SQR372 Engine

Service Manual

Chery Automobile Co., Ltd.

Forewords

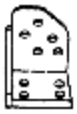
In order to help the technical servicing personnel to have correct understanding and good command of the cute Chery Model SQR7080 vehicle, and to master the skills for fast repairs and rational maintenance, a special edition of the "Chery QQ Technical Service Manual—372 Engine Mechanics Division" is compiled and published.

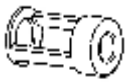
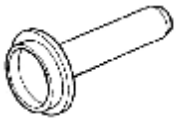
This Manual gives a detailed description on the dismounting, installation, checks and tests, adjustments and diagnoses, technical standards and specifications for adjustments and diagnoses of various parts and components as well as subsystems of Chery QQ 372 engines. This Manual is published by Chery Automobile Co., Ltd.

The right of interpreting the Manual belongs to the Service Department of Chery Automobile Co. Ltd

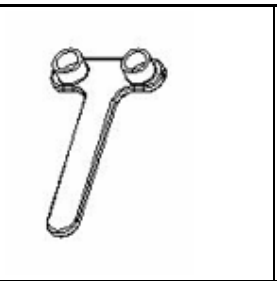
Editors
March of 2004

3、Special tools for maintenance:

	Outer appearance	Code and Name	Purpose
S		Auxiliary devices for engine dismounting and checks	Mounting onto engine dismounting and check stand
		Engine dismounting and check stand	Dismounting and installing engine
		Clockwise belt wheel wrench	Camshaft clockwise belt wheel dismounting

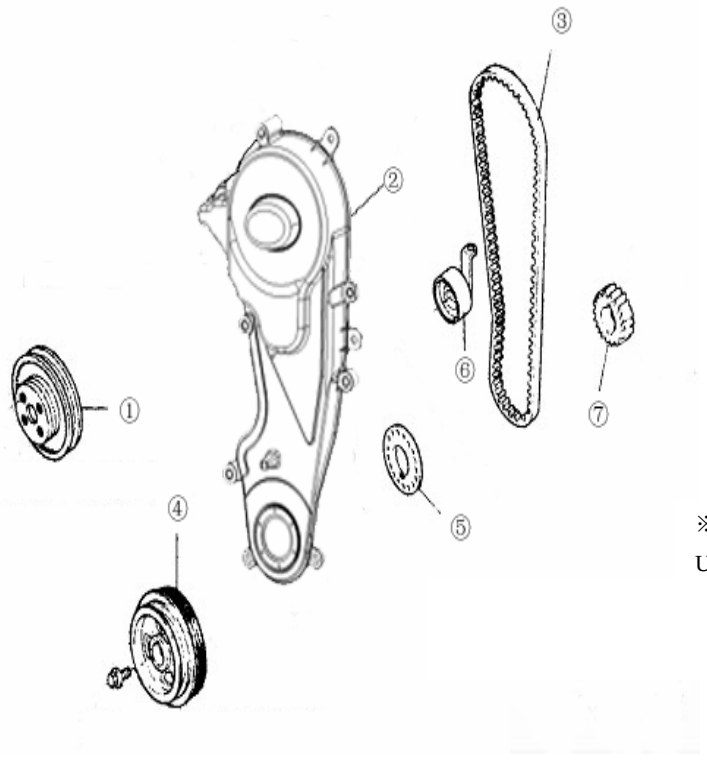
S		Spring bush pulling and removing device	Installing crankshaft oil seal
		Valve locking block removal device	Dismounting and installation of valve spring locks
		Auxiliary tools	
		Flying wheel fixture	Dismounting and installation of crankshaft
T		Valve guiding pipe punch	Removing and installation of valve guiding pipe
		Shaft oil seal replacer	
		Oil seal stand screw driver	

	Outer appearance	Code and Name	Purpose
		Crankshaft belt wheel fixture	Remove and install crankshaft belt wheel
		Wrench	Remove and install camshaft slave gear wheel
			Replace valve spacing adjust washer

		Water pump pulley assembly wrench	water pump Assembly
Measuring tools	Clearance gauge, calipers, Micrometer, ruler, centesimal meter, cylinder gauge , pressure meter, torque wrench		
Tool	Piston ring dismounting device		
Oils	Engine lubricating oil, bond		

Chapter 2 Timing Belt Service

1. **Configuration diagram**



1 Water pump pulley
2 Timing belt cover
3 Timing belt
4 Torsion shock absorber
5 Timing pulley damper
6 Tensioner
7 Crankshaft timing pulley

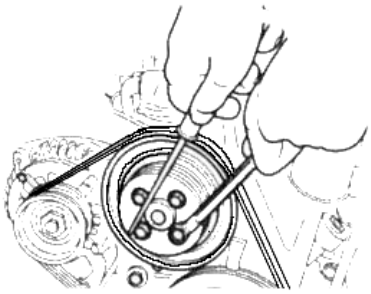
※ : Non-reusable part
Unit: N • m(kg • cm)

Remove torsional vibration damper.

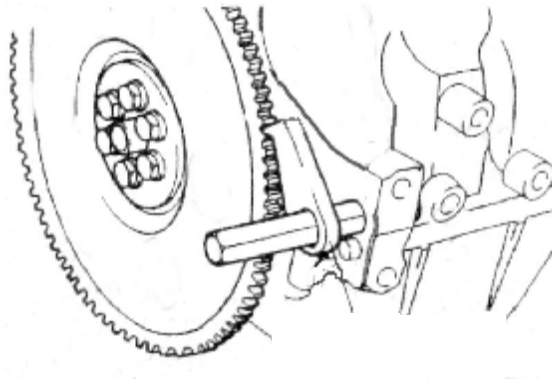
图 29

Remove water pump pulley.

Remove the water pump pulley according to the illustration.

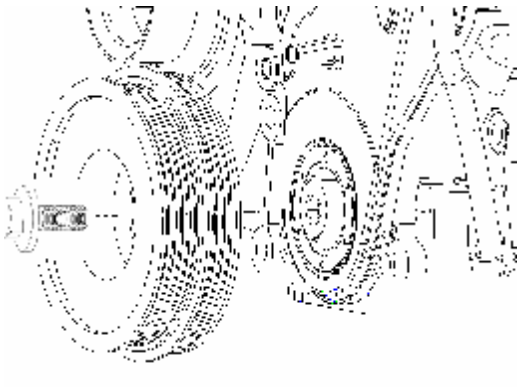


Remove it with screwdriver and wrench according to the illustration.



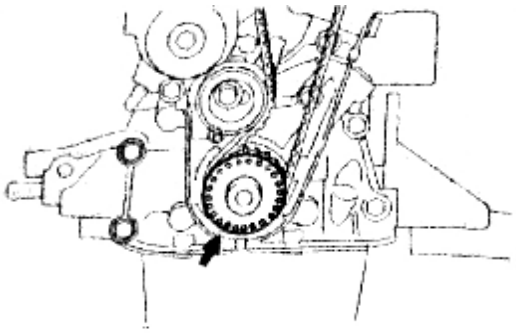
Remove torsional vibration damper

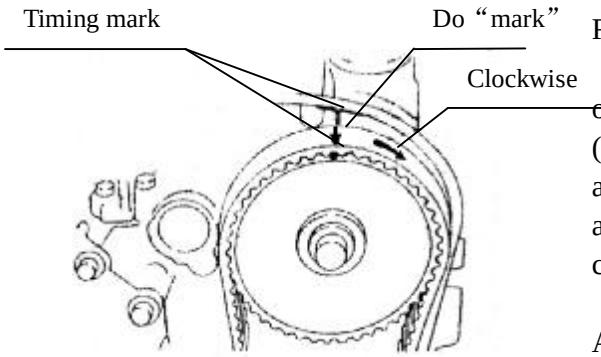
(1) Fix the flywheel and prevent the gear ring from rotating.



(2) Remove bolt of torsional vibration damper.

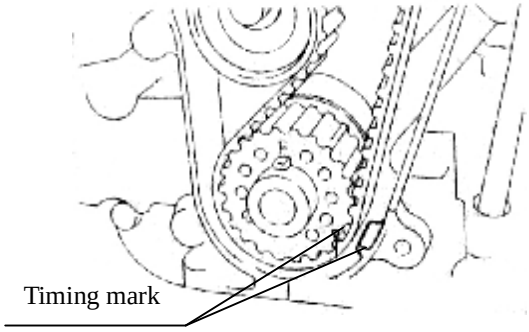
Remove timing cover cap
Torque: 6±1N.m
Remove timing pulley damper

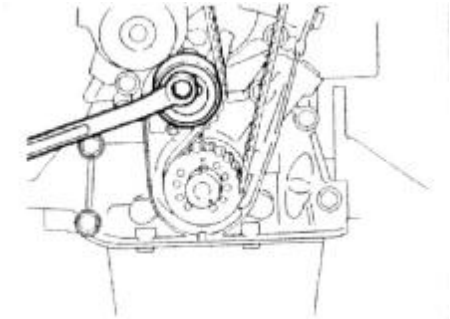




Remove the tensioner
（1）Carry out the operation at the upper thrust point of compression of the first cylinder piston
(2) After removing the timing cover cap, turn the bolt and rotate the timing gear clockwise with wrench, align timing mark of camshaft timing gear with the cam mark of camshaft cover cap;

Attention: You can rotate the engine clockwise only, after installing the pulley;
Before removal, make a arrow mark on the position of timing mark, assemble according to original state.
(3) Make sure that the crankshaft timing pulley wheel mark is aligned with the mark of the oil pump.





(4) Remove the tensioner bolt, and take off the tensioner

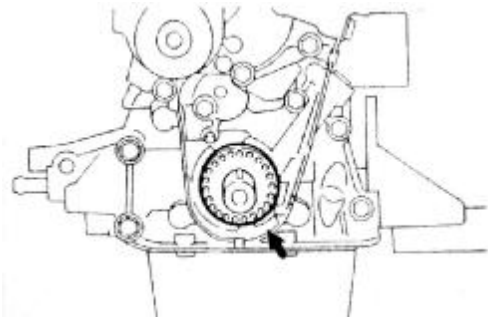
Remove the timing belt.

[Caution] It is absolutely not allowed to use screw driver or some other sharp-edged tools to remove the belt.

Attention: Pay attention to the following points while using timing belt:

- Don't bend the belt even at a small angle, otherwise it will result in rope fracture inside the belt.
- - Service life of belt is short, don't pollute the belt with grease and water.
- You have no choice but rotate the engine clockwise after installing the belt.

2.7 Remove the crankshaft timing gear

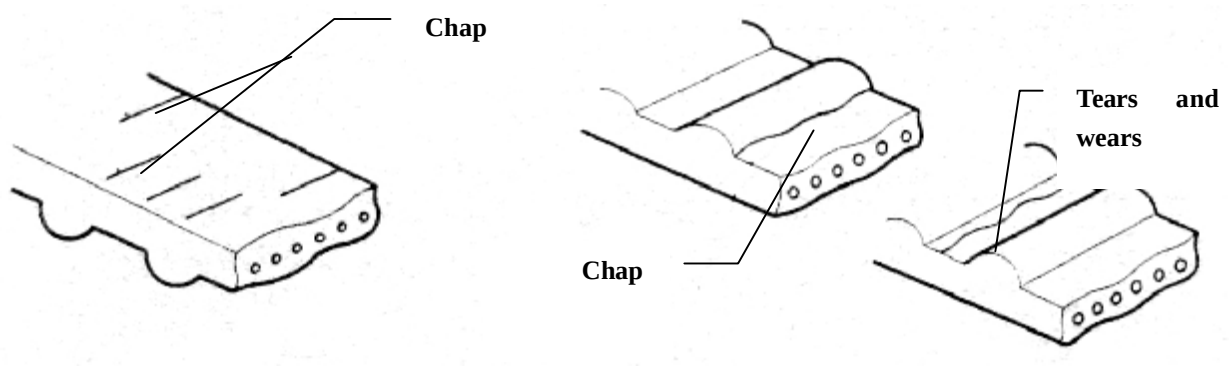


3 Make careful and detailed checks on the timing belt. Replace with new parts if any of the conditions shown in the figure occurs.

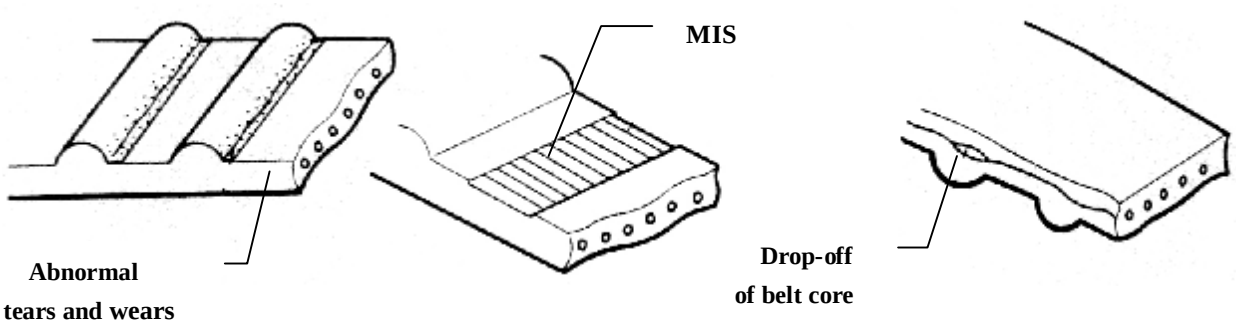
3.1Cracks on the back side rubber;

3.2Cracks of teeth roots, cracks clearing off the fabric lining layer;

3.3Tears and wears of fabric lining layer, missing rear teeth, broken teeth, etc.



3.4 Abnormal tears and wears on belt sides



3.5 Even if the damages on the outer appearance can not be confirmed, the belt should be replaced under any of the following circumstances:

3.5.1If the water in the water pump is leaked, which makes it necessary to refill the water continuously;

3.5.2 There are much oil stains on the belt, the belt should be replaced for the rubber will be damaged when it is expanded;

3.6 Specifications and model of the timing belt

Part number	372-1007081
Belt wide	25.3mm

3.7 Timing belt tensioner

Turn the belt tensioner supporting stand bolts to see if there are any abnormal sound. Check to see if there are any damages on the contacting surface of the belt.

Specifications and model of the timing belt tensioner

Part number	372-1007030
Wide	27.0 mm
Outside diameter	φ50mm

3.8 Check to see if there are any damages on the outer appearance

Specifications and model of clockwise pulley

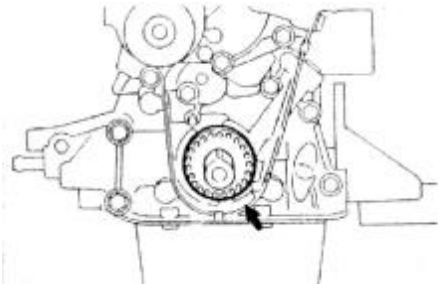
Model / Item	EF
	GL、ZL、GS、ZS
Diameter of camshaft timing gear （mm）	$\varphi 110.7^{+0.1}_{-0.2}$
Diameter of crankshaft timing gear （mm）	$\varphi 54.65^{+0.7}_{-0.13}$

3.9 Baffle of crankshaft timing gear

Check to see if there is any deformation

Standard size of crankshaft timing gear:

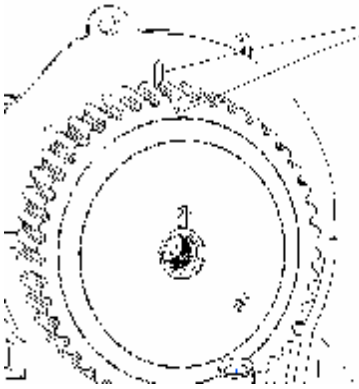
Wide	28.6mm



4. Installation

4.1 Installation of crankshaft timing gear

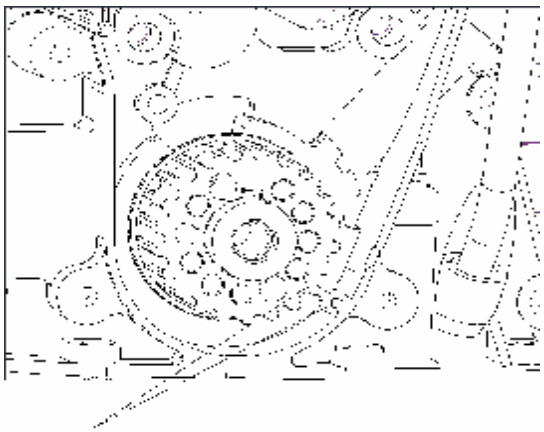
Timing mark



4.2 Installation of timing belt

4.2.1 On the upper thrust point of the first cylinder compression

Place the camshaft timing gear around the front end of the air exhaust camshaft so as to make the positioning groove on the gear be aligned with the positioning pin on the end surface of the camshaft. Then use screws to fix the clockwise gear, with the torque of 100 ± 5N.m.

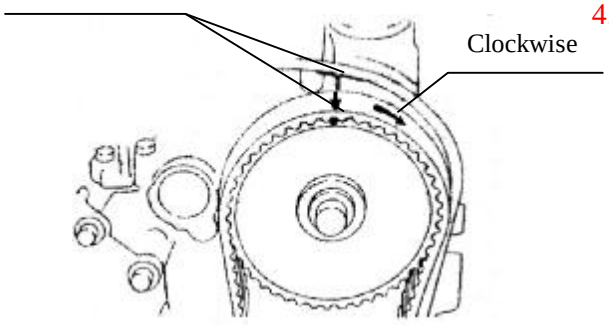


Timing mark

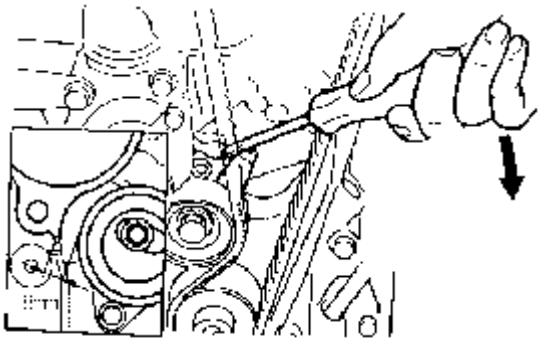
4.2.2 Make sure that the punched mark on the crankshaft clockwise pulley is aligned with the mark of the oil pump.

Timing mark

Clockwise



4.2.3 Install timing pulley accordingly.



4.3 Install the tensioner

4.3.1 Adjust the tension of the timing belt

①As shown in the figure, make the space between the edge of the stretching wheel and the water pump case arc to be about 8mm;

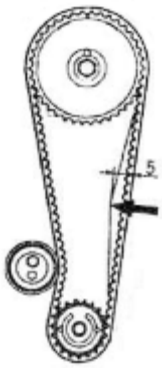
②Tighten the bolt of the stretching wheel with a torque of 25 ± 3N.m. Use a screwdriver to swing the stretcher toward the right..

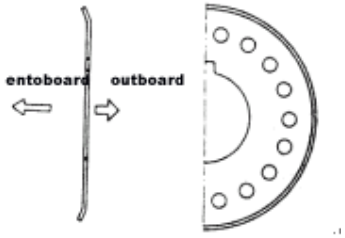
③ Turn the crankshaft for two circles towards the engine rotating direction, so that the camshaft pulley and the crankshaft pulley matches the clockwise marks respectively.

④ Use hands to press down for about 5mm. The force for pressing the clockwise belt is about: ［Reference］ 20～30 N

Notice: When the deflection of the timing belt fails to meet the specifications, the key is to adjust the above-mentioned stretcher fastening bolt by widening the spacing.

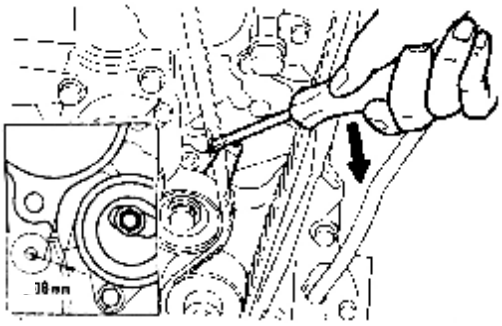
Tighten the S/A fixing bolt of the stretcher with the specified torque of 25 ± 3N.m





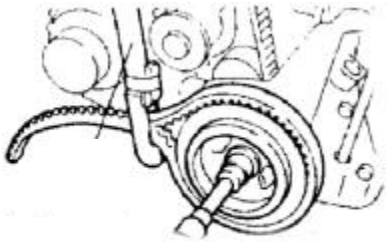
4 Install the baffle of the crankshaft timing pulley

[Attention] Install the baffle towards the direction shown in the right figure.



5 Install the timing cover cap

torque :6±1N.m



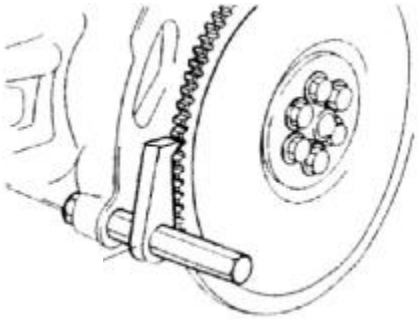
6 Install the torsional vibration damper (use SST)

1）、When there is not a flying wheel,

① Fix a part of the crankshaft pulley.

②Pay attention not to make the gear belt moving, tighten the bolt according to the specified torque :

torque98.0±10N.m{10±1kgm}



2）、When there is a flying wheel,

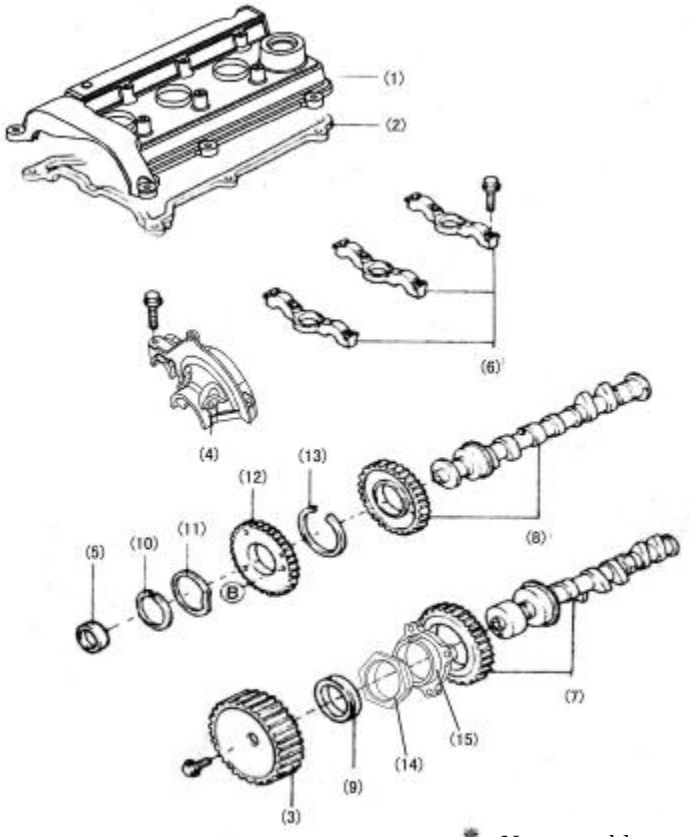
① Fix the flywheel to prevent the tooth ring from turning

② Then tighten bolt of torsional vibration damper.

Chapter 3 Camshaft Service

3-1.Diagram (Removal and installation order for timing belt)

(1) Valve cage cover
(2) Valve cage cover gasket
(3) Camshaft timing pulley
(4) Camshaft cover
(5) Circular plug
(6) Camshaft bearing cap
(7) Exhaust camshaft,
(8) Intake camshaft,
(9) Oil seal
(10) Spring retainer
(11) Wave washer
(12) Intake camshaft sub-gear
(13) Snap ring
(14) Lock nut
(15) Flange



* Non-reusable part

3-2 Removal

①Remove cylinder head cover assembly

Remove the valve chamber cover cap bolt from two sides to the centre symmetrically.

②Remove valve chamber cover gasket

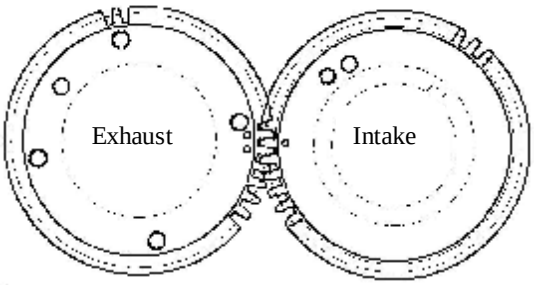
2 Routine check of valve

valve clearance standard：

Valve clearance	IN	0.18±0.05
	EX	0.25±0.05

3 Dismount the camshaft clockwise gear

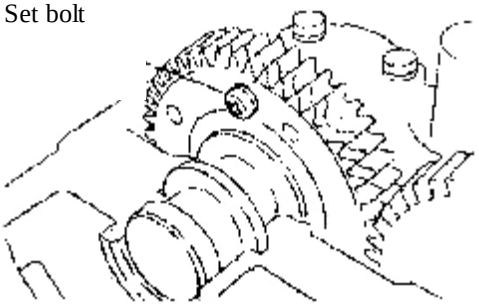
Attention· You must prevent the camshaft from rotating.



4 Removal of camshaft cover cap and camshaft bearing cover

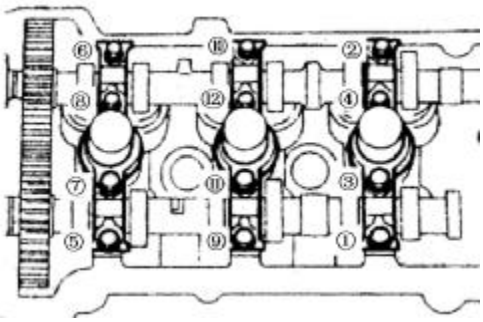
(1) Align the marks on the camshaft gears as shown in the right figure.

Set bolt



（2）Use bolt to position the master and slave gears on the air inlet camshaft, as shown in the right figure.

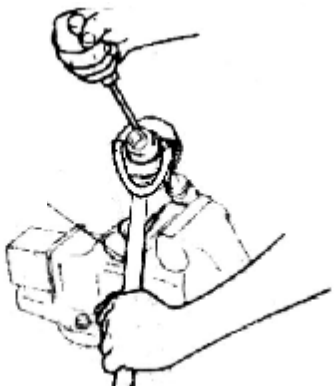
Attention In order to eliminate the radial force, keep the camshaft in the leveled position before dismounting it (to avoid possible damages caused by excessive radial forces)



（3）Remove the bolts in the sequence shown in the right figure;

Remove the camshaft bearing cover

（4）Remove the spark plug



（5）Remove the camshaft slave gear. Use the special tool as shown in the right figure.

Clip the camshaft tightly, and turn the gear, to keep the bite state of master and slave gear; remove the fixing bolts of slave gear.

Attention Do not damage the surface of the camshaft.

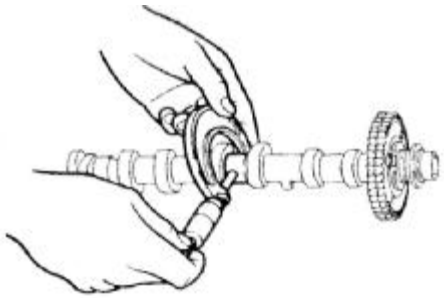
(6) Use tensioning apparatus to remove the bearing use elastic snap ring, remove wave washer and teethed ring.

3-3 Camshaft

1 Use the caliper to measure the height of the camshaft. If it is below the specified limits, make proper replacement.

Camshaft Unit：mm

Item \ Model		EF	
		ZL、RL	GL、GS、ZS
Standard	IN	$\varphi 23.0^{-0.02}_{-0.033}$	
	EX	$\varphi 23.0^{-0.02}_{-0.033}$	
Limit	IN	φ22.9	
	EX	φ22.9	



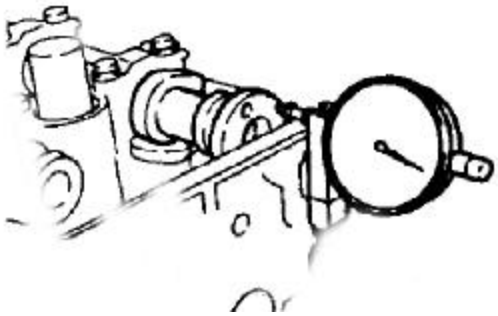
2 Checks on camshaft axial clearance

（1）、When the axial spacing is measured with a clipper to be larger than the benchmark value, the camshaft is to be replaced.

The air inlet camshaft axial clearance is 0.1～0.170mm。

The air exhaust camshaft axial spacing is 0.1～0.173mm。

Limits for operation：0.18mm



3-4 Cleaning

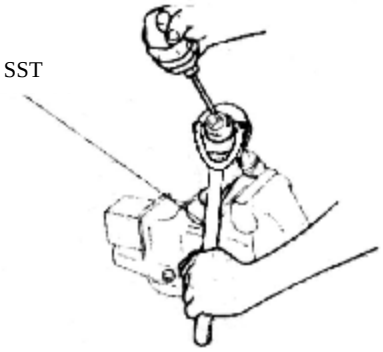
1、Clear off the spark plug carbon accumulation with a metal brush.

3-5 Installation

① Fix the two φ6 holes of the camshaft gear S/A.

② Turn the slave gear to the right, match the mark hole on the slave gear with the mark on the master gear, or align the marks on the slave gear with the mark on the master gear; then fix the slave gear with bolt.

(thread: M5; pitch: 0.8)



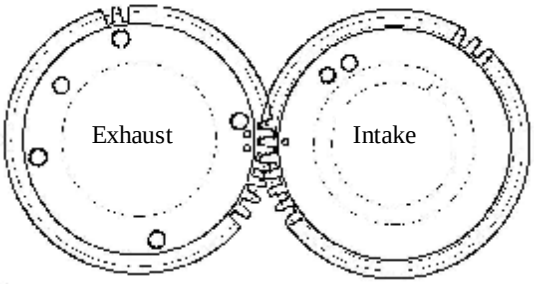
2、Installation of the camshaft

Attention Size of the axial clearance of the camshaft

(1)、Smear lubricating oil at the camshaft gear section and the cylinder cover axial diameter section.

(2)、Fix the camshaft slave gear by roughly adjusting on the cylinder cover.

(3) It is necessary to measure the size of axial clearing of camshaft.

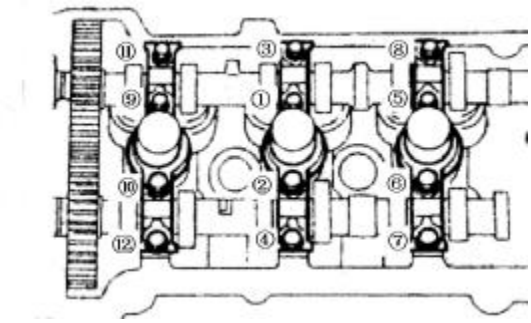


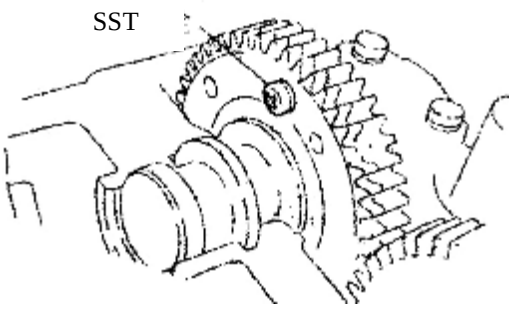
（4）Install camshaft, the timing mark must be aligned shown as the right figure.

（5）Smear lubricating oil on the camshaft assembly, the gears and the cylinder head axial diameter section.

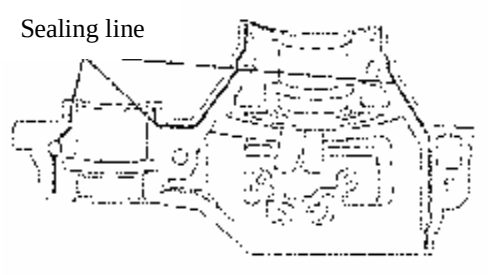
3 Tighten the camshaft bearing cap shown as right figure.

4 Remove the bolt for fixing the slave gear of the camshaft assembly.

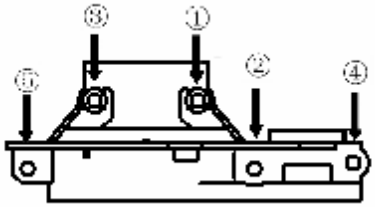




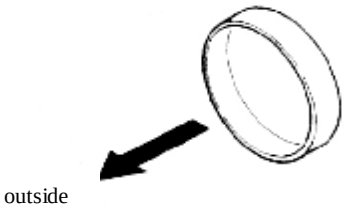
5 installation of camshaft head cap
Smear the fluid sealant on the camshaft head cap section (with oil groove) shown as the right figure.



Tighten the bolts according to the sequences shown as the right figure with the specified torques.



6 After smearing oil in the plug cap hole and assembling surface of the plug, use SST to press the plug lid
Attention· Install the plug lid shown as the right illustration.
Keep unbiased with cylinder head end surface after pressing.



7 Smear engine oil on the oil seal installation port of cylinder head, camshaft oil seal edge of blade and outside ring, use M10 bolt (length 50-60 mm) and SST press the cylinder, lower 1mm than the end surface of the cylinder4 head.
Attention ·Under the condition of use the oil seal repeatedly, press here with engine oil adhesive agent
- The oil seal should not be pressed inclining to one side.

8 Installation of the timing gear of camshaft
After smearing the fluid sealant, use SST to prevent rotating, tighten the timing gear bolt of camshaft according to regulated torque of 100±5N.m.

9 Installation of valve chamber cover cap

⑴The used base facing the cylinder cover of the timing belt cover must be cleaned thoroughly.

⑵Install the new base correctly into the groove of the valve cage cover cap

⑶Install valve cage cover cap to cylinder head from two sides to the centre symmetrically according to the regulated torque of 6±1N.m

1 Use feeler gauge to check the throttle clearance.

Attention· Make sure to measure the clearance between basic circle of cam and valve adjusting gasket.

Standard of valve clearance :

valve spacing	IN	0.18±0.05
	EX	0.25±0.05

2 When it is beyond the benchmark value, the adjustment washer has to be replaced and the clearance should be adjusted.

Attention The valve number that goes beyond the benchmark value has to be recorded, and the result of measurements should be recorded as well

(1) Use a caliper to measure and adjust the thickness of the separation cushion.

2.18	2.40	2.62
2.20	2.42	2.64
2.22	2.44	2.66
2.24	2.46	2.68
2.26	2.48	2.70
2.28	2.50	2.72
2.30	2.52	2.74
2.36	2.58	2.80
2.34	2.56	2.78
2.32	2.54	2.76
2.38	2.60	

(2)Select proper separation cushion on the basis of the throttle thrusting rod benchmark values.

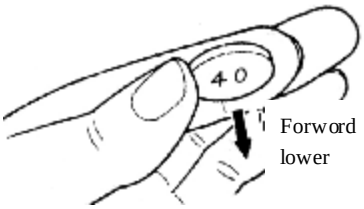
① IN

Selected cushion thickness = removed cushion thickness + (measured throttle spacing – 0.18mm)

② EX

Selected cushion thickness = removed cushion thickness + (measured throttle spacing – 0.25mm）

[Reference] there are 32 kinds of shim is thickness , shown as the illustration

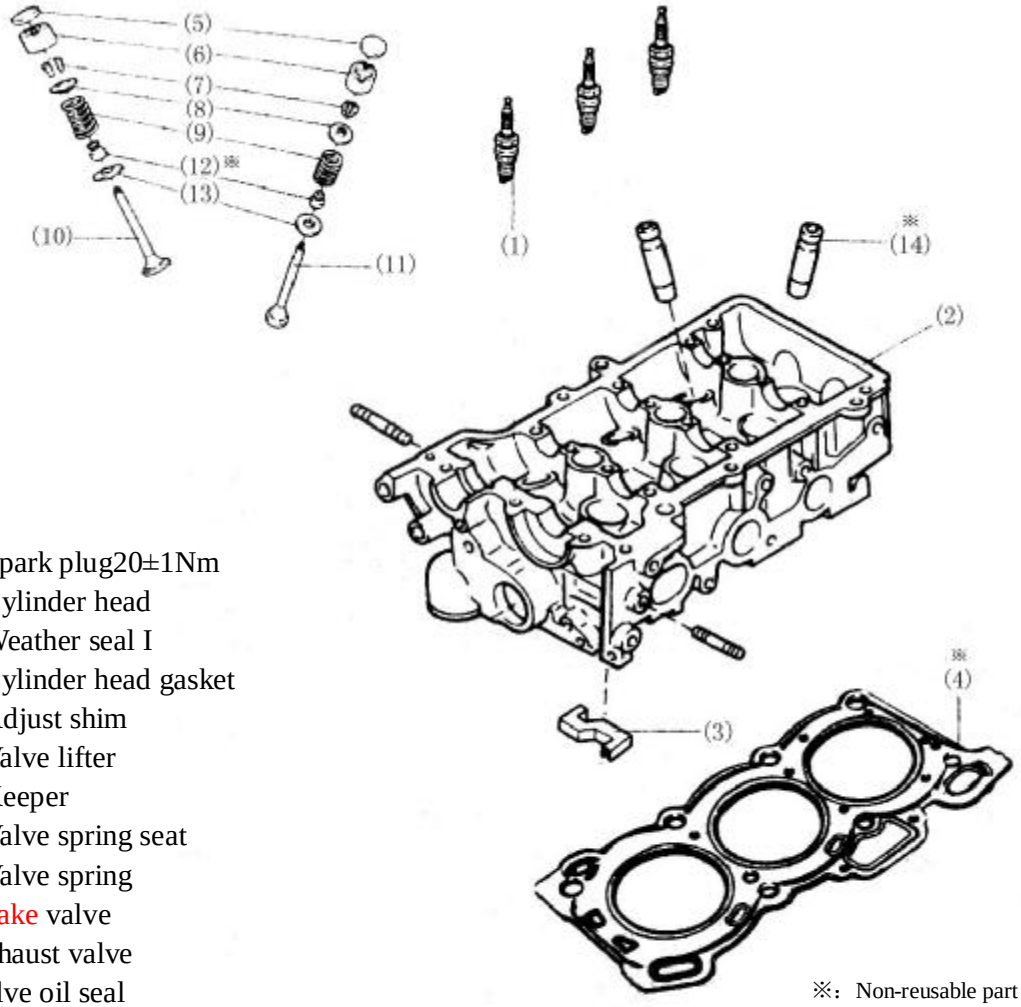


(7) Use the selected adjusting gasket to adjust the throttle clearance.

Attention Install the feeler with the identification mark facing downwards.

4. Cylinder head

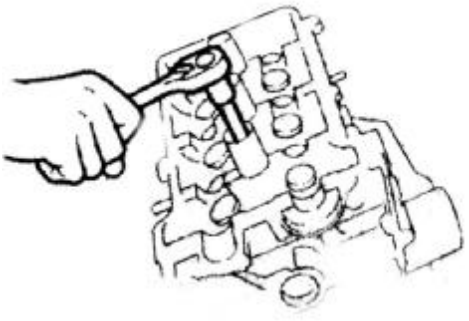
4-1 Configuration diagram (Do the following operations in the procedures for the dismounting and installation of the camshaft)



（1） Spark plug20±1Nm
（2） Cylinder head
（3） Weather seal I
（4） Cylinder head gasket
（5） Adjust shim
（6） Valve lifter
（7） Keeper
（8） Valve spring seat
（9） Valve spring
（10） Intake valve
（11） Exhaust valve
（12） Valve oil seal
（13） Valve seat
（14） Valve guide

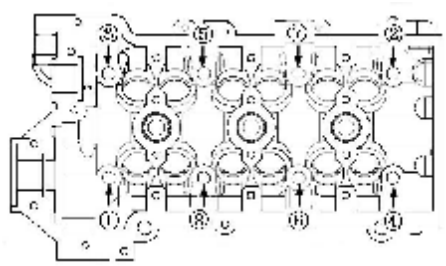
※：Non-reusable part

Unit：N・m(kg・cm)



4-2 Dismounting

1、Removal of spark plug



2 There are 8 cylinder cover bolts. In the process of removing the cylinder, please follow the sequences shown as the right illustration, loosen the bolts one by one evenly and gently.

SST for valve oil seal

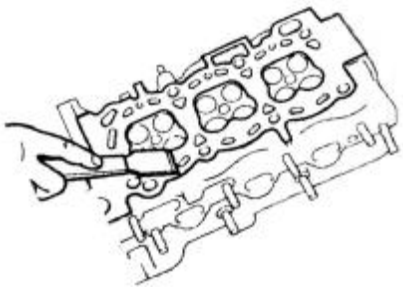
3 Removal of the cylinder dustproof sealing and cylinder cover base.

Attention The cylinder cushion can not be used repeatedly.

4 Removal of throttle adjusting separation cushion and valve thrusting rod

5 Use special tools to remove the valve spring locking block, throttle spring stand, valve spring, IN valve and EX valve

6 Removal of valve oil seal and valve spring washer



4-3 Clearing

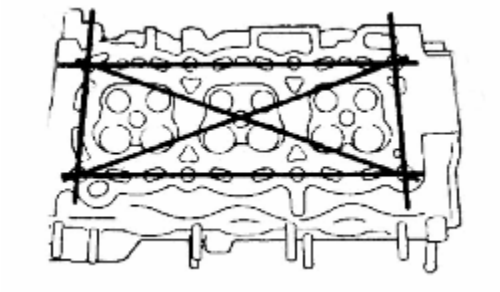
1 The accumulated carbon residue covered on the valve must be cleared.

2 Use scraper to clear the cylinder cover, the air inlet and exhaust branching pipe surfaces and bottoms

Attention

Do not damage the cylinder cover surface by scraping during the process of clearing.

Do not drop filth into the air inlet and the water channel.



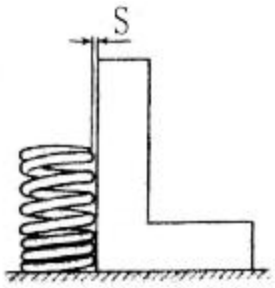
4-4 Routine checks

4-4-1 Cylinder cover

1 Use the straight knife sharp edge ruler to measure the levelness at various points as shown in the figure.

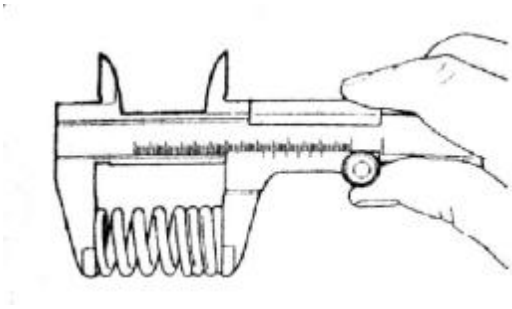
Cylinder cover 0.10mm

Air inlet branching pipe surface 0.10 mm



2 Use a square ruler to measure the right angle of the valve spring. Replace the spring if it fails to meet the specifications.

[Limit] 1.2mm



3 Measure the free state of spring

[Benchmark value] 37mm

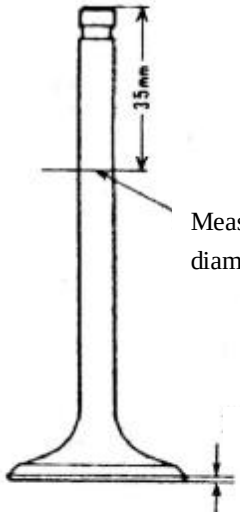
4-4-3 Throttle

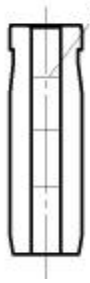
Routine checks on throttles

1. Check to see if there are some deformations, obvious tears and wears

Routine check list on valve Unit: mm

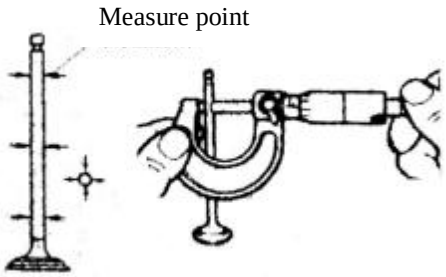
Item		Standard	Limit
Wide	IN	0.85～1.41	___
	EX	1.07～1.36	___
Width of valve top	IN	1.0±0.2	0.75
	EX	1.0±0.2	0.75





(2) Checks on the clearance between the throttle guiding pipe and throttle thrusting rod

1 Use a dial gauge to measure the inner diameter of the throttle guiding pipe, and use a caliper to measure the outer diameter.



a) Work out the differences of the measured values. If it is above the specified limits, the throttle or the guiding pipe must be replaced.

Attention The measurement points are shown as the figure. Work out the clearance of the final torn and worn section

Item		Standard	Limit
Valve guide inside diameter(mm)		φ5.0	___
Valve stem outside diameter (mm)		φ5.0	___
Spacing (mm)	IN	0.056～0.020mm	0.07
	EX	0.066～0.030mm	0.08

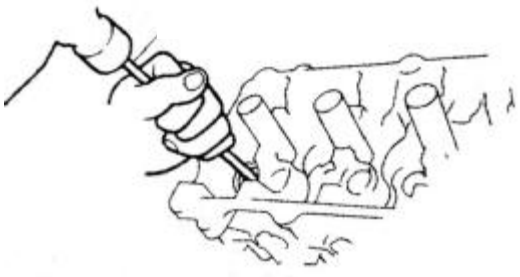
(2) Replacement of valve guide

a) Heat the cylinder cover to 80—100 degrees C with hot water

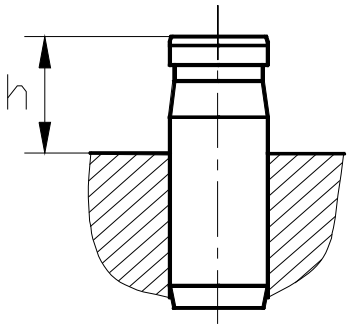
b) Use special tools to drive in the valve guiding pipe to the position as shown in the right figure from the side of the combustion chamber.

Attention The removed guiding pipe cannot be used repeatedly. The air intake and exhaust valve guiding pipes should not be mixed up in installation.

c) Use special tools to drive in the new valve guiding pipe to the position as shown in the right figure.



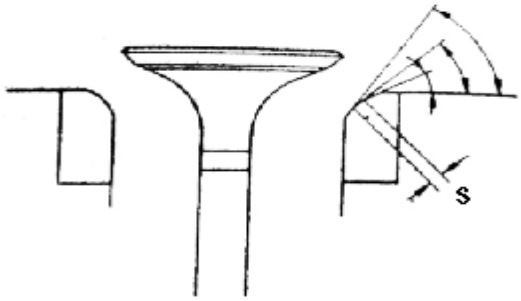
Attention In the process of driving in the guiding pipe into the cylinder cover, the operation should be carried out slowly until the pipe gets to the proper position. No excessive driving should be exerted. Pay attention to the specifications in the operation.



Model / Item	EF	
	GL,ZL,RL,GS,ZS	
Height（mm）	IN	13.71±0.25
	EX	12.11±0.25

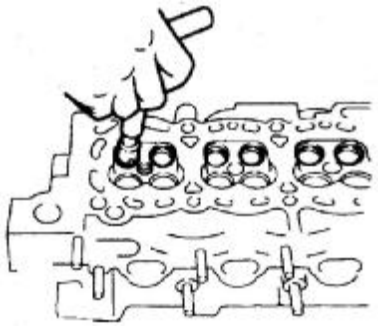
Driving in depth of throttle guiding pipe

Use reamer to grind the inner diameter to achieve the standard value of the clearing.



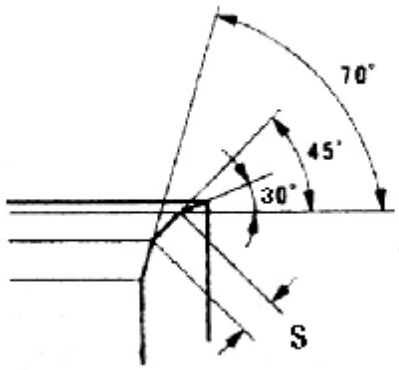
(3) Valve mating surface

a) Smear thin layer of red lead powder on the valve mating surface. Do not turn the valve, and gently drive it in. Check the mating condition and the width of mating line.



Correction of valve base stand ring

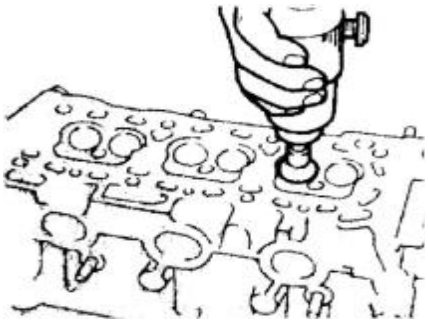
Attention Signs of breaking or cracking should not appear on the correction surface. Take it out slowly after the correction is completed.



1、Use a 45 degree cone as the mating benchmark value.

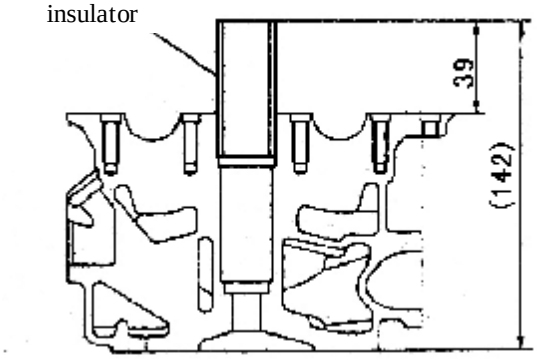
2、Check the mating position of the throttle. If it is in the center of the valve, the position is the best one. If not, proper corrections have to be made.

3、Make conic cutting at the center of the mating position with 70 degrees toward inwards and 30 degrees outwards.



4 Use polishing agent to grind and polish the throttle sealing.

Spark plug insulator



4-5 Assemble of cylinder head

4-5-1 Cylinder head

Pay attention to the following instructions in the process of assembling for the other accessories on the cylinder cover.

(1) Spark plug insulator

1 Put the spark plug insulator in the corresponding hole on the cylinder head with special use auxiliary tools, smear fluid sealant before pressing, pressing height is shown as the illustration:

Attention· Pay attention that the vertical degree of its pressing depth and the cylinder head top surface;

· The insulator should not be deformed while being pressed; otherwise, it is easy for the valve chamber cover cap to lea

4-6 **Installation**

1. Installation of valve spring washer and valve oil sealing

(1) Cover auxiliary tools on the valve rod head, smear oil on the outer circle of the auxiliary roundness and inside of new valve oil seal, install it on the illustrated position, pull out the auxiliary tools of valve oil seal.

[Reference] Insert the oil sealing up to the dimension as shown in the right figure.

Sub stool

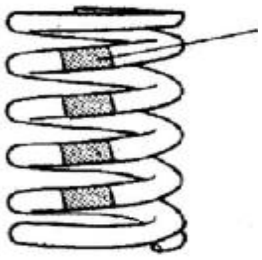
valve

Oil sealing

Spring bottom plate

2 Installation of IN and EX

3 Assembling of valve springs



Attention It is for you to distinguish the different suppliers by means of paintings on the valve spring, valve spring of same engine should have the same identification paint marking.

4 Install the locking blocks for the valve spring stands.

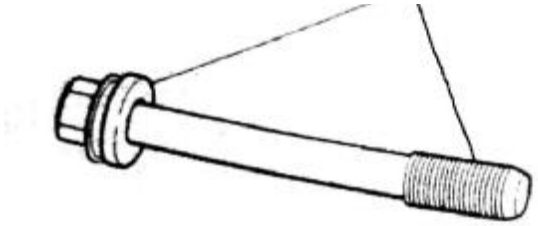
Warning

·Protective eye glasses must be worn in the process of this operation to protect the eyes.

·Beware of the flying spring and other objects

Upon completion of the installation of the throttle springs and throttle spring stands, use special tools to install the locking blocks for the throttle spring stands.

Apply oil position

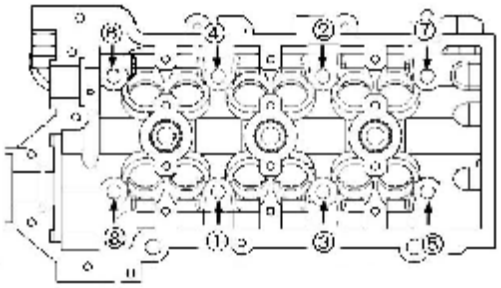


5 Installation of the throttle thrusting rod and throttle spacing by adjusting the separation cushions

6 Install the cylinder cover base, make identification of the marks for the front and rear directions.

7 Assembling of dustproof sealing strip and cylinder cover

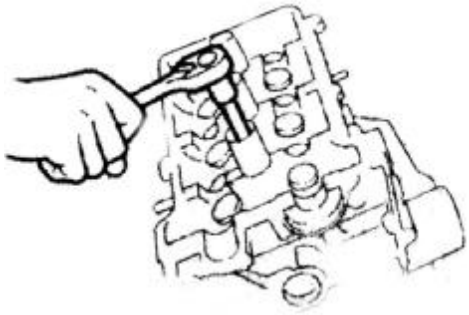
a) Apply lubricating oil at the threads and grooves of the bolts.



b) The tightening of the cylinder bolts should follow the sequence as shown in the right figure. The tightening is to be carried out in 2—3 operations till the torque meets the specifications. The torque for the first tightening operation is 30±2N.m; the torque for the second tightening operation is 50±3N.m; and the torque for the third tightening operation is 70±3.5 Nm.

[Torque] 70±3.5Nm

. ①Installation of the spark plug



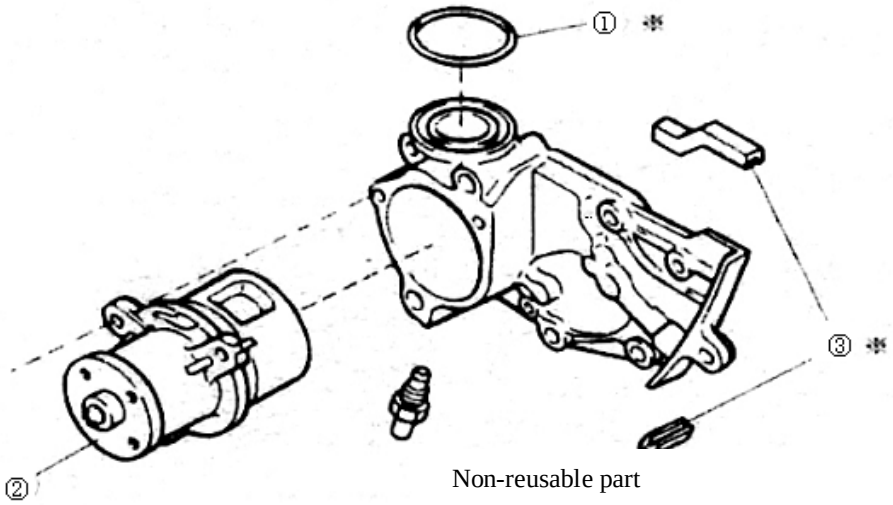
[Torque] 20±1Nm

Attention: The tools should be placed vertically, so as not to make the spark plug insulator become deformed, otherwise it is easy to leak oil.

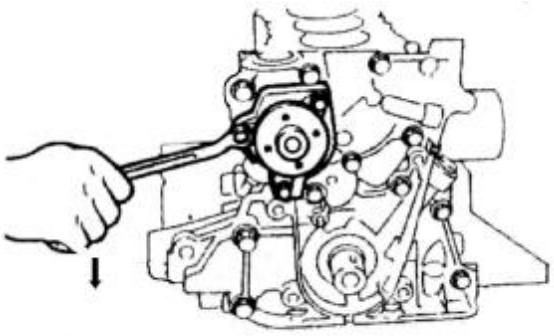
5. Water pump

5-1 Configuration diagram (the dismounting and assembling of the cylinder body should be done in the following procedures)

1 "O" ring, non-reusable
2 Oil pump body
3 Weather seal



Non-reusable part



5-2 Dismounting

1. Dismounting and removal of O-shaped ring

Attention These rings are not reusable.

2. Removing the three bolts and dismount the water pump principal body.

3 Removal of the dustproof sealing stripe

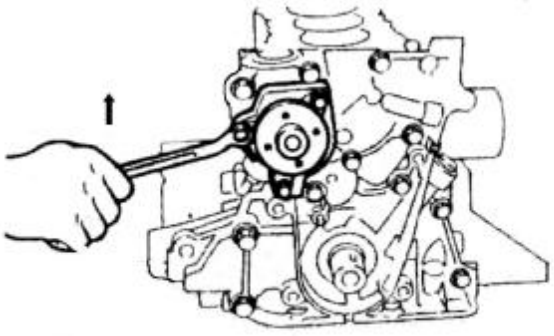
5-3 Clearing

1 .Clearing of the mating surface of the water pump

5-4 Routine checks

1 .Check to see if there are any deformation or damages

2.Use a hand wrench to see if the turning is OK, and if it is smoothly lubricated?



5-5 Installation

1 Install the dustproof sealing stripes

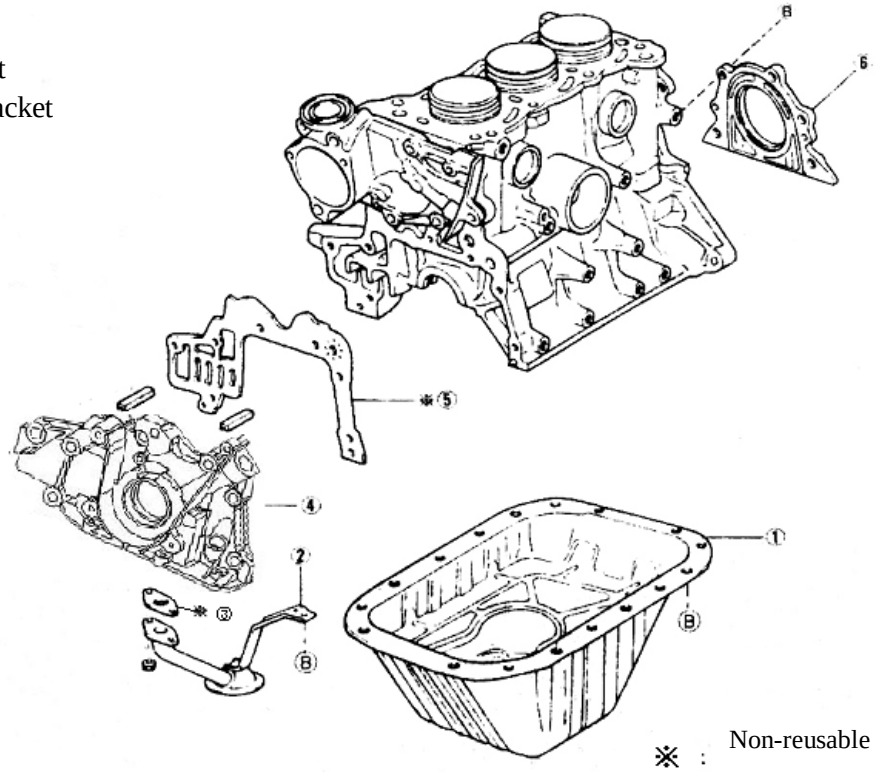
2 Install the water pump principal body
Tighten with a torque of 25±1.5N.m

2 Install the new O-rings

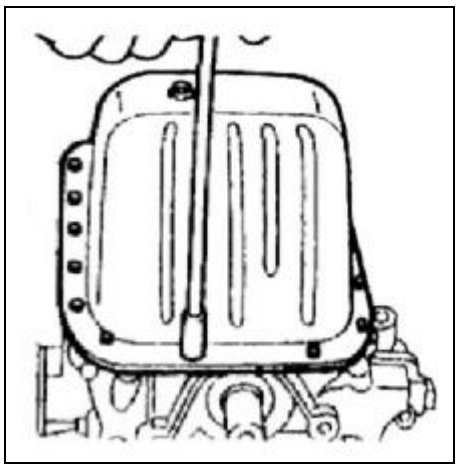
6. Oil pump

6-1 Configuration diagram (The dismounting and installation of the lubricating oil pump should be carried out according to the following procedures).

① Oil pan，tighten bolt：8±2 Nm
② Oil strainer
③ Oil collector gasket
④ Oil pump
⑤ Oil pump gasket
⑥ Rear oil seal bracket

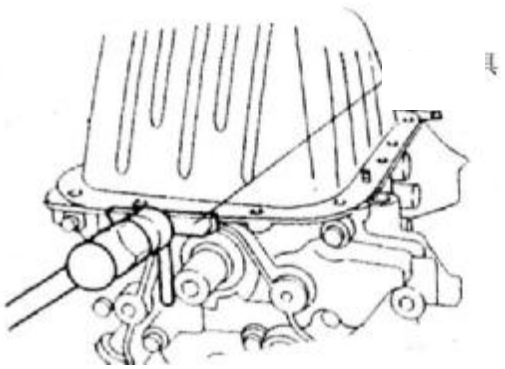


※ : Non-reusable part



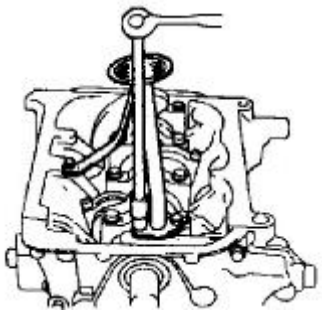
6-2 **Dismounting**

1 The engine being turned upside down on the dismounting frame, take off the bolts.



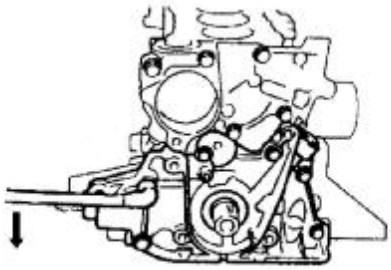
2 Remove the oil pan from the cylinder body.

Attention Do not make the oil pan flange section to be deformed.

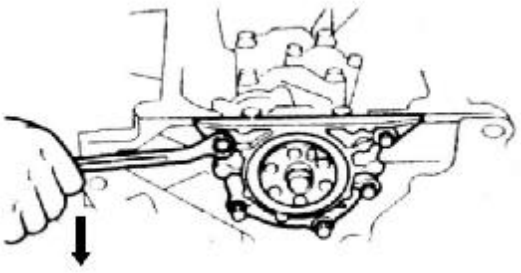


3 Remove the oil collecting filter and its flange

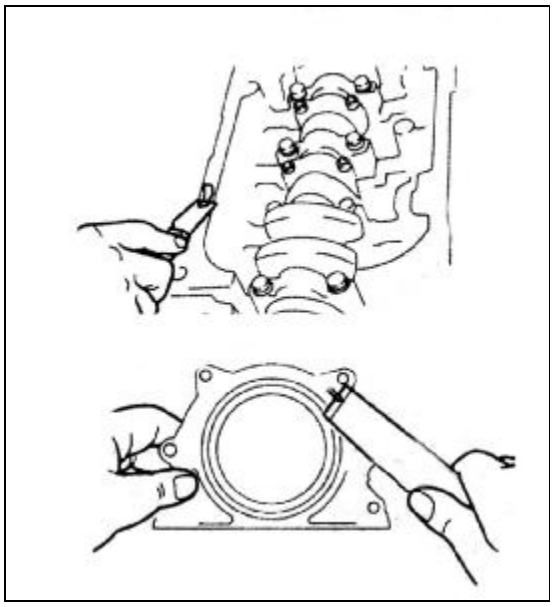
Attention The filter flange is not reusable.



4 Dismount the oil pump assembly and oil pump cushion



5 Dismounting of oil seal stand



6-3 Clearing

1.For the mating surfaces of the oil bottom case, oil pump and oil seal stands,

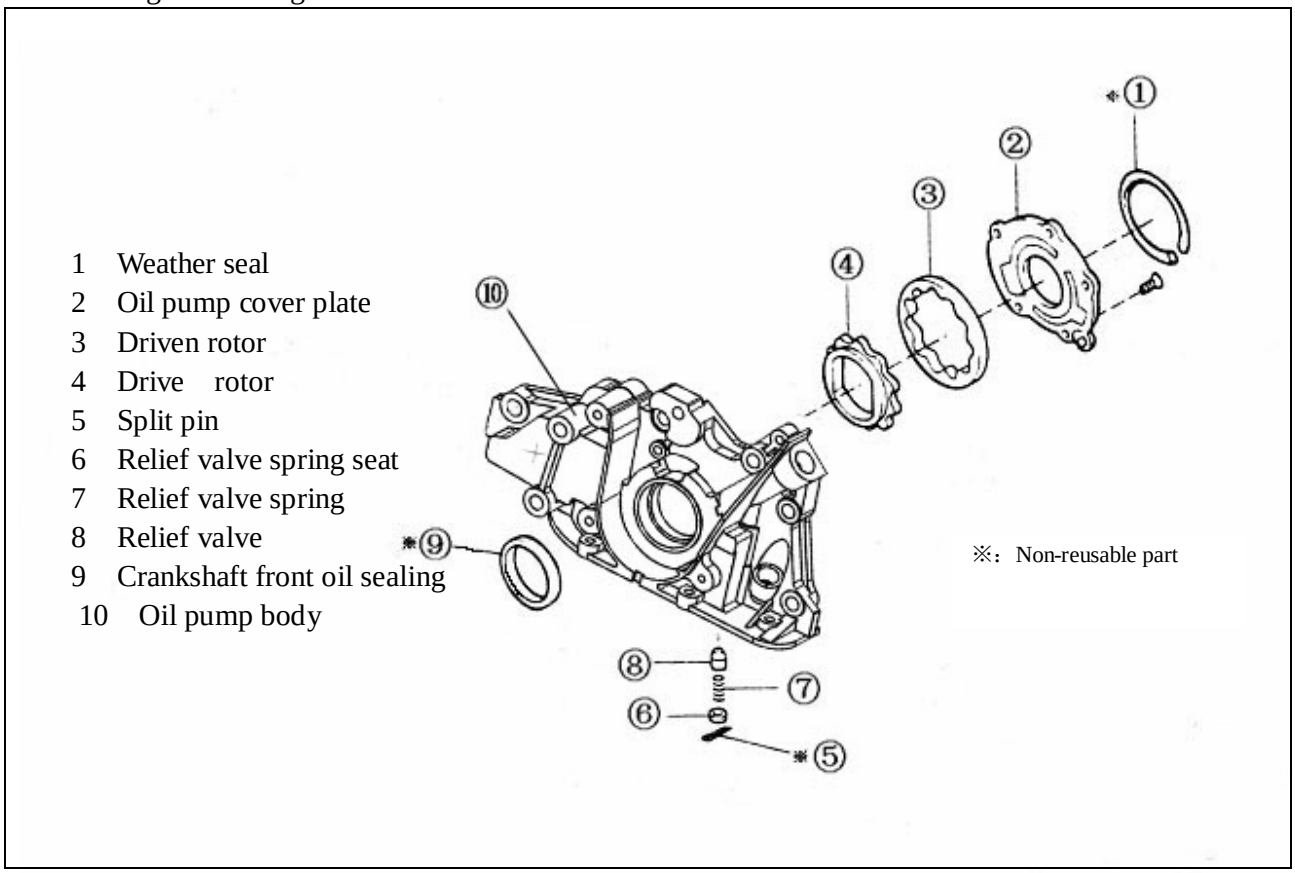
2. For the mating surfaces of the rear oil seal stand and oil pump

scraper and chipping chisel or some other tools may be used to clear the used ones.

Attention Do not drop the residues into the cylinder body.

6-4 Disintegration and assembling of oil pump

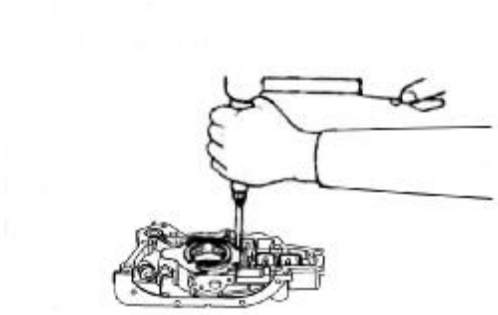
6-4-1 Configuration diagram



6-4-2 Disintegration

1. Weather seal

Attention The weather seal are not reusable.



2 Remove the oil pump cover

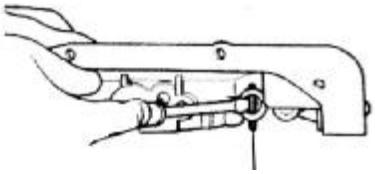
Attention: The bolt is assembled with glue, loosen it with screw driver according to the illustrations

3 Remove the driven and drive rotor of the oil pump

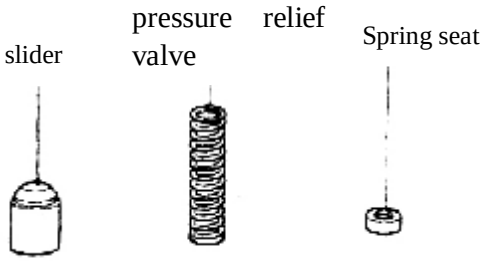
4. Take off the split pin

Attention The split pins are not reusable.

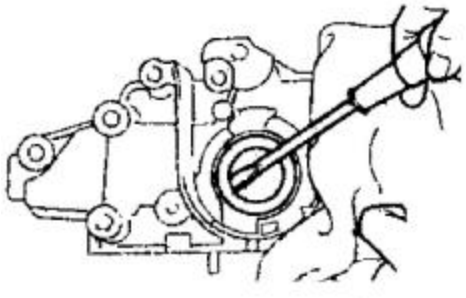
Attention: Pay attention not to make the spring and spring seat sending forth and dropping suddenly, while taking off the open pins.



pressure relief valve

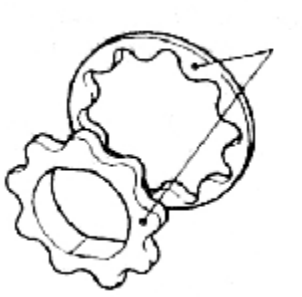


5. Removal of the oil pump pressure relief valve spring stand, spiral spring, oil pump pressure relief valve



6. Removal of the front oil seal of the crankshaft

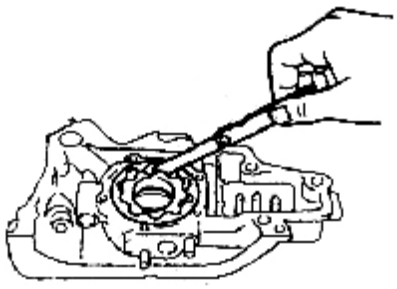
Attention The removed oil seals are not reusable.



6-4-3 Routine checks

(1) Checks on lubricating oil pump spacing

1. Follow the mark on the interior and exterior gears of the oil pump to place it into the lubricating oil pump body on the cylinder body.



2. Use a feeler to measure the clearance between the interior gear and the exterior gear

[Benchmark] 0.05-0.18mm(average of 9 points)

[Limit] 0.35 mm

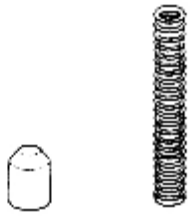
1. Use a feeler to measure the clearance between the rotator and the pump body

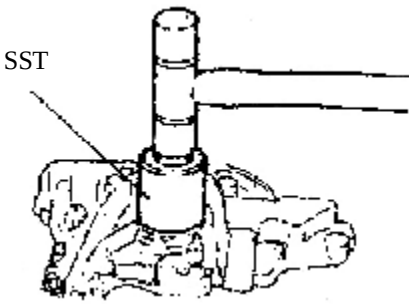
[Benchmark] 0.10-0.181mm

[Limit] 0.25mm

(2) Routine checks on the pressure relief valve

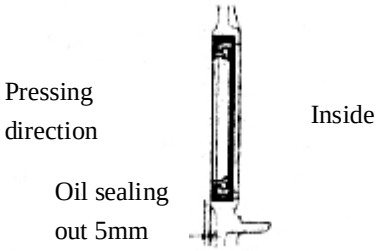
1 Remove the pressure relief valve, there should be no visible tears, wears and scrapes on the pressure relief valve





6-4-4

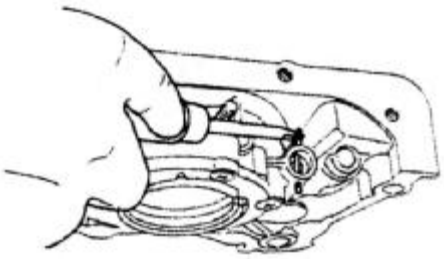
1 After smearing lubricating oil on the lips of the new T-shaped oil seals, use SST to make the assembly.



Attention

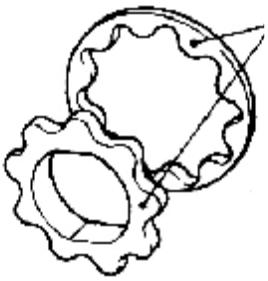
·Use new oil seal..

·The exposed part of the outer edge of the oil seal after being pressed in should be less than 0.5mm.



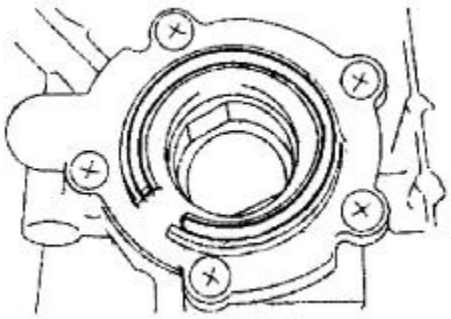
2. Assembling of the oil pump pressure relief valve and split pins

Attention The split pins are not reusable.



Mark

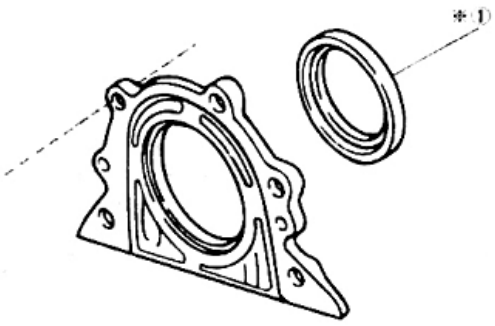
3. The marks of the exterior and interior gears of the lubricating oil pump should be on the visible side when being assembled into the pump body.



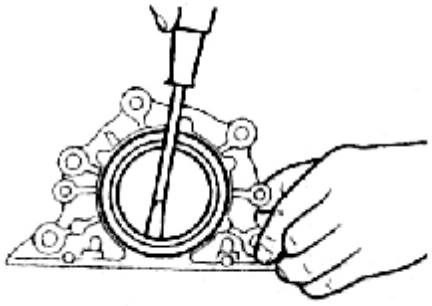
4 The new weather seal should be put inside the oil pump cover groove.

6-5 Disintegratin and assembling of oil seal

6-5-1 Configuration diagram



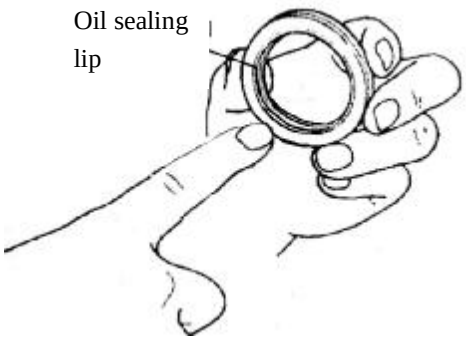
* : Non-reusable part



-5-2 Disintegration

1. Use a flat screwdriver to remove the rear oil seal.

Attention The oil seals are not reusable.

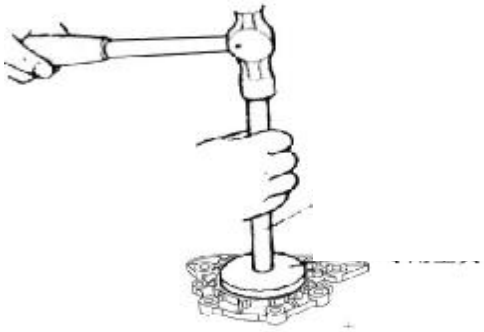


6-5-3 Checks

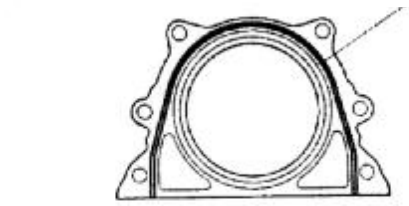
Check to see if the tears and wears of the lip section of the oil seals are within the normal conditions, and if there are any damages in outer appearance.

6-5-4 Assembling

Smear lubricating oil on the new oil seal lip section.



2. Install the oil seal shown as the right figure.



6-6 Assembling

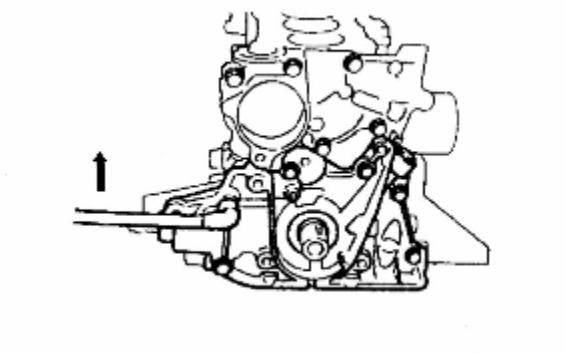
1. Assembling of the oil sealing stands

(1) Smear oil sealing silica on the oil sealing stands shown as the right figure.

[Grease] Letai 5699

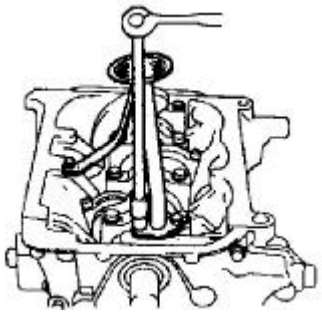
Attention The liquid sealing silica is to be smeared to the mating section of the oil seal stands and cylinder body surface, with a width of 3—4mm.

[Torque] 25±1.5N.m



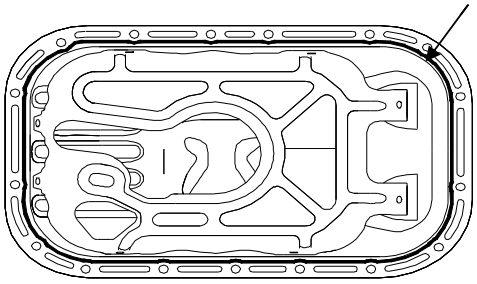
2. Assembling of new oil pump washer, oil pump assembly

[Torque] 20±1.5N.m



3. Installation of new lubricating oil collecting and filtering device, oil pump collecting and filtering device

[Torque] 6±1N.m



4.Assembling of oil pan

(1) Clear the mating surface with the cylinder body

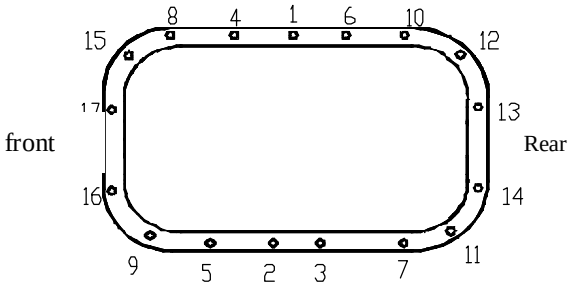
(2) Apply sealing silica before assembling

[Grease] Letai 5699

Attention

·The liquid cushion with silica line diameter of ϕ3-4mm, without any broken section

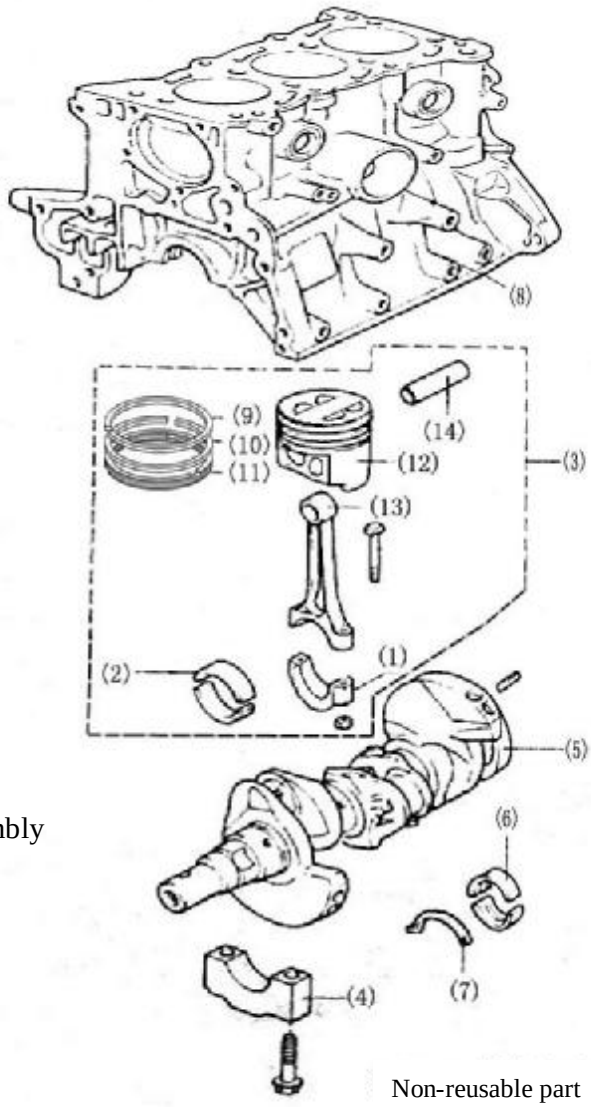
·Make the assembly in 15 minutes after the application of silica



(3). Tighten in the sequence shown in the right figure with the torque of 6±1N.m from the centre to the two sides

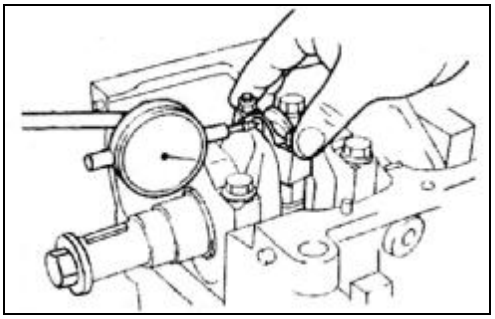
7. Crankshaft connecting rod mechanism

7-1 Configuration diagram (Dismount and assemble the oil pump in the follow sequence)



(1) Connecting rod cover
(2) Connecting rod bearing bush
(3) Piston and connecting rod assembly
(4) Main bearing cover
(5) Crankshaft
(6) Crankshaft bush
(7) Thrust washer
(8) Cylinder block
(9) No.1 compression ring
(10) No.2 compression ring
(11) Oil ring
(12) Piston
(13) Connecting rod
(14) Piston pin

Non-reusable part



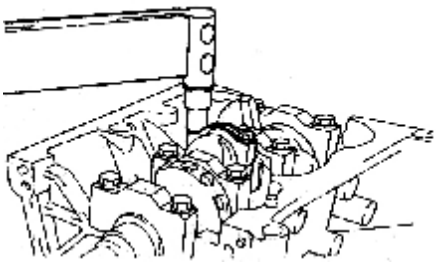
7-2 Disintegration of crankshaft connecting rod mechanism

1、Check the connecting rod axial clearance

(1) Use centimeter or feeler to measure axial spacing

[Benchmark]:0.15-0.24mm

[Limit]:0.30mm

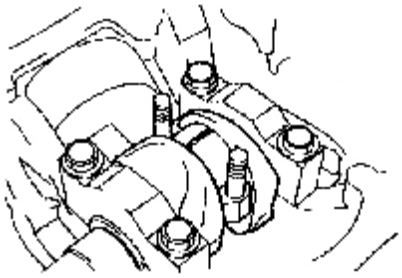


2、Check the connecting rod bush vertical clearance

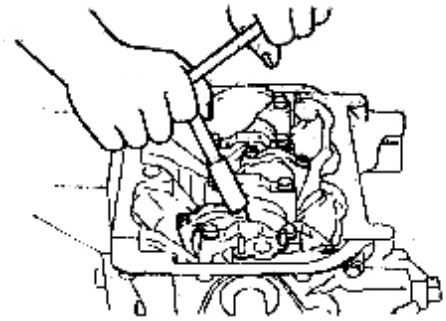
(2)Remove the bush cover

Attention: Parts and components of various cylinders should be placed in good order.

(1) Clean the bush and axle diameter

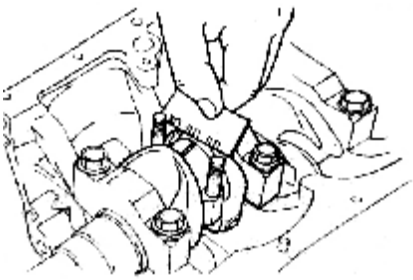


(4) Place clearance gauge on the connecting bearing diameter.



(5) Tighten bush cover according to regulated torque

torque: 40±2N.m

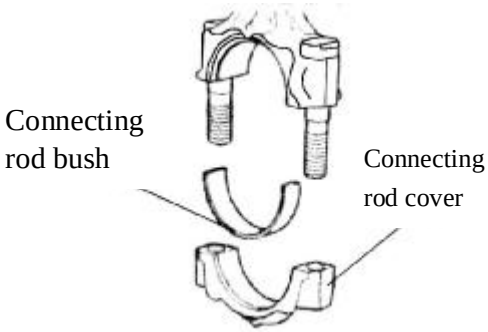


Attention Do not turn the crankshaft

(6) Remove the bush cover, measure the maximum width of the spacing ruler

[Benchmark]: 0.020-0.044 mm

[Limit]: 0.07 mm

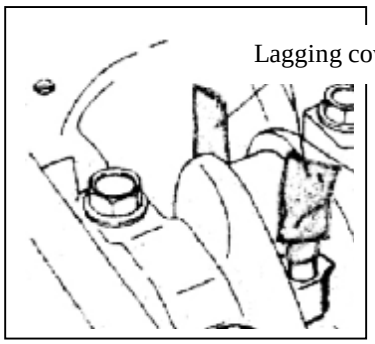


(6) Replace the bush if width is beyond the limit.

Attention:

·In replacing the bushes, you should use the products of same brand and from the same manufacturer, which can accord with the request of clearings.

3. Removal of connecting rod bearing cover and connecting rod bush



(1) The threaded section of the connecting rod bolt is to be equipped with protective sleeve to prevent from scraping the cylinder hoe and crankshaft connecting rod axle diameter. Then knock the piston connecting rod out with the handle of a hammer.

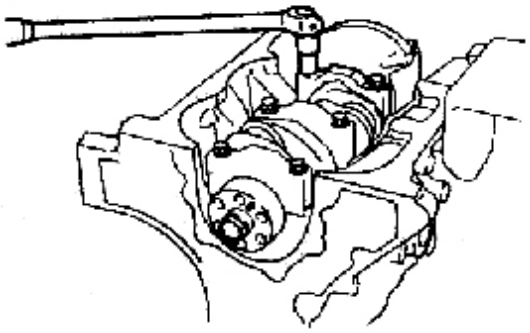
Attention Put the parts and components of various cylinders in good order.

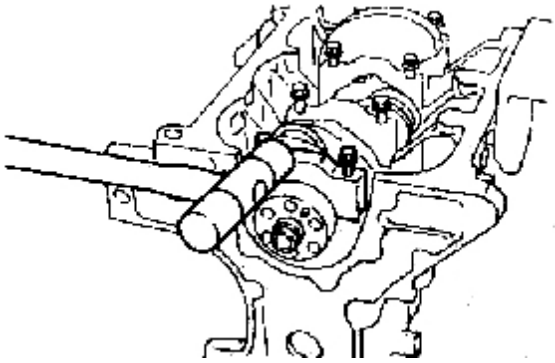
(2) Use a caliper to measure the crankshaft axial clearance. If the axial clearance is above the limits, it is needed to replace the axial thrust washer or the crankshaft.

[Benchmark]:0.089-0.211mm

[Limit]:0.30mm

Item	Benchmark value
Thickness of thrust face	$1.9^{+0.11}_{-0.03}$



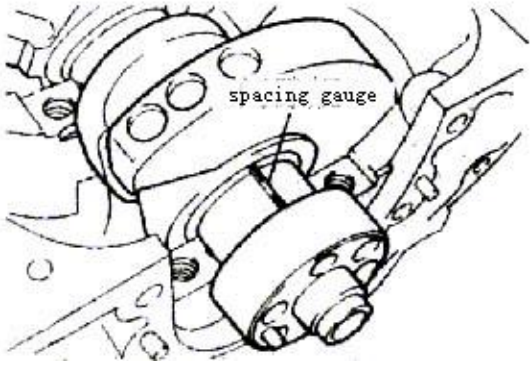


4 Remove the main bush of the crankshaft, the crankshaft, the crankshaft bush, and the axial thrust plate of crankshaft

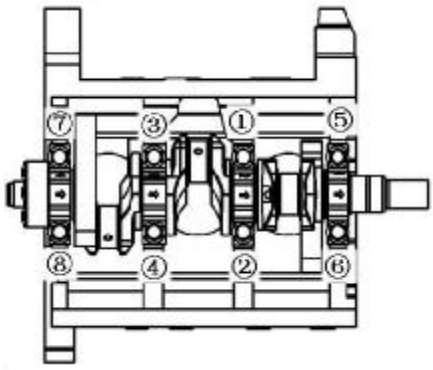
Check the radial clearance of the crankshaft

(1) Remove the crankshaft bearing cover; use a resin hammer to knock the bearing cover off gently.

(2) Clean the inside of the bushes, the inside of the bearing cover, the cylinder walls, the axle diameter, etc. Make thorough checks for any tears and wears as well as other damages.

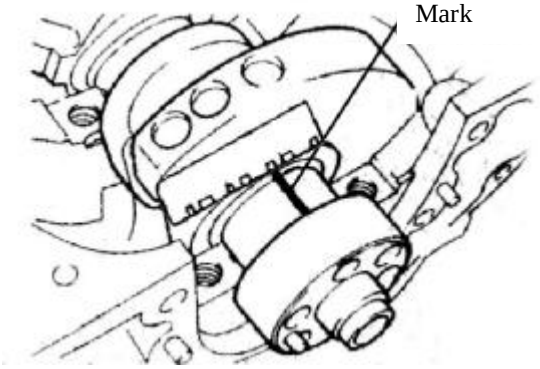


(3) Use a clearance+6 gauge to adjust the **radial clearance** of the crankshaft; tighten the bolts of bearing bush cover with specified torque. **[Torque]** 70±3.5N.m



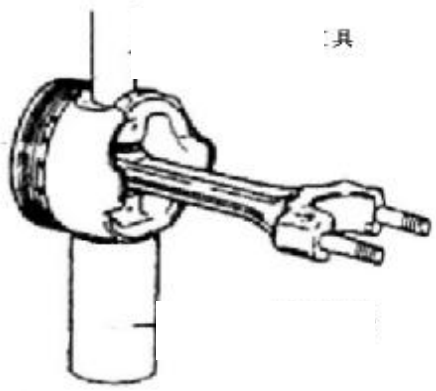
Attention Tighten the bolts of the crankshaft bearing cover in three times to the regulated value, in the sequence as shown in the right figure.

Attention: Don't turn the crankshaft after tightening ,because of the clearance gauge.

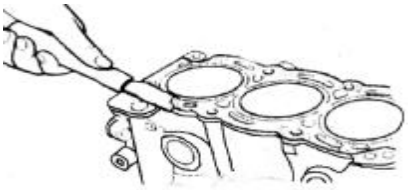


(4) Remove the bearing cover and measure the maximum width of the spacing. If it goes beyond the limit, replace the bush.
[Benchmark]:0.025-0.069mm
[Limit]:0.10mm

5 Disassembling of connecting rod assembly of the piston

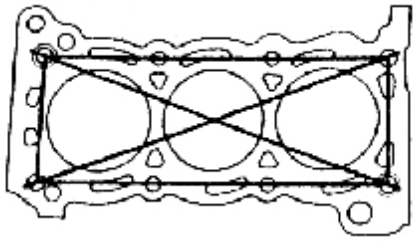


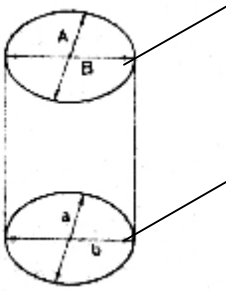
(1). Use the piston ring pliers to remove the primary ring, the secondary ring and the oil ring
Attention Do not mix up the pistons and piston rings for each unit of assembly.
(2). Use SST to remove the piston, connecting rod and piston pin
① Remove the piston pin to take off the piston and the connecting rod by using SST.



7-3 Clearing
7-3-1 Cylinder body
Warning Wear eye glasses during the clearing operation to protect your eyes.
1. Use flat chisel to clear the cylinder body, the cylinder cover, the oil bottom casing, the oil pump and the oil seal.

7-3-2 Piston
Warning Wear eye glassed in the process of cleaning to protect your eyes.
1. Use the old ring to clean the accumulated carbon in the ring groove.
2. Clean the accumulated carbon at various parts with detergents.
Attention Do not use metal brush or some other hard substance to do the cleaning.





Top dead center

Bottom dead center

7-4 Routine checks

7-4-1 Cylinder block

1. Checks on the levelness of cylinder top surface

(1). Use a ruler and feeler to do the measurements of the six parts as shown in the right figure.

[Limit] 0.08mm

2. The use of cylinder meter: Measure the values at the parts as shown in the right figure and work out the maximum value and the minimum value. Replace the cylinder body or do the boring of the cylinder if the values exceed the limits.

[Limit] 0.03mm

[Reference] Circularity：A-B or a-b

Cylindricity：A-a or B-b

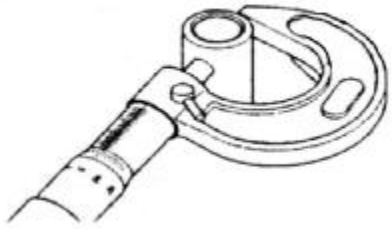
[Reference] Cylinder standard diameter:

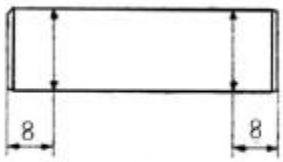
φ72.00-72.01mm

7-4-2 Piston

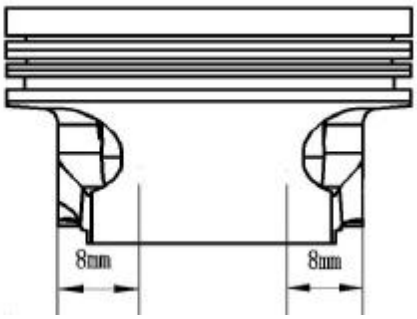
1. Check the clearance between the piston pinholes.

(1) Use a caliper to measure the positions of the piston shown in the following figure, with the maximum value as the size of the piston pin diameter.





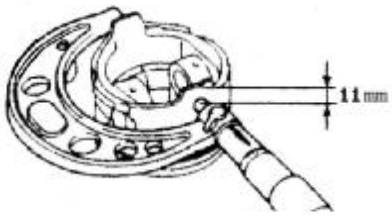
(2) Use the inner diameter centimeter to measure the positions of the piston hole diameter shown as the following figure, take the minimum value as the size of the pinhole diameter.



(3) Work out the clearance on the basis of the size difference between the hole diameter and the pin diameter. Replace the piston pin or the piston if the result exceeds the benchmark value.

[Benchmark] 0.004-0.009mm

[Limit] 0.015mm



1. Measurement of the piston diameter

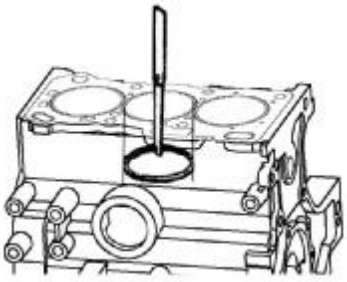
(1) Make the measurement at the position 11mm below the piston skirt and along the vertical direction of the piston pin.

[Benchmark] $\phi 72\ ^{-0.013}_{-0.025}$

2. Check the clearance between the piston ring and the ring groove

(1) Use a feeler to measure the rings

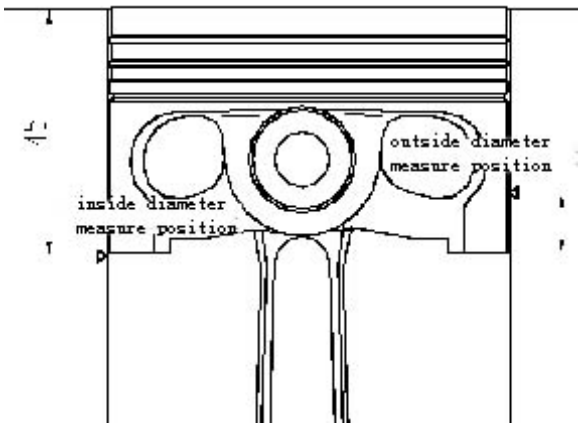
	Benchmark (mm)	Limit (mm)
Primary ring	0.03~0.06	0.12
Secondary ring	0.03~0.06	0.11



3. **Check the clearance of piston ring ends**

(1) Put the piston ring in the position which is 45 mm under the cylinder hole top surface, in order to make the piston ring keep flattened, you can press the piston ring with piston top surface, then use a piston gauge to measure the open clearance.

	Benchmark (mm)	Limit (mm)
Primary ring	0.25-0.40	0.65
Secondary ring	0.35~0.50	0.65
Oil ring	0.20~0.70	1.00



7-4-3 Check the clearance between the piston and the cylinder wall

1. The positions for measuring the inner diameter of the cylinder and the piston skirt are as shown in the right figure. Replace and repair the piston or the cylinder body, or bore the cylinder if the measured results exceed the limits

[Benchmark] 0.018～0.03

[Limit] 0.10

[Reference] The clearance between the piston and the cylinder hole is subject to the innermost diameter of cylinder in vertical direction minus the maximum outer diameter of the piston.

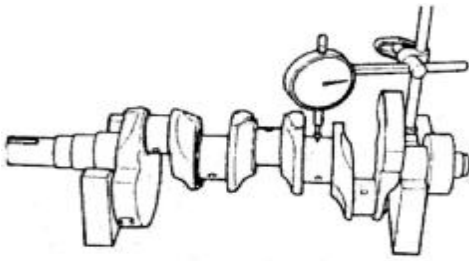
2.After the replacement of the piston or the cylinder body, it is needed to confirm the clearance of the replaced cylinder once again.

Datum: 0.018～0.030

7-4-4 Crankshaft

1. Check the coaxiality of the main shaft diameter

(1) Use the centimeter to measure the coaxiality. Replace the crankshaft if the measurement result exceeds t he limit.

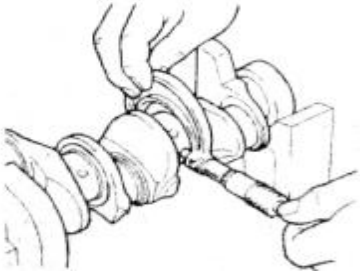


[Limit] 0.03mm

Attention: The bending value should be 1/2 of the fluctuation for one circle of turning the crankshaft.

2. Check the tears and wears of the crankshaft

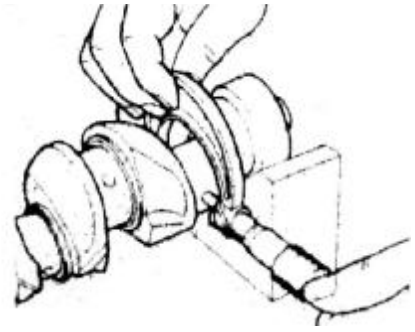
（1）Use a caliper to measure the shaft diameter , and work out the circularity and cylindricity.



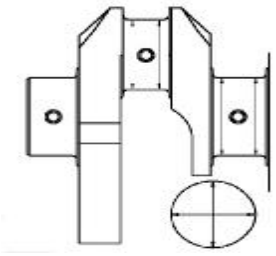
[Limit] 0.005mm

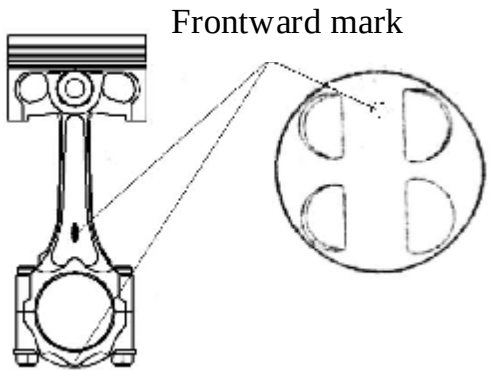
(2)Use a caliper to measure the connecting rod diameter ,and work out the circularity and cylindricity.

[Limit] 0.004mm



the measuring position is shown as the figure,



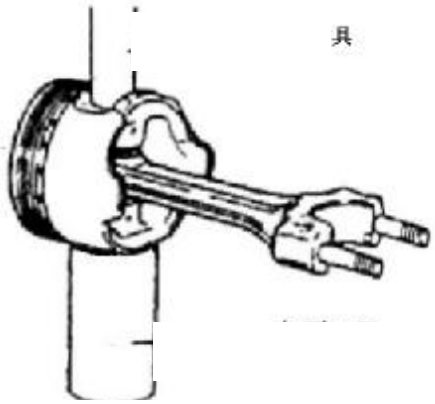


7-4-5Assmbling of the crankshaft connecting rod mechanism

1. Assembly of the piston and connecting rod

（1）Use special tools to assemble the piston, connecting rod and piston pin in the following specified procedures.

① Smear lubricating oil to the connecting rod pin hole, and make the assembly according to the marks for the same unit and in the indicated direction.



② Make the installation shown as the right figure.

③ Make adjustments and installation of the piston and the connecting rod shown as the right figure.

④ After smearing lubricating oil to the piston pin, use pressurizing device to assemble the piston and the connecting rod.

Attention

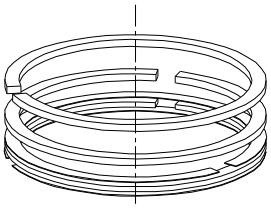
· Pay attention to the assembling direction when pressing in the piston pin;

Ÿ The small bit of connecting rod should be heated to 300℃ while pressing the piston pin in the piston.

Ÿ Exert pressure in the process of pressing by assuring the alignment of the pin.

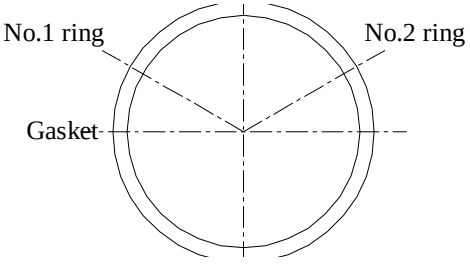
（2）Side face with marks should be upright, install steel belt assembly oil ring (gasket ring, down scraper and upper scraper),then install the secondary ring, then install the primary ring

Open degree of every ring is shown as the illustration:



From up to down:
No.1 ring
No.2 ring
Oil ring

Ring open angle: Down scraping

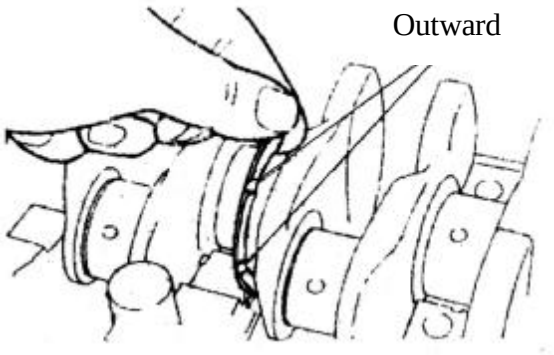


Up scraping

3 The crankshaft main bearing cover. Assemble the crankshaft, shaft bush, shaft body and thruster according to the following instructions.

（1）The protruding thrust block on the bush should match the groove on the cylinder body for installation..

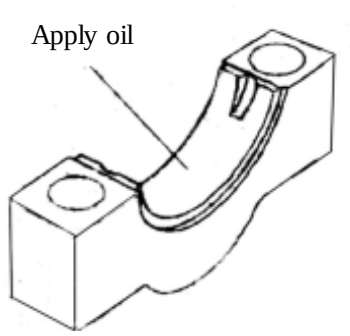
Attention Use the bush made by the same manufacturer.



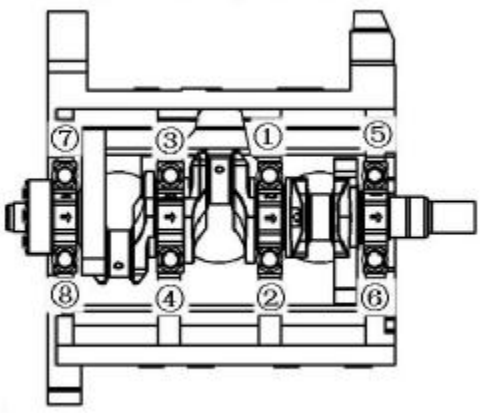
（2）Smear lubricating oil on this side (upper side) of the crankshaft before installing it.

The side thrust chip with oil sink should face outward (crankshaft handle) for installation on the cylinder body bearing stand.

Attention Smear lubricating oil on the side of the oil sink.



（3） Smear lubricating oil on the friction side opposite to the contact of the bush lower parts. Install the parts according to the forward induction mark on the crankshaft bearing cover.

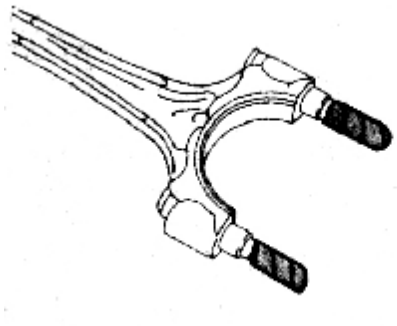


（4）After applying the lubricating oil, tighten the bolts in the sequence shown as the right figure for 2—3 cycles with the specified torque.

[Torque] 70±3.5N.m

（5） Rotate the crankshaft after assembling, you should rotate it with ease, the torque should be less than 1Nm

Attention:· The torque of crankshaft rotating should be less than 1Nm;(The torque is for installing the crankshaft only, not for installing the piston connecting rod)

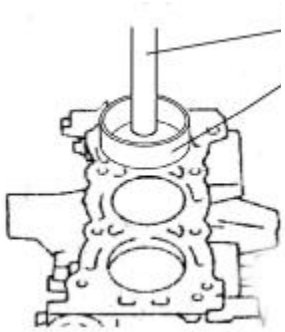


4. Assemble the piston connecting rod Ay, connecting rod bush and connecting rod bearing cover according to the following instructions.

（1）The openings of the air ring and oil ring should match the specified direction.

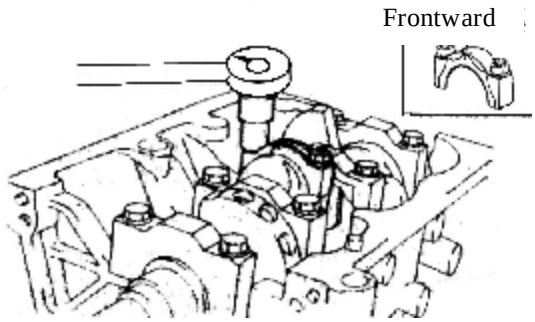
（2）Use nylon sleeves for the bolts of the connecting rod to prevent from scraping the cylinder hole and axial diameter

（3）Apply lubricating oil to the piston I, the connecting rod and the surfaces of the other related moving parts.



（4）Make sure the frontward indication mark on the piston. Should be frontward and assemble the piston connecting rod Ay with SST.

Attention The cylinder number on the piston connecting rod Ay should be identical to the cylinder number.



（5）Assemble the connecting rod bearing cover and bush according to the following instructions.

① Smear a little lubricating oil on the bolt and screw nut stand before they are mounted according to the indication mark.

② Tighten the left and right screw nuts alternately for a couple of times with the specified torque.

[Torque]： 40±2N.m

Attention The connecting rod and the rod bush should be bought from the same supplier.