

## SPECIFICATIONS

### ENGINE MODEL YEARS 1993+

<b>General Specifications</b>	
VSG-411	4 Cylinder — 1.1 Liter
VSG-413	4 Cylinder — 1.3 Liter
Bore and Stroke 1.1L	68.68 and 75.48 mm (2.704 and 2.971 in)
1.3L	73.96 and 75.48 mm (2.912 and 2.971 in)
Firing Order	1-2-4-3
Idle Speed	700-800 rpm
Rated Engine Speed — Maximum	Full Load 2800 rpm
	No Load 3050 rpm
<b>Cylinder Block</b>	
Number of Main Bearings	5
Cast Marks 1.1L	93BM-6015-AA
1.3L	89BM-6015-FA
Cylinder Bore Diameter 1.1L	68.680-68.710 mm (2.7039-2.7051 in)
1.3L	73.94-73.97 mm (2.9110-2.9122 in)
Out-of-Round Maximum	0.038 mm (0.0015 in)
Wear Limit	0.127 mm (0.005 in)
Taper Maximum	0.0254 mm (0.0010 in)
Wear Limit	0.254 mm (0.010 in)
Main Bearing Bore Standard	60.623-60.636 mm (2.3868-2.3872 in)
Oversize	61.003-61.016 mm (2.4017-2.4022 in)
Camshaft Bearing Bore Standard	42.888-42.918 mm (1.6886-1.6896 in)
Oversize	43.396-43.420 mm (1.7086-1.7094 in)
Cylinder Block Liner Bore Diameter 1.1L	71.826-71.852 mm (2.8278-2.8288 in)
1.3L	77.086-77.112 mm (3.0349-3.0359 in)
Deck Height (Oil Pan Rail to Head Deck) 1.1L	194.6 ± 0.065 mm (7.6614 ± 0.0026 in)
1.3L	194.6 ± 0.065 mm (7.6614 ± 0.0026 in)
⌀ of Crankshaft Above Oil Pan Rail 1.1L & 1.3L	2.578 ± 0.115 mm (0.1015 ± 0.0045 in)

All specifications are in millimeters (inches).

For Conversion Factors see page 5.

## SPECIFICATIONS (Continued)

## ENGINE MODEL YEARS 1993+

<b>Crankshaft</b>	
Main Bearing Journal Dia. 1.1L Standard	56.99-57.00 mm (2.2437-2.2441 in)
Yellow	56.98-56.99 mm (2.2433-2.2437 in)
Main Bearing Journal Dia. 1.3L Standard	56.980-57.000 mm (2.2433-2.2441 in)
Yellow	—
Main Bearing Clearance 1.1L	0.009-0.046 mm (0.0004-0.0018 in)
Main Bearing Clearance 1.3L	0.009-0.056 mm (0.0004-0.0022 in)
Rod Bearing Journal Dia. 1.1L Standard	40.99-41.01 mm (1.6138-1.6145 in)
Green	40.74-40.76 mm (1.6039-1.6047 in)
Rod Bearing Journal Dia. 1.3L Standard	42.99-43.01 mm (1.6926-1.6933 in)
Green	42.74-42.76 mm (1.6827-1.6834 in)
Rod Bearing Clearance 1.1L and 1.3L	0.006-0.060 mm (0.0003-0.0023 in)
End Play 1.1L and 1.3L	0.075-0.285 mm (0.003-0.011 in)
<b>Camshaft</b>	
Journal Diameter 1.1L and 1.3L	39.615-39.636 mm (1.5596-1.5605 in)
Bearing I.D. 1.1L and 1.3L	39.662-39.713 mm (1.5615-1.5635 in)
Bearing Clearance (Standard Bearing) 1.1 and 1.3L	0.026-0.067 mm (0.001-0.002 in)
Wear Limit	0.0762 mm (0.003 in)
Camshaft Thrust Plate Thickness 1.1L and 1.3L	4.457-4.508 mm (0.1754-0.1774 in)
End Play	0.02-0.19 mm (0.0008-0.0075 in)
Cam Lift 1.1L Intake	5.15 mm (0.203 in)
Exhaust	4.92 mm (0.194 in)
Camshaft Lift 1.3L Intake	5.70 mm (0.224 in)
Exhaust	5.76 mm (0.227 in)
Drive 1.1L and 1.3L	Chain
<b>Connecting Rod</b>	
Piston Pin Bore 1.1L and 1.3L	17.990-18.010 mm (0.7083-0.7091 in)
Rod Bearing Bore 1.1L and 1.3L	43.990-44.010 mm (1.7319-1.7327 in)
Maximum Twist or Bend	0.10 mm (0.004 in)
End Play 1.1 and 1.3L	0.10-0.25 mm (0.004-0.010 in)
<b>Piston</b>	
Diameter 1.1L	68.670-68.700 mm (2.7035-2.7047 in)
Diameter 1.3L	73.930-73.955 mm (2.9107-2.9116 in)
Piston to Bore Clearance	0.015-0.050 mm (0.0006-0.0019 in)

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## SPECIFICATIONS (Continued)

## ENGINE MODEL YEARS 1993+

<b>Piston Pin</b>	
Diameter 1.1L and 1.3L	18.026-18.029 mm (0.7097-0.7098 in)
Length 1.1L	58.6-59.4 mm (2.31-2.33 in)
1.3L	63.6-64.4 mm (2.51-2.53 in)
Interference Fit in Rod at 21 °C 1.1L and 1.3L	0.016-0.048 mm (0.0006-0.0018 in)
Clearance in Piston at 21 °C 1.1L and 1.3L	0.008-0.014 mm (0.0003-0.0006 in)
<b>Piston Rings</b>	
Top Compression Ring Thickness 1.1L and 1.3L	1.503-1.505 mm (0.05918-0.05925 in)
Bottom Compression Ring Thickness 1.1L and 1.3L	1.728-1.740 mm (0.0680-0.0685 in)
Top Compression Ring Side Clearance 1.1L and 1.3L	.013-.027 mm (0.0005-0.0011 in)
Bottom Compression Ring Side Clearance 1.1L and 1.3L	.005-.042 mm (0.0002-0.0017 in)
Compression Ring Side Clearance — Wear Limit	0.15 mm (0.006 in)
Oil Ring Thickness 1.1L and 1.3L	2.978-2.990 mm (0.1172-0.1177 in)
Oil Ring Side Clearance 1.1L and 1.3L	0-.032 mm (0-0.0012 in)
Top Compression Ring — Standard Bore — Ring Gap <sup>b/</sup>	0.25-0.45 mm (0.010-0.017 in)
Bottom Compression Ring — Standard Bore — Ring Gap <sup>b/</sup>	0.25-0.45 mm (0.010-0.017 in)
Oil Ring — Standard Bore — Ring Gap <sup>b/</sup>	0.20-0.40 mm (0.008-0.015 in)
<b>Cylinder Head</b>	
Maximum permissible cylinder head distortion 1.1L and 1.3L: Measured over a distance of 26 mm	0.04 mm (0.0015 in)
Measured over a distance of 152 mm	0.08 mm (0.003 in)
Measured over the entire length	0.15 mm (0.006 in)
Valve Stem Bore 1.1L and 1.3L	7.063-7.094 (0.2781-0.2793 in)
Valve Seat Angle	45°
Valve Seat Insert — Exhaust, Outside Diameter <sup>c/</sup> 1.1L and 1.3L	31.500-31.515 mm (1.2402-1.2407 in)
Combustion Chamber Volume 1.1L	27.24-29.24 cc (4.22-4.53 cu in)
1.3L	31.79-33.79 cc (4.93-5.24 cu in)
Reface cylinder head mating surface: The following minimum combustion chamber depth must be left after skimming — 1.1L and 1.3L	14.4 mm ± 0.15 mm (0.567 in ± 0.006 in)

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For Conversion Factors see page 8.

<sup>b/</sup> Ring Gap may exceed these specifications by 0.15 mm  
(0.006 in) when measurement is made in the block.

<sup>c/</sup> Insert must be chilled in liquid nitrogen or dry ice prior to assembly.

## SPECIFICATIONS (Continued)

## ENGINE MODEL YEARS 1993+

<b>Valve Mechanism</b>	
Lash Intake — Cold	0.22 mm (0.009 in)
Exhaust — Cold	0.32 mm (0.013 in)
Stem Diameter Intake	7.025-7.043 mm (0.2766-0.2772 in)
Exhaust	6.999-7.017 mm (0.2756-0.2762 in)
Stem to Guide Clearance Intake	0.021-0.069 mm (0.0008-0.0027 in)
Exhaust 1.1L	0.046-0.095 mm (0.0018-0.0037 in)
1.3L	0.043-0.091 mm (0.0017-0.0036 in)
Length Intake	103.70-104.40 mm (4.083-4.110 in)
Exhaust	104.02-104.72 mm (4.096-4.122 in)
Head Diameter 1.1L Intake	32.90-33.10 mm (1.296-1.303 in)
Exhaust	28.90-29.10 mm (1.138-1.145 in)
Head Diameter 1.3L Intake	34.40-34.60 mm (1.355-1.362 in)
Exhaust	28.90-29.10 mm (1.138-1.145 in)
Seat Angle 1.1L and 1.3L	44.0°-44.5°
Spring Free Length 1.1L and 1.3L, Intake/Exhaust	41.0 mm (1.61 in)
Spring Assembled Height (Pad to Retainer)	33.22 mm (1.308 in)
Spring Load at Assembled Height	270 newtons (60.7 lb)
Tappet Diameter	13.081-13.094 mm (0.5150-0.5155 in)
Block Bore	13.110-13.143 mm (0.5162-0.5174 in)
Clearance to Block	0.016-0.062 mm (0.007-0.0024 in)
Rocker Shaft — Diameter	15.82-15.85 mm (0.6229-0.6240 in)
Rocker Bore	15.875-15.913 mm (0.6250-0.6264 in)
Shaft Clearance in Rocker	0.02-0.09 mm (0.0008-0.0035 in)
<b>Lubrication</b>	
Oil Type	Motorcraft Super Engine Oil, API SG
Oil Capacity With Filter (FL 400)	3.25 Liters (3.5 qts)
Without Filter	2.75 Liters (2.9 qts)
Oil Pressure — Hot at 2000 rpm (minimum)	1.5 Bars (22 psi)
Relief Valve Opens	2.41-2.75 Bars (35-40 psi)
Oil Pump Outer Rotor to Housing Clearance	0.14-0.26 mm (0.006-0.010 in)
Inner to Outer Rotor Gap	0.051-0.127 mm (0.002-0.005 in)
End Play — Rotors to Pump Cover	0.025-0.06 mm (0.0010-0.0023 in)

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**SPECIFICATIONS (Continued)****ENGINE MODEL YEARS 1993+**

<b>Ignition System</b>	
Firing Order	1-2-4-3
DIS <sup>d/</sup> (with 87 Octane Unleaded Gasoline) 1.1L and 1.3L	Fixed
Spark Plugs — AGRF 22 C1 (Gap)	1.0 mm (0.040 in)
<b>Distributorless Type</b>	
Coil Type	High Output DIS Coil
Coil Output	37.0 KV Minimum
Primary Resistance (at the Coil Tower)	0.50-1.00 Ohm
High Tension Leads	30,000 Ohms Max. per Lead
<b>Belt Tension</b>	
Alternator New	351-449 N (79-101 lbs)
Used-Reset (Minimum)	249-334 N (56-75 lbs)
Governor New	334 N (75 lbs)
Used-Reset (Minimum)	222 N (50 lbs)
<b>Fuel System</b>	
1.1L and 1.3L Unleaded 1986-	87 Octane
Pump Delivery Pressure	0.24-0.38 Bar (3.5-5.5 psi)
<b>Starter — Current Draw</b>	
Normal Engine Cranking	175 amps
Maximum Load — at Stall	410 amps
No Load	35 to 55 amps

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<sup>d/</sup> Distributorless Ignition System.

## SPECIFICATIONS (Continued)

### SPECIAL SERVICE TOOLS

Description	Tool Number
Installer – Valve Stem Seal – Intake	21-007
Installer – Crankshaft Seal – Front Timing Cover	21-046
Installer – Rear Crankshaft Seal	21-059A
Remover – Crankshaft Oil Seals	21-096
Valve Spring Compressor	T81P-6513-A

Call Owatonna Tool Company

1-800-533-5338

Ask for Ford Order Desk

### CONVERSION FACTORS

Pounds per Square Inch	Bars x 14.5
Cubic Inches	Cubic Centimeter x 0.061
Newton•Meter (Torque)	Ft-lbs x 1.3558
Millimeter	Inches x 25.4
Pounds	Kilogram (Force) x 2.2046
Cubic Inches	Liter x 61.024
Quarts	Liter x 1.0567
Inches	Millimeter x 0.03937
Pounds	Newton x 0.2248
Ft-lbs (Torque)	Newton•Meter x 0.7376

### TORQUE SPECIFICATIONS

Item	Nm	Ft-Lb
Main Bearing Cap	88-102	64-75
Connecting Rod Bolts	1	
Rear Oil Seal Carrier	16 to 20	12-15
Flywheel	64 to 70	47-52
Clutch Pressure Plate	24 to 35	17.6-25.7
Chain Tensioner	24 to 25	17-18
Camshaft Thrust Plate	7 to 9	5-7
Camshaft Sprocket	16 to 20	12-15

### TORQUE SPECIFICATIONS (Continued)

Item	Nm	Ft-Lb
Timing Cover	7 to 10	5-7.5
Water Pump	7 to 10	5-7.5
Crankshaft Pulley 1.1 and 1.3L 89/M.Y. and later	100 to 120	73.4-88
Water Pump Pulley	100-120	73.4-88
Starter Motor	35 to 45	26-33
Fuel Pump	16 to 20	12-15
Distributor Retaining Bolt	7 to 10	5-7.5
Distributor Clamp Bolt	3 to 4	2-2.5
Oil Pump	16 to 20	12-15
Oil Pump Cover	8 to 12	6-9
Oil Pump Pickup Tube Bracket	20 to 25	15-18
Oil Pan — Step 1 Alphabetical	6 to 8	5-6
— Step 2 Numerical	8 to 11	6-8
— Step 3 Alphabetical	8 to 11	6-8
Retorque after engine has warmed up (15 minutes at 1000 rpm)		
Oil Pan Plug	21 to 28	15-20
Oil Pressure Switch	13 to 15	10-11
Temperature Sender	4 to 8	3-6
Rocker Shaft Pedestals	40 to 46	30-34
Cylinder Head Bolts — Step 1	STEP 1-30	22
— Step 2	STEP 2-Turn	90° More
— Step 3	STEP 3-Turn	90° More
Rocker Cover	4 to 5	3-4
Exhaust Manifold	21 to 25	15-18
Inlet Manifold	16 to 20	12-15
Carburetor	17 to 21	12.5-15
Thermostat Housing	17 to 21	12.5-15
Spark Plugs	15 to 20	11-15
EGR Valve Bolts	16 to 20	12-15
EGR Hose	34 to 47	25-35

<sup>1</sup> **Step One** Torque to 4 N•m (3 Ft-lbs), **Step Two** Turn 90° more.