

# SPECIFICATIONS

## SPECIFICATIONS

### GENERAL SPECIFICATIONS

DESCRIPTION	SPECIFICATION	
Type	60° DOHC V-6 24-Valve	
Compression Ratio	10.2:1	
Lead Cylinder	#1 Right Bank	
Firing Order	1-2-3-4-5-6	
	Metric	Standard
Displacement	3.6 Liters	220 Cubic Inches
Bore and Stroke	96.0 x 83.0 mm	3.779 in. x 3.268 in.

### CYLINDER BLOCK

Description	Specification	
	Metric	Standard
Cylinder Bore Diameter - Grade 1	95.995 mm ± 0.005 mm	3.7793 in. ± 0.0002 in.
Cylinder Bore Diameter - Grade 2	96.005 mm ± 0.005 mm	3.7797 in. ± 0.0002 in.
Cylinder Bore Out-of-Round (Max.)	0.009 mm	0.00035 in.
Cylinder Bore Cylindricity	0.014 mm	0.0006 in.
Crankshaft Bore Taper* (Max.)	0.006 mm	0.0002 in.
*Measured over length of bulkhead		

### PISTONS

Description	Specification	
	Metric	Standard
Material	Cast Aluminum Alloy	
Piston Diameter (Metal to Metal) - Grade 1	95.955 mm ± 0.005 mm	3.7778 in. ± 0.0002 in.
Piston Diameter (Metal to Metal) - Grade 2	95.965 mm ± 0.005 mm	3.7781 in. ± 0.0002 in.
Piston Diameter (Metal to Coating) - Grade 1	95.970 - 96.000 mm	3.7783 - 3.7795 in.
Piston Diameter (Metal to Coating) - Grade 2	95.980 - 96.010 mm	3.7787 - 3.7835 in.
Clearance at Size Location (Metal to Metal)	0.030 - 0.050 mm	0.0012 - 0.0020 in.
Clearance at Size Location (Metal to Coating)	0.010 - 0.030 mm	0.0004 - 0.0012 in.
Piston Weight	354 - 364 grams	12.487 - 12.840 oz.
Piston Pin Offset	0.8 mm	0.031 in.
Piston Ring Groove Diameter - No. 1	88.24 - 88.44 mm	3.474 - 3.482 in.
Piston Ring Groove Diameter - No. 2	86.54 - 86.74 mm	3.407 - 3.415 in.

Piston Ring Groove Diameter - No. 3	89.16 - 89.36 mm	3.510 - 3.518 in.
-------------------------------------	------------------	-------------------

### PISTON PINS

Description	Specification	
	Metric	Standard
Type	Full Floating	
Pin Diameter	21.9985 ± 0.0015 mm	0.86608 ± 0.00006 in.
Clearance in Piston	0.002 - 0.011 mm	0.0001 - 0.0004 in.
Clearance in Rod	0.011 - 0.024 mm	0.0004 - 0.0009 in.

### PISTON RINGS

Description	Specification	
	Metric	Standard
Ring Gap - Number 1 Ring (Top)	0.25 - 0.40 mm	0.010 - 0.016 in.
Ring Gap - Number 2 Ring (Center)	0.30 - 0.45 mm	0.012 - 0.018 in.
Ring Gap - Oil Control Ring (Steel Rails)	0.15 - 0.66 mm	0.006 - 0.026 in.

### PISTON RING SIDE CLEARANCE

Description	Specification	
	Metric	Standard
Number 1 Ring (Top)	0.025 - 0.083 mm	0.0010 - 0.0033 in.
Number 2 Ring (Center)	0.030 - 0.078 mm	0.0012 - 0.0031 in.
Oil Control Ring (Steel Rails)	0.007 - 0.173 mm	0.0003 - 0.0068 in.

### PISTON RING WIDTH

Description	Specification	
	Metric	Standard
Number 1 Ring (Top)	3.00 - 3.20 mm	0.118 - 0.126 in.
Number 2 Ring (Center)	3.59 - 3.85 mm	0.141 - 0.152 in.
Oil Control Ring (Steel Rails)	1.930 - 2.083 mm	0.076 - 0.082 in.

### CONNECTING RODS

Description	Specification	
	Metric	Standard
Bearing Clearance (With Crush)	0.023 - 0.064 mm	0.0009 - 0.0025 in.
Side Clearance	0.070 - 0.370 mm	0.0028 - 0.0146 in.
Side Clearance (Max.)	0.370 mm	0.0146 in.
Piston Pin Bore Diameter	22.016 ± 0.005 mm	0.8668 ± 0.0002 in.
Bearing Bore Out of Round (Max.)	0.008 mm	0.0003 in.
Total Weight (Less Bearing)	546.7 ± 8 grams	19.28 ± 0.28 oz.

### CRANKSHAFT MAIN BEARING JOURNALS

Description	Specification	
	Metric	Standard

Diameter	71.996 ± 0.009 mm	2.8345 ± 0.0035 in.
Bearing Clearance	0.024 - 0.050 mm	0.0009 - 0.0020 in.
Bearing Clearance (Max.)	0.050 mm	0.0020 in.
Out of Round (Max.)	0.005 mm	0.0002 in.
Taper (Max.)	0.005 mm	0.0002 in.
End Play	0.050 - 0.290 mm	0.0020 - 0.0114 in.
End Play (Max.)	0.290 mm	0.0114 in.

### CONNECTING ROD JOURNALS

Description	Specification	
	Metric	Standard
Diameter	59.0 ± 0.009 mm	2.3228 ± 0.0035 in.
Bearing Clearance	0.023 - 0.064 mm	0.0009 - 0.0025 in.
Out of Round (Max.)	0.005 mm	0.0002 in.
Taper (Max.)	0.005 mm	0.0002 in.

### CAMSHAFT

Description	Specification	
	Metric	Standard
Bore Diameter - No. 1 Cam Towers	32.020 - 32.041 mm	1.2606 - 1.2615 in.
Bore Diameter - No. 2, 3, 4 Cam Towers	24.020 - 24.041 mm	0.9457 - 0.9465 in.
Bearing Journal Diameter - No. 1	31.976 - 31.995 mm	1.2589 - 1.2596 in.
Bearing Journal Diameter - No. 2, 3, 4	23.977 - 23.996	0.9440 - 0.9447 in.
Bearing Clearance - No. 1	0.025 - 0.065 mm	0.00010 - 0.0026 in.
Bearing Clearance - No. 2, 3, 4	0.024 - 0.064 mm	0.0009 - 0.0025 in.
End Play	0.075 - 0.251 mm	0.003 - 0.010 in.

### VALVE TIMING-INTAKE VALVES

Description	Specification
Opens	2° (ATDC)
Closes	82° (ABDC) or 262° (ATDC)
Duration	260°
Centerline	128°

Note: Units are in crank degrees, using 0.1524 mm (0.006 in.) valve lift as the threshold.

### VALVE TIMING-EXHAUST VALVES

Description	Specification
Opens	59° (BBDC) or 239° (BTDC)
Closes	12° (ATDC)
Duration	251°
Valve Overlap	10°

Note: Units are in crank degrees, using 0.1524 mm (0.006 in.) valve lift as the threshold.

### CYLINDER HEAD

	Specification

<b>Description</b>	<b>Metric</b>	<b>Standard</b>
Gasket Thickness* (Compressed)	0.48 - 0.60 mm	0.019 - 0.024 in.
Flatness (Head Gasket Surface)	0.09 mm	0.0035 in.
Valve Seat Angle	44.75° ± 0.25° from the valve guide axis	
Valve Seat Runout (relative to the valve guide axis) - Intake and Exhaust	0.050 mm	0.002 in.
Intake Valve Seat Width	1.0 - 1.2 mm	0.04 - 0.05 in.
Exhaust Valve Seat Width	1.41 - 1.61 mm	0.055 - 0.063 in.
Guide Bore Diameter (Std.)	6.00 - 6.02 mm	0.236 - 0.237 in.
Valve Guide Height** - Intake and Exhaust	16.05 - 16.55 mm	0.632 - 0.652 in.
*Measured at the fire ring, not at the outer edge **Measured from cylinder head valve spring seat surface to top of guide		

## VALVES

<b>Description</b>	<b>Specification</b>	
	<b>Metric</b>	<b>Standard</b>
Face Angle	45.25° ± 0.25°	
Head Diameter - Intake	39.0 ± 0.100 mm	1.535 ± 0.004 in.
Head Diameter - Exhaust	30.0 ± 0.100 mm	1.181 ± 0.004 in.
Length-Intake (Overall)	116.54 ± 0.23 mm	4.588 ± 0.009 in.
Length-Exhaust (Overall)	115.6 ± 0.23 mm	4.551 ± 0.009 in.
Stem Diameter - Intake	5.968 ± 0.009 mm	0.2350 ± 0.0004 in.
Stem Diameter - Exhaust	5.961 ± 0.009 mm	0.2347 ± 0.0004 in.
Stem-to-Guide Clearance - Intake (New)	0.023 - 0.061 mm	0.0009 - 0.0024 in.
Stem-to-Guide Clearance - Exhaust (New)	0.030 - 0.068 mm	0.0012 - 0.0027 in.
Stem-to-Guide Clearance-Intake (Max., Rocking Method)	0.29 mm	0.011 in.
Stem-to-Guide Clearance - Exhaust (Max., Rocking Method)	0.37 mm	0.015 in.
Valve Lift-Intake (Zero Lash)	10.3 mm	0.406 in.
Valve Lift-Exhaust (Zero Lash)	10.0 mm	0.394 in.
Valve Stem Tip Height* - Intake	52.4 - 53.5 mm	2.063 - 2.106 in.
Valve Stem Tip Height* - Exhaust	51.8 - 52.9 mm	2.039 - 2.083 in.
*Valve tip to aluminum spring seat boss		

## VALVE SPRING

<b>Description</b>	<b>Specification</b>	
	<b>Metric</b>	<b>Standard</b>
Free Length - Intake AND Exhaust (Approx.)	52.5 mm	2.067 in.
Spring Force - Intake AND Exhaust (Valve Closed)	295 ± 13 N @ 40.0 mm	66 ± 3 lbs. @ 1.57 in.
Spring Force - Intake (Valve Open)	688 ± 31 N @ 10.3 mm	155 ± 7 lbs. @ 0.4055 in.
Spring Force - Exhaust (Valve Open)	676 ± 30 N @ 10.0 mm	152 ± 6 lbs. @ 0.3937 in.

Number of Coils - Intake AND Exhaust	9.35	
Wire Diameter - Intake AND Exhaust	3.18 x 3.99 mm (ovate)	0.125 x 0.157 in. (ovate)
Installed Height - Intake AND Exhaust (Spring seat top to bottom of retainer)	40.0 mm	1.575 in.

## OIL PRESSURE

Description	Specification	
	Metric	Standard
(NOTE: At Normal Operating Temperatures)		
Pressure @ Curb Idle Speed*	34.7 kPa Min.	5 psi Min.
Pressure @ 600 - 1200 RPM	34.7 (warm) - 958.0 (cold) kPa	5 (warm) - 139 (cold) psi
Pressure @ 1201 - 3500 RPM	206.8 (warm) - 958.0 (cold) kPa	30 (warm) - 139 (cold) psi
Pressure @ 3501 - 6400 RPM	427.0 (warm) - 958.0 (cold) kPa	62 (warm) - 139 (cold) psi
*CAUTION: If oil pressure is zero at idle, DO NOT run engine at 3000 RPM.		

## TORQUE SPECIFICATIONS

DESCRIPTION	N.m	Ft. Lbs.	In. Lbs.
Air Inlet Hose - Band Clamps	4	-	35
A/C Compressor to Engine - M8 Bolts	25	18	-
Camshaft Chain Tensioner (Primary) - M6 T30	12	-	106
Camshaft Chain Guide (Primary) - M6 T30	12	-	106
Camshaft Chain Idler Sprocket - M8 T45	25	18	-
Camshaft Chain LH Tensioner (Secondary) - M6 T30	12	-	106
Camshaft Chain LH Guide (Secondary) - M6 T30	12	-	106
Camshaft Chain RH Tensioner (Secondary) - M6 T30	12	-	106
Camshaft Chain RH Guide (Secondary) -	12	-	106

M6 T30			
Camshaft Position (CMP) Sensor to Cylinder Head - 6M T30	9	-	80
Camshaft Bearing Cap - M6 T30	9.5	-	84
Connecting Rod Cap - M9 Bolts	20 + 90° Turn	15 + 90° Turn	-
Coolant Pump to Engine Timing Cover - M6 Bolts	12	-	106
Coolant Crossover Housing to Engine Timing Cover - M6 Bolts	12	-	106
Coolant Pump to Engine Timing Cover - M10 Bolt	55	40	-
Crankshaft Target Wheel to Counterweight - M6 T30	10	-	89
Crankshaft Outer Main Bearing Cap and Windage Tray - M8 Bolts	21 + 90° Turn	16 + 90° Turn	-
Crankshaft Inner Main Bearing Cap - M11 Bolts	20 + 90° Turn	15 + 90° Turn	-
Crankshaft Side Main Bearing Cap (Tie Bolt) - M8 Bolts	28	-	250
Crankshaft Vibration Damper - M16 Bolt	40 + 105° Turn	30 + 105° Turn	-
Crankshaft Position (CKP) Sensor to Engine Block - M6 Bolt	12	-	106

Crankshaft Rear Oil Seal Retainer - M6 T30	12	-	106
Cylinder Head Oil Restrictor - M8 Plug	15	-	133
Cylinder Head to Engine Block - M12 Bolts in Sequence	See <b><u>INSTALLATION</u></b> Procedure.		
Cylinder Head Cover - M6 Bolts	12	-	106
Catalytic Converter to Cylinder Head - M8 Bolts	23	17	-
Engine Coolant Temperature (ECT) Sensor	11	-	97
Engine Block Heater - M6 Bolt	12	-	106
Left/Right Engine Mount Bracket to Engine Block - M10 Bolts	61	45	-
Left/Right Engine Mount Isolator to Engine Mount Bracket - M10 Nuts	61	45	-
Left/Right Engine Mount Heatshield to Engine Mount Bracket - M6 Bolts	12	-	106
Left/Right Engine Mount Isolator to Frame - M10 Bolts	61	45	-
Flexplate to Crankshaft - M10 Bolts	95	70	-
Fuel Rail to Lower Intake Manifold - M6 Bolts	7	-	62

Generator - M8 Bolts	25	18	-
Heater Core Supply Tube to Cylinder Head - M8 Bolt	12	-	106
Idler Pulley to Engine Timing Cover - Accessory Drive M8 Bolt	25	18	-
Ignition Capacitor to Cylinder Head - M6 Bolts	10	-	89
Ignition Coil to Cylinder Head Cover - M6 Bolts	8	-	71
Intake Manifold (Upper) - M6 Bolts	8	-	71
Intake Manifold (Lower) - M6 Bolts	8	-	71
Knock Sensor to Engine Block - M8 T40	22	16	-
Negative Battery Cable to Battery	5	-	45
Engine Block Oil Gallery - M24 Plugs	10 + 1250° Turn	-	89 + 1250° Turn
Oil Control Valve - Cam Phaser M18	150	111	-
Upper Oil Pan to Engine Block - M8 Bolts	25	18	-
Transmission to Upper Oil Pan - M10 Bolts	55	41	-
Transmission to Starter - M10 Bolts	55	41	-
Torque Converter Dust Shield - M8 Bolt	12	-	106
Oil Cooler to Oil			



Filter Housing Screws	4	-	35
Upper Oil Pan to Rear Seal Retainer - M6 Bolts	12	-	106
Oil Pan Drain - Plug M14	27	20	-
Oil Pressure Sensor to Oil Filter Housing	20	-	177
Oil Temperature Sensor to Oil Filter Housing	20	-	177
Lower Oil Pan to Upper Oil Pan - M6 Bolts	10.5	-	93
Piston Oil Cooler Jet to Engine Block - M5	6	-	53
Oil Filter Housing/Oil Cooler to Engine Block - M6 Bolts	12	-	106
Oil Filter Housing Cap	25	18	-
Oil Pump to Block - M6 Bolts	12	-	106
Oil Level Indicator to Engine Block - M10 Bolt	35	26	-
Oil Level Indicator to Cylinder Head - M6 Bolt	12	-	106
Oil Pump Sprocket - M8 T45	25	18	-
Oil Pump Pick Up Tube Bracket to Windage Tray - M6 Bolt	12	-	106
Oil Pump Pick Up Tube to Oil Pump - M6 Bolt	12	-	106

Oxygen Sensor to Exhaust Pipe - M18	50	37	-
PCV Valve - M5 T25	4	-	35
Power Steering Pump to Bracket - M8 Bolts	25	18	-
Power Steering Pump Bracket to Engine - M8 Bolts	25	18	-
Spark Plug to Cylinder Head - M12	17.5	13	-
Starter Mounting - M10 Bolts	55	41	-
Tensioner to Engine Timing Cover - Accessory Drive M10 Bolt	55	41	-
Thermostat Housing to Coolant Crossover - M6 Bolts	12	-	106
Throttle Body - M6 Bolts	7	-	62
Engine Timing Cover - M6 Bolts	12	-	106
Engine Timing Cover - M8 Bolt	25	18	-
Engine Timing Cover - M10 Bolts	55	41	-
Transmission to Engine Block - M10 Bolts	55	41	-
Transmission Fluid Indicator to Transmission - M6 Bolt	12	-	106
Torque Converter - M8 Bolts	42	31	-
Upper Intake Manifold			

Support Bracket to Cylinder Head - M8 Bolt	20	-	177
Upper Intake Manifold Support Bracket to Upper Intake Manifold - M6 Nuts	10	-	89
Variable Valve Timing Solenoid to Cylinder Head Cover - M5 T25	4	-	35
Wire Harness Retainer Bracket to LH Cylinder Head - M6 T30	12	-	106
Rear Engine Mount Bracket to Transmission - M8 Bolts	33	24	-
Rear Engine Mount Isolator to Rear Engine Mount Bracket - M10 Bolts	61	45	-
Rear Engine Mount Crossmember to Frame - M10 Bolts	55	41	-
Rear Engine Mount Isolator to Crossmember - M10 Bolts	61	45	-
Left/Right Crossmember Brace to Crossmember - M8 Bolts	55	41	-
Left/Right Crossmember Brace to Frame - M8 Bolts	55	41	-