

SPECIFICATIONS

Model	D1403-E2B	D1503-E2B	D1703-E2B
Number of Cylinders	3		
Type	Vertical, Water-cooled, 4 cycle diesel engine		
Bore × Stroke	80 × 92.4 mm (3.15 × 3.64 in.)	83 × 92.4 mm (3.27 × 3.64 in.)	87 × 92.4 mm (3.43 × 3.64 in.)
Total Displacement	1393 cm ³ (85.01 cu.in.)	1499 cm ³ (91.47 cu.in.)	1647 cm ³ (100.51 cu.in.)
ISO Net Continuous	18.8 kW / 2800 min ⁻¹ (rpm) (25.5 HP / 2800 min ⁻¹ (rpm))	20.4 kW / 2800 min ⁻¹ (rpm) (27.3 HP / 2800 min ⁻¹ (rpm))	22.4 kW / 2800 min ⁻¹ (rpm) (30.0 HP / 2800 min ⁻¹ (rpm))
ISO/SAE Net Intermittent	21.6 kW / 2800 min ⁻¹ (rpm) (29.0 HP / 2800 min ⁻¹ (rpm))	23.5 kW / 2800 min ⁻¹ (rpm) (31.5 HP / 2800 min ⁻¹ (rpm))	25.7 kW / 2800 min ⁻¹ (rpm) (34.5 HP / 2800 min ⁻¹ (rpm))
SAE Gross Intermittent	23.1 kW / 2800 min ⁻¹ (rpm) (31.0 HP / 2800 min ⁻¹ (rpm))	24.9 kW / 2800 min ⁻¹ (rpm) (33.4 HP / 2800 min ⁻¹ (rpm))	27.5 kW / 2800 min ⁻¹ (rpm) (36.9 HP / 2800 min ⁻¹ (rpm))
Maximum Bare Speed	3000 min ⁻¹ (rpm)		
Minimum Bare Idling Speed	700 to 750 min ⁻¹ (rpm)		
Combustion Chamber	Spherical type (E-TVCS)		
Fuel Injection Pump	Bosch type mini pump		
Governor	All speed mechanical governor		
Direction of Rotation	Counter-clockwise (viewed from flywheel side)		
Injection Nozzle	Bosch throttle type		
Injection Timing	0.314 rad (18 °) before T.D.C.		
Firing Order	1-2-3		
Injection Pressure	13.73 MPa (140 kgf/cm ² , 1991 psi)		
Compression Ratio	23 : 1		
Lubricating System	Forced lubrication by trochoid pump		
Oil Pressure Indicating	Electrical type switch		
Lubricating Filter	Full flow paper filter (cartridge type)		
Cooling System	Pressurized radiator, forced circulation with water pump		
Starting System	Electric starting with starter		
Starting Motor	12 V, 1.4 kW		
Starting Support Device	By glow plug in combustion chamber		
Battery	12 V, 60 AH equivalent		
Charging Alternator	12 V, 360 W		
Fuel	Diesel Fuel No.2-D (ASTM D975)		
Lubricating Oil	Class CF lubricating oil as per API classification is recommended. If this class of lubricating oil is not available, preferably use Class CD or CE lubricating oil. For details on recommended lubricating oils, see page G-5, 8.		
Lubricating Oil Capacity	Oil Pan Depth 90 mm (3.54 in.)	5.6 L (1.48 U.S.gals)	
	Oil Pan Depth 124 mm (4.88 in.)	7.0 L (1.85 U.S.gals)	
Weight (Dry)	148 kg (326.3 lbs)		

* The specification described above is of the standard engine of each model.

* Conversion Formula : HP = 0.746 kW, PS = 0.7355 kW

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Model	V1903-E2B		V2003-TE2B	
Number of Cylinders	4			
Type	Vertical, Water-cooled, 4 cycle diesel engine			
Bore × Stroke	80 × 92.4 mm (3.15 × 3.64 in.)		83 × 92.4 mm (3.27 × 3.64 in.)	
Total Displacement	1857 cm ³ (113.32 cu.in.)		1999 cm ³ (121.99 cu.in.)	
ISO Net Continuous	25.4 kW / 2800 min ⁻¹ (rpm) (34.0 HP / 2800 min ⁻¹ (rpm))		36.3 kW / 2800 min ⁻¹ (rpm) (48.7 HP / 2800 min ⁻¹ (rpm))	
ISO/SAE Net Intermittent	29.1 kW / 2800 min ⁻¹ (rpm) (39.0 HP / 2800 min ⁻¹ (rpm))		41.8 kW / 2800 min ⁻¹ (rpm) (56.0 HP / 2800 min ⁻¹ (rpm))	
SAE Gross Intermittent	31.0 kW / 2800 min ⁻¹ (rpm) (41.6 HP / 2800 min ⁻¹ (rpm))		44.5 kW / 2800 min ⁻¹ (rpm) (59.7 HP / 2800 min ⁻¹ (rpm))	
Maximum Bare Speed	3000 min ⁻¹ (rpm)			
Minimum Bare Idling Speed	700 to 750 min ⁻¹ (rpm)		750 to 850 min ⁻¹ (rpm)	
Combustion Chamber	Spherical type (E-TVCS)			
Fuel Injection Pump	Bosch type mini pump			
Governor	All speed mechanical governor			
Direction of Rotation	Counter-clockwise (viewed from flywheel side)			
Injection Nozzle	Bosch throttle type			
Injection Timing	0.314 rad (18 °) before T.D.C.			
Firing Order	1-3-4-2			
Injection Pressure	13.73 MPa (140 kgf/cm ² , 1991 psi)			
Compression Ratio	23 : 1			
Lubricating System	Forced lubrication by trochoid pump			
Oil Pressure Indicating	Electrical type switch			
Lubricating Filter	Full flow paper filter (cartridge type)			
Cooling System	Pressurized radiator, forced circulation with water pump			
Starting System	Electric starting with starter			
Starting Motor	12 V, 1.4 kW			
Starting Support Device	By glow plug in combustion chamber			
Battery	12 V, 80 AH equivalent			
Charging Alternator	12 V, 360 W		12 V, 480 W	
Fuel	Diesel Fuel No.2-D (ASTM D975)			
Lubricating Oil	Class CF lubricating oil as per API classification is recommended. If this class of lubricating oil is not available, preferably use Class CD or CE lubricating oil. For details on recommended lubricating oils, see page G-5, 8.			
Lubricating Oil Capacity	Oil Pan Depth 90 mm (3.54 in.)	7.6 L (2.01 U.S.gals)		7.9 L (2.09 U.S.gals)
	Oil Pan Depth 124 mm (4.88 in.)	9.5 L (2.51 U.S.gals)		9.8 L (2.59 U.S.gals)
Weight (Dry)	180 kg (397 lbs)		186 kg (410 lbs)	

* The specification described above is of the standard engine of each model.

* Conversion Formula : HP = 0.746 kW, PS = 0.7355 kW

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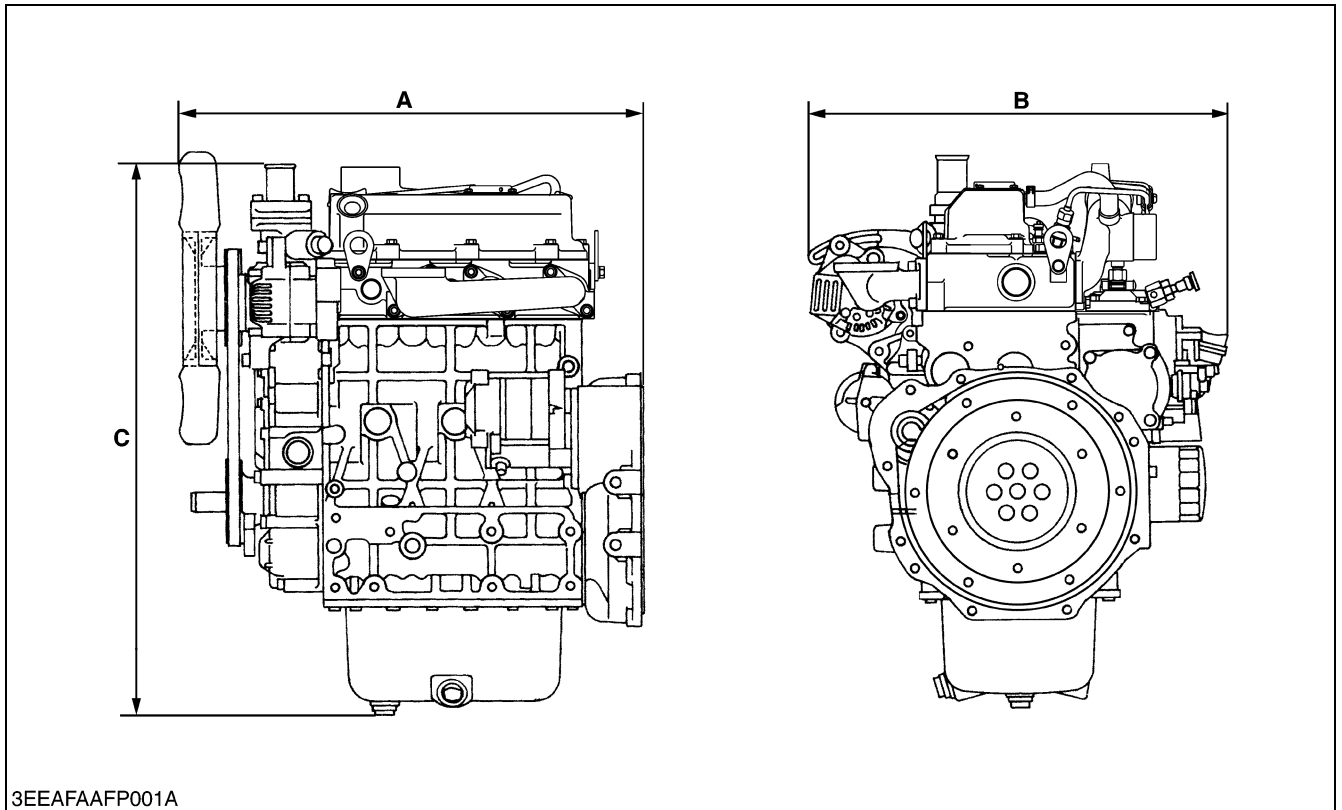
Model	V2203-E2B		F2803-E2B	
Number of Cylinders	4		5	
Type	Vertical, Water-cooled, 4 cycle diesel engine			
Bore × Stroke	87 × 92.4 mm (3.43 × 3.64 in.)			
Total Displacement	2197 cm ³ (134.07 cu.in.)		2746 cm ³ (167.57 cu.in.)	
ISO Net Continuous	29.8 kW / 2800 min ⁻¹ (rpm) (39.9 HP / 2800 min ⁻¹ (rpm))		37.3 kW / 2800 min ⁻¹ (rpm) (50.0 HP / 2800 min ⁻¹ (rpm))	
ISO/SAE Net Intermittent	34.3 kW / 2800 min ⁻¹ (rpm) (46.0 HP / 2800 min ⁻¹ (rpm))		42.9 kW / 2800 min ⁻¹ (rpm) (57.5 HP / 2800 min ⁻¹ (rpm))	
SAE Gross Intermittent	36.4 kW / 2800 min ⁻¹ (rpm) (48.8 HP / 2800 min ⁻¹ (rpm))		46.2 kW / 2800 min ⁻¹ (rpm) (61.9 HP / 2800 min ⁻¹ (rpm))	
Maximum Bare Speed	3000 min ⁻¹ (rpm)			
Minimum Bare Idling Speed	700 to 750 min ⁻¹ (rpm)			
Combustion Chamber	Spherical type (E-TVCS)			
Fuel Injection Pump	Bosch type mini pump			
Governor	All speed mechanical governor			
Direction of Rotation	Counter-clockwise (viewed from flywheel side)			
Injection Nozzle	Bosch throttle type			
Injection Timing	0.314 rad (18 °) before T.D.C.		0.332 rad (19 °) before T.D.C.	
Firing Order	1-3-4-2		1-3-5-4-2	
Injection Pressure	13.73 MPa (140 kgf/cm ² , 1991 psi)			
Compression Ratio	23 : 1			
Lubricating System	Forced lubrication by trochoid pump			
Oil Pressure Indicating	Electrical type switch			
Lubricating Filter	Full flow paper filter (cartridge type)			
Cooling System	Pressurized radiator, forced circulation with water pump			
Starting System	Electric starting with starter			
Starting Motor	12 V, 1.4 kW			
Starting Support Device	By glow plug in combustion chamber			
Battery	12 V, 80 AH equivalent			
Charging Alternator	12 V, 420 W			
Fuel	Diesel Fuel No.2-D (ASTM D975)			
Lubricating Oil	Class CF lubricating oil as per API classification is recommended. If this class of lubricating oil is not available, preferably use Class CD or CE lubricating oil. For details on recommended lubricating oils, see page G-5, 8.			
Lubricating Oil Capacity	Oil Pan Depth 90 mm (3.54 in.)	7.6 L (2.01 U.S.gals)		–
	Oil Pan Depth 124 mm (4.88 in.)	9.5 L (2.51 U.S.gals)		12.0 L (3.17 U.S.gals)
Weight (Dry)	180 kg (397 lbs)		223 kg (492 lbs)	

* The specification described above is of the standard engine of each model.

* Conversion Formula : HP = 0.746 kW, PS = 0.7355 kW

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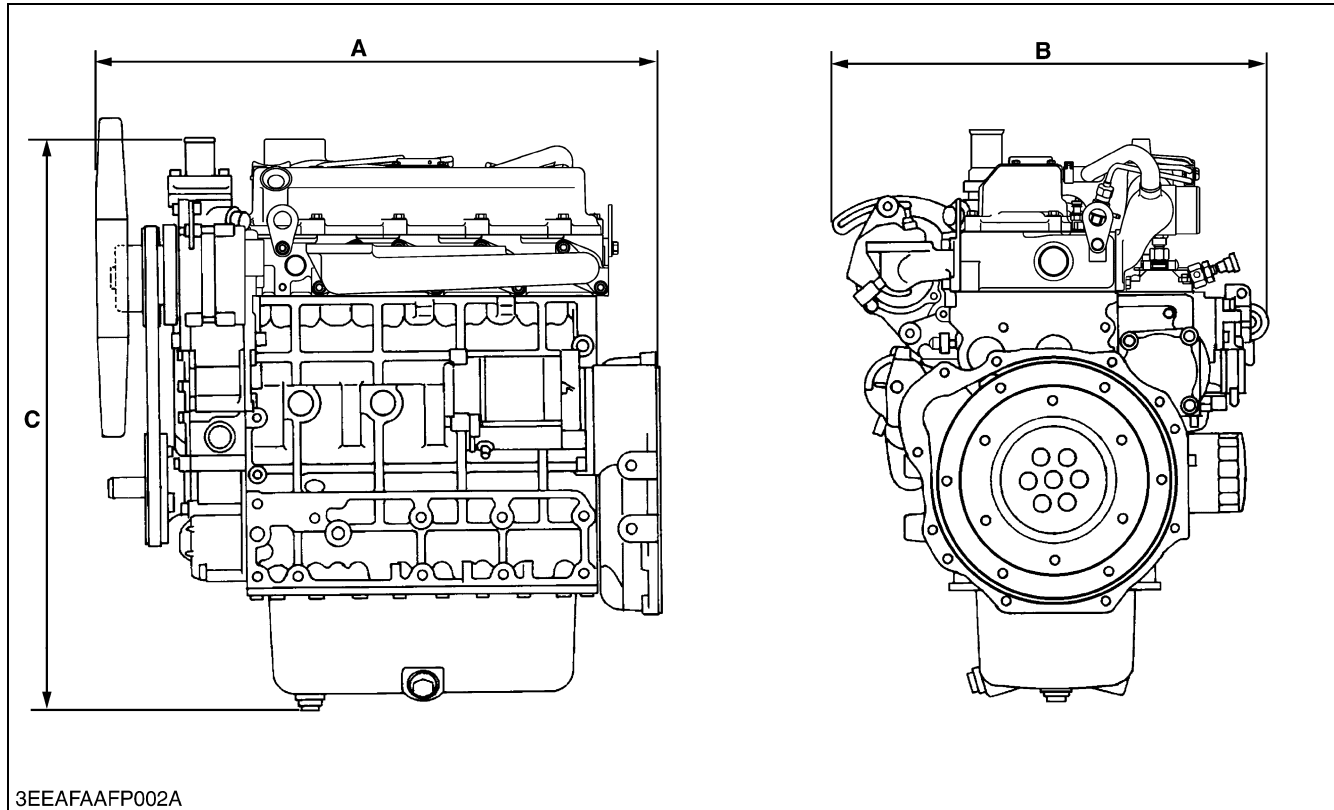
DIMENSIONS



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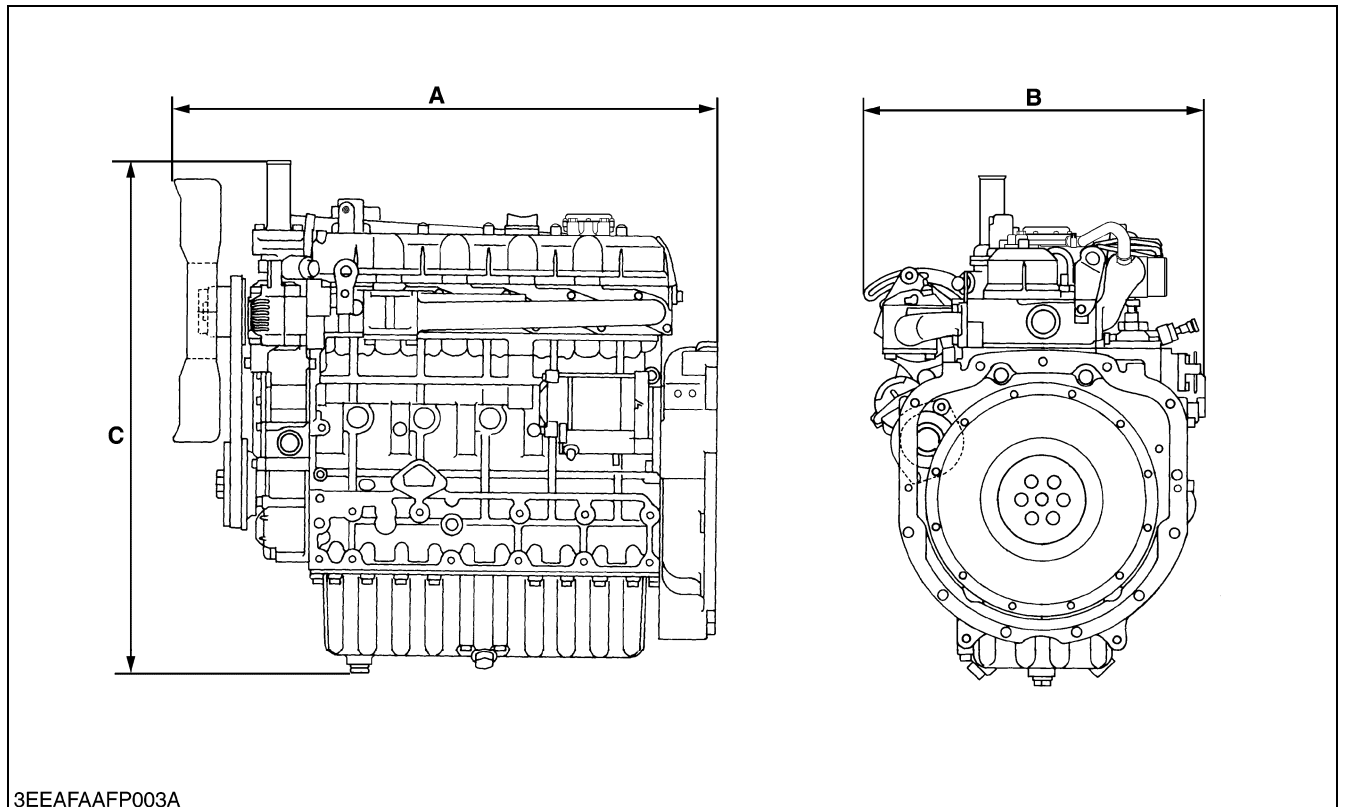
	D1403-E2B	D1503-E2B	D1703-E2B
A	560.1 mm (22.05 in.)	560.1 mm (22.05 in.)	560.1 mm (22.05 in.)
B	502.5 mm (19.78 in.)	502.5 mm (19.78 in.)	502.5 mm (19.78 in.)
C	678.2 mm (26.70 in.)	678.2 mm (26.70 in.)	678.2 mm (26.70 in.)

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	V1903-E2B	V2003-TE2B	V2003-E2B
A	652.1 mm (25.67 in.)	667.1 mm (26.26 in.)	652.1 mm (25.67 in.)
B	502.5 mm (19.78 in.)	520.0 mm (20.47 in.)	502.5 mm (19.78 in.)
C	678.2 mm (26.70 in.)	678.0 mm (26.69 in.)	678.2 mm (26.70 in.)

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	F2803-E2B
A	779.2 mm (30.68 in.)
B	502.5 mm (19.78 in.)
C	739.2 mm (29.10 in.)

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2. SERVICING SPECIFICATIONS

ENGINE BODY

Item		Factory Specification	Allowable Limit
Valve Clearance (When Cold)		0.18 to 0.22 mm 0.0071 to 0.0087 in.	—
Compression Pressure (When Cranking with Starting Motor)		3.53 to 3.72 MPa / 290 min ⁻¹ (rpm) 36 to 38 kgf/cm ² / 290 min ⁻¹ (rpm) 512 to 540 psi / 290 min ⁻¹ (rpm)	2.55 MPa / 290 min ⁻¹ (rpm) 26 kgf/cm ² / 290 min ⁻¹ (rpm) 370 psi / 290 min ⁻¹ (rpm)
Difference among Cylinders		—	10 % or less
Top Clearance		0.55 to 0.70 mm 0.0217 to 0.0276 in.	—
Cylinder Head Surface	Flatness	—	0.05 mm 0.0020 in.
Valve Recessing	Protrusion	0.05 mm 0.0020 in.	—
	Recessing	0.15 mm 0.0059 in.	0.40 mm 0.0157 in.
Valve Stem to Valve Guide	Clearance	0.040 to 0.070 mm 0.00157 to 0.00276 in.	0.10 mm 0.0039 in.
Valve Stem	O.D.	7.960 to 7.975 mm 0.31339 to 0.31398 in.	—
Valve Guide	I.D.	8.015 to 8.030 mm 0.31555 to 0.31614 in.	—
Valve Face	Angle (Intake)	1.047 rad 60 °	—
	Angle (Exhaust)	0.785 rad 45 °	—
Valve Seat	Angle (Intake)	1.047 rad 60 °	—
	Angle (Exhaust)	0.785 rad 45 °	—
Valve Seat	Width (Intake)	2.12 mm 0.0835 in.	—
	Width (Exhaust)	2.12 mm 0.0835 in.	—

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Valve Timing (Intake Valve) [D1403-E2B] [D1503-E2B]	Open	0.14 rad (8 °) before T.D.C.	—
	Close	0.35 rad (20 °) after B.D.C.	—
Valve Timing (Intake Valve) [D1703-E2B] [V1903-E2B] [V2203-E2B] [F2803-E2B]	Open	0.21 rad (12 °) before T.D.C.	—
	Close	0.63 rad (36 °) after B.D.C.	—
Valve Timing (Intake Valve) [V2003-TE2B]	Open	0.35 rad (20 °) before T.D.C.	—
	Close	0.79 rad (45 °) after B.D.C.	—
Valve Timing (Exhaust Valve) [D1403-E2B] [D1503-E2B]	Open	1.05 rad (60 °) before B.D.C.	—
	Close	0.21 rad (12 °) after T.D.C.	—
Valve Timing (Exhaust Valve) [D1703-E2B] [V1903-E2B] [V2203-E2B] [F2803-E2B]	Open	1.05 rad (60 °) before B.D.C.	—
	Close	0.21 rad (12 °) after T.D.C.	—
Valve Timing (Exhaust Valve) [V2003-TE2B]	Open	0.96 rad (55 °) before B.D.C.	—
	Close	0.24 rad (14 °) after T.D.C.	—
Valve Spring	Free Length	41.7 to 42.2 mm 1.6417 to 1.6614 in.	41.2 mm 1.6220 in.
	Setting Load / Setting Length	117.6 N / 35.0 mm 12.0 kgf / 35.0 mm 26.4 lbs / 1.3780 in.	100.0 N / 35.0 mm 10.2 kgf / 35.0 mm 22.5 lbs / 1.3780 in.
	Tilt	—	1.0 mm 0.039 in.
Rocker Arm Shaft to Rocker Arm	Oil Clearance	0.016 to 0.045 mm 0.00063 to 0.00177 in.	0.10 mm 0.0039 in.
Rocker Arm Shaft	O.D.	13.973 to 13.984 mm 0.55012 to 0.55055 in.	—
Rocker Arm	I.D.	14.000 to 14.018 mm 0.55118 to 0.55189 in.	—
Push Rod	Alignment	—	0.25 mm 0.0098 in.

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Tappet to Tappet Guide	Oil Clearance	0.020 to 0.062 mm 0.00079 to 0.00244 in.	0.07 mm 0.0028 in.
Tappet	O.D.	23.959 to 23.980 mm 0.94327 to 0.94410 in.	—
Tappet Guide	I.D.	24.000 to 24.021 mm 0.94488 to 0.94571 in.	—
Timing Gear Crank Gear to Idle Gear	Backlash	0.0415 to 0.1122 mm 0.00163 to 0.00442 in.	0.15 mm 0.0059 in.
Idle Gear to Cam Gear	Backlash	0.0415 to 0.1154 mm 0.00163 to 0.00454 in.	0.15 mm 0.0059 in.
Idle Gear to Injection Pump Gear	Backlash	0.0415 to 0.1154 mm 0.00163 to 0.00454 in.	0.15 mm 0.0059 in.
Crank Gear to Oil Pump Gear	Backlash	0.0415 to 0.1090 mm 0.00163 to 0.00429 in.	0.15 mm 0.0059 in.
Idle Gear	Side Clearance	0.12 to 0.48 mm 0.0047 to 0.0189 in.	0.90 mm 0.0354 in.
Idle Gear Shaft to Idle Gear Bushing	Oil Clearance	0.025 to 0.066 mm 0.00098 to 0.00260 in.	0.10 mm 0.0039 in.
Idle Gear Shaft	O.D.	37.959 to 37.975 mm 1.49445 to 1.49508 in.	—
Idle Gear Bushing	I.D.	38.000 to 38.025 mm 1.49606 to 1.49705 in.	—
Camshaft	Side Clearance	0.07 to 0.22 mm 0.0028 to 0.0087 in.	0.30 mm 0.0118 in.
Camshaft	Alignment	—	0.01 mm 0.0004 in.
Cam [D1403-E2B] [D1503-E2B] [F2803-E2B]	Height (Intake)	33.263 to 33.283 mm 1.3096 to 1.3104 in.	33.22 mm 1.3079 in.
	Height (Exhaust)	33.463 to 33.483 mm 1.3174 to 1.3182 in.	33.42 mm 1.3157 in.
Cam [D1703-E2B] [V1903-E2B] [V2203-E2B]	Height (Intake)	33.463 to 33.483 mm 1.3174 to 1.3182 in.	33.42 mm 1.3157 in.
	Height (Exhaust)	33.463 to 33.483 mm 1.3174 to 1.3182 in.	33.42 mm 1.3157 in.
Cam [V2003-TE2B]	Height (Intake)	33.890 to 33.910 mm 1.3343 to 1.3350 in.	33.85 mm 1.3327 in.
	Height (Exhaust)	33.463 to 33.483 mm 1.3174 to 1.3182 in.	33.42 mm 1.3157 in.

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
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.	39.934 to 39.950 mm 1.57221 to 1.57284 in.	–
Cylinder Block Bore	I.D.	40.000 to 40.025 mm 1.57480 to 1.57579 in.	–
Piston Pin Bore	I.D.	25.000 to 25.013 mm 0.98425 to 0.98476 in.	25.05 mm 0.9862 in.
Second Ring to Ring Groove [D1403/D1503/D1703/V1903/V2203/ F2803-E2B]	Clearance	0.093 to 0.120 mm 0.0037 to 0.0047 in.	0.20 mm 0.0079 in.
Second Ring to Ring Groove [V2003-TE2B]	Clearance	0.093 to 0.123 mm 0.0037 to 0.0048 in.	0.20 mm 0.0079 in.
Oil Ring to Ring Groove	Clearance	0.020 to 0.052 mm 0.0008 to 0.0020 in.	0.15 mm 0.0059 in.
Top Ring	Ring Gap	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.25 mm 0.0492 in.
Second Ring	Ring Gap	0.30 to 0.45 mm 0.0118 to 0.0177 in.	1.25 mm 0.0492 in.
Oil Ring	Ring Gap	0.25 to 0.45 mm 0.0098 to 0.0177 in.	1.25 mm 0.0492 in.
Connecting Rod	Alignment	–	0.05 mm 0.0020 in.
Piston Pin to Small End Bushing	Oil Clearance	0.014 to 0.038 mm 0.00055 to 0.00150 in.	0.15 mm 0.0059 in.
Piston Pin	O.D.	25.002 to 25.011 mm 0.98433 to 0.98469 in.	–
Small End Bushing	I.D.	25.025 to 25.040 mm 0.98524 to 0.98583 in.	–
Crankshaft	Alignment	–	0.02 mm 0.00079 in.

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Crankshaft Journal to Crankshaft Bearing 1 [D1403/D1503/D1703/V1903/V2003-T/ V2203-E2B]		Oil Clearance 0.040 to 0.118 mm 0.00157 to 0.00465 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	59.921 to 59.940 mm 2.35910 to 2.35984 in.	—
Crankshaft Bearing 1	I.D.	59.980 to 60.039 mm 2.36142 to 2.36374 in.	—
Crankshaft Journal to Crankshaft Bearing 1 [F2803-E2B]		Oil Clearance 0.040 to 0.118 mm 0.00157 to 0.00465 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	51.921 to 51.940 mm 2.04413 to 2.04488 in.	—
Crankshaft Bearing 1	I.D.	51.980 to 52.039 mm 2.04646 to 2.04878 in.	—
Crankshaft Journal to Crankshaft Bearing 2 [D1403/D1503/D1703/V1903/V2003-T/ V2203-E2B]		Oil Clearance 0.040 to 0.104 mm 0.00157 to 0.00409 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	59.921 to 59.940 mm 2.35910 to 2.35984 in.	—
Crankshaft Bearing 2	I.D.	59.980 to 60.025 mm 2.36142 to 2.36319 in.	—
Crankshaft Journal to Crankshaft Bearing 2 [F2803-E2B]		Oil Clearance 0.040 to 0.104 mm 0.00157 to 0.00409 in.	0.20 mm 0.0079 in.
Crankshaft Journal	O.D.	51.921 to 51.940 mm 2.04413 to 2.04488 in.	—
Crankshaft Bearing 2	I.D.	51.980 to 52.025 mm 2.04646 to 2.04823 in.	—
Crankpin to Crankpin Bearing		Oil Clearance 0.025 to 0.087 mm 0.00098 to 0.00343 in.	0.20 mm 0.0079 in.
Crankpin	O.D.	46.959 to 46.975 mm 1.84878 to 1.84941 in.	—
Crankpin Bearing	I.D.	47.000 to 47.046 mm 1.85039 to 1.85221 in.	—

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ENGINE BODY (Continued)

Item		Factory Specification	Allowable Limit
Crankshaft [D1403/D1503/D1703/V1903/V2003-T/ V2203-E2B]	Side Clearance	0.15 to 0.31 mm 0.0059 to 0.0122 in.	0.50 mm 0.0197 in.
Crankshaft [F2803-E2B]	Side Clearance	0.15 to 0.35 mm 0.0059 to 0.0138 in.	0.50 mm 0.0197 in.
Cylinder Bore (Standard) [D1403-E2B] [V1903-E2B]	I.D.	80.000 to 80.022 mm 3.14961 to 3.15047 in.	80.150 mm 3.15551 in.
Cylinder Bore (Standard) [D1503-E2B] [V2003-TE2B]	I.D.	83.000 to 83.022 mm 3.26772 to 3.26858 in.	83.150 mm 3.27362 in.
Cylinder Bore (Standard) [D1703-E2B] [V2203-E2B] [F2803-E2B]	I.D.	87.000 to 87.022 mm 3.42520 to 3.42606 in.	87.150 mm 3.43110 in.
Cylinder Bore (Oversize) [D1403-E2B] [V1903-E2B]	I.D.	80.500 to 80.522 mm 3.16929 to 3.17016 in.	80.650 mm 3.17520 in.
Cylinder Bore (Oversize) [D1503-E2B] [V2003-TE2B]	I.D.	83.500 to 83.522 mm 3.28740 to 3.28827 in.	83.650 mm 3.29331 in.
Cylinder Bore (Oversize) [D1703-E2B] [V2203-E2B] [F2803-E2B]	I.D.	87.500 to 87.522 mm 3.44488 to 3.44575 in.	87.650 mm 3.45079 in.

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LUBRICATING SYSTEM

Engine Oil Pressure	At Idle Speed	More than 98 kPa 1.0 kgf/cm ² 14 psi	49 kPa 0.5 kgf/cm ² 7 psi
	At Rated Speed	294 to 441 kPa 3.0 to 4.5 kgf/cm ² 42.7 to 64.0 psi	245 kPa 2.5 kgf/cm ² 35.6 psi
Engine Oil Pressure Switch	Working Pressure	49 kPa 0.5 kgf/cm ² 7 psi	—
Inner Rotor to Outer Rotor	Clearance	0.03 to 0.14 mm 0.0012 to 0.0055 in.	0.20 mm 0.0079 in.
Outer Rotor to Pump Body	Clearance	0.11 to 0.19 mm 0.0043 to 0.0075 in.	0.25 mm 0.0098 in.
Inner Rotor to Cover	Clearance	0.105 to 0.150 mm 0.00413 to 0.00591 in.	0.20 mm 0.0079 in.

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COOLING SYSTEM

Item		Factory Specification	Allowable Limit
Fan Belt	Tension	7.0 to 9.0 mm (0.28 to 0.35 in.) deflection at 98 N (10 kgf, 22 lbs) of force	–
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	Water Tightness	No leak at 137 kPa 1.4 kgf/cm ² 20 psi	–
Radiator Cap	Pressure Falling Time	More than 10 seconds for pressure fall from 88 to 59 kPa from 0.9 to 0.6 kgf/cm ² from 13 to 9 psi	–

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FUEL SYSTEM

Injection Pump [D1403/D1503/D1703/V1903/V2003-T/ V2203-E2B]	Injection Timing	0.297 to 0.331 rad (17 to 19 °) before T.D.C.	–
Injection Pump [F2803-E2B]	Injection Timing	0.314 to 0.349 rad (18 to 20 °) 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
Starter	Commutator	O.D. 30.0 mm 1.181 in.	29.0 mm 1.142 in.
	Mica	Under Cut 0.45 to 0.75 mm 0.0177 to 0.0295 in.	0.20 mm 0.0079 in.
	Brush	Length 15.0 mm 0.591 in.	11.0 mm 0.433 in.
Alternator	No-load voltage	More than 13.5 V	—
	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.
Glow Plug	Resistance	Approx. 0.9 Ω	—

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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 1.0	6.9 to 11.3	0.7 to 1.15	5.1 to 8.32
*Cylinder head cover cap nut	M8 x 1.25	6.9 to 8.8	0.7 to 0.9	5.1 to 6.5
Injection pipe retaining nut	M12 x 1.5	24.5 to 34.3	2.5 to 3.5	18.1 to 25.3
Nozzle holder assembly	M20 x 1.5	49.0 to 68.6	5.0 to 7.0	36.2 to 50.6
Overflow pipe assembly retaining nut	M12 x 1.5	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
Glow plug	M10 x 1.25	19.6 to 24.5	2.0 to 2.5	14.5 to 18.1
*Rocker arm bracket screw	M8 x 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
*Rocker arm bracket nut	M8 x 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
*Cylinder head screw	M11 x 1.25	93.2 to 98.1	9.5 to 10.0	68.7 to 72.3
Fan drive pulley mounting nut	M30 x 1.5	137.3 to 156.9	14.0 to 16.0	101.3 to 115.7
Fan drive pulley screw	M16 x 1.5	313.8 to 333.4	32.0 to 34.0	231.5 to 245.9
Camshaft set screw	M8 x 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
*Connecting rod screw	M8 x 1.0	44.1 to 49.0	4.5 to 5.0	32.5 to 36.2
*Flywheel screw	M12 x 1.25	98.1 to 107.9	10.0 to 11.0	72.3 to 79.6
*Bearing case cover screw	M8 x 1.25	23.5 to 27.5	2.4 to 2.8	17.4 to 20.3
*Main bearing case screw 2	M10 x 1.25	68.6 to 73.5	7.0 to 7.5	50.6 to 54.2
*Main bearing case screw 1	M9 x 1.25	46.1 to 51.0	4.7 to 5.2	34.0 to 37.6
Oil pressure switch	R 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	M8	5.9 to 11.8	0.6 to 1.2	4.3 to 8.7
Alternator's pulley nut	–	58.3 to 78.9	5.95 to 8.05	43.0 to 58.2

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