

Engine (G6EA - GSL 2.7)

GENERAL

ENGINE BLOCK

COOLING SYSTEM

LUBRICATION SYSTEM

INTAKE AND EXHAUST SYSTEM

CYLINDER HEAD ASSEMBLY

TIMING SYSTEM

ENGINE AND TRANSAXLE ASSEMBLY

GENERAL

SPECIFICATIONS EAF9ACDF

Description		Specifications	Limit	
General				
Type	V-type, DOHC			
Number of cylinder	6			
Bore	86.7mm(3.4134in.)			
Stroke	75mm(2.9528in.)			
Total displacement	2,656cc			
Compression ratio	10.4			
Firing order	2-3-4-5-6-1			
Valve timing				
Intake valve	Opens (ATDC)	4° ~ -56°		
	Closes (ABDC)	60° ~ 0°		
Exhaust valve	Opens (BBDC)	46°		
	Closes (ATDC)	10°		
Cylinder head				
Flatness of gasket surface	0.03mm(0.0012in.) or less		0.05mm(0.0020in.)	
Flatness of manifold mounting	Intake	0.15mm(0.0059in.) or less		
	Exhaust	0.15mm(0.0059in.) or less		
Camshaft				
Cam height	LH Camshaft	Intake	44.5mm(1.7520in.)	
		Exhaust	44.5mm(1.7520in.)	
	RH Camshaft	Intake	44.5mm(1.7520in.)	
		Exhaust	44.5mm(1.7520in.)	
Journal outer diameter	LH Camshaft	Intake	27.964 ~ 27.980mm(1.1009 ~ 1.1016in.)	
		Exhaust	27.964 ~ 27.980mm(1.1009 ~ 1.1016in.)	
	RH Camshaft	Intake	27.964 ~ 27.980mm(1.1009 ~ 1.1016in.)	
		Exhaust	27.964 ~ 27.980mm(1.1009 ~ 1.1016in.)	
Bearing oil clearance	Intake	0.020 ~ 0.057mm(0.0008 ~ 0.0022in.)		
	Exhaust	0.020 ~ 0.057mm(0.0008 ~ 0.0022in.)		
End play	0.05 ~ 0.15mm(0.0020 ~ 0.0059in.)			
Valve				
Valve length	Intake	110.1mm(4.3346in.)		
	Exhaust	111.1mm(4.3740in.)		
Stem outer diameter	Intake	5.965 ~ 5.980mm(0.2348 ~ 0.2354in.)		
	Exhaust	5.950 ~ 5.965mm(0.2343 ~ 0.2348in.)		
Face angle	45° ~ 45.5°			

Description		Specifications	Limit
Thickness of valvehead(margin)	Intake	1.0mm(0.0394in.)	
	Exhaust	1.3mm(0.0512in.)	
Valve stem to valve guide clearance	Intake	0.020 ~ 0.050mm(0.0008 ~ 0.0020in.)	0.10mm(0.0039in.) or less
	Exhaust	0.035 ~ 0.065mm(0.0014 ~ 0.0026in.)	0.13mm(0.0051in.) or less
Valve guide			
Inner diameter	Intake	6.000 ~ 6.015mm(2.2362 ~ 2.2368in.)	
	Exhaust	6.000 ~ 6.015mm(2.2362 ~ 2.2368in.)	
Length	Intake	45.8 ~ 46.2mm(1.8031 ~ 1.8189in.)	
	Exhaust	46.8 ~ 47.2mm(1.8425 ~ 1.8583in.)	
Valve spring			
Free length		46.8mm(1.8425in.)	
Load	Height: 35mm	180.5 ~ 199.5N(18.4 ~ 20.3Kgf, 40.6 ~ 44.8lb)	
	Height: 26.5mm	342 ~ 378N(34.9 ~ 38.6Kgf, 76.9 ~ 85.1lb)	
Out of squareness		1.5° or less	
MLA(Mechanical Lash Adjuster)			
MLA outer diameter	Intake	29.964 ~ 29.980mm(1.1797 ~ 1.1803in.)	
	Exhaust	29.964 ~ 29.980mm(1.1797 ~ 1.1803in.)	
Cylinder head tappet bore inner diameter	Intake	30.000 ~ 30.025mm(1.1811 ~ 1.1821in.)	
	Exhaust	30.000 ~ 30.025mm(1.1811 ~ 1.1821in.)	
MLA to tappet bore clearance	Intake	0.020 ~ 0.061mm(0.0008 ~ 0.0024in.)	0.07mm(0.0027in.) or less
	Exhaust	0.020 ~ 0.061mm(0.0008 ~ 0.0024in.)	0.07mm(0.0027in.) or less
Valve clearance			
Intake		0.17 ~ 0.23mm (0.0067 ~ 0.0090in.)	0.10 ~ 0.30mm (0.0039 ~ 0.0118in.)
Exhaust		0.27 ~ 0.33mm (0.0106 ~ 0.0129in.)	0.20 ~ 0.40mm (0.0078 ~ 0.0157in.)
Cylinder block			
Cylinder bore		96.00 ~ 96.03mm (3.7795 ~ 3.7807in.)	
Flatness of gasket surface		Less than 0.05mm (0.0019in.) [Less than 0.02mm (0.0008in.) / 150x150]	
Piston			
Piston outer diameter		95.96 ~ 95.99mm(3.7779 ~ 3.7791in.)	
Piston to cylinder clearance		0.03 ~ 0.05mm(0.0012 ~ 0.0020in.)	

Description		Specifications	Limit
Ring groove width	No. 1 ring groove	1.22 ~ 1.24mm (0.0480 ~ 0.0488in.)	
	No. 2 ring groove	1.22 ~ 1.24mm (0.0480 ~ 0.0488in.)	
	Oil ring groove	2.01 ~ 2.03mm (0.0791 ~ 0.0799in.)	
Piston O.S.		0.25mm(0.0098in.)	
Piston ring			
Side clearance	No. 1 ring	0.04 ~ 0.08mm(0.0016 ~ 0.0031in.)	0.1mm(0.0039in.)
	No. 2 ring	0.03 ~ 0.07mm(0.0012 ~ 0.0027in.)	0.1mm(0.0039in.)
	Oil ring	0.06 ~ 0.15mm(0.0024 ~ 0.0059in.)	0.2mm(0.0079in.)
End gap	No. 1 ring	0.15 ~ 0.30mm(0.0059 ~ 0.0118in.)	0.6mm(0.0236in.)
	No. 2 ring	0.30 ~ 0.45mm(0.0118 ~ 0.0177in.)	0.7mm(0.0275in.)
	Oil ring	0.20 ~ 0.70mm(0.0078 ~ 0.0275in.)	0.8mm(0.0315in.)
Piston ring O.S.		0.25mm(0.0098in.)	
Piston pin			
Piston pin outer diameter		21.001 ~ 21.007mm(0.8268 ~ 0.8270in.)	
Piston pin hole inner diameter		21.014 ~ 21.023mm(0.8273 ~ 0.8277in.)	
Piston pin hole clearance		0.007 ~ 0.022mm(0.0003 ~ 0.0009in.)	
Connecting rod small end inner diameter		20.974 ~ 20.985mm(0.8257 ~ 0.8262in.)	
Connecting rod small end hole clearance		0.016 ~ 0.033mm(0.0006 ~ 0.0013in.)	
Connecting rod			
Connecting rod big end inner diameter		51.000 ~ 51.018mm(2.0079 ~ 2.0086in.)	
Connecting rod bearing oil clearance		0.018 ~ 0.036mm(0.0007 ~ 0.0014in.)	
Side clearance		0.1 ~ 0.25mm (0.0039 ~ 0.0098in.)	0.4mm(0.0157in.)
Crankshaft			
Main journal outer diameter		61.982 ~ 62.000mm(2.4402 ~ 2.4409in.)	
Pin journal outer diameter		47.982 ~ 48.000mm(1.8891 ~ 1.8898in.)	
Main bearing oil clearance		0.004 ~ 0.022mm(0.0002 ~ 0.0009in.)	
End play		0.07 ~ 0.25mm(0.0028 ~ 0.0098in.)	0.30mm(0.0118in.)
Oil pump			
Relief valve opening pressure		490.33 ~ 588.40kPa(5.0 ~ 6.0kgf/cm ² , 71.12 ~ 85.34 psi)	
Engine oil			
Oil quantity (Total)		4.5L(4.76U.S.qts,3.96Imp.qts)	
Oil quantity (Oil pan)		4.2L(4.44U.S.qts,3.70Imp.qts)	
Oil quantity (Oil filter)		0.3L(0.32U.S.qts,0.26Imp.qts)	
Oil quality		Above SJ or SL	
Oil pressure		130kPa(1.32kgf/cm ² ,18.77psi) [at 1000rpm,110°C(230°F)]	
Cooling system			
Cooling method		Forced circulation with electrical fan	

Description		Specifications	Limit
Coolant quantity		8.2~8.3L(8.66~8.77U.S.qts,7.22~7.30Imp.qts)	
Thermostat	Type	Wax pellet type	
	Opening temperature	82±2°C (179.6±35.6°F)	
	Fully opened temperature	95°C (203°F)	
	Full lift	10mm (0.3937in.) or more	
Radiator cap	Main valve opening pressure	93.16 ~ 122.58kpa(0.95 ~ 1.25 kg/cm ² , 13.51 ~ 17.78psi)	
	Vacuum valve opening pressure	0.98 ~ 4.90 kpa(0.01 ~ 0.05 kg/cm ² , 0.14 ~ 0.71 psi)	
Engine coolant temperature sensor			
Type		Thermister type	
Resistance	20°C (68°F)	2.31 ~ 2.59 kΩ	
	80°C(176°F)	0.3222 kΩ	

TIGHTENING TORQUE

Item	Quantity	Nm	kgf.m	lb-ft
Oil seal case bolt	3	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Main bearing cap bolt(M10)	8	29.4 + 90°	3.0 + 90°	21.7 + 90°
Main bearing cap bolt(M8)	8	15.7 + 90°	1.6 + 90°	11.6 ~ + 90°
Rear plate bolt	1	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil pump case bolt(8x25)	1	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Oil pump case bolt(8x35)	1	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
TimingOil pump case bolt(8x65)	1	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
TimiOil relief plug	1	39.2 ~ 49.0	4.0 ~ 5.0	28.9 ~ 36.2
Oil filter bracket bolt(8x35)	4	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Oil filter bracket bolt(8x65)	2	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Oil filter insert	1	44.1 ~ 53.9	4.5 ~ 5.5	32.5 ~ 39.8
Timing chain cover bolt	21	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Upper oil pan bolt(8x22)	15	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Upper oil pan bolt(163.5mm)	1	4.9 ~ 6.9	0.5 ~ 0.7	3.6 ~ 5.1
Upper oil pan bolt(154.5mm)	1	4.9 ~ 6.9	0.5 ~ 0.7	3.6 ~ 5.1
Lower oil pan bolt	11	9.8 ~ 11.8	1.0 ~ 1.2	7.2 ~ 8.7
Oil drain plug	1	34.3 ~ 44.1	3.5 ~ 4.5	25.3 ~ 32.5
Engine support bracket bolt(10x94)	2	58.8 ~ 68.6	6.0 ~ 7.0	43.4 ~ 50.6
Engine support bracket bolt(10x102.5)	1	58.8 ~ 68.6	6.0 ~ 7.0	43.4 ~ 50.6
Camshaft bearing cap bolt(6x38)	24	10.8 ~ 12.7	1.1 ~ 1.3	8.0 ~ 9.4
Camshaft bearing cap bolt(8x38)	12	20.6 ~ 25.5	2.1 ~ 2.6	15.2 ~ 18.8
Cylinder head bolt	16	24.5 + 60° + 45°	2.5 + 60° + 45°	18.1 + 60° + 45°
Cylinder head cover bolt	22	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
Crankshaft pulley bolt	1	166.7 ~ 176.5	17.0 ~ 18.0	123.0 ~ 130.2
Drive plate bolt	8	71.6 ~ 75.5	7.3 ~ 7.7	52.8 ~ 55.7
Connecting rod bearing cap bolt	12	19.6 ~ 90°	2.0 ~ 90°	14.5 ~ 90°
OCV(Oil Control Valve) bolt	2	7.8 ~ 9.8	0.8 ~ 1.0	5.8 ~ 7.2
CVVT & exhaust cam sprocket bolt	4	66.7 ~ 78.5	6.8 ~ 8.0	49.2 ~ 57.9
Timing chain auto tensioner bolt	4	10.8 ~ 12.7	1.1 ~ 1.3	8.0 ~ 9.4
Camshaft sprocket bolt	2	88.3 ~ 107.9	9.0 ~ 11.0	65.1 ~ 79.6
Timing belt idler bolt	1	49.0 ~ 58.8	5.0 ~ 6.0	36.2 ~ 43.4
Timing belt tensioner bolt	2	19.6 ~ 26.5	2.0 ~ 2.7	14.5 ~ 19.5
Timing belt tensioner arm bolt	1	34.3 ~ 53.9	3.5 ~ 5.5	25.3 ~ 39.8
Water pump bolt(8x20)	3	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~ 15.9
Water pump bolt(8x25)	4	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~ 15.9
Drive belt idler bolt	1	34.3 ~ 53.9	3.5 ~ 5.5	25.3 ~ 39.8

Item	Quantity	Nm	kgf.m	lb-ft
Drive belt tensioner bolt	1	34.3 ~ 53.9	3.5 ~ 5.5	25.3 ~ 39.8
Water pipe bolt	1	16.7 ~ 19.6	1.7 ~ 2.0	12.3 ~ 14.5
Water temp. control assembly nut	4	29.4 ~ 41.2	3.0 ~ 4.2	21.7 ~ 30.4
Oil level gauge bolt	1	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Oil screen bolt	2	14.7 ~ 21.6	1.5 ~ 2.2	10.8 ~ 15.9
Water outlet pipe bolt	3	16.7 ~ 19.6	1.7 ~ 2.0	12.3 ~ 14.5
Water inlet pipe bolt	2	16.7 ~ 19.6	1.7 ~ 2.0	12.3 ~ 14.5
Water inlet pipe nut	1	16.7 ~ 19.6	1.7 ~ 2.0	12.3 ~ 14.5
Surge tank bolt(8x28)	3	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Surge tank bolt(8x80)	2	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Surge tank nut	2	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Intake manifold bolt	4	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Intake manifold nut	4	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Surge tank bracket bolt	2	18.6 ~ 23.5	1.9 ~ 2.4	13.7 ~ 17.4
Exhaust manifold bolt	14	29.4 ~ 34.3	3.0 ~ 3.5	21.7 ~ 25.3
Heat protect bolt	6	16.7 ~ 21.6	1.7 ~ 2.2	12.3 ~ 15.9
Front muffler bolt	2	39.2 ~ 58.8	4.0 ~ 6.0	28.9 ~ 43.4

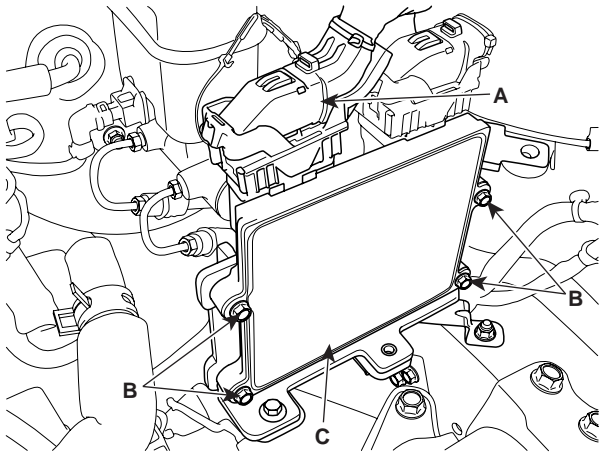
COMPRESSION PRESSURE INSPECTION

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NOTE

If there is a lack of power, excessive oil consumption or poor fuel economy, measure the compression pressure.

1. Warm up the engine until the normal operating temperature becoming 80~95°C(176~203°F).
2. Remove the surge tank.
3. Remove the ignition coil connectors(A) and ignition coils(B).



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4. Using a 16mm plug wrench, remove the 6 spark plugs.
5. Check cylinder compression pressure.
 - 1) Insert a compression gauge into the spark plug hole.
 - 2) Open the throttle fully.
 - 3) With the fully-open throttle in cranking, measure the compression pressure.

NOTE

Always use a fully charged battery to get the engine speed of 250 rpm or more.

Repeat steps 1) through 3) for each cylinder.

NOTE

This measurement must be done in as short a time as possible.

Compression pressure: 1,176.79kPa (12.0kgf/cm², 170.68psi) - 200 ~ 250rpm
 Minimum pressure: 1,029.69kPa (10.5kgf/cm², 149.34psi)
 Difference between cylinders: 98.07kPa (1.0kgf/cm², 14.22psi)

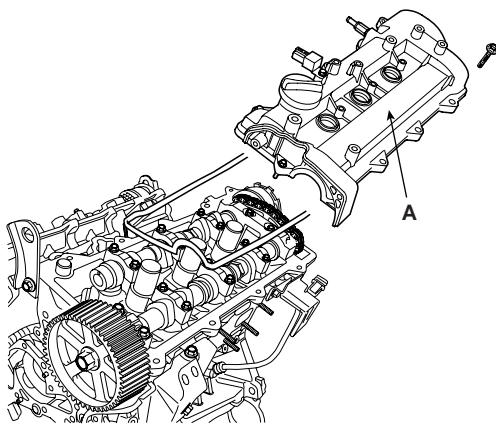
- 4) If the compression pressure in 1 or more cylinders is lower than the specification above, pour a small amount of engine oil into the cylinder through the spark plug hole, repeat the steps (1) through (3) for the cylinder and measure the pressure again.
 - If adding oil increases the pressure up, the piston rings or cylinder bores might be worn or damaged.
 - If the pressure doesn't increase, a valve may be sticking or seating may be improper, or there may be leakage from the gasket.
6. Reinstall the spark plugs.
7. Install the ignition coils and connect ignition coil connectors.
8. Install the surge tank.

VALVE CLEARANCE INSPECTION AND ADJUSTMENT

NOTE

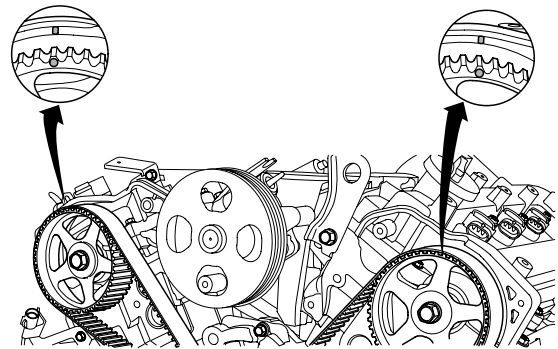
Inspect and adjust the valve clearance when the engine is cold (Engine coolant temperature : 20°C±5°C(59~77°F)) and cylinder head is installed on the cylinder block.

1. Remove the engine cover.
2. Remove air cleaner assembly.
3. Remove the surge tank.
4. Remove the cylinder head cover.
 - 1) Disconnect the ignition coil connector and remove the ignition coil.
 - 2) Remove the cylinder head cover.



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5. Set the piston of the No.1 cylinder to TDC(Top Dead Center) position.
 - 1) Turn the crankshaft pulley clockwise and align its groove with the timing mark "T" of the timing chain cover.
 - 2) Check that the timing marks of the camshaft sprocket are in straight line on that of the cylinder head cover surface as shown in the illustration. It makes the piston of the No.1 cylinder position at TDC.

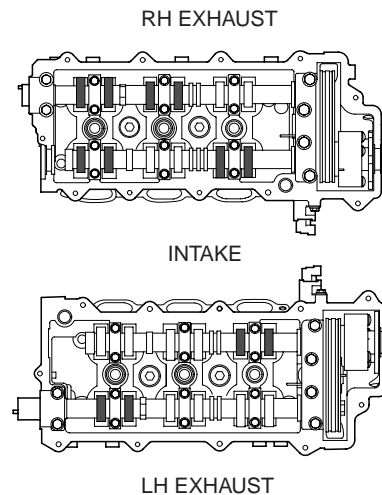


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NOTE

If not, turn the crankshaft one revolution clockwise.

6. Inspect the intake and the exhaust valve clearance.
 - 1) With the piston of the No.1 cylinder positioning at TDC, the valves which can be measured its clearance are as shown below.



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Measurement method.

- Using a thickness gauge, measure the clearance between the tappet and the base circle of camshaft.
- Record the out-of-specification valve clearance measurements. They will be used later to determine the required adjusting tappet for replacement.

Specification

Limit (Engine coolant temperature : 20°C [68°F])

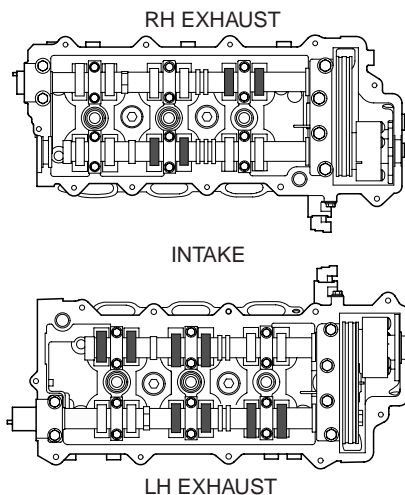
Intake : 0.10 ~ 0.30mm (0.0039 ~ 0.0118in.)

Exhaust : 0.20 ~ 0.40mm (0.0079 ~ 0.0157in.)

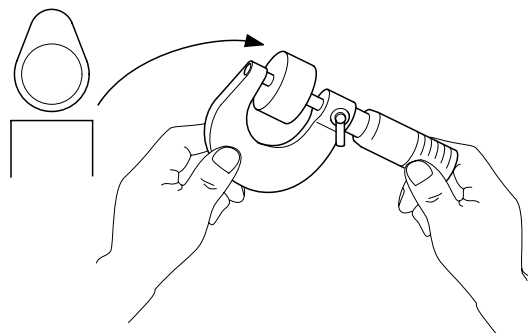
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ENGINE (G6EA - GSL 2.7)

- 2) Turn the crankshaft pulley one revolution (360°) clockwise and align the groove with the timing mark "T" of the timing chain cover.
- 3) With the piston of the No.4 cylinder positioning at TDC, the valves which can be measured its clearance are as shown below.



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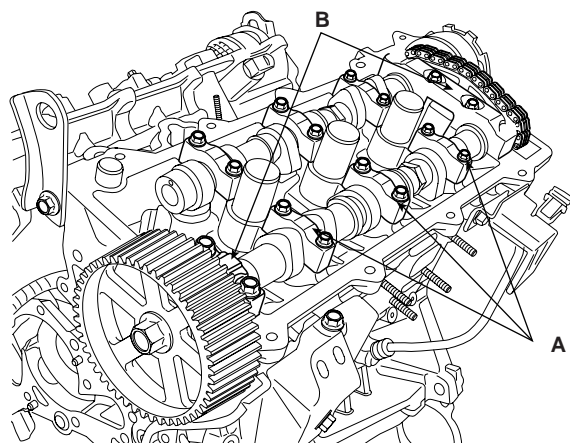
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- 7) Calculate the thickness of a new tappet so that the valve clearance comes within the specified value.

T : Thickness of removed tappet
 A : Measured valve clearance
 N : Thickness of new tappet
 Intake : $N = T + [A - 0.20\text{mm}(0.0079\text{in.})]$
 Exhaust : $N = T + [A - 0.30\text{mm}(0.0118\text{in.})]$

7. Adjust the intake and the exhaust valve clearances.

- 1) Set the piston of the No.1 cylinder to the TDC/position.
- 2) Remove the timing belt.
- 3) Remove the camshaft bearing caps(A, B).



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- 4) Remove the camshaft assembly.
- 5) Remove MLA(Mechanical Lash Adjuster)s.
- 6) Measure the thickness of the removed tappet using a micrometer.

- 8) Select a new tappet with a thickness as close as possible to the calculated value.

NOTE

Tappets are available with 41 different size increments of 0.015mm (0.0006in.) from 3.00mm (0.118in.) to 3.600mm (0.1417in.)

- 9) Place a new tappet on the cylinder head.

NOTE

Apply engine oil on the periphery surface of the selected tappet.

- 10) Install the intake and exhaust camshafts.
- 11) Install the bearing caps.
- 12) Install the timing belt.
- 13) Turn the crankshaft two revolutions in the operating direction(clockwise) and realign crankshaft sprocket and camshaft sprocket timing marks(A).
- 14) Recheck the valve clearance.

Specification (Engine coolant temperature: 20°C[68°F])
 Intake : 0.17 ~ 0.23mm (0.0067 ~ 0.0090in.)
 Exhaust : 0.27 ~ 0.33mm (0.0106 ~ 0.0129in.)
