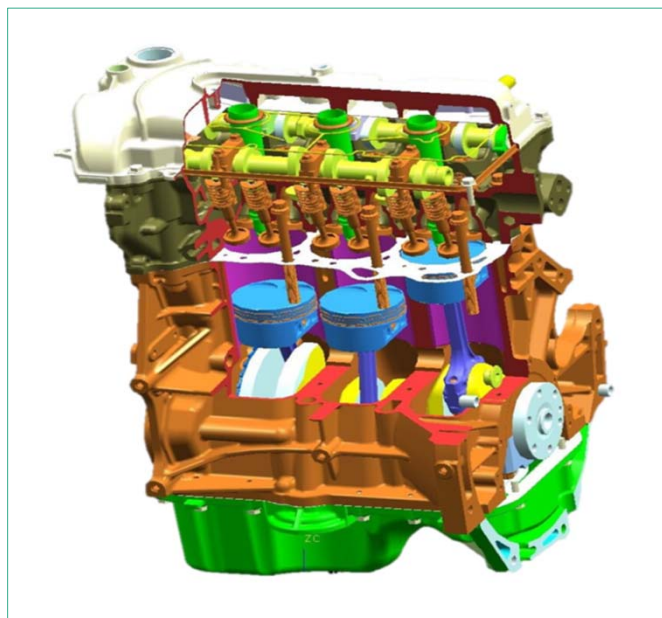


# Engine service - K10B



Engine Mechanical I  
Course code: EN02

Student training manual  
Suzuki Online Training



**SUZUKI  
TRAINING ACADEMY**

## Table of contents

Topic	Page	Topic	Page
Engine construction description	3	Pistons, piston rings, piston pin	62
Engine specifications	3	Timing chain	67
Cylinder head cover	4	Tensioner adjuster	73
Cylinder head	6	Chain cover	76
Cylinder head bolts	7	Oil pump	81
Cylinder head valve seat specifications	11	Oil pan	84
Camshafts	12		
Cylinder head gasket	17		
Valves	18		
Tappets	19		
Tappets replacement on vehicle	21		
Cylinder block	35		
Crankshaft bearing caps	38		
Bearing cap bolts-removal & installation	41		
Crankshaft	42		
CKP sensor plate	44		
Main bearings	45		
Bearing selection	46		
Checking main bearing clearance	51		
Thrust bearing selection	52		
Crankshaft oil seal	53		
Connecting rods	56		
Selecting connecting rod bearings	59		

---

## 1.1 Engine Construction description

The engine is water-cooled, in-line 3 cylinders, 4-stroke-cycle gasoline unit with its DOHC (Double Over Head Camshaft) valve mechanism arranged for “V” type valve configuration and has 12 valves (4 valves / one cylinder).

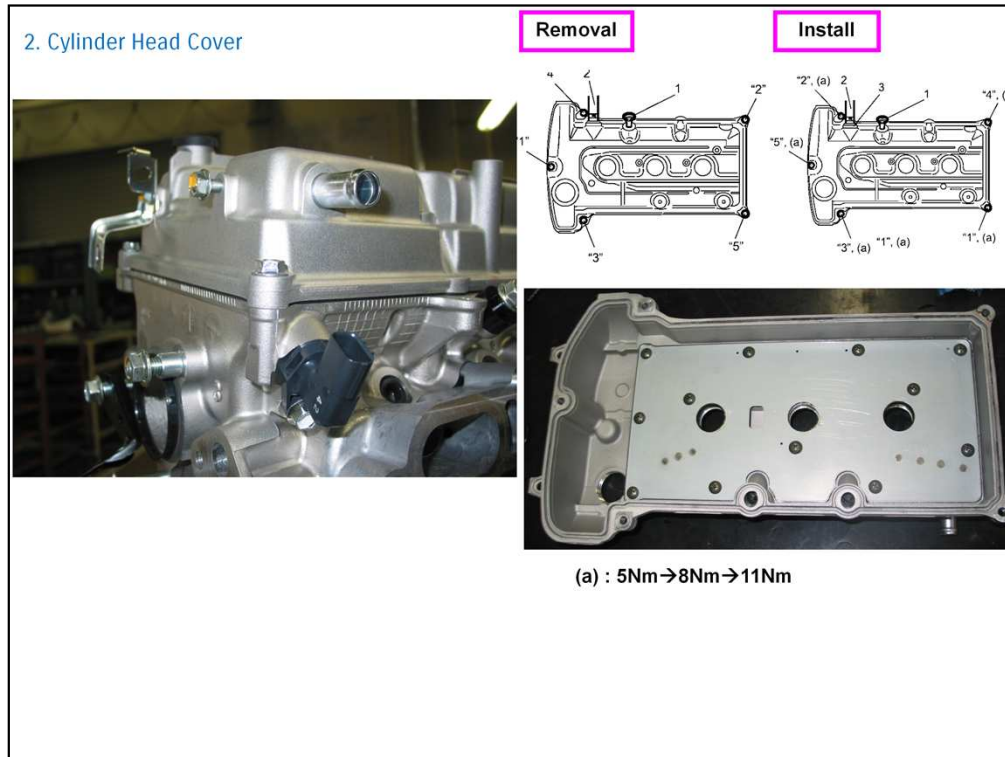
The intake camshaft and exhaust camshaft are mounted over the cylinder head; They are driven by crankshaft through timing chain, and no push rod is provided in the valve train system.

Also, this engine is classified in two, namely a high compression type and a low compression type. The high compression type is identified visually as EGR valve equipped (Bosch ECM), on the other hand, the low compression type is not equipped with an EGR valve (Denso ECM).

- Cylinder head made of aluminum alloy, which is light-weight and excellent in heat radiation
- A center plug pentroof combustion chamber
- Cross-flow type of intake and exhaust layout
- A direct driving type valve train, which increases rigidity and reduces mechanical loss
- Valve clearance adjustable by tappet
- Cylinder head bolt tightened in a plastic range in order to stabilize bolt axis strength and to improve reliability

## 1.2 Engine specifications

Engine type	K10B
Valve mechanism	DOHC Valves chain driven
Displacement (cc)	996
Bore (mm)	73.0
Stroke (mm)	79.5
Compression ratio	11.0
Ignition order	1-3-2



1-1

1-1

## 2. Cylinder head cover

- Cylinder head cover is mounted on the cylinder head via rubber gasket. There is no washer between cylinder head cover and size-8 bolt head.
- Upper left : Bolt removal order
- Upper right : Bolt installation order
- Lower left and right : Cylinder head cover and gasket view



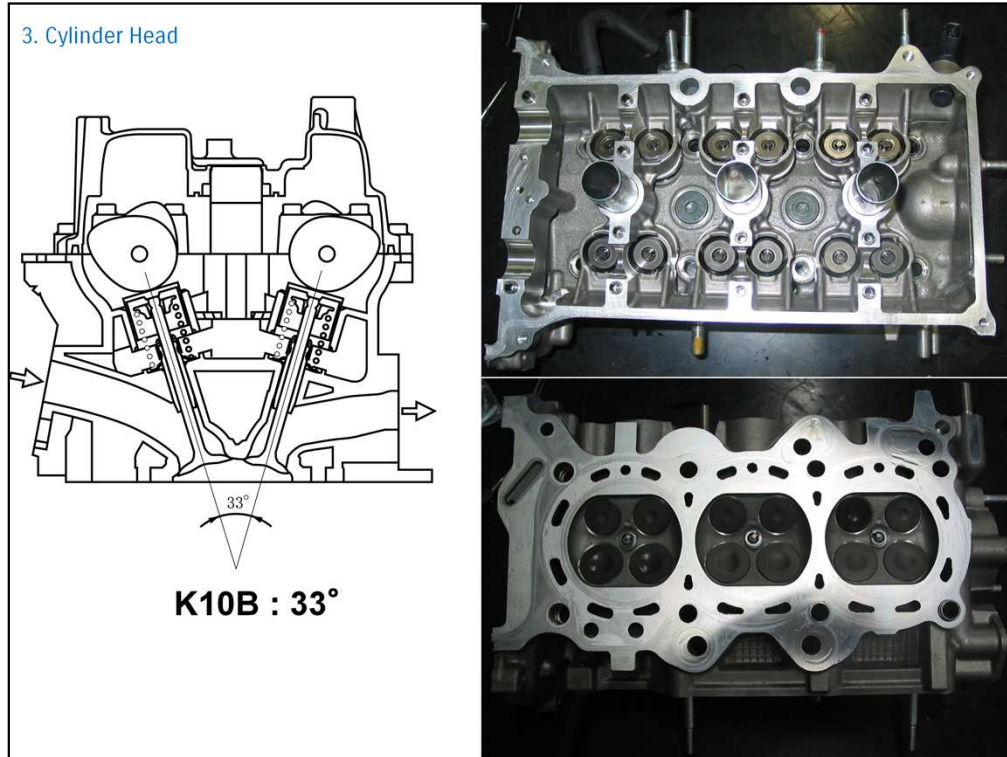


1-1

1-1

### 2.1 Cylinder head cover gasket

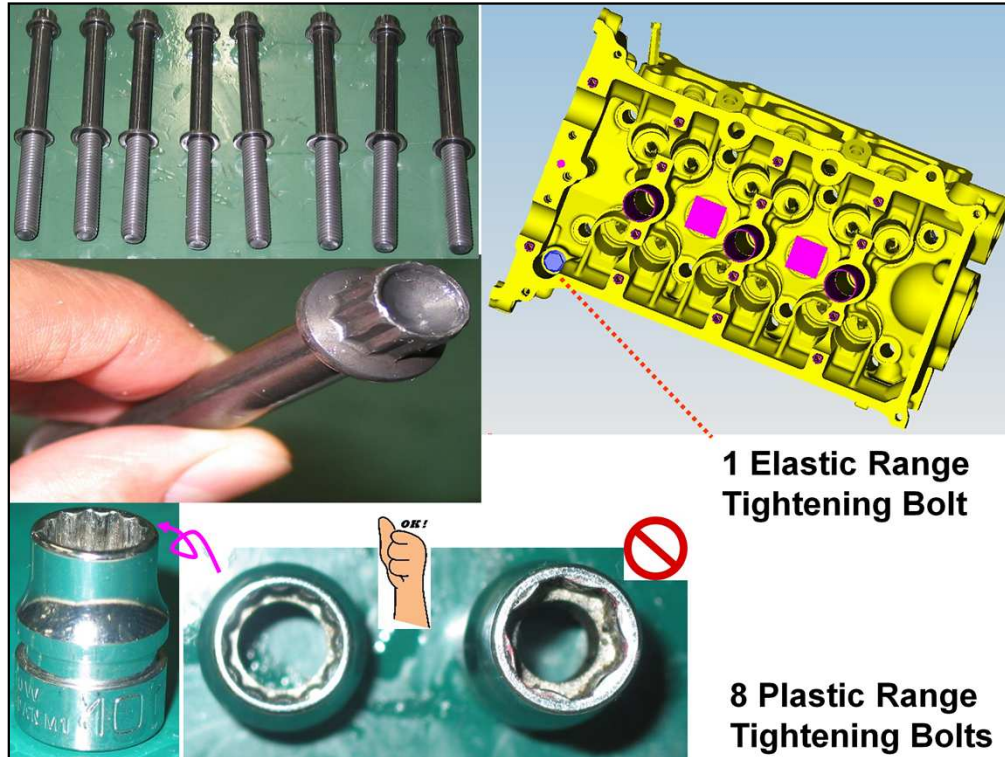
- Use a new one every time the cylinder head cover is removed.
- Cylinder head cover gasket removed from the cylinder head cover



### 3. Cylinder head

- Valve angle is 33 degrees.
- The valves are lifted by cam through a tappet and a shim.

1-1

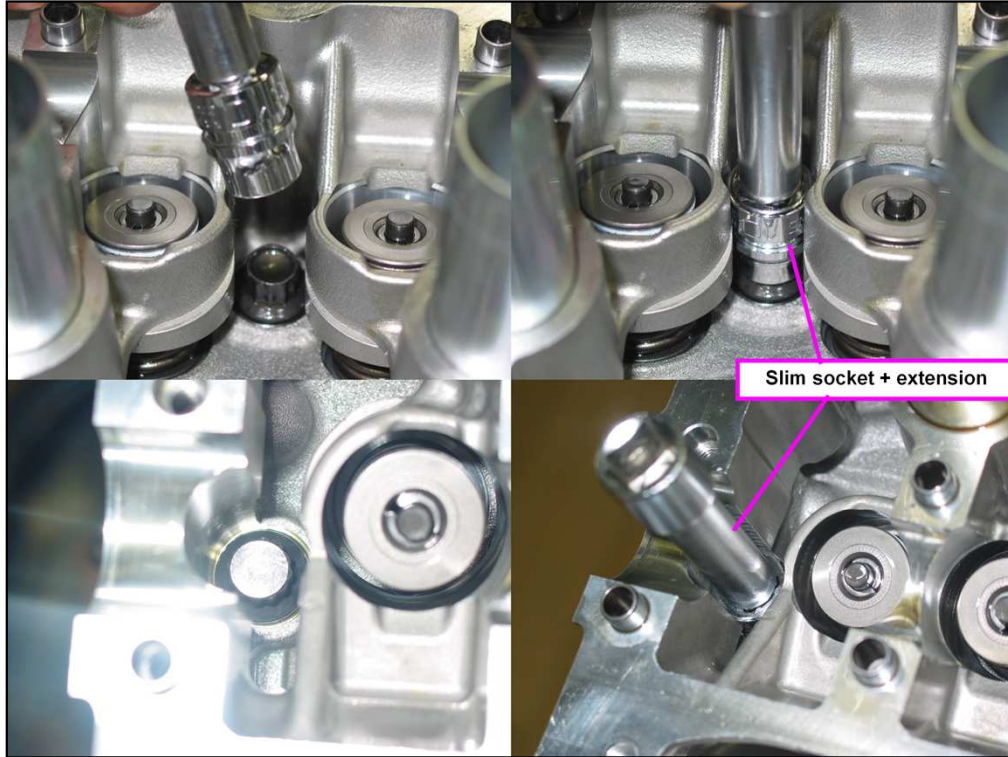


1-1

### 3.1 Cylinder head bolts

- The plastic range tightening bolt is used as a cylinder head bolt.
- As this type of bolt is a plastic deformation bolt, it should be inspected before reuse.
- The method of inspection is described later.
- A 6-point socket cannot be used for cylinder head bolt tightening/loosening.
- A 12-point socket must be used.
- Do not forget an elastic range tightening bolt shown above. This bolt is only fitted onto K10B engine. (Not used in K12B engine)

1-1

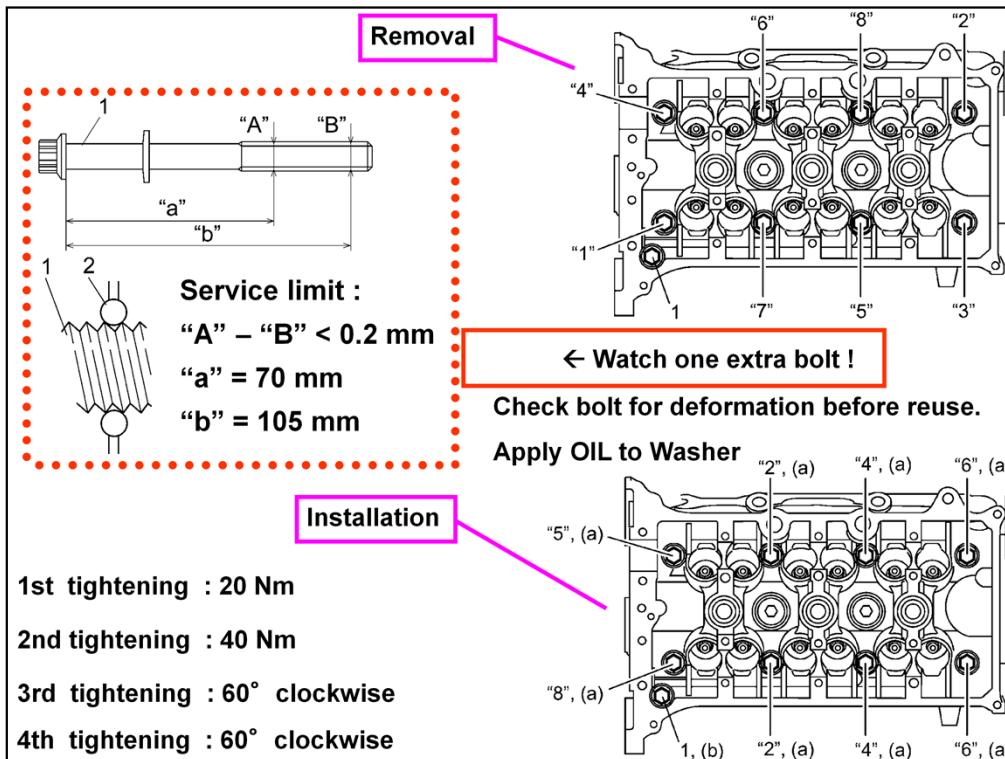


1-1

Cylinder head bolts (continued)

As shown in the pictures, a slim socket and an extension are required for loosening/tightening the cylinder head bolts.

1-1



1-1

Cylinder head bolts (continued)

- Before reusing plastic tightening range bolts, check them for deformation. Measure diameter at points "a" and "b". The difference between obtained values "A" and "B" should be less than 0.2mm.
- If "A"-"B" exceeds this service limit, the bolt should be replaced with a new one.
- When tightening 10 pcs. of the cylinder head bolts, you have to go through four (4) steps.
- 1st step, all bolts shall be tightened in the torque of 20Nm (2.0kg-m) diagonally.
- 2st step, all bolts shall be further tightened in the torque of 40Nm (4.0kg-m) diagonally.
- 3rd step, all bolts shall be turned clockwise 60 degrees clockwise.
- 4th step (last step), all bolts shall be turned more 60 degrees.

Note:

There is no "elastic" range bolt to fit the cylinder head to the cylinder block. This point is different from M engines.

[Reference : M engines]

Service limit of the bolt is 0.1 mm between 83.5 mm and 115 mm points.

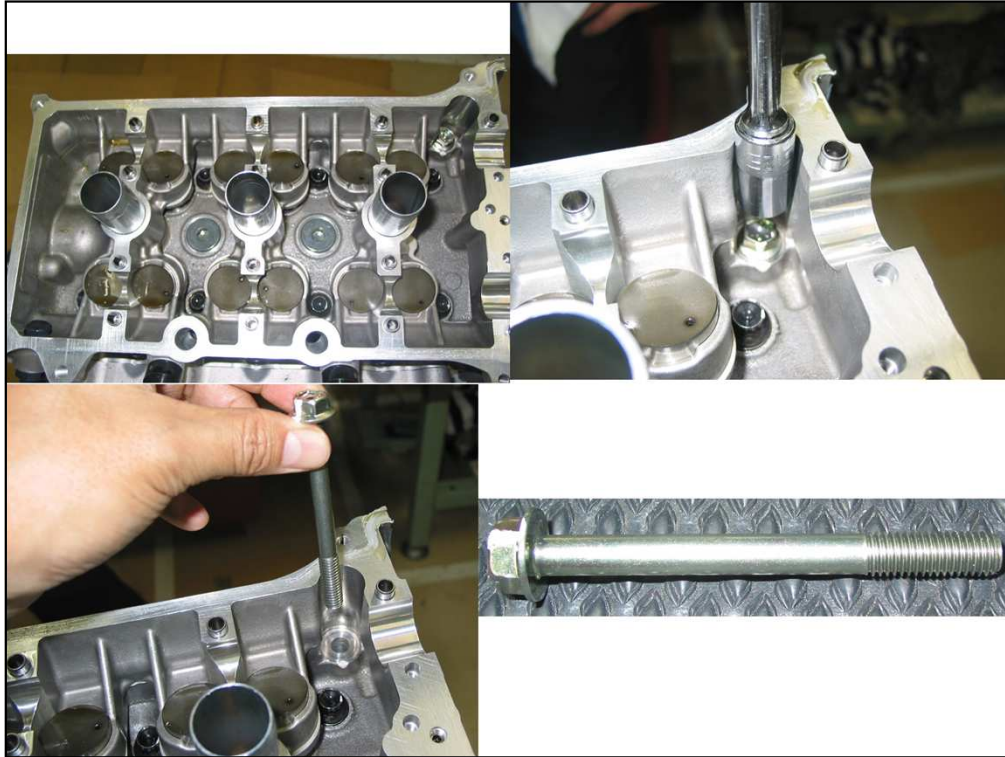
Upper : Bolt removal order

Middle : One extra bolt high-lighted

Lower : Bolt installation order



1-1

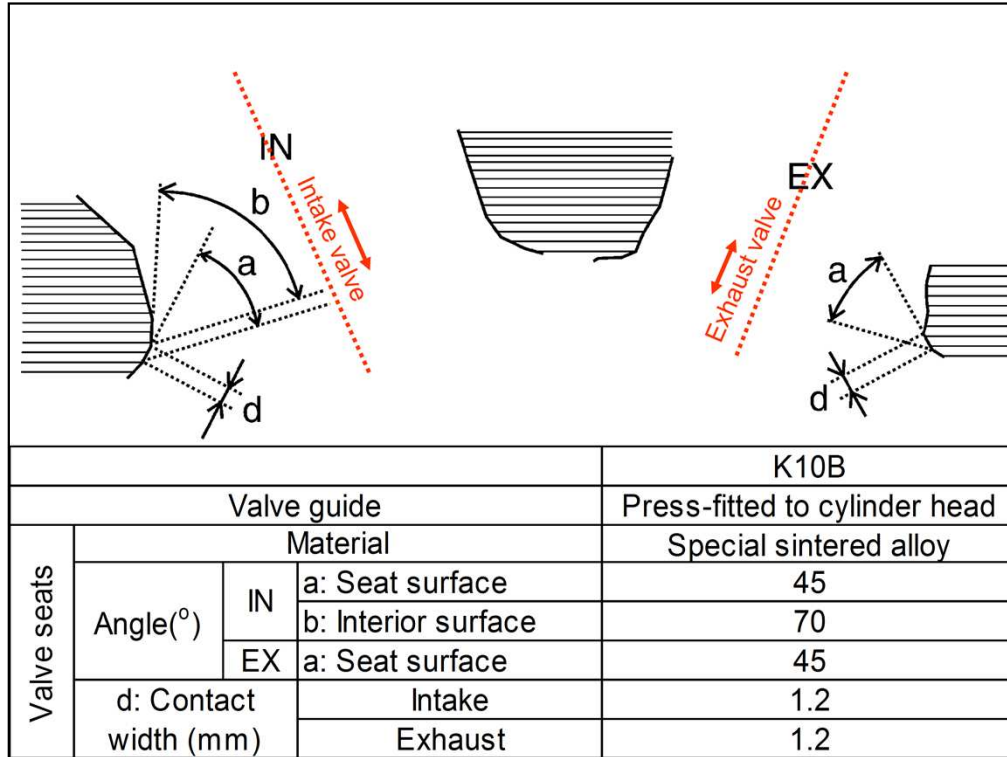


1-1

Cylinder head bolts (continued)

- There is “elastic” range bolt to fit the cylinder head to the cylinder block. [Reference : M engines]

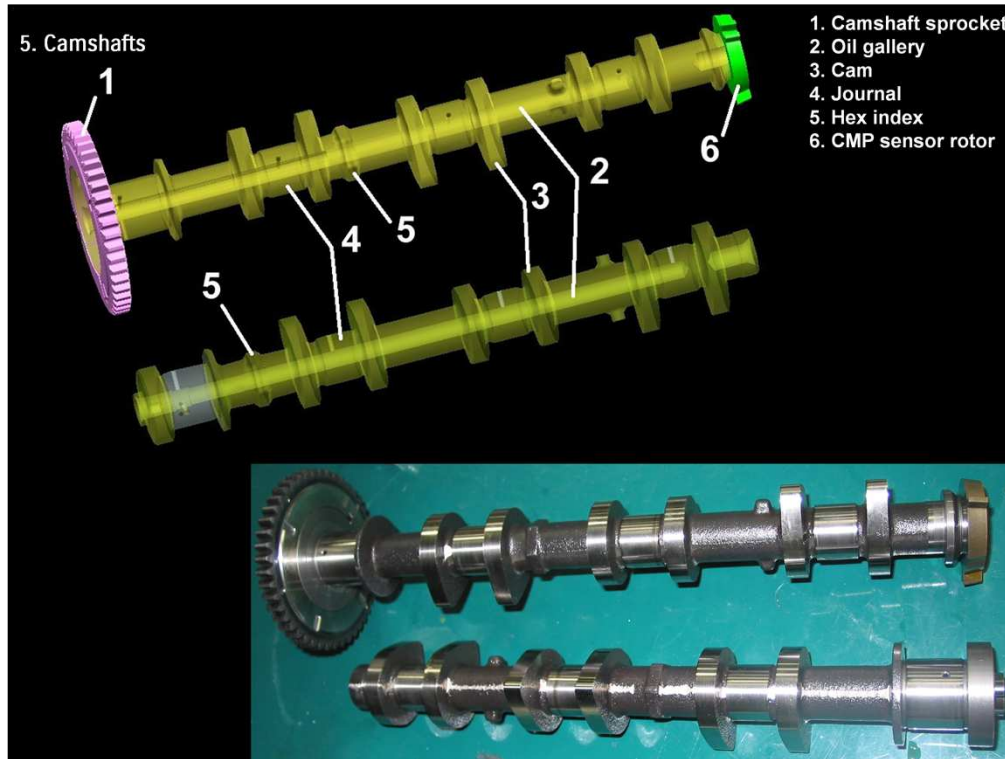
1-1



1-1

### 3.2 Cylinder head valve seat specifications

- This page shows valve seat specification in the cylinder head.
- The figure above shows cylinder profile at valve passage.



1-1

1-1

#### 4. Camshafts

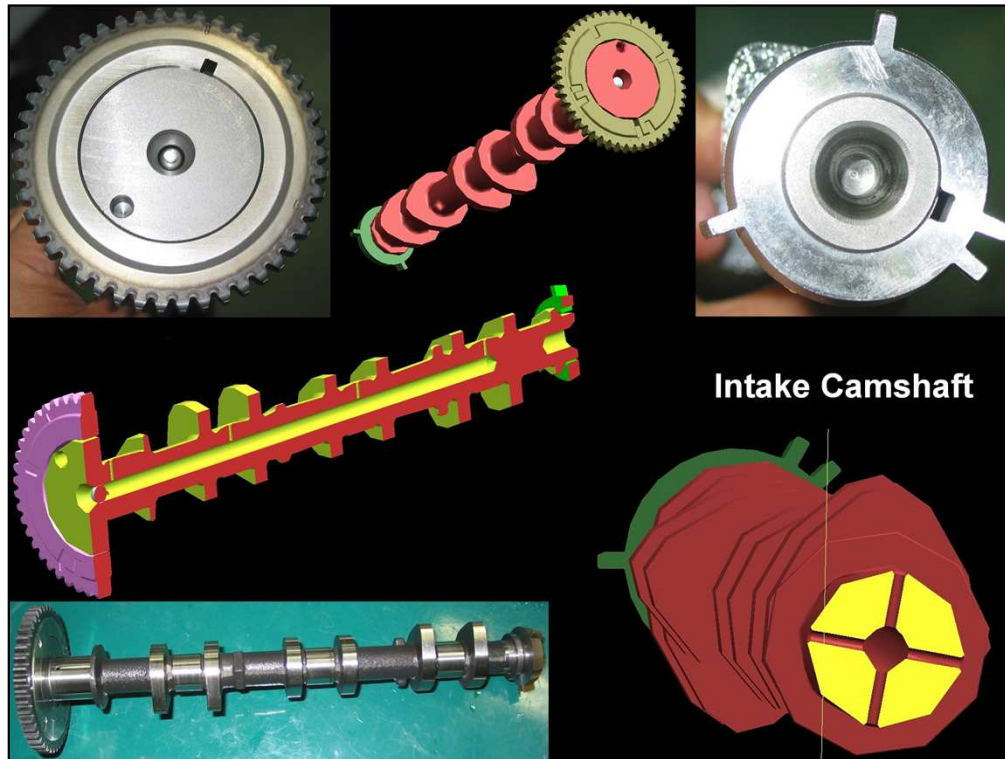
- Camshaft is of a hollow structure. The hollow part is oil passage for a better lubrication.
- Intake camshaft has camshaft position sensor rotor on its flywheel side end.
- A sprocket is press-fitted onto the chain-side end of Intake camshaft
- Camshaft position sensor (CMP sensor) rotor is different between M engines and K12B engine.

Upper : Intake and exhaust camshafts overview

Lower : Camshafts



1-1



1-1

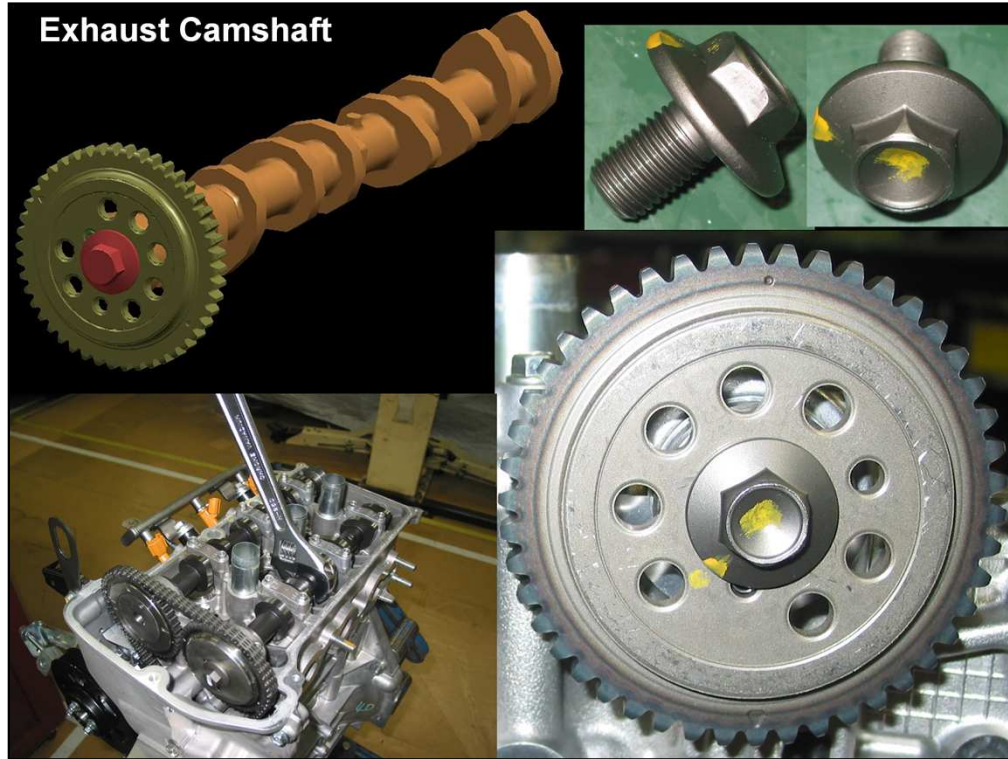
#### 4. Camshafts (continued)

- The picture on the left shows sprocket press-fitted onto the intake camshaft.
- The picture on the right shows CMP sensor rotor press-fitted onto the intake camshaft.

Upper : Overview of intake camshaft

Middle : Cutting the intake camshaft from exhaust side

Bottom : Cutting the intake camshaft from the sprocket side



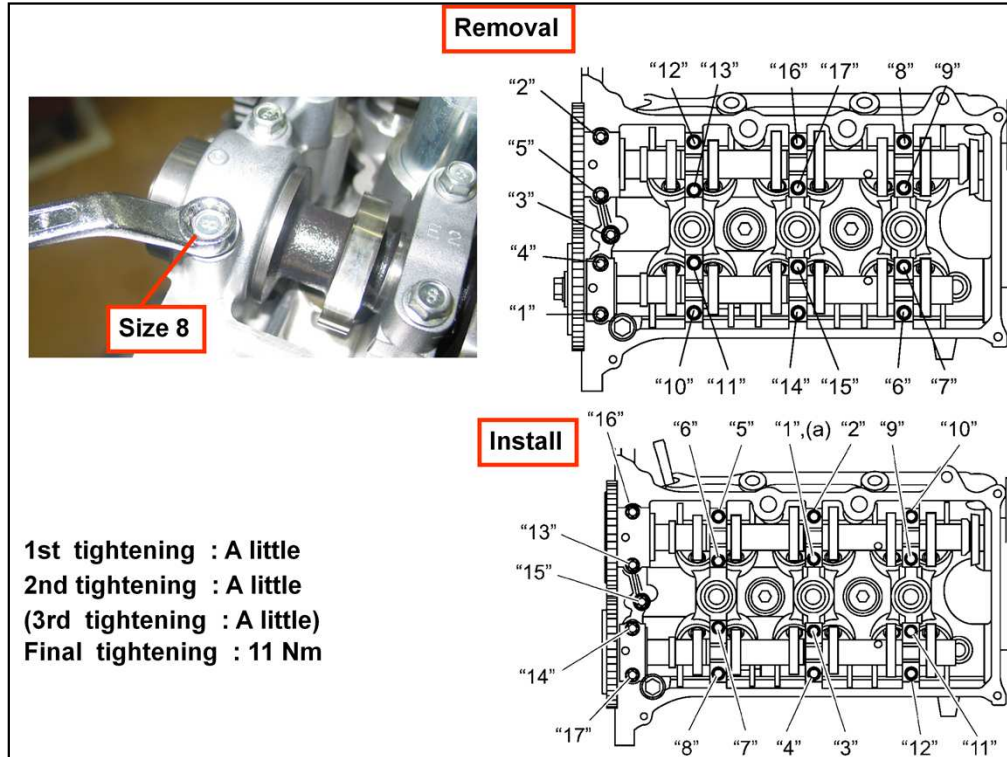
1-1

1-1

#### 4. Camshafts (continued)

- This page shows pictures of exhaust camshaft sprocket fitted with a bolt.
- When loosening/tightening the exhaust camshaft sprocket bolt, the exhaust camshaft must be held stationary with a spanner or the like.
- Special care should be taken not to damage the bolt head, as the head corner is “rounded”.
- Sprocket removal and installation

1-1



1-1

4. Camshafts (continued)

- There is a specified loosening and tightening order of camshaft housing bolts.
- Use a size-8 tool for bolt loosening/tightening.

Upper : Bolt removal order

Lower : Bolt installation order

1-1

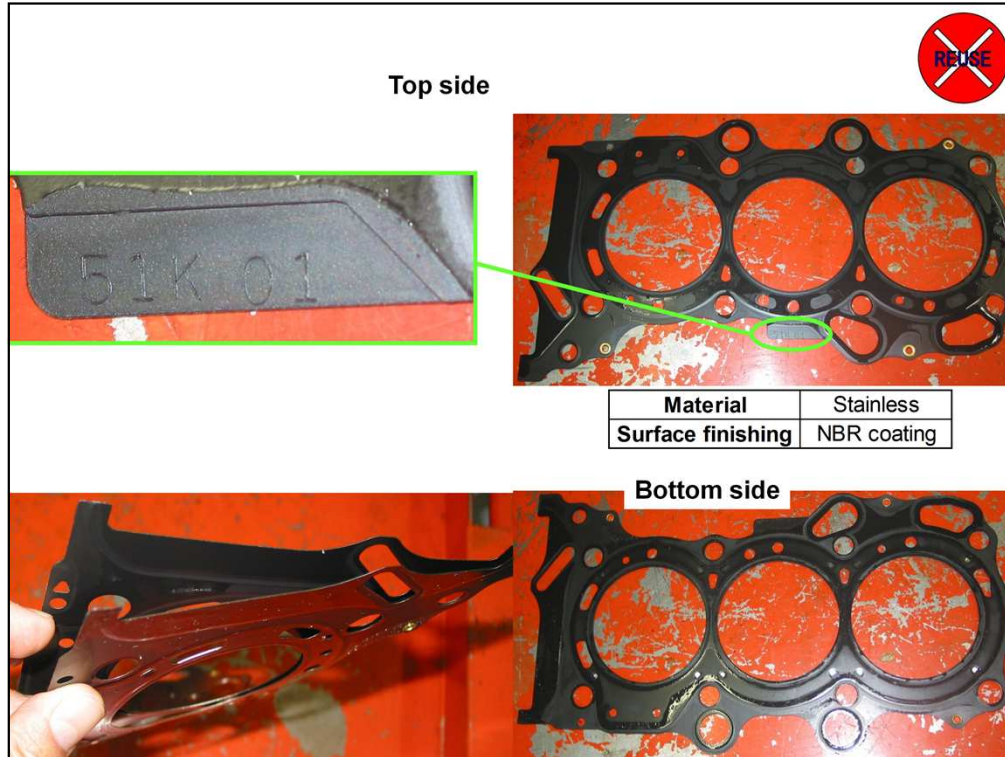


1-1

#### 4. Camshafts (continued)

- Camshaft housing has position and direction marks on the top surface for a proper installation.
- The first housing and I2/E2 housings have oil groove for camshaft lubrication.





1-1

1-1

### 5. Cylinder head gasket

- A two-layer metal gasket is used to improve durability and reliability.
- Stamped numbers should face upward.
- The gasket cannot be reused after removal.

1-1

1. Intake valve
2. Exhaust valve
3. Valve spring seat
4. Valve stem seal
5. Valve spring
6. Valve spring retainer
7. Valve cotter
8. Tappet
9. Cam

			K10B/K12B
	Material		Heat-resistant steel
	Heat treatment		Tuffride process
Valve	Total length(mm)	Intake	87.45
		Exhaust	87.0
	Valve stem diameter (mm)	Intake	5.5
		Exhaust	5.5
	Valve head diameter (mm)	Intake	27.5
		Exhaust	22.9
Valve spring	Wire diameter(mm)		2.6
	Effective number of turn		7.37
	Total length (mm)		40.06
	Pitch		Variable
Valve guide			Press-fitted to cylinder head

1-1

### 8. Valves

- This page shows specifications of valve and valve spring.
- Single type spring is used.

1-1


Valve Clearance	Intake	Exhaust
ECT 15-25°C	0.14-0.23	0.30-0.40

**FORMULA**


**Intake:**  
 $A=B+C-0.19\text{mm}$

**Exhaust:**  
 $A=B+C-0.35\text{mm}$

**Tappet No.**



**A: New tappet No. to be installed**  
**B: Removed tappet No.**  
**C: Measured valve clearance (mm)**



**For example of intake side:**

**Shim with No.350 was installed, and measured clearance is 0.26mm.**

**$A=3.50+0.26-0.19$**   
 **$=3.57 \rightarrow$  Select tappet No.356**  
**(Available thickness : 314, 316, --- 388)**

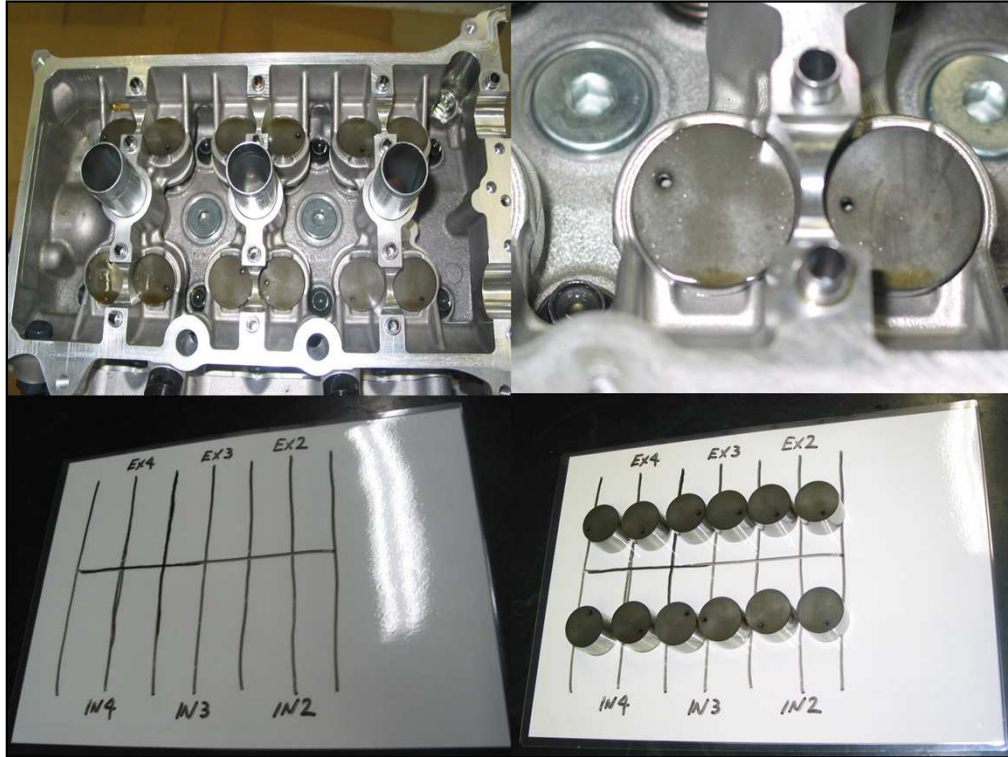
1-1

## 9. Tappets

### 9.1 Tappet selection

- This page shows how to select a proper shim to satisfy the specified valve clearance.
- The service manual states based on the figure printed on the tappet inner surface by laser beam.
- However, in the market, if it is hard to identify the figure, measure tappet head thickness by a micrometer in the scale of 25 one thousand.
- The printed figure is 100 times as big as the actual (measured) thickness in millimeter.
- That is, in case of 3.5 mm, the tappet has a numeral of 350.
- If a desired thickness is 3.57mm, select tappet with a thickness of 3.56mm.

1-1



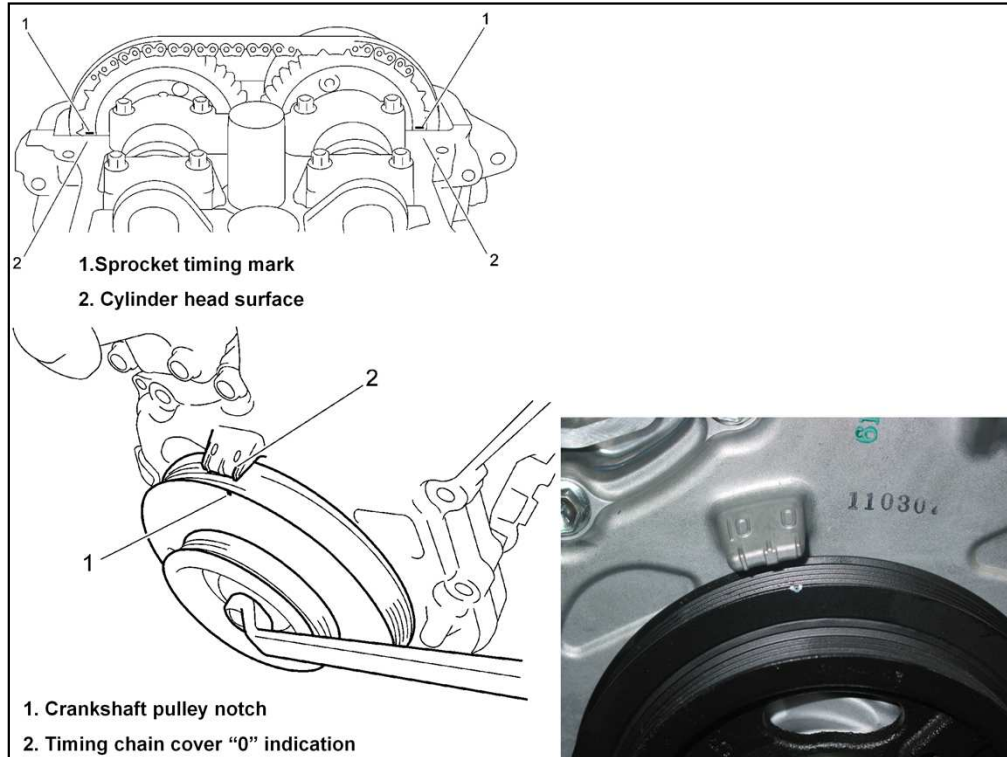
1-1

### 9.2 Tappets removal

- If the tappets should be removed from the cylinder head, put them on a tappet position mat as shown above.
- As each tappet may have different size of shim and no reference mark is put on the shim to determine the position, a tappet position mat as shown above may avoid mixture.



1-1



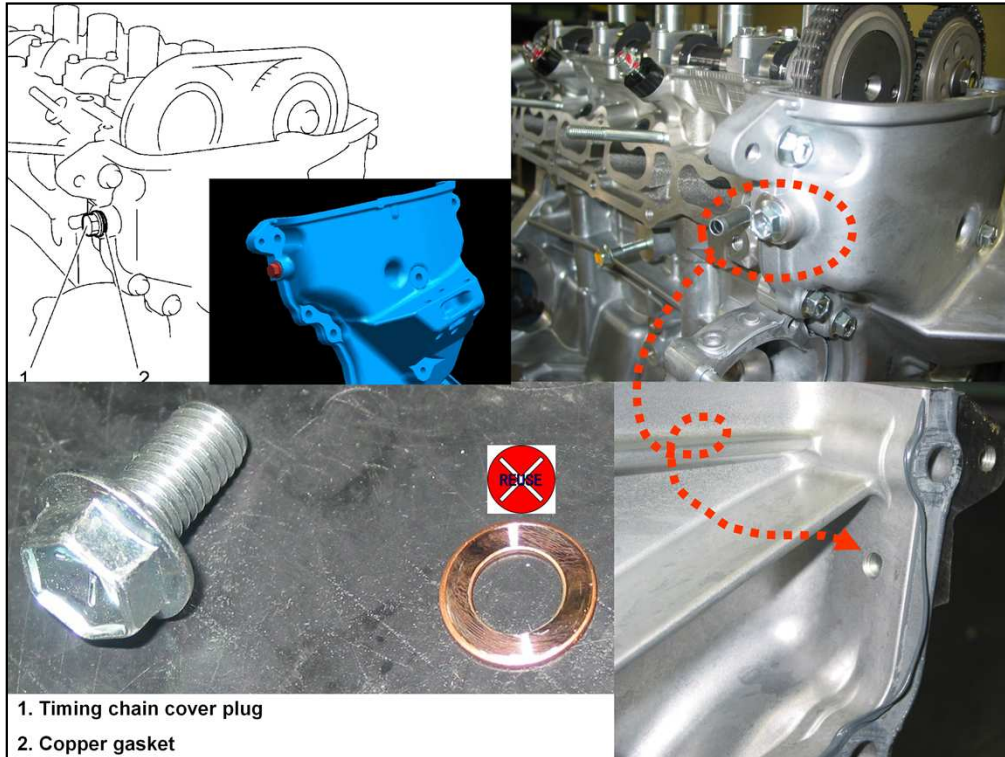
1-1

### 9.3 Tappet replacement on vehicle

- Valve clearance is adjusted by tappet.
- If valve clearance is out of specification, the corresponding tappet should be replaced.
- Tappet can be replaced without dismounting the timing chain cover.

Adjust the timing of both camshafts and crankshaft as shown above.

1-1

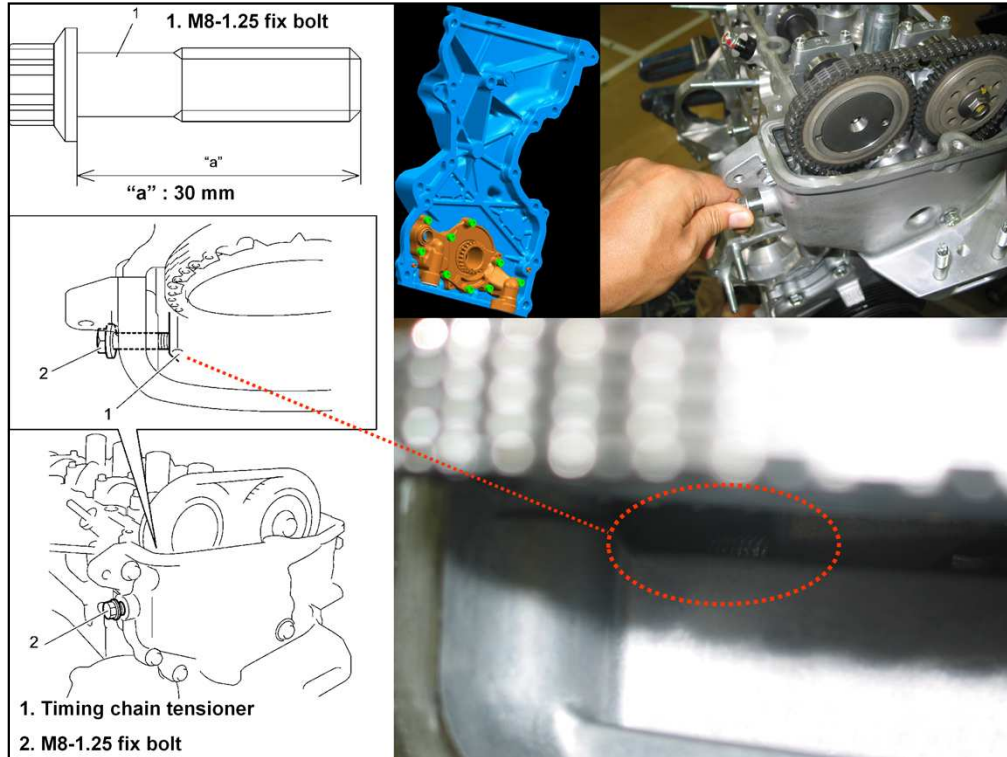


1-1

### 9.3 Tappet replacement on vehicle (continued)

- There is a plug and a copper washer to seal the service hole available on the timing chain cover.
- Remove the plug and copper washer for the next step.
- The copper washer cannot be reused.

1-1



1-1

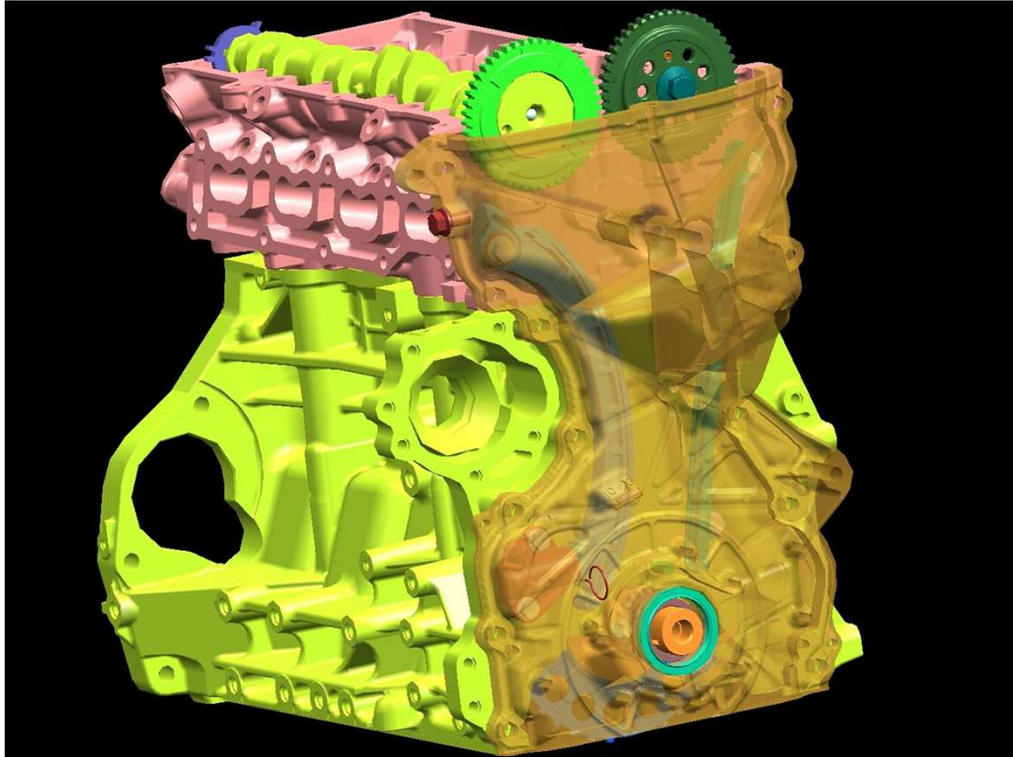
### 9.3 Tappet replacement on vehicle (continued)

- Prepare a commercially available M8 bolt with a 1.25 thread pitch and 30 mm long.
- Tighten the bolt by hand to apply tension to the chain.
- Do not use any tool.
- The bottom picture shows the bolt point fitted onto the chain tensioner.

#### Note:

Bolt length may be between 30 and 35 mm, if 30 mm long bolt is not available.

1-1

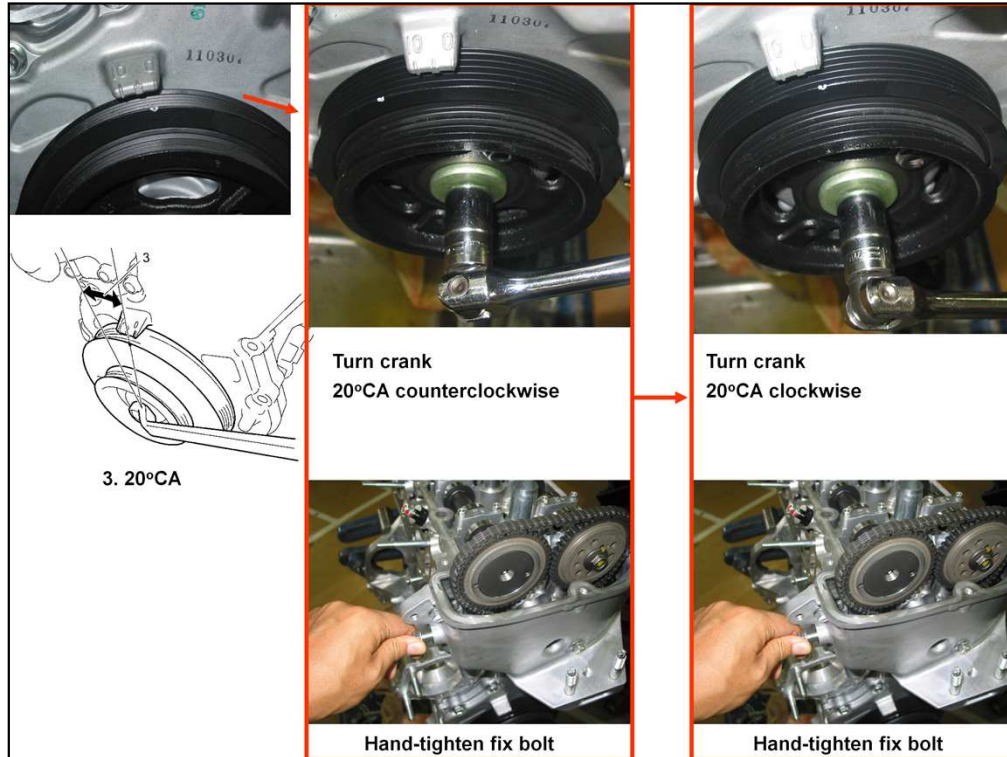


1-1

### 9.3 Tappet replacement on vehicle (continued)

- A 1.25 thread pitch and 30 mm long service bolt presses the chain tensioner against the tensioner adjuster.
- Thus, the chain tensioner adjuster rod does not jump out even if the chain is removed.

1-1



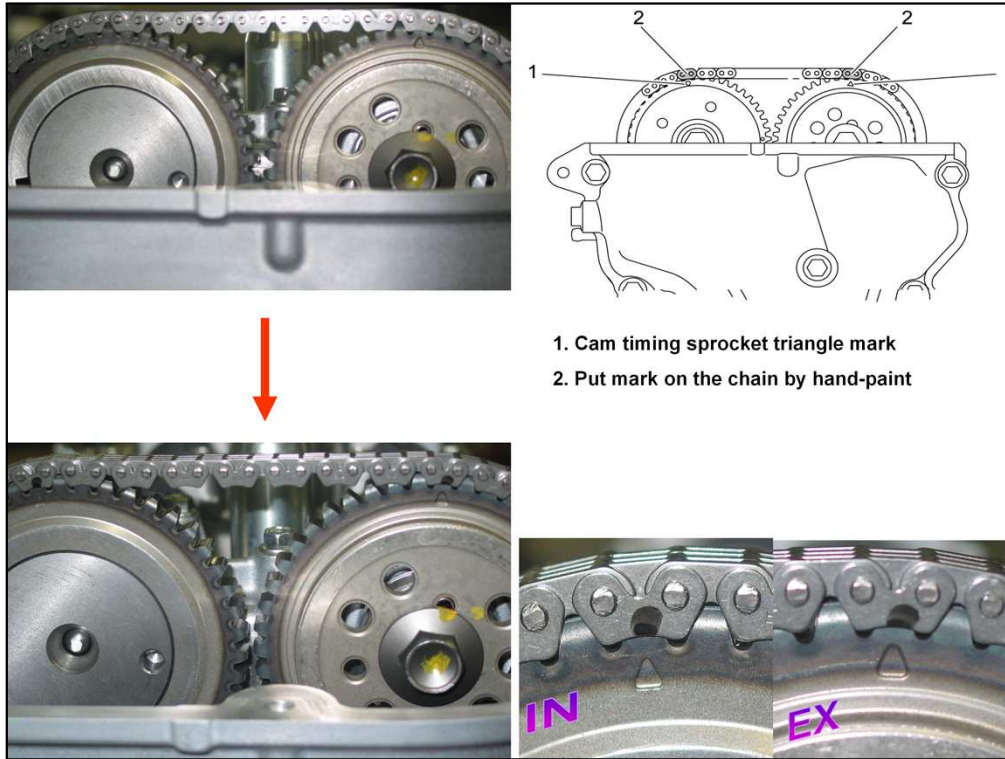
1-1

### 9.3 Tappet replacement on vehicle (continued)

- This page shows how to apply tension to the chain gradually.
  - a) Turn the crankshaft counterclockwise by 20° of crank angle, tightening the bolt by hand.
  - b) Turn the crankshaft clockwise by 20° of crank angle, tightening the bolt by hand.



1-1

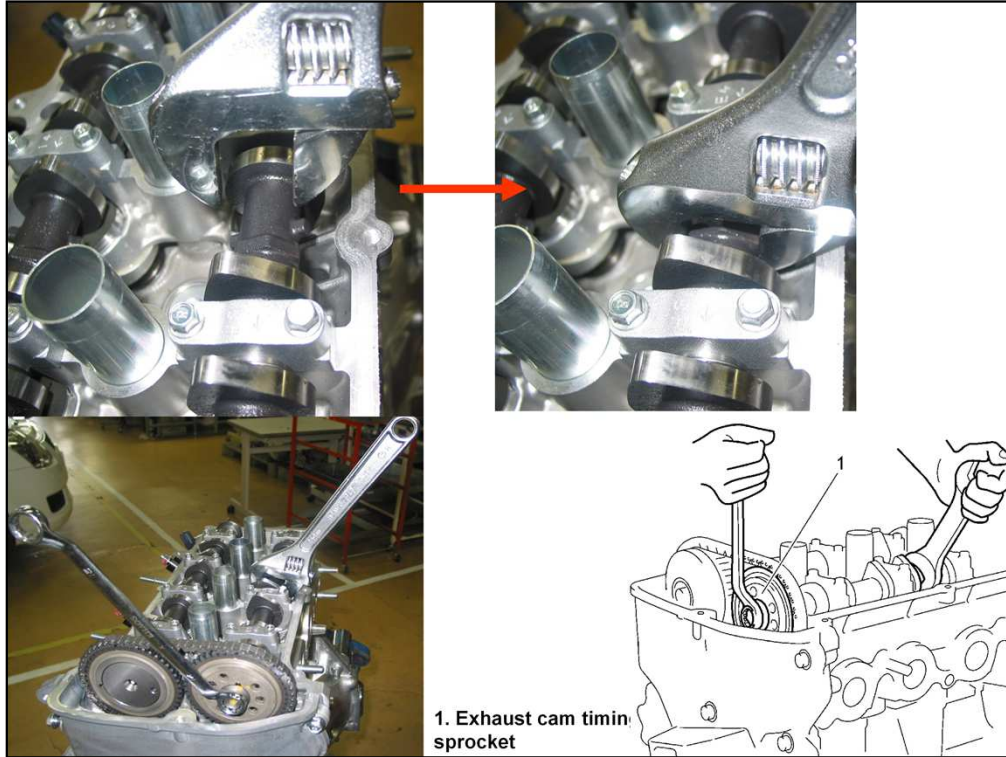


1-1

### 9.3 Tappet replacement on vehicle (continued)

- Put mark on the chain link closest to the triangle mark of the sprocket by oil paint.
- The hand-painted marks are necessary when the chain is refitted.

1-1

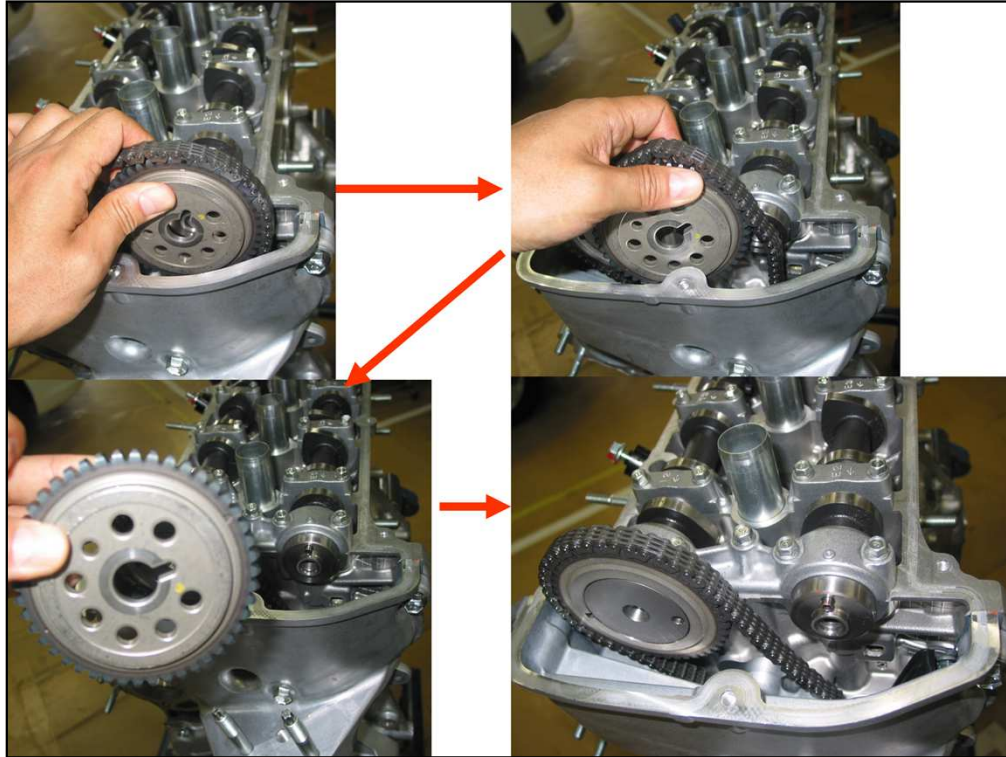


1-1

### 9.3 Tappet replacement on vehicle (continued)

- Loosen the exhaust camshaft sprocket bolt, with the camshaft held stationary with a spanner or the like. Use the hexagonal part of the camshaft.

1-1



1-1

### 9.3 Tappet replacement on vehicle (continued)

- After removing the sprocket bolt, detach the sprocket from the camshaft and chain.
- The sprocket should be detached in this step for a better removal of camshaft in the next step.



1-1



1-1

### 9.3 Tappet replacement on vehicle (continued)

- Remove camshaft housing bolts in the specified order.
- Remove the intake and exhaust camshafts.

#### Note:

If the exhaust camshaft sprocket had not been removed in the previous step, the camshafts could not be detached from the chain in this step.

The chain can be freely fallen down as shown above, because the relationship between the crankshaft sprocket and the chain does not shift. The picture on the next page shows more detail.

After leaving the chain, replace the desired tappet.

1-1

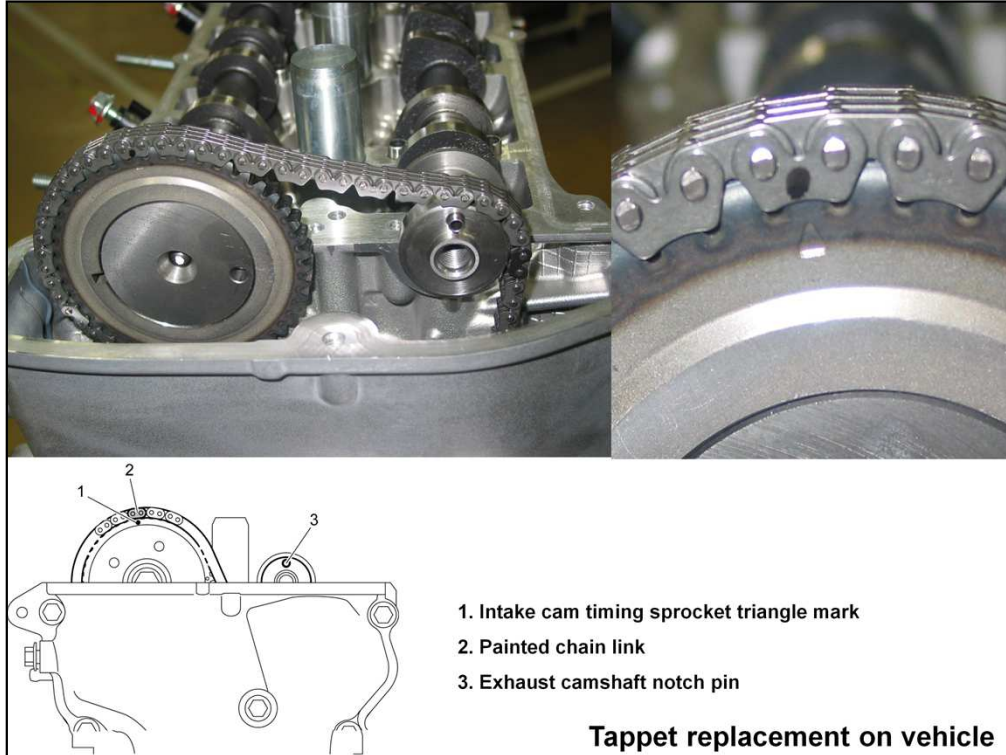


1-1

### 9.3 Tappet replacement on vehicle (continued)

- This picture shows how relationship is maintained between the crank sprocket and the chain.
- The timing chain cover has a "chain guide" just under the crank sprocket position.
- As long as the crankshaft is not rotated, the chain never shifts during the tappet replacement.

1-1

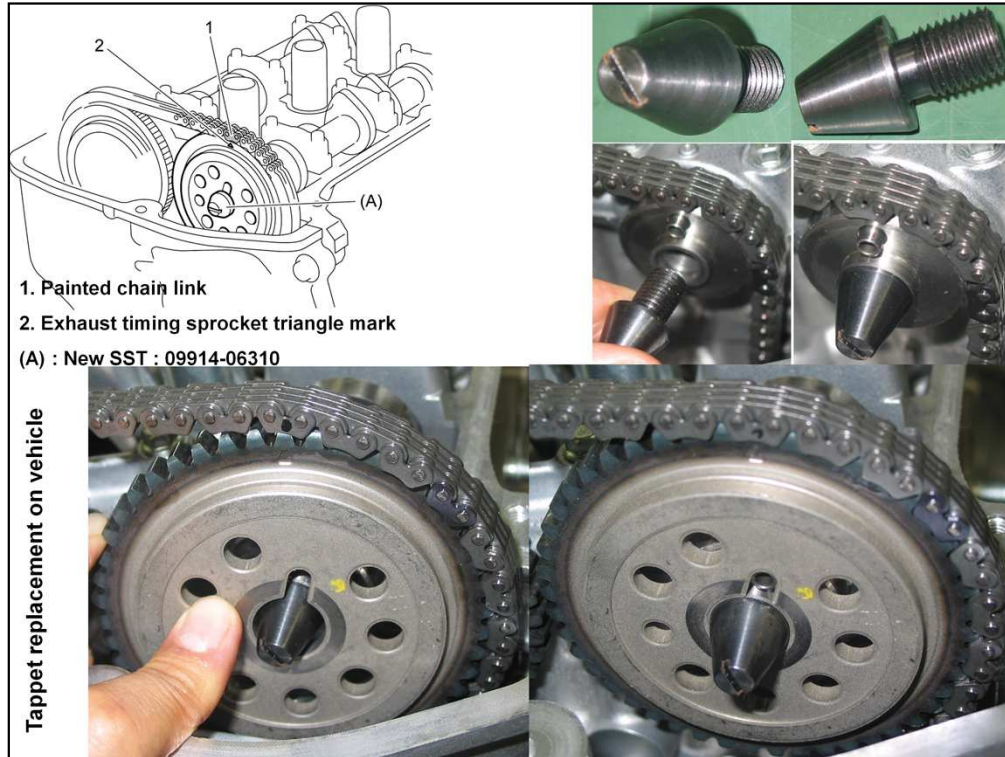


1-1

### 9.3 Tappet replacement on vehicle (continued)

- If the tappets should be removed from the cylinder head, put them on a tappet position mat as shown above.
- As each tappet may have different size of shim and no reference mark is put on the shim to determine the position, a tappet position mat as shown above may avoid mixture.



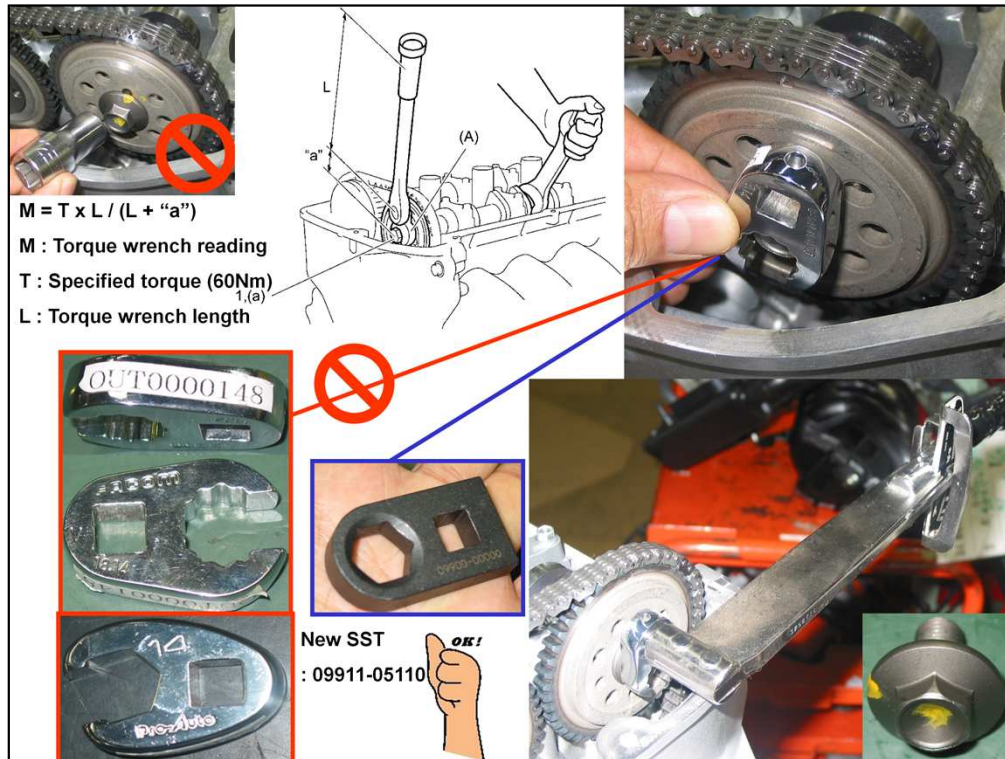


1-1

1-1

### 9.3 Tappet replacement on vehicle (continued)

- Fit the special tool to the exhaust camshaft end as shown above.
- This tool works as a taper guide for a smoother insertion of the exhaust camshaft sprocket.
- The chain link with the hand-painted mark must be faced to the triangle mark on the sprocket.

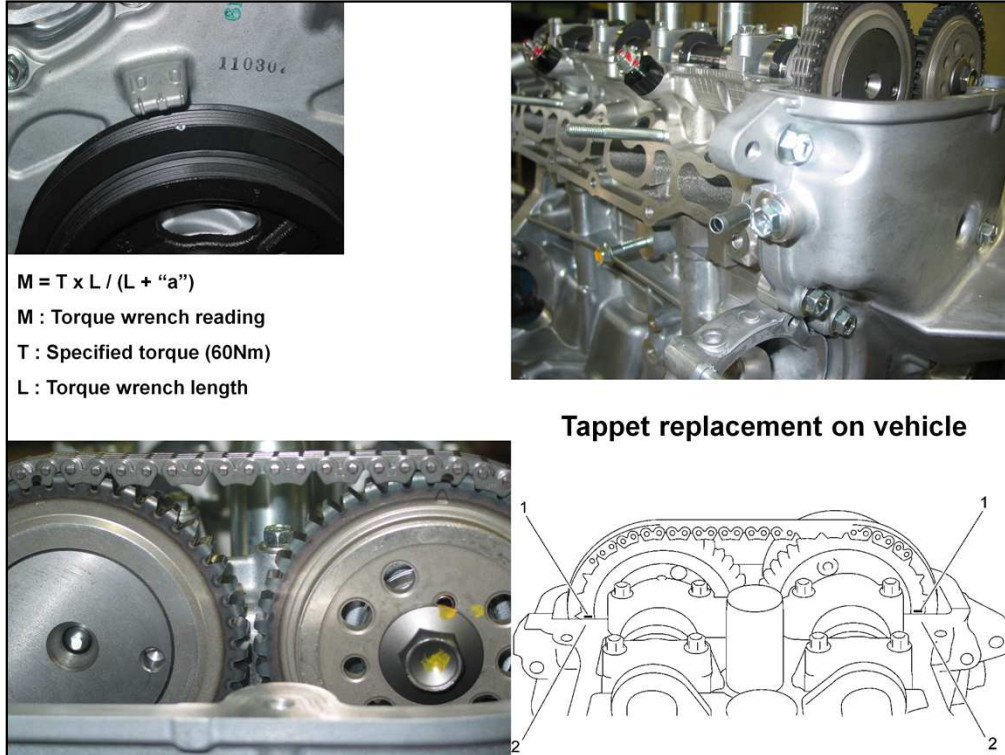


1-1

1-1

### 9.3 Tappet replacement on vehicle (continued)

- After fitting the sprocket to the camshaft by hand, remove the taper guide special tool.
- In order to tighten the bolt to the sprocket, another special tool is required, as the clearance between the bolt head and the timing chain cover is not enough to commercially available socket.
- PCM's special tool OUT0000148 can be fitted to the bolt, but it is hard to obtain 60-Nm torque, because the bolt head is relatively rounded. OUT0000148 is, therefore, not recommended for this purpose.
- Suzuki introduced another special tool made in Japan.
- Tightening torque should be calculated by formula shown above.



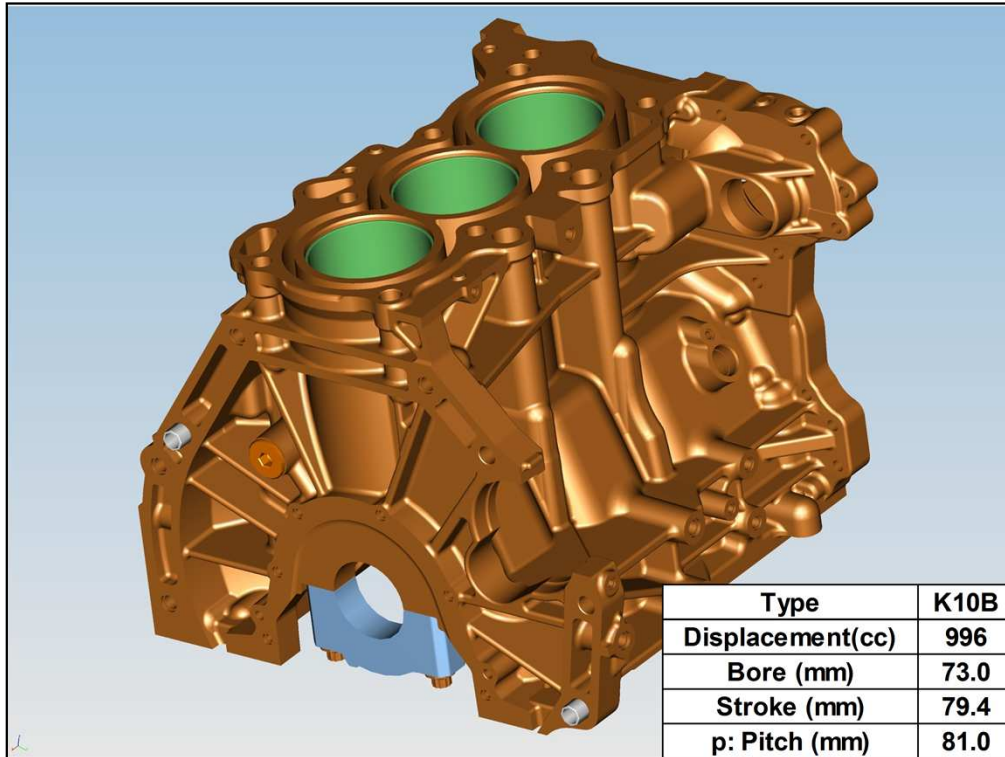
1-1

1-1

### 9.3 Tappet replacement on vehicle (continued)

- After tightening the sprocket bolt, check the timing of camshafts and crankshaft.
- Remove the 30 mm long bolt and fit the plug with a new copper washer to the timing chain cover.

1-1



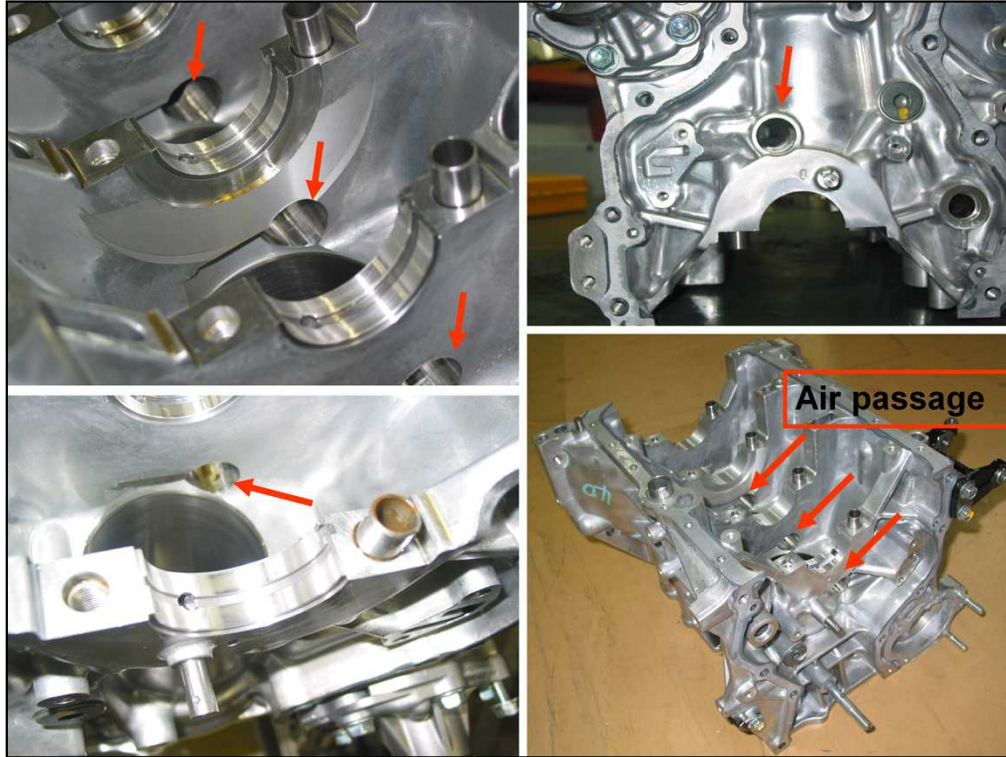
1-1

### 10. Cylinder block

- Cylinder block is made of aluminum alloy, with cast iron liner inserted to the cylinder.
- Dimensions are shown on the table above.



1-1



1-1

10. Cylinder block (continued)

- Crank case at each cylinder has an air passage to absorb pulsation between chambers in order to reduce a “pump loss”.



1-1

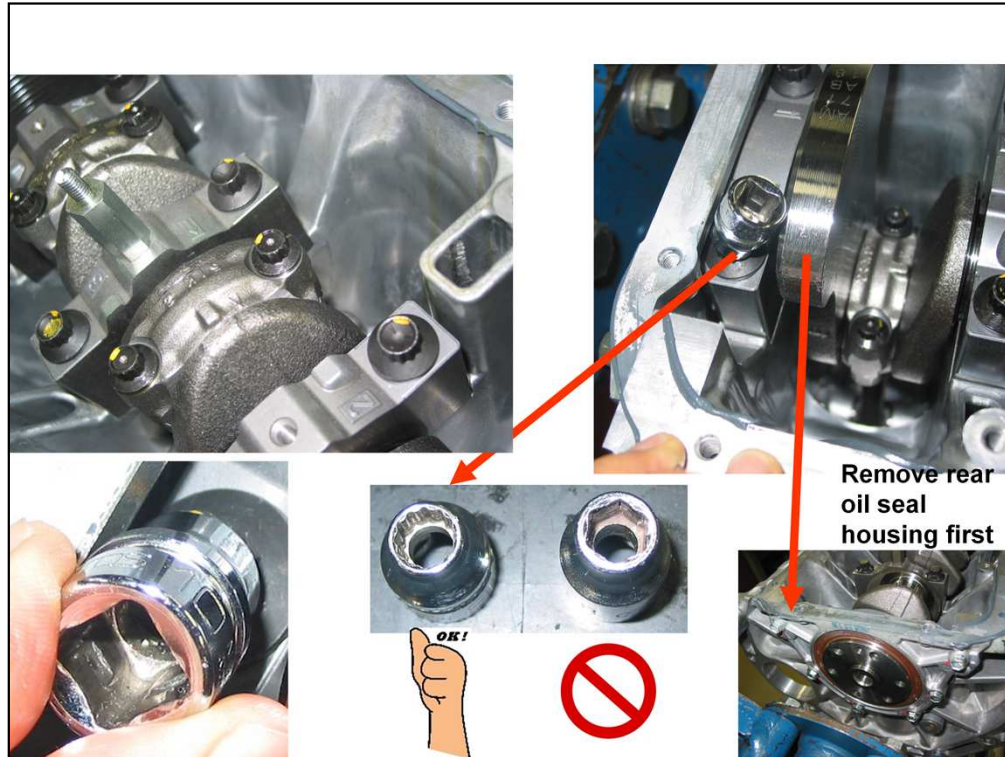


1-1

10. Cylinder block (continued)

- Iron sleeve is cast into aluminum alloy cylinder.

1-1

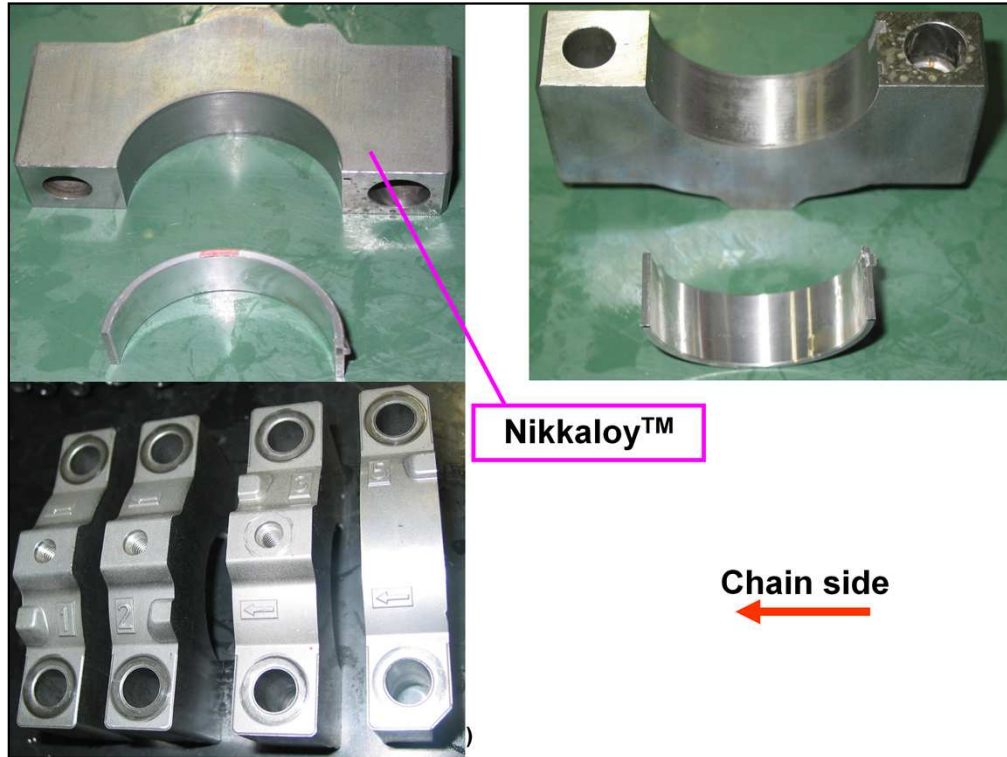


1-1

### 10.1 Crankshaft bearing caps

- Plastic range tightening bolts, which fit crankshaft journal bearing cap, increases rigidity around crankshaft and reduce noise and vibration.
- Use a size 10 socket to loosen/tighten crankshaft bearing cap bolts. Socket must be a 12-point type.
- Socket cannot be well fitted to No.4 bearing cap bolt head due to rear oil seal housing.
- The rear oil seal housing, therefore, should be removed if No.4 bearing cap needs removal.

1-1



1-1

### 10.1 Crankshaft bearing caps (continued)

- Main bearing cap is made of metal alloy called “Nikkaloy™”.
- "Nikkaloy™" is a special alloy developed by HITACHI Powdered Metal Co. Ltd. Nikkaloy™ is their registered trade mark of powder metallurgical products which are produced from metal powders such as Iron, Copper and others in specific ratio in weight, and compacted in tool then sintered at a temperature below melting point of main raw material.
- Density of Nikkaloy™ used as K14B main bearing cap is approximately  $6.8 \text{ g/cm}^3$ , smaller than that of pure steel ( $7.8 \text{ g/cm}^3$ ).
- The high precision forming capability of the parts are produced to near net shapes with complex features and close dimensional precision to eliminate and reduce secondary processes. Its flexibility allows us to tailor the physical characteristics of a product to meet our unique specifications and performance requirements. A unique technique is used to spread the powder material within the die cavity to obtain an even density in multi-level parts. These, in turn, yield benefits in lower costs and greater versatility.

Note:

## Engine service -K10B-

- A stud bolt is fitted to No.3 cap to fit the baffle plate
- In K10B engine, there is no No.4 cap

1-1

1-1

1-1



1-1

## 10.2 Crankshaft bearing cap bolts

- Before reusing plastic tightening range bolts, check them for deformation. Measure diameter at points "a" and "b". The difference between obtained values "A" and "B" should be less than 0.2mm.
- If "A"-"B" exceeds this service limit, the bolt should be replaced with a new one.

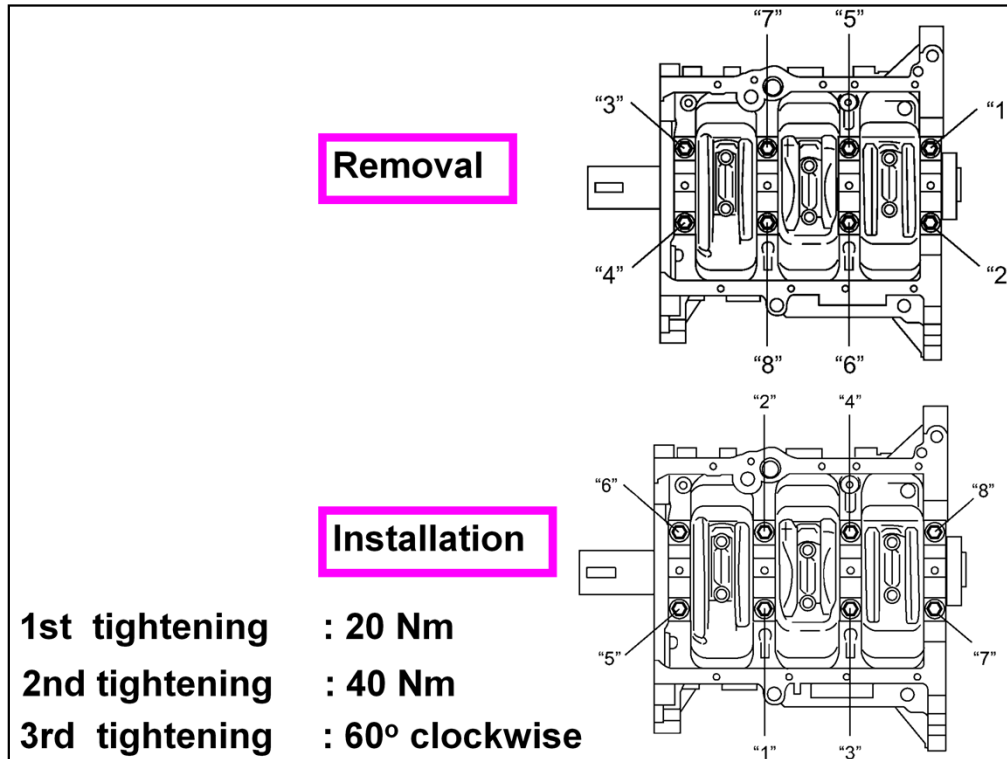
Reference : M engines

Service limit is 0.2 mm between 60-mm and 90 mm points.



1-1

1-1



### 10.2 Bearing cap bolts - removal and installation

- Upper : Bolt removal order
- Lower : Bolt installation order

		<b>K10B</b>
Crankshaft	Material	Steel
	Journal diameter	45
	Pin diameter	38
	Crank diameter	39.65
	Total length	357.65
Main bearing	Base material	Aluminum alloy
	Backing material	Steel
	Central thickness (mm)	2.0
Thrust bearing	Base material	Aluminum alloy
	Backing material	Steel
	Central thickness (mm)	2.5

1-1

1-1

## 11. Crankshaft

### 11.1 Crankshaft specifications

- This page shows the specification of the crankshaft.
- Crankshaft is made of steel by SUMITOMO METAL Industries, Ltd.

1-1



1-1

### 11.1 Crankshaft balancer weights

- Balance weight is a totally parallel type.
- CKP sensor plate is fitted to crankshaft counterweight No.1 by pin and screws.

1-1

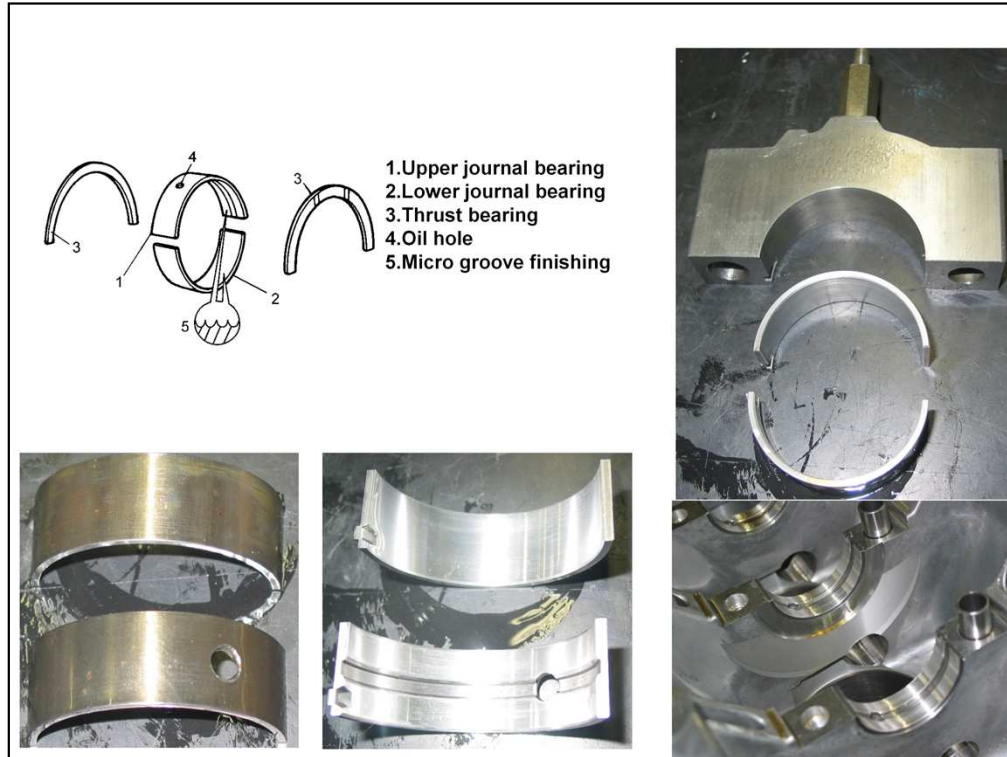


1-1

### 11.2 CKP sensor plate

- CKP sensor plate is similar to M engine's one. The number of teeth is different.
- K10B/K12B : 32 teeth (36-2-2)
- M13A/M15A/M16A/M18A : 30 teeth (36-2-2-2)

1-1



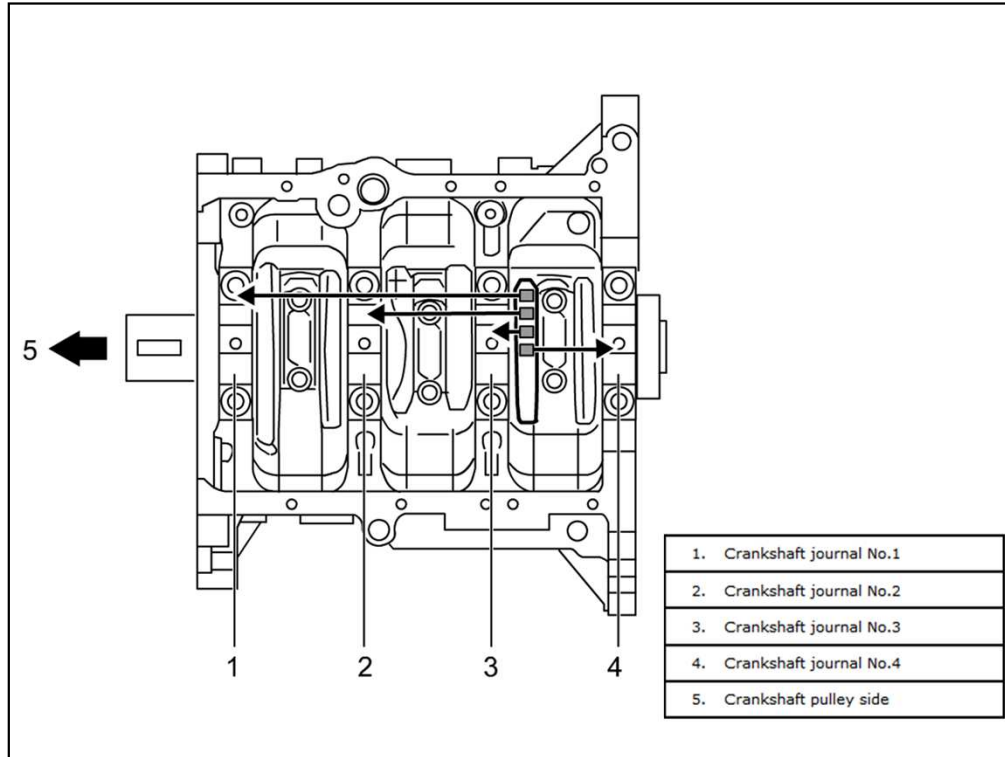
1-1

## 12. Main bearings

- A micro groove type is used for both upper and lower journal bearings to maintain oil film so that seizing might be prevented. Thanks to micro groove type, the clearance has been scaled down, which results in reduction of noise and vibration.



1-1



1-1

## 12. Main bearings

### 12.1 Bearing Selection

If engine is under one of the following conditions, select new standard bearings and install it.

- Bearing is in defective condition.
- Bearing clearance is out of specification.
- Crankshaft or cylinder block is replaced

#### Bearing selection

1) Check crankshaft journal diameter.

a) There are four stamped numbers (any of “1” through “6”) on crank web No.5 as shown in figure.

b) Those numbers represent crankshaft journal diameter as follows.

1- Crankshaft journal No.1


Engine service -K10B-

- 2- Crankshaft journal No.2
- 3- Crankshaft journal No.3
- 4- Crankshaft journal No.4
- 5- Crankshaft pulley side

**1-1**

**1-1**

1-1



Example:  
Numbers stamped  
on this crankshaft  
web

Stamped numbers	Journal diameter
1	45.015-45.018
2	45.012-45.015
3	45.009-45.012
4	45.006-45.009
5	45.003-45.006
6	45.000-45.003

1-1

12.1 Bearing Selection (continued)

- Determine crankshaft journal diameter for journals No.1 through No.4 using stamped numbers and following table

Cylinder block journal inside diameter

Example:  
4 4 4 4  
stamped in this cylinder  
block)

Stamped alphabet	Cylinder block journal inside diameter
A or 1	49.000-49.003
B or 2	49.003-49.006
C or 3	49.006-49.009
D or 4	49.009-49.012
E or 5	49.012-49.015
F or 6	49.015-49.018

1-1

1-1

### 12.1 Bearing Selection (continued)


2) Check cylinder block journal inside diameter.

a) There are four stamped letters (any of “A” through “F”) on Lower crank case as shown in figure.

b) Those letters represent cylinder block journal inside diameter as shown in the reference table

Bearing selection chart

			Number stamped on crank web No.2					
			1	2	3	4	5	6
Alphabet on cylinder block	A	Upper	Pink	Pink	Pink	Purple	Purple	Brown
		Lower	Pink	Pink	Purple	Purple	Brown	Brown
	B	Upper	Pink	Pink	Purple	Purple	Brown	Brown
		Lower	Pink	Purple	Purple	Brown	Brown	Green
	C	Upper	Pink	Purple	Purple	Brown	Brown	Green
		Lower	Purple	Purple	Brown	Brown	Green	Green
	D	Upper	Purple	Purple	Brown	Brown	Green	Green
		Lower	Purple	Brown	Brown	Green	Green	Black
	E	Upper	Purple	Brown	Brown	Green	Green	Black
		Lower	Brown	Brown	Green	Green	Black	Black
	F	Upper	Brown	Brown	Green	Green	Black	Black
		Lower	Brown	Green	Green	Black	Black	Black

**1. Color**

Color	Journal bearing thickness	Stamped numbers	Journal diameter	Stamped alphabet	Journal bore diameter
Pink	1.990-1.993	1	45.015-45.018	A or 1	49.000-49.003
Purple	1.993-1.996	2	45.012-45.015	B or 2	49.003-49.006
Brown	1.996-1.999	3	45.009-45.012	C or 3	49.006-49.009
Green	1.999-2.002	4	45.006-45.009	D or 4	49.009-49.012
Black	2.002-2.005	5	45.003-45.006	E or 5	49.012-49.015
		6	45.000-45.003	F or 6	49.015-49.018

1-1

1-1

### 12.1 Bearing Selection (continued)

How to select a proper pair of main bearings.

- There are 5 kinds of standard bearings differing in thickness. To distinguish them, they are painted in the following colors at the position (1 on bearing) as shown in figure. Each color indicates the thickness at the center of the bearing.

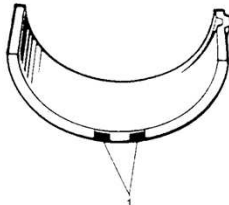


		Measured journal diameter (mm)						
		44.765-44.768	44.762-44.765	44.759-44.762	44.756-44.759	44.753-44.756	44.750-44.753	
Alphabet on lower crankcase	A	Up	RED/PNK	RED/PNK	RED/PNK	RED/PPL	RED/PPL	RED/BRN
		Lo	RED/PNK	RED/PNK	RED/PPL	RED/PPL	RED/BRN	RED/BRN
	B	Up	RED/PNK	RED/PNK	RED/PPL	RED/PPL	RED/BRN	RED/BRN
		Lo	RED/PNK	RED/PPL	RED/PPL	RED/BRN	RED/BRN	RED/GRN
	C	Up	RED/PNK	RED/PPL	RED/PPL	RED/BRN	RED/BRN	RED/GRN
		Lo	RED/PPL	RED/PPL	RED/BRN	RED/BRN	RED/GRN	RED/GRN
	D	Up	RED/PPL	RED/PPL	RED/BRN	RED/BRN	RED/GRN	RED/GRN
		Lo	RED/PPL	RED/BRN	RED/BRN	RED/GRN	RED/GRN	RED/BLK
	E	Up	RED/PPL	RED/BRN	RED/BRN	RED/GRN	RED/GRN	RED/BLK
		Lo	RED/BRN	RED/BRN	RED/GRN	RED/GRN	RED/BLK	RED/BLK
	F	Up	RED/BRN	RED/BRN	RED/GRN	RED/GRN	RED/BLK	RED/BLK
		Lo	RED/BRN	RED/GRN	RED/GRN	RED/BLK	RED/BLK	RED/BLK

**Finished journal diameter : 44.750 – 44.768 mm**

Color	Journal bearing thickness
	2.115-2.118
	2.118-2.121
	2.121-2.124
	2.124-2.127
	2.127-2.130



**1. Double Color**

1-1

1-1

12.1 Bearing Selection (continued)

- 0.25 mm undersize bearing is available, in five kinds varying in thickness.
- To distinguish them, each bearing is painted in the following colors at such position as indicated in figure.
- Each color represents the following thickness at the center of bearing.
- If necessary, regrind crankshaft journal and select undersize bearing to use with it as follows.

1) Regrind journal to the following finished diameter.

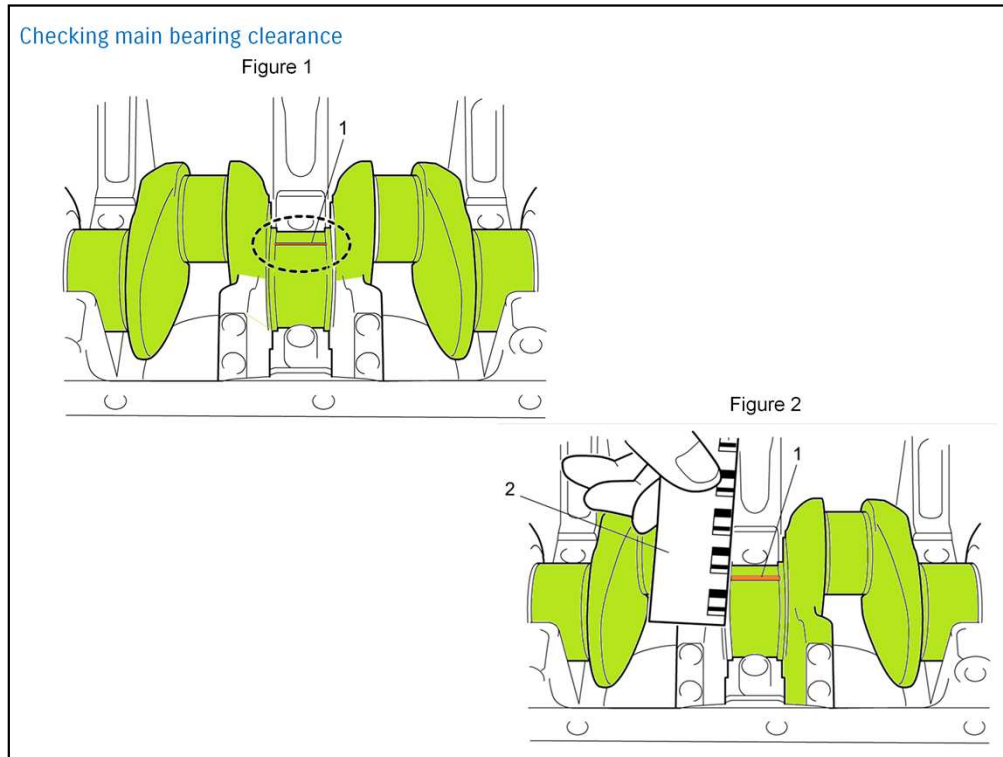
**Finished journal diameter**

**45.2500 – 45.2580 mm**

2) Using micrometer, measure reground journal diameter.

- Measurement should be taken in two directions perpendicular to each other in order to check for out-of-round.

3) Using journal diameter measured above and alphabets stamped on cylinder block, select undersize bearing referring to cross-reference table given above. Check bearing clearance with newly selected undersize bearing (procedure shown on next page)



1-1

1-1

## 12.2 Procedure to check main bearing clearance

- 1) Remove main bearing caps.
- 2) Clean bearings and crankshaft journals.
- 3) Place a piece of gauging plastic (figure 1(1)) over the full width of bearing (parallel to crankshaft) on journal, avoiding oil hole.
- 5) Install main bearing cap by following the main bearing cap installation procedure.
- 5) After three minutes, remove main bearing cap and using scale (Figure 2 (2)) on gauging plastic envelope (Figure 2(1)), measure gauging plastic width at its widest point.

### Main bearing clearance

Standard: 0.016 – 0.034 mm (0.00063 – 0.00133 in.)

Limit: 0.050 mm (0.00196 in.)

- If measured clearance is less than standard or more than service limit, replace main bearings with new ones referring to Selection of Main Bearings and recheck main bearing clearance.

## Engine service -K10B-

- If measured clearance with new bearings is out of standard, select other bearings according to the following procedures and recheck main bearing clearance.

- More than standard:

Replace bearing with one size thicker or regrind crank shaft journal to undersize and use 0.25 mm undersize bearing (0.0098 in).

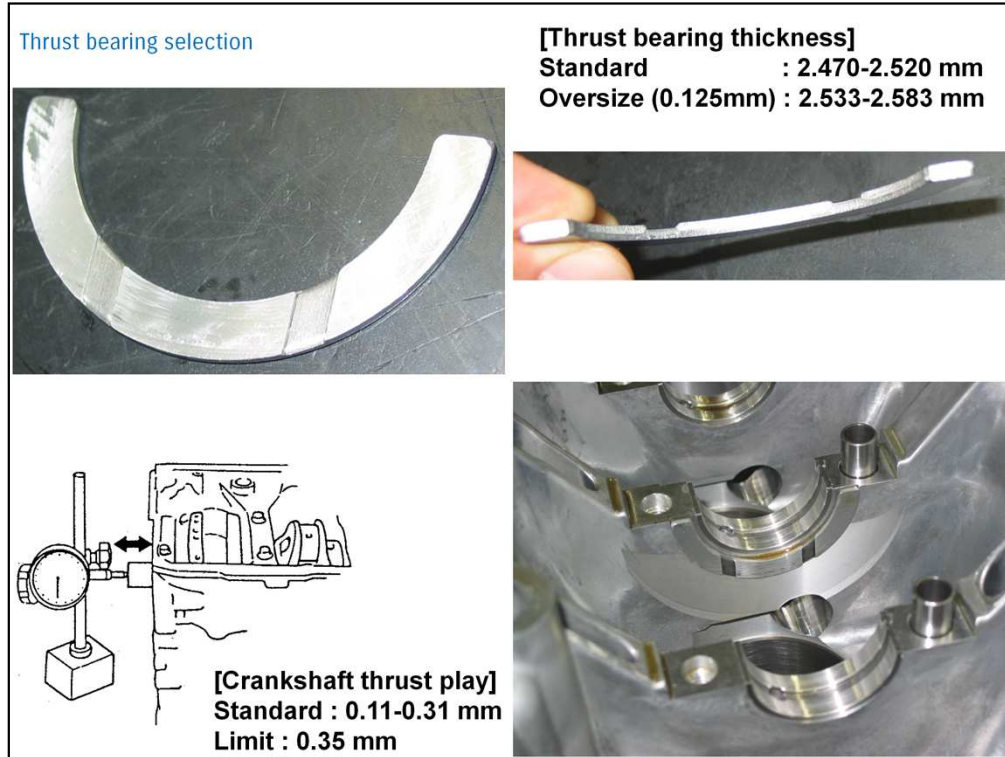
- Less than standard:

Replace bearing with one size thinner or regrind crank shaft journal to undersize and use 0.25 mm undersize bearing (0.0098 in).

1-1

1-1

1-1



1-1

### 12.3 Thrust bearing selection

- Using a dial gauge, measure play in axial (thrust) direction of crankshaft.
- If its limit is exceeded, replace thrust bearing with new standard one or oversize one to obtain standard thrust play.
- Thrust bearing is fitted between cylinders No.2 and No.3.

#### **Crankshaft thrust play**

**Standard: 0.11 – 0.31 mm (0.0043 – 0.0122 in.)**

**Limit: 0.35 mm (0.0138 in.)**

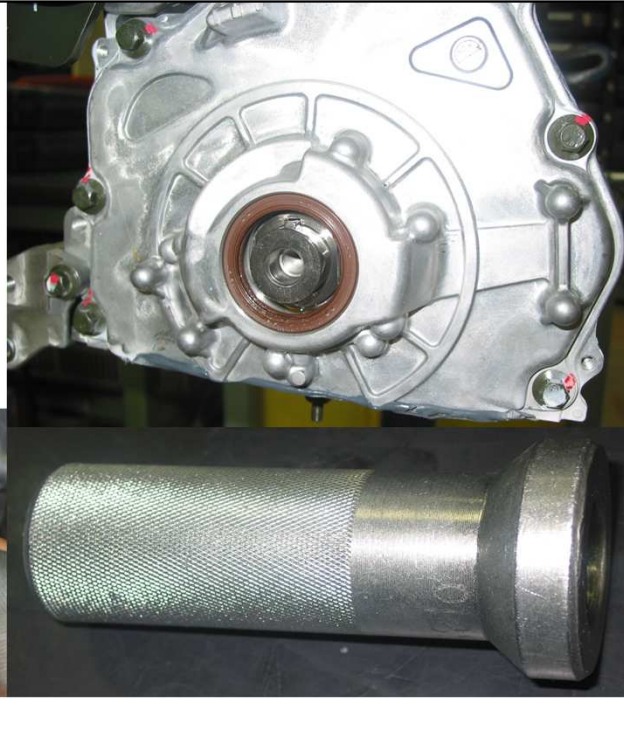
#### **NOTE:**

**After checking the thrust play, make sure that thread deformation of each main bearing cap bolt.**

15. Crankshaft oil seal

**Front oil seal**

**Use 09913-75810**



1-1

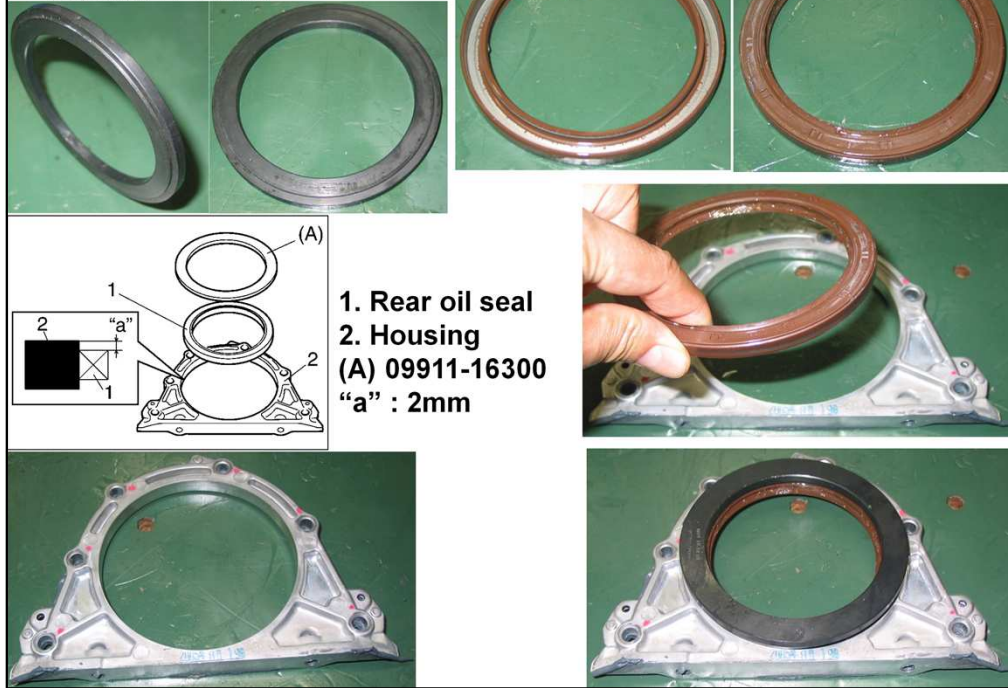
1-1

13. Crankshaft oil seal

- Special tool to fit the crankshaft front oil seal.



**Rear oil seal**  
**Use 09911-16300**



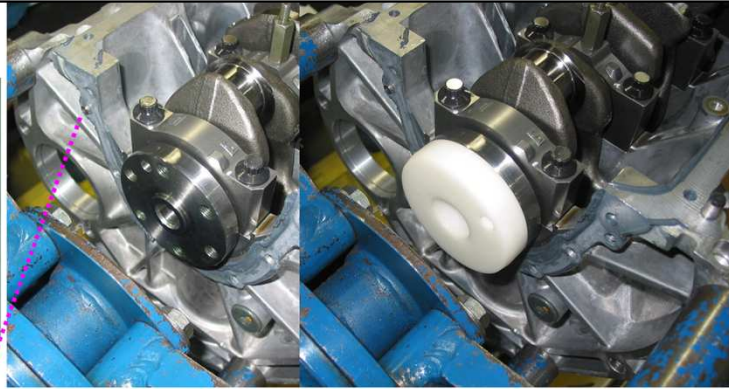
1-1

1-1

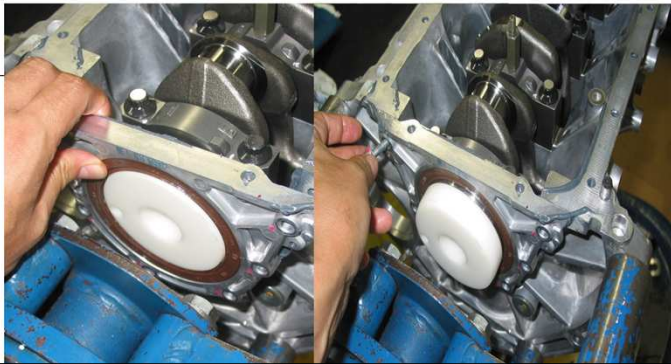
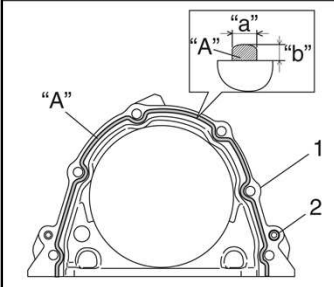
13. Crankshaft oil seal (continued)

Special tool 09911-97610 provides a proper fitting of crankshaft rear oil seal.

Rear oil seal  
Use 09911-97720



- 1. Housing
  - 2. Dowel pin
- "A" : 99000-31260  
"a" : 3 mm  
"b" : 2 mm



1-1


1-1

### 13. Crankshaft oil seal (continued)

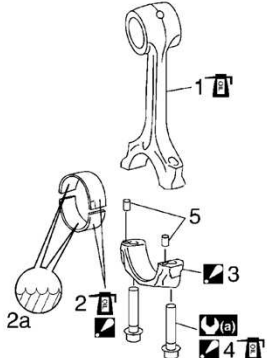
- Install dowel pin (2) to oil seal housing.
- Before fitting crankshaft rear oil seal housing to cylinder block, apply sealant as shown above.

1-1

		(mm)	<b>K10B</b>	
Connecting rod	Material		Steel	
	Lower diameter		41	
	Upper diameter		18	
Connecting rod bearing	Center to center distance		133.7	
	Base material		Aluminum alloy	
	Finishing material		Steel	
	Central thickness	Standard		1.5
Undersize			1.605-1.615	

1. Connecting rod  
 2. Connecting rod bearing  
 2a. Micro-groove  
 3. Connecting rod cap  
 4. Connecting rod bolt  
 5. Dowel pin



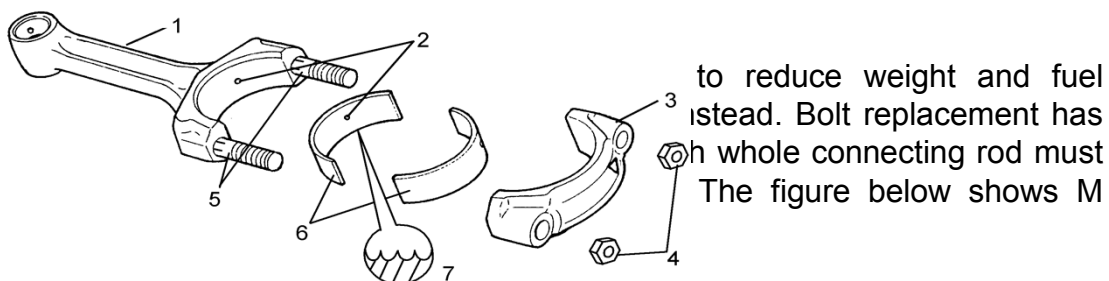
1-1

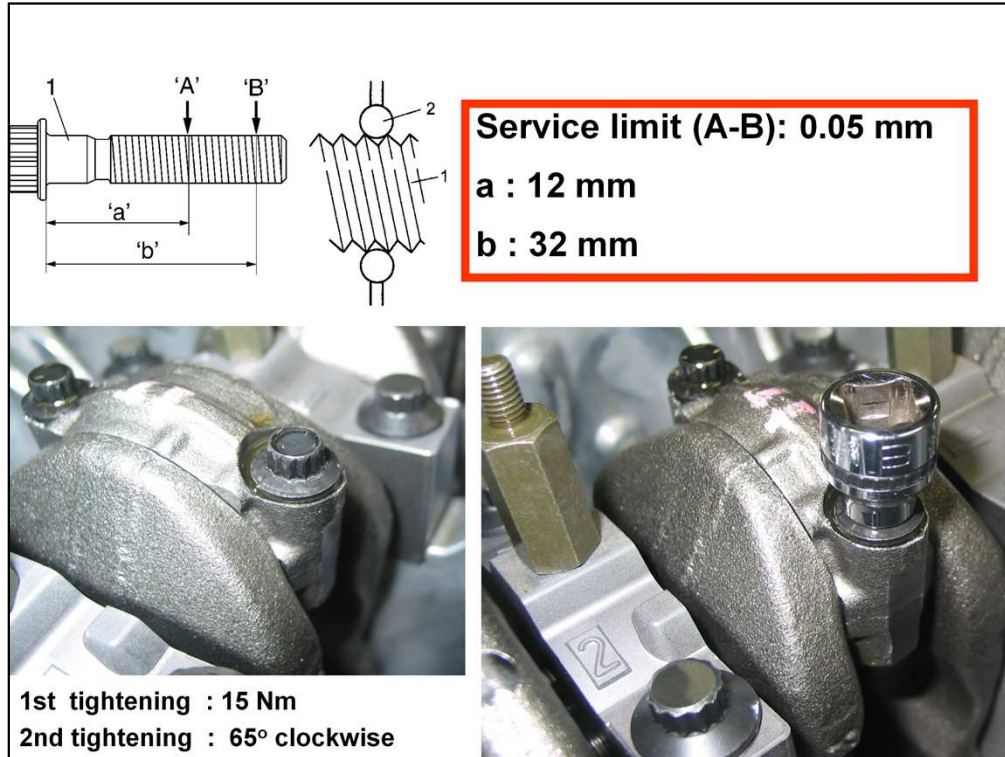
#### 14. Connecting rods

- Connecting rods are made of steel and have H-shaped cross section.
- Connecting rod cap is fitted to connecting rod by tightening bolts with a plastic range torque to stabilize bolt axial strength.
- The large end has oil jet to lubricate small end, piston and cylinder inner surface.
- Connecting rod bearing is finished with micro groove.

NB:

- Do not apply engine oil to outer surface of bearings.
- Do not apply engine oil to inner surface of bearing cap.
- Check bolts for deformation.



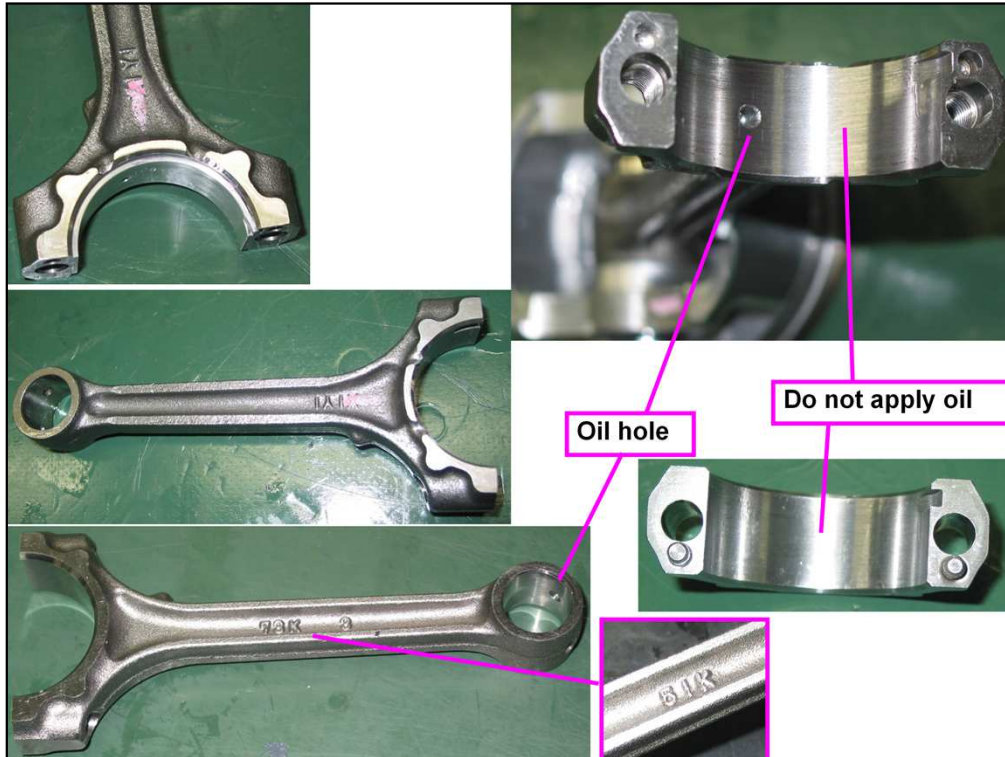


#### 14. Connecting rods (continued)

- Before reusing connecting rod, check it for deformation.
- Measure diameter at two points shown above. The difference between obtained values "A" and "B" should be less than 0.05 mm.
- Use a size-8 type 12-point socket to loosen/tighten the connecting rod bolts.



1-1



1-1

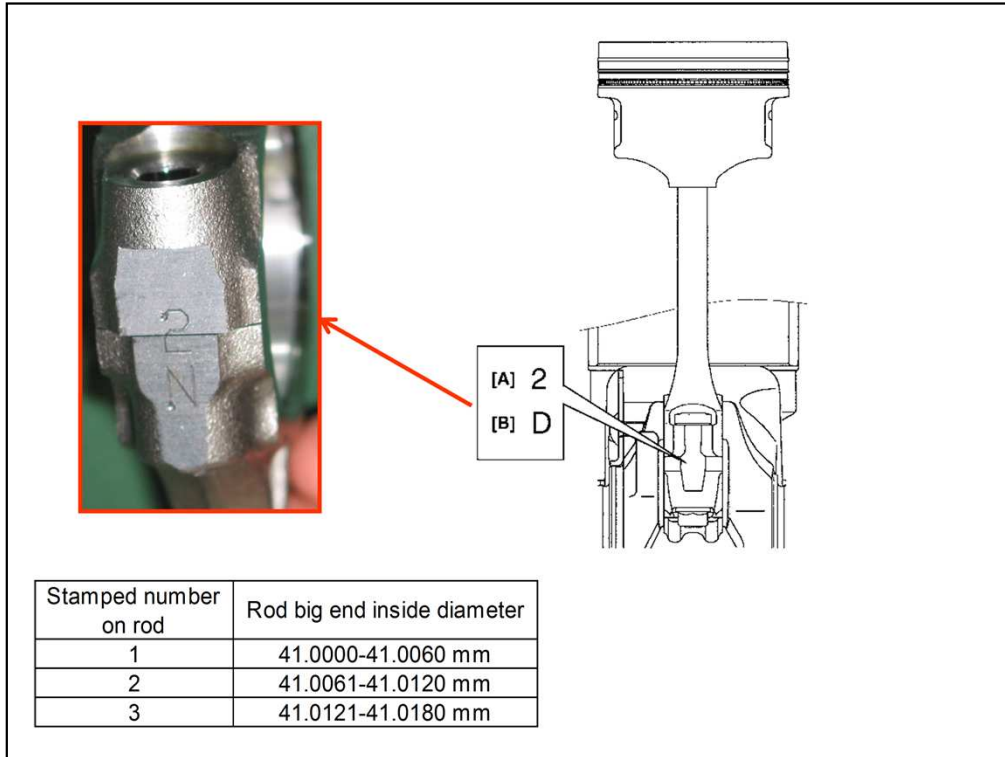
#### 14. Connecting rods (continued)

- Connecting rod larger end has an oil hole to supply crank pin with engine oil.
- Do not apply engine oil to connecting rod larger end mating surface with bearing.
- Do not apply engine oil to inner surface of connecting rod cap.

Mark on the rod is “51K” for K10B engine.



1-1



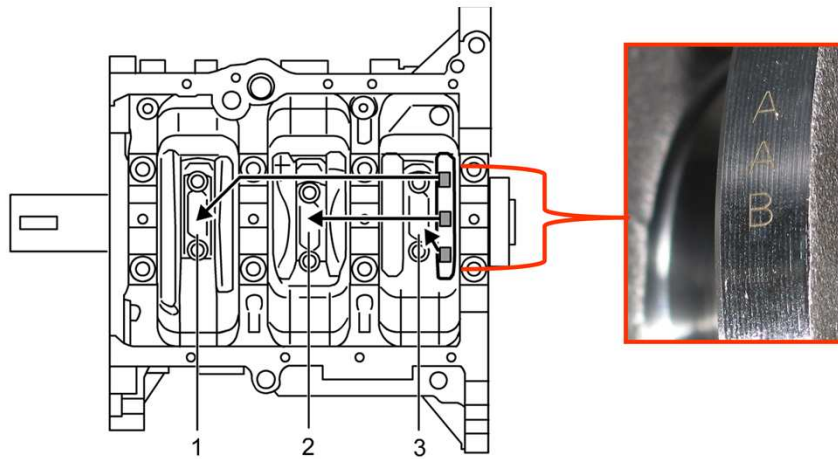
1-1

#### 14. 1 Selecting connecting rod bearings

- Stamped number on connecting rod with cap indicates connecting rod big end inside diameter as shown above.

[A] Stamped number (indicates inside diameter of connecting rod)

[B] Weight (not for service)

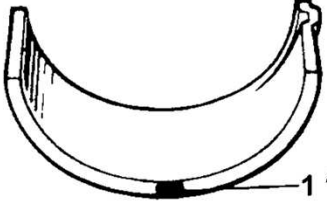


Stamped alphabet on crank web No.6	Crankshaft pin diameter
A	37.9940-38.0000 mm
B	37.9880-37.9939 mm
C	37.9820-37.9879 mm

#### 14. 1 Selecting connecting rod bearings

Stamped alphabet on crank web No.6 indicates diameter at corresponding crankshaft pin.

Selecting connecting rod bearings



Blue	1.4981-1.5010 mm
Yellow	1.4951-1.4980 mm
Nothing	1.4921-1.4950 mm
Black	1.4891-1.4920 mm
Green	1.4860-1.4890 mm
Red (Undersize)	1.6050-1.6150 mm

		Stamped number on rod with cap		
		1	2	3
Stamped alphabet on crank web No.5	A	Green	Black	Nothing
	B	Black	Nothing	Yellow
	C	Nothing	Yellow	Blue

1-1

1-1

#### 14. 1 Selecting connecting rod bearings

- This page shows how to select a proper thickness of connecting rod bearing.
- If undersize bearing is used, confirm that connecting rod bearing clearance is within standard value shown below.

**Connecting rod bearing clearance:**

**Standard : 0.039-0.065 mm, Limit : 0.075 mm**

1-1

(mm)		K10B
Piston	Destination	Others
	Compression Ratio	10.0
	Material	Aluminum alloy
	Top volume (cc)	3.4
	Outer diameter (mm)	72.990-73.025
	Height (mm)	44.25
	Pin to top distance	27.25

1. Single dot mark : Timing chain side  
2. Dry film coating

1-1

15. Pistons, piston rings and piston pin

- Piston is made of aluminum alloy.
- Outer surface of piston skirt is finished with dry film coating to reduce friction. Dry film is of an organoresin compound.

[11.0 compression ratio specification]

The top surface is flat.

- There are valve recesses for intake valves.

Single dot mark indicates timing chain side.

[10.0 compression ratio specification]

A big top volume exists.

Single dot mark indicates timing chain side.

1-1

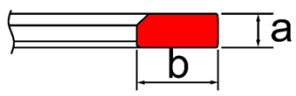
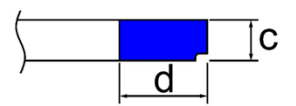
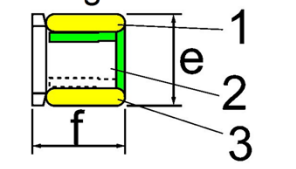


1-1

15. Pistons, piston rings and piston pin (continued)

- Piston pin is held by a pair of snap rings.
- Snap ring cannot be reused once removed.



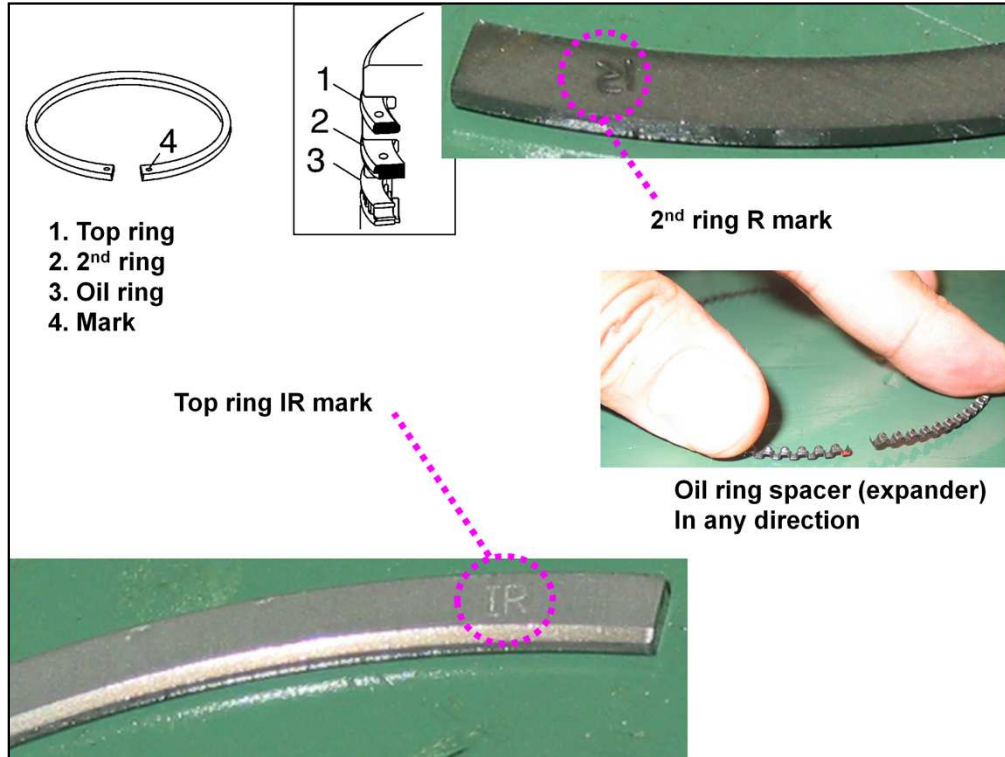
		1. Upper rail 2. Spacer 3. Lower rail
<b>1st ring</b> 	Width (a)	1.0 mm
	Thickness (b)	2.3 mm
	Shape	Barrel face
	Surface finishing	Zinc phosphate + PVD on outer surface
<b>2nd ring</b> 	Width (c)	1.2 mm
	Thickness (d)	2.5 mm
	Shape	Taper under cut
	Surface finishing	Zinc phosphate
<b>Oil ring</b> 	Width (e)	2.0 mm
	Thickness (f)	1.9 mm
	Shape	Multi-piece
	Surface finishing	Zinc phosphate (rail) + PVD on outer surface

1-1

1-1

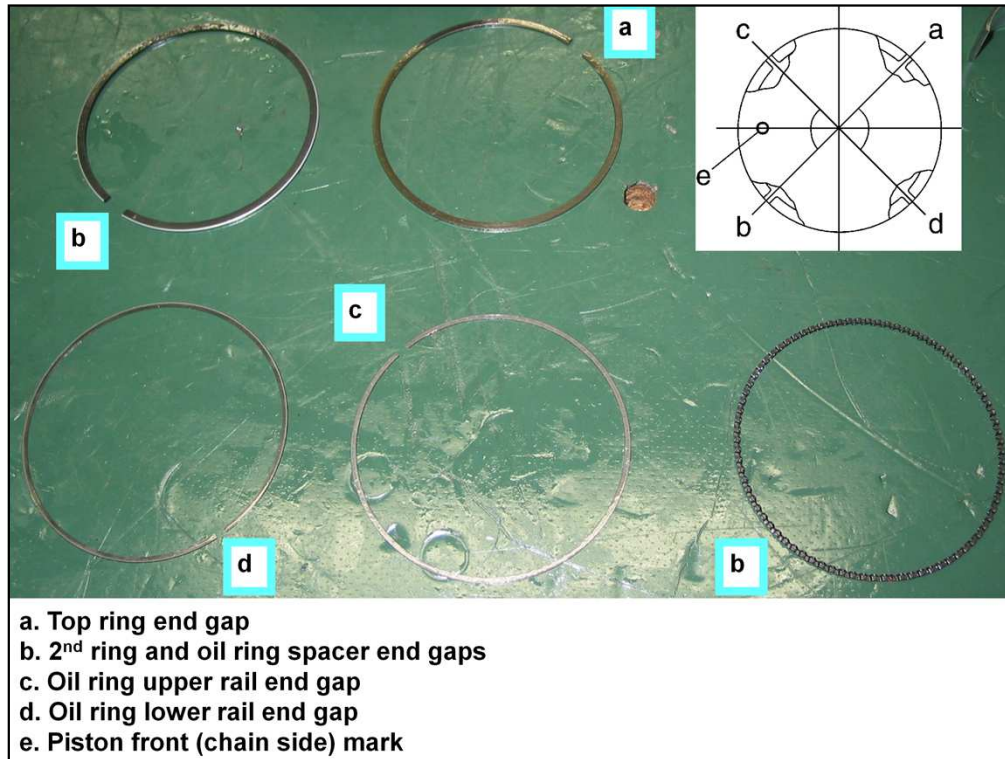
15. Pistons, piston rings and piston pin (continued)

- The 1<sup>st</sup> ring is of barrel type for smoother initial movement of piston.
- The second ring is of taper under cut type to improve combustion efficiency.
- Outer surface of 1<sup>st</sup> ring and oil ring is finished with physical vapor deposition process to increase durability.



15. Pistons, piston rings and piston pin (continued)

- Top ring and 2<sup>nd</sup> ring have a discrimination mark. The mark should face upward.
- Oil rings do not have a mark. Oil rings can be fitted in any direction.
- Oil ring spacer (expander) also can be fitted in any direction.



1-1

1-1

15. Pistons, piston rings and piston pin (continued)

- After installing all piston rings to the piston, align end gaps as shown above.

18. Timing Chain

Timing chain			
Structure	77 links		
Sprocket			
	Crank	Intake cam	Exhaust cam
Number of teeth	23	46	46
Pitch (mm)	6.35	6.35	6.35

1-1

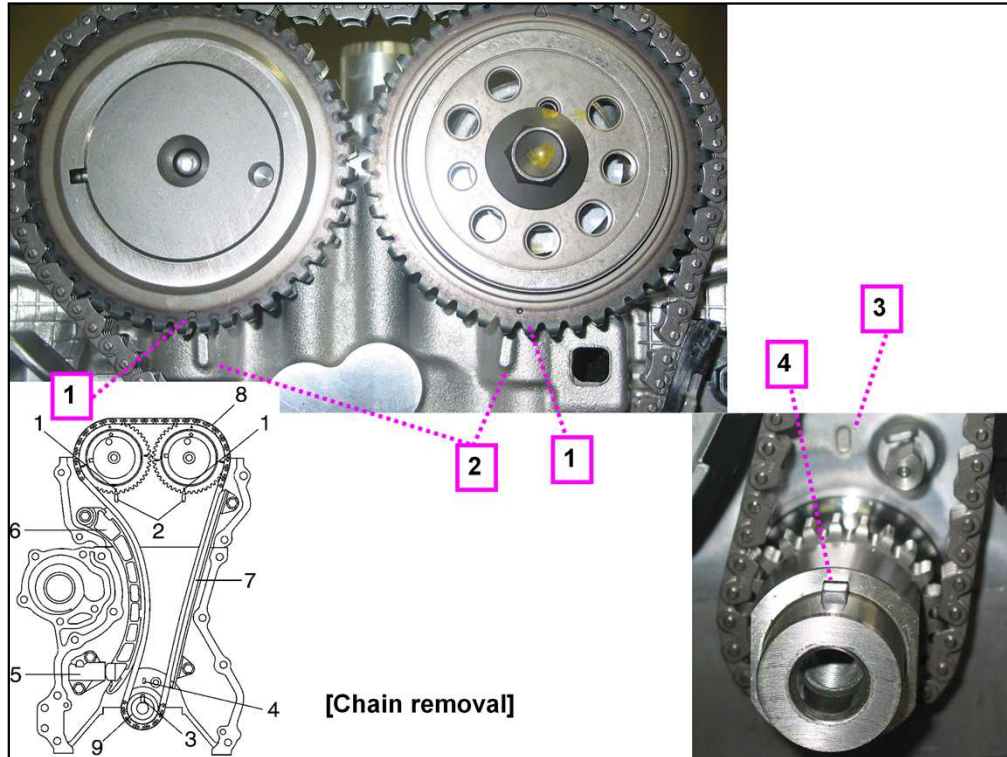
1-1

16. Timing chain

- The timing chain is a silent type.
- As inner plate has a mountain shape, it can be well engaged with sprocket. It therefore produces less noise compared with a roller type chain.
- Chain pitch is much shorter than M engines. This provides a better fitting of the chain onto the sprocket. This means K10B generates smaller noise than M engines.

Timing chain			
Structure	130 teeth		
Sprocket			
	Crank	Intake cam	Exhaust cam
Number of teeth	19	38	38
Pitch (mm)	8.0	8.0	8.0

1-1



1-1

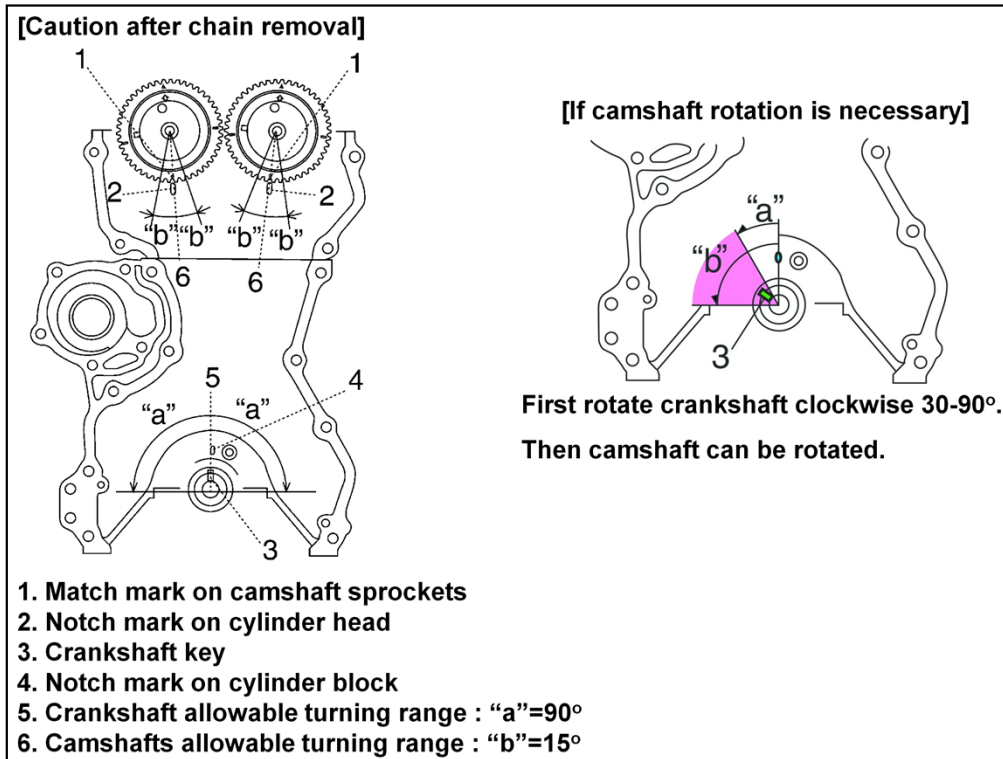
### 16. Timing chain (continued)

1. Camshaft timing sprocket dot mark
2. Cylinder head notch
3. Cylinder block notch
4. Crankshaft sprocket key
5. Timing chain tensioner adjuster
6. Timing chain tensioner
7. Timing chain guide
8. Timing chain

Before removing the timing chain, align 3 marks with 3 notches respectively to avoid interference between valve and piston.



1-1



1-1

16. Timing chain (continued)

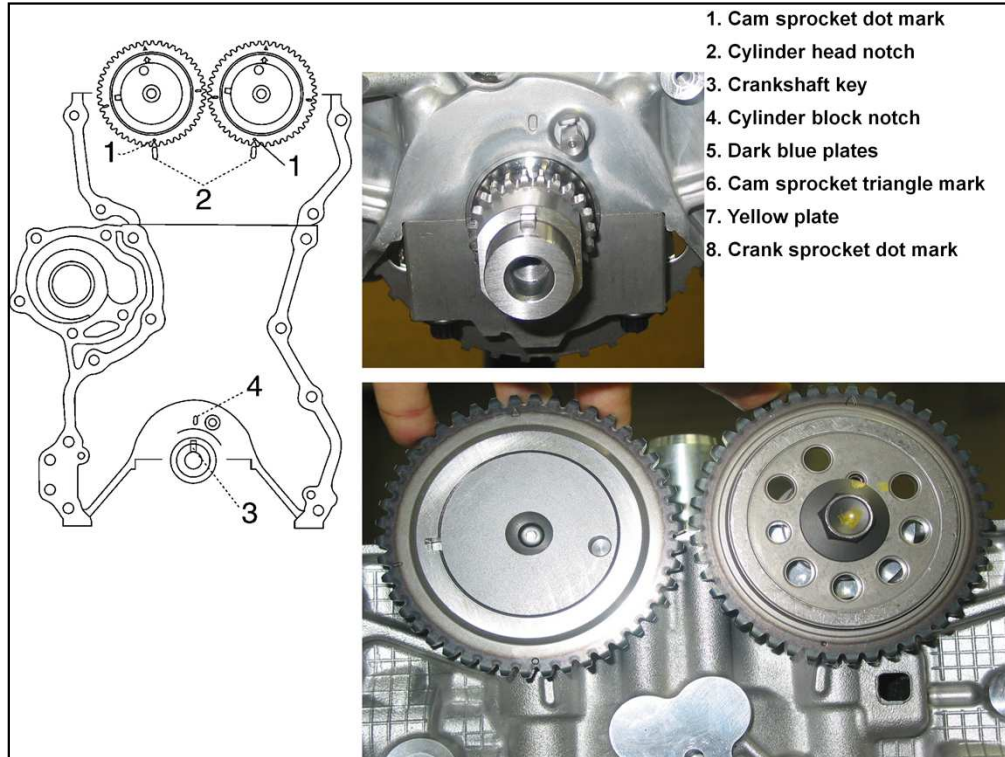
[Caution after timing chain removal]

After timing chain is removed, never turn crankshaft and camshafts independently more than such an extent ("a", "b") as shown in figure.

If turned, interference may occur between piston and valves and valves themselves, and parts related to piston and valves may be damaged.

[If camshaft rotation is necessary after chain removal]

If it is necessary to rotate the camshaft with the timing chain removed, rotate the camshaft after turning crankshaft clockwise 30 - 90° as shown in figure.

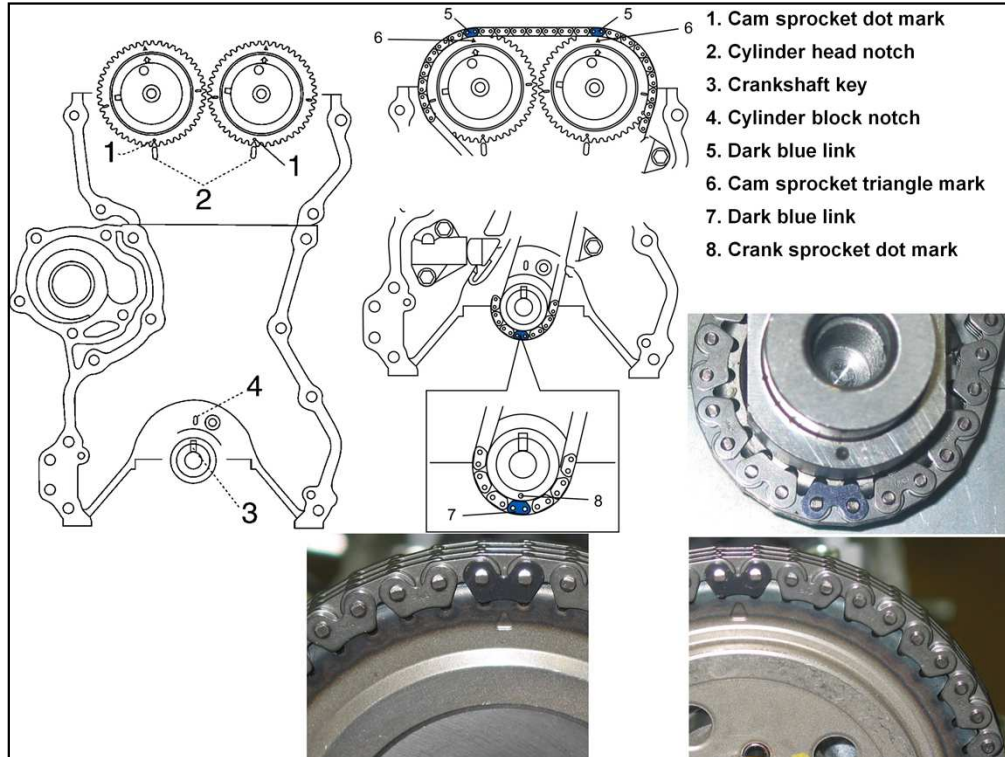


1-1

1-1

### 16.1 Chain installation

- If camshafts have been removed, install camshafts aligned as shown above.



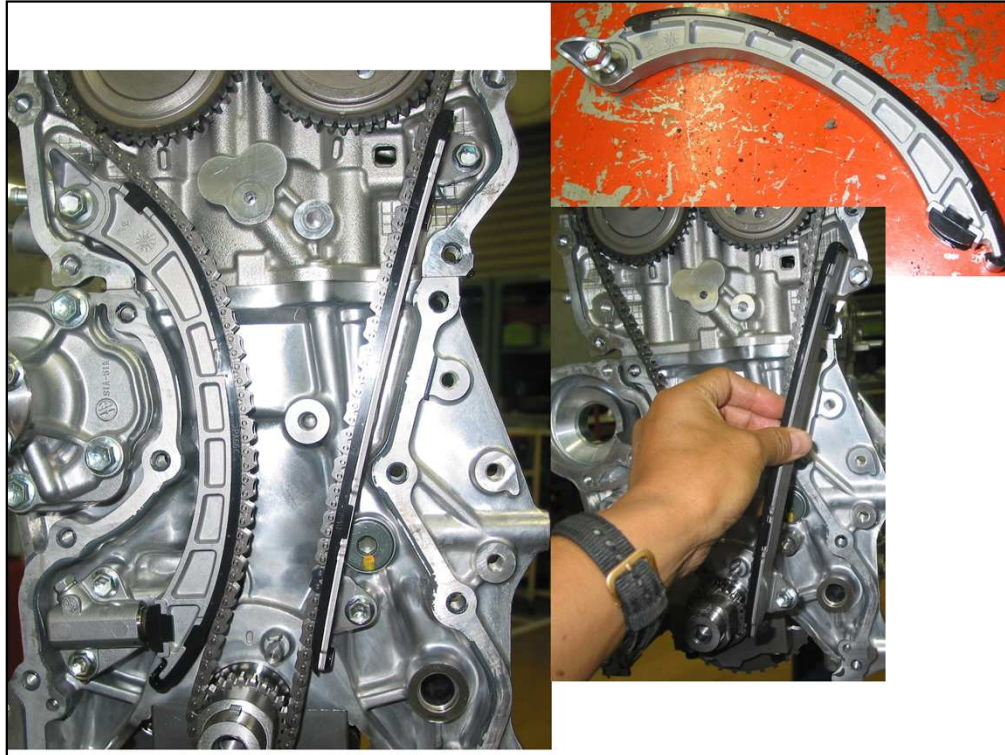
1-1

1-1

### 16.1 Chain installation (continued)

- Then fit the chain as shown above.

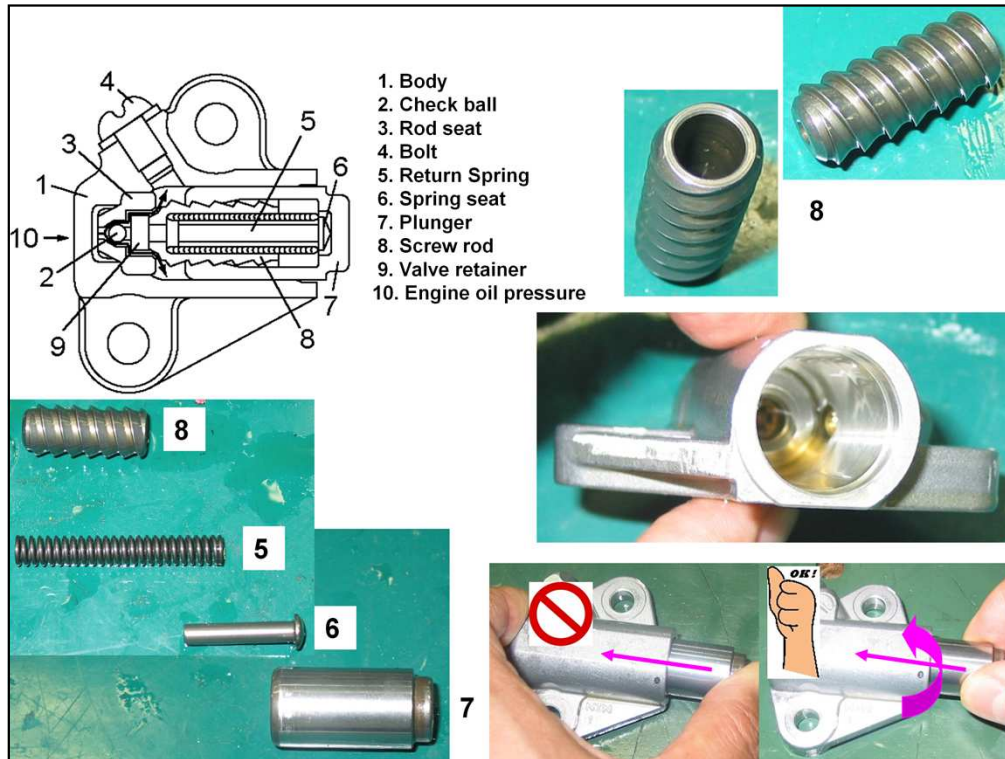
1-1



1-1

### 16.2 Chain guide/tensioner

- Chain tensioner consists of aluminum base and resin shoe. Resin shoe is clamped to the aluminum base.
- Chain guide consists of steel plate and resin shoe. Resin shoe is adhered to the steel plate.



1-1

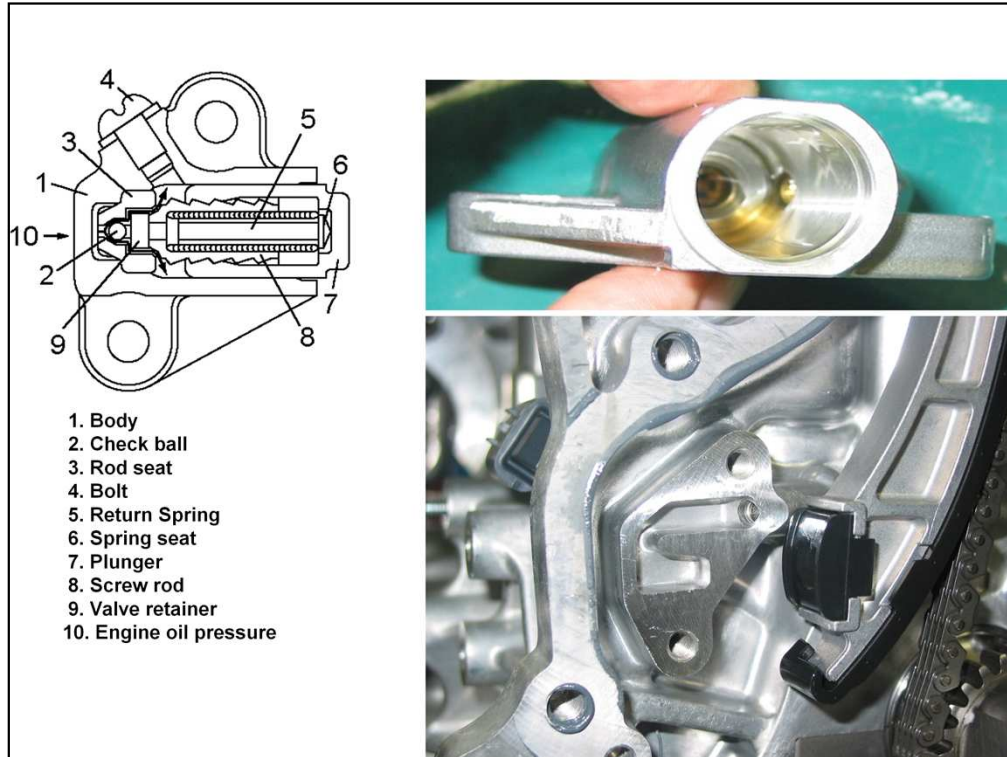
1-1

### 16.3 Tensioner adjuster

- Screw Rod Type chain tensioner adjuster.
- Plunger is pushed out by return spring and engine oil pressure to obtain a chain tension.
- Once the plunger is pushed out, it can not return freely due to screw rod resistance (due to a large thread pitch) and check ball that maintains hydraulic pressure in tensioner adjuster.
- If it is necessary to push the plunger into the body, turn the plunger clockwise (looking at the body from the left side in the picture above).



1-1

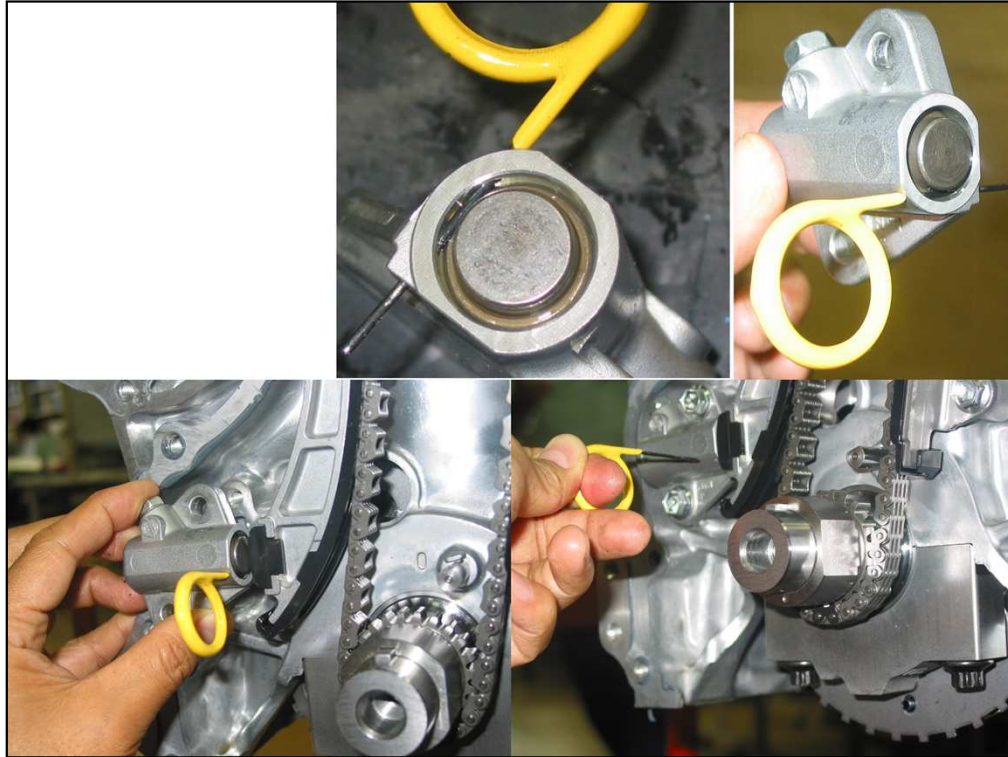


1-1

### 16.3 Tensioner adjuster (continued)

- Screw Rod Type chain tensioner adjuster.
- Plunger is pushed out by return spring and engine oil pressure to obtain a chain tension.
- Once the plunger is pushed out, it can not return freely due to screw rod resistance (due to a large thread pitch) and check ball that maintains hydraulic pressure in tensioner adjuster.
- If it is necessary to push the plunger into the body, turn the plunger clockwise (looking at the body from the left side in the picture above).

1-1

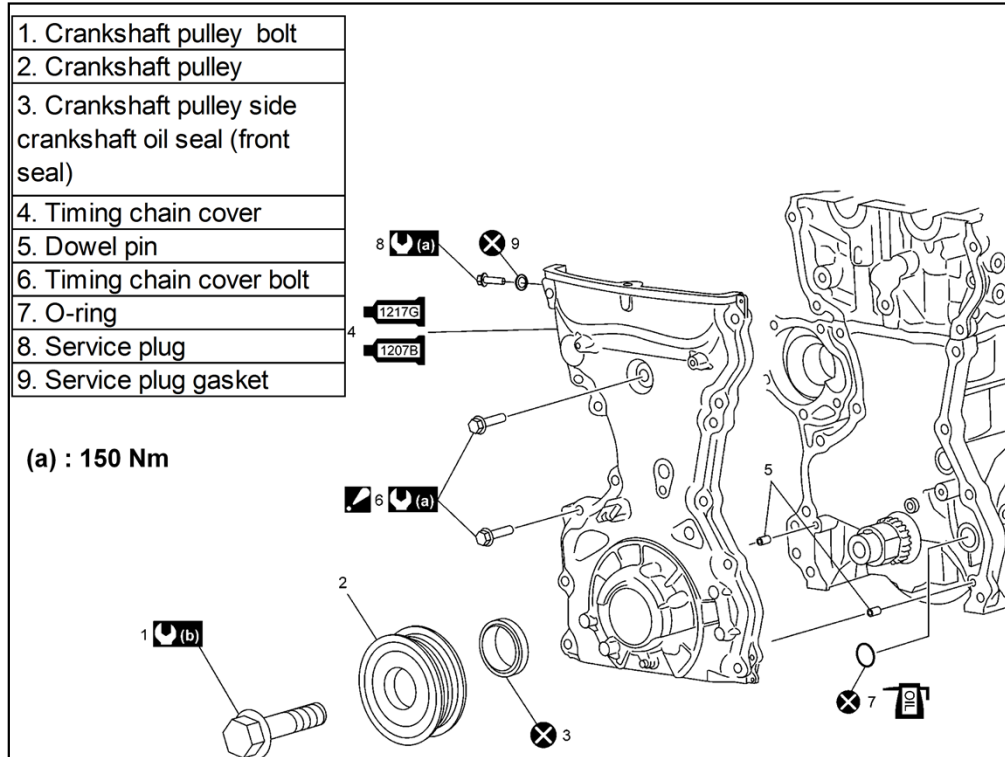


1-1

### 16.3 Tensioner adjuster (continued)

- Before installing the chain tensioner adjuster onto the cylinder block, fit timing chain, chain guide and chain tensioner. Push the plunger into the chain tensioner adjuster body completely and lock the plunger with a clip.
- Then install the chain tensioner adjuster to the cylinder block. After tightening the two bolts, extract the clip.

1-1

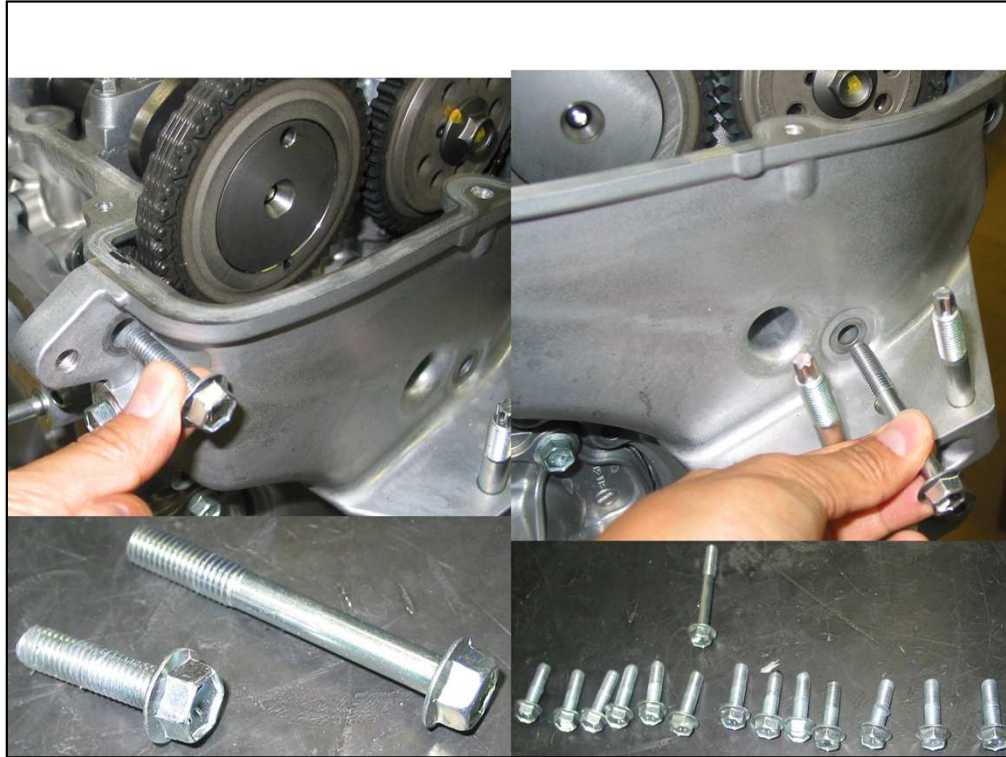


1-1

### 17. Chain cover

- Timing chain cover is made of aluminum alloy and include a trochoid type oil pump.
- Crankshaft pulley side (front) crankshaft oil seal is described in “12. Crankshaft Oil Seals” in this section.
- Dowel pins assure a proper fitting of timing chain cover to cylinder head and block.

1-1



1-1

17. Chain cover (continued)

- Timing chain cover is fitted to the cylinder block and cylinder head with 13 short bolts and 1 long bolt.

1-1



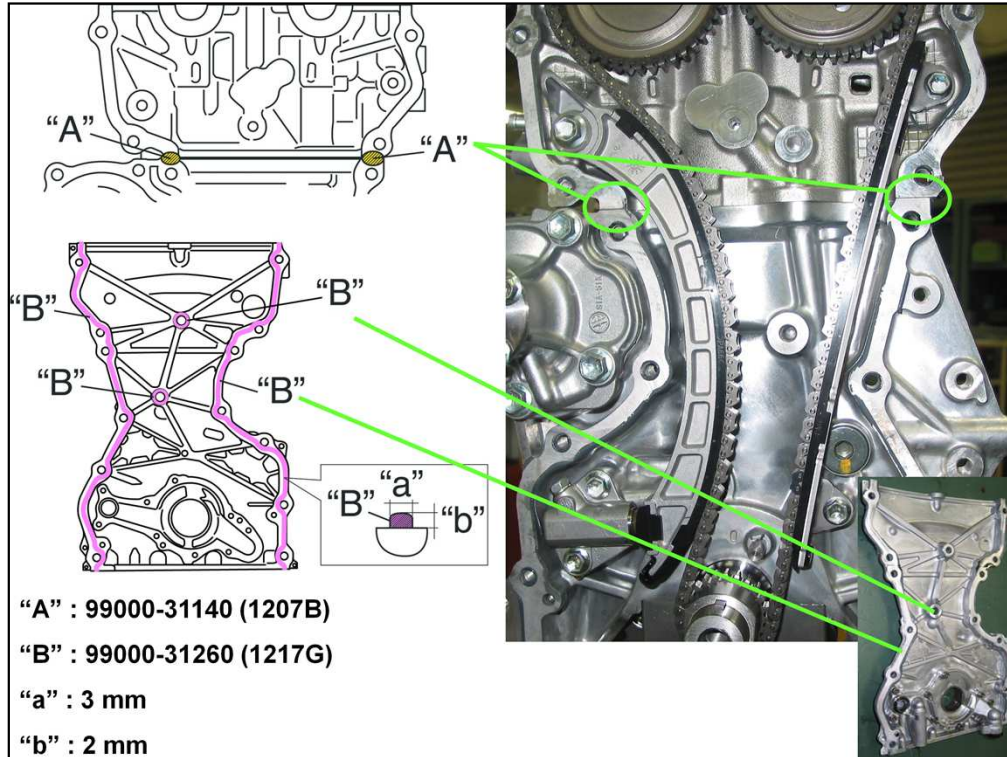
1-1

17. Chain cover (continued)

These pictures show overview of timing chain cover.



1-1

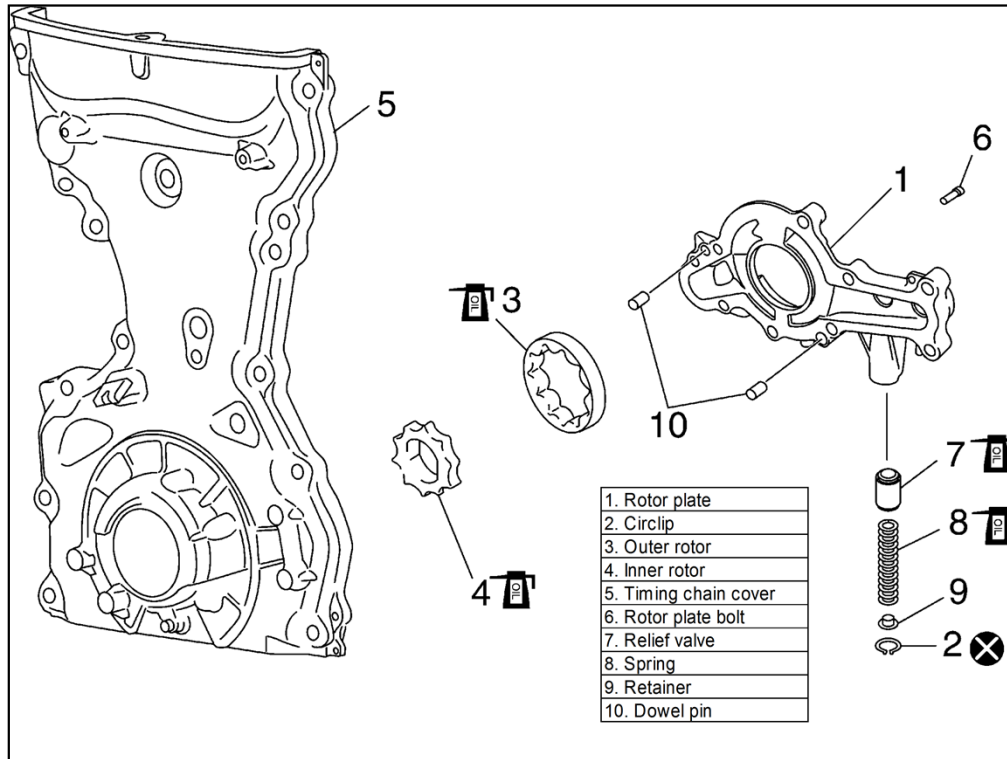


1-1

### 17. Chain cover (continued)

- Apply sealant "A" to mating surface of cylinder block and cylinder head.
- Apply sealant "B" to mating surface of timing chain cover.

1-1

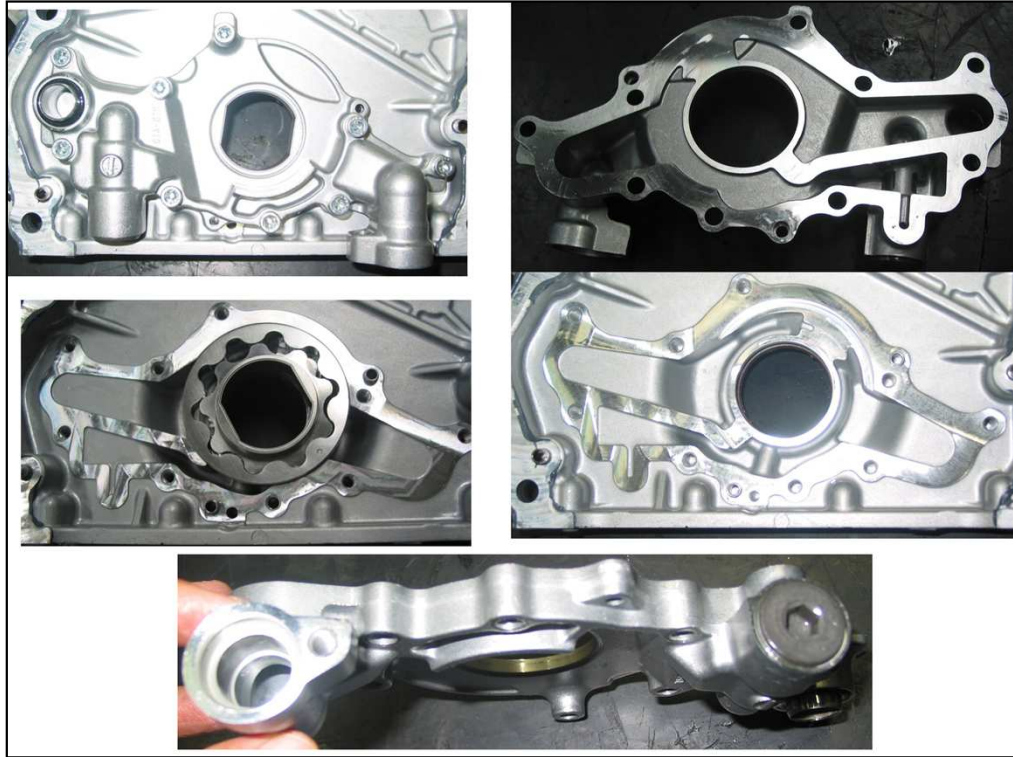


1-1

17. Chain cover (continued)

- This page shows the detail of oil pump mounted in the timing chain cover.

1-1

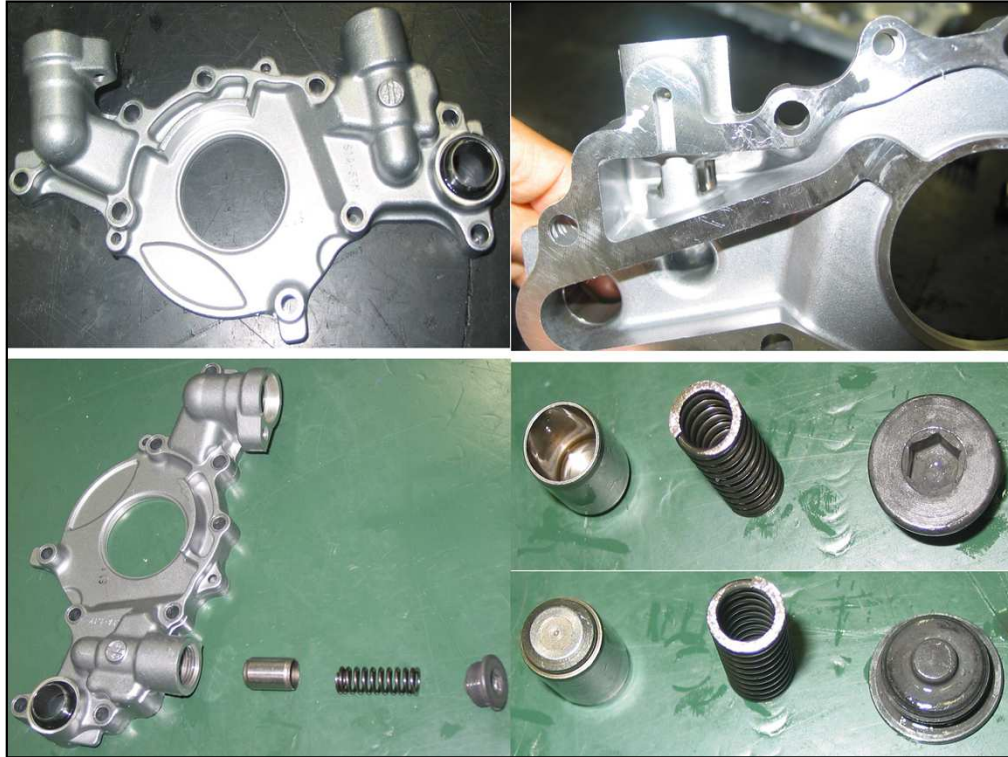


1-1

### 17. Oil pump

- The inlet held by hand in the picture at the bottom is connected to the oil strainer.
- The oil strainer, therefore, must be removed when the timing chain cover needs removal.

1-1



1-1

### 18.1 Oil pressure relief valve

This page shows oil pressure relief valve and spring.



1-1



1-1

### 18.2. Oil pump gears

These are inner and outer gears used for oil pump.  
Outer gear can be installed in any direction.



1-1

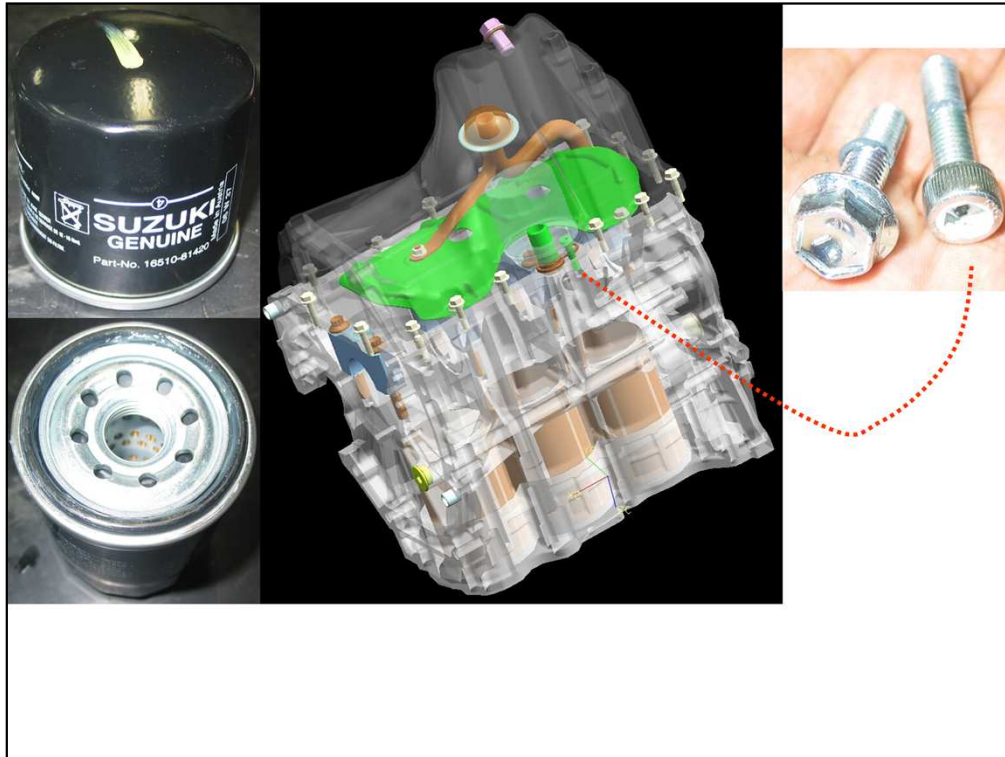


1-1

### 19. Oil pan

- Oil pan is made of aluminum alloy.
- One bolt is located above the engine oil filter. This bolt is also fitting the oil pan to the cylinder block.

1-1



1-1

Oil pan (continued)

- Oil pan is fitted to the cylinder block with 16 hexagon head bolt and one hexagon hole head bolt.

1-1



1-1

Oil pan (continued)

- There is a collar between cylinder block and oil pan for a better positioning.
- The oil strainer bolt is fitted to the oil pump inlet port, and the oil strainer plate is fitted to the No.3 main bearing cap via stud bolt and nut.

1-1



1-1

Oil pan (continued)

This page shows the details of oil pan itself.

“51K” indicates Suzuki part number.

The other side of engine oil filter base is sealed with an “8” shaped rubber seal.



1-1



1-1

Oil pan (continued)

- Baffle plate is made of stamped steel.
- It avoids engine oil shaking due to vehicle movement.
- It is fitted to the cylinder block via 4 bolts.



1-1



1-1

- Double O-rings are fitted to oil strainer pipe, which is fitted to the oil pump inlet port.

Well done, you have now completed the “Engine service K10B” online training course!

Please complete the online exam on [Train Track](#)

1-1

1-1