8.7 in.·lbf |
| Camshaft oil seal retainer x Cylinder head | | 18 | 185 | 13 |
| Camshaft bearing cap x Cylinder head | | 25 | 255 | 18 |
| Crankshaft pulley x Crankshaft | | 235 | 2,400 | 173 |
| Main bearing cap x Cylinder block | | 105 | 1,050 | 77 |
| Connecting rod cap x Connecting rod | 1st | 54 | 550 | 40 |
| | 2nd | Turn 90° | Turn 90° | Turn 90° |
| Rear oil seal retainer x Cylinder block | | 13 | 130 | 10 |
| Union for alternator hose x Cylinder block | | 32 | 330 | 24 |
| Fan belt adjusting bar x Cylinder block | | 45 | 460 | 33 |
| Engine mounting bracket x Cylinder block | | 39 | 400 | 29 |
| Alternator bracket x Cylinder block | | 39 | 400 | 29 |
| Rear end plate x Cylinder block | | 18 | 185 | 13 |
| Flywheel x Crankshaft | | 123 | 1,250 | 90 |