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«Group 03: ENGINE»

«Section 03-01B: Engine, 3.0L SHO»

## SPECIFICATIONS

### TORQUE SPECIFICATIONS

Description	N-m	Lb-Ft
Crankshaft Pulley Bolt	152-172	113-126
Transaxle-to-Engine Bolts	34-47	25-35
Catalyst-to-Engine Bolts	27-47	19-34
Oil Drain Plug	20-33	15-24
A/C Compressor Bracket Bolts	36-55	27-40
Alternator Retaining Bolts	48-72	36-53
Insulator-to-Engine Bracket	54-75	40-55
RH Front and Rear Insulator-to-Frame Nuts	68-95	50-70
Roll Damper Nuts	54-75	40-55
Engine Damper Bolts	54-75	40-55
LH Insulator-to-Bracket Nuts	54-75	40-55
LH Insulator-to-Transaxle	95-130	70-95
LH Insulator-to-Frame	81-116	60-85
RH Engine Damper-to-Engine Bracket	28-41	21-30
RH Engine Bracket-to-Shock Tower Bolts	54-75	40-55
LH Engine Damper Flag Nut	28-41	21-30
Timing Belt Cover Bolts (Front)	7-11	60-90 (Lb-In)
Tension Locknut	33-51	25-37
Water Pump Pulley Nut	16-23	12-16
Power Steering Pump Pulley	54-68	40-50
Wheel Lug Nuts	115-142	85-105
Throttle Body Bolts	16-23	12-16
Idler Pulley Nut	34-50	25-36
Alternator/A/C Pulley and Bracket Bolts	15-23	11-16

Intake Manifold Crossover Tube Nuts	15-23	11-66
Water Pump Retaining Bolts	16-23	12-16
Cylinder Head Cover Bolts	9.8-16	8-11
Intake Manifold Retaining Bolts	15-23	11-16
Intake Manifold Bracket Bolts	15-23	11-16
Thermostat Housing Retaining Nuts	7-11	5-8
Cylinder Head Bolts	(1)	(1)
Upper Oil Battle Bolts	15-23	11-16
Connecting Rod Nuts	(4)	(4)
Oil Pump Retaining Bolts	15-23	11-16
Oil Sump-to-Oil Pump Bolts	7-11	6-8
Oil Pan Retaining Bolts	15-23	11-16
EGR Valve Retaining Bolts	15-23	11-16
Engine Coolant Temperature Sensor	16-24	12-17
Knock Sensor	29-39	22-28
Oil Level Sensor	21-33	16-24
Oil Pressure Sending Switch	16-24	12-17
Camshaft Sensor	7-11	6-8
Crankshaft Sensor	1.5-2.5	14-22 (Lb-In)
Throttle Position Sensor	2-3	18-26 (Lb-In)
Exhaust Manifold-to-Cylinder Head	35-52	26-38
Heat Shield Retaining Bolts	15-23	11-16
Exhaust Pipe-to-Manifold Nuts	21-32	16-24
Main Bearing Cap Bolts	(2)	(2)
Main Bearing Support Beam	21-32	15-24
Oil Seal Carrier Bolts	6.3-9.4	55-82 (Lb-In)
Oil Pick-Up Tube Bolts	7.1-11	60-90 (Lb-In)
Oil Pick-Up Tube Nuts	21-32	15-24
Flywheel Bolts	(3)	(3)
Pressure Plate Retaining Bolts	16-33	12-24
Camshaft Sprocket Bolts	14-18	10-13

Camshaft Caps	16-22	12-16
Chain Tensioner Retaining Bolts	15-19	11-14
Timing Belt Rear Cover Bolts	8.8	70 (Lb-In)
Camshaft Pulley Bolts	21-25	15-18
Ignition Coil Pack Screws	4.5-7	3.3-5.2
Ignition Coil Pack Bracket Bolts	28-42	21-31
Fuel Rail Retaining Bolts	15-23	11-16
Spark Plugs	22-27	17-19
Engine Lifting Eye Bolts	15-23	11-16
Alternator Retaining Bolts	34-50	25-36
EGR Tube to Exhaust Manifold	15-23	11-16
HEGO Sensor	37-45	27-33
Crankshaft Sensor Retaining Bolts	1.5-2.5	13-22 (Lb-In)
Camshaft Bearing Caps	(5)	(5)
Oil Screen Bolts	7-11	6-8

- (1) Tighten in two steps: 49-69 N-m (37-50 Lb-Ft) 83-93 N-m (62-68 Lb-Ft)
- (2) Tighten in two steps: 46-69 N-m (34-50 Lb-Ft) 78-88 N-m (58-65 Lb-Ft)
- (3) Tighten in two steps: 39-50 N-m (29-43 Lb-Ft) 69-78 N-m (51-58 Lb-Ft)
- (4) Tighten in two steps: 30-35 N-m (22-26 Lb-Ft) 45-50 N-m (33-36 Lb-Ft)
- (5) Tighten in two steps: 8-12 N-m (71-106 Lb-In) 16-22 N-m (12-16 Lb-Ft)

**GENERAL SPECIFICATIONS**

DISPLACEMENT	3.0L
NUMBER OF CYLINDERS	6
BORE AND STROKE	
Bore	89.00mm (3.5039 in.)
Stroke	80.00mm (3.1496 in.)
FIRING ORDER	1-4-2-5-3-6
OIL PRESSURE (HOT, Idling)	Min 12.8 PSI
DRIVE BELT TENSION	SEE CHART

**CYLINDER HEAD AND VALVE TRAIN**

COMBUSTION CHAMBER VOLUME (cc)	47.0-48.0
VALVE GUIDE BORE DIAMETER	
Intake and Exhaust	6.000-6.018 mm (0.2362-0.2369 in.)
VALVE SEATS	
Width — Intake	1.0-1.4mm (0.039-0.055 in.)
— Exhaust	1.0-1.4mm (0.039-0.055 in.)
Angle	45°
Width Limit	1.5mm (0.06 in.)
GASKET SURFACE FLATNESS	0.2mm (0.008 in.)
VALVE STEM TO GUIDE CLEARANCE	
Intake	0.025-0.058mm (0.0010-0.0023 in.)
Exhaust	0.030-0.063mm (0.0012-0.0025 in.)
VALVE HEAD DIAMETER (GAGE)	
Intake	35mm (1.38 in.)
Exhaust	30mm (1.18 in.)
MARGIN THICKNESS LIMIT	0.5mm (0.02 in.)
VALVE FACE ANGLE	45.5°
VALVE STEM DIAMETER (STD.)	
Intake	5.960-5.975mm (0.2346-0.2352 in.)
Exhaust	5.955-5.970mm (0.2344-0.2350 in.)
VALVE SPRINGS	
Compression Pressure (Kg [Lb] @ Spec. Length)	
Maximum Load	537.4 N (120.8 lbs.) @ 30.2mm (1.19 in.)
Set Load	188.3 N (42.3 lbs.) @ 38.7mm (1.52 in.)
Free Length (Approximate)	44.82mm (1.76 in.)
Service Limit	10% Force Loss @ Specified Height
VALVE LIFTER	
Diameter (Std.)	31.970-31.994mm (1.2587-1.2596 in.)
Clearance to Bore	0.024-0.036mm (0.0009-0.0014 in.)
Service Limit	0.07mm (0.003 in.)
VALVE CLEARANCE	
Intake	0.15-0.25mm (0.006-0.010 in.)
Exhaust	0.25-0.35mm (0.010-0.014 in.)
CAMSHAFT BORE INSIDE DIAMETER	
All	31.000-31.025mm (1.2205-1.2215 in.)

**CAMSHAFT**

LOBE LIFT	
Intake	8.5mm (0.335 in.)
Exhaust	8.0mm (0.315 in.)
LOBE HEIGHT	
Intake	41.81-41.91mm (1.6461-1.650 in.)
Limit	41.80mm (1.6457 in.)
Exhaust	41.31-41.41mm (1.6264-1.6303 in.)
Limit	41.30mm (1.6260 in.)
END PLAY	
Service Limit	0.30mm (0.012 in.)
JOURNAL TO BEARING CLEARANCE	0.025-0.066mm (0.0010-0.0026 in.)
JOURNAL DIAMETER	
All	30.959-30.975mm (1.2189-1.2195 in.)

**CYLINDER BLOCK**

HEAD GASKET SURFACE FLATNESS	0.05mm (0.002 in.)
CYLINDER BORE	
Diameter	89.000-89.030mm (3.5039-3.5051 in.)
Surface Finish (RMS) micrometers	TBD
Out-of-Round Limit	0.01mm (0.0004 in.)
Out-of-Round Service Limit	0.02mm (0.0008 in.)
Taper Service Limit	0.02mm (0.0008 in.)
MAIN BEARING BORE DIAMETER	68.000mm (2.677 in.)

**CRANKSHAFT AND FLYWHEEL**

MAIN BEARING JOURNAL	
DIAMETER	63.976-64.000mm (2.5187-2.5197 in.)
Out-of-Round Limit	0.02mm (0.0008 in.)
Taper Limit	0.02mm (0.0008 in.) TOTAL
Journal Runout Limit	0.06mm (0.0024 in.)
THRUST BEARING	
Thickness	2.227-2.277mm (0.0877-0.0896 in.)
CONNECTING ROD JOURNAL	
Diameter	51.976-52.000mm (2.0463-2.0472 in.)
Out-of-Round Limit	0.02mm (0.0008 in.) MAX
Taper Limit	0.02mm (0.0008 in.) TOTAL

**FLYWHEEL RING GEAR LATERAL RUNOUT (T.I.R.)**

CRANKSHAFT END PLAY	0.021-0.221mm (0.0008-0.0087 in.)
CONNECTING ROD BEARINGS	
Clearance to Crankshaft	
Desired	0.024-0.056mm (0.0009-0.0022 in.)
Allowable	0.08mm (0.0031 in.)
Bearing Wall Thickness (Std.)	1.484-1.496mm (0.0584-0.0589 in.)
MAIN BEARINGS	
Clearance to Crankshaft	
Desired	0.028-0.056mm (0.0011-0.0022 in.)
Allowable	0.08mm (0.0031 in.)
Bearing Wall Thickness (Std.)	1.981-1.998mm (0.0780-0.0787 in.)

**CONNECTING ROD, PISTON AND RINGS**

CONNECTING ROD	
Piston Pin Bore Diameter	21.005-21.017mm (0.8270-0.8274 in.)
Crankshaft Bearing Bore Diameter	55.000-55.016mm (2.1653-2.1660 in.)
Length (Center-to-Center)	146.75-146.85mm (5.778-5.781 in.)
ALIGNMENT (BORE-TO-BORE MAX. DIFF.)	
Twist	0.15 per 100mm (0.0015 per in.)
Bend	0.05 per 100mm (0.0005 per in.)
SIDE CLEARANCE (ASSEMBLED TO CRANK)	
Standard	0.16-0.312mm (0.0063-0.0123 in.)
Service Limit	0.35mm MAX. (0.0138 in. MAX.)

**PISTON**

Diameter	
Coded (STD.)	88.960-88.990mm (3.5023-3.5035 in.)
Coded (O/S: 0.25)	TBDmm (TBD in.)
Coded (O/S: 0.50)	TBDmm (TBD in.)
PISTON-TO-BORE CLEARANCE	0.030-0.050mm (0.0012-0.0020 in.)
Service Limit	0.080mm MAX.
RING GROOVE WIDTH	
Compression (Top)	1.21-1.23mm (0.0476-0.0484 in.)
Compression (Bottom)	1.505-1.525mm (0.0593-0.0600 in.)
Oil	2.81-2.83mm (0.1106-0.1114 in.)
PISTON PIN	
Length	61.9-62.0mm (2.437-2.441 in.)
Diameter	20.997-21.009mm (0.8267-0.8271 in.)
PIN TO PISTON CLEARANCE	-0.005 + 0.001mm (-0.00020 + 0.00004 in.)
PIN TO ROD CLEARANCE	0.005-0.011mm (0.00020-0.00043 in.)
PISTON PIN INSTALLING TEMPERATURE	70-80°C (158-176°F)

**PISTON — Continued****PISTON RINGS**

<b>Ring Width</b>	
Compression (Top) .....	1.17-1.19mm (0.0461-0.0469 in.)
Compression (Bottom) .....	1.47-1.49mm (0.0579-0.587 in.)
<b>Ring Gap</b>	
Compression (Top) (In Gauge) .....	0.30-0.45mm (0.012-0.018 in.)
Compression (Bottom) (In Gauge) .....	0.30-0.45mm (0.012-0.018 in.)
Oil Ring (Steel Rail) (In Gauge) .....	0.20-0.50mm (0.008-0.020 in.)
<b>Side Clearance</b>	
1st Ring .....	0.02-0.06mm (0.0008-0.0024 in.)
2nd Ring .....	0.015-0.055mm (0.0006-0.0022 in.)
Oil Ring .....	0.06-0.15mm (0.0024-0.0059 in.)

**LUBRICATION SYSTEM****OIL PUMP**

<b>Relief Valve Spring Tension</b>	
(Force @ Length) .....	6.05 N/mm (34.5 lb./in.)
<b>Relief Valve to Bore Clearance</b> .....	
	0.052-0.068mm (0.0020-0.0035 in.)
<b>Outer and Inner Rotor</b>	
Tip Clearance .....	0.06-0.18mm (0.0024-0.0071 in.)
Rotor to Housing Side Clearance .....	0.03-0.09mm (0.0012-0.0035 in.)
<b>Outer Rotor to Housing</b>	
Radial Clearance .....	0.10-0.175mm (0.0039-0.0069 in.)
<b>Inner Rotor Shaft to</b>	
Housing Clearance .....	0.03-0.095mm (0.0012-0.0037 in.)

**OIL CAPACITY**

Passenger Car: 5.0 qt. with filter change.

**BELT TENSION ALLOWABLE LIMITS**

	Specifications		Allowable Minimum Cold Belt (2) (3) Audit Check
	New Belt (1) Installation Tension	Use Belt (2) Reset Tension	
6 Rib	100-120 kg (220-265 lbs.)	67-87 kg (148-192 lbs.)	N.A.
4 Rib	70-90 kg (154-198 lbs.)	51-71 kg (112-157 lbs.)	

- (1) New belt installed and tensioned/engine not rotated.  
 (2) Used belt is any belt that has rotated on an engine.  
 (3) Cold belt (i.e., 3-hour soak; 0 warm-up).

CA12924-A