

# CHAPTER 3 ENGINE

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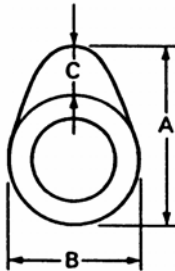
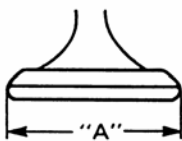
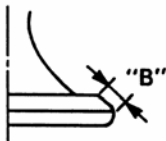
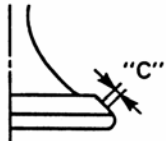

### 3.11.1 RADIATOR

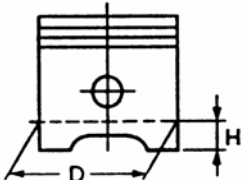
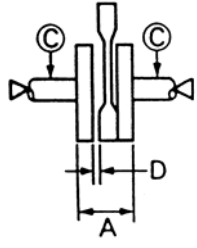
### 3.11.2 WATER PUMP

### 3.11.3 THERMOSTAT

**3.1 MAINTENANCE SPECIFICATIONS**

**3.1.1 SPECIFICATIONS**

Item		Standard	Limit	
Cylinder head : Warp limit:			0.03 mm	
Cylinder: Bore size Out of round limit		70.000- 70.014 mm	70.025 mm 0.03 mm	
Camshaft: Cam dimensions Intake "A" "B" "C" Exhaust "A" "B" "C" Camshaft runout limit		36 .545- 36 .645 mm 30.021-30.121 mm 6.524 mm 36 .547- 36 .647 mm 30 .067- 30.167 mm 6.48 mm .....	36 .45 mm 29.92 mm ... 36 .45 mm 29 .97 mm ... 0.03m m	
Cam chain: Cam chain type/No. of links		DID SC.A-0404A SDH/104	...	
Rocker arm /rocker armshaft: Rocker arm inside diameter Rocker shaft outside diameter Rocker arm - to- rocker arm shaft clearance		12 .000- 12 .018 mm 11.981- 11.991 mm 0.009- 0.012 mm	12 .03 mm 11.95 mm ...	
Valve, Valve seat, Valve guide: Valve clearance (cold)				
Valve dimensions	IN EX	0.08-0.12 mm 28.4-28.6 mm	... ...	
Valve dimensions				
		Face Width	Seat Width	Margin Thickness
"A" head diameter	IN EX	33.9-34.1mm 28.4-28.6mm	...	...
"B" face width	IN EX	3.394-3 .960mm 3.394-3.960 mm	...	...
"C " seat width	IN EX	0.9-1.1mm 0.9-1.1 mm	...	...
"D" margin thickness	IN EX	0.8-1.2 mm 0.8-1.2 mm	...	...
Stem outside diameter	IN EX	5.975- 5.990 mm 5.960-5.975 mm	5.94 mm 5.92 mm	
Guide inside diameter	IN EX	6.000- 6.012 mm 6.000- 6.012 mm	6.05 mm 6.05 mm	

Item	Standard	Limit	
Stem-to-guide clearance	IN EX	0.010- 0.037 mm 0.025-0.052 mm	0.08 mm 0.1 mm
Stem runout limit	IN	0.9-1.1 mm	0.01 mm 1.6 mm
Valve seat width	EX	0.9-1.1 mm	1.6 mm
<b>Valve spring :</b>			
Free length (Inner)	IN/EX	38.1 mm	38.1 mm
(Outer)	IN/EX	36.93 mm	35.0 mm
Set length (valve closed)	(Inner) IN/EX	30.1 mm	...
	(Outer) IN/EX	31.6 mm	...
Com pressed pressure	(Inner) IN/EX	7.8- 9.0 kg	...
	(Outer) IN/EX	37.22-42.83 kg	...
Tilt limit	(Inner) IN/EX	...	2.5° /1.7mm
	(Outer) IN/EX	...	2.5° /1.7mm
<b>Piston:</b>			
Piston to cylinder clearance		0.02 - 0.04 mm	0.15m m
Piston size "D"		69.965-69.980 mm	...
Measuring point "H"		5mm	...
Piston pin bore inside diameter		17.004-17.015 mm	17.045 mm
Piston pin outside diameter		16.991-17.000 mm	16.975 mm
<b>Piston rings :</b>			
<b>Top ring :</b>			
Type	Barrel	...	...
End gap (installed)	0.15- 0.30 mm	0.45 mm	0.45 mm
Side clearance (installed )	0.04- 0.08 mm	0.12 mm	0.12 mm
<b>2nd ring :</b>			
Type	Taper	...	...
End gap (installed)	0.30- 0.45 mm	0.7 mm	0.7 mm
Side clearance	0.03 - 0.07 mm	0.12 mm	0.12 mm
<b>Oil ring :</b>			
End gap (installed)	0.2- 0.7 mm	...	...
<b>Crankshaft:</b>			
Crank width "A"		59.95-60.00 mm	...
Runout limit "C "		0.03 mm	...
Big end side clearance "D"		0.35- 0.85 mm	...

Item	Standard	Limit
Automatic centrifugal clutch: Clutch shoe thickness Clutch hosing inside diameter Clutch shoe spring free length Weight outside diameter Clutch- in revolution	3.0 mm 135 mm 2 8.1 mm 20 mm 2 ,100- 2,700 r/m in	2.0 mm 135 .5 mm ... 19 .5 mm ...
V-belt: V-belt width	22.6 mm	21.0 mm
Carburetor: Type I.D. mark Ventuly outside diameter Main jet (M .J) Jet needle (M .A.J) Throttle valve size (J.N) Pilot air jet (Th .V) Needle jet (P.A.J.1) Pilot outlet (N.J) Pilot jet (P.O) Bypass (B.P) Pilot screw (P.S) Valve seat size (V.S) Starter jet 1 (G.S.1) Starter jet 2 (G.S.2) Float height (F.H) Engine idle speed Intake vacuum	CVK 1000-L06-0000 T H V- 052 A $\phi$ 30 # 128 N425- 7AD 01 10° $\phi$ 1.2 $\phi$ 2.1 $\phi$ 0.9 # 40 $\phi$ 0.7x4 1*3/8 j 3/4 $\phi$ 1.2 # 42 $\phi$ 0 .9 >3.0 1,450-1,550 r/m in 220-260 mmHg	... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...
Oil pump: Type Tip clearance Side clearance Housing and rotor clearance	Trochoid type 0.1- 0 .34 mm 0.013- 0.03 6 mm 0 .04- 0.09 mm	0 .4 mm 0 .15 mm 0 .15 mm

Item	Standard	Limit
Radiator: Type Width/height/thickness Radiator cap opening pressure Radiator capacity Reservoir tank capacity	Cooling fin with electric fan 140/238/24 mm 110-140kPa (1.1-1.4kg/cm <sup>2</sup> , 1.1-1.4bar) 2 L 0 .35 L	... ... ... ... ...
Thermostatic valve: Valve opening temperature Valve full open temperature Valve full open lift	70 .5- 73 .5°C 85 °C 3 mm	

**3.1.2 TIGHTENING TORQUES**

Part to be tightened	Part name	Thread size	Q'ty	Tightening Torque		Remarks
				N.m	m.kg	
Oil check bolt	—	M 6	1	7	0.7	
Exhaust pipe stud bolt	—	M 8	2	13	1.3	
Spark plug	—	M12	1	18	1.8	
Cam sprocket cover	Bolt	M 6	2	10	1.0	
Cylinder head and cylinder	Nut	M 8	4	22	2.2	
Cylinder head and cylinder (Cam chain side)	Bolt	M 6	2	10	1.0	
Valve cover	Bolt	M 6	5	10	1.0	
Rotor	Nut	M16	1	80	8.0	
Valve adjuster locknut	Nut	M 6	2	14	1.4	
Cam shaft bearing stopper	Bolt	M 6	2	8	0.8	
Cam sprocket	Bolt	M10	1	60	6.0	
Cam chain tensioner (Body)	Bolt	M 6	2	10	1.0	
(Plug)	Bolt	M8	1	8	0.8	
Guide stopper 2	Bolt	M 6	1	10	1.0	
Water pump housing cover	Bolt	M 6	3	10	1.0	
Hose joint	—	M 6	2	7	0.7	
Thermostatic valve cover	Bolt	M 6	2	10	1.0	
Filer neck supporting	Bolt	M 5	1	5	0.5	
Oil pump	Screw	M 6	2	7	0.7	
Oil pump cover	Bolt	M 3	1	1	0.1	
Drain plug	Bolt	M 35	1	32	3.2	
Carburetor joint	Bolt	M 6	2	10	1.0	
Carburetor joint and carburetor	Nut	M 6	2	10	1.0	
Fuel pump	—	M6	2	10	1.0	
Exhaust pipe assembly	Nut	M8	2	20	2.0	
Crankcase (left and right)	Bolt	M 6	9	10	1.0	
Drain bolt	Bolt	M 8	1	22	2.2	
Oil filer	Bolt	M 14	1	3	0.3	
Crankcase cover (left)	Bolt	M 6	10	10	1.0	
Magnet cover	—	M 6	10	10	1.0	

Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		Remarks
				Nm	m.kg	
Cover (oil pump)	Bolt	M 6	2	12	1.2	
Timing check plug	P lug	M 16	1	8	0.8	
One way clutch	—	M 8	3	30	3.0	
Clutch housing	Bolt	M 14	1	60	6.0	
Grease stopper (Primary sheave)	—	M 4	4	3	0.3	
Primary fixed sheave	—	M 14	1	60	6.0	
Clutch carrier assembly	—	M 36	1	90	9.0	
Stator	—	M 5	3	7	0.7	
Pick up coil	—	M 5	2	7	0.7	
Starter motor	Bolt	M 6	2	10	1.0	
Thermo switch	—	M 16	1	23	2.3	
Thermo unit	—	P t1/8	1	8	0.8	

**3.2 PARTS INSPECTION AND SERVICE**

**3.2.1 VALVE CLEARANCE ADJUSTMENT**

**NOTE:**

Valve clearance adjustment should be made with the engine cool, at room temperature.

When the valve clearance is to be measured or adjusted, the piston must be at Top Dead Center (T.D.C.) on the compression.

1. Remove :

- Crankcase cover

2. Remove :

- Spark plug
- Valve cover (intake side)
- Valve cover (exhaust side)

3. Remove:

- Timing check plug

4.Measure:

- Valve clearance

Out of specification → Adjust.

**Valve clearance (cold):**

**Intake valve 0.08- 0.12m m**

**Exhaust valve 0.16- 0.20mm**

**Measurement steps:**

- Rotate the primary fixed sheave counterclockwise to align the slit a on the rotor with the stationary pointer b on the crankcover 1 when the piston is Top Dead Center (TDC).
- Measure the valve clearance by using a feeler gauge.

6. Adjust

- Valve clearance

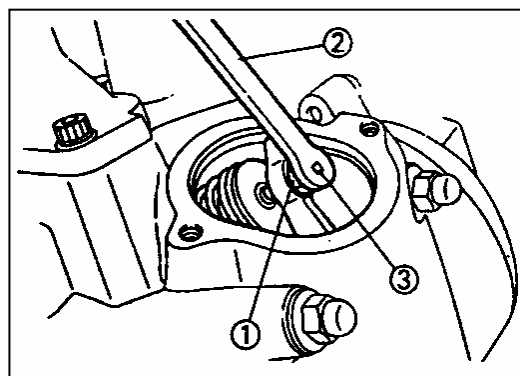
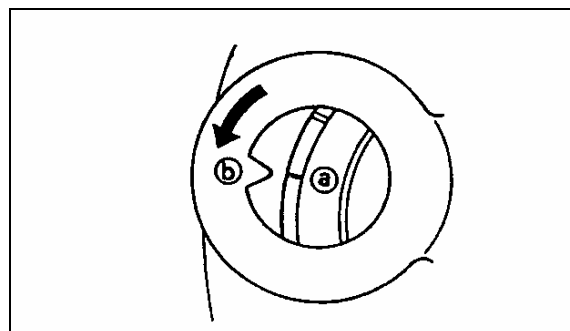
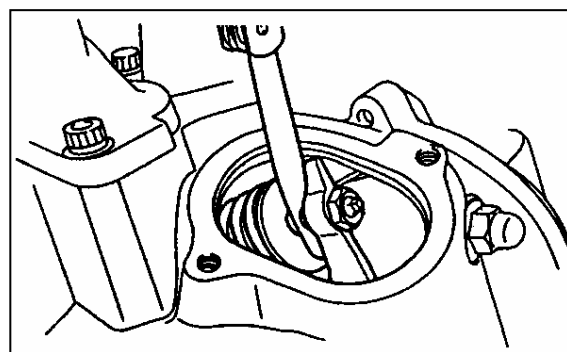
**Adjustment steps:**


- Loosen the locknut ①
- Turn the adjuster ③ in or out with the valve adjusting tool ② until specified clearance is obtained .

Turning in → Valve clearance is decreased

Turning out → Valve clearance is increased

- Hold the adjuster to prevent it from moving and tighten the locknut.




 14Nm(1.4m·kg)



- Measure the valve clearance.
- If the clearance is incorrect, repeat above steps until specified clearance is obtained.

7. Install:

- Valve cover (intake side) ①  10Nm(10m·kg)

- O-ring②

8. Install:

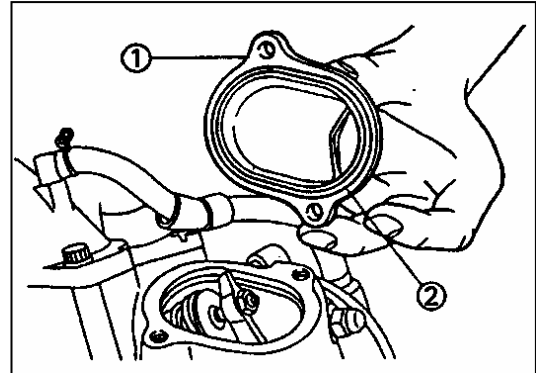
- Valve cover(exhaust side)  10Nm(1.0m·kg)

- O-ring

- Spark plug  18Nm(1.8m·kg)

- Timing check window screw

- Crankcase cover  10Nm(1.0m·kg)



### 3.2.2 IDLING SPEED ADJUSTMENT


1. Start the engine and let it warm up for several minutes.

2. Attach :

- Inductive tachometer to the spark plug lead.

3. Check:

- Engine idling speed


	Out of specification → Adjust. <b>Engine idling speed:</b> <b>1,450-1,550 r/min</b>
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4. Adjust:

- Engine idle speed

#### Adjustment steps:

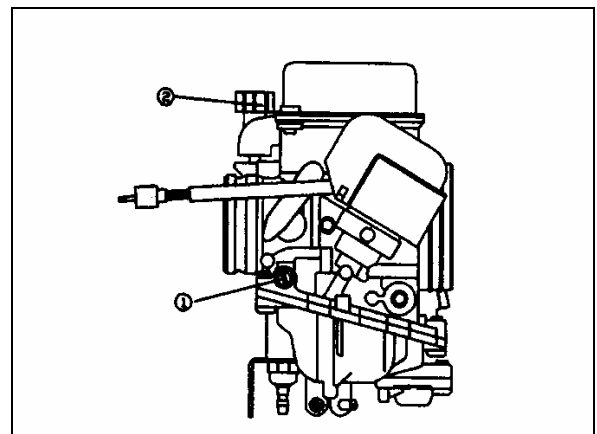
- Turn the pilot screw ① until it is lightly seated.
- Turn the pilot screw out by the specified number of turns.

	<b>Pilot screw:</b> <b>1 3/8 turn out</b>
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- Turn the throttle stop screw ② in or out until the specified idling speed is obtained.

**Turning in → Idling speed is increased.**

**Turning out → Idling speed is decreased.**



**3.2.SPARK PLUG INSPECTION**

1.Remove :

- Spark plug cap
- Spark plug


**CAUTION:**

Before removing the spark plug, use compressed air to blow away any dirt accumulated in the spark plug wells to prevent it from falling into the cylinder.

1. Check:

- Spark plug type

Incorrect →Replace.

	<b>Standard spark plug: DR8EA (NGK)</b>
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2.Inspect:

- Electrode ①

Wear/ damage →Replace.

- Insulator ②

Abnormal color →Replace.

Normal color is a medium - to- light tan color.

3.Clean:

- Spark plug


(with spark plug cleaner or wire brush)

4.Measure:


- Spark plug gap ③

(with a wire gauge)

Out of specification →Adjust gap.

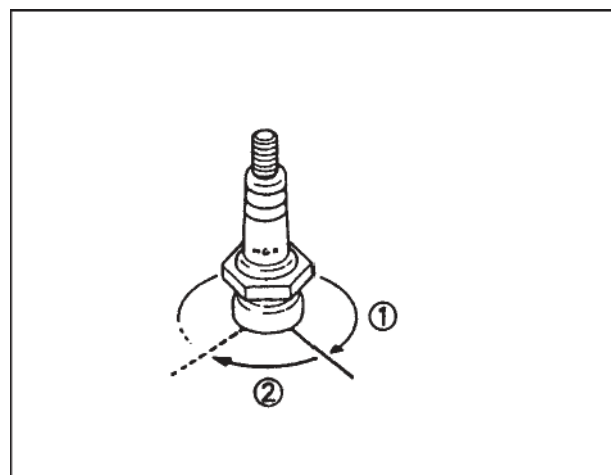
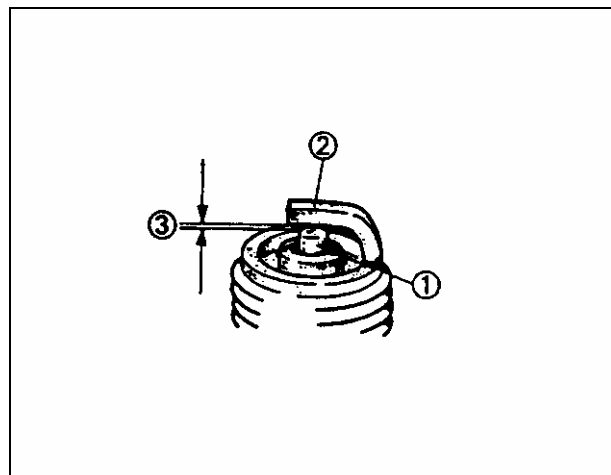
	<b>Spark plug gap : 0.6-0.7 mm</b>
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6. Install:

- Spark plug  18Nm(1.8m·kg)

**NOTE:**

**Before installing a spark plug, clean the Gasket surface and plug surface.**



**3.2.4 COMPRESSION PRESSURE MEASUREMENT**

**NOTE :**

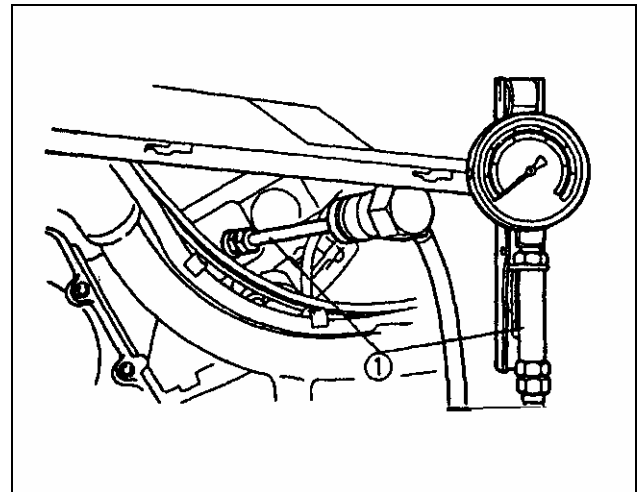
Insufficient compression pressure will result in performance loss.

1. Check:
  - Valve clearance  
Out of specification →Adjust.  
Refer to “CALCE CLEARANCE ADJUSTMENT” section.
2. Start the engine and let it warm up for several minutes.
3. Turn off the engine.
4. Remove:
  - Spark plug

Before removing the spark plug, use compressed air to blow away any dirt accumulated in the spark plug well to prevent it from falling into the cylinder.


5. Attach:
  - Compression gauge①

6. Measure:
  - Compression pressure  
If it exceeds the maximum pressure allowed→Inspect the cylinder head, valve surfaces and piston crown for carbon deposits.



If it is below the minimum pressure →  
Squirt a few drops of oil into the affected cylinder and measure again. Follow the table below.

Compression pressure (With oil applied into cylinder)	
Reading	Diagnosis
Higher than without oil	Worn or damaged pistons
Same as without oil	Possible defective ring (s), valves, cylinder head gasket or Piston →Repair.

 Compression pressure(at sea level):  
Standard:

1,400 kPa (14Kg/cm<sup>2</sup>, 14 bar)  
 Minimum :  
 1,120 kPa (11.2 kg /cm<sup>2</sup>, 11.2 bar)

Measurement steps :

- Crank the engine with the throttle wide open until reading on the compression gauge stabilizes.

**WARNING :**

Before cranking the engine, ground all spark plug leads to prevent sparking.

8. Install:

- Spark plug  18Nm(1.8m·kg)

**3.2.5ENGINE OIL LEVEL INSPECTION**

1. Start the engine and let it warm up for a few minutes .

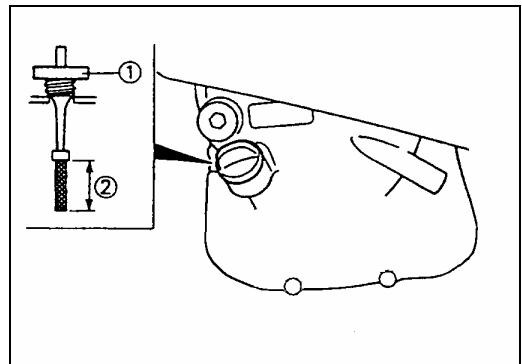
2. Turn off the engine.

3. Inspect: (Do not thread dipstick in)

- Engine oil level

Oil level should be between maximum ①and minimum ②marks .

Oil level is below the minimum mark      Add oil up to the proper lever.



**RECOMMENDED ENGINE OIL**

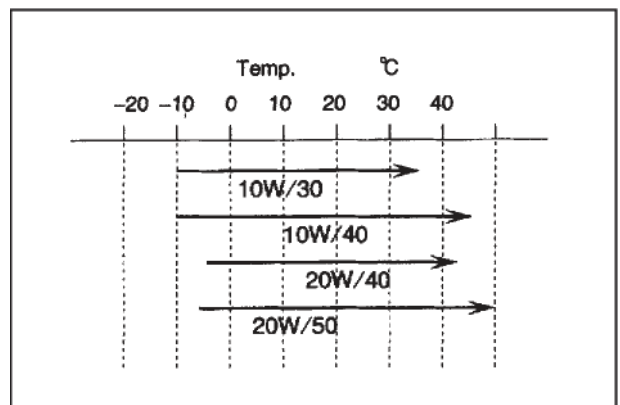
Refer to the chart for selection of the oils suited to the atmospheric temperature.

	<b>API STANDARD:</b> API SE or higher grade
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**CAUTION:**

- Do not put in any chemical additives or use oils with a grade of CD or higher.
- Be sure not to use oils labeled "ENERGY CONSERVING I" or higher. Engine oil also lubricates the clutch and additives could cause clutch slippage.
- Be sure no foreign material enters the crankcase.

4. Start the engine and let it warm up for a few minutes.



5. Turn off the engine.

**NOTE:**

Wait a few minutes until the oil settles before inspecting the oil level.

**ENGINE OIL REPLACEMENT**

1. Start the engine and let it warm up for several minutes .

2. Turn off the engine and place an oil pan under the engine.

3. Remove :

- Oil filler plug

- Drain plug ①  32Nm(3.2m·kg)

- Compression spring ②

- Oil strainer ③

- O-ring

- Drain the crankcase of its oil.

4. Install:

- O-ring ① **NEW**

- Compression spring ②

- Oil strainer ③

- Drain plug ④


- Oil filler plug

**NOTE :**

Check the drain plug O-ring. If damaged, replace it with a new one.

5. Fill:

- Crankcase

	Oil quantity: 1.4L
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6. Check:

- Engine oil level

Refer to "ENGINE OIL LEVEL INSPECTION" section

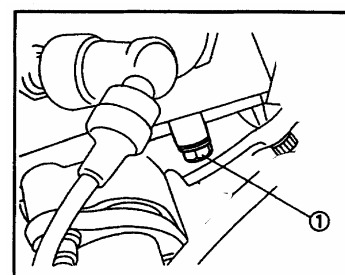
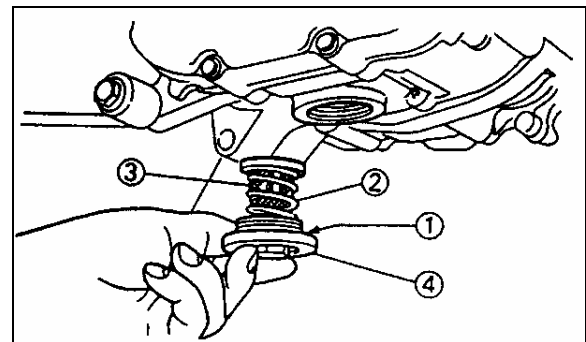
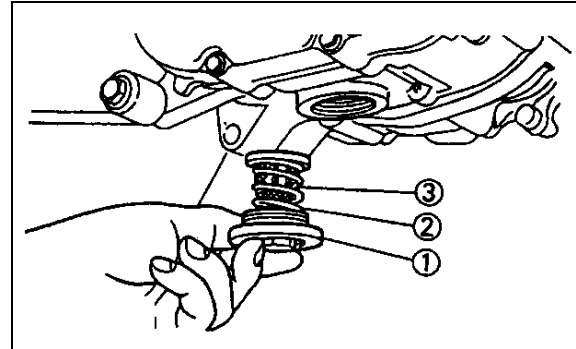
**ENGINE OIL PRESSURE INSPECTION**

Inspection steps:


- Slightly loosen the oil check bolt ①

●Start the engine and keep it idling until the oil begins to seep from the oil check bolt. If no oil comes out after one minute, turn the engine off so it will not seize.

- Check oil passages and oil pump for dam age or leakage.



- Start the engine after solving the problem (s), and recheck the oil pressure.
- Tighten the oil check bolt to specification.

 10Nm(1.0m·kg)

### CAUTION:

- Start the engine and check the oil pressure with the oil check bolt loosened.
- Do not apply at high speeds more than specified when checking the pressure.

### NOTE:

Wipe any spilled oil off the engine.

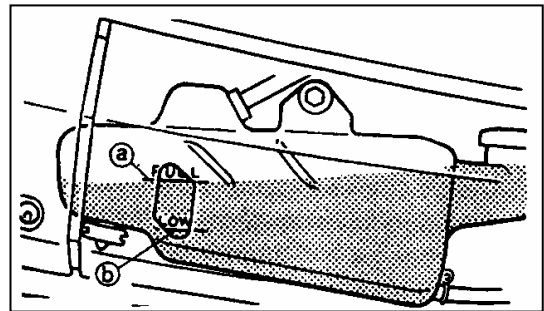
### 3.2.6 COOLANT LEVEL INSPECTION

Inspect:

- Coolant level

Coolant level should be between the maximum<sup>Ⓐ</sup> and minimum<sup>Ⓑ</sup> marks.

Coolant level is below the "LOWER" level line  
Add soft water (tap water) up to the proper level.



### CAUTION:

Hard water or salt water is harmful to engine parts. Use only distilled water if soft water is not available. If you use tap water, make sure it is soft water.

1. Start the engine and let it warm up for several minutes.
2. Turn off the engine and inspect the coolant level again.

### NOTE:

Wait a few minutes until the coolant settles before inspecting the coolant level.

### COOLANTRE PLACE MENT

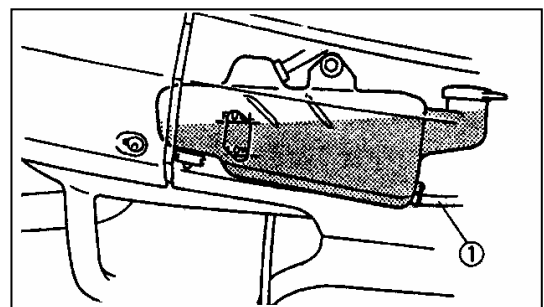
1. Remove:

- Front cover of ATV plastic body work.
- Seat.

2. Remove:

- Hose ① (reservoir tank)

Drain the reservoir tank of its coolant.



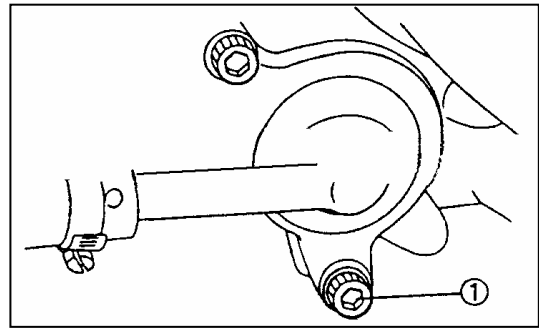
3. Remove:

- Drain bolt ①
- Radiator cap

**WARNING:**

Do not remove the radiator cap when the engine and radiator are hot. Scalding hot fluid and steam may be blown out under pressure, which could cause serious injury. When the engine has cooled, open the radiator cap as follows:

Place a thick rag or a towel over the radiator cap. Slowly rotate the cap counterclockwise toward the detent. This allows any residual pressure to escape. When the hissing sound has stopped, press down on the cap while turning counterclockwise and remove it.



**NOTE:**

- Remove the radiator cap after removing the drain bolt.

4. Clean:

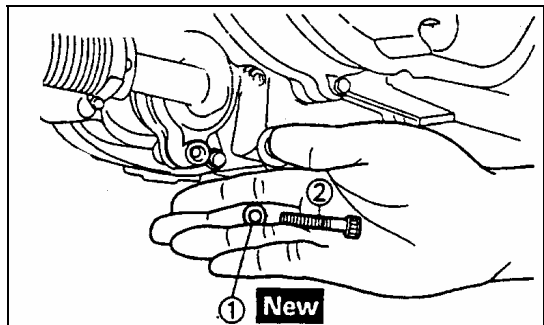
- Radiator

Fill soft water into the filler neck support ① (reservoir tank).

5. Install:

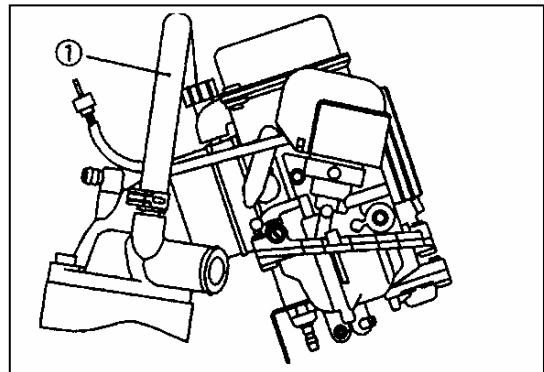
- Gasket ① **NEW**

- Drain bolt ② 10Nm(1.0m·kg)



6. Loosen:

- Hose ①



7. Connect:

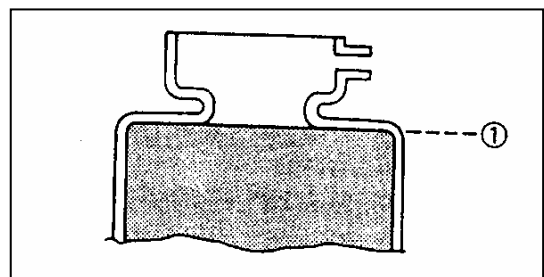
- Hose (reservoir tank)

8. Fill:


- Radiator ( to specified level ① )


Fill the coolant slowly, until the coolant comes out from the head hose.

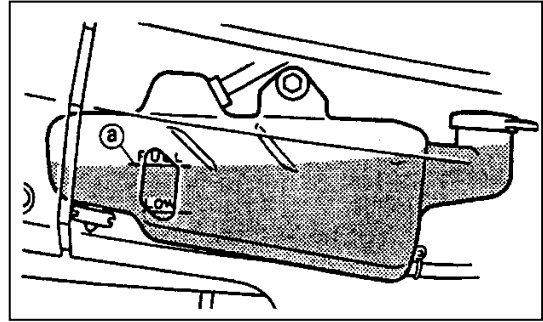
- Reservoir tank



( to maximum level ① )

	Recommended coolant: High quality ethylene glycol anti-freeze containing corrosion inhibitors for aluminum engine.
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	Coolant ② and water ③ (soft water) : Mixed ratio: min50% /max50% follow the instruction of the coolant Total amount: 1.4L Reservoir tank capacity: 0.35L
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Handling notes for coolant:

Coolant is potentially harmful and should be handled with special care.

**WARNING:**

splashes in your eyes:

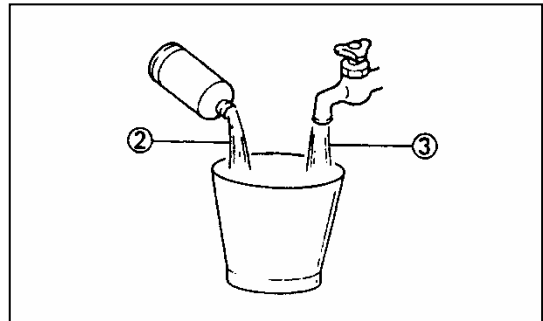
Thoroughly wash your eyes with water and consult a doctor.

If coolant splashes on your clothes:

- Quickly wash it away with water and then with soap and water.

If coolant is swallowed:

Vomit immediately and see a physician.



**CAUTION:**

- Hard water or salt water is harmful to engine parts. Use only distilled water if soft water is not available.

- If you use tap water, make sure it is soft water.

- Do not use water containing impurities or oil.

- Take care that no coolant splashes onto painted surfaces. If it does, wash them immediately with water.

- Do not mix different types of ethylene glycol antifreeze containing corrosion inhibitors for aluminum engines.

9. Tighten:

- Hose

Fill the coolant slowly to the specified level.

10. Install:

- Radiator cap



11. Start the engine and let it warm up for several minutes.

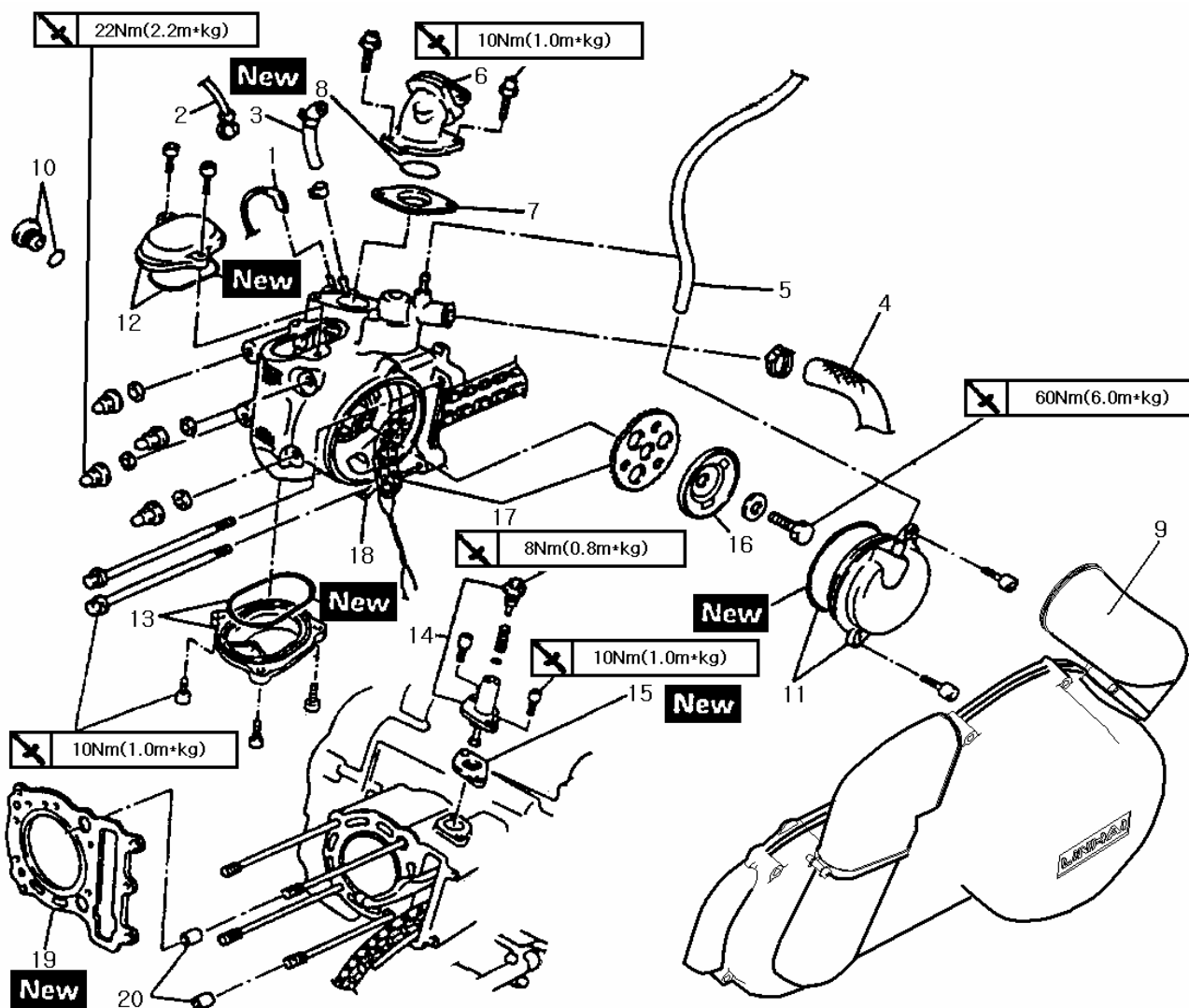
12. Stop the engine and inspect the level.

**NOTE:**

Wait a few minutes until the coolant settles before inspecting the coolant level.

13. Install: Remain parts.

**3.3CYLINDER HEAD**



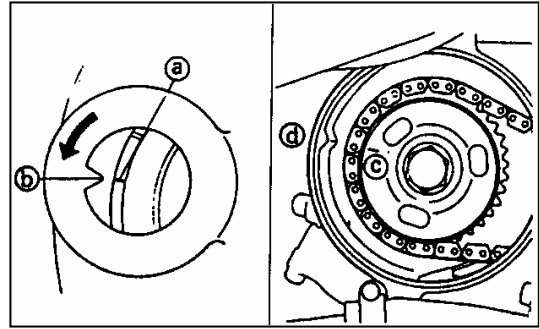
Order	Job name / Part name	Q 'ty	Remarks
1	Cylinder head removal Drain the coolant. Side panel Footrest board Carburetor Thermo unit lead		Remove the parts in order.      Refer to "CARBURETOR" section .
2	Plug cap	1	
3	Crankcase breather hose	1	
4	Outlet hose (cylinder head)	2	
5	Breather hose (crankcase)	1	
6	Carburetor joint	1	
7	Joint	1	
8	O-ring	1	
		2	
9	Crankcase cover	1	
10	Plug/O-ring	1/1	
11	Cam sprocket cover/O-ring	1/1	
12	Valve cover (intake side)/O-ring	1/1	
13	Valve cover (exhaust	1/1	
14	side)/O-ring	1	
15	Timing chain tensioner assembly	1	Refer to "CYLINDER HEAD REMOVAL AND INSTALLATION" section.
16	Timing chain tensioner gasket	1	
17	Breather plate	1/1	
18	Cam sprocket/Timing chain	1	
19	Cylinder head	1	Reverse the removal
20	Cylinder head gasket	2	procedure for installation.
	Dowel pin		

## CYLINDER HEAD REMOVAL

1. Align:

"I" mark ① on the rotor  
(with stationary pointer ② on the crankcase cover )

**NOTE:** If any special mark found, contact the ATV manufacture via the agent for the parts and special instruction.



**NOTE:**

Turn the primary sheave counterclockwise with a wrench and align the "I" mark ③ with the cylinder head match mark ④ when the piston is at TDC on the compression

2. Loosen:

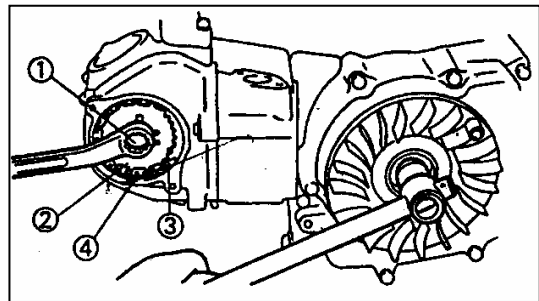
- Bolt ①

3. Remove:

- Timing chain tensioner assembly
- Timing chain tensioner gasket

4. Remove:

- Breather plate ②
- Cam sprocket ③
- Timing chain ④



**NOTE:**

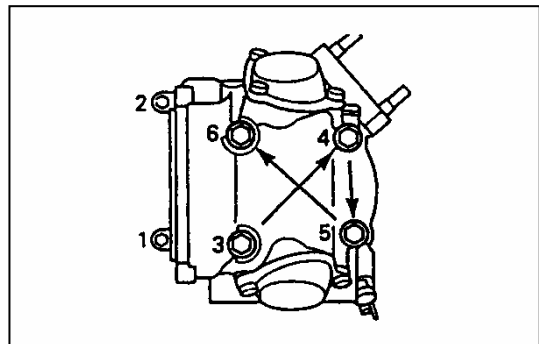
- Fasten a safety wire to the timing chain to prevent it from falling into the crankcase.
- Remove the bolt ① while holding the rotor mounting bolt with a wrench.

5. Remove:

- Cylinder head

**NOTE:**

- Loosen the nuts in their proper loosening sequence.
- Start by loosening each nut 1/2 turn until all are loose.



## CYLINDER HEAD INSPECTION:

1. Eliminate:

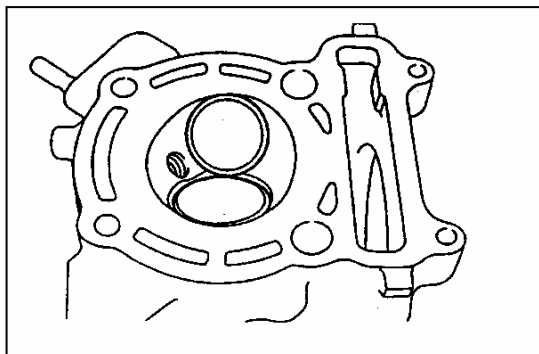
- Carbon deposits (from combustion chambers)

Use a rounded scraper.

**NOTE:**


Do not use a sharp instrument to avoid damaging or scratching:

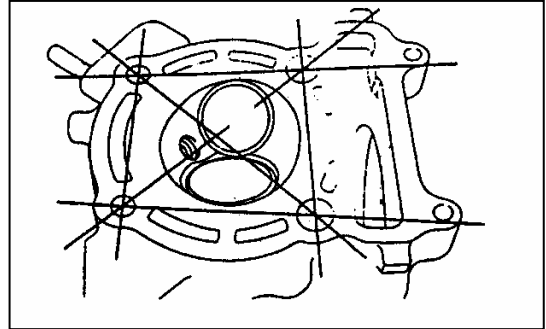
- Spark plug threads



- Valve seats
- 2. Inspect:
  - Cylinder head
  - Scratches/damage → Replace.

- 3. Measure:
  - Cylinder head warpage
  - Out of specification → Resurface .

	<b>Cylinder head warpage :</b> <b>Less than 0.03 mm</b>
--	--



### Warpage measurement and resurfacement steps:

- Place a straight edge and a feeler gauge across the cylinder head.
  - Measure the warpage.
- If the warpage is out of specification, resurface the cylinder head.
- Place a 400 ~ 600 grit wet abrasive pape on the surface plate, and resurface the head using a figure eight sanding patten.

### NOTE:

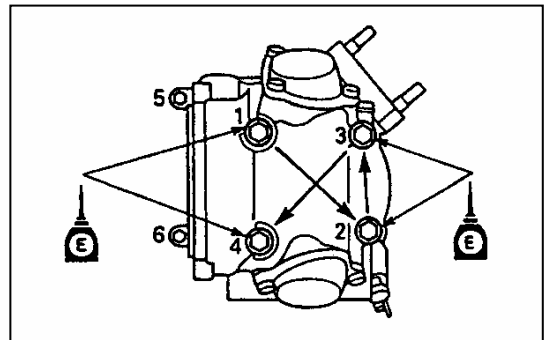
Rotate the cylinder head several times for an even resurfacement.

### CYINDER HEAD INSTALLATION



- 1. Install:
  - Gasket (cylinder head) **NEW**
  - Dowel pins
  - Cylinder head

### NOTE:

- Apply engine oil onto the nut threads.
- Tighten the nuts in a crisscross pattern.



- 2. Tighten:

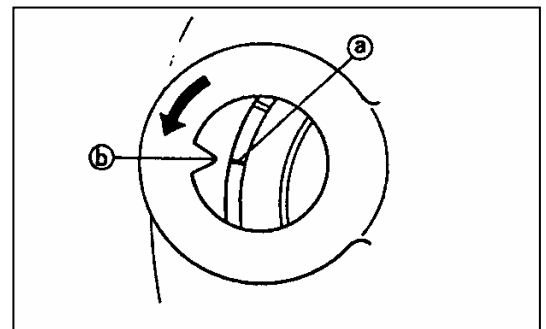
- Nuts (cylinder head)  22Nm(2.2m·kg)
- Bolts (cylinder)  10Nm(1.0m·kg)

- 3. Install:

- Cam sprocket ①
- Timing chain ②

### Installing steps :

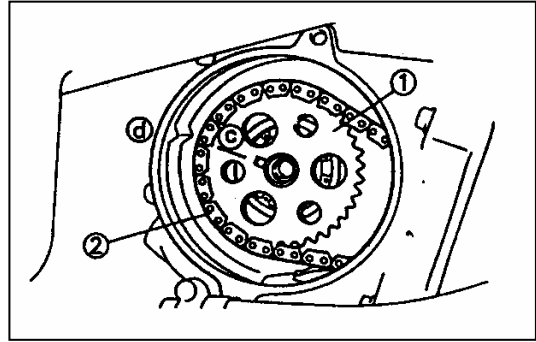
- Turn the primary sheave counterclockwise until the TDC mark ① matches the stationary pointer ②.
- Align the "I" mark ③ on the cam sprocket with



the stationary pointer ④ on the cylinder head.

**NOTE:** If any special mark found, contact the ATV manufacture via the agent for the parts and special instruction.

- Fit the timing chain onto the cam sprocket and install the cam sprocket on the camshaft.



**NOTE:**

- When installing the cam sprocket, keep the timing chain as tense as possible on the exhaust side.
- Align the match mark ③ on the cam sprocket with the stationary pointer ④ on the cylinder head.
- Align the pin on the cam shaft with the slot in the cam sprocket.

**CAUTION:**

Do not turn the crankshaft during installation of the cam shaft. Dam age or improper valve timing will result.

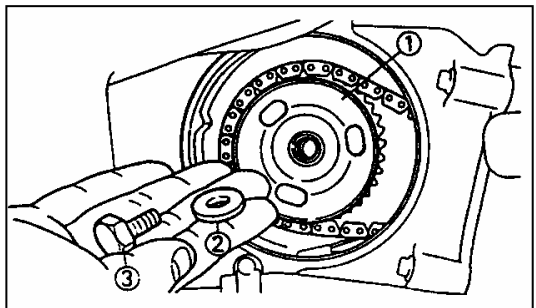
- While holding the camshaft, temporarily tighten the bolts .
- Remove the safety wire from the timing chain.

4. Install:

- Breather plate ①
- Plane washer ②

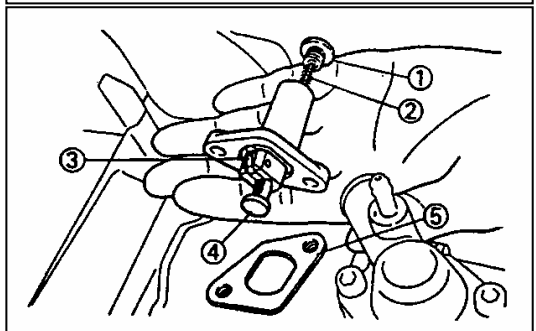
5. Install:

- Timing chain tensioner



**Installing steps:**

- Remove the tensioner cap bolt ① and springs ②.
- Release the timing chain tensioner one-w ay cam ③ and push the tensioner rod ④ all the way in.
- Install the tensioner with a new gasket ⑤ onto the cylinder.
- Install the springs ② and cap bolt ①.
- Tighten the bolt (with gasket) to the specified torque .



Bolt (chain tensioner) 10Nm(1.0m·kg)

Cap bolt (timing chain tensioner) 8Nm(0.8m·kg)

6. Tighten:

●Bolt (cam sprocket)

7. Check:

●Valve timing

Out of alignment → Adjust.

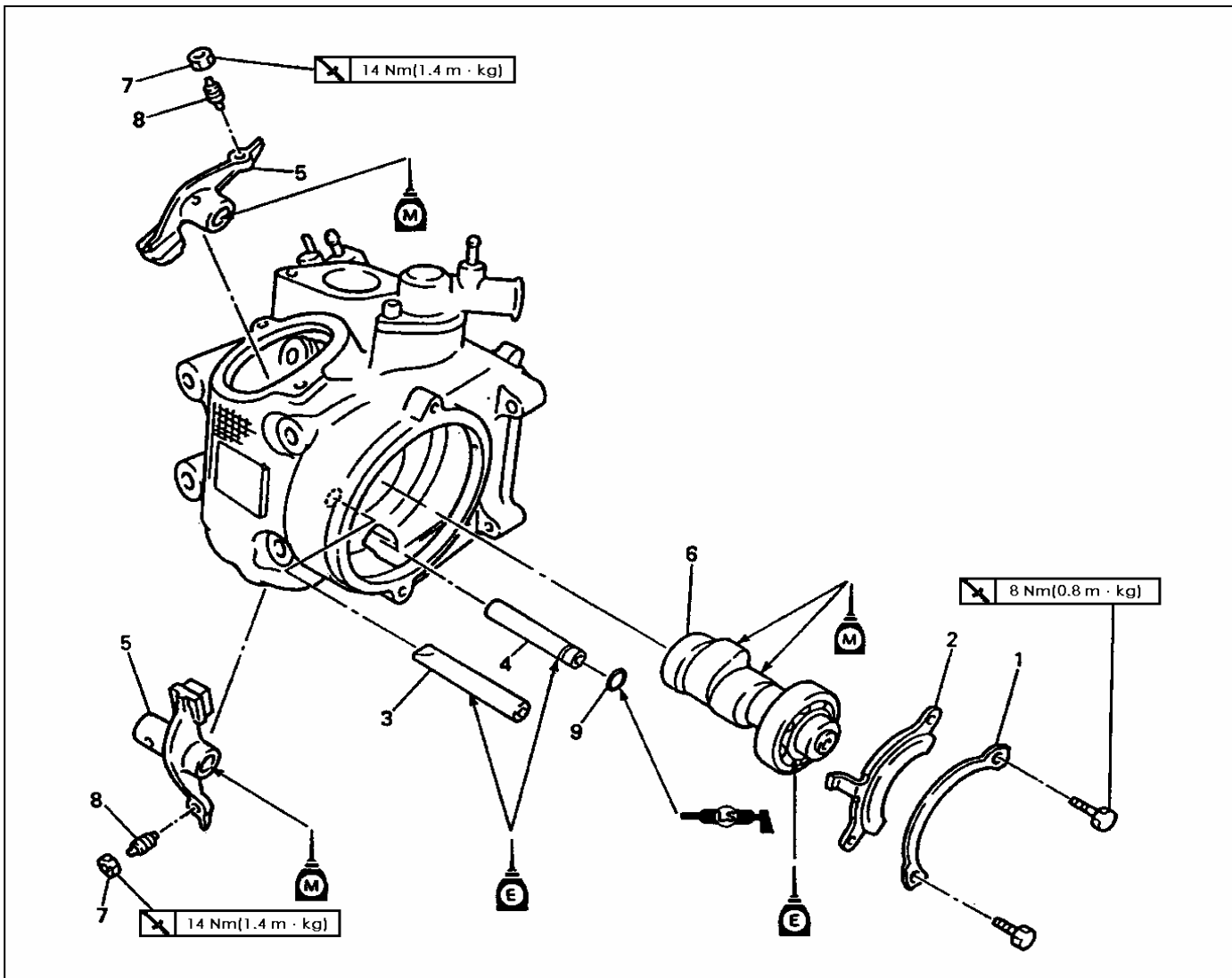
8. Check:

●Valve clearance

Out of specification → Adjust.

Refer to the "VALVE CLEARANCE ADJUSTMENT" section.

**3.4 CAMSHAFT AND ROCKER ARMS**



Order	Job name / Part name	Q 'ty	Remarks
	<b>Cam shaft and rocker arms removal</b>		Remove the parts in order. Refer to "CYLINDER HEAD" section.
1	Cylinder head Lock washer	1	
2	Plate	1	Refer to "ROCKER ARM AND ROCKER SHAFT REMOVAL AND INSTALLATION"
3	Rocker arm shaft (intake)	1	

4	Rocker arm shaft (exhaust)	1	Refer to "CAMSHAFT INSTALLATION" section .  Reverse the removal procedure for installation
5	Rocker arm	2	
6	Camshaft	1	
7	Locknut	2	
8	Adjuster	2	
9	O-ring	1	

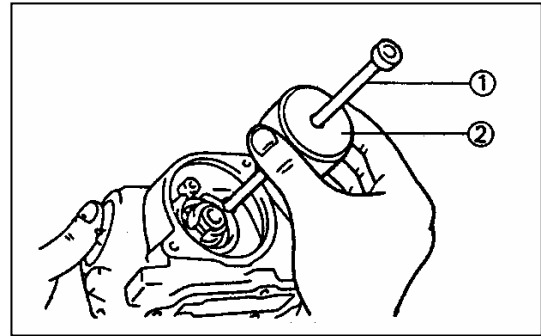
**ROCKER ARM AND ROCKER ARM SHAFTRE MOVAL**

1. Remove:

- Rocker arm shaft (intake)
- Rocker arm shaft (exhaust)

**NOTE:**

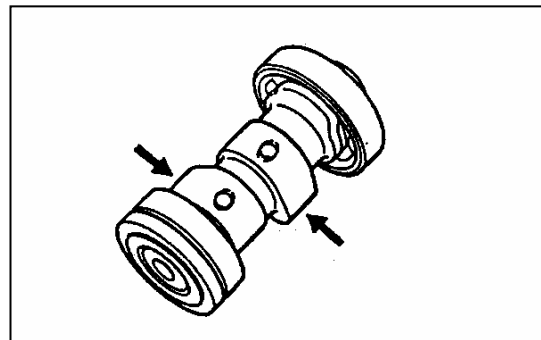
Attach a rocker arm shaft puller bolt ① and weight ② to the rocker arm shaft and slide out the shaft.



**CAM SHAFT INSPECTION**

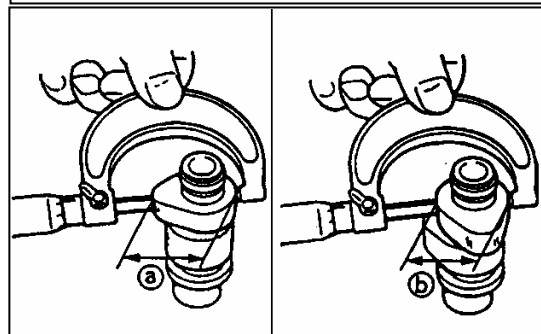
1. Inspect:

- Cam lobes
- Pitting/Scratches/Blue discoloration → Replace .



2. Measure:

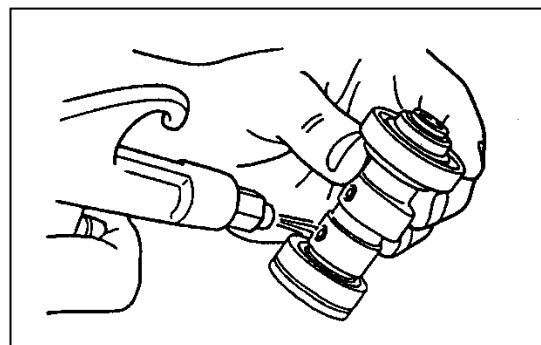
- Cam lobes length ① and ②
- Out of specification → Replace.



	<p><b>Cam lobes length:</b></p> <p><b>Intake:</b></p> <ul style="list-style-type: none"> <li>① 36 .545- 36 .645 mm &lt;Lim it: 36.45 mm&gt;</li> <li>② 30.021-30.121 mm &lt;Lim it: 29.92 mm&gt;</li> </ul> <p><b>Exhaust:</b></p> <ul style="list-style-type: none"> <li>① 36 .547- 36 .647 mm &lt;Lim it: 36.45 mm&gt;</li> <li>② 30.067- 30.167 mm &lt;Lim it: 29.17 mm&gt;</li> </ul>
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3. Inspect:

- Cam shaft oil passage
- Stuffed → Blow out oil passage with compressed air.

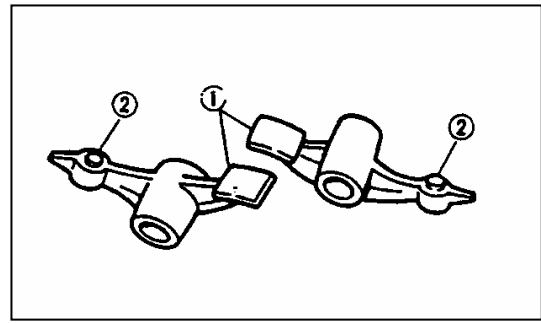


**ROCKER ARMS AND ROCKER ARM SHAFTS INSPECTION**

1. Inspect:

- Cam lobe contact surface ①
- Adjuster surface ②

Wear/Pitting/Scratches/Blue discoloration→  
Replace.



**Inspection steps:**

- Inspect the two contact areas on the rocker arms for signs of unusual wear.
- Rocker arm shaft hole.
- Cam-lobe contact surface.

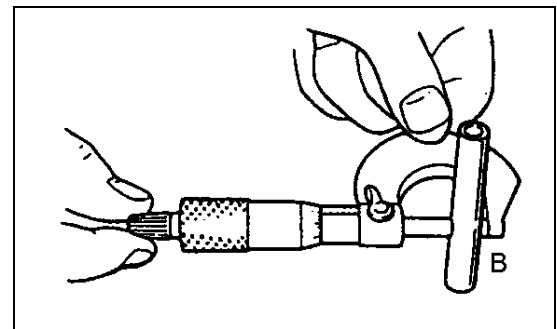
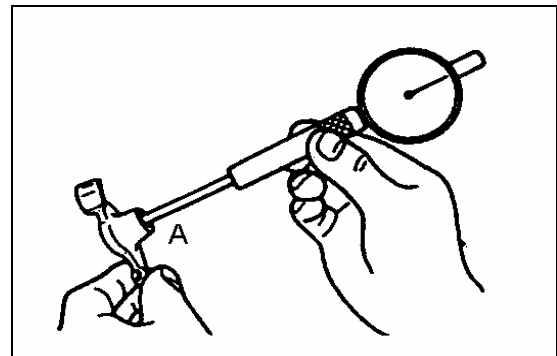
Excessive wear → Replace.

- Inspect the surface condition of the rocker arm shafts.

Pitting/scratches/blue discoloration → Replace or check lubrication.

- Measure the inside diameter A of the rocker arm holes.

Out of specification → Replace.



**Inside diameter (rocker arm):**  
**12.000- 12.018mm**  
**< Lim it: 12.030 mm >**

- Measure the outside diameter B of the rocker arm shafts.

Out of specification → Replace.



**Outside diameter(rocker arm shaft):**  
**11.981-11.991 mm**  
**<Lim it: 11.991 mm>**

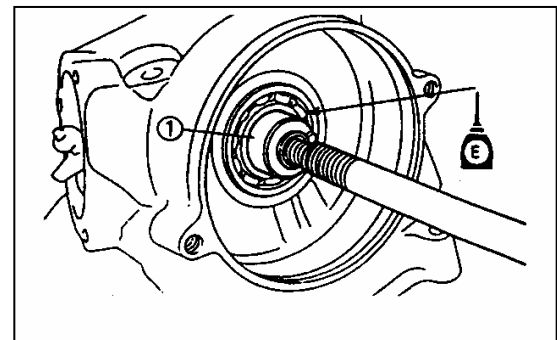
**CAMSHAFT AND ROCKER ARM INSTALLATION**

1. Lubricate:

- Cam shaft ①

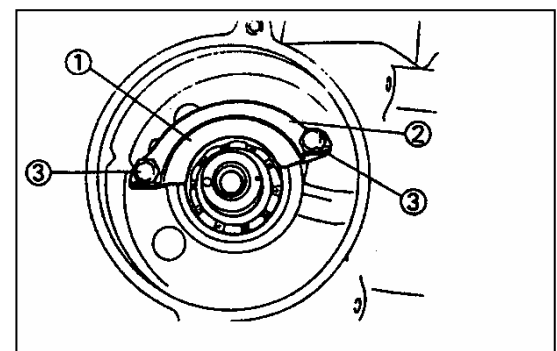


**Camshaft:**  
**Molybdenum disulfide oil**  
**Camshaft bearing:**  
**Engine oil**



2. Install:

- Plate ①
- Lockwasher ② **NEW**
- Bolt ③ 8Nm(0.8m·kg)



**NOTE:**



Bend the lockwasher tabs along the bolt ③ faults.

3. Apply:

- Molybdenum disulfide oil onto the rocker arm and rocker arm shaft.



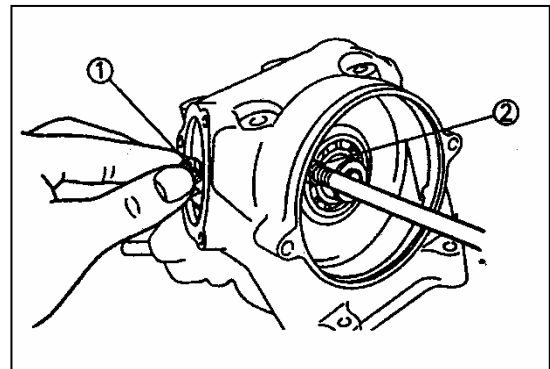
4. Install:

- Rocker arm ①
- Rocker arm shaft ② (exhaust)

**NOTE:**

Exhaust:

Install the rocker arm shaft (exhaust) completely pushed in.



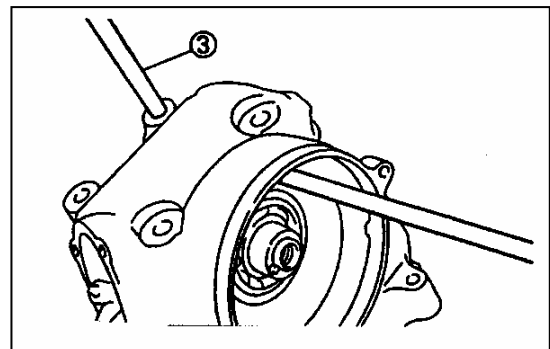
5. Install:

- Rocker arm ①
- Rocker arm shaft ② (intake)

**NOTE:**

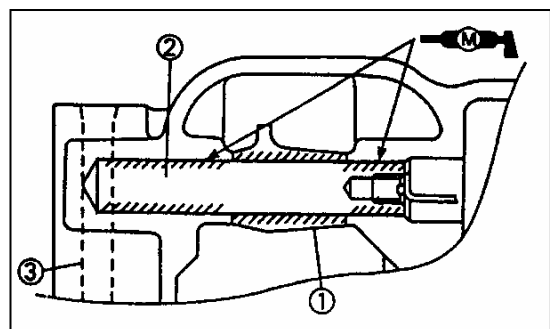
Intake:

Insert the guide shaft (8 mm) ③ into the stud bolt hole in the cylinder head to the rocker arm shaft (intake).

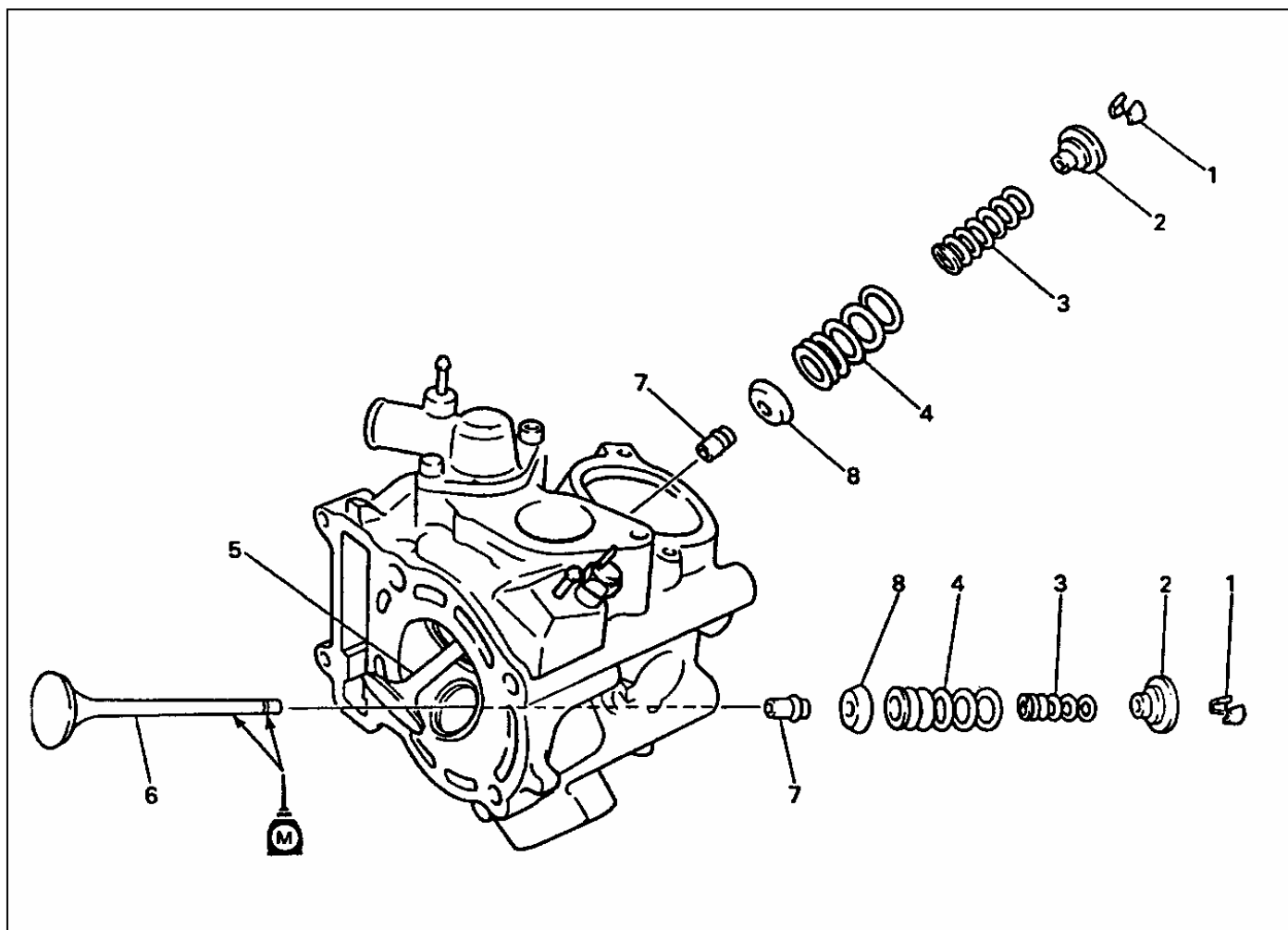


**CAUTION:**

Do not confuse the installation direction of rocker arm shaft. Be sure to install the threaded part facing outward.



**3.5 VALVES AND VALVE SPRINGS**

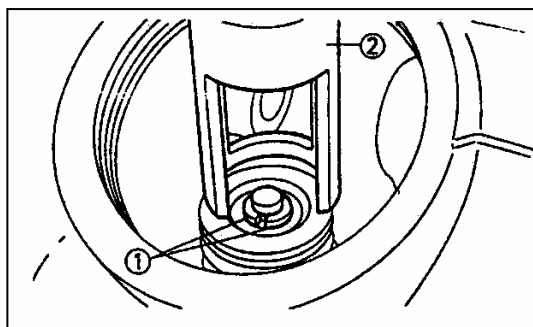


Order	Job name / Part name	Q 'ty	Remarks
	Valves and valve springs removal Cylinder head Rocker arm , rocker arm shaft		Remove the parts in order. Refer to "CYLINDER HEAD " section . Refer to "ROCKER ARM SHAFT AND ROCKER ARMS" section.
1	Valve cotters	4	Refer to "VALVES AND VALVE SPRINGS REMOVAL/INSTALLATION" section.
2	Spring retainer	2	Refer to "VALVES AND VALVE SPRINGS INSTALLATION" section
3	Valve spring (inner)	2	
4	Valve spring (Outer)	2	
5	Valve (intake)	1	
6	Valve (exhaust)	1	
7	Valve guide	2	Reverse the removal procedure for installation
8	Spring seat	2	

**VALVES AND VALVE SPRINGS REMOVAL**

1. Remove:  
 ● Valve cotters ①

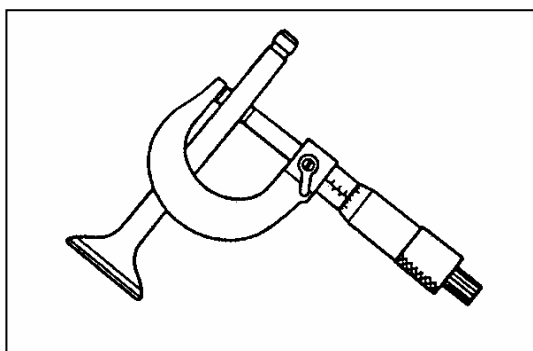
**NOTE:**  
 Attach a valve spring compressor and attachment ② between the valve spring retainer and cylinder head to remove the valve cotters.




**CAUTION:**  
 Do not compress so much as to avoid damage to the valve spring.

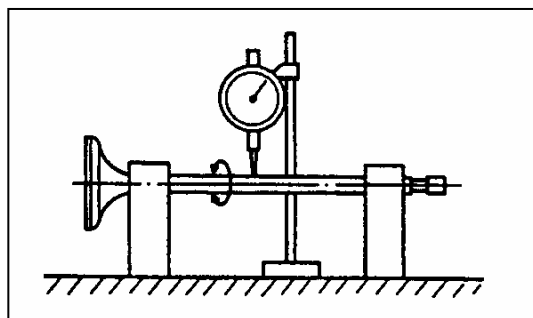
**VALVE AND VALVE SPRINGS INSPECTION**


1. Measure:  
 ●Valve stem diameter  
 Out of specification → Replace.



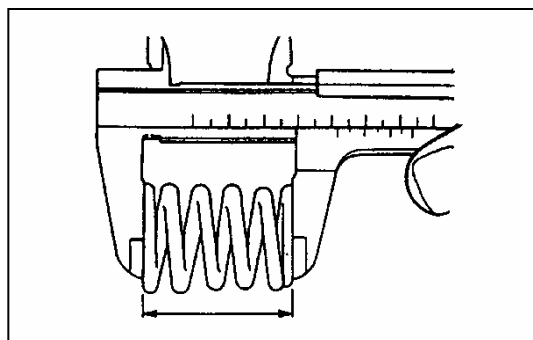
	<p><b>Valve stem diameter:</b>  <b>Intake:</b>                  5.975-5.990mm                  &lt;Limit: 5.94mm&gt;  <b>Exhaust:</b>                  5.960-5.975mm                  &lt;Limit: 5.92mm&gt;</p>
---	---


2. Measure:  
 ●Runout (valve stem )  
 Out of specification → Replace.



	<p>●Runout limit:                  0.01 mm</p>
--	--

3. Measure:  
 ●Free length (valve spring)  
 Out of specification → Replace.



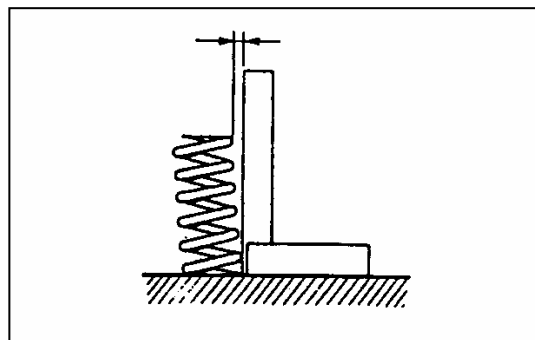
	<p><b>Valve spring free length:</b>  <b>Inner spring:</b>                  38.1 mm                  &lt;Limit: 36.1mm&gt;  <b>Outer spring:</b>                  36.93 mm                  &lt;Limit: 35.0mm&gt;</p>
--	--

4. Measure:

- Spring tilt
- Out of specification → Replace.

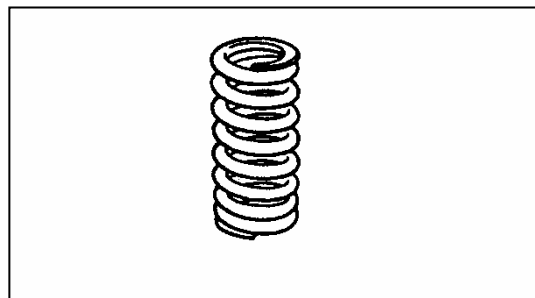


Spring tilt limit:  
1.7mm (2.5°)



5. Inspect:

- Spring contact face
- Wear/Pitting/Scratches → Replace.



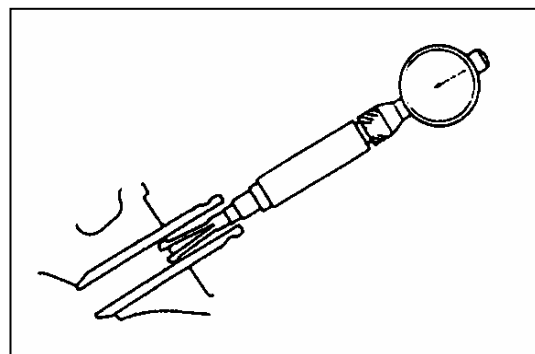
6. Measure:

- Valve guide inside diameter
- Out of specification → Replace.



**Valve guide inside diameter:**

**Intake:**  
6.000-6.012 mm  
<Limit: 6.05mm>  
**Exhaust:**  
6.000-6.012 mm  
<Limit: 6.05 mm>



7. Measure:

**Stem-to guide clearance=**  
**Valve guide inside diameter-**  
**Valve stem diameter**

Out of specification → Replace the valve guide.



**Stem-to-guide clearance limit:**

**Intake:**  
0.08 mm  
**Exhaust:**  
0.10 mm

**VALVE SEATS INSPECTION**

1. Eliminate:

- Carbon deposits
- (from the valve face and valve seat)

2. Inspect:

- Valve seats
- Pitting/wear → Reface the valve seat.

3. Measure:

- Valve seat width ②

Out of specification → Reface the valve seat.



**Valve seat width:**

**Intake:**

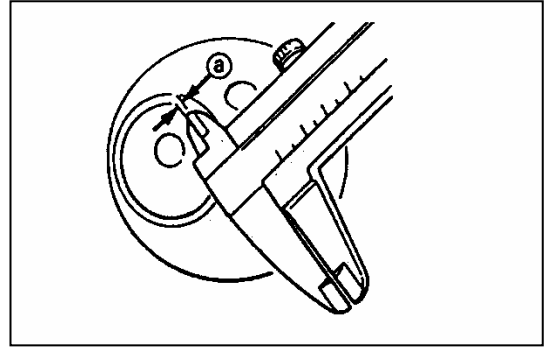
0.9-1.1mm

<Limit:1.6mm>

**Exhaust:**

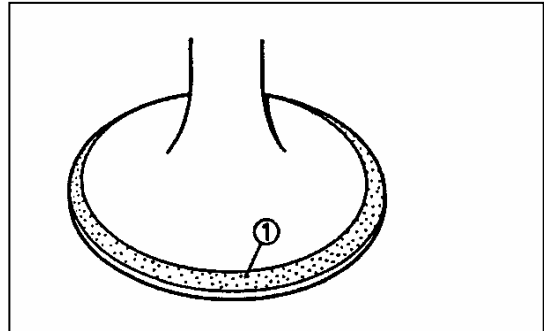
0.9-1.1mm

<Limit:1.6mm>



**Measurement step:**

- Apply Mechanic's blueing dye (Dykem)① to the valve face.
- Install the valve into the cylinder head. Press the valve through the valve guide and onto the valve seat to make a clear pattern.
- Measure the valve seat width. Where the valve seat and valve face made contact, blueing will have been removed.
- If the valve seat is too wide, too narrow, or the seat is not centered, the valve seat must be replaced.

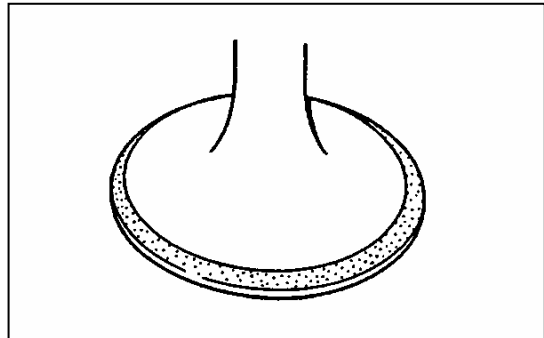


4. Lap:

- Valve face
- Valve seat

**NOTE:**

After replacing the valve seat, valve and valve guide, the valve seat and valve face should be lapped.



**Lapping steps:**

- Apply a coarse lapping compound ③ to the valve face.

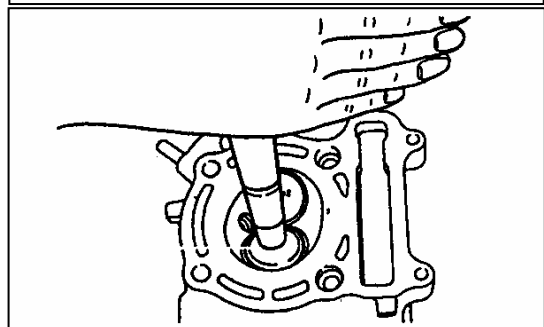
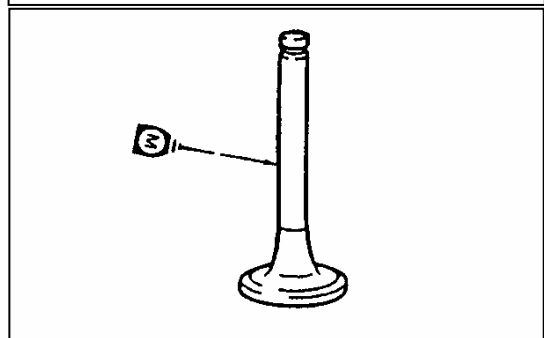
**CAUTION:**

Do not let compound enter the gap between the valve stem and the guide.

- Apply molybdenum disulfide oil to the valve stem.
- Install the valve into the cylinder head.
- Turn the valve until the valve face and valve seat are evenly polished, then clean off all compound.

**NOTE:**

For best lapping results, lightly tap the valve seat while rotating the valve back and forth between your hand.

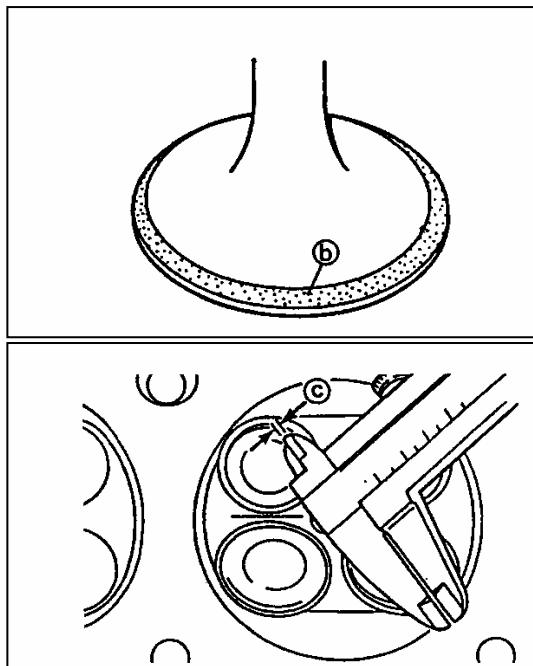


●Apply a fine lapping compound to the valve face and repeat the above steps.

**NOTE:**

Make sure to clean off all compound from the valve face and valve seat after every lapping operation.

- Apply Mechanic's blueing dye (Dykem) ⑥ to the valve face.
- Install the valve into the cylinder head.
- Press the valve through the valve guide and onto the valve seat to make a clear pattern.
- Measure the valve seat with ⑦ again.



**VALVES AND VALVE SPRINGS INSTALLATION**

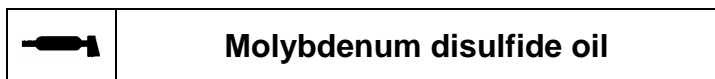
1. Deburr:

- Valve stem end

Use an oilstone to smooth the stem end.

2. Apply:

- Molybdenum disulfide oil (onto the valve stem ③ and oil seal ② )



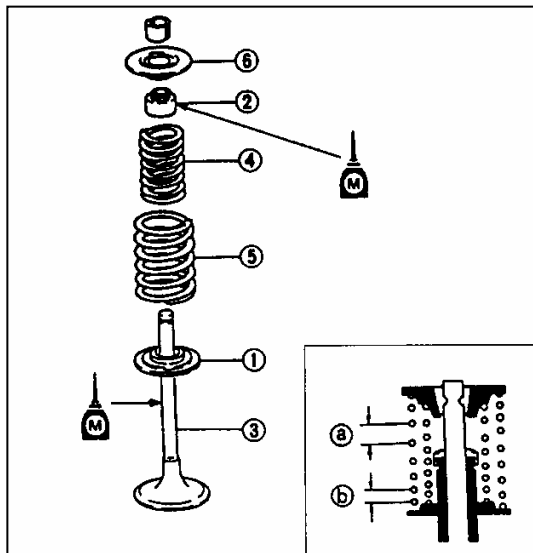
3. Install:

- Valve spring seat ①
- Valve stem seal ② **NEW**
- Valve ③ (into the cylinder head)
- Valve spring (under) ④
- Valve spring (outer) ⑤
- Spring retainer ⑥

**NOTE:**

Install the valve spring with the larger pitch ③ facing upwards.

- ③ Smaller pitch

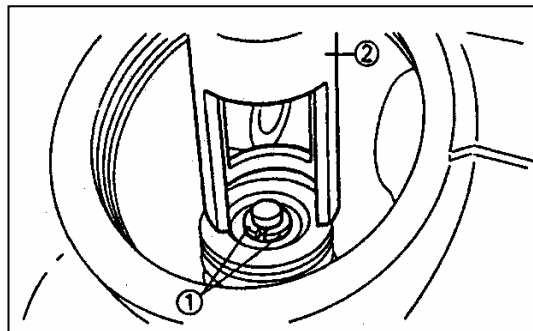


4. Instal:

●Valve cotters ①

**NOTE:**

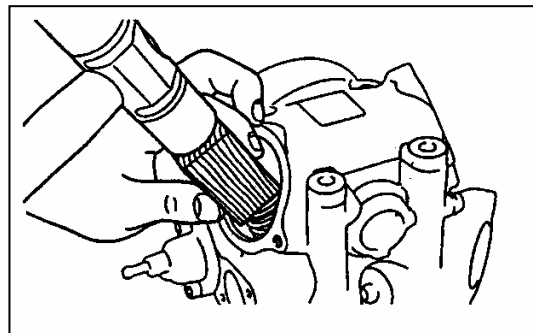
Install the valve cotters while com pressing the valve spring with a valve spring compressor and attachment ②.



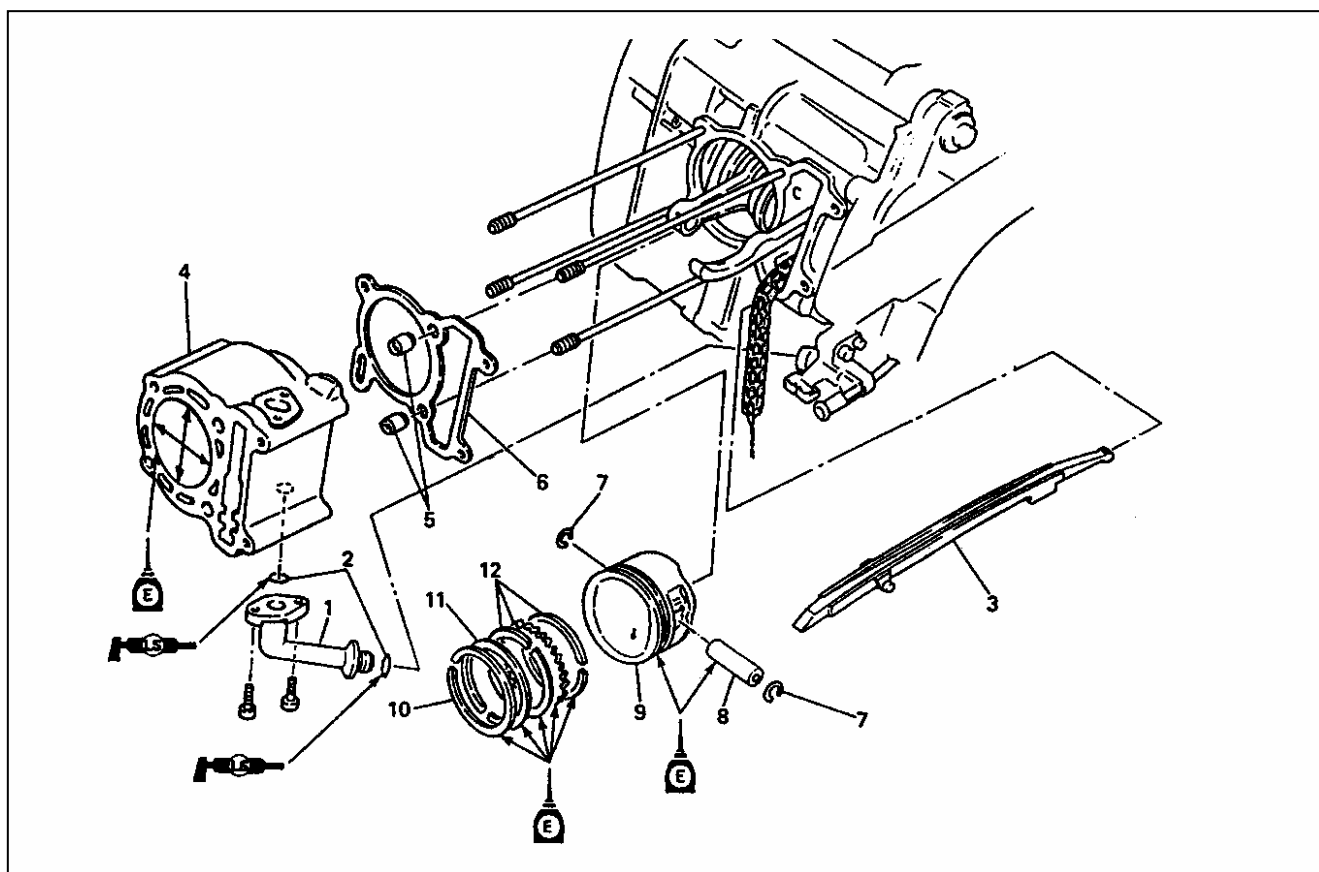
5. Secure the valve cotters onto the valve stem by tapping lightly with a piece of wood.

**CAUTION:**

Do not hit so much as to damage the valve.



**3.6 CYLINDER AND PISTON**



Order	Job name / Part name	Q 'ty	Remarks
	Cylinder and piston removal		Remove the parts in order.
1	Cylinder head joint	1	Refer to " CYLINDER HEAD " section .
2	O-ring	2	
3	Timing chain guide (exhaust side)	1	Refer to " PISTON RINGS, PISTON AND CYLINDER INSTALLATION" section.
4	Cylinder	1	
5	Dowel pin	2	
6	Cylinder gasket	1	
7	Piston pin circlip	2	Refer to "PISTON AND PISTON RINGS REMOVAL" section .
8	Piston pin	1	
9	Piston	1	Refer to "PISTON RINGS, PISTON AND CYLINDER INSTALLATION " section .
10	Piston ring (top)	1	
11	Piston ring (2nd)	1	
12	Side rail/Spacer	2/1	Reverse the removal procedure for installation .



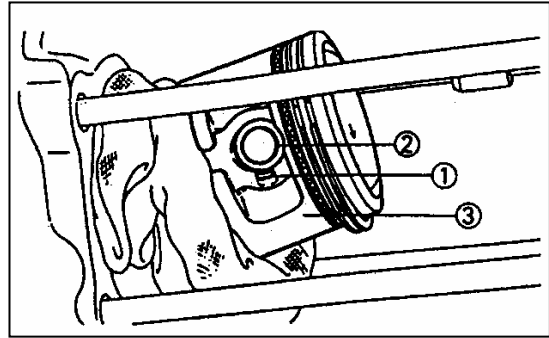
## PISTON AND PISTON RINGS REMOVAL

1. Remove:

- Piston pin circlip ①
- Piston pin ②
- Piston ③

**NOTE:**

Before removing the piston pin circlip, cover the crankcase opening with a clean towel or rag to prevent the circlip from falling into the crankcase cavity.

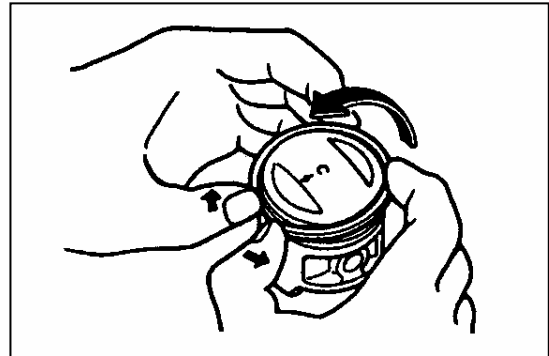


2. Remove:

- Top ring
- 2nd ring
- Oil ring

**NOTE:**

When removing the piston ring, open the end gap of the ring by fingers, and push up the other side of the ring.



## CYLINDER INSPECTION

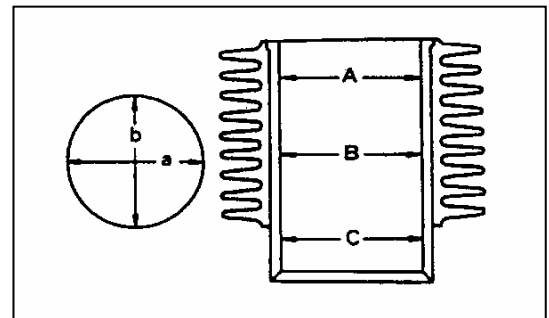
1. Measure:


- Cylinder bore

Out of specification → Rebore or replace.

**NOTE:**

- Measure the cylinder bore with a cylinder bore gauge.
- Measure the cylinder bore in parallel to and a right angle to the crankshaft. Then, find the average of the measurements.

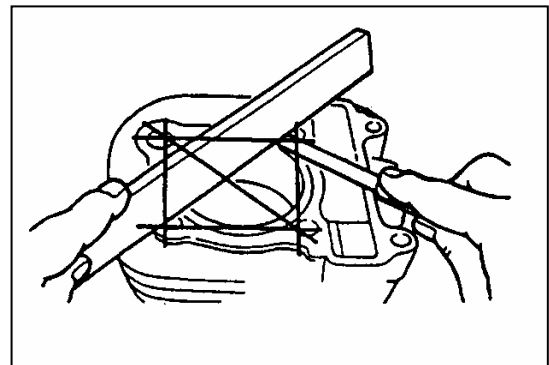



	<p><b>Cylinder bore:</b>  <b>70.000- 70.014mm</b>                  &lt; Limit:70.25mm&gt;                  &lt; Difference limit between A,B and C :0.03m m &gt;</p>
--	--

2. Measure:

- Warpage

Out of specification → Replace.



	<p>Cylinder warpage limit:                  0.03mm</p>
--	--

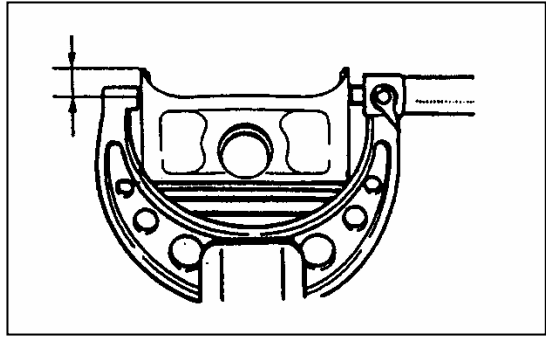
**PISTON AND PISTON PIN INSPECTION**

1. Measure:

- Piston skirt diameter

Out of specification → Replace .

ⓐ 5.0mm from the piston bottom edge.



	<p><b>Valve skirt diameter:</b>  <b>69.965-69.980 mm</b></p> <p><b>Oversize (2)</b>  <b>69.5 mm</b></p> <p><b>Oversize (4)</b>  <b>70.0 mm</b></p>
--	--

2. Calculate:

- Piston-to-cylinder clearance

	<p><b>Piston-to-cylinder clearance=</b>  <b>Cylinder bore-Piston skirt diameter</b></p>
--	---

Refer to “CYLINDER” section for cylinder bore measurement.

Out of specification → Replace the piston and piston rings as a set.

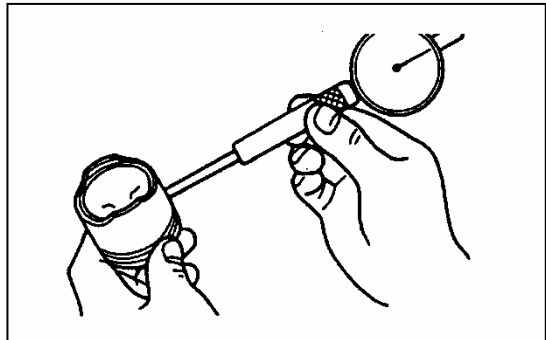
	<p><b>Piston-to-cylinder clearance:</b>  <b>0.02-0.04mm</b></p>
--	---

3. Measure:

- Piston pin bore diameter

Out of specification → Replace.

	<p><b>Piston pin bore diameter:</b>  <b>17.004-17.015mm</b>  <b>&lt;Limit:17.045mm&gt;</b></p>
--	--

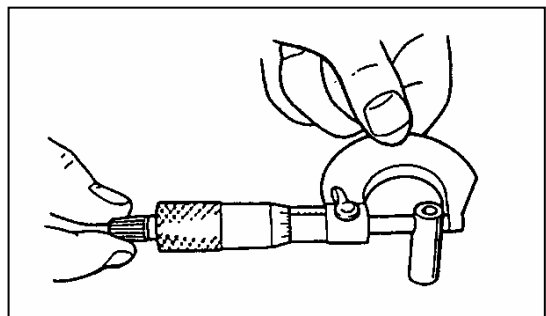


4. Measure:

- Piston pin outside diameter

Out of specification → Replace.

	<p><b>Piston pin bore diameter:</b>  <b>16.991-17.000mm</b>  <b>&lt;Limit:16.975mm&gt;</b></p>
--	--



5. Inspect:

- Piston pin

Blue discoloration/groove → Clean or replace.

## PISTON RINGS INSPECTION

### 1. Measure:

- Side clearance ①

Out of specification → Replace the piston and the piston rings as a set.

#### NOTE:

Eliminate the carbon deposits from the piston ring grooves and rings before measuring the side clearance.



#### Side clearance (piston ring):

##### Top ring:

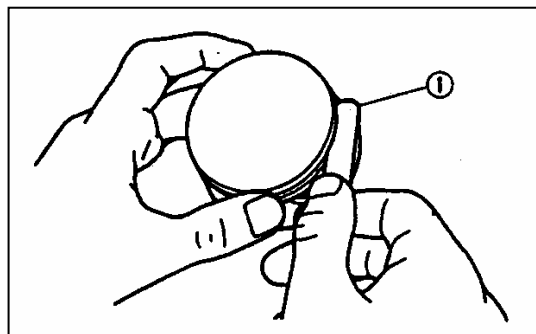
0.04- 0.08m m

<Limit: 0.12mm>

##### 2nd ring:

0.03 - 0.07mm

<Limit: 0.12mm>



### 2.Position:

- Piston ring into the cylinder

#### NOTE :

Push the ring with the piston crown so that the ring will be at a right angle to the cylinder bore.

- ① 5.0mm

### 3. Measure:

- End gap
- Out of specification → Replace.

#### NOTE:

You cannot measure the end gap on the expander spacer of the oil ring. If the oil ring rails show excessive gap, replace all three rings.



#### End gap:

##### Top ring:

0.15-0.30mm

<Limit:0.45mm>

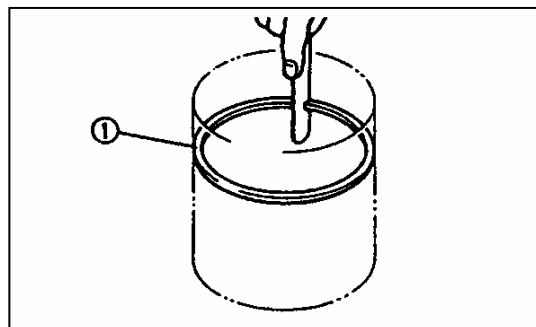
##### 2nd ring:

0.30-0.45mm

<Limit:0.70m m>

##### Oil ring:

0.20-0.70mm



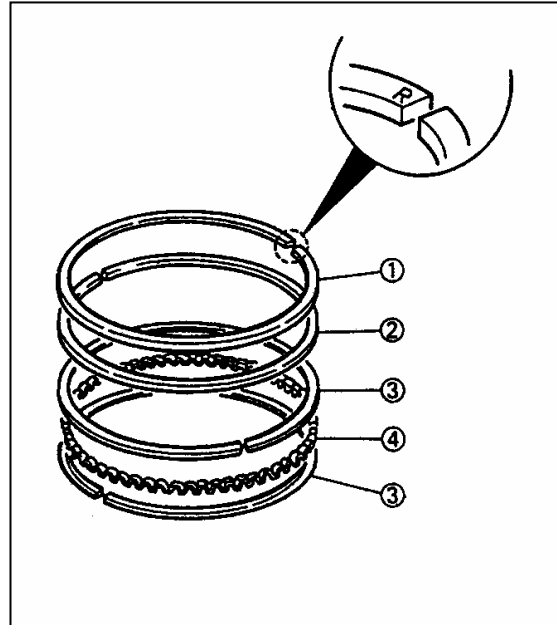
## PISTON RINGS, PISTON AND CYLINDER INSTALLATION

### 1. Install:

- Top ring ①
- 2nd ring ②
- Side rails (oil ring) ③
- Expander spacer (oil ring) ④

**NOTE:**

- Make sure to install the piston rings so that the manufacturer's marks or numbers are located on the upper side of the rings.
- Lubricate the pistons and piston rings liberally with engine oil.

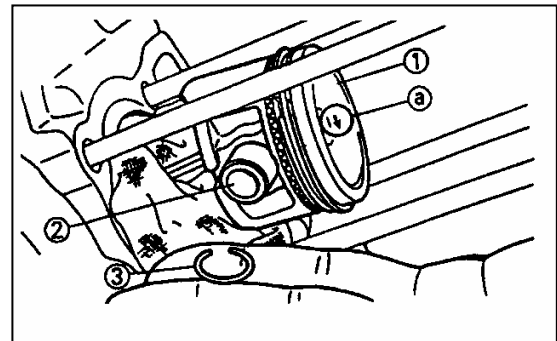


**2. Install:**

- Piston ①
- Piston pin ②
- Piston pin clip ③ **NEW**

**NOTE:**

- Apply engine oil to the piston pins.
- The " → " mark ④ on the piston must face the exhaust side of the cylinder.
- Before installing the piston pin clip, cover the crankcase opening with a clean rag to prevent the piston pin clip from falling into the crankcase.
- Make sure to install each piston in its respective cylinder.



**3. Install:**

- Gasket (cylinder) **NEW**
- Dowel pins

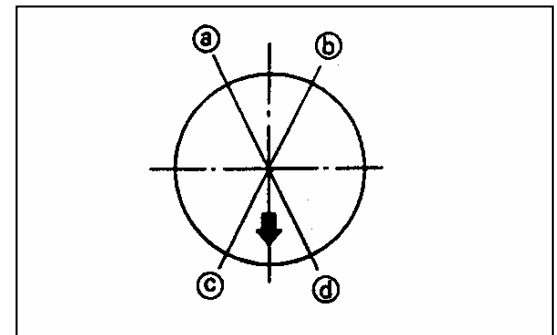
**4. Position:**

- Piston rings

**NOTE:**

Offset the piston ring end gaps as shown.

- Ⓐ Top ring end
- Ⓑ Oil ring end (lower)
- Ⓒ Oil ring end (upper)
- Ⓓ 2nd ring end



### 5. Lubricate:

- Piston outer surface
- Piston ring
- Cylinder inner surface

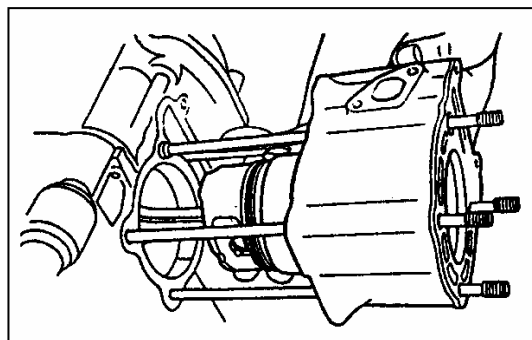


### 6. Install:

- Cylinder

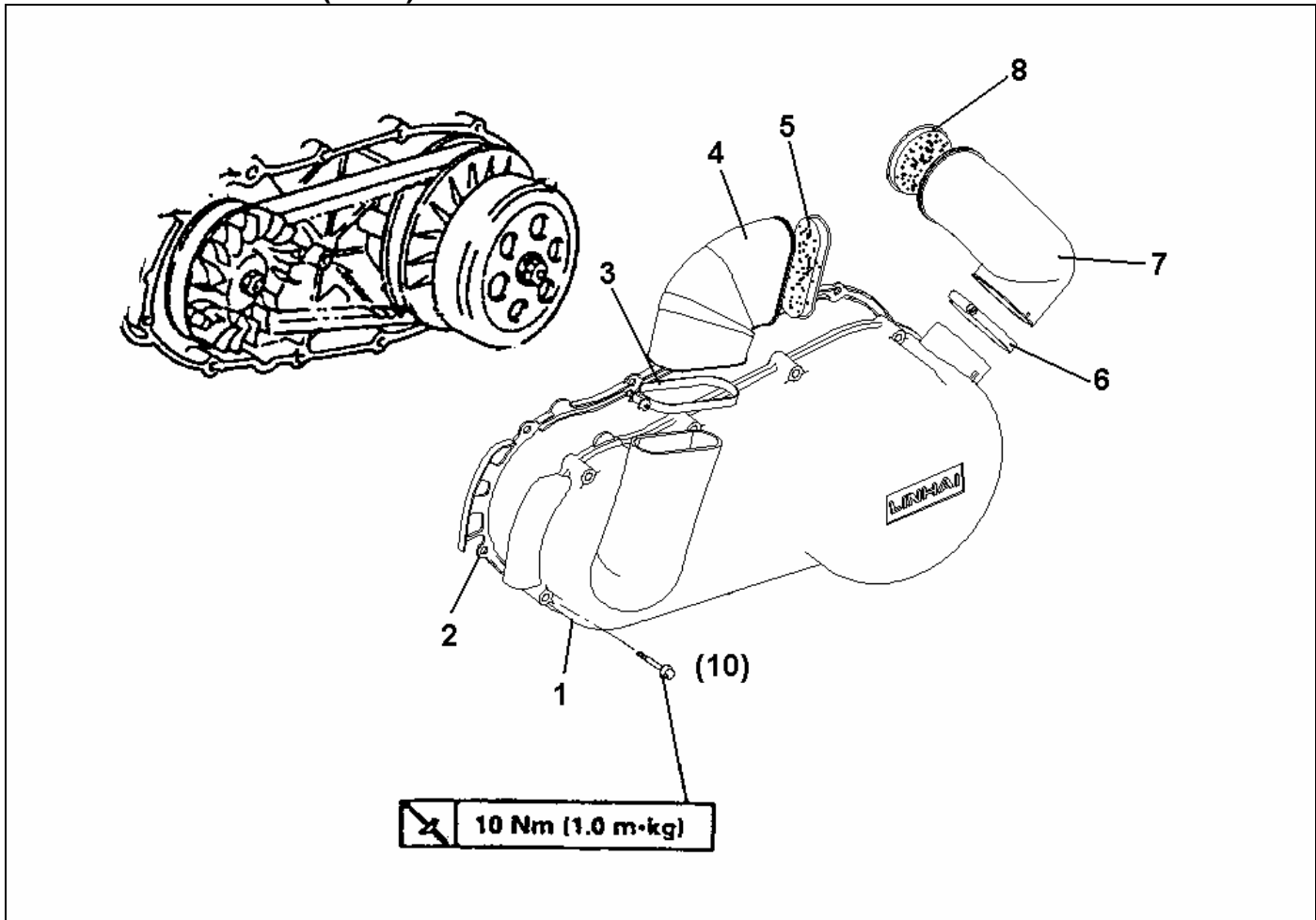
#### NOTE:

- Install the cylinder with one hand while compressing the piston rings with the other hand.
- Pass the timing chain and timing chain guide (exhaust side) through the timing chain cavity.



**3.7V-BELT,CLUTCH AND SECONDARY/PRIMARY SHEAVE**

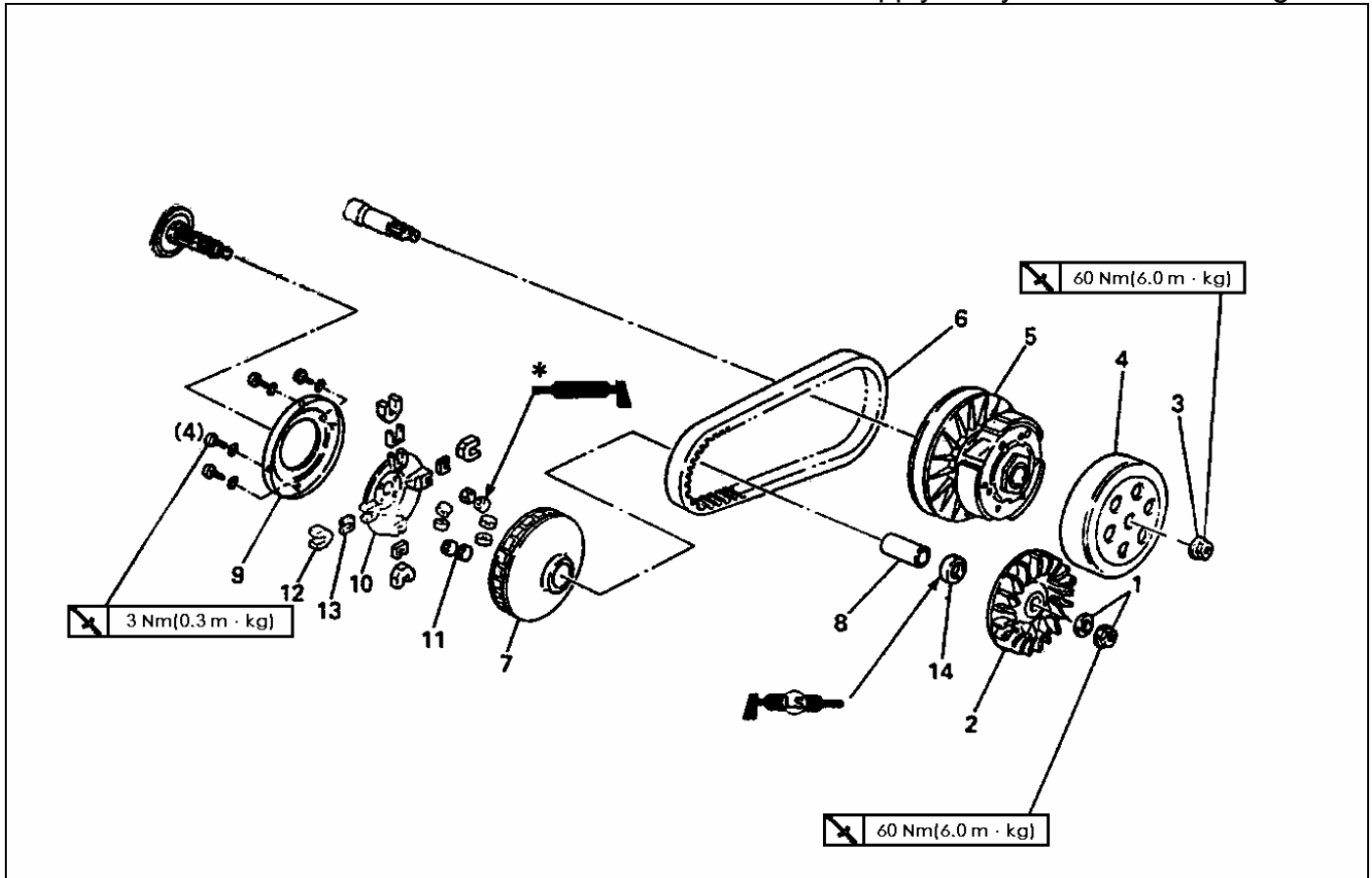
**CRANKCASE COVER (LEFT)**



Order	Job name / Part name	Q 'ty	Remarks
	Crankcase cover (left) removal		<b>Remove the parts in order.</b>
1	Crankcase cover (left)	1	
2		1	
3	Hose clamp B	1	
4	Joint B	1	
5	Air strainer B	1	
6	Hose clamp A	1	
7	Joint A	1	
8	Air strainer A	1	Reverse the removal procedure for installation .

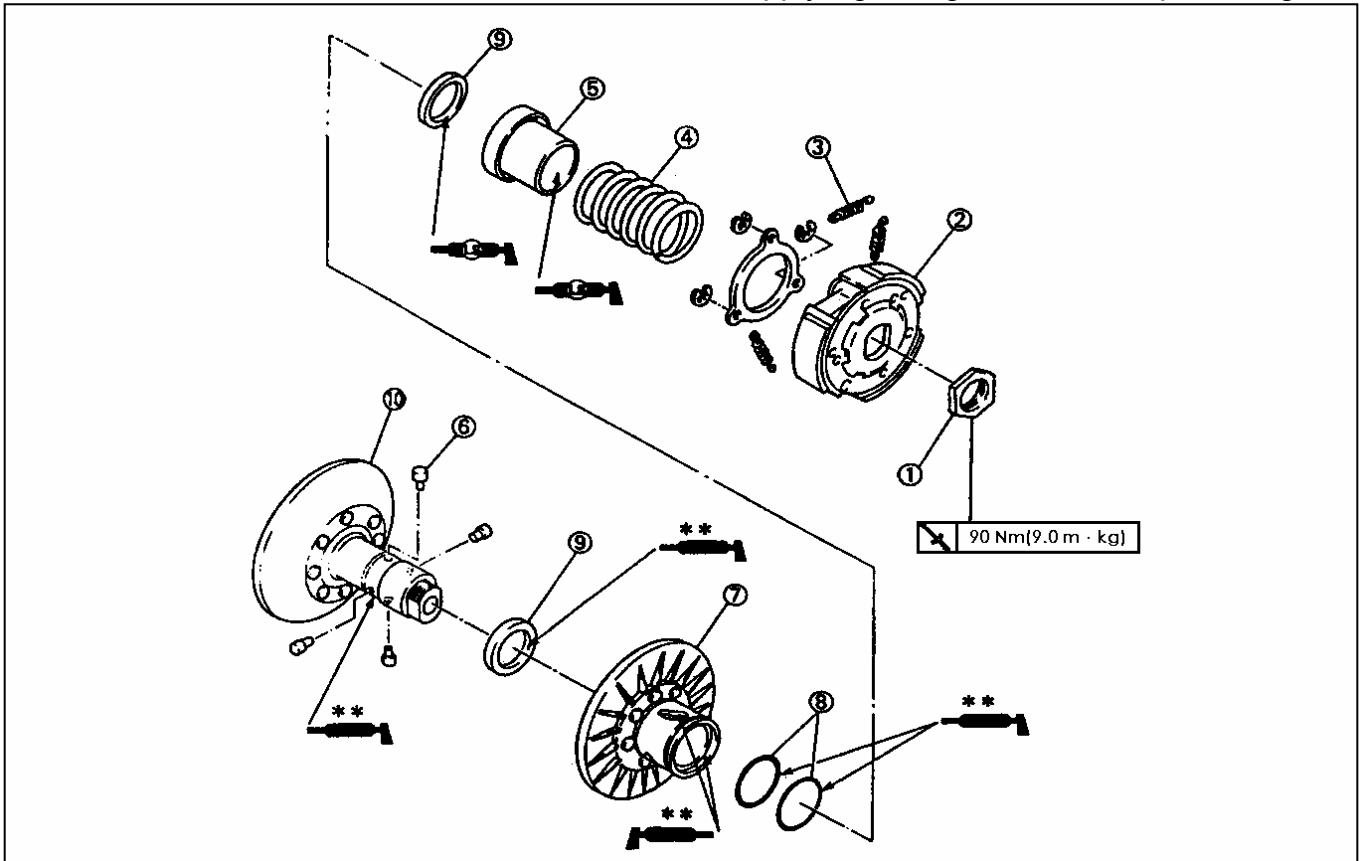
PRIMARY SHEAVE

\*Apply molybdenum disulfide grease



Order	Job name / Part name	Q 'ty	Remarks
	V-belt, clutch and secondary/ primary sheave removal		Remove the parts in order
1	Nut/Plain washer	1/1	Refer to "PRIMARY SHEAVE REMOVAL" section.
2	Primary fixed sheave	1	Refer to "SECONDARY SHEAVE AND V-BELT REMOVAL"
3	Nut	1	section.
4	Clutch housing	1	Refer to "SECONDARY SHEAVE INSTALLATION" section.
5	Clutch assembly	1	
6	V-belt	1	
7	Primary sliding sheave	1	
8	Collar	1	
9	Primary sheave cap	1	Refer to "PRIMARY SHEAVE ASSEMBLY" section.
10	Cam	1	
11	Weight	8	
12	Slider	4	Refer to "PRIMARY SHEAVE ASSEMBLY" section.
13	Spacer	4	
14	Oil seal	1	Reverse the removal Procedure for installation.

\*\*Apply lightweight lithium-soap base grease



Order	Job name / Part name	Q 'ty	Remarks
	Secondary sheave disassembly		Disassemble the parts in order.
1	Nut	1	
2	Clutch carrier	1	Refer to "SECONDARY SHEAVE DISASSEMBLY" section.
3	Clutch shoe spring	3	
4	Compression spring	1	
5	Spring seat	1	Refer to "SECONDARY SHEAVE INSTALLATION " section .
6	Guide pin	4	
7	Secondary sliding sheave	1	
8	O-ring	2	Refer to "SECONDARY SHEAVE INSTALLATION" section.
9	Oil seal	2	
10	Secondary fixed sheave	1	
			Reverse the disassembly procedure for assembly.



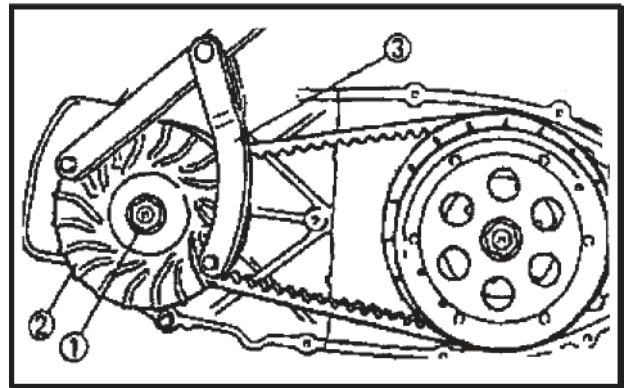
## PRIMARY SHEAVE REMOVAL

1. Remove:

- Nut ①(primary sheave)
- Plate washer
- Primary fixed sheave②

**NOTE:**

Loosen the nut (primary fixed sheave) while holding the primary fixed sheave with the rotor holder③.



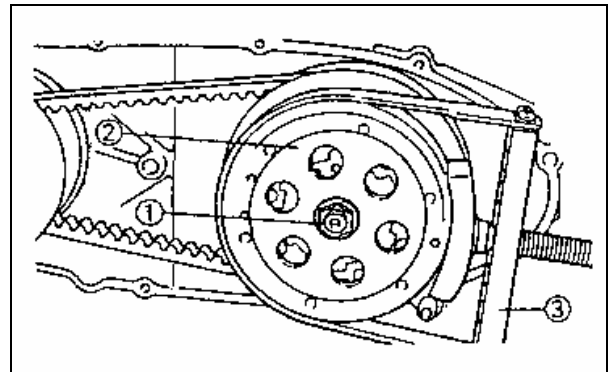
## SECONDARY SHEAVE AND V-BELT REMOVAL

1. Remove:

- Nut ① (secondary sheave)
- Clutch housing ②

**NOTE:**

Loosen the nut (secondary sheave) while holding the clutch housing with the sheave holder③.



2. Remove:

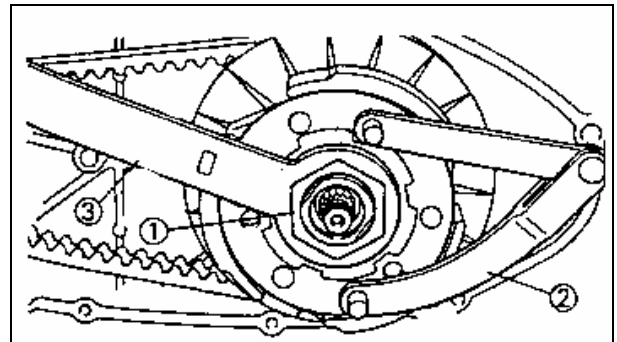
- Nut ① (clutch carrier)

**CAUTION:**

Do not remove the nut (clutch carrier) yet.

**NOTE:**

Loosen the nut (clutch carrier) one turn using the locknut wrench ③ while holding the clutch carrier with the rotor holder②.

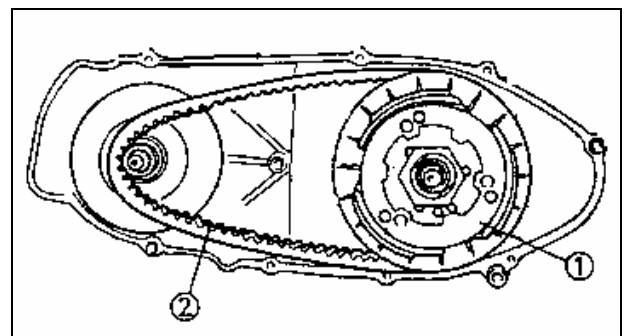


3. Remove:

- Clutch assembly ①
- V-belt ②

**NOTE:**

Remove the V-belt from the primary sheave side with clutch assembly.



**SECONDARY SHEAVE DISASSEMBLY**

1. Remove:

- Nut ① (secondary sheave)

**NOTE:**

Loosen the nut ① while attaching the clutch spring compressor ② and clutch spring holder arm ③ and release the compressed spring after removing the nut.

**CAUTION:**

Use the spacer ④ (diameter:  $\varnothing$  30mm thickness: 2-3mm).

**CLUTCH INSPECTION**

1. Measure:

- Clutch shoe thickness

Scratches → Glaze using coarse sandpaper.

Wear /Damage → Replace



**Clutch shoe thickness:**  
**3.0mm**  
**<Limit:2.0mm>**

**NOTE:**

- After using the sandpaper, clean off the polished particles.
- Inspect the other clutch shoes.
- Replace all three as a set.

**V-BELT INSPECTION**

1. Inspect:

- V-belt ①

Cracks/Wear /Scaling /Chipping → Replace.

Oil/Grease → Check primary sheave and secondary sheave.

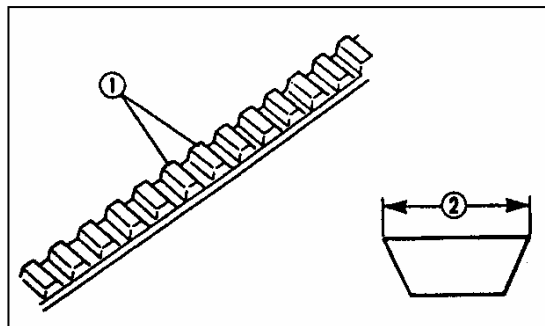
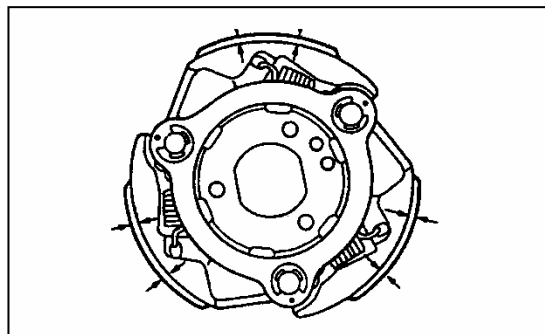
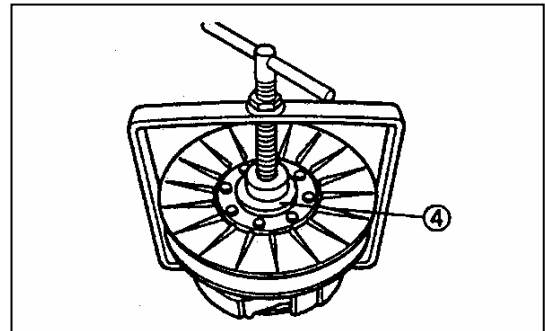
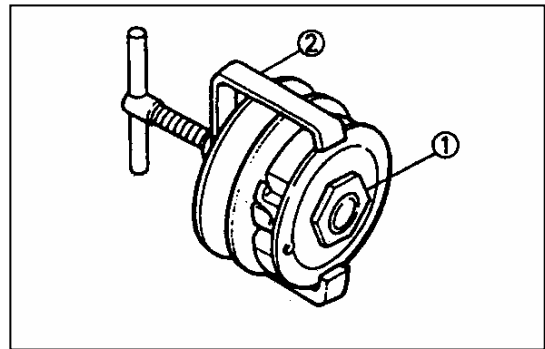
2. Measure:

- V-belt width ②

Out of specification → Replace



**V-belt width:**  
**22.6mm**  
**(Limit:21.0mm)**



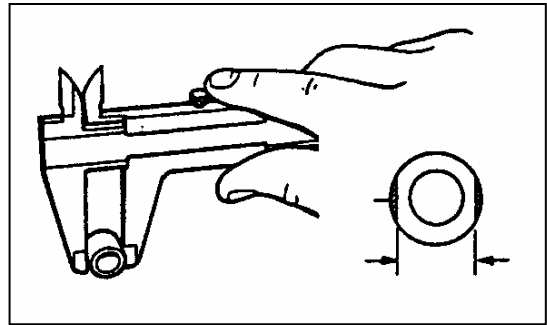
**WEIGHT INSPECTION**

1. Inspect:

- Weight minimum outside diameter
- Cracks/Wear /Scaling /Chipping → Replace.
- Out of specification → Replace



**Weight out side diameter:**  
**20.0 mm**  
**<Limit: 19.5mm>**



**SECONDARY SHEAVE INSPECTION**

1. Inspect:

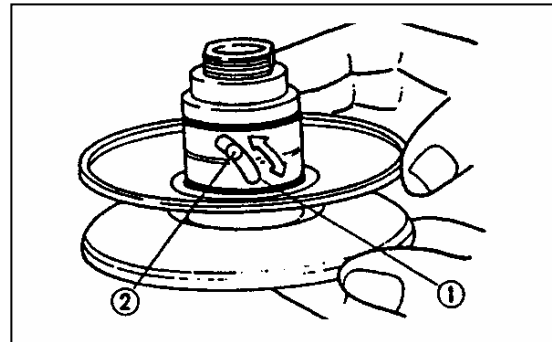
- Secondary fixed sheave smooth operation
- Secondary sliding sheave smooth operation

2. Inspect:

- Torque cam groove ①
- Wear /Damage → Replace.

3. Inspect:

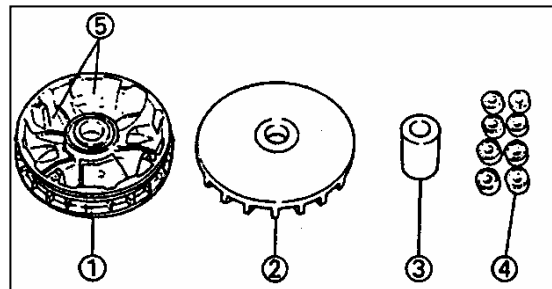
- Guide pin ②
- Wear /Damage → Replace.



**PRIMARY SHEAVE ASSEMBLY**

1. Clean:

- Primary sliding sheave face ①
- Primary fixed sheave face ②
- Collar ③
- Weight ④
- Primary sliding sheave cam face



**NOTE:**

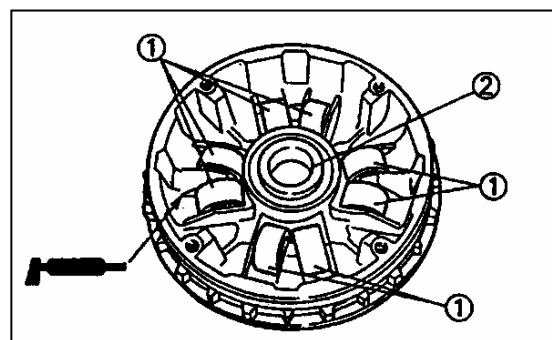
Remove any excess grease.

2. Install:

- Weight ①
- Collar ②

**NOTE:**

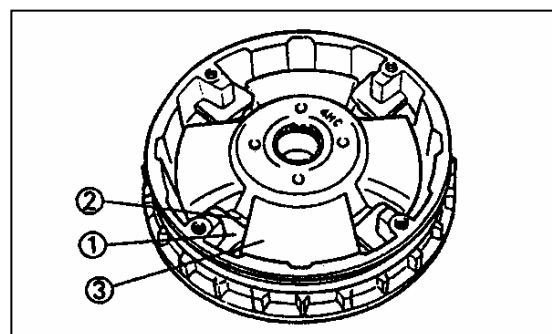
- Apply molybdenum disulfide grease to all of the outside of the weight and install.
- Apply lightweight lithium-soap base grease to the inside of the collar.



3. Install:

- Spacer ①
- Slider ②
- Cam ③
- Primary sliding sheave cap.

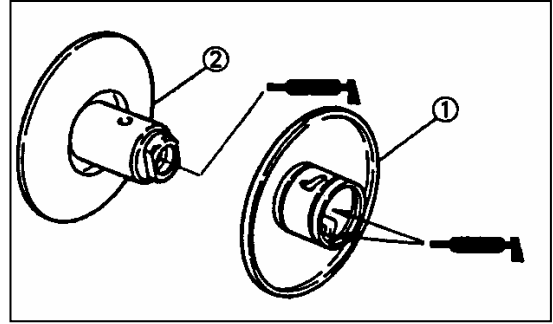
**3Nm(0.3m·kg)**



**SECONDARY SHEAVE INSTALLATION**

1. Apply:

- Lightweight lithium-soap base grease (to the secondary sliding sheave ① inner surface, grease nipple groove, and oil seals)
- Lightweight lithium-soap base grease (to the bearings, oil seals and inner surface of the secondary fixed sheave ② )

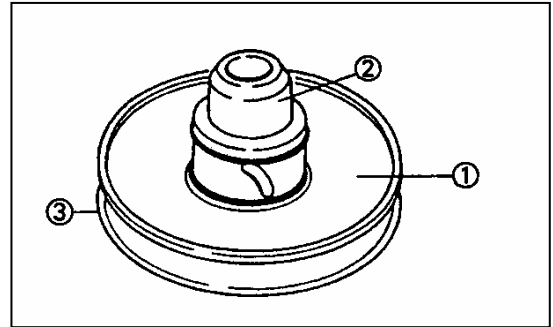


2. Install:

- Secondary sliding sheave ①

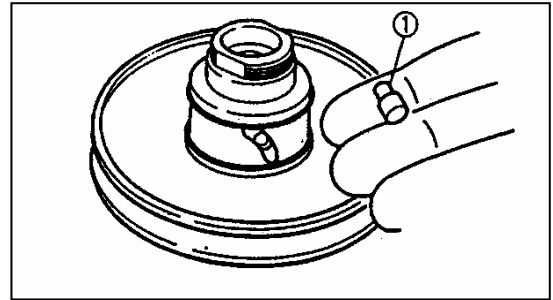
**NOTE:**

Install the secondary sliding sheave ① using the oil seal guide ② to the secondary fixed sheave ③.



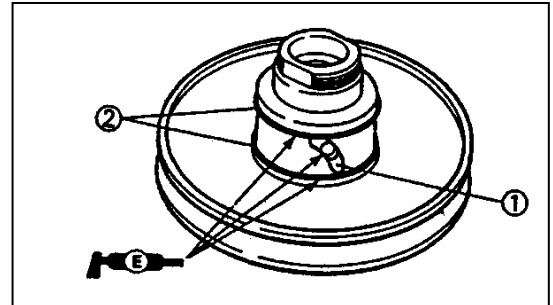
3. Install:

- Guide pin ①



4. Apply:

- Lightweight lithium-soap base grease (to the guide pin sliding groove ①, and oil seal ② **NEW**)

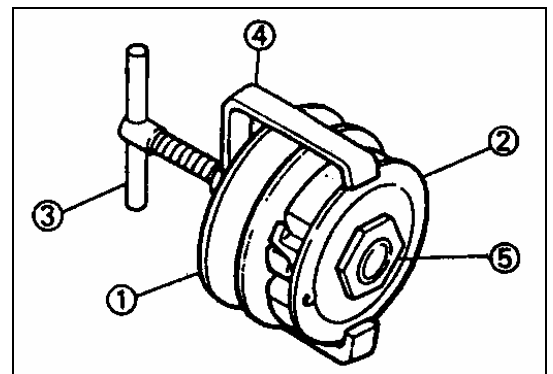


5. Install:

- Secondary sheave complete ①
- Compression spring
- Clutch carrier ②

**NOTE:**

Temporarily tighten the nut ⑤ while attaching the clutch spring holder ③ and clutch spring holder arm ④ and compress the spring.



**CAUTION:**

Use the spacer ⑥ (30mm, thickness: 2-3mm).

**6. Install:**

- V-belt ①
- Clutch assembly ②

**NOTE:**

Install the V-bet with clutch assembly to the primary sheave side.

**CAUTION:**

Never smear grease to the V-belt, secondary sheave and clutch.

**7. Install:**

- Nut ① (clutch carrier)

**NOTE:**

Tighten the nut (clutch carrier), using the locknut wrench ③ while holding the clutch carrier with the rotor holder ②

**8. Install:**

- Clutch housing ①
- Nut (clutch housing) ②

**NOTE:**

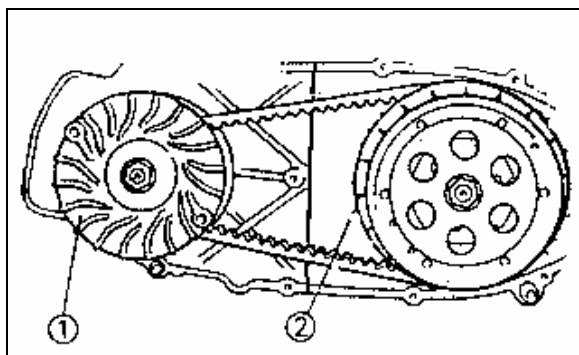
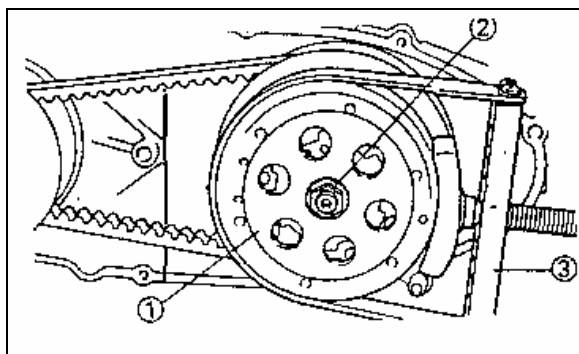
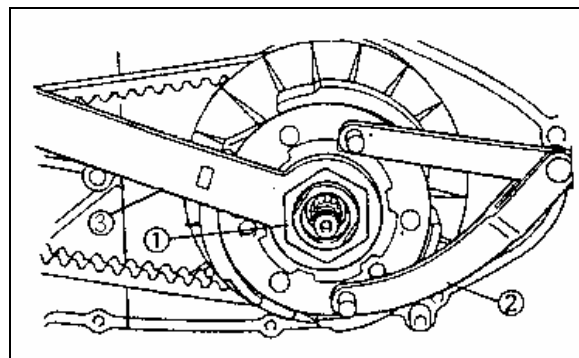
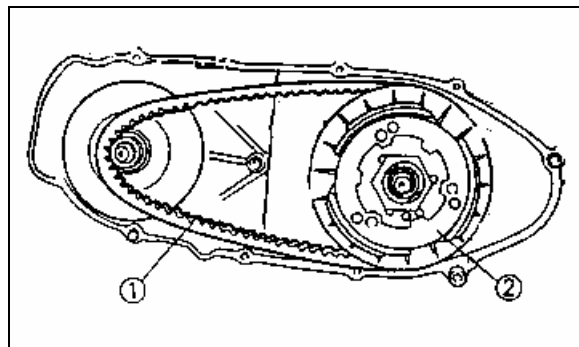
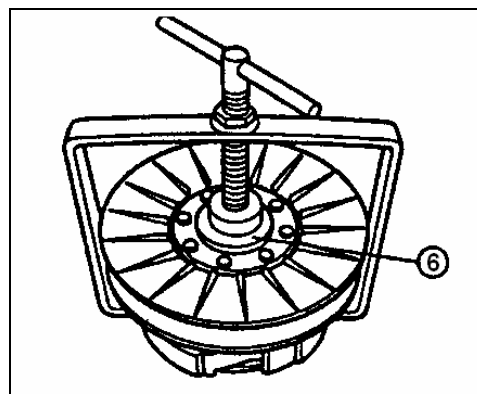
Tighten the nut (clutch housing),using the sheave holder ③).

**9. Set:**

- V- belt ①

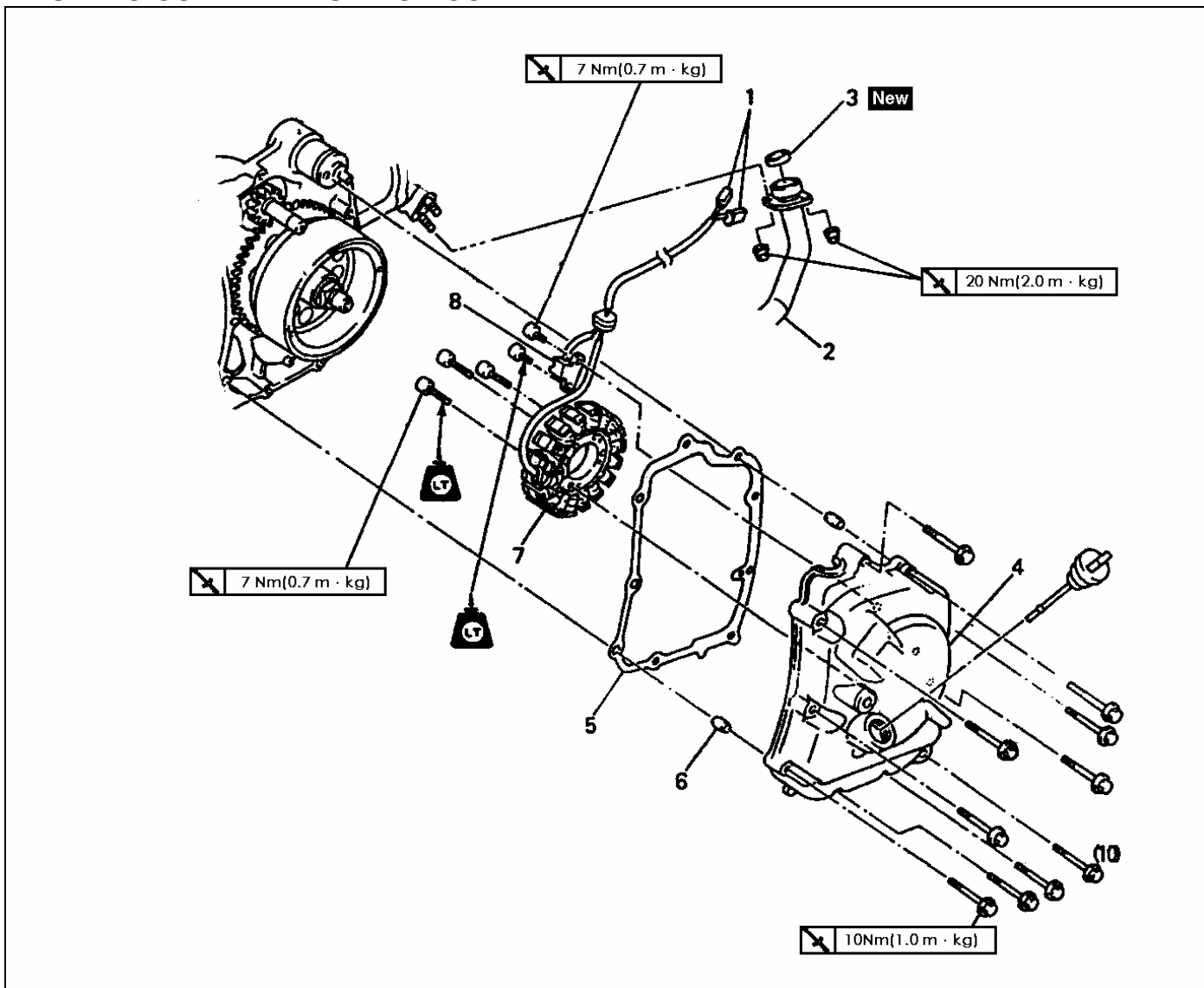
**NOTE:**

Move the V-belt to minimum diameter of the primary sheave ①, maximum diameter of the secondary sheave ② and make the V-belt tense.



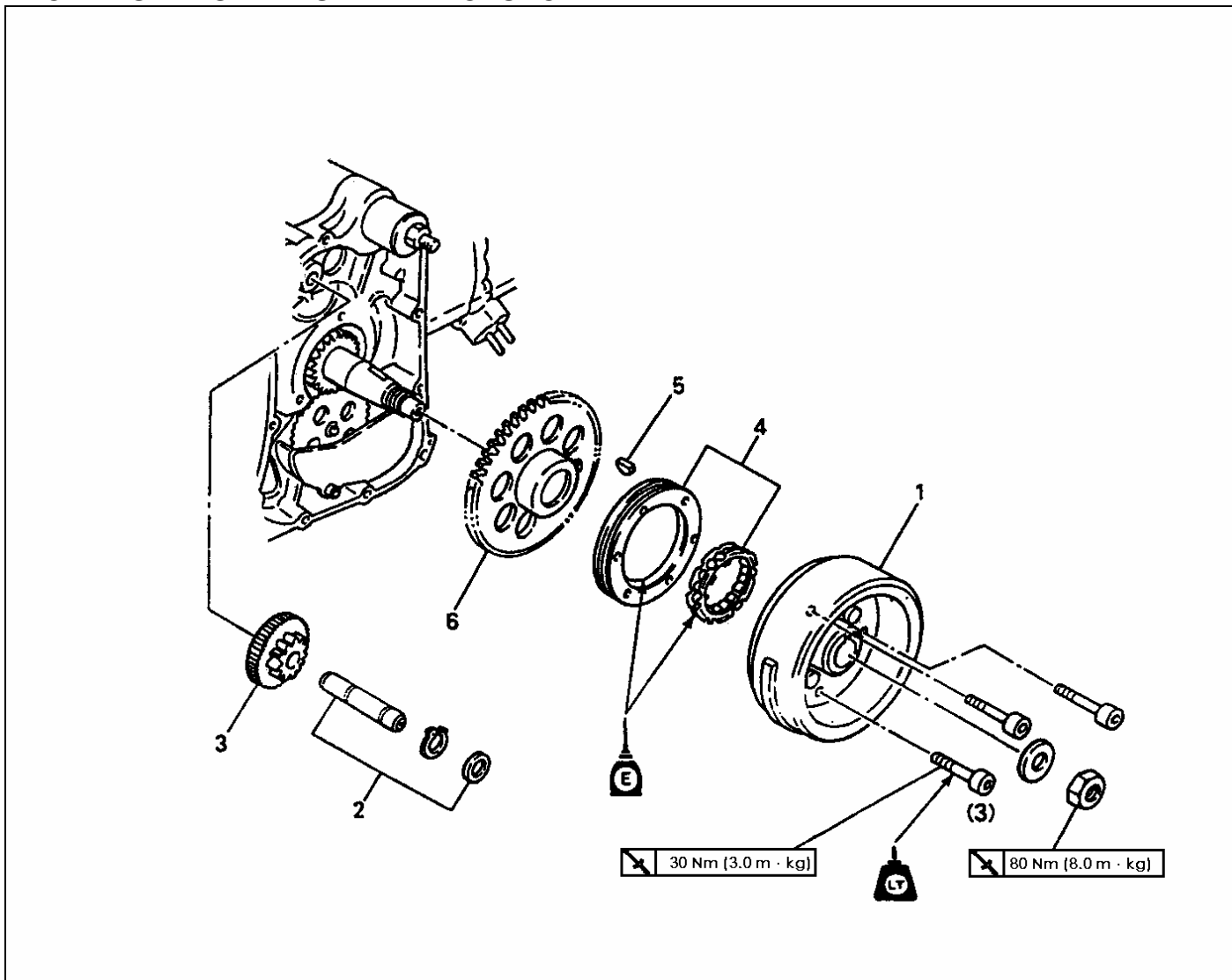
**3.8A.C. MAGNETO AND STARTER CLUTCH**

**MAGNETO COVER AND STATOR COIL**



Order	Job name/ Part name	Q'ty	Remarks
	<b>Magneto cover and stator coil removal</b>		Remove the parts in order. Refer to "ENGINE OIL REPLACEMENT" section.
	Drain the engine oil.		
1	Couplers (A.C. magneto lead)	2	<b>NOTE:</b> Disconnect the couplers.  Reverse the removal procedure for installation.
2	Exhaust pipe	1	
3	Exhaust pipe gasket	1	
4	Magneto cover	1	
5	Gasket (magneto cover)	1	
6	Dowel pins	2	
7	Stator coil	1	
8	Pick up coil	1	

A. C. MAGNETO AND STARTER CLUTCH



Order	Job name/ Part name	Q'ty	Remarks
	<b>A.C. magneto and starter clutch removal</b>		Remove the parts in order.
1	Rotor	1	Refer to "A.C. MAGNETO ROTOR REMOVAL /INSTALLATION" section.
2	Shaft (idle gear)	1	
3	Idler gear	1	
4	Starter one way clutch assembly	1	
5	Woodruff key	1	
6	Starter wheel gear	1	
			Reverse the removal procedure for installation.

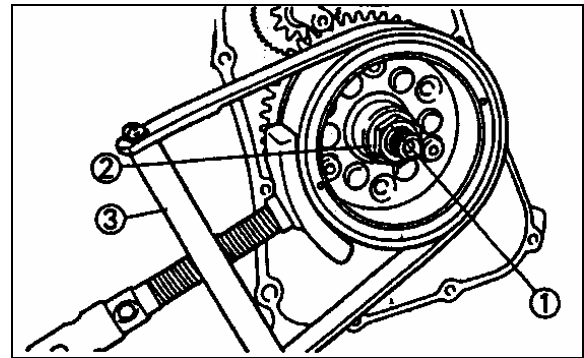
**A.C. MAGNETO ROTOR REMOVAL**

1. Remove:

- Nut ① (rotor)
- Plain washer②

**NOTE:**

- Loosen the nut (rotor) ①while holding the rotor with a sheave holder③ .
- Do not allow sheave the holder touch to the projection on the rotor.

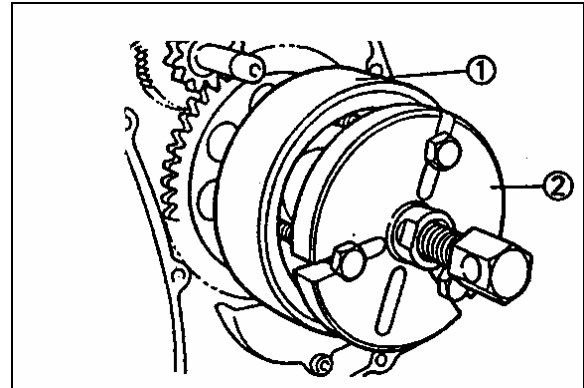


2. Remove:

- Rotor ①
- Woodruff key

**NOTE:**

- Remove the rotor ②using the flywheel puller.
  - Center the flywheel puller over the rotor.
- Make sure after installing the holding bolts that the clearance between the flywheel puller and the rotor is the same everywhere. If necessary, one holding bolt may be turned out slightly to adjust the flywheel puller's position.



**CAUTION:**

Cover the crankshaft end with the box wrench for protection.

**STARTER DRIVE GEAR INSPECTION**

1. Inspect:

- Starter idle gear teeth
- Starter drive gear teeth
- Starter wheel gear teeth

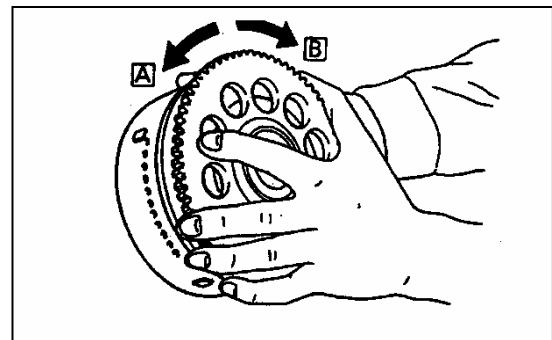
Burrs /chips /roughness /wear → Replace.

2. Check:

- Starter clutch operation

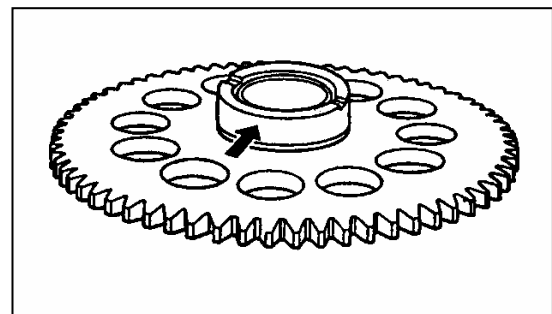
Push the dowel pins to the arrow direction.

Unsmooth operation → Replace.



**Checking steps:**

- Hold the starter clutch.
- When turning the starter wheel gear clockwise, the starter clutch and the starter wheel gear should be engaged.
- If not, the starter clutch is faulty. Replace it.
- When turning the starter wheel gear counter clockwise, it should turn freely.
- If not, the starter clutch is faulty. Replace it.





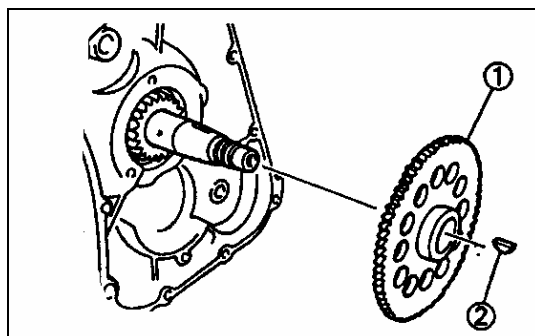
## A.C. MAGNETO ROTOR INSTALLATION

1. Install:

- Starter wheel gear ①.
- Woodruff key ②.

**NOTE:**

Install the starter wheel gear①, then install the woodruff key②.



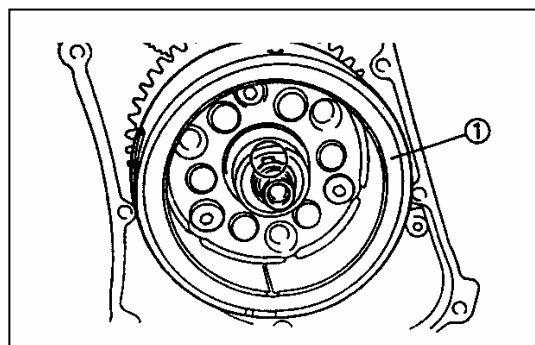
2. Install:

- Plain washer
- Rotor ①

**NOTE:**

● Clean the tapered portion of the crankshaft and the rotor hub.

● When installing the magneto rotor, make sure the woodruff key is properly seated in the key way of the crankshaft.

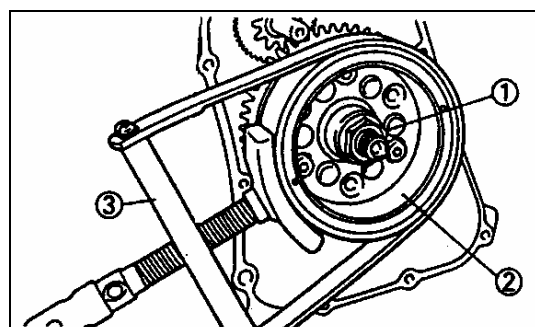


3. Tighten:

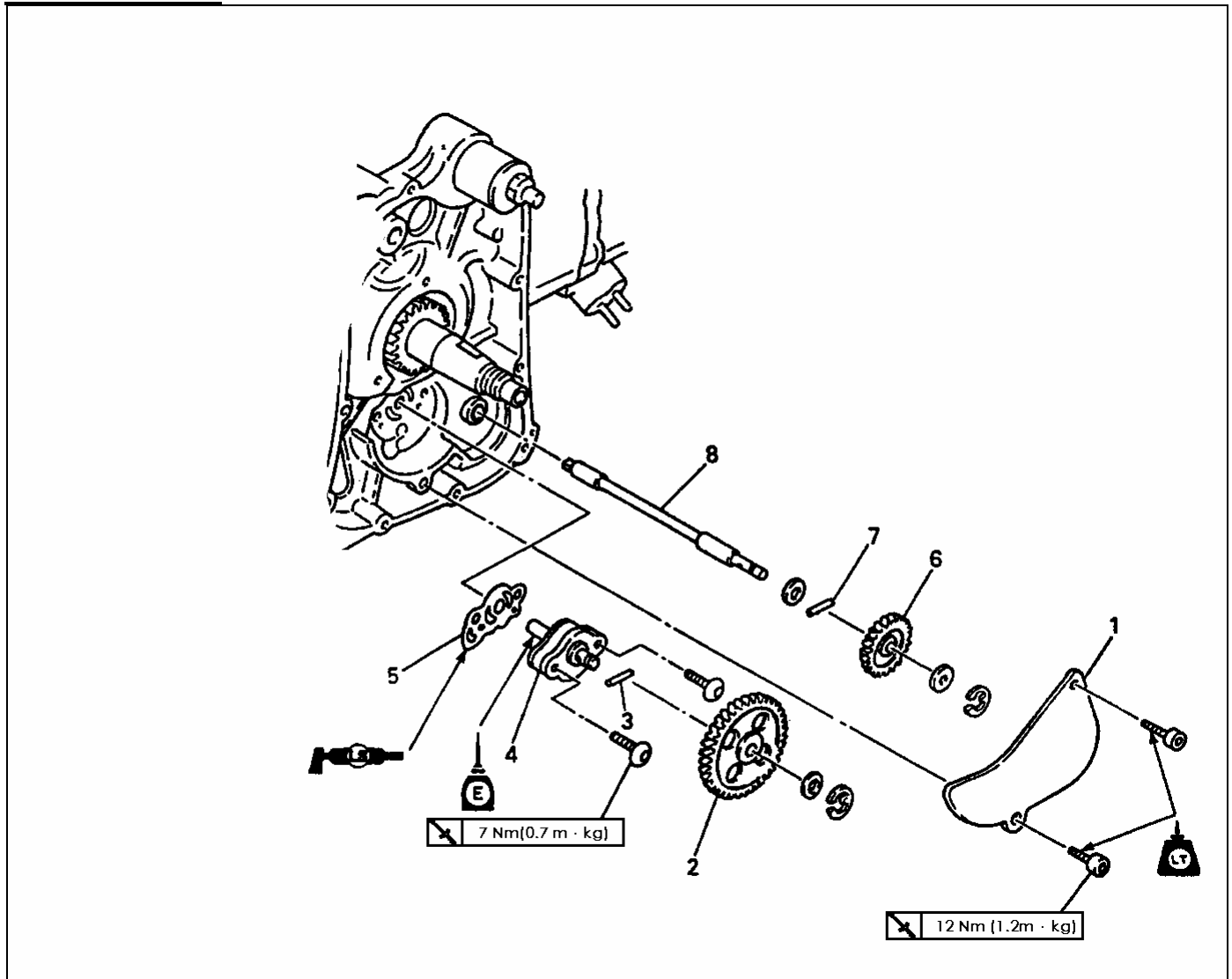
- Nut(rotor)①  80Nm(8.0m·kg)

**NOTE:**

Tighten the nut (rotor)① while holding the magneto rotor② with a sheave holder③.



3.9 OIL PUMP



Order	Job name/ Part name	Q'ty	Remarks
	<b>Oil pump removal</b>		
	<b>A.C. magneto</b>		
1	Cover	1	Remove the parts in order. Refer to "A.C. MAGNETO AND STARTER CLUTCH" section.
2	Pump driven gear	1	
3	Dowel pin	1	
4	Oil pump assembly	1	
5	Gasket	1	
6	Impeller shaft gear	1	
7	Dowel Pin	1	
8	Shaft	1	
			Reverse the removal procedure for installation.

## OIL PUMP INSPECTION

### 1. Inspect:

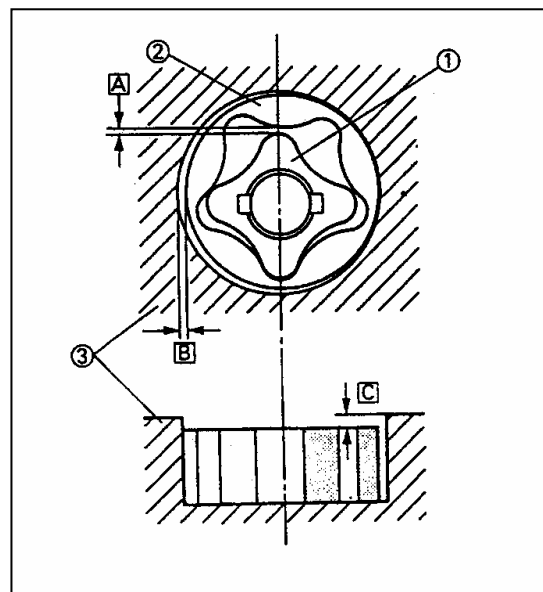
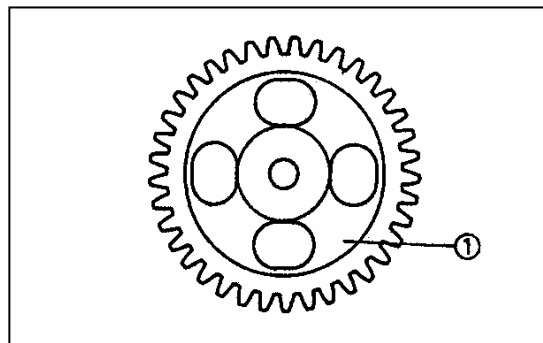
- Drive gear (oil pump) ①
- Pump housing
- Pump housing cover

Wear /cracks/ damage → Replace.

### 2. Measure:

- Tip clearance (between the inner rotor ① and the outer rotor ②)
- Side clearance (between the outer rotor ② and the pump housing ③)
- Housing and rotor clearance (between the pump housing ③ and the rotors ① ②)

Out of specification → Replace the oil pump assembly.



**Tip clearance [A]:**

**0.10-0.34 mm <Limit: 0.40mm>**

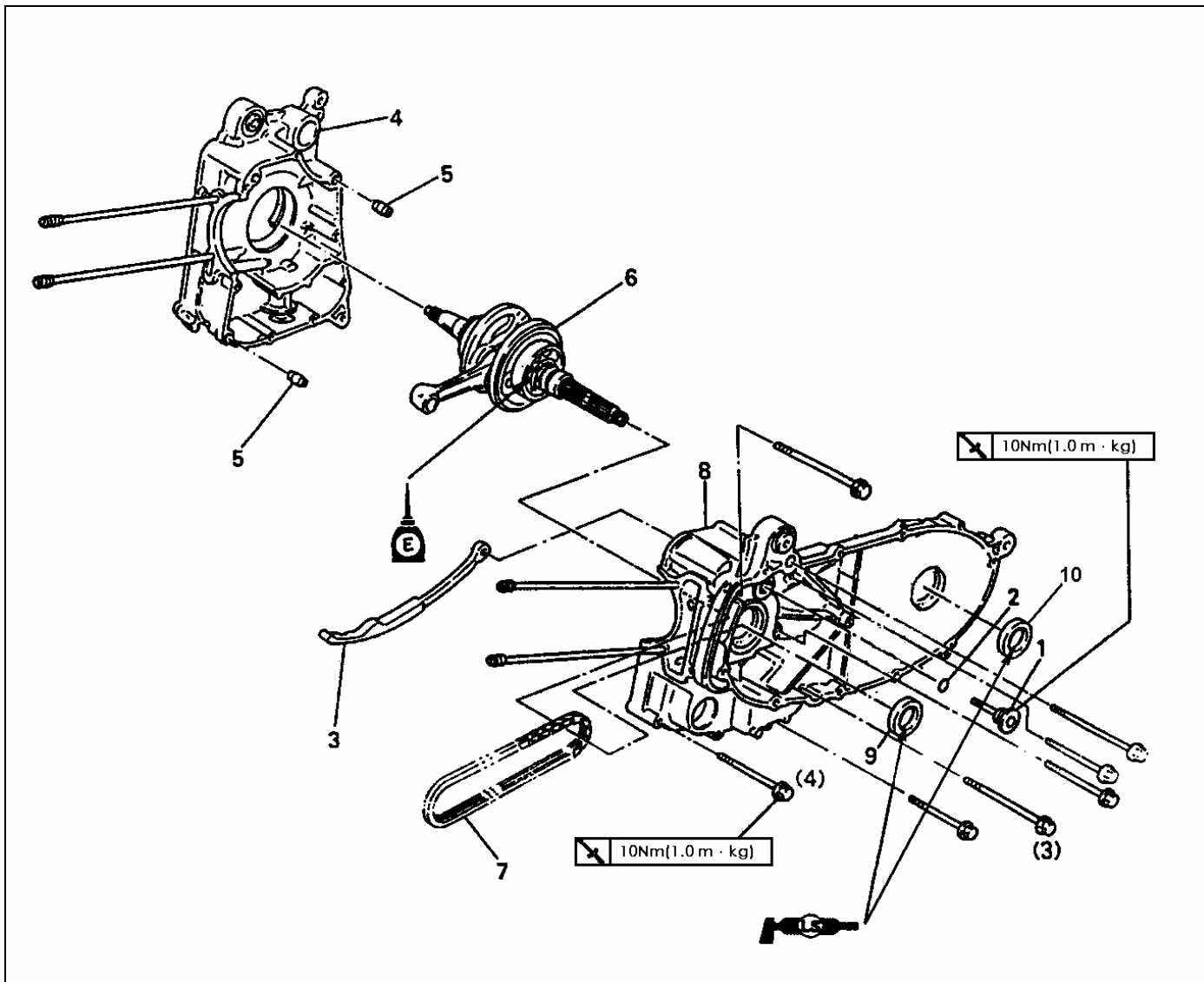
**Side clearance [B]:**

**0.013-0.036mm <Limit:0.15mm>**

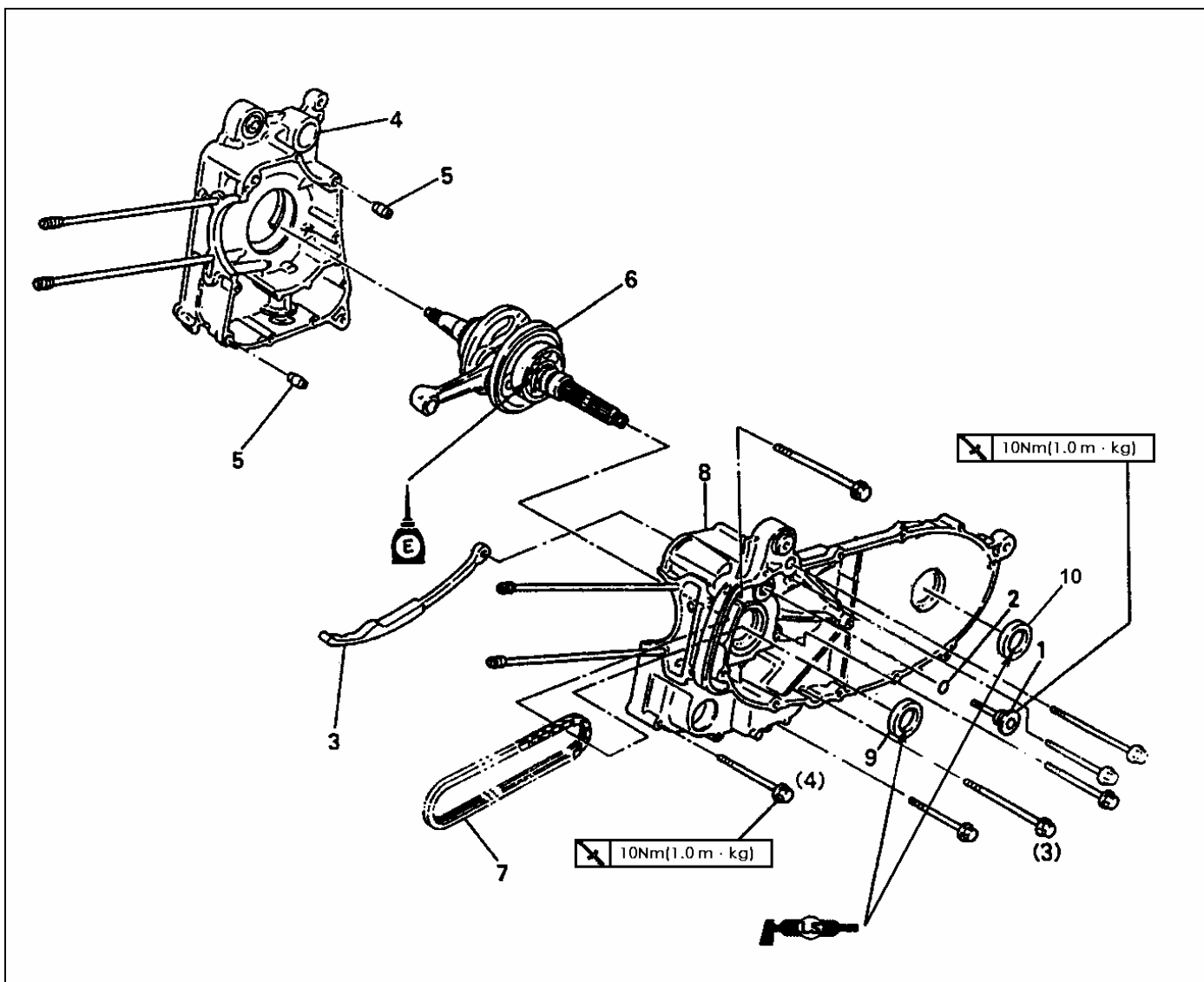
**Housing and rotor clearance [C]:**

**0.04-0.09 mm <Limit: 0.15mm>**

**3.10 CRANKCASE AND CRANKSHAFT**



Order	Job name/ Part name	Q'ty	Remarks
	<b>Crankcase and crankshaft removal</b>		Remove the parts in the order.
	Engine removal		Refer to "ENGINE REMOVAL" section.
	Cylinder head		Refer to "CYLINDER HEAD" section.
	Cylinder, and piston		Refer to "CYLINDER AND PISTON" section.
	V-belt, clutch, secondary/ primary sheave		Refer to "V BELT, CLUTCH AND SECONDARY/ PRIMARY SHEAVE" section.
	A.C. magneto and starter clutch		Refer to "A.C. MAGNETO AND STARTER CLUTCH" section.
	Oil pump		Refer to "OIL PUMP" section.
	Water pump		Refer to "WATER PUMP" section.
	Rear wheel		Refer to "REAR WHEEL AND REAR BRAKE" section.
1	Bolt	1	
2	O- ring	1	



Order	Job name/ Part name	Q'ty	Remarks
3	Timing chain guide (intake)	1	
4	Crankcase (right)	1	Refer to "CRANKSHAFT INSTALLATION" section.
5	Dowel pin	2	Refer to "CRANKSHAFT REMOVAL/ INSTALLATION" section.
6	Crankshaft assembly	1	
7	Timing chain	1	
8	Crankcase (left)	1	
9	Oil seal	1	
10	Oil seal		
			Reverse the removal procedure for installation.

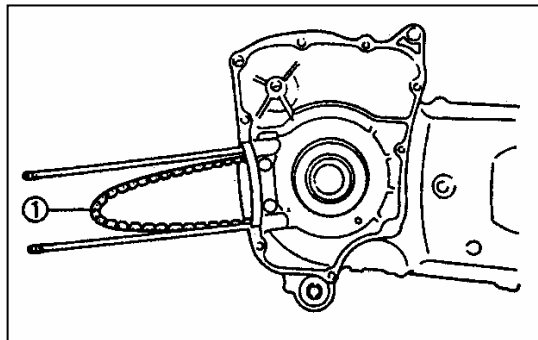
**CRANKSHAFT REMOVAL**

1. Remove:

- Crankshaft assembly
- Timing chain

**NOTE:**

- Before removing the crankshaft assembly, remove the timing chain from the crankshaft sprocket.
- If the timing chain hooks to the crankshaft sprocket, the crankshaft cannot be removed.



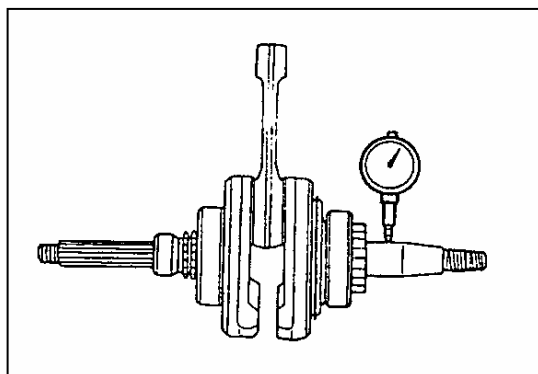
**CRANKSHAFT INSPECTION**


1. Measure:

- Crankshaft runout
- Out of specification → Replace crankshaft and/or bearing.

**NOTE:**

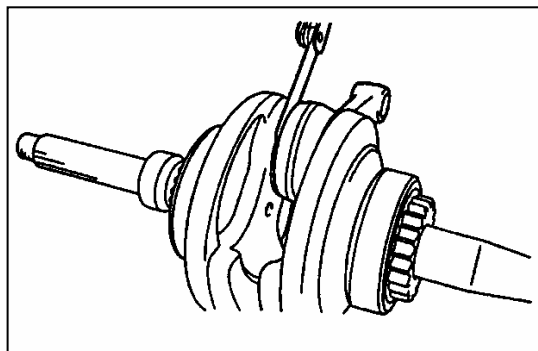
Measure the crankshaft runout with the crankshaft assembly running slowly.




	<b>Runout limit: 0.03 mm</b>
---	----------------------------------

2. Measure:

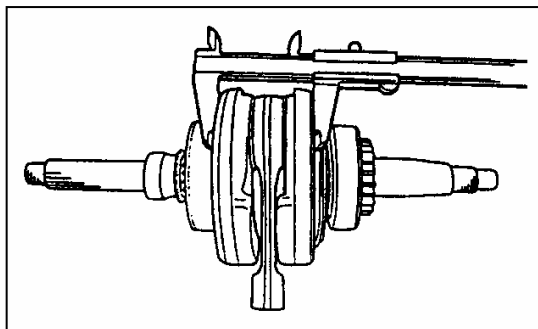
- Big end side clearance
- Out of specification → Replace big end bearing, crank pin and/or connecting rod.




	<b>Big end side clearance: 0.35-0.85 mm</b>
--	---

3. Measure:

- Crank width
- Out of specification → Replace crankshaft.



	<b>Crank width: 59.95-60.00 mm</b>
--	--

4. Inspect:

- Crankshaft sprocket ①

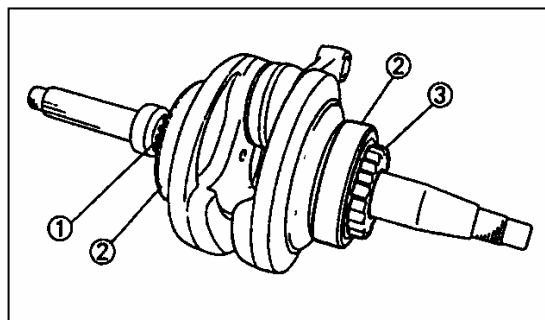
Wear/ Damage → Replace crankshaft.

- Bearing ②

Wear/ Crack /Damage → Replace crankshaft.

- Pump drive gear ③

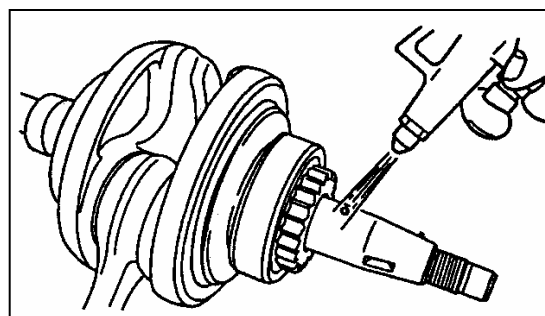
Wear/ Damage → Replace crankshaft.



5. Inspect:

- Crankshaft journal

Clogged → Blow out the journal with compressed air.



**CRANKCASE INSTALLATION**

1. Clean all the gasket mating surface and crankcase mating surface thoroughly.

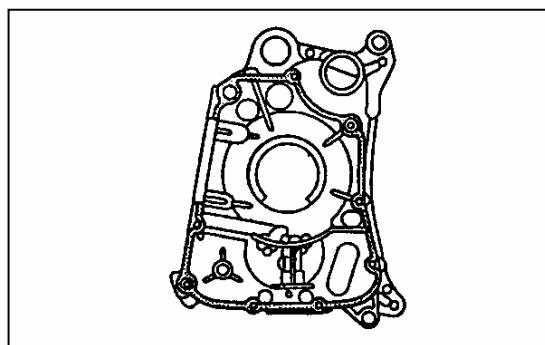
2. Apply:

- Sealant

(onto the crankcase mating surfaces)

**NOTE:**

DO NOT ALLOW any sealant to come into contact with the oil gallery.



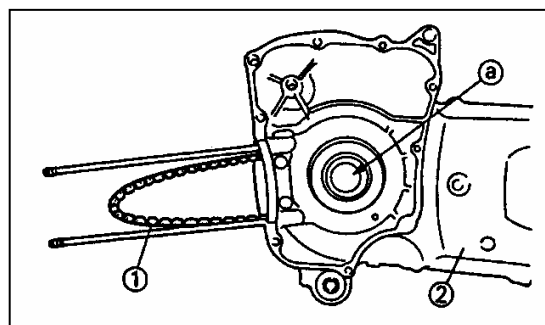
3. Install:

- Dowel pins

- Timing chain ①

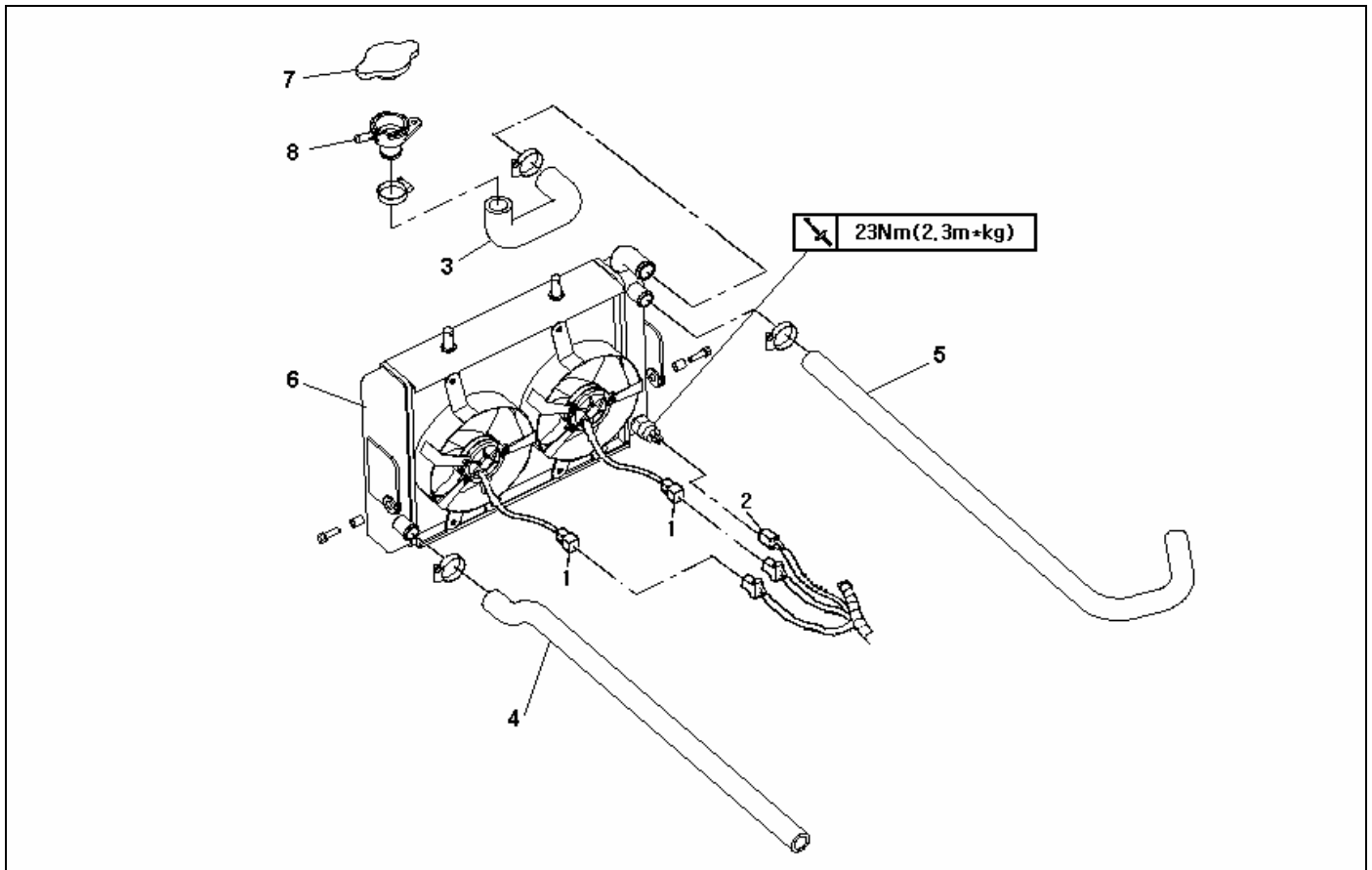
**NOTE:**

Install the timing chain not to be seen through the crankshaft holeⒶ on the crankcase (left)Ⓒ.



**3.11 COOLING SYSTEM**

**3.11.1 RADIATOR**



Order	Job name/ Part name	Q'ty	Remarks
	<b>Radiator removal</b> Drain the coolant.		Remove the parts in order. Refer to "COOLANT REPLACEMENT" section.
1	Fan motor leads	2	
2	Thermo switch leads	2	
3	hose (radiator)	1	
4	Outlet hose (radiator)	1	
5	Inlet hose (radiator)	1	
6	Radiator	1	
7	Radiator cap	1	
8	Radiator filler neck	1	
			Reverse the removal procedure for installation.



## INSPECTION

1. Inspect:

- Radiator ①

Obstruction → Blow out with compressed air through the rear of the radiator.

Flattened fins → Repair or replace.

If flattened over the 20% of radiator fin, repair or replace the radiator.

### CAUTION:

Use only specified adhesive to repair the radiator.

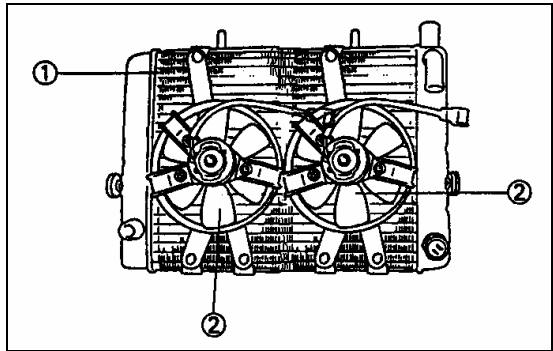
2. Inspect:

- Radiator hoses
- Radiator pipes

Cracks/damage → Replace.

3. Measure:

- Radiator cap opening pressure
- Radiator cap opens at a pressure below the specified pressure → Replace.



**Radiator cap opening pressure:**  
**110-140kPa**  
**(1.1-1.4kg/cm<sup>2</sup> , 1.1-1.4 bar)**

Measurement steps:

- Attach the radiator cap tester ① and adapter ② to the radiator cap ③.
- Apply the specified pressure for 10 seconds, and make sure there is no pressure drop.

4. Inspect:

- Fan motor assembly

Damage → Replace.

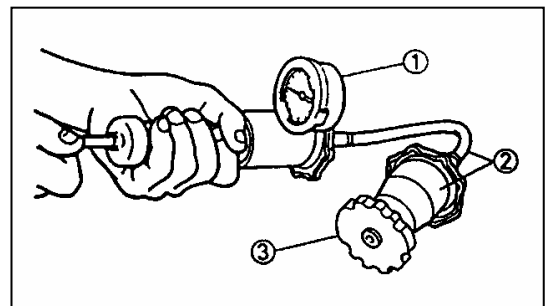
Malfunction → Check and repair.

Refer to "COOLING SYSTEM".

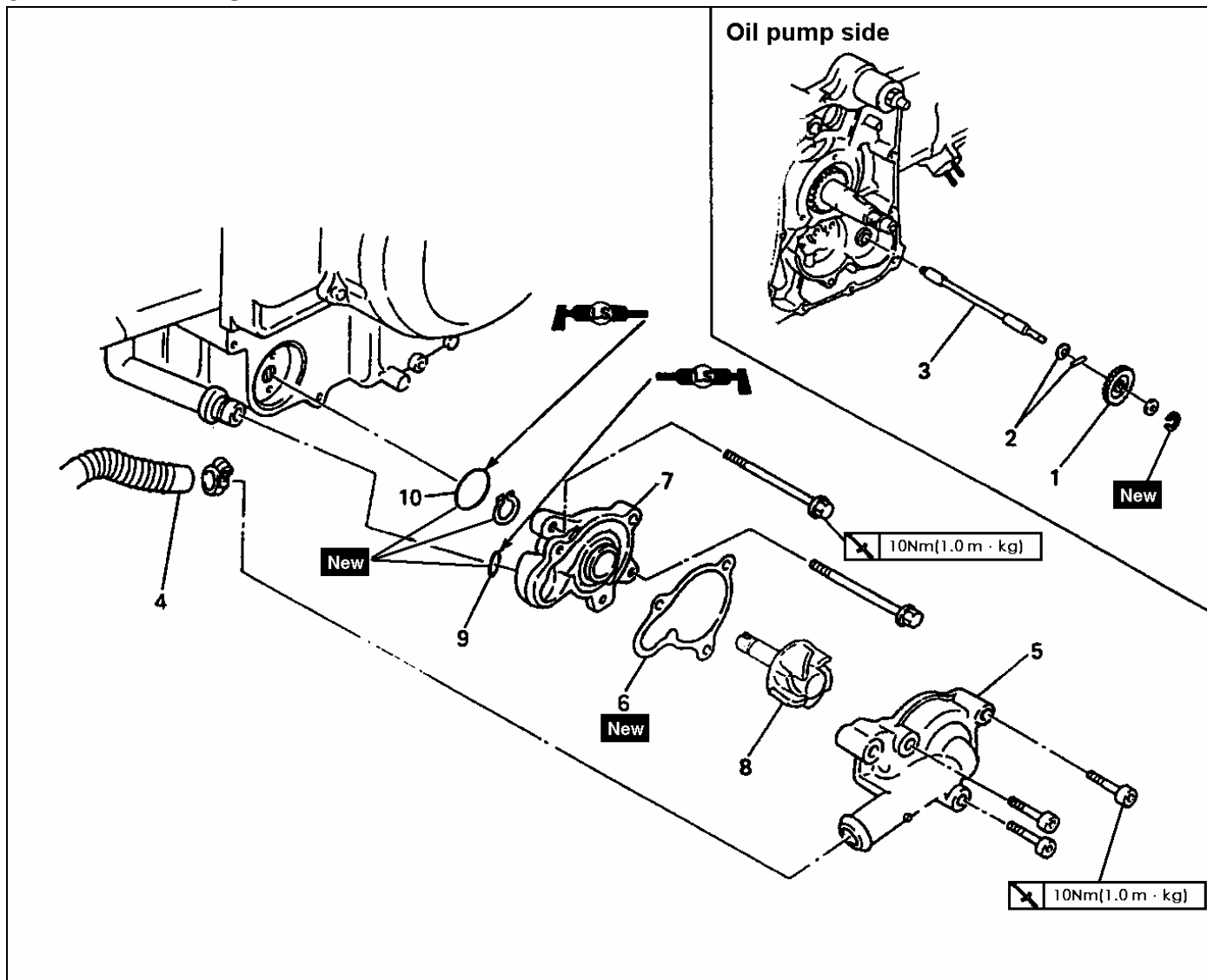
5. Inspect:

- Pipes

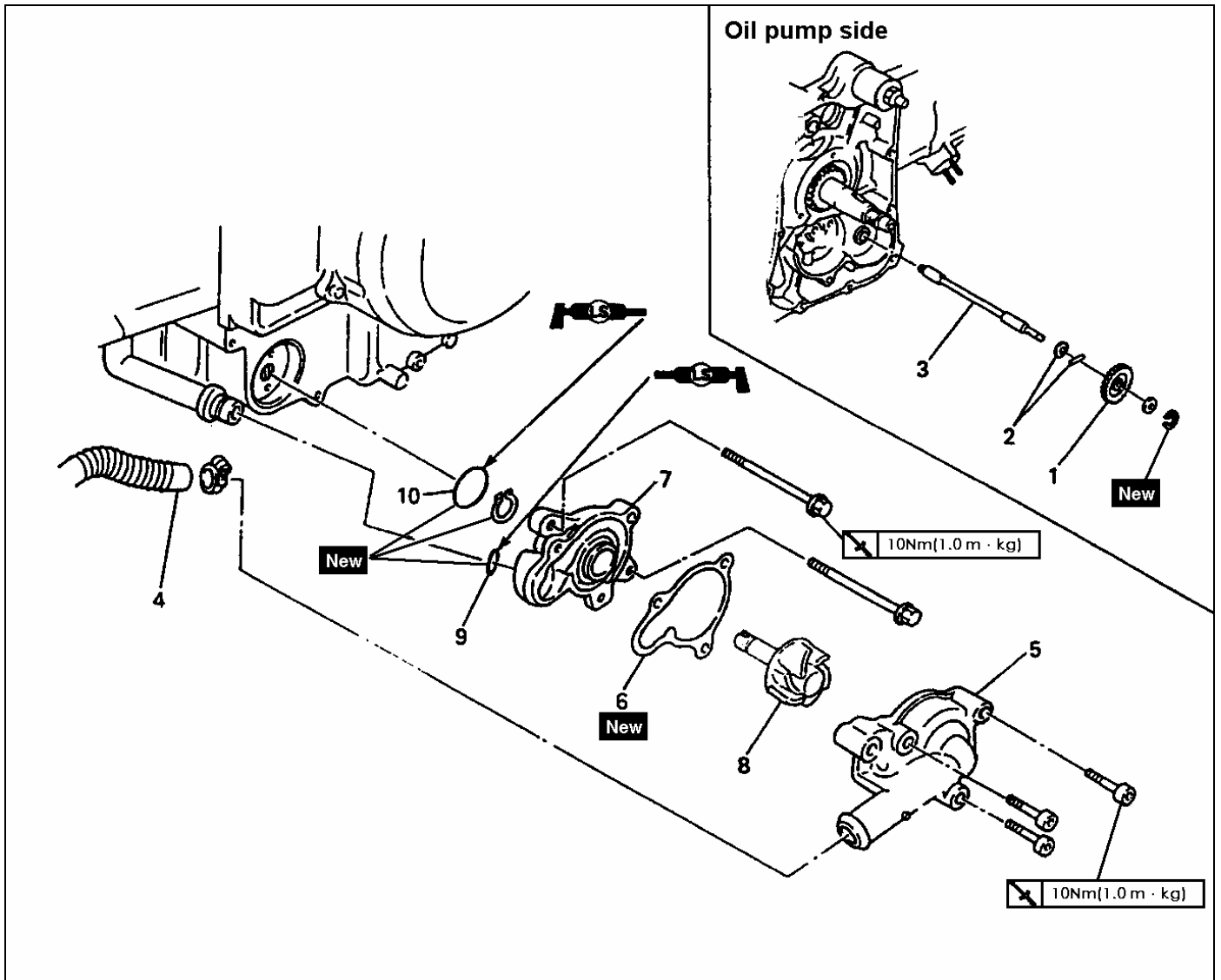
Cracks/damage → Replace.



3.11.2 WATER PUMP



Order	Job name/ Part name	Q'ty	Remarks
	Water pump removal Drain the coolant.		Remove the parts in order. Refer to "COOLANT REPLACEMENT" section.
	A.C. magneto		Refer to "A.C. MAGNETO AND STARTER CLUTCH" section.
1	Impeller shaft gear	1	
2	Dowel pin/plain washer	1/1	
3	Shaft	1	Refer to "WATER PUMP INSTALLATION" section.
4	Outlet hose (radiator)	1	
5	Housing cover	1	
6	Housing cover gasket	1	
7	Water pump housing	1	
		1	



Order	Job name/Part name	Q'ty	Remarks
8	Impeller shaft	1	Refer to "WATER PUMP INSTALLATION" section.
9	O-ring	1	
10	O-ring	1	
			Reverse the removal procedure for installation.

**NOTE:**

●It is not necessary to disassemble the water pump, unless there is an abnormality such as excessive change in coolant temperature and/or level, discoloration of coolant, or milky transmission oil.

●If necessary, replace water pump as an assembly.

**INSPECTION**

1. Inspect:

●Impeller shaft

Wear/damage → Replace.

Fur deposits → Clean.

2. Inspect:

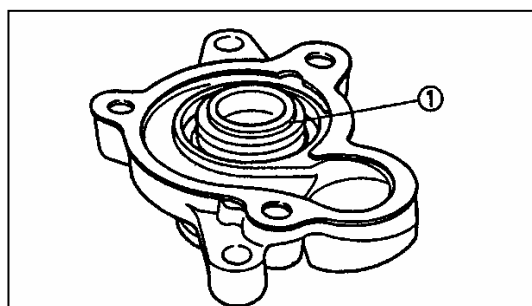
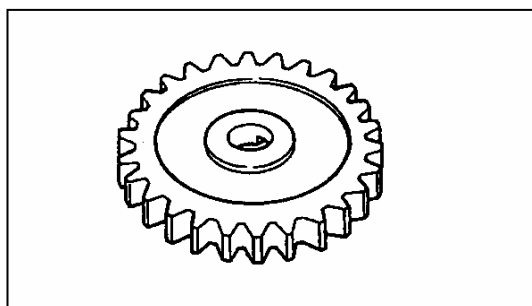
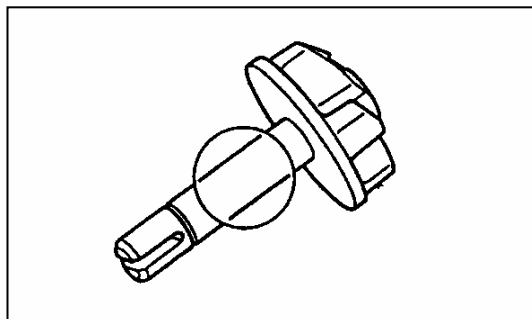
●Impeller shaft gear

Wear/damage → Replace.

3. Inspect:

●Mechanical seal ①

Damage/worn/wear → Replace.



**WATER PUMP INSTALLATION**

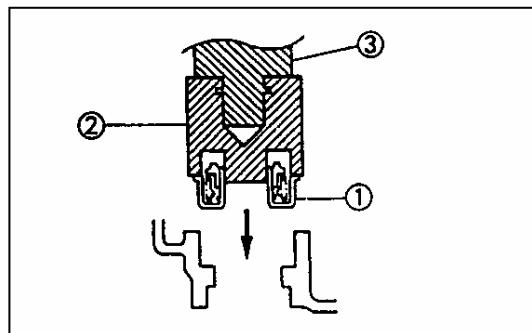
1. Install:

●Mechanical seal ① **NEW**

**Installation steps:**

●Apply the bond to the outside of the mechanical seal.

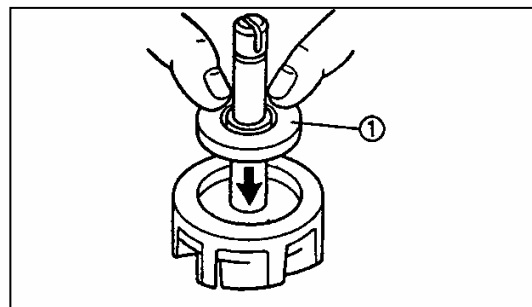
●Install the mechanical seal by using the mechanical seal installer ② and middle shaft bearing driver ③



2. Install:

●Mechanical seal ① **NEW**

Apply coolant to the outside of the mechanical seal before installing.

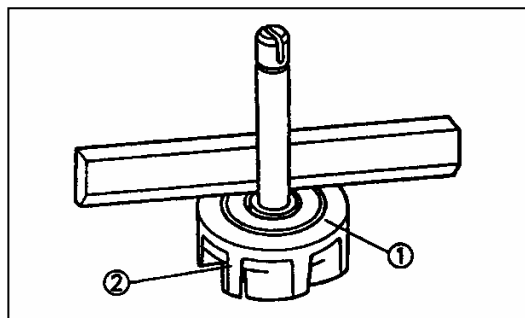


**NOTE:**

Do not smear any oils or grease on the ring side of the mechanical seal.

### 3. Inspect:

- Mechanical sea , slip ring side ①
- Inspect the slip ring side of the mechanical seal and the impeller ② for level installation.  
 Incorrect level → Reinstall.



### 4. Install:

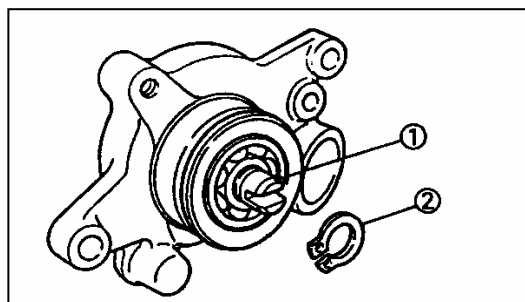
- Impeller shaft①
- Circ lip ② **NEW**

#### Installation steps:

- Apply a small amount of grease to the impeller shaft tip.
- Install the impeller shaft while turning it. Use care so that the oil seal is not damaged or the spring does not slip off its position.

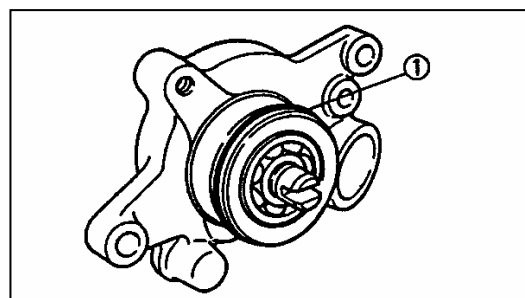
#### NOTE:

After installing the impeller shaft, check it for smooth rotation.




### 5. Install:

- O-ring①**NEW**

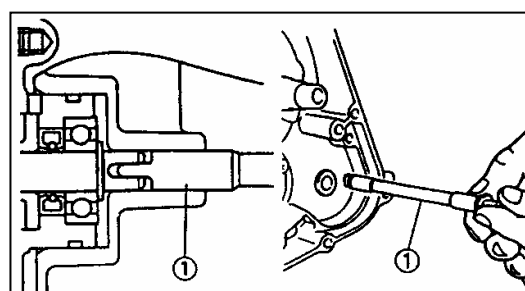


### 6. Install:

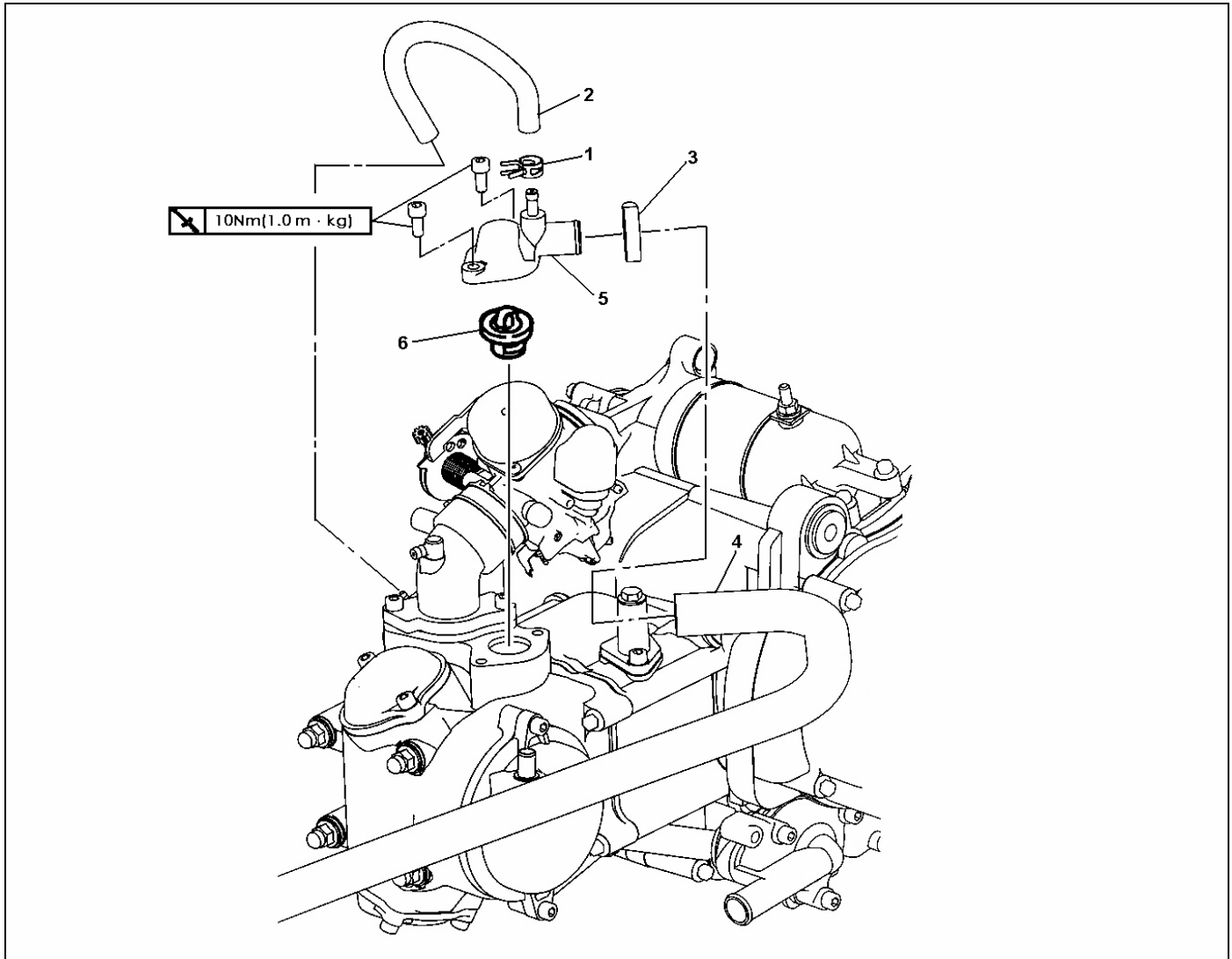
- Water pump housing
- Housing cover  10Nm(1.0m·kg)

### 7. Install:

- Shaft①
- Align the slot on the impeller shaft with the projection on the shaft when installing.



3.11.3 THERMOSTAT



Order	Job name/ Part name	Q'ty	Remarks
	<b>Thermostat removal</b> Drain the coolant		Remove the parts in order. Refer to "COOLANT REPLACEMENT" section.
1	Clip	1	
2	Hose	1	
3	Hose clamp	1	
4	Inlet hose (radiator)	1	
5	Thermostatic cover	1	Refer to "THERMOSTAT INSTALLATION" section.
6	Thermostatic valve	1	Reverse the removal procedure for installation.

## INSTALLATION

1. Inspect:

- Thermostatic valve

Valve does not open at  $70.5-73.5^{\circ}\text{C}$  → Replace.

### Inspection steps:

- Suspend the thermostatic valve in a vessel.
- Place a reliable thermometer in water.
- Observe the thermometer, while continually stirring the water.

① Thermostatic valve

② Vessel

③ Thermometer

④ Water

**A** CLOSE

**B** OPEN

### NOTE:

The thermostatic valve is sealed and its setting requires specialized work. If its accuracy is in doubt, replace. A faulty unit could cause serious over-heating or over cooling.

2. Inspect:

- Thermostatic cover

Cracks /damage → Replace.

## INSTALLATION

1. Install:

- Thermostatic valve

- Thermostatic cover

