

**Material**

Item	Specification	Fill Capacity
Motorcraft® Metal Surface Prep ZC-31-A	—	—
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil XO-5W30-QSP (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil CXO-5W30-LSP12 (Canada); or equivalent	WSS-M2C929-A	4.73L (5 qt) with filter
Silicone Brake Caliper Grease and Dielectric Compound XG-3-A	ESE-M1C171-A	—
Silicone Gasket and Sealant TA-30	WSE-M4G323-A4	—
Motorcraft® Silicone Gasket Remover ZC-30	—	—
Thread Sealant with PTFE TA-24	WSK-M2G350-A2	—

**General Specifications**

Item	Specification
<b>Engine</b>	
Displacement	4.0L (244 CID)
Number of cylinders	6
Bore	100.4 mm (3.953 in)
Stroke	84.4 mm (3.32 in)
Firing order	1-4-2-5-3-6
Oil pressure minimum at 2,000 rpm (engine at normal operating temperature)	103 kPa (15 psi)
Engine weight (without accessory drive components and flexplate or flywheel)	189 kg (416.7 lb)
<b>Cylinder Head and Valve Train</b>	
Cylinder head gasket surface flatness	0.08 mm (0.003 in) total
Combustion chamber volume	65.197 ± 2.068-2.018 cc
Valve arrangement (front to rear) — LH	I-E-I-E-I-E
Valve arrangement (front to rear) — RH	E-I-E-I-E-I
Valve guide bore diameter	7.00-7.018 mm (0.276 in)
Valve stem diameter — intake	6.965-6.98 mm (0.274-0.275 in)
Valve stem diameter — exhaust	6.95-6.965 mm (0.27-0.274 in)
Valve stem-to-guide clearance — intake	0.020-0.053 mm (0.001-0.002 in)
Valve stem-to-guide clearance — exhaust	0.035-0.068 mm (0.001-0.003 in)
Valve head diameter — intake	45.9-46.1 mm (1.807-1.815 in)

Valve head diameter — exhaust	38.9-39.1 mm (1.531-1.539 in)
Valve face runout	0.03 mm (0.001 in)
Valve face angle	45 degrees
Valve seat width — intake	1.273-2.121 mm (0.05-0.083 in)
Valve seat width — exhaust	1.556-2.404 mm (0.061-0.095 in)
Valve seat runout	0.059 mm (0.002 in)
Valve seat angle	45 degrees
Valve spring free length	43.1 mm (1.7 in)
Valve spring squareness	± 1.5 deg
Valve spring compression pressure at specified height (lbs)	275-305 Nm at 35.9-36.7 mm (202.84-224.968 lb-ft at 1.413-1.445 in)
Valve spring installed height	39.86-40.86 mm (1.569-1.609 in)
Valve spring installed pressure	320 N (72 lb)
Roller follower ratio	1.98:1
<b>Camshaft</b>	
Theoretical valve lift @ 0 lash	11.93 mm (0.472 in)
Lobe lift	6.584 mm (0.259 in)
Allowable lobe lift loss	0.127 mm (0.005 in)
Journal diameter	27.935-27.96 mm (1.099-1.101 in)
Camshaft journal bore inside diameter	28.0-28.03 mm (1.102-1.104 in)
Camshaft journal-to-bearing clearance	0.04-0.095 mm (0.002-0.004 in)
Runout	0.05 mm (0.002 in)
End play	0.075-0.185 mm (0.003-0.007 in)
<b>Cylinder Block</b>	
Cylinder bore diameter	100.4 mm (3.953 in)
Cylinder bore maximum taper	0.025 mm (0.001 in)
Cylinder bore maximum out-of-round	0.025 mm (0.001 in)
Main bearing bore inside diameter	60.620-60.634 mm (2.387-2.387 in)
Head gasket surface flatness	0.1 mm (0.004 in) overall
<b>Crankshaft</b>	
Main bearing journal diameter	56.980-57.0 mm (2.243-2.244 in)
Main bearing journal maximum taper	0.008 mm (0.0003 in)
Main bearing journal maximum out-of-round	0.008 mm (0.0003 in)
Main bearing journal-to-cylinder block clearance	0.008-0.062 mm (0.0003-0.0024 in)
Connecting rod journal diameter	53.98-54.0 mm (2.125-2.126 in)
Connecting rod journal maximum taper	0.008 mm (0.0003 in)
Connecting rod journal maximum out-of-round	0.008 mm (0.0003 in)
Crankshaft maximum end play	0.05-0.32 mm (0.002-0.0126 in)
<b>Main Bearings</b>	
Clearance to crankshaft	0.015-0.053 mm (0.0006-0.002 in)
Bearing wall thickness	1.8-1.806 mm (0.0709-0.0711 in)
<b>Piston and Connecting Rod</b>	
Piston diameter — coded standard	100.36-100.400 mm (3.951-3.9528 in)
Piston diameter — coded 0.5	100.880-100.900 mm (3.971-3.972 in)

	101.390-101.400 mm (3.991-3.992 in)
Piston-to-cylinder bore clearance	0.030-0.050 mm (0.0012-0.002 in)
Piston ring end gap — top	0.250-0.400 mm (0.009-0.015 in)
Piston ring end gap — bottom	0.40-0.65 mm (0.016-0.025 in)
Piston ring groove width — top	1.23-1.25 mm (0.0484-0.0492 in)
Piston ring groove width — bottom	1.52-1.54 mm (0.0598-0.0606 in)
Piston ring groove width — oil ring	3.01-3.03 mm (0.1185-0.1193 in)
Piston ring width — top	1.170-1.190 mm (0.0460-0.0469 in)
Piston ring width — bottom	1.472-1.490 mm (0.0580-0.0587 in)
Piston ring-to-groove clearance — top	0.040-0.080 mm (0.0016-0.0031 in)
Piston ring-to-groove clearance — bottom	0.030-0.068 mm (0.0012-0.0027 in)
Piston pin bore diameter	24.009-24.013 mm (0.9452-0.9453 in)
Piston pin diameter (red)	23.997-24.000 mm (0.9447-0.9448 in)
Piston pin length	71.8-72.3 mm (2.826-2.846 in)
Piston pin-to-piston fit	0.009-0.016 mm (0.0003-0.0006 in)
Connecting rod pin bore diameter	23.958-23.976 mm (0.943-0.944 in)
Connecting rod length (center-to-center)	145.965-146.035 mm (5.747-5.749 in)
Connecting rod maximum allowed bend	0.0125 mm (0.0004 in) per 25.4 mm (1.000 in)
Connecting rod maximum allowed twist	0.038 mm (0.0015 in) per 25.4 mm (1.000 in)
Connecting rod bearing bore diameter	56.82 mm-56.84 mm (2.237 in-2.238 in)
Connecting rod bearing-to-crankshaft clearance	0.022-0.064 mm (0.0008-0.0025 in)
Connecting rod side clearance	0.092-0.318 mm (0.0036-0.0125 in)

### Torque Specifications

Description	Nm	lb-ft	lb-in
Accessory drive belt tensioner bolt	47	35	—
Accessory drive belt idler pulley bolt	47	35	—
Balance shaft bolts <sup>a</sup>	—	—	—
Balance shaft chain guide bolts	10	—	89
Balance shaft chain tensioner bolts	29	21	—
Bell housing-to-cylinder block cradle bolts	47	35	—
Camshaft bearing cap bolts <sub>a</sub>	—	—	—
Camshaft sprocket bolt	85	63	—
Camshaft sprocket holding tool bolts	10	—	89
Camshaft tensioners	44	32	—
Catalytic converter-to-exhaust manifold nuts	45	33	—
Connecting rod bolts and nuts <sup>a</sup>	—	—	—
Coolant hose bracket bolt	45	33	—
Coolant pump bolts	10	—	89
Coolant tube bracket bolt (M8)	23	17	—
Coolant tube bracket bolt (M12)	34	25	—
Crankshaft Position (CKP) sensor bolts	10	—	89

Crankshaft pulley bolt <sup>a</sup>	—	—	—
Crankshaft main bearing cap bolts <sup>a</sup>	—	—	—
Cylinder block cradle bolts	14	—	124
Cylinder block cradle nuts	10	—	89
Cylinder block cradle bolts (inside) <sup>a</sup>	—	—	—
Cylinder block cradle Torx bolts	10	—	89
Cylinder block cradle rear Torx bolts	10	—	89
Cylinder block cradle inserts	3	—	27
Cylinder head bolts (M8) <sup>a</sup>	—	—	—
Cylinder head bolts (M12) <sup>a</sup>	—	—	—
Engine wiring harness-to-cylinder head bolts	40	30	—
Engine front cover bolts and stud bolts	19	—	168
Engine mount bracket bolts	80	59	—
Engine mount nut	63	46	—
Engine mount bolts	70	52	—
Exhaust manifold-to-EGR system module tube fittings	40	30	—
Exhaust manifold nuts	23	17	—
Exhaust manifold studs	12	—	106
Flexplate/flywheel bolts <sup>a</sup>	—	—	—
Front End Accessory Drive (FEAD) bracket bolts	48	35	—
Fuel rail bolts	23	17	—
Fuel rail supply tube bracket-to-LH valve cover bolt	6	—	53
Fuel rail supply tube bracket-to-LH cylinder head bolt	10	—	89
Generator bracket bolts and nut	47	35	—
Generator B+ terminal nut	8	—	71
Ground cable-to-RH strut tower bolt	10	—	89
Ground strap-to-cylinder block stud bolt	10	—	89
Ground strap-to-LH cylinder head bolt	40	30	—
Hood hinge bolts	12	—	106
Hydraulic chain tensioner, LH	44	32	—
Hydraulic chain tensioner, RH	44	32	—
Ignition coil bracket upper bolts	9	—	80
Ignition coil bracket lower bolts (M12)	34	25	—
Ignition coil bracket lower bolt (M8)	24	18	—
Intake manifold bolts <sup>a</sup>	—	—	—
Jackshaft chain guide bolts	19	—	168
Jackshaft chain tensioner bolts	9	—	80
Jackshaft rear sprocket bolt <sup>a</sup>	—	—	—
Jackshaft front sprocket bolt <sup>a</sup>	—	—	—
Jackshaft thrust plate bolts	11	—	97
Knock Sensor (KS) bolt	20	—	177
LH cassette-to-cylinder head bolt	12	—	106
LH cassette-to-cylinder block bolt	19	—	168

Oil filter <sup>a</sup>	—	—	—
Oil filter adapter bolt	57	42	—
Oil level indicator tube bracket bolt	11	—	97
Oil pan bolts	11	—	97
Oil pan drain plug	26	19	—
Oil pump intermediate shaft bolts	19	—	168
Oil pump bolts	19	—	168
Oil pump drive bolt	19	—	168
Oil pump screen and pickup tube bolt	11	—	97
Power Distribution Box (PDB) B+ terminal bolt	12	—	106
<u>PDB</u> electrical connector bolt	6	—	53
Power Steering Pressure (PSP) tube-to-crossmember bolt	11	—	97
Power steering supply hose bracket-to- <u>FEAD</u> bracket bolt	11	—	97
Power steering pump bolts	25	18	—
Power steering pump pulley bolts	25	18	—
Pressure tube bracket nut	7	—	62
RH cassette-to-cylinder block bolt	12	—	106
RH cassette-to-cylinder head bolt	10	—	89
Spark plug	17	—	150
Starter motor wiring harness retainer bracket bolt	40	30	—
Steering column intermediate shaft-to-steering gear bolt	25	18	—
Steering gear-to-crossmember bolts	115	85	—
Suction hose bracket bolt	8	—	71
Thermostat housing bolts	11	—	97
Valve cover bolts and stud bolts <sup>a</sup>	—	—	—

<sup>a</sup> Refer to the procedure in this section.

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