ENGINE MECHANICAL

Specifications

Engine tune-up	Coolant capacity				
	w/o Heater				
	PZJ70, 73, 75		9.6 liters	10.1 US qts	8.4 Imp. qts
	HZJ70, 73, 75				
	M/T		9.9 liters	10.5 US qts	8.7 Imp. qts
	A/T		9.7 liters	10.3 US qts	8.5 Imp. qts
	HZJ80 and HDJ80				
	M/T		10.4 liters	11.0 US qts	9.2 Imp. qts
	A/T		10.2 liters	10.8 US qts	9.0 Imp. qts
	HZB30 and HDB30		10.2 liters	10.8 US qts	9.0 Imp. qts
	w/ Heater				
	PZJ70, 73, 75		10.3 liters	10.9 US qts	9.1 Imp. qts
	HZJ70, 73, 75				
	M/T		10.6 liters	11.2 US qts	9.3 Imp. qts
	A/T		10.4 liters	11.0 US qts	9.2 Imp. qts
	HZJ80 and HDJ80				
	M/T		11.1 liters	11.6 US qts	9.8 Imp. qts
	A/T		10.9 liters	11.5 US qts	9.6 Imp. qts
	HZB30 and HDB30		14.6 liters	15.4 US qts	12.8 Imp. qts
	w/ Front and rear heaters				
	PZJ70, 73, 75		11.3 liters	11.9 US qts	9.9 Imp. qts
	HZJ70, 73, 75		11.6 liters	12.2 US qts	10.2 Imp. qts
	HZJ80 and HDJ80				
	M/T (Europe)		12.0 liters	12.7 US qts	10.6 Imp. qts
	A/T (Europe)		11.8 liters	12.5 US qts	10.4 Imp. qts
	M/T (Othres)		11.9 liters	12.6 US qts	10.5 Imp. qts
	A/T (Others)		11.7 liters	12.4 US qts	10.3 Imp. qts
	Engine oil capacity (PZJ70, 73, 75)				
	Drain and refill	w/ Oil filter change	9.0 liters	9.5 US qts	7.9 Imp. qts
		w/o Oil filter change	7.7 liters	8.1 US qts	6.8 Imp. qts
	Dry fill		9.3 liters	9.8 US qts	8.2 Imp. qts
	Engine oil capacity (HZJ70, 73, 75)				
	Drain and refill	w/ Oil filter change	9.5 liters	10.0 US qts	8.4 Imp. qts
		w/o Oil filter change	8.2 liters	8.7 US qts	7.2 Imp. qts
	Dry fill		9.8 liters	10.4 US qts	8.6 Imp. qts
	Engine oil capacity (HZJ80 and HDJ80)				
	Drain and refill	w/ Oil filter change	9.3 liters	9.8 US qts	8.1 Imp. qts
		w/o Oil filter change	8.0 liters	8.5 US qts	7.0 Imp. qts
	Dry fill		9.6 liters	10.1 US qts	8.4 Imp. qts
	Engine oil capacity (HZB30 and HDB30)				
	Drain and refill	w/ Oil filter change	9.8 liters	10.4 US qts	8.6 Imp. qts
		w/o Oil filter change	8.5 liters	9.0 US qts	7.5 Imp. qts
	Dry fill		10.1 liters	10.7 US qts	8.9 Imp. qts
	Engine oil API grade				
	Europe		CD or better		
	Others		CC, CD or better		
	Alternator drive belt				
	Deflection	New belt	6 – 7 mm	0.24 – 0.28 in.	
		Used belt	8 – 11 mm	0.31 – 0.43 in.	
	Tension (Reference)	New belt	45 – 55 kg		
		Used belt	20 – 35 kg		
	Battery specific gravity				
	When fully charged at 20°C (68°F)				
	95D31R and 95D31L		1.27 – 1.29		
	ex. (95D31R and 95D31L)		1.25 – 1.27		

Specification (Cont'd)

Engine tune-up (cont'd)	Valve clearance	Intake	0.15 – 0.25 mm	0.006 – 0.010 in.
		Exhaust	0.35 – 0.45 mm	0.014 – 0.018 in.
	New valve adjusting shim thickness		2.35 mm	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.
	Injection timing			
	Plunger stroke	1PZ	0.82 – 0.88 mm	0.0323 – 0.0346 in.
		1HZ	1.03 – 1.09 mm	0.0406 – 0.0429 in.
		1HD-T	1.29 – 1.35 mm	0.0508 – 0.0531 in.
	Idle speed	1PZ	650 rpm	
		1HZ (M/T)	650 rpm	
		1HZ (A/T)	710 rpm	
		1HD-T (M/T)	650 rpm	
		1HD-T (A/T)	800 rpm	
	Maximum speed	1PZ and 1HZ	4,600 rpm	
		1HD-T	4,400 rpm	
	A/C idle-up setting speed		950 rpm	
	Injection order	1PZ	1 – 2 – 4 – 5 – 3	
		1HZ and 1HD-T	1 – 4 – 2 – 6 – 3 – 5	
Compression pressure	Engine revolution at 250 rpm			
	1PZ and 1HZ	STD	37.0 kg/cm^2 (526 psi, 3,628 kPa) or more	
		Limit	27.0 kg/cm^2 (384 psi, 2,648 kPa)	
	1HD-T	STD	35.0 kg/cm^2 (498 psi, 3,432 kPa) or more	
		Limit	25.0 kg/cm^2 (356 psi, 2,452 kPa)	
	Difference of pressure between each cylinder		5.0 kg/cm^2 (71 psi, 490 kPa) or less	
Idler pulley tension spring	Free length		72.7 mm	2.862 in.
	Installed load at 90.1 mm (3.547 in.)		23 – 28 kg (50.7 – 61.7 lb, 225 – 275 N)	
Timing gear	Idler gear inside diameter		45.000 – 45.025 mm	1.7717 – 1.7726 in.
	Idler gear shaft diameter		44.950 – 44.975 mm	1.7679 – 1.7707 in.
	Idler gear oil clearance	STD	0.025 – 0.075 mm	0.0010 – 0.0030 in.
		Limit	0.20 mm	0.0079 in.
	Gear backlash	STD	0.05 – 0.15 mm	0.0020 – 0.0059 in.
		Limit	0.30 mm	0.0118 in.
	Idler gear thrust clearance	STD	0.05 – 0.15 mm	0.0020 – 0.059 in.
		Limit	0.30 mm	0.0118 in.

Specifications (Cont'd)

Cylinder head	Warpage			Limit	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.
				Limit	10.55 mm	0.4154 in.
	New cylinder head gasket thickness					
	1PZ	Hole number "1"			1.16 – 1.24 mm	0.0457 – 0.0488 in.
		Hole number "3"			1.26 – 1.34 mm	0.0496 – 0.0528 in.
		Hole number "5"			1.36 – 1.44 mm	0.0535 – 0.0567 in.
	1HZ and 1HD-T	Cutout number "1"			1.15 – 1.25 mm	0.0453 – 0.0492 in.
		Cutout number "3"			1.25 – 1.35 mm	0.0492 – 0.0531 in.
		Cutout number "5"			1.35 – 1.45 mm	0.0531 – 0.0571 in.
Valve guide bushing	Inside diameter				8.010 – 8.030 mm	0.3154 – 0.3161 in.
	Outside diameter			STD	13.004 – 13.025 mm	0.5112 – 0.5128 in.
				O/S 0.05	13.054 – 13.075 mm	0.5154 – 0.5148 in.
Valve	Valve overall length		STD	Intake	103.29 – 103.69 mm	4.0655 – 4.0823 in.
				Exhaust	103.14 – 103.54 mm	4.0606 – 4.0764 in.
			Limit	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.
			Limit	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.
			Limit	Intake	1.1 mm	0.043 in.
				Exhaust	1.2 mm	0.047 in.
Valve spring	Free length					
	Yellow painted mark				46.20 mm	1.8189 in.
	Blue painted mark				49.14 mm	1.9346 in.
	Installed tension at 37.0 mm (1.457 in.)				30.7 – 33.9 kg (67.7 – 74.7 lb, 301 – 332 N)	
	Squareness			Limit	2.0 mm	0.075 in.
Valve lifter	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.
				Limit	0.10 mm	0.0039 in.
Manifold	Warpage			Limit	0.40 mm	0.0157 in.

Specifications (Cont'd)

Camshaft	Thrust clearance		STD	0.10 – 0.20 mm	0.0039 – 0.0079 in.
			Limit	0.30 mm	0.0118 in.
	Journal oil clearance				
	No.1 journal		STD	0.022 – 0.074 mm	0.0009 – 0.0029 in.
			Limit	0.10 mm	0.0039 in.
	Others		STD	0.030 – 0.066 mm	0.0012 – 0.0026 in.
			Limit	0.10 mm	0.0039 in.
	Journal diameter				
	No.1 journal		STD	34.969 – 34.985 mm	1.3767 – 1.3774 in.
	Others			27.986 – 27.998 mm	1.1018 – 1.1023 in.
	Circle runout		Limit	0.10 mm	0.0039 in.
	Cam lobe height				
	1PZ and 1HZ	STD	Intake	55.090 – 55.110 mm	2.1689 – 2.1697 in.
			Exhaust	55.940 – 55.960 mm	2.2024 – 2.2031 in.
		Limit	Intake	54.59 mm	2.1419 in.
			Exhaust	55.44 mm	2.1827 in.
	1HD-T	STD	Intake	54.440 – 54.460 mm	2.1433 – 2.1441 in.
			Exhaust	55.940 – 55.960 mm	2.2024 – 2.2031 in.
		Limit	Intake	53.94 mm	2.1236 in.
			Exhaust	55.44 mm	2.1827 in.
Combustion chamber (1PZ and 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		Limit	0.20 mm	0.0079 in.
	Cylinder bore diameter				
		STD	Mark "1"	94.000 – 94.010 mm	3.7008 – 3.7012 in.
			Mark "2"	94.010 – 94.020 mm	3.7012 – 3.7016 in.
			Mark "3"	94.020 – 94.030 mm	3.7016 – 3.7020 in.
		Limit	STD	94.23 mm	3.7098 in.
			O/S 0.50	94.73 mm	3.7295 in.
	Main journal bore diameter (Reference)	STD	Mark "1"	71.000 – 71.006 mm	2.7953 – 2.7955 in.
			Mark "2"	71.006 – 71.012 mm	2.7955 – 2.7957 in.
			Mark "3"	71.012 – 71.018 mm	2.7957 – 2.7960 in.
Piston and piston ring	Piston diameter	STD	Mark "1"	93.95 – 93.96 mm	3.6988 – 3.6992 in.
			Mark "2"	93.96 – 93.97 mm	3.6992 – 3.7000 in.
			Mark "3"	93.97 – 93.98 mm	3.7000 – 3.7000 in.
		O/S 0.50		94.45 – 94.48 mm	3.7185 – 3.7197 in.
	Piston oil clearance		STD	0.04 – 0.06 mm	0.0016 – 0.0024 in.
			Limit	0.14 mm	0.0055 in.
	Piston ring groove clearance		No.1	0.050 – 0.095 mm	0.0020 – 0.0037 in.
			No.2	0.060 – 0.100 mm	0.0024 – 0.0039 in.
			Oil	0.030 – 0.070 mm	0.0012 – 0.0028 in.
	Piston ring end gap	STD	No.1	0.27 – 0.54 mm	0.0106 – 0.0213 in.
			No.2	0.40 – 0.62 mm	0.0118 – 0.0244 in.
			Oil	0.20 – 0.52 mm	0.0079 – 0.0205 in.
		Limit	No.1	1.34 mm	0.0591 in.
			No.2	1.42 mm	0.0551 in.
			Oil	1.32 mm	0.0520 in.

Specification (Cont'd)

Connecting rod	Thrust clearance		STD	0.10 – 0.20 mm	0.0039 – 0.0079 in.
			Limit	0.30 mm	0.0118 in.
	Connecting rod oil clearance				
	STD	STD		0.036 – 0.054 mm	0.0014 – 0.0021 in.
		U/S 0.25, U/S 0.50		0.037 – 0.077 mm	0.0015 – 0.0030 in.
	Limit			0.10 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 bending	Limit per 100 mm (3.94 in.)		0.03 mm	0.0012 in.
	Twist	Limit per 100 mm (3.94 in.)		0.15 mm	0.0059 in.
	Connecting rod bolt outer diameter		STD	8.300 – 8.400 mm	0.3268 – 0.3307 in.
			Limit	7.95 mm	0.3130 in.
	Bushing inside diameter				
	1PZ and 1HZ			29.008 – 29.020 mm	1.1420 – 1.1425 in.
	1HD-T			33.008 – 33.020 mm	1.2995 – 1.3000 in.
	Piston pin diameter				
	1PZ and 1HZ			29.000 – 29.012 mm	1.1417 – 1.1422 in.
	1HD-T			33.000 – 33.012 mm	1.2992 – 1.2997 in.
	Piston pin oil clearance		STD	0.004 – 0.012 mm	0.0002 – 0.0005 in.
			Limit	0.03 mm	0.0012 in.
	Big end inner diameter				
	(Reference)	STD	Mark "1"	62.014 – 62.020 mm	2.4415 – 2.4417 in.
			Mark "2"	62.020 – 62.026 mm	2.4417 – 2.4420 in.
			Mark "3"	62.026 – 62.032 mm	2.4420 – 2.4422 in.
Crankshaft	Thrust clearance		STD	0.04 – 0.24 mm	0.0016 – 0.0094 in.
			Limit	0.30 mm	0.0118 in.
	Thrust washer thickness		STD	2.930 – 2.980 mm	0.1154 – 0.1173 in.
	Main journal oil clearance				
	STD	STD		0.036 – 0.054 mm	0.0014 – 0.0021 in.
		U/S 0.25, U/S 0.50		0.037 – 0.077 mm	0.0015 – 0.0030 in.
	Limit			0.10 mm	0.0039 in.
	Main journal diameter	STD	Mark "1"	66.994 – 57.000 mm	2.7953 – 2.7955 in.
			Mark "2"	66.988 – 66.994 mm	2.7955 – 2.7957 in.
			Mark "3"	66.982 – 66.988 mm	2.7957 – 2.7960 in.
		U/S 0.25		66.745 – 66.755 mm	2.6278 – 2.3132 in.
		U/S 0.50		66.495 – 66.505 mm	2.6179 – 2.3033 in.
	Main 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.
	Crank pin diameter	STD	Mark "1"	58.994 – 59.000 mm	2.3226 – 2.3228 in.
			Mark "2"	58.988 – 58.994 mm	2.3224 – 2.3226 in.
			Mark "3"	58.982 – 58.988 mm	2.3221 – 2.3224 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		Limit	0.06 mm	0.0024 in.
	Main journal taper and out-of-round		Limit	0.02 mm	0.0008 in.
	Crank pin taper and out-of-round		Limit	0.02 mm	0.0008 in.
Main bearing	Main bearing cap bolt outer diameter				
			STD	11.800 – 12.000 mm	0.4646 – 0.4724 in.
			Limit	11.50 mm	0.4528 in.

Torque Specifications

Part tightened			kg-cm	ft-lb	N·m
Injection pump × Timing gear case			185	13	18
Injection pump × Injection pump stay			700	51	69
Injection pump distributive head plug bolt					
1PZ and 1HZ			170	12	17
1HD-T			250	18	25
No.1 camshaft timing pulley × Camshaft			1,000	72	98
No.2 camshaft timing pulley × Injection pump drive gear			315	23	31
Idler pulley bolt × Cylinder head			270	20	26
Spring bolt × Cylinder head			270	20	26
Injection pump drive gear × Injection pump			1,000	27	98
Idler gear (thrust plate) × Cylinder block			400	29	39
Timing gear cover × Timing gear case			200	14	20
Timing gear cover × Cylinder block			200	14	20
No.1 crankshaft pulley × Crankshaft			5,000	362	490
No.2 crankshaft pulley × No.1 crankshaft pulley			250	18	25
Vacuum pump × Timing gear case			400	29	39
Oil pipe × Vacuum pump			185	13	18
Oil pipe × Cylinder block			185	13	18
Cylinder head × Cylinder block		1st	700	51	69
		2nd	90° turns		
		3rd	90° turns		
Camshaft bearing cap × Cylinder head	No.1 journal		250	18	25
	Others		185	13	18
Camshaft oil seal retainer × Cylinder head			200	14	20
Exhaust manifold × Cylinder head			400	29	39
(For additional tighteninig torque)			330	24	32
Glow plug × Cylinder head			130	9	13
Injection nozzle × Cylinder head		1PZ and 1HZ	650	47	64
		1HD-T	400	29	39
Nozzle leakage pipe × Injection nozzle		1PZ and 1HZ	300	22	29
		1HD-T	125	9	12
Water outlet × Cylinder head			200	14	20
Intake manifold × Cylinder head			200	14	20
Oil dipstick guide × Intake manifold			200	14	20
Oil dipstick guide × Oil cooler cover			200	14	20
Main bearing cap × Cylinder head			1,050	76	103
Connecting rod cap × Connecting rod		1st	375	27	37
		2nd	90° turns		
Main bearing cap × Cylinder block		1st	1,050	76	103
		2nd	90° turns		
Oil nozzle × Cylinder block			275	20	27
Rear oil seal retainer × Cylinder block			65	56 in.-lb	6.4
Rear end plate × Cylinder block			185	13	18
Flywheel (M/T) × Crankshaft			1,300	94	127
Flywheel (drive plate) (A/T) × Crankshaft			1,300	94	127