

SPECIFICATIONS

General Specifications

Item	Specification
Lubricants and Sealants	
Motorcraft SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP (US); Motorcraft SAE 5W-20 Super Premium Motor Oil CXO-5W20-LSP12 (Canada); or equivalent	WSS-M2C930-A
Motorcraft Premium Gold Engine Coolant with Bittering Agent (US only) VC-7-B (US); CVC-7-A (Canada); or equivalent (yellow color)	WSS-M97B51-A1
Motorcraft Metal Surface Prep ZC-31	—
Silicone Gasket Remover ZC-30	—
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4
Engine	
Displacement	4.6L (281 CID)
Number of cylinders	8
Bore	90.2 mm (3.55 in)
Stroke	90.0 mm (3.54 in)
Firing order	1-3-7-2-6-5-4-8
Oil pressure minimum at 2,000 rpm (engine at normal operating temperature)	517 kPa (75 psi)
Oil capacity	5.7 liters (6 quarts) with filter
Compression ratio	9.8:1
Cylinder Head and Valve Train	
Combustion chamber volume	48.1-51.1 cc (2.94-3.12 cu in)
Valve arrangement (front to rear) — LH	I-E-I-I-E-I-I-E-I-I-E-I
Valve arrangement (front to rear) — RH	I-E-I-I-E-I-I-E-I-I-E-I
Valve guide bore diameter	6.015-6.044 mm (0.237-0.238 in)
Valve stem diameter — intake	5.975-5.995 mm (0.235-0.236 in)

General Specifications (Continued)

Item	Specification
Valve stem diameter — exhaust	5.95-5.97 mm (0.234-0.235 in)
Valve stem-to-guide clearance — intake	0.020-0.069 mm (0.001-0.003 in)
Valve stem-to-guide clearance — exhaust	0.045-0.094 mm (0.002-0.004 in)
Valve head diameter — intake	33.62-33.98 mm (1.324-1.338 in)
Valve head diameter — exhaust	37.32-37.68 mm (1.469-1.483 in)
Valve face runout	0.05 mm (0.002 in)
Valve face angle	45.5 degrees
Valve seat width — intake	1.2-1.4 mm (0.047-0.055 in)
Valve seat width — exhaust	1.4-1.6 mm (0.055-0.063 in)
Valve seat angle	44.5-45.0 degrees
Valve spring free length	56.5 mm (2.22 in)
Valve spring compression pressure (maximum lift)	760 N (79 lbs) ± 39.0 N (4 lbs) @ 31.04 mm (1.22 in)
Valve spring installed height	42.04 mm (1.66 in)
Valve spring installed pressure	350 N (79 lbs) ± 17.5 N (4 lbs) @ 42.04 mm (1.66 in)
Hydraulic Lash Adjuster	
Diameter	15.988-16.000 mm (0.6294-0.6299 in)
Clearance-to-bore	0.018-0.069 (0.0007-0.0027 in)
Service limit	—
Collapsed lash adjuster gap	0.45-0.85 (0.018-0.033)
Camshaft	
Theoretical valve lift @ 0 lash — intake	11.166 mm (0.439 in)
Theoretical valve lift @ 0 lash — exhaust	11.066 mm (0.436 in)
Lobe lift — intake	5.520 mm (0.217 in)
Lobe lift — exhaust	5.506 mm (0.217 in)
Allowable lobe lift loss	0.00127 mm (0.005 in)
Journal diameter	28.607-28.633 mm (1.126-1.127 in)

SPECIFICATIONS (Continued)**General Specifications (Continued)**

Item	Specification
Camshaft journal bore inside diameter	28.657-28.682 mm (1.128-1.129 in)
Camshaft journal-to-bearing clearance	0.024-0.075 mm (0.001-0.003 in)
Runout	0.03 mm (0.001 in)
End play	0.0050-0.250 mm (0.0002-0.009 in)
Cylinder Block	
Cylinder bore diameter — grade 1	90.200-90.210 mm (3.5512-3.5516 in)
Cylinder bore diameter — grade 2	90.210-90.220 mm (3.5516-3.5520 in)
Cylinder bore diameter — grade 3	90.220-90.230 mm (3.5520-3.5524 in)
Cylinder bore maximum taper	0.006 mm (0.0002 in)
Cylinder bore maximum out-of-round	0.020 mm (0.0008 in)
Main bearing bore inside diameter	72.400-72.424 mm (2.850-2.851 in)
Crankshaft	
Main bearing journal diameter	67.481-67.505 mm (2.6567-2.6576 in)
Main bearing journal maximum taper	0.004 mm (0.0002 in)
Main bearing journal maximum out-of-round	0.0075 mm (0.0003 in) between cross sections
Main bearing journal-to-cylinder block clearance	0.048-0.024 mm (0.0019-0.0009 in)
Connecting rod journal diameter	53.003-52.983 mm (2.0867-2.0859 in)
Connecting rod journal maximum taper	0.004 mm (0.0002 in)
Connecting rod journal maximum out-of-round	0.0075 mm (0.0003 in) between cross sections
Crankshaft maximum end play	0.075-0.377 mm (0.0030-0.0148 in)
Piston and Connecting Rod	
Piston diameter — grade 1 (at right angle to pin bore) (uncoated)	90.182-90.167 mm (3.5504-3.5499 in)
Piston diameter — grade 2 (at right angle to pin bore) (uncoated)	90.196-90.179 mm (3.551-3.5503 in)

General Specifications (Continued)

Item	Specification
Piston diameter — grade 3 (at right angle to pin bore) (uncoated)	90.208-90.193 mm (3.5515-3.551 in)
Piston-to-cylinder bore clearance (at grade size)	0.017-0.047 mm (0.0007-0.0019 in)
Piston ring end gap — top	0.15-0.30 mm (0.006-0.012 in)
Piston ring end gap — intermediate	0.25-0.50 mm (0.0098-0.0197 in)
Piston ring end gap — oil control	0.15-0.65 mm (0.0059-0.0256 in)
Piston ring groove width — top	1.52-1.54 mm (0.0598-0.0606 in)
Piston ring groove width — intermediate	1.52-1.54 mm (0.0598-0.0606 in)
Piston ring groove width — oil control	3.030-3.056 mm (0.1193-0.1203 in)
Piston ring width — top and intermediate	1.50-1.48 mm (0.0590-0.0582 in)
Piston ring-to-groove clearance — top	0.020-0.060 mm (0.0008-0.0020 in)
Piston ring-to-groove clearance — intermediate	0.020-0.060 mm (0.0008-0.0020 in)
Piston pin bore diameter	22.0125-22.0175 mm (0.8666-0.8668 in)
Piston pin diameter	22.0010-22.0030 mm (0.8662-0.8663 in)
Piston pin length	61.8 mm (2.433 in)
Piston pin-to-piston fit	0.0095-0.023 mm (0.0004-0.0009 in)
Connecting rod-to-pin clearance	0.009-0.023 mm (0.0004-0.0009 in)
Connecting rod pin bore diameter	22.012-22.024 mm (0.8666-0.8671 in)
Connecting rod length (center-to-center)	150.7 mm (5.933 in)
Connecting rod maximum allowed bend	± 0.038 mm (0.0015 in)
Connecting rod maximum allowed twist ^a	± 0.05 mm (0.0020 in)
Connecting rod bearing bore diameter (with assembled liners)	53.049-53.027 mm (2.0885-2.0877 in)

SPECIFICATIONS (Continued)**General Specifications (Continued)**

Item	Specification
Connecting rod bearing-to-crankshaft clearance	0.024-0.066 mm (0.0009-0.0026 in)
Connecting rod side clearance	0.5-0.15 mm (0.02-0.006 in)

- a The pin bore and crank bearing bore must be parallel and in the same vertical plane within the specified total difference when measured at the ends of a 203 mm bar, 105.5 mm on each side of rod centerline.

Torque Specifications

Description	Nm	lb-ft	lb-in
A/C compressor bolts	25	18	—
Accessory drive belt idler pulley bolts	25	18	—
Accessory drive belt tensioner bolts	25	18	—
Camshaft bearing cap bolts ^a	—	—	—
Camshaft phaser sprocket assembly bolts ^a	—	—	—
Camshaft position (CMP) sensor bolt	10	—	89
Catalytic converter-to-exhaust manifold nuts	40	30	—
Connecting rod bolts ^a	—	—	—
Coolant pump bolts	25	18	—
Coolant pump pulley bolts	25	18	—
Coolant tube stud bolt	10	—	89
Crankshaft main bearing bolts ^a	—	—	—
Crankshaft main bearing bolts (cross-mounted) ^a	—	—	—
Crankshaft main bearing stud bolts ^a	—	—	—
Crankshaft position (CKP) sensor bolt	10	—	89
Crankshaft pulley bolt ^a	—	—	—
Crankshaft rear seal retainer plate bolts ^a	—	—	—

Torque Specifications (Continued)

Description	Nm	lb-ft	lb-in
Cylinder head temperature sensor (CHT)	26	19	—
Cylinder heads bolts ^a	—	—	—
Engine front cover bolts ^a	—	—	—
Engine support bracket bolts	55	41	—
Engine support insulator nuts	63	46	—
Exhaust manifold nuts ^a	—	—	—
Flexplate bolts	80	59	—
Generator B+ terminal nut	8	—	71
Generator lower mounting bolts	25	18	—
Generator lower mounting nuts	25	18	—
Generator mounting bracket bolts	10	—	89
Ground strap-to-cowl bolt	6	—	53
Ground strap-to-cylinder head stud bolt	10	—	89
Ground strap-to-engine support bracket nut	25	18	—
Ignition coil bolts	6	—	53
Intake manifold bolts ^a	—	—	—
Knock sensor (KS)	20	15	—
Oil filter adapter bolts	25	18	—
Oil level indicator tube bolt	10	—	89
Oil pan drain plug	26	19	—
Oil pan bolts ^a	—	—	—
Oil pump bolts	10	—	89
Oil pump screen and pickup tube spacer	25	18	—
Oil pump screen and pickup tube-to-oil pump bolts	10	—	89
Oil pump screen and pickup tube-to-spacer bolt	25	18	—
Power distribution box connector bolt	6	—	53

SPECIFICATIONS (Continued)**Torque Specifications (Continued)**

Description	Nm	lb-ft	lb-in
Power steering pressure tube bracket-to-crossmember bolt	9	—	80
Power steering pump stud bolts	25	18	—
Power steering tube retaining clip nut	10	—	89
Radio interference capacitor nuts	25	18	—
Spark plugs	34	25	—
Steering column coupling pinch bolt	25	18	—
Steering gear bolts	115	85	—
Subframe bolts	115	85	—
Subframe nuts	115	85	—

Torque Specifications (Continued)

Description	Nm	lb-ft	lb-in
Transmission cooler line bracket nut	25	18	—
Throttle body bolts	10	—	89
Throttle body nuts	10	—	89
Timing chain guide bolts	10	—	89
Timing chain hydraulic tensioner bolts	25	18	—
Timing chain tensioner arm bolts	10	—	89
Valve cover bolts ^a	—	—	—
Variable camshaft timing (VCT) housing bolts	10	—	89
Windage tray nuts	25	18	—

a Refer to the procedure in this section.