

SPECIFICATIONS

GENERAL SPECIFICATIONS

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Item	Specification
Lubricants and Sealants	
SAE 5W-20 Premium Synthetic Blend Engine Oil XO-5W20-QSP	WSS-M2C153-H
Motorcraft Premium Gold Engine Coolant VC-7-A (in Oregon VC-7-B) ^a	WSS-M97B51-A1 (yellow color)
Motorcraft Silicone Gasket Remover ZC-30	-
Motorcraft Metal Surface Prep ZC-31	-
Silicone Gasket and Sealant F7AZ-19554-EA	WSE-M4G323-A4
Instant Adhesive E8AZ-19554-A	WSK-M2G402-A4
High Temperature Nickel Anti-Seize Lubricant XL-2	ESE-M12A4-A
Petroleum Jelly	WSD-M1C226-A

SPECIFICATIONS - 4.6L

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Item	Specification
Engine - 4.6L	
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 (@ 2000 RPM @ 93°C (200°F))	275.8-517.1 kPa (40-75 psi)
Oil capacity (includes filter change)	5.7L (6.0 qts)
Compression ratio	9.3:1
Cylinder Head and Valve Train	
Combustion chamber volume	51.5-52.5 cc (3.14-3.20 cu in)
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 (0.2773-0.2762 in)
Valve stem diameter - intake	6.995-6.975 mm (0.2754-0.2746 in)
Valve stem diameter - exhaust	6.970-6.949 mm (0.2744-0.2736 in)
Valve stem-to-guide clearance - intake	0.020-0.069 mm (0.0008-0.0027 in)
Valve stem-to-guide clearance - exhaust	0.045-0.095 mm (0.0018-0.0037 in)
Valve head diameter - intake	44.5 mm (1.751 in)
Valve head diameter - exhaust	34.0 mm (1.338 in)
Valve face runout	0.05 mm (0.0019 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 (0.0010 in)

Valve seat angle	45.50 degrees
Valve spring free length	49.55 mm (1.9508 in)
Valve spring squareness	2 degrees
Valve spring compression pressure	587.14 N @ 28.02 mm (131.994 lb @ 1.1032 in)
Valve spring installed height	39.7-40.3 mm (1.5630-1.5866 in)
Valve spring installed pressure - valve open	587.165 N @ 27.99 mm (132 lb @ 1.102 in)
Valve spring installed pressure - valve closed	244.652 N @ 39.98 mm (55 lb @ 1.574 in)
Roller follower ratio	1.75:1
Hydraulic Lash Adjuster	
Diameter	16.000-15.9888 mm (0.6299-0.6295 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 second ⁽¹⁾
Collapsed lash adjuster gap	0.085-0.450 mm (0.0033-0.0177 in)
Camshaft	
Theoretical valve lift @ 0 lash	12.0 mm (0.472 in)
Lobe lift	6.5 mm (0.2560 in)
Allowable lobe lift loss	0
Journal diameter (all)	26.962-26.936 mm (1.0615-1.0605 in)
Camshaft journal bore inside diameter (all)	27.012-26.987 mm (1.0635-1.0625 in)
Camshaft journal-to-bearing clearance	0.025-0.076 mm (0.0010-0.0030 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	72.400-72.424 mm (2.850-2.851 in)
Crankshaft	
Main bearing journal diameter	67.482-67.504 mm (2.6568-2.6576 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	0.027-0.065 mm (0.0011-0.0026 in)
Connecting rod journal diameter	52.988-53.003 mm (2.0861-2.0867 in)
Connecting rod journal maximum taper	0.015 mm (0.0006 in)
Connecting rod journal maximum out-of-round	0.05 mm (0.0020 in)
Crankshaft maximum end play	0.130-0.301 mm (0.0051-0.012 in)
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	-0.005-0.025 mm (-0.0002-0.0010 in)

Piston ring end gap - compression (top and bottom)	0.23-0.49 mm (0.010-0.020 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 mm (0.060-0.610 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	22.0015-22.004 mm (0.866-0.8663 in)
Piston pin diameter	22.0 mm (0.866 in)
Piston pin length	61.8 mm (2.433 in)
Piston pin-to-piston fit	0.005-0.010 mm (0.0002-0.0004 in)
Connecting rod-to-pin clearance	0.015-0.040 mm (0.0006-0.0016 in)
Connecting rod pin bore diameter	21.959-21.979 mm (0.864-0.865 in)
Connecting rod length (center-to-center)	150.7 mm (5.93 in)
Connecting rod maximum allowed bend	
Connecting rod maximum allowed twist ⁽²⁾	+/-1.016 mm (0.04 in)
Connecting rod bearing bore diameter	56.756-56.876 mm (2.234-2.24 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	0.015-0.45 mm (0.0006-0.0177 in)
Connecting rod side clearance (assembled to crank) - service limit	0.05 mm (0.02 in) max.
(1) Time required for the plunger to leak down 1.6 mm of travel with 222 N force and leak-down fluid in the lash adjuster.	
(2) 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.	

SPECIFICATIONS - 5.4L

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Item	Specification
Engine - 5.4L	
Displacement	5.4L (330 cu in)
Number of cylinders	8
Bore	90.2 mm (3.55 in)
Stroke	105.8 mm (4.17 in)
Firing order	1-3-7-2-6-5-4-8
Oil pressure (@ 2000 RPM @ 93 °C (200 °F))	275.8-517.1 kPa (40-75 psi)

Oil capacity (includes filter change)	5.7 L (6.0 qts)
Compression ratio	9.0:1
Cylinder Head and Valve Train	
Combustion chamber volume	42.45-45.45 cc (2.59-2.77 cu in)
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 (0.2773-0.2762 in)
Valve stem diameter - intake	6.995-6.975 mm (0.2754-0.2746 in)
Valve stem diameter - exhaust	6.970-6.949 mm (0.2744-0.2736 in)
Valve stem-to-guide clearance - intake	0.069-0.020 mm (0.0027-0.0008 in)
Valve stem-to-guide clearance - exhaust	0.095-0.045 mm (0.0037-0.0018 in)
Valve head diameter - intake	44.63-44.37 mm (1.7571-1.7469 in)
Valve head diameter - exhaust	36.01 mm (1.4177 in)
Valve face runout	0.05 mm (0.0020 in)
Valve face angle	45.75-45.25 degrees
Valve seat width - intake	1.3-1.5 mm (0.0512-0.0591 in)
Valve seat width - exhaust	2.1-1.9 mm (0.0827-0.0748 in)
Valve seat runout (T.I.R.)	0.025 mm (0.0010 in)
Valve seat angle	45.50 degrees
Valve spring free length	53.37 mm (2.10 in)
Valve spring squareness	2.0 degrees
Valve spring compression pressure	720-800 N (161.862-179.847 lb) @ 28.02 mm (1.10 in)
Valve spring installed height	42.9-42.3 mm (1.6890-1.6654 in)
Valve spring installed pressure - valve open	760 N @ 28.80 mm (170.855 lb @ 1.1339 in)
Valve spring installed pressure - valve closed	302 N @ 42.56 mm (67.8923 lb @ 1.6756 in)
Roller follower ratio	1.75:1
Hydraulic Lash Adjuster	
Diameter	16.000-15.988 mm (0.6299-0.6295 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 ⁽¹⁾
Collapsed lash adjuster gap	0.085-0.450 mm (0.0335-0.0177 in)
Camshaft	
Theoretical valve lift @ 0 lash - intake	12.02 mm (0.4732 in)
Theoretical valve lift @ 0 lash - exhaust	12.67 mm (0.4988 in)
Lobe lift - intake	7.1104 mm (0.2799 in)
Lobe lift - exhaust	7.4979 mm (0.2952 in)
Allowable lobe lift loss	0
Journal diameter	26.962-26.936 mm (1.0615-1.0605 in)
Camshaft journal bore inside diameter (cap assembled)	27.012-26.987 mm (1.0635-1.0625 in)
Camshaft journal-to-bearing clearance	0.076-0.025 mm (0.0030-0.0010 in)
Runout ⁽²⁾	0.03 mm (0.0012 in)

End play	0.0270-0.0190 mm (0.0011-0.0075 in)
Cylinder Block	
Cylinder bore surface finish	0.2-0.6 microns
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	72.401-72.422 mm (2.850-2.851 in)
Crankshaft	
Main bearing journal diameter	67.483-67.503 mm (2.6568-2.6576 in)
Main bearing journal maximum taper (straightness)	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)	90.175-90.165 mm (3.5502-3.5498 in)
Piston diameter - grade 2 (at right angle to pin bore)	90.185-90.175 mm (3.5506-3.5502 in)
Piston diameter - grade 3 (at right angle to pin bore)	90.195-90.185 mm (3.5510-3.5506 in)
Piston-to-cylinder bore clearance (at grade size)	0.005-0.025 mm (0.0002-0.0010 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	1.503-1.505 mm (0.0592-0.0593 in)
Piston ring groove width - intermediate	1.502-1.504 mm (0.0591-0.0592 in)
Piston ring groove width - oil control	3.030-3.050 mm (0.1193-0.1201 in)
Piston ring width	1.5-1.47 mm (0.0591-0.0579 in)
Piston ring-to-groove clearance - top	0.033-0.005 mm (0.0013-0.0002 in)
Piston ring-to-groove clearance - intermediate	0.033-0.005 mm (0.0013-0.0002 in)
Piston pin bore diameter	22.001-22.014 mm (0.8662-0.8667 in)
Piston pin diameter	22.0005-22.0030 mm (0.8662-0.8663 in)
Piston pin length	61.8 mm (2.433 in)
Piston pin-to-piston fit (clearance)	0.005-0.013 mm (0.0002-0.0005 in)
Connecting rod-to-pin clearance	0.009-0.023 mm (0.0004-0.0093 in)
Connecting rod pin bore diameter	22.012-22.024 mm (0.8666-0.8671 in)
Connecting rod length (centerline bore-to-bore)	169.1 mm (6.6575 in)
Connecting rod maximum allowed bend	+/-0.03 mm (0.0011 in)
Connecting rod maximum allowed twist	+/-0.04 mm (0.0015 in)
Connecting rod bearing bore diameter (with assembled liners)	53.049-53.027 mm (2.0885-2.0877 in)
Connecting rod bearing-to-crankshaft clearance	0.064-0.026 mm (0.0025-0.0010 in)

Connecting rod side clearance	0.475-0.125 mm (0.0187-0.0049 in)
(1) Time required for the plunger to leak down 1.6 mm of travel with 222 N force and leak-down fluid in the lash adjuster.	
(2) Full indicator measurement on all journals when supported on front and rear journals (4 places).	

TORQUE SPECIFICATIONS

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Description	Nm	lb-ft	lb-in
Accelerator cable bracket bolts	10	-	89
Brake booster vacuum hose bracket nut (4.6L)	10	-	89
Brake booster vacuum hose bracket bolt (5.4L)	10	-	89
Camshaft bearing cap bolts	10	-	89
Camshaft sprocket bolts ^a	-	-	-
Cylinder head temperature sensor (CHT)	26	19	-
Camshaft position sensor bolt	10	-	89
Crankshaft position sensor bolt	10	-	89
Connecting rod bolts ⁽¹⁾	-	-	-
Crankshaft damper pulley bolt ⁽¹⁾	-	-	-
Crankshaft main bearing bolts (cross-mounted) ⁽¹⁾	-	-	-
Crankshaft main bearing bolts (vertical) ⁽¹⁾	-	-	-
Cylinder heads bolts ⁽¹⁾	-	-	-
Differential pressure feedback EGR sensor nuts (4.6L)	4	-	35
Differential pressure feedback EGR sensor nuts (5.4L)	10	-	89
Differential pressure feedback EGR sensor bracket nut	10	-	89
Differential pressure feedback EGR sensor bracket bolt	10	-	89
Drive belt idler pulley bolts	25	18	-
Engine front cover bolts ^a	-	-	-
Engine mount to cylinder block bolts	63	44	-
Engine mount LH through bolt	200	148	-
Engine mount RH nut	103	76	-
EGR valve to intake manifold bolts ⁽¹⁾	-	-	-
Exhaust manifold nuts	25	18	-
Exhaust manifold studs	12	9	-
Exhaust manifold to EGR valve tube fittings ⁽¹⁾	-	-	-
Exhaust manifold-to-Y-pipe nuts	40	30	-
Fan shroud bolts	9	-	80
Flywheel bolts	80	59	-
Frame crossmember nuts (under oil pan)	102	75	-
Fuel injection supply manifold bracket bolts	10	-	89
Generator upper mounting bracket bolts	10	-	89
Generator lower mounting bolts	25	18	-

Heater return tube studs (4.6L)	25	18	-
Heater return tube studs (5.4L)	40	30	-
Idle air control valve screws ⁽¹⁾	-	-	-
Ignition coil	6	-	53
Lower intake manifold to upper intake manifold bolts ⁽¹⁾	-	-	-
Upper intake manifold to cylinder head bolts ⁽¹⁾	-	-	-
Intake manifold tuning valve screws ⁽¹⁾	-	-	-
Knock sensor	20	15	-
Oil filter	16	12	-
Oil filter adapter bolts	25	18	-
Oil level indicator tube bolt	10	-	89
Oil pan bolts ⁽¹⁾	-	-	-
Oil pan drain plug	14	10	-
Oil pressure switch	14	10	-
Oil pump bolts	10	-	89
Oil pump screen and pickup tube bolts	10	-	89
Oil pump screen and pickup tube spacer	25	18	-
Oil pump screen and pickup tube spacer bolt	25	18	-
Power steering pump bolts	25	18	-
Power steering reservoir upper bracket-to-thermostat housing bolt	11	8	-
Power steering reservoir upper bracket-to-middle bracket bolts	17	13	-
Power steering reservoir middle bracket-to-lower bracket bolts	23	17	-
Power steering reservoir lower bracket-to-engine cylinder head bolts	80	59	-
Powertrain control module bolts	7	-	62
Powertrain control module bracket bolts	7	-	62
Rear main oil seal retainer bolts	10	-	89
Spark plugs	18	13	-
Thermostat housing bolts	10	-	89
Throttle body spacer-to-intake manifold bolts	10	-	89
Throttle body-to-throttle body spacer bolts ⁽¹⁾	-	-	-
Timing chain guide bolts	10	-	89
Timing chain hydraulic tensioner bolts	25	18	-
Torque converter-to-flexplate nuts	35	26	-
Transmission-to-engine bolts	48	35	-
Valve cover bolts	10	-	89
Water pump bolts	25	18	-
Water pump pulley bolts	25	18	-

(1) Refer to the procedure in this section.