

WSM

**WORKSHOP MANUAL
DIESEL ENGINE**

SM-E2B SERIES

Kubota

2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Valve Clearance (Cold)		0.145 to 0.185 mm 0.00571 to 0.00728 in.	—
Compression Pressure	Z482-E2B D662-E2B D722-E2B D782-E2B	2.84 to 3.24 MPa 29.0 to 33.0 kgf/cm ² 412 to 469 psi	2.26 MPa 23.0 kgf/cm ² 327 psi
	Z602-E2B D902-E2B	3.53 to 4.02 MPa 36.0 to 41.0 kgf/cm ² 512 to 583 psi	2.55 MPa 26.0 kgf/cm ² 370 psi
Difference among Cylinders		—	10 % or less
Top Clearance		0.50 to 0.70 mm 0.0197 to 0.0276 in.	—
Cylinder Head Surface	Flatness	—	0.05 mm 0.0020 in.
Valve Recessing	Intake and Exhaust	−0.10 to 0.10 mm −0.0039 to 0.0039 in.	0.30 mm 0.0118 in.
Valve Stem to Valve Guide	Clearance	0.030 to 0.057 mm 0.00118 to 0.00224 in.	0.10 mm 0.0039 in.
Valve Stem	O.D.	5.968 to 5.980 mm 0.23496 to 0.23543 in.	—
Valve Guide	I.D.	6.010 to 6.025 mm 0.23661 to 0.23720 in.	—
Valve Face	Angle	0.785 rad 45 °	—
Valve Seat	Angle	0.785 rad 45 °	—
	Width	2.12 mm 0.0835 in.	—
Valve Spring	Free Length	31.3 to 31.8 mm 1.232 to 1.252 in.	28.4 mm 1.118 in.
	Tilt	—	1.2 mm 0.047 in.
	Setting Load / Setting Length	64.7 N / 27.0 mm 6.6 kgf / 27.0 mm 14.6 lbs / 1.063 in.	54.9 N / 27.0 mm 5.6 kgf / 27.0 mm 12.3 lbs / 1.063 in.

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Rocker Arm Shaft to Rocker Arm	Oil Clearance	0.016 to 0.045 mm 0.00063 to 0.00177 in.	0.15 mm 0.0059 in.
Rocker Arm Shaft	O.D.	10.473 to 10.484 mm 0.41232 to 0.41276 in.	—
Rocker Arm	I.D.	10.500 to 10.518 mm 0.41339 to 0.41410 in.	—
Push Rod	Alignment	—	0.25 mm 0.0098 in.
Tappet to Tappet Guide	Oil Clearance	0.016 to 0.052 mm 0.00063 to 0.00205 in.	0.10 mm 0.0039 in.
Tappet	O.D.	17.966 to 17.984 mm 0.70732 to 0.70803 in.	—
Tappet Guide	I.D.	18.000 to 18.018 mm 0.70866 to 0.70937 in.	—
Timing Gear			
Crank Gear to Idle Gear	Backlash	0.043 to 0.124 mm 0.00169 to 0.00488 in.	0.15 mm 0.0059 in.
Idle Gear to Cam Gear	Backlash	0.047 to 0.123 mm 0.00185 to 0.00484 in.	0.15 mm 0.0059 in.
Idle Gear to Injection Pump Gear	Backlash	0.046 to 0.124 mm 0.00181 to 0.00488 in.	0.15 mm 0.0059 in.
Crank Gear to Oil Pump Drive Gear	Backlash	0.041 to 0.123 mm 0.00161 to 0.00484 in.	0.15 mm 0.0059 in.
Idle Gear	Side Clearance	0.20 to 0.51 mm 0.0079 to 0.0201 in.	0.80 mm 0.0315 in.
Camshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.
	Alignment	—	0.01 mm 0.0004 in.
Cam Height	Intake and Exhaust	26.88 mm 1.0583 in.	26.83 mm 1.0563 in.
Camshaft Journal to Cylinder Block Bore	Oil Clearance	0.050 to 0.091 mm 0.00197 to 0.00358 in.	0.15 mm 0.0059 in.
Camshaft Journal	O.D.	32.934 to 32.950 mm 1.29661 to 1.29724 in.	—
Cylinder Block Bore	I.D.	33.000 to 33.025 mm 1.29921 to 1.30020 in.	—

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Idle Gear Shaft to Idle Gear Bushing	Oil Clearance	0.020 to 0.084 mm 0.00079 to 0.00331 in.	0.10 mm 0.0039 in.
Idle Gear Shaft	O.D.	19.967 to 19.980 mm 0.78610 to 0.78661 in.	—
Idle Gear Bushing	I.D.	20.000 to 20.051 mm 0.78740 to 0.78941 in.	—
Piston Pin Bore	I.D.	20.000 to 20.013 mm 0.78740 to 0.78791 in.	20.05 mm 0.7894 in.
Piston Pin to Small End Bushing	Oil Clearance	0.014 to 0.038 mm 0.00055 to 0.00150 in.	0.10 mm 0.0039 in.
Piston Pin	O.D.	20.002 to 20.011 mm 0.78748 to 0.78783 in.	—
Small End Bushing	I.D.	20.025 to 20.040 mm 0.78839 to 0.78897 in.	—
Piston Pin to Small End Bushing (Spare Parts)	Oil Clearance	0.015 to 0.075 mm 0.00059 to 0.00295 in.	0.15 mm 0.0059 in.
Small End Bushing	I.D.	20.026 to 20.077 mm 0.78843 to 0.79043 in.	—
Piston Ring Gap [Z482-E2B] [D662-E2B] [D722-E2B] [D782-E2B]	Top Ring	0.15 to 0.30 mm 0.0059 to 0.0118 in.	1.20 mm 0.0472 in.
	Second Ring	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.20 mm 0.0472 in.
	Oil Ring	0.15 to 0.30 mm 0.0059 to 0.0118 in.	1.20 mm 0.0472 in.
Piston Ring Gap [Z602-E2B] [D902-E2B]	Top Ring	0.20 to 0.35 mm 0.0079 to 0.0138 in.	1.25 mm 0.0492 in.
	Second Ring	0.35 to 0.50 mm 0.0138 to 0.0197 in.	1.25 mm 0.0492 in.
	Oil Ring	0.20 to 0.35 mm 0.0079 to 0.0138 in.	1.25 mm 0.0492 in.
Piston Ring to Piston Ring Groove Second Ring	Clearance	0.090 to 0.120 mm 0.00354 to 0.00472 in.	0.15 mm 0.0059 in.
Oil Ring	Clearance	0.04 to 0.08 mm 0.0016 to 0.0031 in.	0.15 mm 0.0059 in.
Connecting Rod	Alignment	—	0.05 mm 0.0020 in.
Crankshaft	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.
	Alignment	—	0.02 mm 0.0008 in.

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Crankpin to Crankpin Bearing	Oil Clearance	0.020 to 0.051 mm 0.00079 to 0.00201 in.	0.15 mm 0.0059 in.
Crankpin	O.D.	33.959 to 33.975 mm 1.33697 to 1.33760 in.	—
Crankpin Bearing	I.D.	33.995 to 34.010 mm 1.33839 to 1.33898 in.	—
Crankshaft Journal to Crankshaft Bearing 1 [Z482/D662/D722/D782-E2B]	Oil Clearance	0.034 to 0.106 mm 0.00134 to 0.00417 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	39.934 to 39.950 mm 1.57221 to 1.57284 in.	—
Crankshaft Bearing 1	I.D.	39.984 to 40.040 mm 1.57417 to 1.57638 in.	—
Crankshaft Journal to Crankshaft Bearing 1 [Z602/D902-E2B]	Oil Clearance	0.034 to 0.106 mm 0.00134 to 0.00417 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	43.934 to 43.950 mm 1.72968 to 1.73031 in.	—
Crankshaft Bearing 1	I.D.	43.984 to 44.040 mm 1.73165 to 1.73386 in.	—
Crankshaft Journal to Crankshaft Bearing 2 (Flywheel Side)	Oil Clearance	0.028 to 0.059 mm 0.00110 to 0.00232 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	43.934 to 43.950 mm 1.72968 to 1.73031 in.	—
Crankshaft Bearing 2	I.D.	43.978 to 43.993 mm 1.73142 to 1.73201 in.	—
Crankshaft Journal to Crankshaft Bearing 3 (Intermediate) [Z482/D662/D722/D782-E2B]	Oil Clearance	0.028 to 0.059 mm 0.00110 to 0.00232 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	39.934 to 39.950 mm 1.57221 to 1.57284 in.	—
Crankshaft Bearing 3	I.D.	39.978 to 39.993 mm 1.57394 to 1.57453 in.	—
Crankshaft Journal to Crankshaft Bearing 3 (Intermediate) [Z602/D902-E2B]	Oil Clearance	0.028 to 0.059 mm 0.00110 to 0.00232 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	43.934 to 43.950 mm 1.72968 to 1.73031 in.	—
Crankshaft Bearing 3	I.D.	43.978 to 43.993 mm 1.73142 to 1.73201 in.	—

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Cylinder Liner [D662-E2B]	I.D.	64.000 to 64.019 mm 2.51968 to 2.52043 in.	64.150 mm 2.52559 in.
Cylinder Liner [Z482/D722/D782-E2B]	I.D.	67.000 to 67.019 mm 2.63779 to 2.63854 in.	67.150 mm 2.64370 in.
Cylinder Liner [Z602/D902-E2B]	I.D.	72.000 to 72.019 mm 2.83464 to 2.83539 in.	72.150 mm 2.84055 in.
Cylinder Liner [Oversize : 0.25 mm (0.0098 in.)] [D662-E2B]	I.D.	64.250 to 64.269 mm 2.52953 to 2.53027 in.	64.400 mm 2.53543 in.
Cylinder Liner [Oversize : 0.25 mm (0.0098 in.)] [Z482/D722/D782-E2B]	I.D.	67.250 to 67.269 mm 2.64764 to 2.64839 in.	67.400 mm 2.65354 in.
Cylinder Liner [Oversize : 0.25 mm (0.0098 in.)] [Z602/D902-E2B]	I.D.	72.250 to 72.269 mm 2.84449 to 2.84524 in.	72.400 mm 2.85040 in.

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LUBRICATING SYSTEM

Engine Oil Pressure	At Idle Speed	More than 49 kPa 0.5 kgf/cm ² 7 psi	—
	At Rated Speed	196 to 441 kPa 2.0 to 4.5 kgf/cm ² 28 to 64 psi	147 kPa 1.5 kgf/cm ² 21 psi
Inner Rotor to Outer Rotor	Clearance	0.03 to 0.14 mm 0.0012 to 0.0055 in.	—
Outer Rotor to Pump Body	Clearance	0.07 to 0.15 mm 0.0028 to 0.0059 in.	—
Inner Rotor to Cover	Clearance	0.075 to 0.135 mm 0.00295 to 0.00531 in.	—

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COOLING SYSTEM

Item		Factory Specification	Allowable Limit
Fan Belt	Tension	7.0 to 9.0 mm / 98 N 0.28 to 0.35 in. / 98 N (10 kgf, 22 lbs)	—
Thermostat	Valve Opening Temperature (At Beginning)	69.5 to 72.5 °C 157.1 to 162.5 °F	—
	Valve Opening Temperature (Opened Completely)	85 °C 185 °F	—
Radiator Cap	Pressure Falling Time	10 seconds or more 88 → 59 kPa 0.9 → 0.6 kgf/cm ² 13 → 9 psi	—
Radiator	Water Leakage Test Pressure	No leak at specified pressure 157 kPa 1.6 kgf/cm ² 23 psi	—

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FUEL SYSTEM

Item		Factory Specification	Allowable Limit
Injection Pump [Z482/D662/D722-E2B]	Injection Timing (3600 min ⁻¹ (rpm))	0.33 to 0.37 rad (19 to 21°) before T.D.C.	—
Injection Pump [D782-E2B]	Injection Timing (3200 min ⁻¹ (rpm))	0.28 to 0.31 rad (16 to 18°) before T.D.C.	—
Injection Pump [Z602/D902-E2B]	Injection Timing (3200 min ⁻¹ (rpm))	0.30 to 0.33 rad (17 to 19°) before T.D.C.	—
Injection Pump [Z602/D902-E2B]	Injection Timing (3600 min ⁻¹ (rpm))	0.33 to 0.37 rad (19 to 21°) before T.D.C.	—
Pump Element	Fuel Tightness	—	13.73 MPa 140 kgf/cm ² 1991 psi
Delivery Valve	Fuel Tightness	10 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm ² 1991 → 1849 psi	5 seconds 13.73 → 12.75 MPa 140 → 130 kgf/cm ² 1991 → 1849 psi
Injection Nozzle	Injection Pressure	13.73 to 14.71 MPa 140 to 150 kgf/cm ² 1991 to 2134 psi	—
Injection Nozzle Valve Seat	Valve Seat Tightness	When the pressure is 12.75 MPa (130 kgf/cm ² , 1849 psi), the valve seat must be fuel tightness.	—

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ELECTRICAL SYSTEM

Item		Factory Specification	Allowable Limit
Glow Plug	Resistance	Approx. 0.9 Ω	—
Starter (Electromagnetic Drive Type) Commutator	O.D.	28.0 mm 1.102 in.	27.0 mm 1.063 in.
	Difference	Less than 0.05 mm 0.0002 in.	0.4 mm 0.016 in.
	Mica	Undercut 0.50 to 0.80 mm 0.0197 to 0.0315 in.	0.20 mm 0.0079 in.
	Brush	Length 16.0 mm 0.630 in.	10.5 mm 0.413 in.
Starter (Planetary Gear Reduction Type) Commutator	O.D.	30.0 mm 1.181 in.	29.0 mm 1.142 in.
	Difference	Less than 0.02 mm 0.0008 in.	0.05 mm 0.0020 in.
	Mica	Undercut 0.50 to 0.80 mm 0.0197 to 0.0315 in.	0.20 mm 0.0079 in.
	Brush	Length 14.0 mm 0.551 in.	9.0 mm 0.354 in.
Dynamo	No-load	Output Voltage AC20V or more at 5200 min ⁻¹ (rpm)	—
	Regulating	Output Voltage 14 to 15 V at 5200 min ⁻¹ (rpm)	—
Alternator	Stator	Resistance Less than 1.0 Ω	—
	Rotor	Resistance 2.9 Ω	—
	Slip Ring	O.D. 14.4 mm 0.567 in.	14.0 mm 0.551 in.
	Brush	Length 10.5 mm 0.413 in.	8.4 mm 0.331 in.

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3. TIGHTENING TORQUES

Screws, bolts and nuts must be tightened to the specified torque using a torque wrench, several screws, bolts and nuts such as those used on the cylinder head must be tightened in proper sequence and the proper torque.

[1] TIGHTENING TORQUES FOR GENERAL USE SCREWS, BOLTS AND NUTS

When the tightening torques are not specified, tighten the screws, bolts and nuts according to the table below.

Grade Nominal Diameter \ Unit	Standard Screw and Bolt ④			Special Screw and Bolt ⑦		
	N·m	kgf·m	ft-lbs	N·m	kgf·m	ft-lbs
M6	7.9 to 9.3	0.80 to 0.95	5.8 to 6.9	9.8 to 11.3	1.00 to 1.15	7.23 to 8.32
M8	17.7 to 20.6	1.8 to 2.1	13.0 to 15.2	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
M10	39.2 to 45.1	4.0 to 4.6	28.9 to 33.3	48.1 to 55.9	4.9 to 5.7	35.4 to 41.2
M12	62.8 to 72.6	6.4 to 7.4	46.3 to 53.5	77.5 to 90.2	7.9 to 9.2	57.1 to 66.5

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Screw and bolt material grades are shown by numbers punched on the screw and bolt heads. Prior to tightening, be sure to check out the numbers as shown below.

Punched number	Screw and bolt material grade
None or 4	Standard screw and bolt SS41, S20C
7	Special screw and bolt S43C, S48C (Refined)

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[2] TIGHTENING TORQUES FOR SPECIAL USE SCREWS, BOLTS AND NUTS

■ NOTE

- For “*” marked screws, bolts and nuts on the table, apply engine oil to their threads and seats before tightening.
- The letter “M” in Size x Pitch means that the screw, bolt or nut dimension stands for metric. The size is the nominal outside diameter in mm of the threads. The pitch is the nominal distance in mm between two threads.

Item	Size x Pitch	N·m	kgf·m	ft-lbs
*Cylinder head cover screw	M6 x 1	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
Injection pipe retaining nut	M12 x 1.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
Overflow pipe retaining nut	M12 x 1.5	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Nozzle holder assembly	M20 x 1.5	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Glow plug	M8 x 1	7.8 to 14.7	0.8 to 1.5	5.8 to 10.8
*Rocker arm bracket nut	M6 x 1	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
*Cylinder head screw	M8 x 1.25	37.3 to 42.2	3.8 to 4.3	27.5 to 31.1
*Fan drive pulley screw	M12 x 1.5	117.7 to 127.5	12.0 to 13.0	86.8 to 94.0
*Idle gear shaft mounting screw	M6 x 1	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
Oil pump mounting screw	M8 x 1.25	17.7 to 21.6	1.80 to 2.20	13.0 to 15.9
*Connecting rod screw	M7 x 0.75	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
*Flywheel screw	M10 x 1.25	53.9 to 58.8	5.5 to 6.0	39.8 to 43.4
Bearing case cover mounting screw	M6 x 1	9.8 to 11.3	1.00 to 1.15	7.2 to 8.3
*Main bearing case screw 2	M7 x 1	26.5 to 30.4	2.7 to 3.1	19.5 to 22.4
*Main bearing case screw 1	M6 x 1	12.7 to 15.7	1.3 to 1.6	9.4 to 11.6
Oil pressure switch	PT 1/8	14.7 to 19.6	1.5 to 2.0	10.8 to 14.5
Nozzle holder	—	34.3 to 39.2	3.5 to 4.0	25.3 to 28.9
Starter's terminal B mounting nut (Electromagnetic drive type)	M8	7.8 to 9.8	0.8 to 1.0	5.8 to 7.2
Starter's terminal B mounting nut (Planetary gear reduction type)	M8	5.9 to 11.8	0.6 to 1.2	4.3 to 8.7
Dynamo's pulley nut	M10 x 1.25	39.2 to 44.1	4.0 to 4.5	28.9 to 32.5
Alternator's pulley nut	—	58.3 to 78.9	5.95 to 8.05	43.0 to 58.2
Drain plug with copper gasket	M12 x 1.25	32.4 to 37.3	3.3 to 3.8	23.9 to 27.5
Drain plug with copper gasket	M22 x 1.5	63.7 to 73.5	6.5 to 7.5	47.0 to 54.2
Drain plug with rubber coated gasket	M22 x 1.5	44.1 to 53.9	4.5 to 5.5	32.5 to 39.8

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