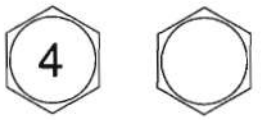
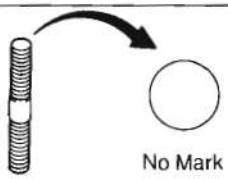
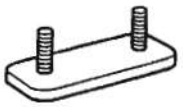
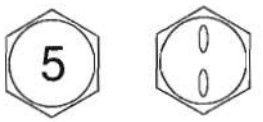
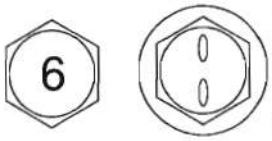
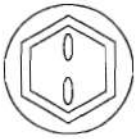
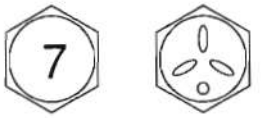
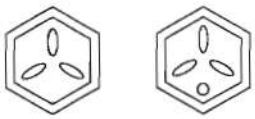
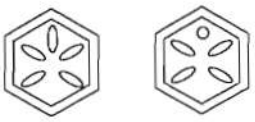
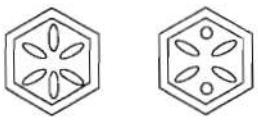
SERVICE SPECIFICATIONS

STANDARD BOLT

HOW TO DETERMINE BOLT STRENGTH

SS0Z5-01

Bolt Type				Class
Hexagon Head Bolt		Stud Bolt	Weld Bolt	
Normal Recess Bolt	Deep Recess Bolt			
 No Mark	 No Mark	 No Mark		4T
				5T
 w/ Washer	 w/ Washer			6T
				7T
				8T
				9T
				10T
				11T

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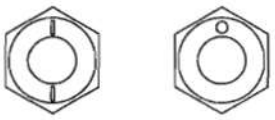
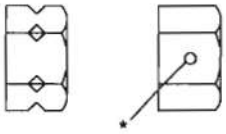
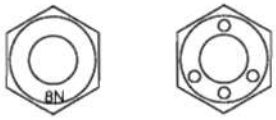
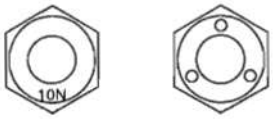
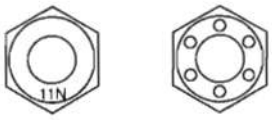
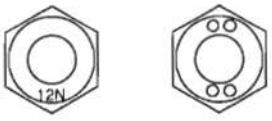
SS0ZT-01

SPECIFIED TORQUE FOR STANDARD BOLTS

Class	Diameter mm	Pitch mm	Specified torque					
			Hexagon head bolt			Hexagon flange bolt		
			N·m	kgf·cm	ft·lbf	N·m	kgf·cm	ft·lbf
4T	6	1	5	55	48 in.·lbf	6	60	52 in.·lbf
	8	1.25	12.5	130	9	14	145	10
	10	1.25	26	260	19	29	290	21
	12	1.25	47	480	35	53	540	39
	14	1.5	74	760	55	84	850	61
	16	1.5	115	1,150	83	–	–	–
5T	6	1	6.5	65	56 in.·lbf	7.5	75	65 in.·lbf
	8	1.25	15.5	160	12	17.5	175	13
	10	1.25	32	330	24	36	360	26
	12	1.25	59	600	43	65	670	48
	14	1.5	91	930	67	100	1,050	76
	16	1.5	140	1,400	101	–	–	–
6T	6	1	8	80	69 in.·lbf	9	90	78 in.·lbf
	8	1.25	19	195	14	21	210	15
	10	1.25	39	400	29	44	440	32
	12	1.25	71	730	53	80	810	59
	14	1.5	110	1,100	80	125	1,250	90
	16	1.5	170	1,750	127	–	–	–
7T	6	1	10.5	110	8	12	120	9
	8	1.25	25	260	19	28	290	21
	10	1.25	52	530	38	58	590	43
	12	1.25	95	970	70	105	1,050	76
	14	1.5	145	1,500	108	165	1,700	123
	16	1.5	230	2,300	166	–	–	–
8T	8	1.25	29	300	22	33	330	24
	10	1.25	61	620	45	68	690	50
	12	1.25	110	1,100	80	120	1,250	90
9T	8	1.25	34	340	25	37	380	27
	10	1.25	70	710	51	78	790	57
	12	1.25	125	1,300	94	140	1,450	105
10T	8	1.25	38	390	28	42	430	31
	10	1.25	78	800	58	88	890	64
	12	1.25	140	1,450	105	155	1,600	116
11T	8	1.25	42	430	31	47	480	35
	10	1.25	87	890	64	97	990	72
	12	1.25	155	1,600	116	175	1,800	130

SS0ZU-01

HOW TO DETERMINE NUT STRENGTH

Nut Type			Class
Present Standard Hexagon Nut	Old Standard Hexagon Nut		
	Cold Forging Nut	Cutting Processed Nut	
 No Mark			4N
 No Mark (w/ Washer)	 No Mark (w/ Washer)	 No Mark	5N (4T)
 6N			6N
		 *	7N (5T)
 8N			8N
 10N		 No Mark	10N (7T)
 11N			11N
 12N			12N

*: Nut with 1 or more marks on one side surface of the nut.

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HINT:

Use the nut with the same number of the nut strength classification or the greater than the bolt strength classification number when tightening parts with a bolt and nut.

Example: Bolt = 4T

Nut = 4N or more

SS

ENGINE MECHANICAL

SERVICE DATA

SS0JM-04

Compression pressure		at 250 rpm	2,700 kPa (27.5 kgf/cm^2, 391 psi) or more
		Minimum	2,200 kPa (22.5 kgf/cm^2, 320 psi) or more
	Difference of pressure between each cylinder		500 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	0.35 – 0.45 mm (0.014 – 0.018 in.)
	Adjusting shim thickness	Mark	
		2525	2.525 mm (0.0994 in.)
		2550	2.550 mm (0.1004 in.)
		2575	2.575 mm (0.1014 in.)
		2600	2.600 mm (0.1024 in.)
		2625	2.625 mm (0.1033 in.)
		2650	2.650 mm (0.1043 in.)
		2675	2.675 mm (0.1053 in.)
		2700	2.700 mm (0.1063 in.)
		2725	2.725 mm (0.1073 in.)
		2750	2.750 mm (0.1083 in.)
		2775	2.775 mm (0.1093 in.)
		2800	2.800 mm (0.1102 in.)
		2825	2.825 mm (0.1112 in.)
		2850	2.850 mm (0.1122 in.)
		2875	2.875 mm (0.1132 in.)
		2900	2.900 mm (0.1142 in.)
		2925	2.925 mm (0.1152 in.)
		2950	2.950 mm (0.1161 in.)
		2975	2.975 mm (0.1171 in.)
		3000	3.000 mm (0.1181 in.)
		3025	3.025 mm (0.1191 in.)
		3050	3.050 mm (0.1201 in.)
		3075	3.075 mm (0.1211 in.)
		3100	3.100 mm (0.1220 in.)
		3125	3.125 mm (0.1230 in.)
		3150	3.150 mm (0.1240 in.)
		3175	3.175 mm (0.1250 in.)
		3200	3.200 mm (0.1260 in.)
		3225	3.225 mm (0.1270 in.)
		3250	3.250 mm (0.1280 in.)
		3275	3.275 mm (0.1289 in.)
		3300	3.300 mm (0.1299 in.)
Idle speed	–		650 – 750 rpm
Maximum speed	–		4,500 – 4,700 rpm
Timing belt tensioner	Protrusion from housing end		8.1 – 8.9 mm (0.319 – 0.350 in.)
Timing gear	Idler gear thrust clearance	STD	0.06 – 0.11 mm (0.0024 – 0.0043 in.)
		Maximum	0.30 mm (0.0118 in.)
	Idler gear inside diameter		44.000 – 44.025 mm (1.7323 – 1.7333 in.)
	Idler gear shaft diameter		43.955 – 43.990 mm (1.7305 – 1.7319 in.)
	Idler gear oil clearance	STD	0.010 – 0.070 mm (0.0004 – 0.0028 in.)
		Maximum	0.20 mm (0.0079 in.)
	Gear backlash	STD	0.02 – 0.15 mm (0.0008 – 0.0060 in.)
		Maximum	0.20 mm (0.0079 in.)

Cylinder head	Warpage		0.15 mm (0.0059 in.)
	Valve seat		
	Refacing angle	Intake	25°, 45°, 70°
		Exhaust	25°, 45°, 75°
	Contacting angle		45°
	Contacting width	Intake	1.2 – 1.6 mm (0.047 – 0.063 in.)
		Exhaust	1.6 – 2.0 mm (0.063 – 0.079 in.)
	Valve guide bushing bore diameter	STD	10.985 – 11.006 mm (0.4325 – 0.4333 in.)
		O/S 0.05	11.035 – 11.056 mm (0.4344 – 0.4353 in.)
	Cylinder head bolt outer diameter	STD	11.8 – 12.0 mm (0.465 – 0.472 in.)
		Minimum	11.6 mm (0.457 in.)
	New cylinder head gasket thickness	A	0.80 – 0.90 mm (0.0315 – 0.0354 in.)
		B	0.85 – 0.95 mm (0.0335 – 0.0374 in.)
		C	0.90 – 1.00 mm (0.0354 – 0.0394 in.)
		D	0.95 – 1.05 mm (0.0374 – 0.0413 in.)
		E	1.00 – 1.10 mm (0.0394 – 0.0443 in.)
Valve guide Bushing	Inside diameter		6.010 – 6.030 mm (0.2366 – 0.2374 in.)
	Outside diameter for repair part	STD	11.033 – 11.044 mm (0.4344 – 0.4110 in.)
		O/S 0.05	11.083 – 11.094 mm (0.4363 – 0.4368 in.)
Valve	Valve overall length	STD Intake	105.15 – 105.75 mm (4.1398 – 4.1634 in.)
		Exhaust	105.02 – 105.62 mm (4.1346 – 4.1583 in.)
		Minimum Intake	104.65 mm (4.1201 in.)
		Exhaust	104.52 mm (4.1150 in.)
	Stem diameter	Intake	5.970 – 5.985 mm (0.23504 – 0.23563 in.)
		Exhaust	5.960 – 5.975 mm (0.23465 – 0.23524 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 Intake	1.1 mm (0.043 in.)
		Exhaust	1.2 mm (0.047 in.)
		Minimum Intake	0.6 mm (0.023 in.)
		Exhaust	0.7 mm (0.027 in.)
Valve spring	Deviation	Maximum	2.0 mm (0.079 in.)
	Free length	Paint color	
		Blue	46.8 mm (1.843 in.)
		None	46.5 mm (1.831 in.)
	Installed tension at 33.1 mm (1.303 in.)	Paint color	
		Blue	149.9 – 166.1 N (15.3 – 16.9 kgf, 33.7 – 37.4 lbf)
		None	150.2 – 165.8 N (15.3 – 16.9 kgf, 33.8 – 37.3 lbf)
Valve lifter	Cylinder head lifter bore diameter		31.000 – 31.021 mm (1.22047 – 1.22130 in.)
	Lifter diameter		30.966 – 30.976 mm (1.21913 – 1.21953 in.)
	Oil clearance	STD	0.024 – 0.055 mm (0.00094 – 0.00217 in.)
		Maximum	0.08 mm (0.0031 in.)
Camshaft	Thrust clearance		0.035 – 0.185 mm (0.00138 – 0.00728 in.)
	Journal oil clearance	STD	0.025 – 0.062 mm (0.0010 – 0.0024 in.)
		Maximum	0.08 mm (0.0031 in.)
	Journal diameter		27.969 – 27.985 mm (1.1011 – 1.1018 in.)
	Circle runout	Maximum	0.03 mm (0.0012 in.)
	Cam lobe height	STD Intake	47.180 – 47.280 mm (1.85748 – 1.86141 in.)
		Exhaust	48.070 – 48.170 mm (1.89252 – 1.89645 in.)
		Minimum Intake	46.76 mm (1.8409 in.)
		Exhaust	47.65 mm (1.8760 in.)
	Camshaft gear backlash	STD	0.035 – 0.185 mm (0.00138 – 0.00728 in.)
		Maximum	0.189 mm (0.00744 in.)
Manifold	Warpage	Maximum	0.4 mm (0.016 in.)

Cylinder block	Cylinder head surface warpage Warpage	Maximum	0.10 mm (0.0039 in.)
	Cylinder bore diameter	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.)
		Maximum	96.23 mm (3.7886 in.)
	Main journal bore diameter	STD Mark 1	75.000 – 75.006 mm (2.9528 – 2.9530 in.)
		Mark 2	75.006 – 75.012 mm (2.9530 – 2.9532 in.)
		Mark 3	75.012 – 75.018 mm (2.9532 – 2.9535 in.)
Piston and piston ring	Piston diameter	STD Mark 1	95.920 – 95.930 mm (3.77637 – 3.77676 in.)
		Mark 2	95.930 – 95.940 mm (3.77676 – 3.77715 in.)
		Marl 3	95.940 – 95.950 mm (3.77715 – 3.77755 in.)
	Piston oil clearance	STD	0.070 – 0.090 mm (0.00276 – 0.00354 in.)
		Maximum	0.14 mm (0.0055 in.)
	Piston ring groove clearance	STD No.1	0.091 – 0.135 mm (0.00358 – 0.00531 in.)
		No.2	0.090 – 0.130 mm (0.00358 – 0.00512 in.)
		Oil	0.030 – 0.070 mm (0.00118 – 0.00276 in.)
	Piston ring end gap	STD No.1	0.27 – 0.39 mm (0.0106 – 0.0154 in.)
		No.2	0.47 – 0.57 mm (0.0185 – 0.0224 in.)
		Oil	0.20 – 0.40 mm (0.0079 – 0.0157 in.)
		Maximum No.1	0.85 mm (0.0335 in.)
		No.2	1.07 mm (0.0421 in.)
		Oil	0.77 mm (0.0303 in.)
Balance shaft	Thrust clearance	STD	0.065 – 0.140 mm (0.0026 – 0.0055 in.)
		Maximum	0.25 mm (0.0098 in.)
	No.1 journal oil clearance	STD	0.040 – 0.079 mm (0.0957 – 0.0976 in.)
		Maximum	0.180 mm (0.0071 in.)
	No.2 journal oil clearance	STD	0.040 – 0.079 mm (0.0957 – 0.0976 in.)
		Maximum	0.190 mm (0.0075 in.)
	No.3 journal oil clearance	STD	0.050 – 0.089 mm (0.0020 – 0.0035 in.)
		Maximum	0.180 mm (0.0071 in.)
	No.1 Bearing inside diameter		42.000 – 42.020 mm (1.6535 – 1.6543 in.)
	No.2 Bearing inside diameter		41.000 – 41.020 mm (1.6142 – 1.6150 in.)
	No.3 Bearing inside diameter		32.000 – 31.020 mm (1.2598 – 1.2606 in.)
	No.1 journal diameter		41.941 – 41.960 mm (1.6512 – 1.6520 in.)
	No.2 journal diameter		40.931 – 40.950 mm (1.6115 – 1.6122 in.)
	No.3 journal diameter		31.941 – 31.960 mm (1.2575 – 1.2583 in.)

Connecting rod	Thrust clearance	STD	0.10 – 0.30 mm (0.0039 – 0.0118 in.)
		Maximum	0.40 mm (0.0157 in.)
	Connecting rod oil clearance	STD	0.036 – 0.054 mm (0.0014 – 0.0021 in.)
		Maximum	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 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.)
	Bushing inside diameter		34.012 – 34.024 mm (1.33905 – 1.33952 in.)
	Piston pin diameter		33.996 – 34.008 mm (1.33842 – 1.33889 in.)
	Piston pin oil clearance	STD	0.012 – 0.020 mm (0.00047 – 0.00079 in.)
		Maximum	0.03 mm (0.0012 in.)
	Connecting rod bolt tension portion diameter	STD	8.500 – 8.600 (0.3346 – 0.3385 in.)
		Minimum	8.30 mm (0.3268 in.)
Crankshaft	Thrust clearance	STD	0.040 – 0.240 mm (0.0016 – 0.0094 in.)
		Maximum	0.30 mm (0.0118 in.)
	Thrust washer thickness		
		STD (STD)	2.430 – 2.480 mm (0.0957 – 0.0976 in.)
		(U/S 0.25)	2.555 – 2.605 mm (0.1006 – 0.1026 in.)
		(U/S 1.125)	2.493 – 2.543 mm (0.0981 – 0.1001 in.)
	Main journal oil clearance	STD (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	0.10 mm (0.0039 in.)
	Main journal diameter	STD Mark 1	69.994 – 70.000 mm (2.7557 – 2.7559 in.)
		Mark 2	69.988 – 69.994 mm (2.7554 – 2.7557 in.)
		Mark 3	69.982 – 69.988 mm (2.7552 – 2.7554 in.)
	Main bearing center wall thickness (Reference)		
		STD Mark 2	2.482 – 2.485 mm (0.09772 – 0.09783 in.)
		Mark 3	2.485 – 2.488 mm (0.09783 – 0.09795 in.)
		Mark 4	2.488 – 2.491 mm (0.09795 – 0.09807 in.)
		Mark 5	2.491 – 2.494 mm (0.09807 – 0.09819 in.)
		Mark 6	2.494 – 2.497 mm (0.09819 – 0.09831 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.)
	Circle runout	Maximum	0.06 mm (0.0024 in.)
	Main journal taper and out–of–round	Maximum	0.002 mm (0.0008 in.)
	Crank pin taper and out–of–round	Maximum	0.002 mm (0.0008 in.)
	Main bearing cap bolt outer diameter	STD	13.500 – 14.000 mm (0.5315 – 0.5512 in.)
		Maximum	12.60 mm (0.4961 in.)

SS0JN-04

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
No 1 camshaft timing pulley x Camshaft		98	1,000	72
Cylinder head cover x Cylinder head		9.0	90	78 in.·lbf
No. 2 camshaft timing pulley x Supply pump drive gear		31	316	23
Timing belt tensioner x Timing gear case		13	133	9
Timing belt cover x Timing belt No. 2 cover		6.0	6	53 in.·lbf
Supply pump drive gear set nut		103	1,050	76
Thrust plate x Idler gear shaft		50	510	37
Timing gear cover x Timing gear case		13	133	9
Vacuum pipe x Timing gear cover		13	133	9
Crankshaft position sensor x Timing gear cover		8.5	87	75 in.·lbf
Camshaft position sensor x Timing gear cover		8.5	87	75 in.·lbf
Crankshaft pulley Crankshaft		365	3,700	268
Vacuum pump x Timing gear cover		21	214	15
Timing belt No. 2 cover x Cylinder head, Cylinder block		10	102	7
Water outlet housing x Cylinder head		19	194	14
Engine hanger No. 1 x Cylinder head		47	479	35
Cylinder head x Cylinder block	1st 2nd 3rd	85 Turn 90° Turn 90°	867 Turn 90° Turn 90°	63 Turn 90° Turn 90°
Camshaft bearing cap x Cylinder head		19	194	14
Intake manifold x Cylinder head		29	296	21
E-VRV x Intake manifold		20	204	15
Connecting rod cap x Connecting rod	1st 2nd	35 Turn 90°	357 Turn 90°	26 Turn 90°
Main bearing cap x Cylinder block		50 Turn 90°	510 Turn 90°	37 Turn 90°
Oil nozzle x Cylinder		25	260	19
Rear oil seal retainer x Cylinder block		13	133	9
Balance shaft driven gear x Balance shaft		36	367	27
Balance shaft thrust washer x Cylinder block		13	133	9
Engine Mounting x Cylinder block		68	693	50
Rear end plate x Cylinder block		8.0	85	74 in.·lbf
Flywheel x Crankshaft		145	1,479	107
Drive plate x Crankshaft		178	1,820	131

TURBOCHARGING

SERVICE DATA

SS0JO-03

Turbocharger	Turbocharging pressure		205 kPa (2.1 kgf/cm^2, 15.6 psi)
	Turbine shaft axial play		0.15 mm (0.0063 in.)
	Turbine shaft radial play		0.13 mm (0.0051 in.)
Step motor	Rod stroke		11 ± 0.03 mm (0.43 ± 0.0012 in.)
Compensate resistor	Resistance	Mark	
		1	214 – 228 Ω
		2	285 – 303 Ω
		3	372 – 394 Ω
		4	472 – 502 Ω
		5	600 – 638 Ω
		6	763 – 811 Ω
		7	989 – 1,051 Ω
		8	1,290 – 1,370 Ω
		9	1,727 – 1,833 Ω

550JP-03

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Turbo water pipe x turbocharger	Bolt:	8.0	82	71 in.·lbf
	Nut:	12	122	9
Compressor inlet elbow x Turbocharger		19	194	14
Exhaust manifold x Turbocharger		52	530	38
Exhaust manifold x Cylinder head		52	530	38
Turbo oil pipe x Turbocharger		13	133	10
Turbo oil pipe x Cylinder block	Bolt:	12	122	9
	Union bolt	26	265	19
Turbocharger stay x Turbocharger, Cylinder block		19	194	14
Turbine outlet elbow x Turbocharger		39	398	29
Oil level gauge guide x Water inlet		8.0	82	71 in.·lbf
Exhaust manifold heat insulator x Turbocharger		12	122	9
Turbo insulator x Turbocharger		12	122	9
PCV pipe x Cylinder head		20	204	15
No. 1 water by–pass pipe x Cylinder head		18	184	13
Intercooler x Cylinder head	Bolt A:	12	122	9
(See page TC–12)	Bolt B:	18	184	13
Intake air temperature sensor x Intercooler		29.4	300	22
Intake air connector x Intercooler		10	102	7

EMISSION CONTROL

SERVICE DATA

SS14C–02

E–VRV for EGR	Resistance	at 20°C (68°F)	11 – 13 Ω
EGR cut VSV	Resistance	at 20°C (68°F)	33 – 39 Ω

SS14D–03

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
VSV assembly x Throttle body	8.0	82	71 in.·lbf
E–VRV for EGR x Intake manifold	20	204	15
EGR cooler x EGR valve, Cylinder head	13	133	10
Front exhaust pipe x Exhaust manifold	62	630	46
Front exhaust pipe x Exhaust tail pipe	43	438	32
Protector x Front exhaust pipe	10.5	107	8

ELECTRONIC CONTROL DIESEL

SERVICE DATA

SS14E-03

Air flow mater	Resistance (THA – E2)	at –20°C (–4°F)	13.6 – 18.4 kΩ
		at 20°C (68°F)	2.21 – 2.69 kΩ
		at 60°C (140°F)	0.493 – 0.667 kΩ
VSV for turbo pressure sensor	Resistance	at 20°C (68°F)	37 – 44 Ω
Fuel temperature sensor	Resistance	at 20°C (68°F)	2.21 – 2.79 Ω
		at 80°C (176°F)	0.287 – 0.349 Ω
Intake air temperature sensor	Resistance	at 20°C (68°F)	2.187 – 2.673 Ω
Fuel pressure sensor	Voltage		4.75 – 5.25 V
Turbo pressure sensor	Voltage		4.5 – 5.5 V
	Voltage drop	Applied vacuum	
		13.3 kPa (100 mmHg, 3.94 in.Hg)	0.1 – 0.3 V
		26.7 kPa (200 mmHg, 7.87 in.Hg)	0.3 – 0.5 V
		40.0 kPa (300 mmHg, 11.81 in.Hg)	0.5 – 0.7 V
	Voltage up	Applied pressure	
		19.6 kPa (0.20 kgf/cm^2, 2.84psi)	0.1 – 0.4 V
		39.2 kPa (0.40 kgf/cm^2, 5.69psi)	0.4 – 0.7 V
		58.8 kPa (0.60 kgf/cm^2, 8.53psi)	0.7 – 1.0 V
		78.5 kPa (0.80 kgf/cm^2, 11.4psi)	1.0 – 1.3 V
		98.0 kPa (1.00 kgf/cm^2, 1.42 psi)	1.3 – 1.6V
Camshaft position sensor	Resistance	at Cold	1,630 – 2,740 Ω
		at Hot	2,065 – 3,225 Ω
Crankshaft position sensor	Resistance	at Cold	1,630 – 2,740 Ω
		at Hot	2,065 – 3,225 Ω
Accelerator pedal position sensor	Resistance	at 20°C	1.5 – 6.0 kΩ

SS14F-02

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Diesel throttle body x Intake manifold	20	204	15
Water temperature sensor x Cylinder block	20	208	15
Intake air temperature sensor x Intercooler	34.3	350	25
Camshaft position sensor x Timing gear case	8.5	87	75 in.·lbf
Crankshaft position sensor x Timing gear case	8.5	87	75 in.·lbf

ENGINE FUEL

SERVICE DATA

SS14G-03

Fuel heater	Resistance	at 20°C (68°F)	0.5 – 2.0 Ω
Injector	Resistance	at 20°C (68°F)	2.5 – 3.1 Ω
Supply pump (SCV1 and SCV2)	Resistance	at 20°C (68°F)	1.5 – 1.7 Ω

SS14H–03

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Fuel filler bracket x Fuel filter		1.96	20	17 in.·lbf
Nozzle holder clamp x Cylinder head		21.6	220	16
Nozzle leakage pipe x Injector	Hollow screw	16	163	12
	Union bolt	12.5	128	9
Check valve plug x Overflow screw		9.8	100	87 in.·lbf
Check valve x Cylinder head		21	214	15
Injection pipe clamp x Intake manifold		5	51	44 in.·lbf
Injection pipe, Fuel inlet pipe x Common rail	for use with SST	31.6	322	23
		35	357	26
Injection pipe x Injector	for use with SST	31.9	325	24
		35	357	26
Nozzle leakage pipe No.2 x Cylinder head	Check valve	21	214	15
Nozzle leakage pipe No.2 x Common rail	Bolt:	12.7	130	9
	Union bolt	12.7	130	9
Supply pump x Timing gear case		21	214	15
Supply pump stay x Cylinder block, Supply pump		21	214	15
Fuel inlet pipe x Supply pump	for use with SST	31.6	325	24
		35	357	26
Common rail x Cylinder head		38	387	28

COOLING

SERVICE DATA

SS0JV-06

Thermostat	Valve opening temperature		80 – 84°C (176 – 183°F)
	Valve lift	at 95°C (203°F)	10.0 mm (0.394 in.) or more
Radiator cap	Relief valve opening pressure	STD	93 – 123 kPa (0.95 – 1.25 kgf/cm^2, 13.5 – 17.8 psi)
		Minimum	79 kPa (0.8 kgf/cm^2, 11.5 psi)

SS0JW–05

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Engine drain plug x Engine coolant drain union	8	80	69 in.·lbf
Water pump x Cylinder block	13	130	9
Water pump pulley x Fun coupling	18	185	13
Water inlet x Cylinder block	13	130	9

LUBRICATION

SERVICE DATA

S90JX-04

Oil pressure		at idle speed	29 kPa (0.3 kgf/cm^2, 4.2 psi) or more
		at 4,500 rpm	245 kPa (2.5 kgf/cm^2, 36 psi)
Oil pump	Tip clearance	STD	0.06 – 0.16mm (0.0024 – 0.0063 in.)
		Maximum	0.21 mm (0.0083 in.)
	Body clearance	STD	0.10 – 0.17 mm (0.0039 – 0.0067 in.)
		Maximum	(0.20 mm (0.0079 in.)
	Side clearance	STD	0.03 – 0.09 mm (0.0012 – 0.0035 in.)
		Maximum	0.15 mm (0.0059 in.)

S50JY–04

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Oil pan x Drain plug		34	350	25
Relief valve x Oil pump		42	425	31
Oil pump x Cylinder block	Bolt	13	130	9
	Union bolt	16	160	12
Supply pump x Oil pump		21	210	15
Oil strainer x Cylinder block		8	82	71 in.·lbf
Oil pan x Cylinder block		16	165	12
Alternator bracket x Oil pump		21	210	15
Oil cooler cover x Drain plug		8	80	69 in.·lbf
Oil cooler cover x Oil cooler		16	160	12
Oil cooler cover x Cylinder bolck		13	130	9
Oil nozzle x Cylinder bolck		26	260	19

STARTING

SERVICE DATA

SS0UY-09

Pre–heating System	Light lighting time	at 28°C (82°F)	2.1 seconds
	Glow plug resistance	at 20°C (68°F)	Approx. 0.72 Ω
Starter	Rated voltage and output power	M/T	12 V 2.2 kW
		M/T (Cold area spec,), A/T	12 V 2.7 kW
		A/T (Cold area spec,)	12 V 3.3 kW
	No–load characteristics		
	Current	2.2 kw	120 A or less at 11.5 V
		2.7 kw	180 A or less at 11.0
		3.3 kw	220 A or less at 11.0
	rpm	2.2 kw	4,000 rpm or more
		2.7 kw	3,500 rpm or more
		3.3 kw	4,200 rpm or more
	Brush length		
	STD	2.2 kw	16.5 mm (0.650 in.)
		2.7 kw	20.5 mm (0.807 in.)
		3.3 kw	21.0 mm (0.827 in.)
	Minimum	2.2 kw	9.0 mm (0.354 in.)
		2.7 kw	11.0 mm (0.433 in.)
		3.3 kw	12.0 mm (0.472 in.)
	Commutator		
	Diameter	STD	
		2.2 kw	35 mm (1.38 in.)
		2.7 kw	36 mm (1.42 in.)
		3.3 kw	43 mm (1.65 in.)
		Minimum	
		2.2 kw	34 mm (1.34 in.)
		2.7 kw	35 mm (1.38 in.)
		3.3 kw	42 mm (1.65 in.)
	Undercut depth	STD	0.7 mm (0.027 in.)
		Minimum	0.2 mm (0.008 in.)
	Circle runout	Maximum	0.05 mm (0.0020 in.)
	Magnetic switch		
	contact plate for wear	Maximum	
		2.2 kw	0.9 mm (0.035 in.)
		2.7, 3.3 kw	1.6 mm (0.063 in.)

SS0UZ-07

TORQUE SPECIFICATION

Part tightened		N·m	kgf·cm	ft·lbf
Glow plug x Cylinder head		13	130	10
Starter housing x Magnetic switch assembly	2.2, 2.7 kw	9.3	95	82 in.·lbf
	3.3 kw	11	115	8
Field frame x Starter housing	2.2 kw	13	130	9
	2.7 kw	9.3	95	82 in.·lbf
	3.3 kw	14	145	10
Lead wire x Terminal C	2.2 kw	5.9	60	52 in.·lbf
	2.7, 3.3 kw	24	240	17
Terminal nut x Terminal 30 of starter, Terminal C of starter	2.2 kw	17	173	12
	2.7, 3.3 kw	30	310	22
End cover x Magnetic switch housing		3.6	36	32 in.·lbf

CHARGING

SERVICE DATA

SS0YW-09

Battery	Specific gravity	at 20°C (68°F)	1.25 – 1.29
	Voltage	at 20°C (68°F)	12.5 – 12.9 V
Alternator	Rated output		12 V 120 A
	Rotor coil resistance	at 20°C (68°F)	2.1 – 2.5 Ω
	Slip ring diameter	STD	14.2 – 14.4 mm (0.559 – 0.567 in.)
		Minimum	12.8 mm (0.504 in.)
	Brush exposed length	STD	9.5 – 11.5 mm (0.374 – 0.453in.)
		Minimum	1.5 mm (0.059 in.)
IC regulator	Regulating voltage	at 115°C (239°F)	13.2 – 14.8 V

SS0YX-08

TORQUE SPECIFICATION

Part tightened	N·m	kgf·cm	ft·lbf
Rectifier end frame without cord clip x Drive end frame	4.5	46	40 in.·lbf
Rectifier end frame with cord clip x Drive end frame	5.4	55	48 in.·lbf
Rectifier holder x Lead wire on rectifier end frame	2.94	30	26 in.·lbf
IC regulator x Rectifier end frame	2.0	20	18 in.·lbf
IC regulator x Rectifier holder	2.0	20	18 in.·lbf
Brush holder x Rectifier holder	2.0	20	18 in.·lbf
Brush holder x IC regulator	2.0	20	18 in.·lbf
Rear end cover x Rectifier holder	4.4	45	39 in.·lbf
Plate terminal x Rectifier holder	3.8	39	34 in.·lbf
Terminal insulator x Rectifier holder	4.1	42	36 in.·lbf