

# SST & SPECIFICATION

	Page
SST (SPECIAL SERVICE TOOL) .....	12 - 2
STANDARD BOLT TIGHTENING TORQUE .....	12 - 4
18R ENGINE MAIN PART TIGHTENING TORQUE	...12 - 5
18R ENGINE SERVICE SPECIFICATION	...12 - 6
18R-G ENGINE MAIN PART TIGHTENING TORQUE	...12 - 14
18R-G ENGINE SERVICE SPECIFICATION .....	12 - 14

## SST (SPECIAL SERVICE TOOL)



























Illustration	Tool Number	18R	18R-G	Tool Name
	09081-00010	<input type="radio"/>	<input type="radio"/>	Alternator Checker
	09201-60011	<input type="radio"/>	<input type="radio"/>	Valve Stem Guide Remover & Replacer
	09202-43011	<input type="radio"/>	<input type="radio"/>	Valve Spring Compressor
	09213-31021	<input type="radio"/>	<input type="radio"/>	Crankshaft Pulley & Gear Puller
	09213-36010	<input type="radio"/>	<input type="radio"/>	Timing Gear Remover
	09214-60010	<input type="radio"/>	<input type="radio"/>	Crankshaft Pulley & Gear Replacer
	09222-30010	<input type="radio"/>	<input type="radio"/>	Connecting Rod Bushing Remover & Replacer
	09223-41010	<input type="radio"/>	<input type="radio"/>	Crankshaft Rear Oil Seal Replacer
	09223-50010	<input type="radio"/>	<input type="radio"/>	Crankshaft Front Oil Seal Replacer
	09228-22020	<input type="radio"/>		Oil Filter Wrench
	09228-34010		<input type="radio"/>	
	09233-33010	<input type="radio"/>	<input type="radio"/>	Pump Drive Shaft Bearing Replacer
	09236-36010	<input type="radio"/>	<input type="radio"/>	Water Pump Overhaul Tool (For Fluid Coupling Service)

Illustration	Tool Number	18R	18R-G	Tool Name
14 	09240-00014	○	○	Carburetor Adjusting Gauge Set
15 	09240-00020	○	○	Wire Gauge Set
16 	09240-27010		○	Float Level Gauge
17 	09243-00010	○	○	Idle Mixture Adjusting Screw Wrench
18 	09248-27010		○	Valve Timing Adjusting Gauge
19 	09286-46011	○	○	Injection Pump Spline Shaft Puller (For Alternator Service)
20 	09303-35010	○	○	Input Shaft Front Bearing Puller
21 	09304-30012	○	○	Input Shaft Front Bearing Replacer
22 	09308-10010	○	○	Oil Seal Puller
23 	09325-12010	○	○	Transmission Oil Plug (For Alternator Service)
24 	09816-30010	○	○	Oil Pressure Switch Socket
25 	09860-11011	○	○	Carburetor Drive Set
26 	09992-00010		○	Dual Vacuum Gauge

**STANDARD BOLT TIGHTENING TORQUE****STANDARD BOLT CLASSIFICATION**

Class	Basic Dia.	Pitch	Standard Torque		Torque Limit		
			kg-m	ft-lb	kg-m	ft-lb	
4T	6	1	0.47	3.4	0.4 – 0.7	2.9 – 5.1	
	8	1.25	1.11	8.0	1.0 – 1.6	7.2 – 11.6	
	10	1.25	2.25	16.3	1.9 – 3.1	13.7 – 22.4	
	10	1.5	2.14	15.5	1.8 – 3.0	13.0 – 21.7	
	12	1.25 (ISO)	4.40	31.8	3.5 – 5.5	25.3 – 39.8	
	12	1.5	3.89	28.1	3.5 – 5.0	25.3 – 36.2	
	12	1.75	3.74	27.0	3.0 – 5.0	21.7 – 36.2	
	13	1.5	5.08	36.8	4.5 – 7.0	32.5 – 50.6	
	14	1.5	6.33	45.8	5.0 – 8.0	36.2 – 57.9	
	14	2	5.93	42.8	4.7 – 7.7	34.0 – 55.7	
	16	1.5	9.57	69.2	7.5 – 11.0	54.2 – 79.6	
	16	2	9.10	65.8	7.1 – 10.6	51.3 – 76.7	
	5T	6	1	0.71	5.1	0.6 – 0.9	4.3 – 6.5
		8	1.25	1.66	12.0	1.5 – 2.2	10.9 – 15.9
10		1.25	3.34	24.1	3.0 – 4.5	21.7 – 32.5	
10		1.5	3.22	23.3	2.7 – 4.2	19.5 – 30.4	
12		1.25 (ISO)	6.60	47.7	5.0 – 8.0	36.2 – 57.9	
12		1.5	5.84	42.2	5.0 – 7.0	36.2 – 50.6	
12		1.75	5.61	40.6	4.8 – 6.8	34.7 – 49.2	
13		1.5	7.63	55.2	6.5 – 9.0	47.0 – 65.1	
14		1.5	9.50	68.7	7.5 – 11.0	54.2 – 79.6	
14		2	8.90	65.3	7.0 – 10.5	50.6 – 75.9	
16		1.5	14.36	103.8	12.0 – 17.0	86.8 – 123.0	
16		2	13.58	98.1	11.5 – 16.5	83.2 – 119.2	
6T		6	1	0.71	5.1	0.6 – 0.9	4.3 – 6.5
		8	1.25	1.66	12.0	1.5 – 2.2	10.9 – 15.9
	10	1.25	3.37	24.0	3.0 – 4.5	21.7 – 32.5	
	10	1.5	3.20	23.1	2.7 – 4.2	19.5 – 30.4	
	12	1.25 (ISO)	6.60	47.7	5.0 – 8.0	36.2 – 57.9	
	12	1.5	5.84	42.2	5.0 – 7.0	36.2 – 50.6	
	12	1.75	5.61	40.6	4.8 – 6.8	34.7 – 49.2	

Class	Basic Dia.	Pitch	Standard Torque		Torque Limit	
			kg-m	ft-lb	kg-m	ft-lb
7T	6	1	0.95	6.5	0.8 – 1.2	5.8 – 8.6
	8	1.25	2.21	16.1	2.0 – 3.0	14.5 – 21.7
	10	1.25	4.49	32.5	4.0 – 5.5	28.9 – 39.8
	10	1.5	4.29	31.0	3.7 – 5.2	26.8 – 37.6
	12	1.25 (ISO)	8.80	63.6	7.5 – 10.5	54.2 – 75.9
	12	1.5	7.78	56.2	7.0 – 9.0	50.6 – 65.1
	12	1.75	7.48	54.1	6.0 – 8.5	43.3 – 61.4
	13	1.5	10.17	73.5	8.0 – 12.0	57.9 – 86.8
	14	1.5	12.67	91.6	10.0 – 15.0	72.3 – 108.5
	14	2	11.86	85.8	9.5 – 14.0	68.7 – 101.2
	16	1.5	19.15	138.5	15.0 – 23.0	108.5 – 166.2
	16	2	18.11	131.0	14.0 – 22.0	101.2 – 159.0

Note: The above specified tightening torque is applicable only for female threads cut into a steel material.

If the female threads are cut in other materials than steel, and also tightening surface are encountered to heat or vibrations, these specified tightening torque must be reconsidered.

## 16R-18R ENGINE MAIN PART TIGHTENING TORQUE

Tightening Part		Tightening Torque	
		kg-m	ft-lb
Cylinder head	13 mm bolt	10.0 – 12.0	72.3 – 86.8
Valve rocker support		1.7 – 2.3	12.3 – 16.6
Manifold		4.5 – 5.5	32.6 – 39.8
Camshaft bearing cap		1.7 – 2.3	12.3 – 16.6
Camshaft timing gear		1.7 – 2.3	12.3 – 16.6
Camshaft drive gear		8.0 – 10.0	57.7 – 72.3
Crankshaft bearing cap		9.5 – 11.5	68.7 – 83.2
Connecting rod cap		5.4 – 6.6	39.1 – 47.7
Oil pan		0.4 – 0.8	2.9 – 5.8
Crankshaft pulley		9.5 – 11.0	68.7 – 79.6
Flywheel	18R	7.5 – 8.5	54.3 – 61.5
	16R	8.0 – 9.0	57.7 – 65.1
Thermo switch		3.0 – 4.0	21.7 – 28.9

# 18R SERVICE SPECIFICATION

## 18R ENGINE TUNE-UP

Drive belt tension at 10 kg (22 lb)			
Fan — Alternator	8 — 12 mm	0.31 — 0.47 in	
A/C Compressor — Crankshaft	15 — 18 mm	0.59 — 0.71 in	
Battery specific gravity at 20°C (70°F)	1.25 — 1.27		
Engine oil capacity			
RT Total	5.0 Liter	5.3 US qt	4.4 Imp.qt
Crankcase	3.8 Liter	4.0 US qt	3.3 Imp.qt
RA Total	4.7 Liter	5.0 US qt	4.1 Imp.qt
Crankcase	3.8 Liter	4.0 US qt	3.3 Imp.qt
RX Total	5.0 Liter	5.3 US qt	4.4 Imp.qt
Crankcase	3.9 Liter	4.1 US qt	3.4 Imp.qt
RN Total	5.0 Liter	5.3 US qt	4.4 Imp.qt
Crankcase	4.1 Liter	4.3 US qt	3.6 Imp.qt
Coolant capacity (w/heater)	8.0 Liter	8.5 US qt	7.5 Imp.qt
Spark plug heat range			
ND	W20EPR (for ECE)	W20EP	
NGK	BPR6ES (for ECE)	BP6ES	
Spark plug gap	0.8 mm	0.03 in	
Distributor			
Dwell angle	50 — 54°		
Point gap	0.4 — 0.5 mm	0.016 — 0.020 in	
Damping spring gap	0.1 — 0.4 mm	0.004 — 0.168 in	
Ignition timing	7° BTDC/650 rpm		
Firing order	1 — 3 — 4 — 2		
Valve clearance (Hot)			
Intake	0.20 mm	0.0079 in	
Exhaust	0.36 mm	0.0141 in	
Initial idle speed			
Manual transmission	750 ± 50 rpm		
Manifold vacuum (at idle speed)			
Manual transmission	More than 420 mm Hg	16.5 in Hg	
Automatic transmission	More than 350 mm Hg	13.8 in Hg	
CO Concentration	1—3 %		
Fast idle speed	2600 ± 200 rpm		
Compression pressure (at 250 rpm)			
STD	12.0 kg/cm <sup>2</sup>	170.0 psi	
Limit	9.0 kg/cm <sup>2</sup>	127.8 psi	
Difference of pressure between cylinders	Less than 1.0 kg/cm <sup>2</sup>	14.2 psi	

**18R ENGINE****Cylinder Head**

Surface warpage limit		0.05 mm	0.0019 in
Valve	Contacting surface angle	45°	
	Contacting width	1.2 – 1.6 mm	0.047 – 0.063 in
	Refacing angle	30°	45° 60°

**Valve Guide Bushing**

Inner diameter		8.01 – 8.03 mm	
Outer diameter	STD	14.02 – 14.04 mm	0.5513 – 0.5528 in
	O/S 0.05	14.07 – 14.09 mm	0.5548 – 0.5551 in
Projection from cylinder head		15.8 – 16.2 mm	0.622 – 0.638 in

**Valve**

Valve overall length limit		112.7 mm	4.437 in
	(Both intake and exhaust)		
Valve head contacting face angle		45°	
Valve stem diameter	Intake	7.970 – 7.985 mm	0.3138 – 0.3144 in
	Exhaust	7.960 – 7.975 mm	0.3139 – 0.3140 in
Valve stem oil clearance	Intake	0.03 – 0.06 mm	0.0012 – 0.0024 in
	Exhaust	0.04 – 0.08 mm	0.0016 – 0.0032 in
	Limit Intake	0.08 mm	0.0032 in
	Exhaust	0.10 mm	0.0039 in
Valve head thickness limit		0.6 mm	0.024 in
	(Both intake and exhaust)		

**Valve Spring**

Free length		Inner	44.1 mm	1.736 in
		Outer	46.5 mm	1.830 in
Installed length		Inner	37.5 mm	1.476 in
		Outer	41.5 mm	1.634 in
Installed Tension	STD	Inner	6.9 kg	15.21 lb
		Outer	23.0 kg	50.71 lb
	Limit	Inner	6.0 kg	13.23 lb
		Outer	19.0 kg	41.89 lb
Squareness	Limit	Inner	1.6 mm	0.063 in
		Outer	1.9 mm	0.075 in

**Camshaft**

Bent limit			0.10 mm	0.004 in
Thrust clearance	STD		0.04 – 0.17 mm	0.0056 – 0.0067 in
	Limit		0.25 mm	0.0098 in
Journal oil clearance	STD		0.03 – 0.06 mm	0.0012 – 0.0024 in
	Limit		0.1 mm	0.0039 in
Journal diameter			34.97 – 35.00 mm	1.3768 – 1.3780 in
Bearing U/S Type			0.125, 0.25	
Cam height	STD	Intake	44.04 mm	1.7339 in
		Exhaust	44.14 mm	1.7378 in
	Limit	Intake	43.7 mm	1.720 in
		Exhaust	43.8 mm	1.724 in

**Valve Rocker Arm and Shaft**

Oil clearance	STD		0.02 – 0.05 mm	0.0008 – 0.0020 in
	Limit		0.08 mm	0.0032 in

**Manifold**

Manifold surface warpage limit			0.4 mm	0.016 in
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**Timing Chain**

Elongation limit	No.1		291.4 mm	11.47 in
	No.2 (17 Links)		147.0 mm	5.79 in

**Timing Gear**

Wear limit	Crankshaft gear		60.0 mm	2.362 in
	Pump drive shaft gear		114.5 mm	4.508 in
	Camshaft drive gear		78.2 mm	3.079 in
	Camshaft timing gear		78.2 mm	3.079 in

**Chain Tensioner and Vibration Damper**

Wear limit	No.1 tensioner		11.5 mm	0.45 in
	No.1 damper		5.0 mm	0.20 in
	No.2 damper		5.0 mm	0.20 in
	Tensioner slipper		6.8 mm	0.26 in



**Pump Drive Shaft and Bearing**

Thrust clearance	STD	0.06 – 0.13 mm	0.0024 – 0.0051 in
	Limit	0.3 mm	0.012 in
Journal diameter	Front	45.96 – 45.98 mm	1.8098 – 1.8106 in
	Rear	40.96 – 40.98 mm	1.6126 – 1.6134 in
Oil clearance	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in
	Limit	0.08 mm	0.0032 in
Bearing fitting tolerance		0.02 – 0.06 mm	0.0008 – 0.0024 in

**Cylinder Block**

Warping limit		0.05 mm	0.0019 in
Cylinder bore	STD	88.50–88.55 mm	3.4842–3.4862 in
Cylinder bore wear limit		0.2 mm	0.008 in
Difference of bore limit between cylinders		0.05 mm	0.002 in
Taper and out-of-round		0.02 mm	0.0008 in

**Crankshaft**

Runout limit		0.1 mm	0.0040 in
Crank journal taper and out-of-round limit		0.01 mm	0.0004 in
Crankpin journal taper and out-of-round limit		0.01 mm	0.0004 in
Thrust clearance	STD	0.02 – 0.20 mm	0.0008 – 0.0079 in
	Limit	0.3 mm	0.0118 in
Crankpin journal oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in
	Limit	0.08 mm	0.0032
Bearing U/S		0.05, 0.25, 0.50	
Journal diameter	STD	52.976 – 53.000 mm	2.0857 – 2.0866 in
	U/S 0.25	52.70 – 52.71 mm	2.0749 – 2.0751 in
	U/S 0.50	52.45 – 52.46 mm	2.0650 – 2.0654 in
Crank journal oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in
	Limit	0.08 mm	0.0032 in
Bearing U/S		0.05, 0.25, 0.50	
Journal diameter	STD	59.976 – 60.000 mm	2.3613 – 2.3622 in
	U/S 0.25	59.70 – 59.71 mm	2.3504 – 2.3508 in
	U/S 0.50	59.45 – 59.46 mm	2.3406 – 2.3409 in

**Piston and Piston Ring**

Piston outer diameter	STD	88.44 – 88.49 mm	3.4819 – 3.4839 in
	O/S	0.50, 1.00	
Cylinder to piston clearance		0.05 – 0.07 mm	0.0020 – 0.0028 in
Piston pin installing temperature		100°C	212°F
Piston ring end gap	Compression ring No.1	0.10 – 0.30 mm	0.0039 – 0.0118 in
	Compression ring No.2	0.10 – 0.30 mm	0.0039 – 0.0118 in
	Oil ring	0.2 – 0.5 mm	0.008 – 0.020 in
Piston ring to ring groove clearance	Comp. ring No.1	0.02 – 0.06 mm	0.0008 – 0.0024 in
	Comp. ring No.2	0.02 – 0.06 mm	0.0008 – 0.0024 in

**Connecting Rod and Bearing**

Big end thrust clearance	STD	0.16 – 0.26 mm	0.0063 – 0.0102 in
	Limit	0.3 mm	0.012 in
Bearing oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in
	Limit	0.08 mm	0.0031 in
Bearing U/S		0.05, 0.25, 0.50, 0.75, 1.00	
Bushing oil clearance	STD	0.005 – 0.014 mm	0.00020 – 0.00055
	Limit	0.015 mm	0.00059 in

**Flywheel**

Run-out limit	0.2 mm	0.008 in
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**LUBRICATING SYSTEM****Oil Pump**

Tip clearance	STD	0.10 – 0.15 mm	0.0039 – 0.0059 in
	Limit	0.2 mm	0.008 in
Side clearance	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in
	Limit	0.15 mm	0.0059 in
Body clearance	STD	0.10 – 0.16 mm	0.0039 – 0.0063 in
	Limit	0.2 mm	0.008 in



**Carburetor (except South Africa)**

Float Level	Raised position	10.0 – 11.0 mm	0.39 – 0.43 in
	Lowered position	1.0 – 1.2 mm	0.039 – 0.047 in
Throttle Valve Fully opened angle (from bore)		90°	
Kick up	Secondary Throttle	0.1 – 0.3 mm	0.004 – 0.012 in
	Valve to Body Clearance		
Seco-touch		57 – 61°	
Fast Idle	Automatic Choke	0.81 mm (0.032 in)	
	Manual Choke	1.01 mm (0.039 in)	
First Throttle Valve to Body Clearance		50°	
Unloader Angle (from bore)		50°	
Accelerating Pump Stroke		4.0 mm	0.16 in
Idle Mixture Adjusting Screw Preset Position		Screw out 3 turns	
Choke Valve Fully Closed Temperature		Below 25°C	77°F
Choke Breaker	Automatic Choke	19°	
	Manual Choke	16°	

**STARTING SYSTEM****Starter**

No load characteristics	Ampere	Less than 50 A at 11.5 V	
	RPM	More than 5000 rpm	
Armature shaft to bushing clearance	STD	0.1 – 0.14 mm	0.0039 – 0.0055 in
	Limit	0.2 mm	0.008 in
Armature shaft thrust clearance	Limit	0.8 mm	0.032 in
	STD	16 mm	0.63 in
Brush length	Limit	12 mm	0.47 in
	STD	Less than 0.05	0.002 in
Commutator runout	Limit	0.4 mm	0.016 in
	STD	32.7 mm	1.287 in
Commutator diameter	Limit	31 mm	1.22 in
	STD	0.5 – 0.8 mm	0.020 – 0.031 in
Mica depth	Limit	0.2 mm	0.008 in
	STD	1.0 – 4.0 mm	0.04 – 0.16 in
Pinion end to stop collar clearance		1.0 – 4.0 mm	0.04 – 0.16 in
Moving stud length (Reference only)		34 mm	1.34 in

**IGNITION SYSTEM****Distributor**

Shaft thrust clearance	0.15 – 0.50 mm	0.006 – 0.020 in
Point gap	0.45 mm	0.018 in
Dwell angle	50 – 54°	
Demping spring gap	0.1 – 0.4 mm	0.004 – 0.016 in

**Distributor (Cont'd)**

ADVANCE CHARACTERISTICS (PART NO. 19100-34044, 19100-36020) (Except 18R-C A/T)			
Vacuum advance angle	mmHg	inHg	Dis. advance angle Degree
	80	3.15	Advance begins
	120	4.72	2°
	200	7.87	5°
	300	11.81	8°
Governor advance angle	Distributor	rpm	Dis. advance angle Degree
	600		Advance begins
	1050		5.5°
	1600		13.0°

**Ignition Coil**

Primary coil resistance	About 1.4 $\Omega$
Secondary coil resistance	About 8.5 k $\Omega$
External resistor resistance	1.3 – 1.7 $\Omega$
Insulation resistance at 500 V	Over 10 M $\Omega$

**High Tension Cord**

End to end resistance	Less than 25 k $\Omega$
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**Spark Plug**

Heat Range	ND W20EPR (for ECE)	W20EP
	NGK BPR6ES (for ECE)	BP6ES
Plug gap	0.8 mm	0.031 in

**CHARGING SYSTEM****Alternator**

Maximum output ampere	40A		
Rotor coil resistance	4.1 – 4.3 $\Omega$		
Brush length	STD	12.5 mm	0.49 in
	Limit	5.5 mm	0.22 in

**Alternator Regulator**

Voltage regulator regulating voltage	13.8 – 14.8 V
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**18R-G ENGINE MAIN PART TIGHTENING TORQUE**

Tightening Part	Tightening Torque	
	kg-m	ft-lb
Cylinder head	7.2 – 8.8	52.1 – 63.7
Camshaft bearing cap	1.7 – 2.3	12.3 – 16.6
Camshaft timing gear	7.0 – 8.0	50.6 – 57.9
Camshaft drive gear	6.0 – 7.0	43.4 – 50.6
Manifold (Intake and Exhaust)	1.0 – 1.6	7.2 – 11.6
Crankshaft bearing cap	10.0 – 11.0	72.3 – 79.6
Connecting rod cap	6.4 – 7.0	46.3 – 50.6
Oil pan	0.4 – 0.8	2.9 – 5.8
Crankshaft pulley	9.9 – 10.1	71.6 – 73.1
Flywheel	8.2 – 8.8	59.3 – 63.7
Thermo vacuum switching valve	3.0 – 4.0	21.7 – 28.9

**18R-G ENGINE SERVICE SPECIFICATION****18R-G ENGINE TUNE-UP**

Drive belt tension at 10 kg (22 lb)			
Fan – Alternator		8 – 12 mm	0.31 – 0.47 in
A/C compressor – Crankshaft		16 – 19 mm	0.63 – 0.75 in
Battery specific gravity at 20°C (70°F)		1.25 – 1.27	
Coolant capacity (W/Heater)		9.1 Liter	9.6 US qt    8.0 Imp.qt
Engine oil capacity	Total	4.7 Liter	5.0 US qt    4.1 Imp.qt
	Crankcase	4.2 Liter	4.4 US qt    3.9 Imp.qt
Spark plug heat range	ND	W20EXR	
	NGK	BPR-6EZ	
Spark plug gap		0.9 – 1.0 mm	0.035 – 0.039 in
Distributor	Dwell Angle	50 – 54°	
	Point Gap	0.45 mm	0.081 in
Ignition timing	at Engine stop	5° BTDC	
	Coolant 60°C below	20° BTDC (Reference only)	
	Coolant 60°C above	5° BTDC/1000 rpm	
Firing order		1 – 3 – 4 – 2	
Valve clearance (Cold)	Intake	0.26 – 0.32 mm	0.010 – 0.013 in
	Exhaust	0.31 – 0.36 mm	0.012 – 0.015 in
Initial idle speed		1000 ± 50 rpm	
Manifold vacuum	at Idle Speed	330 mm Hg	13.00 in Hg
	Front and rear difference	below 10 mm Hg	0.39 in Hg
Compression pressure	STD	13.0 kg/cm <sup>2</sup>	184.6 psi
	Limit	10.0 kg/cm <sup>2</sup>	142.0 psi
Difference of pressure between cylinders		Less than 1.0 kg/cm <sup>2</sup>	14.2 psi

**18R-G ENGINE****Cylinder Head**

Surface warpage limit		0.05 mm	0.0019 in
Valve	Contacting surface angle	45°	
	Contacting width	1.2 – 1.6 mm	0.047 – 0.063 in
	Refacing angle	30°      45°	60°
Valve lifter inner diameter	Black	37.951 – 37.957 mm	1.4941 – 1.4944 in
	Blue	37.957 – 37.963 mm	1.4944 – 1.4946 in
	Yellow	37.963 – 37.969 mm	1.4946 – 1.4948 in
	Red	37.969 – 37.975 mm	1.4948 – 1.4951 in

**Valve Guide Bushing**

Inner diameter		8.500 – 8.515 mm	0.3346 – 0.3352 in
Outer diameter	STD	14.02 – 14.04 mm	0.5513 – 0.5528 in
	O/S 0.05	14.07 – 14.09 mm	0.5548 – 0.5551 in
Replacing temperature		100°C	212°F

**Valve**

Valve overall length	Intake	106.8 mm	4.20 in
	Exhaust	105.1 mm	4.14 in
Valve head contacting face angle		45°	
Valve stem diameter	Intake	8.465 – 8.480 mm	0.3333 – 0.3338 in
	Exhaust	8.460 – 8.475 mm	0.3330 – 0.3337 in
Valve stem oil clearance	Intake	0.02 – 0.05 mm	0.0008 – 0.0020 in
	Exhaust	0.03 – 0.06 mm	0.0012 – 0.0024 in
	Limit	Intake	0.08 mm
		Exhaust	0.10 mm
Valve head thickness limit	Intake	0.5 mm	0.02 in
	Exhaust	0.6 mm	0.024 in

**Valve Spring**

Free length		45.6 mm	1.795 in
Installed length		39.0 mm	1.535 in
Installed tension	STD	35.0 kg	77.2 lb
	Limit	29.5 kg	65.0 lb
Squareness limit		1.6 mm	0.063 in

**Valve Lifter**

Oil clearance	STD	0.02 – 0.03 mm	0.0008 – 0.0012 in
	Limit	0.1 mm	0.004 in
Outer diameter	Black	37.925 – 37.931 mm	1.4931 – 1.4933 in
	Blue	37.931 – 37.937 mm	1.4933 – 1.4936 in
	Yellow	37.937 – 37.943 mm	1.4936 – 1.4938 in
	Red	37.943 – 37.949 mm	1.4938 – 1.4941 in

**Camshaft**

Bend limit		0.03 mm	0.0012 in
Thrust clearance	STD	0.15 – 0.35 mm	0.0059 – 0.0138 in
	Limit	0.4 mm	0.0158 in
Journal oil clearance	STD	0.05 – 0.09 mm	0.0020 – 0.0035 in
	Limit	0.15 mm	0.0059 in
Journal diameter	STD	31.934 – 31.950 mm	1.2572 – 1.258 in
Cam height (Both intake and exhaust)	STD	45.37 – 45.47 mm	1.786 – 1.790 in
	Limit	45.0 mm	1.77 in

**Manifold**

Manifold surface warpage limit (Both intake and exhaust)		0.1 mm	0.0039 in
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**Timing Chain**

Elongation limit	No.1 (at 5 kg)	291.4 mm	11.47 in
	No.2 (17 Links)	147.0 mm	5.79 in

**Timing Gear**

Wear limit	Crankshaft gear	60.0 mm	2.362 in
	Pump drive shaft gear	114.5 mm	4.508 in
	Camshaft drive gear	78.2 mm	3.079 in
	Camshaft timing gear	78.2 mm	3.079 in

**Chain Tensioner and Vibration Damper**

Wear limit	No.1 tensioner	11.5 mm	0.453 in
	No.1 damper	5.0 mm	0.20 in
	No.2 damper	5.5 mm	0.22 in
	No.3 damper	6.5 mm	0.26 in
	Tensioner slipper	7.5 mm	0.30 in



**Pump Drive Shaft and Bearing**

Thrust clearance	STD	0.06 – 0.13 mm	0.0024 – 0.0051 in
	Limit	0.3 mm	0.012 in
Journal diameter	Front	45.59 – 45.75 mm	1.7949 – 1.8012 in
	Rear	40.59 – 40.75 mm	1.5980 – 1.6043 in
Oil clearance	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in
	Limit	0.08 mm	0.0032 in
Bearing fitting tolerance		0.02 – 0.06 mm	0.0008 – 0.0024 in

**Cylinder Block**

Warpage limit		0.05 mm	0.0019 in
Cylinder bore	STD	88.50 – 88.55 mm	3.484 – 3.486 in
Cylinder bore wear limit		0.2 mm	0.008 in
Difference of bore limit between cylinders		0.05 mm	0.002 in
Taper and out-of-round		0.02 mm	0.0008 in

**Crankshaft**

Runout limit		0.05 mm	0.0020 in
Crank journal taper and out-of-round limit		0.01 mm	0.0004 in
Crankpin journal taper and out-of-round limit		0.01 mm	0.0004 in
Thrust clearance	STD	0.02 – 0.20 mm	0.0008 – 0.0079 in
	Limit	0.3 mm	0.0118 in
Crankpin journal oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in
	Limit	0.08 mm	0.0032 in
Bearing U/S		0.05, 0.25, 0.50	
Journal diameter	STD	52.976 – 53.000 mm	2.0857 – 2.0866 in
	U/S 0.25	52.70 – 52.71 mm	2.0749 – 2.0751 in
	U/S 0.50	52.45 – 52.46 mm	2.0650 – 2.0654 in
Crank journal oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in
	Limit	0.08 mm	0.0032 in
Bearing U/S		0.05, 0.25, 0.50	
Journal diameter	STD	59.976 – 60.000 mm	2.3613 – 2.3622 in
	U/S 0.25	59.70 – 59.71 mm	2.3504 – 2.3508 in
	U/S 0.50	59.45 – 59.46 mm	2.3406 – 2.3409 in

**Piston and Piston Ring**

Piston outer diameter	STD	88.44 – 88.49 mm	3.4819 – 3.4839 in
	O/S	0.50, 1.00	
Cylinder to piston clearance		0.05 – 0.07 mm	0.0020 – 0.0028 in
Piston pin installing temperature		100°C	212°F
Piston ring end gap	Compression ring No.1	0.10 – 0.30 mm	0.0039 – 0.0118 in
	Compression ring No.2	0.10 – 0.30 mm	0.0039 – 0.0118 in
	Oil ring	0.2 – 0.5 mm	0.008 – 0.020 in
Piston ring to ring groove clearance	Comp. ring No.1	0.02 – 0.06 mm	0.0008 – 0.0024 in
	Comp. ring No.2	0.02 – 0.06 mm	0.0008 – 0.0024 in

**Connecting Rod and Bearing**

Big end thrust clearance	STD	0.16 – 0.26 mm	0.0063 – 0.010 in
	Limit	0.3 mm	0.012 in
Bearing oil clearance	STD	0.02 – 0.05 mm	0.0008 – 0.0020 in
	Limit	0.08 mm	0.0032 in
Bearing U/S		0.25, 0.50, 0.75, 1.00	
Bushing oil clearance	STD	0.005 – 0.014 mm	0.00020 – 0.00055 in
	Limit	0.015 mm	0.00059 in

**Flywheel**

Run-out limit	0.2 mm	0.008 in
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**LUBRICATING SYSTEM****Oil Pump**

Tip clearance	STD	0.10 – 0.15 mm	0.0039 – 0.0059 in
	Limit	0.2 mm	0.008 in
Side clearance	STD	0.03 – 0.07 mm	0.0012 – 0.0028 in
	Limit	0.15 mm	0.0059 in
Body clearance	STD	0.10 – 0.16 mm	0.0039 – 0.0063 in
	Limit	0.2 mm	0.008 in

**COOLING SYSTEM****Water Pump**

Bearing fitting temperature	100°C	212°F
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**Fluid Coupling**

Silicon oil viscosity w/Tempered fan	3000 cst	
Capacity w/Tempered fan	35 cc	

**Thermostat**

Valve opening temperature		
Starts to open at	80.5 – 83.5°C	177 – 182°F
Fully opens at	95°C	203°F
Valve opening travel	8 mm	0.31 in

**Radiator**

Relief valve opening pressure	STD	0.9 kg/cm <sup>2</sup>	12.8 psi
	Limit	0.6 kg/cm <sup>2</sup>	8.5 psi

**FUEL SYSTEM****Carburetor**

Model	40-PHH-4	
Float adjusting screw one turn		
Float level change	1.8 mm	0.07 in
Float level (Use SST)	16 – 18 mm	0.63 – 0.71 in
Accelerating pump		
Discharging time	0.8 – 1.1 second	
Idle mixture adjusting screw preset position	Screw out 1½ turns	

## STARTING SYSTEM

## Starter

No load characteristics	Ampere	Less than 50A at 11.5V	
	RPM	More than 5000 rpm	
Armature shaft to bushing clearance	STD	0.1 – 0.14 mm	0.0039 – 0.0055 in
	Limit	0.2 mm	0.008 in
Armature shaft thrust clearance	Limit	0.8 mm	0.032 in
Brush length	STD	16 mm	0.63 in
	Limit	12 mm	0.47 in
Commutator runout	STD	Less than 0.05 mm	0.002 in
	Limit	0.4 mm	0.016 in
Commutator diameter	STD	32.7 mm	1.287 in
	Limit	31 mm	1.22 in
Mica depth	STD	0.5 – 0.8 mm	0.020 – 0.031 in
	Limit	0.2 mm	0.008 in
Pinion end to stop collar clearance		1.0 – 4.0 mm	0.04 – 0.16 in
Moving stud length (Reference only)		34 mm	1.34 in

## IGNITION SYSTEM

## Distributor

Shaft thrust clearance	0.15 – 0.50 mm		0.006 – 0.020 in
Point gap	0.45 mm		0.018 in
Dwell angle	50 – 54°		
ADVANCE CHARACTERISTICS			
Vacuum advance angle	mmHg	inHg	Dis. advance angle Degrees
	45	1.77	Advance begins
	75	2.95	4.3°
	105	4.13	7.5°
Governor advance angle	Distributor	rpm	Dis. advance angle Degree
	600		Advance begins
	1400 3000		14° 13.5°

**Ignition Coil**

Primary	About 1.4 $\Omega$
Secondary coil resistance	About 8.5 k $\Omega$
External resistor resistance	1.3 – 1.7 $\Omega$
Insulation resistance at 500V	Over 10 M $\Omega$

**High Tension Cord**

End to end resistance	Less than 25 k $\Omega$
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**Spark Plug**

Heat Range	ND W20EXR
Plug gap	NGK BPR-6EZ 0.9 – 1.0 mm      0.035 – 0.039 in

**CHARGING SYSTEM****Alternator**

Maximum output ampere	45A
Rotor coil resistance	4.1 – 4.3 $\Omega$
Brush length	STD      12.5 mm      0.49 in
	Limit      5.5 mm      0.22 in

**Alternator Regulator**

Voltage regulator regulating voltage	13.8 – 14.8 V
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MEMO

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