

ENGINE

4M41

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NOTES

GENERAL INFORMATION

Descriptions	Specifications
Total displacement dm ³	3200
No. and arrangement of cylinders	4 in-line
Combustion chamber	Direct injection
No. of intake/exhaust valves (per cylinder)	2 each
Valve mechanism	Double overhead camshaft, 4-valve
Cylinder bore x stroke mm	98.5 x 105
Compression ratio	17
Supercharger	Turbo-charging type
Intercooler	Air-cooling type
Fuel supply	Distributor type electronically controlled fuel injection pump

1. SPECIFICATIONS

SERVICE SPECIFICATIONS

Unit: mm

Descriptions			Standard	Limit	
Glow plug					
Glow plug	Resistance Ω		1.1	-	
Turbocharger assembly					
Turbocharger	Actuator operating pressure (when operating 1 mm) kPa		161	-	
Rocker cover, camshaft holder assembly, camshaft assembly					
Camshaft	End play		0.10 - 0.18	0.3	
	Cam lobe lift	Intake	Front	6.16	6.11
			Rear	6.10	6.05
		Exhaust	Front	5.91	5.86
			Rear	6.16	6.11
	Bend		Less than 0.015	0.03	
Journal oil clearance		0.05 - 0.09	0.15		
Rocker	Rocker roller radial play		0.03 - 0.07	-	
Injection nozzle					
Injection nozzle	Injection pressure (valve opening pressure)	No. 1 valve opening pressure MPa	17.60 - 18.58	-	
		No. 2 valve opening pressure MPa	22.6 - 23.6	-	
	Pre-lift		0.05 - 0.07	-	
	Needle valve lift		0.23 - 0.28	-	
Cylinder head and valve mechanism					
Valve spring	Free height		51.3	-	
	Load (installed height: 39.5) N		255	-	
	Out-of-squareness		2°	4°	
Valve	Intake	Stem diameter	6.560 - 6.575	6.45	
		Sinkage from cylinder head bottom	0.05 - 0.55	0.8	
		Margin	1.0	0.8	
		Valve seat angle	45° ± 15'	-	
	Exhaust	Stem diameter	6.53 - 6.55	6.45	
		Sinkage from cylinder head bottom	0.05 - 0.55	0.8	
		Margin	1.0	0.8	
		Valve seat angle	45° ± 15'	-	
Valve guide	Stem-to-guide clearance		Intake	0.02 - 0.06	0.10
			Exhaust	0.05 - 0.09	0.15

Descriptions		Standard	Limit
Valve seat	Seat width	1.8 - 2.2	2.8
Cylinder head	Bottom surface distortion	Less than 0.05	0.2
Vacuum pump			
Vacuum pump	Performance	Attained degree of vacuum	93 kPa or more
		Pump speed	1500 r/min
Timing gears and balance shafts			
Backlash between gears	Balance shaft gear RH and oil pump gear	0.04 - 0.19	0.3
	Oil pump gear and crankshaft gear	0.04 - 0.18	0.3
	Crankshaft gear and idler gear	0.04 - 0.18	0.3
	Idler gear and idler gear LH	0.04 - 0.19	0.3
	Idler gear LH and balance shaft gear LH	0.04 - 0.22	0.4
	Idler gear and injection pump gear	0.04 - 0.21	0.4
End play	Balance shaft LH, RH	0.09 - 0.24	0.3
	Idler gear/sprocket assembly	0.05 - 0.20	0.3
	Idler gear LH assembly	0.05 - 0.20	0.3
Timing chain elongation (minimum distance between chain spans facing each other when pressing on tensioner lever)		16.5	9
Tension lever-to-tension lever shaft clearance		0.06 - 0.18	0.3
Idler gear bush LH-to-idler shaft clearance		0.02 - 0.05	0.1
Idler sprocket bush-to-idler shaft clearance		0.02 - 0.06	0.1
Oil pump			
Oil pump	Driven gear shaft-to-oil pump case and cover clearance	0.03 - 0.05	0.15
	Side clearance	0.05 - 0.10	0.15
	Tip clearance	0.15 - 0.26	0.27
Oil cooler and oil filter			
Bypass valve spring	Valve opening pressure	kPa	490 ± 30
Regulator valve spring	Valve opening pressure	kPa	620 ± 30
Piston and connecting rod assembly			
Piston	Protrusion		-0.20 - -0.30
Piston pin	Piston pin-to-connecting rod bush clearance		0.03 - 0.05
	Piston pin-to-piston clearance		0.007 - 0.021
Piston ring	Ring-to-ring groove clearance	No.1 compression ring	0.03 - 0.08
		No.2 compression ring	0.07 - 0.10
		Oil ring	0.03 - 0.06
	End gap	No.1 compression ring	0.3 - 0.45
		No.2 compression ring	0.4 - 0.55
		Oil ring	0.3 - 0.5

Descriptions		Standard	Limit	
Connecting rod	End play	0.15 - 0.45	0.6	
	Bend	-	0.05	
	Twist	-	0.1	
Connecting rod bearing	Oil clearance	0.03 - 0.05	0.1	
	Free span	-	58.8 max.	
Crankshaft and crankcase				
Crankshaft	End play	0.10 - 0.28	0.4	
	Bend	Less than 0.02	0.05	
	Pin and journal	Out-of-roundness	Less than 0.01	-
		Conicity	Less than 0.006	-
Main bearing	Main bearing-to-crankshaft clearance	No.1, 2, 4 and 5 journal	0.04 - 0.06	
		No.3 journal	0.06 - 0.08	
	Free span	-	73.16 max.	
Upper crankcase	Upper surface distortion	Less than 0.05	0.1	
	Cylinder I.D.	98.5 - 98.53	98.75	
	Piston and connecting rod assembly-to-upper crankcase cylinder clearance	0.04 - 0.05	-	
Balance shaft bush				
Balance shaft	Clearance between balance shaft and balance shaft bush	0.06 - 0.11	0.16	

TORQUE SPECIFICATIONS

Items	Torque Nm	
Glow plug		
Connection plate	1.3 ± 1	
Glow plug	18 ± 1	
Cooling fan V-belt and water pump		
Cooling fan bolt	10 ± 1	
Auto-cooling fan coupling nut	24 ± 2	
Water pump bolt	24 ± 2	
Water hoses and pipes		
Eyebolt	25 ± 2	
Coolant temperature sensor	9 ± 1	
Intake manifold		
Boost air temperature sensor	15 ± 1	
Gas filter assembly	17 ± 1	
Turbocharger assembly		
Eye bolt (for oil pipe)	20 ± 2	
Eye bolt (for water pipe)	25 ± 2	
Coupler nut	49 ± 4	
Turbocharger nut	49 ± 4	
Turbocharger bolt	54 ± 5	
Exhaust manifold		
Exhaust manifold nut	30 ± 3	
Injection pump assembly		
Injection pipe	25 ± 2	
Pump stay mounting bolt	18 ± 2	
Injection pump		
Injection pump gear mounting nut	180 ± 10	
Sensor plate mounting bolt	5 ± 1	
Flange plate mounting nut	38 ± 2	
Engine speed sensor mounting bolt	5 ± 1	
Rocker cover, camshaft holder assembly, camshaft assembly		
Rocker cover mounting bolt	3.0 ± 0.3	
Fuel leak-off pipe eyebolt	Injection nozzle side	13 ± 2
	Cylinder head side	11 ± 1
Cam sprocket mounting bolt	88 ± 10	
Camshaft cap mounting bolt	20 ± 1	
Adjust screw locknut	9.5 ± 0.5	
Pivot bolt	38 ± 8	

Items	Torque Nm
Injection nozzle	
Injection pipe	33 ± 3
Return pipe eyebolt	11 ± 1
Injection nozzle assembly eyebolt	13 ± 2
Leak-off pipe eye bolt	11 ± 1
Injection nozzle assembly mounting bolt	21 ± 2
Retaining nut	34 ± 5
Cylinder head and valve mechanism	
Injection nozzle mounting bolt	21 ± 2
Connecting plate mounting nut	1.3 ± 1.0
Glow plug	18 ± 2
Bolt (M10)	58 ± 6
Cylinder head bolt (M12: long)	49 ± 5 + 90° + 90°
Cylinder head bolt (M12: short)	49 ± 5 + 90° + 90°
Water joint	47 ± 5
Vacuum pump	
Eyebolt	20 ± 2
Cover and body assembly mounting bolt	5.4 ± 0.5
Timing gear case	
Crankshaft pulley mounting bolt	323 ± 32
Cap nut	23 ± 2
Timing gear and balance shaft	
Tension lever shaft mounting bolt	40 ± 4
Guide plate mounting bolt	33 ± 3
Balance shaft gear RH mounting bolt	36 ± 4
Thrust plate mounting bolt	12 ± 1
Balance shaft gear LH mounting bolt	36 ± 4
Oil Pump	
Balance shaft RH bolt	36 ± 3
Plug	44 ± 4
Oil pump cover screw	10 ± 1
Oil cooler and oil filter	
Oil cooler element nut	20 ± 2
Bypass plug	44 ± 4
Regulator plug	44 ± 4
Water drain plug	30 ± 3







Items	Torque Nm
Oil pan, oil strainer and oil jet	
Drain plug	39 ± 3
Oil jet	32 ± 3
Piston and connecting rod	
Connecting rod cap mounting nut	29 ± 3 + 49 ± 5 + 45° + 45°
Drive plate	
Drive plate assembly and crankshaft mounting bolt	123 ± 12
Crankshaft and crankcase	
Dust cover mounting bolt	47 ± 5
Lower crankcase mounting bolt	25 ± 3
Main bearing cap bolt	20 ± 2 + 90° + 90°
Check valve	32 ± 3

STANDARD BOLT AND NUT TIGHTENING TORQUE TABLE

1. Fasten the parts and equipment of vehicle using the specified standard bolts and nuts. Tighten these bolts and nuts to the torques indicated below, unless otherwise specified.
2. Threads and bearing surfaces must be dry.
3. In case nut and bolt (or stud bolt) differ in strength, tighten them to the torque specified for the bolt.







Hexagon head bolts and stud bolts

Unit: Nm

Strength Code	4T		7T		8T	
Head Mark	 		 		 	
Nominal Diameter mm	(Stud)	4ME0494	(Stud)	4ME0495	(Stud)	4ME0496
M5	2.5 ± 0.5	-	5 ± 1	-	6 ± 1	-
M6	5 ± 1	-	9 ± 2	-	10 ± 2	-
M8	11.5 ± 2.5	-	21 ± 4	-	25 ± 4	-
M10	23 ± 4	22 ± 4	44 ± 10	41 ± 8	52 ± 7	55 ± 13
M12	41 ± 8	38 ± 8	81 ± 12	74 ± 9	96 ± 12	86 ± 12



Hexagon flange bolts

Unit: Nm

Strength Code	4T		7T		8T	
Head Mark						
Nominal Diameter mm		4ME0497		4ME0498		4ME0499
M6	5 ± 1	-	10 ± 2	-	12 ± 2	-
M8	13 ± 2	-	23 ± 4	-	27 ± 5	-
M10	26 ± 4	22 ± 4	49 ± 10	44 ± 9	57 ± 7	54 ± 10
M12	46 ± 8	42 ± 9	93 ± 15	81 ± 12	103 ± 15	96 ± 12

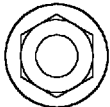
Hexagon nuts

Unit: Nm

Strength Code	4T		6T	
Head Mark				
Nominal Diameter mm	Standard Thread	Coarse Thread	Standard Thread	Coarse Thread
M5	2.5 ± 0.5	-	5 ± 1	-
M6	5 ± 1	-	9 ± 2	-
M8	12 ± 2	-	21 ± 4	-
M10	23 ± 4	22 ± 4	44 ± 10	41 ± 8
M12	41 ± 8	38 ± 8	81 ± 12	73 ± 10

Hexagon flange nuts

Unit: Nm

Strength Code	4T	
Head Mark		
Nominal Diameter mm	Standard Thread	Coarse Thread
M6	5 ± 1	-
M8	13 ± 2	-
M10	26 ± 4	24 ± 4
M12	41 ± 8	42 ± 9