

# SPECIFICATIONS

## MATERIAL

### MATERIAL SPECIFICATIONS CHART

Item	Specification	Fill Capacity
Motorcraft® High Performance Engine RTV Silicone TA-357	WSE-M4G323-A6	-
Motorcraft® Metal Surface Prep ZC-31-A	-	-
Motorcraft® SAE 5W-30 Premium Synthetic Blend Motor Oil (US); Motorcraft® SAE 5W-30 Super Premium Motor Oil (Canada) XO-5W30-QSP (US); CXO-5W30-LSP12 (Canada)	WSS-M2C946-A	5.9L (6.25qt) includes oil filter change
Motorcraft® Specialty Orange Engine Coolant VC-3-B (US); CVC-3-B (Canada)	WSS-M97B44-D	-
Motorcraft® Silicone Gasket Remover ZC-30	-	-
Thread Sealant with PTFE TA-24	WSK-M2G350-A2	-
Threadlock 262 TA-26	WSK-M2G351-A6	-

## GENERAL SPECIFICATIONS

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Item	Specification
<b>Engine</b>	
Displacement	3.5L Gasoline Turbocharged Direct Injection (GTDI) (214 CID)
No. cylinders	6
Bore/stroke	92.5/86.7 mm (3.641/3.413 in)
Fire order	1-4-2-5-3-6
Oil pressure	Minimum 30 psi @ 1,500 RPM with engine at normal operating temperature
Compression ratio	10.0: 1
Spark plug	CYFS-12F Gap = 0.889 mm (0.035 in)
Engine weight (without accessory drive components)	189.01 kg (416.7 lb)
<b>Cylinder Head and Valve Train</b>	
Cylinder head gasket surface flatness	Flat within 0.08 mm (0.003 in) length end to end, area 150 mm (5.9 in) x 150 mm (5.9 in) (or full width) should be less than 0.05 mm (0.002 in)
Combustion chamber volume	55.84 cc (3.41 CI)
Valve tappet clearance - intake	0.15-0.25 mm (0.006-0.01 in)
Valve tappet clearance - exhaust	0.360-0.460 mm (0.0142-0.0181 in) Engine must be at room temperature before measuring
Valve guide bore inner diameter	5.519-5.549 mm (0.217-0.218 in)
Valve stem diameter - intake	5.479-5.497 mm (0.2157-0.2164 in)
Valve stem diameter - exhaust	5.466-5.484 mm (0.2151-0.2159 in)
Valve stem-to-guide clearance -	

intake	0.022-0.070 mm (0.0008-0.0027 in)
Valve stem-to-guide clearance - exhaust	0.035-0.083 mm (0.0013-0.032 in)
Valve head diameter - intake	36.82-37.18 mm (1.44-1.46 in)
Valve head diameter - exhaust	30.82-31.18 mm (1.21-1.22 in)
Valve face runout	0.05 mm (0.0001 in)
Valve face angle	44.5-45.5 degrees
Valve seat width - intake	1.3-1.6 mm (0.051-0.063 in)
Valve seat width - exhaust	1.7-2.0 mm (0.067-0.079 in)
Valve seat runout	0.04 mm (0.0001 in) MAX
Valve seat angle	44.5-45.5 degrees
Valve spring free length (approx.)	55.16 mm (2.17 in)
Valve spring compression pressure (N @ spec. length)	465 N @ 28.0 mm (105 lb @ 1.10 in)
Valve spring installed height	37.0 mm (1.45 in)
Valve spring installed height pressure (N @ spec. length)	265 N @ 37.0 mm (60 lb @ 1.45 in)
Valve spring installed pressure - service limit	10% force loss @ specified height
<b>Camshaft</b>	
Theoretical valve lift @ 0 lash	9.49 mm (0.373 in)
Lobe lift - intake	9.49 mm (0.373 in)
Lobe lift - exhaust	9.49 mm (0.373 in)
Allowable lobe lift loss	0.062 mm (0.0024 in)
Camshaft journal bore inside diameter - 1st journal	39.0375-39.0625 mm (1.537-1.538 in)
Camshaft journal bore inside diameter - intermediate journals	25.9875-26.0125 mm (1.023-1.024 in)
Camshaft bearing outside diameter - 1st journal	38.990-39.010 mm (1.535-1.536 in)
Camshaft bearing outside diameter - intermediate journals	25.937-25.963 mm (1.021-1.022 in)
Camshaft journal-to-bearing clearance, 1st journal - service limit	0.0725 mm (0.0029 in) MAX
Camshaft journal-to-bearing clearance, intermediate journals - service limit	0.0755 mm (0.0029 in) MAX
Runout	0.040 mm (0.0015 in) MAX
End play - standard	0.032-0.170 mm (0.0012-0.0066 in)
End play - service limit	0.190 mm (0.00748 in) MAX
<b>Cylinder Block</b>	
block main bore roundness	0.008 mm (0.003 in)
Cylinder bore diameter - grade 1	92.500-92.520 mm (3.641-3.642 in)
Cylinder bore roundness	0.013 mm (0.0005 in)
Cylinder bore taper	0.010 mm (0.0004 in) per 25.4 mm (1.000 in)

Main bearing bore inside diameter	72.400-72.424 mm (2.8503-2.8513 in)
Head gasket surface flatness	Flat within 0.150 mm (0.005 in) overall, 0.050 mm (0.001 in) per 150 mm (5.905 in) x 150 mm (5.905 in), 0.025 mm (0.0009 in) per 25 mm (0.984 in) x 25 mm (0.984 in)
<b>Crankshaft</b>	
Main bearing journal diameter	67.5 mm (2.657 in)
Main bearing journal maximum taper	0.004 mm (0.00015 in)
Main bearing journal maximum out-of-round	0.006 mm (0.00023 in)
Main bearing journal-to-cylinder block clearance	0.026-0.041 mm (0.0010-0.0016 in)
Connecting rod journal diameter	55.983-56.003 mm (2.204-2.205 in)
Connecting rod journal maximum taper	0.004 mm (0.00015 in)
Connecting rod journal maximum out-of-round	0.006 mm (0.00023 in)
Crankshaft maximum end play	0.101-0.291 mm (0.0039-0.0114 in)
<b>Piston and Connecting Rod</b>	
Piston diameter - single grade	92.476-92.490 mm (3.6407-3.6413 in)
Piston-to-cylinder bore clearance	0.010 to 0.044 mm (0.0003-0.0017 in)
Piston ring end gap - compression (top, gauge diameter)	0.17-0.27 mm (0.0067-0.0106 in)
Piston ring end gap - compression (bottom, gauge diameter)	0.30-0.55 mm (0.0118-0.0216 in)
Piston ring end gap - oil ring (steel rail, gauge diameter)	0.15-0.45 mm (0.0059-0.0177 in)
Piston ring groove width - compression (top)	1.230-1.25 mm (0.0484-0.0492 in)
Piston ring groove width - compression (bottom)	1.530-1.55 mm (0.0602-0.0610 in)
Piston ring groove width - oil ring	2.53-2.55 mm (0.0996-0.1003 in)
Piston ring width - upper compression ring	1.17-1.19 mm (0.0460-0.0468 in)
Piston ring width - lower compression ring	1.47-1.49 mm (0.0578-0.0586 in)
Piston ring-to-groove clearance (upper and lower compression rings)	0.040-0.080 mm (0.0014-0.0031 in)
Piston pin bore diameter	23.004-23.008 mm (0.9056-0.9058 in)
Piston pin diameter	22.997-23.000 mm (0.9053-0.9055 in)
Piston pin length	59.5 mm (2.343 in)
Piston pin-to-piston fit	0.004-0.011 mm (0.00015-0.00043 in)
Piston-to-connecting rod clearance	3.3 mm (0.13 in)
Connecting rod-to-pin clearance - standard	0.007-0.022 mm (0.0002-0.0009 in)

Connecting rod pin bore diameter	23.007-23.019 mm (0.905-0.906 in)
Connecting rod length (center-to-center)	152.68 mm (6.01 in)
Connecting rod maximum allowed bend	0.038 mm (0.0014 in)
Connecting rod maximum allowed twist	0.050 mm (0.0019 in)
Connecting rod bearing bore diameter - grade 1	59.866-59.872 mm (2.3569-2.3571 in)
Connecting rod bearing bore diameter - grade 2	59.873-59.879 mm (2.3572-2.3574 in)
Connecting rod bearing bore diameter - grade 3	59.880-59.886 mm (2.3574-2.3577 in)
Connecting rod bearing-to-crankshaft clearance	0.020-0.054 mm (0.0007-0.0021 in)
Connecting rod side clearance (assembled to crank) - standard	0.175-0.425 mm (0.0068-0.0167 in)
Connecting rod side clearance (assembled to crank) - service limit	0.175-0.425 mm (0.0068-0.0167 in)

## TORQUE SPECIFICATIONS

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Description	Nm	lb-ft	lb-in
A/C compressor bolt	25	18	-
A/C compressor stud	9	-	80
A/C tube nut	15	-	133
Accessory drive belt tensioner bolts	25	18	-
Axle shaft housing carrier bushing bolt	115	85	-
Bellhousing-to-engine bolts and stud bolts	48	35	-
Bellhousing-to-oil pan bolts	48	35	-
Block coolant drain plug - RH <sup>(1)</sup>	-	-	-
Block coolant drain plug - LH <sup>(2)</sup>	-	-	-
Block oil plug - RH	32	24	-
Block oil plug - LH	48	35	-
Block oil plug - Rear	85	63	-
Charge Air Cooler (CAC) tube bracket nuts	6	-	53
CAC tube clamps	5	-	44
CAC -to-Throttle Body	5	-	44

(TB) pipe clamp			
Camshaft bearing cap bolts <sup>(3)</sup>	-	-	-
Camshaft Position (CMP) sensor bolts	10	-	89
CMP sensor heat shield bolt	10	-	89
CMP sensor heat shield nut	11	-	97
Catalytic converter-to-exhaust manifold nuts	45	35	-
Catalytic converter-to-intermediate pipe bolts <sup>(3)</sup>	-	-	-
Connecting rod cap bolts <sup>(3)</sup>	-	-	-
Coolant pump bolts <sup>(3)</sup>	-	-	-
Coolant pump pulley bolts	24	18	-
Crankcase rear seal retainer plate bolts <sup>(3)</sup>	-	-	-
Crankshaft pulley bolt <sup>(3)</sup>	-	-	-
Crankshaft Position (CKP) sensor bolt	10	-	89
CKP sensor heat shield bolt	10	-	89
CKP sensor heat shield nut	10	-	89
Crossmember brace nuts and bolts	90	66	-
Cylinder head bolts <sup>(3)</sup>	-	-	-
Cylinder head M6 bolt	10	-	89
Cylinder Head Temperature (CHT) sensor	10	-	89
Engine appearance cover bracket bolts	10	-	89
Engine appearance cover nuts	7	-	62
Engine coolant crossover assembly bolt <sup>(3)</sup>	-	-	-
Engine front cover bolts <sup>(3)</sup>	-	-	-
Engine support insulator bolts	175	129	-
Engine support insulator bracket bolts	63	46	-
Engine support insulator nuts	175	129	-

Engine support insulator studs	15	-	133
Engine support insulator through bolts	350	258	-
Engine oil filter <sup>(4)</sup>	-	-	-
Engine-to-bellhousing bolt	45	35	-
Engine Oil Pressure (EOP) switch <sup>(3)</sup>	-	-	-
Evaporative Emission (EVAP) canister purge valve bolt	10	-	89
Exhaust manifold nuts <sup>(3)</sup>	-	-	-
Exhaust manifold studs	12	-	106
Flexplate bolts <sup>(3)</sup>	-	-	-
Fuel injection pump mounting plate bolt <sup>(3)</sup>	-	-	-
Fuel rail bolts <sup>(3)</sup>	-	-	-
Generator B+ terminal nut	17	-	150
Generator nut and bolt	48	35	-
Generator stud	8	-	71
Ground strap bolt	10	-	89
Ground stud bolt	10	-	89
Hood bolts	12	-	106
High pressure fuel tube bracket bolt <sup>(3)</sup>	-	-	-
High pressure fuel tube bracket nut	8	-	71
High pressure fuel tube flare nut <sup>(3)</sup>	-	-	-
Ignition coil-on-plug bolts	7	-	62
Intake manifold bolts <sup>(3)</sup>	-	-	-
Knock Sensor (KS) bolts	20	-	177
Lower front axle carrier mounting bushing bolt	115	85	-
Main bearing bolts <sup>(3)</sup>	-	-	-
Main bearing side bolts <sup>(3)</sup>	-	-	-
Main bearing cap support brace bolts <sup>(3)</sup>	-	-	-
Oil cooler insert bolt	58	43	-
Oil filter adapter bolts <sup>(3)</sup>	-	-	-
Oil pan bolts <sup>(3)</sup>	-	-	-
Oil pan drain plug	27	20	-

Oil pump bolts	10	-	89
Oil pump screen and pickup tube bolts	10	-	89
Primary timing chain tensioner bolts	10	-	89
Skid plate bolts	48	35	-
Radio ignition interference capacitor bolt	10	-	89
Spark plugs	15	-	133
Thermostat housing bolts (3)	-	-	-
Timing chain guide bolts	10	-	89
Timing chain guide pin <sup>(5)</sup>	-	-	-
Timing chain tensioner arm guide pin <sup>(5)</sup>	-	-	-
Torque converter nuts	44	32	-
Transmission cooler tube bracket bolt	12	-	106
Transmission cooler tube bracket nut	12	-	106
Transmission crossmember nuts	103	75	-
Turbocharger intake tube clamp	5	-	44
Turbocharger bracket-to-engine bolts	10	-	89
Turbocharger oil return tube assembly bolts <sup>(6)</sup>	-	-	-
Turbocharger-to-mounting bracket bolt	18	-	159
Turbocharger-to-exhaust manifold bolts	32	24	-
Upper front axle carrier mounting bushing bolt	115	85	-
Valve cover bolts and stud bolts <sup>(3)</sup>	-	-	-
Valve train oil tube bolts (3)	-	-	-
Variable Camshaft Timing (VCT) bolts <sup>(3)</sup>	-	-	-
VCT oil control solenoid bolts <sup>(3)</sup>	-	-	-
Wiring harness retainer stud bolt	10	-	89

(1) Tighten to 20 Nm (177 lb-in) plus an additional 180 degrees.

- (2) Tighten to 10 Nm (89 lb-in) plus an additional 720 degrees
- (3) Refer to the procedure in this article.
- (4) Tighten to 5 Nm (44 lb-in) plus an additional 180 degrees.
- (5) 20 Nm (177 lb-in) plus an additional 60 degrees
- (6) Refer to the assembly procedure in this article.