ENGINE MECHANICAL

0304P-02

SERVICE DATA

2AZ-FE

Ignition timing	w/ Terminals TC and CG of DLC3 connected	8 to 12° BTDC @ idle
	w/ Terminals TC and CG of DLC3 disconnected	5 to 15° BTDC @ idle
Idle speed	A/T	610 to 710 rpm
Compression	Compression pressure	1.360 kPa (13.9 kgf/cm^2, 198 psi)
	Minimum pressure	0.98 MPa (10 kgf/cm^2, 142 psi)
	Difference between each cylinder	100 kPa (1.0 kgf/cm^2, 14 psi)
Valve clearance (cold)	Intake	0.19 to 0.29 mm (0.008 to 0.011 in.)
	Exhaust	0.30 to 0.40 mm (0.012 to 0.016 in.)
Balanceshaft		
Standard thrust clearance		0.050 to 0.090 mm (0.0020 to 0.0035 in.)
Maximum thrust clearance		0.090 mm (0.0035 in.)
Standard oil clearance		0.031 mm (0.0012 in.)
Maximum oil clearance		0.004 to 0.031 mm (0.0002 to 0.0012 in.)
Housing journal bore diameter	Mark 1	26.000 to 26.006 mm (1.0236 to 1.0239 in.)
	Mark 2	26.007 to 26.012 mm (1.0239 to 1.0241 in.)
	Mark 3	26.013 to 26.018 mm (1.0241 to 1.0243 in.)
Journal diameter		22.985 to 23.000 mm (0.9049 to 0.9055 in.)
Bearing center wall thickness	Mark 1	1.486 to 1.489 mm (0.0585 to 0.0586 in.)
	Mark 2	1.489 to 1.492 mm (0.0586 to 0.0587 in.)
	Mark 3	1.492 to 1.495 mm (0.0587 to 0.0589 in.)
Oil pump drive sprocket		
Minimum sprocket diameter (w/ chain)		48.2 mm (1.898 in.)
Crankshaft timing sprocket		
Minimum sprocket diameter (w/ chain)		51.6 mm (2.031 in.)
Chain tensioner slipper		
Maximum wear		1.0 mm (0.039 in.)
Chain vibration damper No. 1		
Maximum wear		1.0 mm (0.039 in.)
Cylinder head set bolt		
Specified bolt length		161.3 to 162.7 mm (6.3503 to 6.4055 in.)
Chain sub-assy		
Maximum chain elongation		115.4 mm (4.543 in.)
Camshaft timing gear or sprocket		
Minimum gear or sprocket diameter (w/ chain)		97.3 mm (3.831 in.)
Camshaft (Intake)		
Maximum circle runout		0.03 mm (0.0012 in.)
Standard cam lobe height		46.495 to 46.595 mm (1.8305 to 1.8344 in.)
MInimum cam lobe height		46.385 mm (1.8262 in.)
No. 1 journal diameter		35.971 to 35.985 mm (1.4162 to 1.4167 in.)
Other journal diameter		22.959 to 22.975 mm (0.9039 to 0.9045 in.)
Standard journal thrust clearance		0.040 to 0.095 mm (0.0016 to 0.0037 in.)
Maximum journal thrust clearance		0.11 mm (0.0043 in.)
Standard journal oil clearance	No. 1 journal bearing mark 1	0.007 to 0.038 mm (0.0028 to 0.0015 in.)
	No. 1 journal bearing mark 2	0.008 to 0.038 mm (0.0031 to 0.0015 in.)
	No. 1 journal bearing mark 3	0.008 to 0.038 mm (0.0031 to 0.0015 in.)
	Other journals	0.025 to 0.062 mm (0.00098 to 0.00244 in.)
Maximum journal oil clearance	No. 1 journal	0.07 mm (0.0028 in.)
	Other journals	0.10 mm (0.0039 in.)
Cylinder head journal bore diameter	Mark 1	40.000 to 40.008 mm (1.57480 to 1.57511 in.)
	Mark 2	40.009 to 40.017 mm (1.57515 to 1.57547 in.)
	Mark 3	40.018 to 40.025 mm (1.57551 to 1.57578 in.)
Standard bearing center wall thickness	Mark 1	2.000 to 2.004 mm (0.07874 to 0.07890 in.)
	Mark 2	2.004 to 2.008 mm (0.07894 to 0.07905 in.)
	Mark 3	2.009 to 2.012 mm (0.07909 to 0.07921 in.)
Camshaft journal diameter		35.971 to 35.985 mm (1.41618 to 1.41673 in.)

Camshaft No. 2 (Exhaust)		
Maximum circle runout		0.03 mm (0.0012 in.)
Standard cam lobe height		46.873 to 46.083 mm (1.8060 to 1.8143 in.)
Minimum cam lobe height		45.873 mm (1.8060 in.)
No. 1 journal diameter		35.971 to 35.985 mm (1.41618 to 1.41673 in.)
Other journal diameter		22.959 to 22.975 mm (0.9039 to 0.9045 in.)
Standard thrust clearance		0.080 to 0.135 mm (0.0032 to 0.0053 in.)
Maximum thrust clearance		0.15 mm (0.0059 in.)
Standard journal oil clearance	No. 1 journal	0.040 to 0.079 mm (0.00157 to 0.00311 in.)
	Other journals	0.025 to 0.062 mm (0.00098 to 0.00244 in.)
Cylinder head journal bore diameter	Mark 1	40.000 to 40.008 mm (1.57480 to 1.57511 in.)
	Mark 2	40.009 to 40.017 mm (1.57515 to 1.57547 in.)
	Mark 3	40.018 to 40.025 mm (1.57551 to 1.57578 in.)
Standard bearing center wall thickness	Mark 1	2.000 to 2.004 mm (0.07874 to 0.07890 in.)
	Mark 2	2.004 to 2.008 mm (0.07894 to 0.07905 in.)
	Mark 3	2.009 to 2.012 mm (0.07909 to 0.07921 in.)
Camshaft journal diameter		35.971 to 35.985 mm (1.4162 to 1.4167 in.)
Intake manifold		
Maximum warpage		0.20 mm (0.079 in.)
Exhaust manifold		
Maximum warpage		0.70 mm (0.0276 in.)
Cylinder head		
Maximum warpage	Cylinder block side	0.05 mm (0.0020 in.)
	Intake manifold side	0.08 mm (0.0031 in.)
	Exhaust manifold side	0.08 mm (0.0031 in.)
Inner compression spring		
Free length		45.7 mm (1.799 in.)
Maximum deviation		1.6 mm (0.063 in.)
Intake valve		
Standard overall length		101.71 mm (4.0043 in.)
Minimum overall length		101.21 mm (3.9846 in.)
Valve stem diameter		5.470 to 5.485 mm (0.2154 to 0.2159 in.)
Standard margin thickness		1.05 to 1.45 mm (0.0413 to 0.0571 in.)
Minimum margin thickness		0.50 to (0.0197 in.)
Exhaust valve		
Standard overall length		101.15 mm (3.9823 in.)
Minimum overall length		100.70 mm (3.9646 in.)
Valve stem diameter		5.465 to 5.480 mm (0.2152 to 0.2157 in.)
Standard margin thickness		1.20 to1.60 mm (0.0470 to 0.0630 in.)
Minimum margin thickness		0.50 mm (0.020 in.)
Intake valve guide bush		
Bush inside diameter		5.510 to 5.530 mm (0.2169 to 0.2177 in.)
standard oil clearance		0.025 to 0.060 mm (0.0010 to 0.0024 in.)
Maximum oil clearance		0.08 mm (0.0031 in.)
Exhaust valve guide bush		
Bush inside diameter		5.510 to 5.530 mm (0.2169 to 0.2177 in.)
Standard oil clearance		0.030 to 0.065 mm (0.0012 to 0.0026 in.)
Maximum oil clearance		0.10 mm (0.0039 in.)
Valve lifter		
Lifter diameter		30.966 to 30.976 mm (1.2191 to 1.2195 in.)
Lifter bore diameter		31.009 to 31.025 mm (1.2208 to 1.2215 in.)
Standard oil clearance		0.033 to 0.059 mm (0.0013 to 0.0023 in.)
Maximum oil clearance		0.07 mm (0.0028 in.)

Connecting rod		
Standard thrust clearance		0.160 to 0.362 mm (0.0063 to 0.0143 in.)
Maximum thrust clearance		0.362 mm (0.0143 in.)
Standard oil clearance		0.024 to 0.048 mm (0.0009 to 0.0019 in.)
Maximum oil clearance		0.08 mm (0.0031 in.)
Connecting rod bearing center wall thickness (Reference)	Mark 1	1.485 to 1.488 mm (0.05854 to 0.05858 in.)
	Mark 2	1.489 to 1.491 mm (0.05862 to 0.05870 in.)
	Mark 3	1.492 to 1.494 mm (0.05874 to 0.05881 in.)
Bush inside diameter		22.005 to 22.014 mm (0.8663 to 0.8667 in.)
Bush inside diameter (Reference)	Mark A	22.005 to 22.008 mm (0.8663 to 0.8665 in.)
	Mark B	22.008 to 22.011 mm (0.8665 to 0.8666 in.)
	Mark C	22.011 to 22.014 mm (0.8666 to 0.8667 in.)
Maximum rod out-of-alignment per 100 mm (3.94 in.)		0.05 mm (0.0020 in.)
Maximum rod twist per 100 mm (3.94 in.)		0.15 mm (0.0059 in.)
Cylinder block		
Maximum warpage		0.05 mm (0.0020 in.)
Standard cylinder bore diameter		88.500 to 88.513 mm (3.4842 to 3.4848 in.)
Maximum cylinder bore diameter		88.633 mm (3.4895 in.)
Piston		
Piston diameter		88.439 to 88.449 mm (3.4818 to 3.4822 in.)
Specified piston oil clearance		0.051 to 0.100 mm (0.0020 to 0.0039 in.)
Piston pin hole bush inside diameter		22.001 to 22.010 mm (0.8662 to 0.8665 in.)
Piston pin hole bush inside diameter (Reference)	Mark A	22.001 to 22.004 mm (0.86618 to 0.86630 in.)
	Mark B	22.005 to 22.007 mm (0.86634 to 0.86612 in.)
	Mark C	22.008 to 22.010 mm (0.86645 to 0.86653 in.)
Piston ring		
Ring groove clearance		
Standard end gap	No. 1	0.22 to 0.32 mm (0.0087 to 0.0126 in.)
	No. 2	0.50 to 0.60 mm (0.0197 to 0.0236 in.)
	Oil (side rail)	0.10 to 0.35 mm (0.0039 to 0.0138 in.)
Maximum end gap	No. 1	0.89 mm (0.0350 in.)
	No. 2	1.35 mm (0.0531 in.)
	Oil (side rail)	0.73 mm (0.0287 in.)
Piston pin		
Piston pin diameter		21.997 to 22.009 mm (0.8660 to 0.8665 in.)
Piston pin diameter (Reference)	Mark A	21.997 to 22.000 mm (0.86602 to 0.86614 in.)
	Mark B	22.001 to 22.003 mm (0.86618 to 0.86626 in.)
	Mark C	22.004 to 22.006 mm (0.86630 to 0.86638 in.)
Standard oil clearance		0.001 to 0.007 mm (0.00004 to 0.00028 in.)
Maximum oil clearance		0.010 mm (0.0020 in.)
Connecting rod bolt		
Standard diameter		7.2 to 7.3 mm (0.283 to 0.287 in.)
MInimum diameter		7.0 mm (0.276 in.)

Crankshaft		
Standard thrust clearance		0.040 to 0.240 mm (0.0016 to 0.0094 in.)
Maximum thrust clearance		0.30 mm (0.0118 in.)
Thrust washer thickness		1.930 to 1.980 mm (0.0760 to 0.0780 in.)
Cylinder block main journal bore diameter (Reference)	Mark 0	59.000 to 59.002 mm (2.32283 to 2.32291 in.)
	Mark 1	59.003 to 59.004 mm (2.32294 to 2.32299 in.)
	Mark 2	59.005 to 59.006 mm (2.32303 to 2.32307 in.)
	Mark 3	59.007 to 59.009 mm (2.32311 to 2.32318 in.)
	Mark 4	59.009 to 59.011 mm (2.32322 to 2.32326 in.)
	Mark 5	59.012 to 59.013 mm (2.32330 to 2.32334 in.)
	Mark 6	59.014 to 59.016 mm (2.32338 to 2.32346 in.)
Main journal diameter		54.988 to 55.000 mm (2.1648 to 2.1654 in.)
Main journal diameter (Reference)	Mark 0	54.999 to 55.000 mm (2.16531 to 2.16535 in.)
	Mark 1	54.997 to 54.998 mm (2.16523 to 2.16527 in.)
	Mark 2	54.995 to 54.996 mm (2.16515 to 2.16519 in.)
	Mark 3	54.993 to 54.994 mm (2.16507 to 2.16511 in.)
	Mark 4	54.991 to 54.992 mm (2.16500 to 2.16504 in.)
	Mark 5	54.989 to 54.990 mm (2.16489 to 2.16496 in.)
Standard main bearing center wall thickness (Reference)	Mark 1	1.993 to 1.996 mm (0.07846 to 0.07858 in.)
	Mark 2	1.997 to 1.999 mm (0.07862 to 0.07870 in.)
	Mark 3	2.000 to 2.002 mm (0.07874 to 0.07882 in.)
	Mark 4	2.003 to 2.005 mm (0.07886 to 0.07894 in.)
Maximum circle runout		0.03 mm (0.0012 in.)
Standard main journal oil clearance		0.024 to 0.048 mm (0.00094 to 0.00189 in.)
Maximum main journal taper and out-of-round		0.003 mm (0.0001 in.)
Maximum crank pin taper and out-of-round		0.003 mm (0.0001 in.)
Crank pin diameter		47.990 to 48.000 mm (1.8894 to 1.8898 in.)
Crankshaft bearing cap set bolt		
Standard diameter		7.3 to 7.6 mm (0.287 to 0.299 in.)
Minimum diameter		7.2 mm (0.283 in.)

3MZ-FE

New V-ribbed belt tension		
	For fan and generator	143 to 165 lbf
	For vane pump	132 to 154 lbf
Used V-ribbed belt tension		
	For fan and generator	80 to 132 lbf
	For vane pump	55 to 88 lbf
Ignition timing	w/ Terminals TC and CG of DLC3 connected	8 to 12° BTDC @ idle
	w/ Terminals TC and CG of DLC3 disconnected	7 to 24° BTDC @ idle
Idle speed		650 to 750 rpm
Compression	Compression pressure	1.5 MPa (15.3 kgf/cm^2, 218 psi)
	Minimum pressure	1.0 MPa (10.2 kgf/cm^2, 145 psi)
	Difference between each cylinder	100 kPa (1.0 kgf/cm^2, 15 psi)
Valve clearance (cold)	Intake	0.15 to 0.25 mm (0.006 to 0.010 in.)
	Exhaust	0.25 to 0.35 mm (0.010 to 0.014 in.)
Intake air surge tank		
Maximum warpage		0.10 mm (0.0039 in.)
Intake manifold		
Maximum warpage	Air intake surge tank side	0.15 mm (0.0059 in.)
	Cylinder head side	0.08 mm (0.0031 in.)
Exhaust manifold		
Maximum warpage		0.50 mm (0.0196 in.)
Camshaft		
Maximum circle runout		0.06 mm (0.0024 in.)
Specified cam lobe height	Intake	42.980 to 43.232 mm (1.6921 to 1.7020 in.)
	Exhaust	42.960 to 43.110 mm (1.6874 to 1.6972 in.)
Camshaft Journal diameter		26.959 to 26.975 mm (1.0614 to 1.0620 in.)
Specified gear backlash		0.020 to 0.300 mm (0.0008 to 0.0118 in.)
Specified journal thrust clearance		0.040 to 0.120 mm (0.0016 to 0.0047 in.)
Specified journal oil clearance		0.025 to 0.100 mm (0.0010 to 0.0039 in.)
Cylinder head set bolt		
Specified outside diameter at tension portion		8.75 to 9.05 mm (0.3445 to 0.3563 in.)
Cylinder head		
Maximum warpage	Cylinder block side	0.05 mm (0.0020 in.)
	Intake manifold side	0.10 mm (0.0039 in.)
	Exhaust manifold side	0.10 mm (0.0039 in.)
Intake valve		
Specified overall length		94.95 to 95.45 mm (3.7382 to 3.7579 in.)
Valve stem diameter		5.470 to 5.485 mm (0.2154 to 0.2159 in.)
Minimum margin thickness		0.5 to 1.0 mm (0.020 to 0.039 in.)
Exhaust valve		
Specified overall length		94.90 to 95.40 mm (3.7362 to 3.7559 in.)
Valve stem diameter		5.465 to 5.480 mm (0.2152 to 0.2157 in.)
Minimum margin thickness		0.5 to 1.0 mm (0.020 to 0.039 in.)
Inner compression spring		
Free length		45.50 mm (1.7913 in.)
Maximum deviation		2.0 mm (0.079 in.)
Installed tension at 33.8 mm (1.331 in.)		186 to 206 N (19.0 to 21.0 kgf, 41.9 to 46.3 lbf)
Valve guide bush		
Bush inside diameter		5.510 to 5.530 mm (0.2169 to 0.2177 in.)
Specified bush oil clearance	Intake	0.025 to 0.080 mm (0.0010 to 0.0031 in.)
	Exhaust	0.030 to 0.100 mm (0.0012 to 0.0039 in.)
Cylinder head valve guide bush bore diameter	STD	10.295 to 10.313 mm (0.4053 to 0.4060 in.)
	O/S 0.05	10.345 to 10.363 mm (0.4073 to 0.4080 in.)
Bush diameter	STD	10.333 to 10.344 mm (0.4068 to 0.4072 in.)
	O/S 0.05	10.383 to 10.394 mm (0.4088 to 0.4092 in.)
Valve lifter		
Lifter diameter		30.966 to 30.976 mm (1.2191 to 1.2195 in.)
Lifter bore diameter		31.009 to 31.025 mm (1.2208 to 1.2215 in.)
Specified oil clearance	Standard	0.033 to 0.070 mm (0.0013 to 0.0028 in.)

Connecting rod		
Specified thrust clearance		0.15 to 0.35 mm (0.0059 to 0.0138 in.)
Connecting rod thickness		20.80 to 20.85 mm (0.8189 to 0.8209 in.)
Specified connecting rod oil clearance		0.038 to 0.080 mm (0.0015 to 0.0031 in.)
Connecting rod bearing center wall thickness	Mark 1	1.484 to 1.486 mm (0.0584 to 0.0585 in.)
	Mark 2	1.487 to 1.489 mm (0.0585 to 0.0586 in.)
	Mark 3	1.490 to 1.492 mm (0.0587 to 0.0587 in.)
	Mark 4	1.493 to 1.495 mm (0.0588 to 0.0588 in.)
Crankshaft		
Crankshaft thrust clearance		0.04 to 0.30 mm (0.0016 to 0.0118 in.)
Thrust washer thickness		1.93 to 1.98 mm (0.0760 to 0.0780 in.)
Specified main journal oil clearance	No. 1 and No. 4 journals	0.014 to 0.050 mm (0.0006 to 0.0020 in.)
	No. 2 and No. 3 journals	0.026 to 0.060 mm (0.0010 to 0.0024 in.)
Cylinder block main journal bore diameter (Reference)	Mark 00	66.000 mm (2.5984 in.)
	Mark 01	66.001 mm (2.5985 in.)
	Mark 02	66.002 mm (2.5985 in.)
	Mark 03	66.003 mm (2.5985 in.)
	Mark 04	66.004 mm (2.5986 in.)
	Mark 05	66.005 mm (2.5986 in.)
	Mark 06	66.006 mm (2.5987 in.)
	Mark 07	66.007 mm (2.5987 in.)
	Mark 08	66.008 mm (2.5987 in.)
	Mark 09	66.009 mm (2.5988 in.)
	Mark 10	66.010 mm (2.5988 in.)
	Mark 11	66.011 mm (2.5989 in.)
	Mark 12	66.012 mm (2.5989 in.)
	Mark 13	66.013 mm (2.5989 in.)
	Mark 14	66.014 mm (2.5990 in.)
	Mark 15	66.015 mm (2.5990 in.)
	Mark 16	66.016 mm (2.5990 in.)
Main journal diameter		61.000 mm (4.1016 in.)
Main journal diameter (Reference)	Mark 00	60.999 mm (4.4015 in.)
	Mark 01	60.998 mm (4.4015 in.)
	Mark 02	60.997 mm (4.4015 in.)
	Mark 03	60.996 mm (4.4014 in.)
	Mark 04	60.995 mm (4.4014 in.)
	Mark 05	60.994 mm (4.4013 in.)
	Mark 06	60.993 mm (4.4012 in.)
	Mark 07	60.992 mm (4.4012 in.)
	Mark 08	60.991 mm (4.4012 in.)
	Mark 09	60.990 mm (4.4012 in.)
	Mark 10	60.989 mm (4.4011 in.)
	Mark 11	60.988 mm (4.4011 in.)
	Mark 12	2.486 to 2.489 mm (0.0979 to 0.0980 in.)
Standard main bearing center wall thickness (Reference)	Mark 1	2.489 to 2.492 mm (0.0980 to 0.0981 in.)
	Mark 2	2.492 to 2.495 mm (0.0981 to 0.0982 in.)
	Mark 3	2.495 to 2.498 mm (0.0982 to 0.0983 in.)
	Mark 4	2.498 to 2.501 mm (0.0983 to 0.0985 in.)
	Mark 5	2.501 to 2.504 mm (0.0985 to 0.0986 in.)
	Mark 6	2.504 to 2.507 mm (0.0986 to 0.0987 in.)
	Mark 7	0.06 mm (0.0024 in.)
Maximum circle runout		60.988 to 61.000 mm (2.4011 to 2.4016 in.)
Main journal taper and out-of-round		0.02 mm (0.0008 in.)
Crank pin diameter		52.992 to 53.000 mm (2.0863 to 2.0866 in.)
Maximum crank pin taper and out-of-round		0.02 mm (0.0008 in.)
Cylinder block		
Maximum warpage		0.05 mm (0.0020 in.)
Specified cylinder bore diameter		92.000 to 92.132 mm (3.6220 to 3.6272 in.)
Piston		
Piston diameter		91.953 to 91.967 mm (3.6202 to 3.6207 in.)
Specified oil clearance		0.033 to 0.130 mm (0.0013 to 0.0051 in.)

Connecting rod		
Maximum misalignment per 100 mm (3.94 in.)		0.05 mm (0.0020 in.) per 100 mm (3.94 in.)
Maximum rod twist per 100 mm (3.94 in.)		0.15 mm (0.0059 in.) per 100 mm (3.94 in.)
Bush inside diameter		22.005 to 22.014 mm (0.8663 to 0.8667 in.)
Piston pin		
Piston pin diameter		21.997 to 22.006 mm (0.8660 to 0.8664 in.)
Pecified oil clearance		0.005 to 0.050 mm (0.0002 to 0.0020 in.)
Piston ring		
Piston ring groove clearance	No. 1	0.03 to 0.08 mm (0.0012 to 0.0031 in.)
	No. 2	0.02 to 0.06 mm (0.0008 to 0.0024 in.)
	Oil	0.03 to 0.11 mm (0.0011 to 0.0043 in.)
Specified end gap	No. 1	0.30 to 0.95 mm (0.0118 to 0.0031 in.)
	No. 2	0.50 to 1.05 mm (0.0008 to 0.0024 in.)
	Oil (Side rail)	0.15 to 1.00 mm (0.0012 to 0.0043 in.)
Connecting rod bolt		
Specified diameter		7.0 to 7.3 mm (0.276 to 0.287 in.)
Crankshaft bearing cap set bolt		
Specified diameter		7.2 to 7.6 mm (0.283 to 0.299 in.)