

Section 1

Safety and General Information

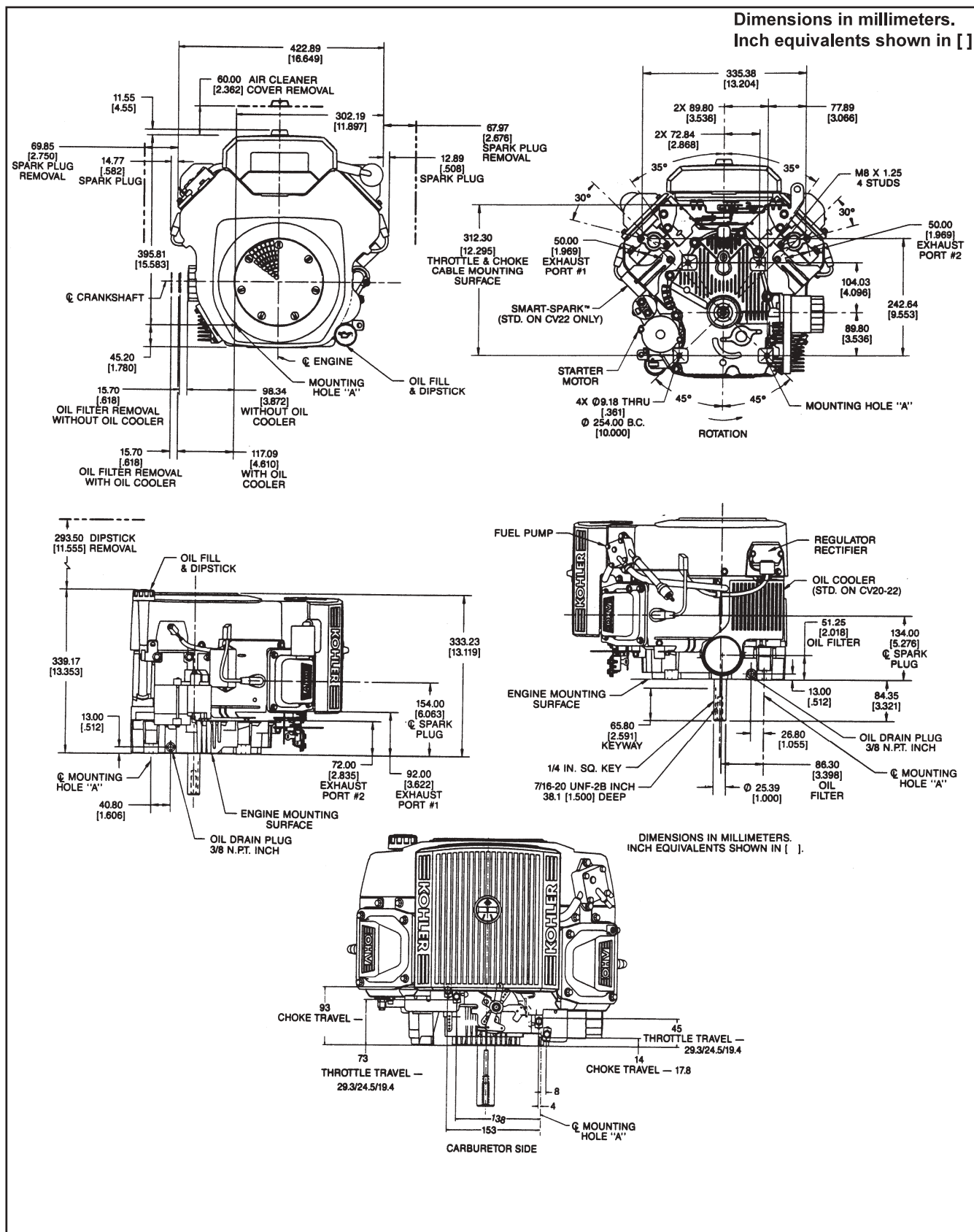


Figure 1-4. Typical Engine Dimensions CV Series with Standard Flat Air Cleaner.

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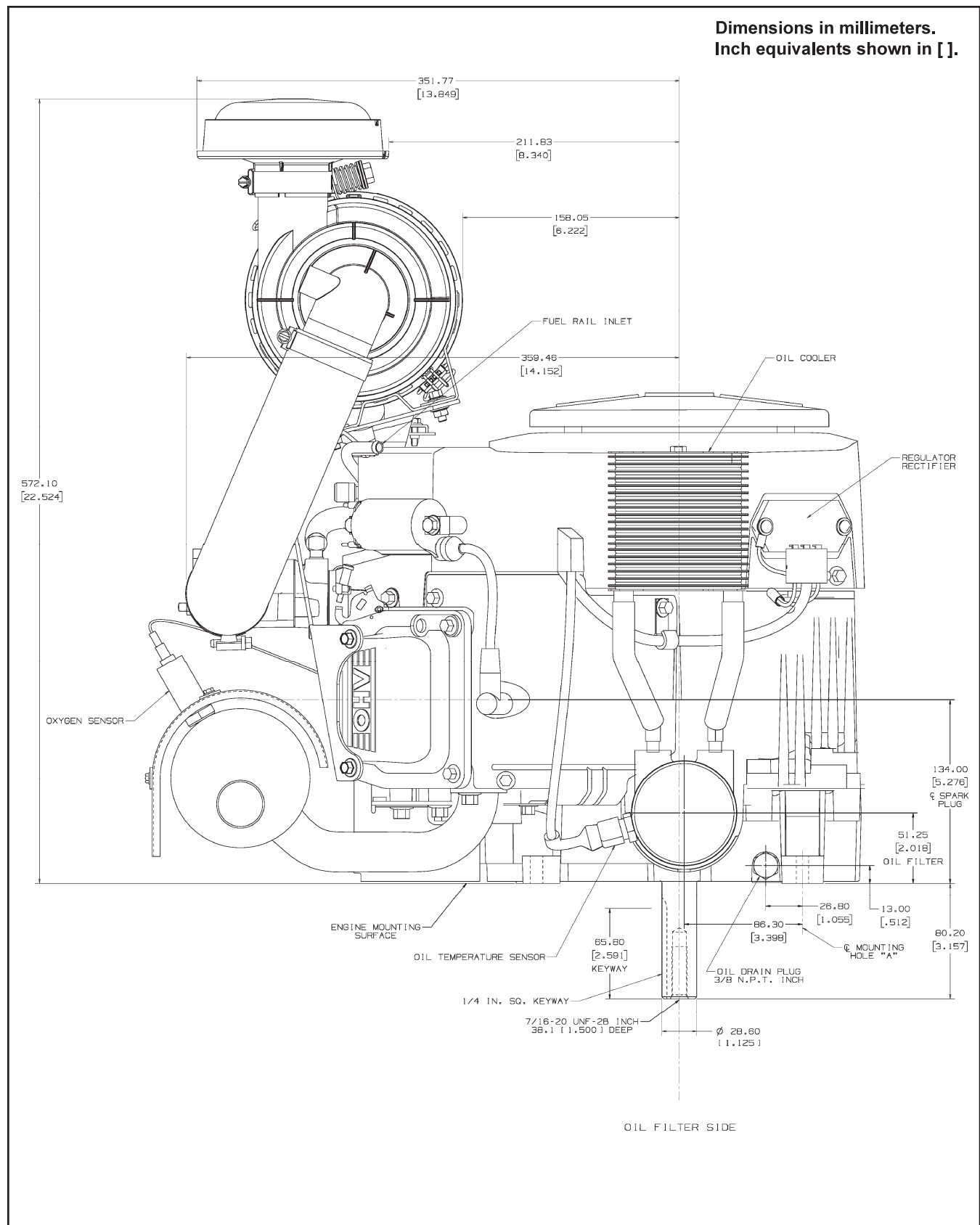


Figure 1-6. Typical Engine Dimensions CV EFI Series with Heavy-Duty Air Cleaner.

General Specifications¹

Power (@3600 RPM, exceeds Society of Automotive Engineers-Small Engine Test Code J1940.)

CV17.....	12.7 kW (17 HP)
CV18/CV620.....	13.4 kW (18 HP)
CV20/CV640.....	14.9 kW (20 HP)
CV22/CV670.....	16.4 kW (22 HP)
CV23/CV680.....	17.2 kW (23 HP)
CV25,CV730.....	18.6 kW (25 HP)
CV26/CV735.....	19.4 kW (26 HP)
CV740.....	20.1 kW (27 HP)
CV745.....	20.9 kW (28 HP)
CV750.....	22.4 kW (30 HP)

Peak Torque

CV17 @ 2200 RPM.....	35.9 N·m (28.7 ft. lb.)
CV18/CV620 @ 2200 RPM.....	42.5 N·m (31.4 ft. lb.)
CV20/CV640 @ 2400 RPM.....	45.1 N·m (33.3 ft. lb.)
CV22/CV670 @ 2200 RPM.....	49.6 N·m (36.6 ft. lb.)
CV23/CV680 @ 2400 RPM.....	54.5 N·m (40.2 ft. lb.)
CV25,CV730 @ 2400 RPM.....	55.6 N·m (41.0 ft. lb.)
CV26/CV735 @ 2800 RPM.....	54.2 N·m (40.0 ft. lb.)
CV740 @ 2800 RPM.....	56.9 N·m (42.0 ft. lb.)
CV745 @ 2400 RPM.....	60.0 N·m (44.3 ft. lb.)
CV750 @ 2600 RPM.....	63.8 N·m (47.1 ft. lb.)

Bore

CV17.....	73 mm (2.87 in.)
CV18/CV620,CV20/CV640,CV22 (624 cc).....	77 mm (3.03 in.)
CV22/CV670,CV23/CV680 (674 cc).....	80 mm (3.15 in.)
CV25,CV26/CV735,CV730,CV740,CV745,CV750.....	83 mm (3.27 in.)

Stroke

CV17-745.....	67 mm (2.64 in.)
CV750.....	69 mm (2.7 in.)

Displacement

CV17.....	561 cc (34 cu. in.)
CV18/CV620,CV20/CV640,CV22 (624 cc).....	624 cc (38 cu. in.)
CV22/CV670,CV23/CV680 (674 cc).....	674 cc (41 cu. in.)
CV25,CV26/CV735,CV730,CV740,CV745.....	725 cc (44 cu. in.)
CV750.....	755 cc (46 cu. in.)

Compression Ratio

CV17.....	8.2:1
CV18/CV620,CV20/CV640,CV22/CV670,CV23/CV680.....	8.5:1
CV25,CV26/CV735,CV730,CV740,CV745.....	9.0:1
CV750.....	9.4:1

Dry Weight

CV17,CV18/CV620,CV20/CV640,CV22/CV670,CV23/CV680.....	41 kg (90 lb.)
CV25,CV26/CV735,CV730,CV740,CV745.....	43 kg (94 lb.)
CV750.....	48 kg (105 lb.)

¹Values are in Metric units. Values in parentheses are English equivalents. Lubricate threads with engine oil prior to assembly.

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General Specifications¹ cont.

Oil Capacity (w/filter) - approximate,
determined by oil filter and oil cooler used:1.6-1.8 L (1.7-1.9 U.S. qt.)

Angle of Operation - Maximum (At Full Oil Level) All Directions.....25°

Blower Housing and Sheet Metal

M5 Fasteners Torque.....6.2 N·m (55 in. lb.) into new holes
4.0 N·m (35 in. lb.) into used holes

M6 Fasteners Torque.....10.7 N·m (95 in. lb.) into new holes
7.3 N·m (65 in. lb.) into used holes

Rectifier-Regulator Fastener Torque.....1.4 N·m (12.6 in. lb.)

Camshaft

End Play (With Shim)0.076/0.127 mm (0.0030/0.0050 in.)

Running Clearance.....0.025/0.063 mm (0.0010/0.0025 in.)

Bore I.D.

New20.000/20.025 mm (0.7874/0.7884 in.)
Max. Wear Limit.....20.038 mm (0.7889 in.)

Camshaft Bearing Surface O.D.

New19.962/19.975 mm (0.7859/0.7864 in.)
Max. Wear Limit.....19.959 mm (0.7858 in.)

Carburetor and Intake Manifold

Intake Manifold Mounting Fastener Torque

Torque in Two Stagesfirst to 7.4 N·m (66 in. lb.)
finally to 9.9 N·m (88 in. lb.)

Carburetor Mounting Nut Torque6.2-7.3 N·m (55-65 in. lb.)

Connecting Rod

Cap Fastener Torque (torque in increments)

8 mm straight shank22.7 N·m (200 in. lb.)
8 mm step-down14.7 N·m (130 in. lb.)
6 mm straight shank11.3 N·m (100 in. lb.)

Connecting Rod-to-Crankpin Running Clearance

New0.030/0.055 mm (0.0012/0.0022 in.)
Max. Wear Limit.....0.070 mm (0.0028 in.)

Connecting Rod-to-Crankpin Side Clearance.....0.26/0.63 mm (0.0102/0.0248 in.)

Connecting Rod-to-Piston Pin Running Clearance.....0.015/0.028 mm (0.0006/0.0011 in.)

Piston Pin End I.D.

New17.015/17.023 mm (0.6699/0.6702 in.)
Max. Wear Limit.....17.036 mm (0.6707 in.)

¹Values are in Metric units. Values in parentheses are English equivalents. Lubricate threads with engine oil prior to assembly.

Crankcase

Governor Cross Shaft Bore I.D.

6 mm Shaft

New 6.025/6.050 mm (0.2372/0.2382 in.)

Max. Wear Limit 6.063 mm (0.2387 in.)

8 mm Shaft

New 8.025/8.075 mm (0.3159/0.3179 in.)

Max. Wear Limit 8.088 mm (0.3184 in.)

Breather Cover Fastener Torque 7.3 N·m (65 in. lb.)

Oil Drain Plug Torque 13.6 N·m (10 ft. lb.)

Oil Pan

Oil Pan Fastener Torque 24.4 N·m (216 in. lb.)

Crankshaft

End Play (Free) 0.070/0.590 mm (0.0028/0.0230 in.)

Crankshaft Bore (In Crankcase)

New 40.965/41.003 mm (1.6128/1.6143 in.)

Max. Wear Limit 41.016 mm (1.6148 in.)

Crankshaft to Sleeve Bearing (Crankcase)

Running Clearance-New 0.03/0.09 mm (0.0012/0.0035 in.)

Crankshaft Bore (In Oil Pan) - New 40.987/40.974 mm (1.6136/1.6131 in.)

Crankshaft Bore (In Oil Pan)-to-Crankshaft

Running Clearance - New 0.039/0.074 mm (0.0015/0.0029 in.)

Flywheel End Main Bearing Journal

O.D.-New 40.913/40.935 mm (1.6107/1.6116 in.)

O.D.-Max. Wear Limit 40.84 mm (1.608 in.)

Max. Taper 0.022 mm (0.0009 in.)

Max. Out-of-Round 0.025 mm (0.0010 in.)

Oil Pan End Main Bearing Journal

O.D.-New 40.913/40.935 mm (1.6107/1.6116 in.)

O.D.-Max. Wear Limit 40.84 mm (1.608 in.)

Max. Taper 0.022 mm (0.0009 in.)

Max. Out-of-Round 0.025 mm (0.0010 in.)

Connecting Rod Journal

O.D.-New 35.955/35.973 mm (1.4156/1.4163 in.)

O.D.-Max. Wear Limit 35.94 mm (1.415 in.)

Max. Taper 0.018 mm (0.0007 in.)

Max. Out-of-Round 0.025 mm (0.0010 in.)

Crankshaft T.I.R.

PTO End, Crank in Engine 0.279 mm (0.0110 in.)

Entire Crank, in V-Blocks 0.10 mm (0.0039 in.)

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Cylinder Bore

Cylinder Bore I.D.

New-CV17.....	73.006/73.031 mm (2.8742/2.8752 in.)
New-CV18/CV620,CV20/CV640,CV22 (624 cc).....	77.000/77.025 mm (3.0315/3.0325 in.)
New-CV22/CV670,CV23/CV680 (674 cc).....	80.000/80.025 mm (3.1496/3.1506 in.)
New-CV25,CV26/CV735,CV730,CV740,CV745,CV750.....	82.988/83.013 mm (3.2672/3.2682 in.)
Max. Wear Limit-CV17.....	73.070 mm (2.8757 in.)
Max. Wear Limit-CV18/CV620,CV20/CV640,CV22 (624 cc).....	77.063 mm (3.0340 in.)
Max. Wear Limit-CV22/CV670,CV23/CV680 (674 cc).....	80.065 mm (3.1522 in.)
Max. Wear Limit-CV25,CV26/CV735,CV730,CV740,CV745,CV750.....	83.051 mm (3.2697 in.)
Max. Out-of-Round CV17.....	0.13 mm (0.0051 in.)
Max. Out-of-Round CV18-750.....	0.12 mm (0.0047 in.)
Max. Taper.....	0.05 mm (0.0020 in.)

Cylinder Head

Cylinder Head Fastener Torque

Hex Flange Nut-Torque in Two Stages.....	first to 16.9 N·m (150 in. lb.) finally to 33.9 N·m (300 in. lb.)
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Head Bolt-Torque in Two Stages.....	first to 22.6 N·m (200 in. lb.) finally to 41.8 N·m (370 in. lb.)
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Max. Out-of-Flatness.....	0.076 mm (0.003 in.)
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Rocker Arm Screw Torque.....	11.3 N·m (100 in. lb.)
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Fan/Flywheel

Fan Fastener Torque.....	9.9 N·m (88 in. lb.)
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Flywheel Retaining Screw Torque.....	66.4 N·m (49 ft. lb.)
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Governor

Governor Cross Shaft-to-Crankcase Running Clearance

6 mm Shaft.....	0.013/0.075 mm (0.0005/0.0030 in.)
8 mm Shaft.....	0.025/0.126 mm (0.0009/0.0049 in.)

Governor Cross Shaft O.D.

6 mm Shaft	
New.....	5.975/6.012 mm (0.2352/0.2367 in.)
Max. Wear Limit.....	5.962 mm (0.2347 in.)
8 mm Shaft	
New.....	7.949/8.000 mm (0.3129/0.3149 in.)
Max. Wear Limit.....	7.936 mm (0.3124 in.)

Governor Gear Shaft-to-Governor

Gear Running Clearance.....	0.015/0.140 mm (0.0006/0.0055 in.)
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Governor Gear Shaft O.D.

New.....	5.990/6.000 mm (0.2358/0.2362 in.)
Max. Wear Limit.....	5.977 mm (0.2353 in.)

Governor Lever Nut Torque.....	6.8 N·m (60 in. lb.)
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Ignition

Spark Plug Type (Champion® or Equivalent) RC12YC, XC12YC, or Platinum 3071

Spark Plug Gap..... 0.76 mm (0.030 in.)

Spark Plug Torque..... 24.4-29.8 N·m (18-22 ft. lb.)

Ignition Module Air Gap 0.28/0.33 mm (0.011/0.013 in.)

Ignition Module Fastener Torque 4.0-6.2 N·m (35-55 in. lb.)

Speed Sensor Air Gap (EFI engines)..... 1.50 ± 0.25 mm (0.059 ± 0.010 in.)

Muffler

Muffler Retaining Nuts Torque..... 24.4 N·m (216 in. lb.)

Oil Filter

Oil Filter Torque refer to the oil filter for instructions

Oil Cooler

Oil Cooler/Adapter Nipple Torque 27 N·m (20 ft. lb.)

Piston, Piston Rings, and Piston Pin

Piston-to-Piston Pin Running Clearance 0.006/0.017 mm (0.0002/0.0007 in.)

Piston Pin Bore I.D.

New..... 17.006/17.012 mm (0.6695/0.6698 in.)

Max. Wear Limit..... 17.025 mm (0.6703 in.)

Piston Pin O.D.

New..... 16.995/17.000 mm (0.6691/0.6693 in.)

Max. Wear Limit..... 16.994 mm (0.6691 in.)

Top Compression Ring-to-Groove Side Clearance

CV17..... 0.040/0.085 mm (0.0016/0.0033 in.)

CV18/CV620,CV20/CV640,CV22 (624 cc)..... 0.040/0.080 mm (0.0016/0.0031 in.)

CV22/CV670,CV23/CV680 (674 cc)..... 0.030/0.076 mm (0.0012/0.0030 in.)

CV25,CV26/CV735,CV730,CV740,CV745,CV750 0.025/0.048 mm (0.0010/0.0019 in.)

Middle Compression Ring-to-Groove Side Clearance

CV17..... 0.030/0.080 mm (0.0012/0.0031 in.)

CV18/CV620,CV20/CV640,CV22 (624 cc)..... 0.040/0.080 mm (0.0016/0.0031 in.)

CV22/CV670,CV23/CV680 (674 cc)..... 0.030/0.076 mm (0.0012/0.0030 in.)

CV25,CV26/CV735,CV730,CV740,CV745,CV750 0.015/0.037 mm (0.0006/0.0015 in.)

Oil Control Ring-to-Groove Side Clearance

CV17..... 0.046/0.201 mm (0.0018/0.0079 in.)

CV18/CV620,CV20/CV640,CV22 (624 cc)..... 0.060/0.202 mm (0.0024/0.0080 in.)

CV22/CV670,CV23/CV680 (674 cc)..... 0.046/0.196 mm (0.0018/0.0077 in.)

CV25,CV26/CV735,CV730,CV740,CV745,CV750 0.026/0.176 mm (0.0010/0.0070 in.)

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Piston, Piston Rings, and Piston Pin cont.

Top and Middle Compression Ring End Gap

New Bore-CV17

Top Ring.....	0.180/0.380 mm (0.0071/0.0150 in.)
Middle Ring.....	0.180/0.440 mm (0.0071/0.0173 in.)
New Bore-CV18/CV620,CV20/CV640,CV22 (624 cc).....	0.25/0.45 mm (0.0098/0.0177 in.)
New Bore-CV22/CV670,CV23/CV680 (674 cc).....	0.18/0.46 mm (0.0071/0.0181 in.)
New Bore-CV25,CV26/CV735,CV730,CV740,CV745,CV750.....	0.25/0.56 mm (0.0100/0.0224 in.)

Used Bore (Max.)-CV17

Top Ring.....	0.70 mm (0.028 in.)
Middle Ring.....	0.90 mm (0.035 in.)
Used Bore (Max.)-CV18/CV620,CV20/CV640,CV22 (624 cc).....	0.77 mm (0.030 in.)
Used Bore (Max.)-CV22/CV670,CV23/CV680 (674 cc).....	0.80 mm (0.0315 in.)
Used Bore (Max.)-CV25,CV26/CV735,CV730,CV740,CV745,CV750.....	0.94 mm (0.037 in.)

Piston Thrust Face O.D.²

New-CV17.....	72.966/72.984 mm (2.8727/2.8734 in.)
New-CV18/CV620,CV20/CV640,CV22 (624 cc).....	76.967/76.985 mm (3.0302/3.0309 in.)
New-CV22/CV670,CV23/CV680 (674 cc).....	79.963/79.979 mm (3.1481/3.1488 in.)
New-CV25,CV26/CV735,CV730,CV740,CV745,CV750.....	82.986 mm (3.2671 in.)
Max. Wear Limit-CV17.....	72.839 mm (2.8677 in.)
Max. Wear Limit-CV18/CV620,CV20/CV640,CV22 (624 cc).....	76.840 mm (3.0252 in.)
Max. Wear Limit-CV22/CV670,CV23/CV680 (674 cc).....	79.831 mm (3.1430 in.)
Max. Wear Limit-CV25,CV26/CV735,CV730,CV740,CV745,CV750.....	82.841 mm (3.2614 in.)

Piston Thrust Face-to-Cylinder Bore² Running Clearance

New-CV17.....	0.022/0.065 mm (0.0009/0.0026 in.)
New-CV18/CV620,CV20/CV640,CV22 (624 cc).....	0.014/0.057 mm (0.0005/0.0022 in.)
New-CV22/CV670,CV23/CV680 (674 cc).....	0.021/0.062 mm (0.0008/0.0024 in.)
New-CV25,CV26/CV735,CV730,CV740,CV745,CV750.....	0.001/0.045 mm (0.039/0.0018 in.)

Speed Control Bracket

Fastener Torque.....	10.7 N·m (95 in. lb.) into new holes
	7.3 N·m (65 in. lb.) into used holes

Starter Assembly

Thru Bolt Torque

UTE/Johnson Electric, Eaton (Inertia Drive).....	4.5-5.7 N·m (40-50 in. lb.)
Nippondenso (Solenoid Shift).....	4.5-7.5 N·m (40-84 in. lb.)
Delco-Remy (Solenoid Shift).....	5.6-9.0 N·m (49-79 in. lb.)

Mounting Screw Torque (All).....	15.3 N·m (135 in. lb.)
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Brush Holder Mounting Screw Torque

Delco-Remy Starter.....	2.5-3.3 N·m (22-29 in. lb.)
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Solenoid (Starter)

Mounting Hardware Torque

Nippondenso Starter.....	6.0-9.0 N·m (53-79 in. lb.)
Delco-Remy Starter.....	4.0-6.0 N·m (35-53 in. lb.)

Nut, Positive (+) Brush Lead Torque

Nippondenso Starter.....	8.0-12.0 N·m (71-106 in. lb.)
Delco-Remy Starter.....	8.0-11.0 N·m (71-97 in. lb.)

²Measure 6 mm (0.236 in.) above the bottom of the piston skirt at right angles to the piston pin.

Stator

Mounting Screw Torque..... 6.2 N·m (55 in. lb.)

Valve Cover

Valve Cover Fastener Torque

Gasket Style Cover..... 3.4 N·m (30 in. lb.)

Black O-Ring Style Cover

w/Shoulder Screws..... 5.6 N·m (50 in. lb.)

w/Flange Screws and Spacers..... 9.9 N·m (88 in. lb.)

Yellow or Brown O-Ring Style Cover w/Integral Metal Spacers 6.2 N·m (55 in. lb.)

Valves and Valve Lifters

Hydraulic Valve Lifter to Crankcase Running Clearance 0.0241/0.0501 mm (0.0009/0.0020 in.)

Intake Valve Stem-to-Valve Guide Running Clearance 0.038/0.076 mm (0.0015/0.0030 in.)

Exhaust Valve Stem-to-Valve Guide Running Clearance 0.050/0.088 mm (0.0020/0.0035 in.)

Intake Valve Guide I.D.

New..... 7.038/7.058 mm (0.2771/0.2779 in.)

Max. Wear Limit..... 7.134 mm (0.2809 in.)

Exhaust Valve Guide I.D.

New..... 7.038/7.058 mm (0.2771/0.2779 in.)

Max. Wear Limit..... 7.159 mm (0.2819 in.)

Valve Guide Reamer Size

Standard 7.048 mm (0.2775 in.)

0.25 mm O.S. 7.298 mm (0.2873 in.)

Intake Valve Minimum Lift 8.07 mm (0.3177 in.)

Exhaust Valve Minimum Lift 8.07 mm (0.3177 in.)

Nominal Valve Seat Angle 45°

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General Torque Values

Metric Fastener Torque Recommendations for Standard Applications

Tightening Torque: N·m (in. lb.) + or - 10%						
	Property Class					Noncritical Fasteners Into Aluminum
Size						
M4	1.2 (11)	1.7 (15)	2.9 (26)	4.1 (36)	5.0 (44)	2.0 (18)
M5	2.5 (22)	3.2 (28)	5.8 (51)	8.1 (72)	9.7 (86)	4.0 (35)
M6	4.3 (38)	5.7 (50)	9.9 (88)	14.0 (124)	16.5 (146)	6.8 (60)
M8	10.5 (93)	13.6 (120)	24.4 (216)	33.9 (300)	40.7 (360)	17.0 (150)

Tightening Torque: N·m (ft. lb.) + or - 10%						
	Property Class					Noncritical Fasteners Into Aluminum
						
M10	21.7 (16)	27.1 (20)	47.5 (35)	66.4 (49)	81.4 (60)	33.9 (25)
M12	36.6 (27)	47.5 (35)	82.7 (61)	116.6 (86)	139.7 (103)	61.0 (45)
M14	58.3 (43)	76.4 (55)	131.5 (97)	184.4 (136)	219.7 (162)	94.9 (70)

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English Fastener Torque Recommendations for Standard Applications

Tightening Torque: N·m (in. lb.) + or - 20%				
Bolts, Screws, Nuts and Fasteners Assembled Into Cast Iron or Steel				Grade 2 or 5 Fasteners Into Aluminum
	 Grade 2	 Grade 5	 Grade 8	
Size				
8-32	2.3 (20)	2.8 (25)	-----	2.3 (20)
10-24	3.6 (32)	4.5 (40)	-----	3.6 (32)
10-32	3.6 (32)	4.5 (40)	-----	-----
1/4-20	7.9 (70)	13.0 (115)	18.7 (165)	7.9 (70)
1/4-28	9.6 (85)	15.8 (140)	22.6 (200)	-----
5/16-18	17.0 (150)	28.3 (250)	39.6 (350)	17.0 (150)
5/16-24	18.7 (165)	30.5 (270)	-----	-----
3/8-16	29.4 (260)	-----	-----	-----
3/8-24	33.9 (300)	-----	-----	-----
Tightening Torque: N·m (ft. lb.) + or - 20%				
Size				
5/16-24	-----	-----	40.7 (30)	-----
3/8-16	-----	47.5 (35)	67.8 (50)	-----
3/8-24	-----	54.2 (40)	81.4 (60)	-----
7/16-14	47.5 (35)	74.6 (55)	108.5 (80)	-----
7/16-20	61.0 (45)	101.7 (75)	142.4 (105)	-----
1/2-13	67.8 (50)	108.5 (80)	155.9 (115)	-----
1/2-20	94.9 (70)	142.4 (105)	223.7 (165)	-----
9/16-12	101.7 (75)	169.5 (125)	237.3 (175)	-----
9/16-18	135.6 (100)	223.7 (165)	311.9 (230)	-----
5/8-11	149.2 (110)	244.1 (180)	352.6 (260)	-----
5/8-18	189.8 (140)	311.9 (230)	447.5 (330)	-----
3/4-10	199.3 (150)	332.2 (245)	474.6 (350)	-----
3/4-16	271.2 (200)	440.7 (325)	637.3 (470)	-----

Torque Conversions

N·m = in. lb. x 0.113
 N·m = ft. lb. x 1.356
 in. lb. = N·m x 8.85
 ft. lb. = N·m x 0.737