SERVICE SPECIFICATIONS

SERVICE DATA

EQOVT-0V

EG

Idle CO check and adjust	Idle CO concentration		1.5 ± 0.5 %
Compression pressure	at 250 rpm	STD 3RZ—FE	1,230 kPa (12.5 kgf/cm², 178 psi) or more
		3RZ—F	1,127 kPa (11.5 kgf/cm², 168 psi) or more
		Minimum	880 kPa (9.0 kgf/cm², 127 psi)
	Difference of pressure between each cylinder		98 kPa (1.0 kgf/cm², 14 psi) or less
Valve clearance		Intake	0.15 — 0.25 mm (0.006 — 0.010 in.)
		Exhaust	0.25 — 0.35 mm (0.010 — 0.014 in.)
Ignition timing	w/ Terminals TE1 and E1 connected of check connector	3RZ—FE	3 — 7° BTDC @ idle
Ignition timing		3RZ—F	3 — 7° BTDC @ Max.850rpm Sub-Advance Cut
Idle speed	Engine at normal operating temperature	3RZ—FE	650 — 750 rpm
		3RZ—F	750 — 850 rpm
	Fast idle speed	3RZ—F	2,600 rpm
Cylinder head	Warpage		
	Cylinder block side	Maximum	0.05 mm (0.0020 in.)
	Manifold side	Maximum	0.10 mm (0.0039 in.)
	Valve seat		
	Refacing angle	Intake	30°, 45°, 60°
		Exhaust	45°, 60°
	Contacting angle		45°
	Contacting width		1.0 — 1.4 mm (0.039 — 0.055 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	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)
Valve	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 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	*STD*	*1.0 mm (0.039 in.)*
		Minimum	0.5 mm (0.020 in.)
Valve spring	Deviation	Maximum	2.0 mm (0.079 in.)
	Installed tension	at 35.7 mm (1.406 in.)	177 — 204 N (18.0 — 20.8 kgf, 39.7 — 45.9 lbf)

Valve lifter	Lifter diameter		30.966 — 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	Warpage	Maximum Intake	0.20 mm (0.0078 in.)
		Exhaust	0.50 mm (0.0197 in.)
Air intake chamber	Warpage	Maximum	0.20 mm (0.0078 in.)
Camshaft	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.)
Spark plug tube	Protrusion		47.0 mm (1.850 in.)
Chain and timing gear	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.)
Chain tensioner slipper and vibration damper	Wear	Maximum	1.0 mm (0.039 in.)
Cylinder block	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	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		0.047 – 0.070 mm (0.0019 – 0.0028 in.)
	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.)
	Piston pin installing temperature		80 – 90°C (176 – 194°F)
Connecting rod	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 – 0.0028 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	0.015 mm (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	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 – 2.0770 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	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 – 1.4955 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.)

EGOVU–01

TORQUE SPECIFICATIONS

Part tightened		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	1st	39	400	29
	2nd	Turn 90°	Turn 90°	Turn 90°
	3rd	Turn 90°	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
Distributor gear x Exhaust camshaft		46	470	34
No.1 chain tensioner x Cylinder head		21	210	15
Front Engine hanger x Cylinder head		42	420	30
Intake manifold x Water bypass 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 chamber stay x LH engine mounting bracket (3RZ–FE)		20	200	15
Intake manifold stay x Intake manifold, LH munting braket		20	200	15
Oil dipstick guide x Cylinder head		20	200	15
Intake air connector x Cylinder head		18	185	13
Balance shaft drive gear x Balance shaft		25	250	18
No.2 chain tensioner, No.3 vibration damper x Cylinder block		18	185	13
No.2 vibration damper x Cylinder block		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	20	200	14
	bolt B	24.5	250	18
	14 mm head bolt	44	440	32
	Nut	20	200	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	1st	45	460	33
	2nd	Turn 90°	Turn 90°	Turn 90°
Main bearing cap x Cylinder block	1st	39	400	29
	2nd	Turn 90°	Turn 90°	Turn 90°
No.1 balance shaft, No.2 balance chaft x Timing gear		36	365	26
Balance shaft thrust plate x Cylinder block		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	1st	26.5	270	19
	2nd	Turn 90°	Turn 90°	Turn 90°
Drive plate x Crankshaft		74	750	54
Fuel pump x Cylinder head (3RZ–F)		28	280	21
Accelerator braket x Cylinder head (3RZ–F)		21	210	15