

SPECIFICATIONS

GENERAL SPECIFICATIONS

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Item	Specification
Lubricants and Sealants	
SAE 5W-20 Premium Synthetic Blend Motor Oil XO-5W20-QSP or equivalent	WSS-M2C153-H
Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) or equivalent ⁽¹⁾	WSS-M97B51-A1 (yellow color)
Metal Surface Cleaner F4AZ-19A536-RA or equivalent	WSE-M5B392-A
Silicone Gasket and Sealant F7AZ-19554-EA or equivalent	WSE-M4G323-A6
Engine	
Displacement	4.6L (281 CID)
Number of cylinders	8
Bore	90.2 mm
Stroke	90.0 mm
Firing order	1-3-7-2-6-5-4-8
Oil pressure (hot @ 1,500 psi)	138-310 kPa (20-45 psi)
Oil capacity	6.1 L (6.4 qts)
Compression ratio	9.3:1
Cylinder Head and Valve Train	
Cylinder head gasket surface flatness	0.05 mm (0.002 in) in any 150 mm x 150 mm (6.0 in x 6.0 in) area
Combustion chamber volume (Cylinder head only)	43.95 +/- 1.5 cc
Valve arrangement (front to rear) - LH	E-I-E-I-E-I-E-I
Valve arrangement (front to rear) - RH	I-E-I-E-I-E-I-E
Valve guide bore diameter	7.044-7.015 mm (0.2773-0.2761 in)
Valve stem diameter - intake	6.995-6.965 mm (0.275-0.2742 in)
Valve stem diameter - exhaust	6.970-6.940 mm (0.274-0.2732 in)
Valve stem-to-guide clearance	0.020-0.079 mm (0.0008-0.0031 in)
Valve head diameter - intake	44.5 mm (1.75 in)
Valve head diameter - exhaust	36.0 mm (1.41 in)
Valve face runout	0.05 mm (0.002 in)
Valve face angle	45.25-45.75 degrees
Valve seat width	1.9-2.1 mm (0.0748-0.0827 in)
Valve seat runout (T.I.R.) max.	0.025 mm (0.001 in)
Valve seat angle	44.51-45.01 degrees
Valve spring free length	53.37 mm (2.10 in) +/- 1.0 mm (0.039 in)
Valve spring squareness	2 degrees
Valve spring compression pressure	720.0-800.0 N @ 28.80 mm
Valve spring installed height	39.7-40.3 mm (1.5630-1.5866 in)

Valve spring installed pressure	283.0-321.0 N @ 42.56 mm
Rocker arm ratio	1.80:1
Hydraulic Lash Adjuster	
Diameter	16.000-15.988 mm (0.66-0.629 in)
Clearance-to-bore	0.018-0.069 mm (0.0007-0.0027 in)
Service limit	0.016 mm (0.0006 in)
Hydraulic leakdown rate	5-25 seconds
Collapsed lash adjuster gap	0.085-0.45 mm (0.0335-0.0177 in)
Camshaft	
Theoretical valve lift @ 0 lash - intake	13.006 mm (0.512 in)
Theoretical valve lift @ 0 lash - exhaust	13.753 mm (0.541 in)
Lobe lift - intake	7.11038 mm (0.2799 in)
Lobe lift - exhaust	7.49744 mm (0.2951 in)
Allowable lobe lift loss	0.0 mm (0.000 in)
Journal diameter	26.962-26.936 mm (1.061-1.060 in)
Camshaft journal bore inside diameter	27.012-26.987 mm (1.063-1.0625 in)
Camshaft journal-to-bearing clearance	0.025-0.076 mm (0.00098-0.003 in)
Runout	0.05 mm (0.002 in)
End play	0.09-0.19 mm (0.0035-0.0075 in)
Cylinder Block	
Cylinder bore diameter - grade 1	90.200-90.213 mm (3.5512-3.5517 in)
Cylinder bore diameter - grade 2	90.213-90.226 mm (3.5517-3.5522 in)
Cylinder bore diameter - grade 3	90.226-90.239 mm (3.5522-3.5527 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	72.401-72.422 mm (2.85-2.851 in)
Head gasket surface flatness	0.05 mm (0.0020 in) in any 150 mm x 150 mm (6.0 in x 6.0 in) area
Crankshaft	
Main bearing journal diameter	67.483-67.503 mm (2.65-2.657 in)
Main bearing journal maximum taper	0.020 mm (0.0007 in)
Main bearing journal maximum out-of-round	0.05 mm (0.002 in)
Main bearing journal-to-cylinder block clearance	0.025-0.045 mm (0.0009-0.0018 in)
Connecting rod journal diameter	52.983-53.003 mm (2.0819-2.0867 in)
Connecting rod journal maximum taper	0.015 mm (0.0005 in)
Connecting rod journal maximum out-of-round	0.05 mm (0.0020 in)
Crankshaft maximum end play	0.130-0.301 mm (0.0051-0.0118 in)
Diameter-surface finish (RMS)	0.2-0.6 Microns
Diameter-out-of-round limit mm (inch)	0.015 (0.0006)
Diameter-out-of-round service limit mm (inch)	0.020(0.00079)
Diameter-taper service limit mm (inch)	0.006 (0.00023)
Piston and Connecting Rod	
Piston diameter - coded red 1	90.177-90.197 mm (3.550-3.551 in)
Piston diameter - coded blue 2	90.190-90.210 mm (3.5507-3.5515 in)

Piston diameter - coded yellow 3	90.203-90.223 mm (3.513-3.5521 in)
Piston-to-cylinder bore clearance	0.012-0.026 mm (0.0005-0.001 in)
Piston ring end gap - top and bottom	0.23-0.49 mm (0.01-0.02 in)
Piston ring end gap - oil ring (steel rail)	0.05-0.66 mm (0.006-0.026 in)
Piston ring groove width - compression (top)	1.520-1.550 (0.06-0.610 in)
Piston ring groove width - compression (bottom)	1.520-1.530 mm (0.060-0.0602 in)
Piston ring groove width - oil ring	6.996-7.224 mm (0.275-0.2844 in)
Piston ring width - compression	1.49-1.47 mm (0.0587-0.0579 in)
Piston ring width - oil ring rail (2)	0.473-0.447 mm (0.0186-0.0176 in), 0.483 mm (0.0190 in) max. at ID
Piston ring width - oil ring expander	2.038-1.960 mm (0.080-0.077 in)
Piston ring-to-groove clearance - compression	0.030-0.070 mm (0.0012-0.0028 in)
Piston ring-to-groove clearance - oil ring assembly	0.046-0.196 mm (0.0018-0.0077 in)
Piston pin bore diameter	22.0125-22.0125 mm (0.8666-0.8668 in)
Piston pin diameter	22.001-22.003 mm (0.8662-0.8663 in)
Piston pin length	62.030 mm (2.44 in)
Piston pin-to-piston fit	0.009-0.0165 mm (0.0003-0.0006 in)
Connecting rod-to-pin clearance	0.009-0.023 mm (0.0003-0.0009 in)
Connecting rod pin bore diameter	22.012-22.024 mm (0.866-0.867 in)
Connecting rod length (center-to-center)	150.7 mm (5.93 in)
Connecting rod maximum allowed bend	0.038 mm per 25 mm (0.0015-0.984 in)
Connecting rod maximum allowed twist	0.050 mm per 25 mm (0.00197 per 0.9843 in)
Connecting rod bearing bore diameter	56.866-56.886 mm (2.238-2.239 in)
Connecting rod bearing-to-crankshaft clearance	0.027-0.069 mm (0.001-0.0027 in)
Connecting rod side clearance - assembled to crank (standard)	0.15-0.45 mm (0.0059-0.0177 in)
Accessory Drive Belt	
Drive belt	6 ribs
(1) The addition of Motorcraft Cooling System Stop Leak Pellets, VC-6, darkens Motorcraft Premium Gold Engine Coolant from yellow to golden tan.	

TORQUE SPECIFICATIONS

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Description	Nm	lb-ft	lb-in
Valve cover bolts	10	-	89
Camshaft bearing cap bolts	10	-	89
Camshaft sprocket bolts (1)	-	-	-
Cylinder head temperature (CHT) sensor	26	19	-
Camshaft position (CMP) sensor bolt	10	-	89
Crankshaft position (CKP)	10	-	89

sensor bolt			
Connecting rod bolts ⁽¹⁾	-	-	-
Crankshaft damper pulley bolt ⁽¹⁾	-	-	-
Crankshaft main bearing bolts (cross-mounted) ⁽¹⁾	-	-	-
Crankshaft main bearing bolts (vertical) ⁽¹⁾	-	-	-
Cylinder head bolts ⁽¹⁾	-	-	-
Exhaust gas recirculation (EGR) tube nuts	40	30	-
EGR system module bolts	25	18	-
Exhaust manifold nuts ⁽¹⁾	20	15	-
Drive belt idler pulley bolt	25	18	-
Drive belt tensioner pulley bolt	25	18	-
Flexplate bolts	80	59	-
Engine front cover bolts ⁽¹⁾	25	18	-
Fuel injection supply manifold bracket bolts	10	-	89
Heater return tube studs	40	30	-
Ignition coil	6	-	53
Intake manifold bolts ⁽¹⁾	25	18	-
Knock sensor (KS)	20	15	-
Oil filter	15	11	-
Oil filter adapter bolt	25	18	-
Oil level indicator tube bolt	10	-	89
Oil tube connector adapter assembly bolt	25	18	-
Oil pan bolts l _a	-	-	-
Oil pan drain plug	14	10	-
Oil pressure switch	10	-	89
Oil pump bolts	10	-	89
Oil pump screen cover and tube bolts ⁽¹⁾	-	-	-
Oil pump screen cover and tube spacer	25	18	-
Oil pump screen cover and tube spacer bolt	25	18	-
Power steering pump bolts ⁽¹⁾	25	18	-
Rear main oil seal retainer	10	-	89

bolts			
Spark plugs	15	11	-
Thermostat housing bolts	25	18	-
Throttle body adapter to intake manifold bolts	10	-	89
Electronic throttle body to throttle body adapter bolts (1)	-	-	-
Timing chain guide bolts	10	-	89
Timing chain hydraulic tensioner bolts	25	18	-
Coolant pump bolts	25	18	-
Coolant pump pulley bolts	25	18	-
Heater coolant inlet tube	15	11	-
EGR system module to exhaust manifold tube fittings (1)	-	-	-
Brake booster vacuum hose bracket nut	10	-	89
Power steering bracket upper bolts	10	-	89
Power steering bracket lower bolts	40	30	-
Motor mount nuts	70	52	-
Motor mount through bolts	103	76	-
Oil pressure switch	15	11	-
Fan shroud bolts	7	-	68

(1) Refer to the procedure in this article.