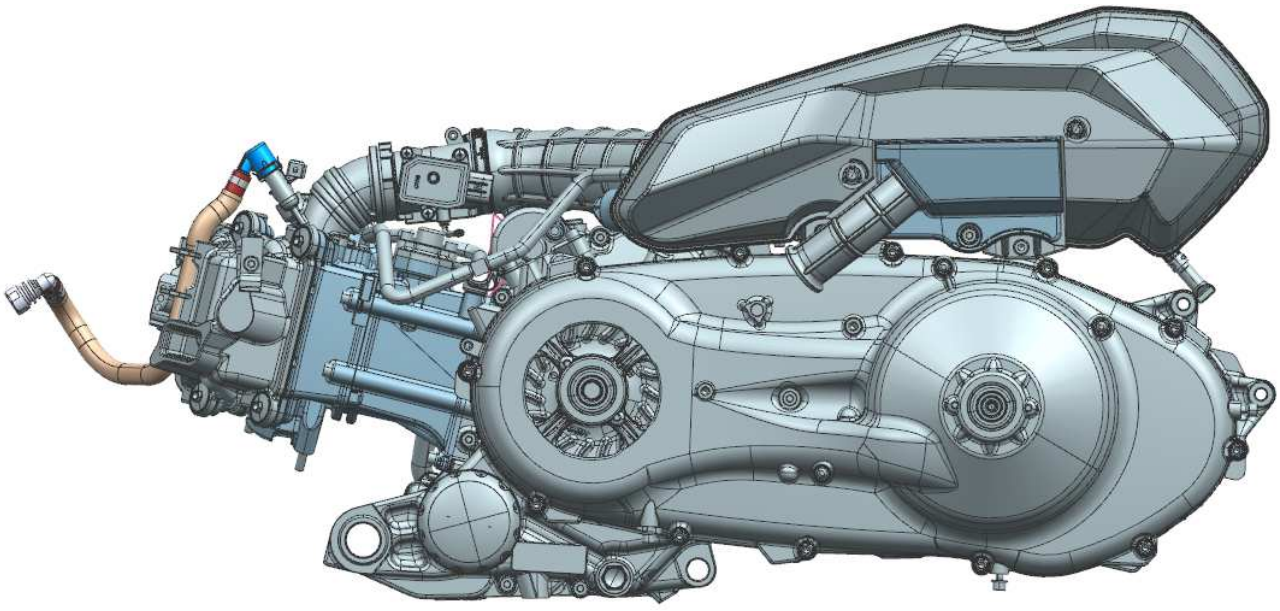
# KS350 Repair Manual

**LXFD0901-054**



**Loncinengine Co,. LtdDecember 2021**

# Introduction

Due to the increasing variety of motorcycles listed, new structures and technologies are constantly being adopted.In order to enable the majority of Loncin users and maintenance personnel to better master the maintenance, adjustment and repair techniques of KS350 engine.We have prepared this repair manual.May this manual bring convenience to the majority of Loncin users and maintenance personnel and give technical guidance on maintenance, so as to facilitate access to maintenance personnel.

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# I. Overview

## Maintenance code

1. Please use spare parts, lubricating oil or other auxiliary materials manufactured or recommended by Loncin Motor Co., Ltd.If the materials used do not meet Loncin's specifications or requirements, the motorcycle may be damaged.

2. Do not use non-metric tools when servicing the motorcycle. Metric size bolts, nuts and screws are not interchangeable with inch size fasteners.

3. Please replace the gaskets, O-rings, cotter pins and locking plates with new ones when reassembling after disassembly.

4. Please tighten the larger diameter bolts or inner bolts first while tightening bolts or nuts. Then gradually tighten each bolt in diagonal order to its specified torque value, unless a special order is specified.

5. Clean the disassembled parts with cleaning agent. Before assembling, apply lubricating oil to the sliding surfaces of the components.

6. Check whether the parts are properly installed and operated, and perform rotation, movement and operation checks after reassembly

**7.** Coolant, engine oil, waste parts and other pollutants must be treated in accordance with national environmental protection requirements during maintenance.

# Specification

## General Specification

| | Item | Data |
|---|---|---|
| **Engine** | Model | LX1P80MP |
| | Displacement | 350ml |
| | Cylinder arrangement | Single cylinder |
| | Cylinder diameter×stroke | 80×69.6mm |
| | Compression ratio | 11.5:1 |
| | Maximum power and corresponding speed | 21.25Kw/7500rpm |
| | Maximumtorque and corresponding speed | 30N-m/6000rpm |
| | Valve train | Single overhead camshaft |
| | Intake valve | Intake valve opens before the upper stop 37° and closes after the lower stop 70° (at 1mm valve lift). |
| | Exhaust valve | Exhaust valves open before 61° of the lower stop and close after 38° of the upper stop (at 1 mm valve lift). |
| | Lubrication system | Forced pressure lubrication + splash lubrication |
| | Cooling system | Water cooling |
| | Net Engine Mass | 48kg |
| **Drivetrain** | Clutch | Dry centrifugal friction clutch |
| | Transmission | CVT automatic transmission |
| | Continuously Variable Transmission (CVT) Ratio | 0.692-2.618 |
| | Primary ratio | 3.4 |
| | Secondary ratio | 2.5625 |
| | Gear shift method | Automatic |
| **Electrical system** | Ignition system | Ignition type |
| | Starter system | Electric starter |
| | Lighting system | Battery |
| | Spark plug type | LMAR8J-9E(NGK) |
| | Spark plug gap | 0.8-0.9mm |

## Cooling system specification

| Item | | Specification |
|---|---|---|
| Engine thermostat | Openingtemperature | 82℃ |
| | Fully opentemperature | 95℃ |
| | Valve lift | ≥5mm |
| Recommended coolant | | BASF Glysantin G48-24 |

## Lubrication system specification

Unit: mm

| Item | | Standard value | Service limit |
|---|---|---|---|
| Engine oil capacity | After engine oil change | 1.7L | — |
| | After removing the engine oil filter again | 1.8L | — |
| | After engine removal | 1.9L | — |
| Recommended engine oil | | Recommended engine oil：<br>SAE 5W/40<br>API quality grade：SJ/JASO MA2 | — |
| Gearbox oil capacity | | 0.25L | — |
| Recommended gearboxoil | | HYPOIDOEL TITAN EG 4218 DR HRNS | |
| Engine oil pump rotor | Tip clearance | 0.15 | 0.20 |
| | Case clearance | 0.005-0.23 | 0.35 |
| | Side clearance | 0.04-0.09 | 0.12 |

## Cylinder head/ Valve specification

Unit: mm

| Item | | | Standard value | Service limit |
|---|---|---|---|---|
| Electric starter cylinder pressure | | | 700-900kPa | — |
| Valve clearance | | Intake valve | 0.16-0.24 | — |
| | | Exhaust valve | 0.34-0.42 | — |
| Rocker arm, rocker arm shaft | Rocker arm bore inside diameter | Intake/Exhaust | 13.006-13.024 | 13.10 |
| | Rocker arm outsidediameter | Intake/Exhaust | 16.95-17.00 | 16.85 |
| | Clearance between | Intake/Exhaust | 0.012-0.048 | 0.10 |

| | | | | |
|---|---|---|---|---|
| | rocker arm and rocker arm shaft | | | |
| Camshaft | Camprotrusion height | Intake | 36.47 | 36.40 |
| | | Exhaust | 36.03 | 35.95 |
| Valve, valveguide | Valve stem diameter | Intake | 4.973±0.007 | 4.956 |
| | | Exhaust | 4.963±0.007 | 4.946 |
| | Valve guide inner diameter | Intake/Exhaust | 5.000-5.012 | 5.05 |
| | Valve stem-to-guide clearance | Intake | 0.02-0.046 | 0.08 |
| | | Exhaust | 0.03-0.056 | 0.09 |
| | Valveline width | Intake | 1.2-1.4 | 2.0 |
| | | Exhaust | 1.3-1.5 | 2.0 |
| Valve spring free length | | | 40.1 | 39.0 |
| Cylinder head flatness | | | 0.04 | 0.10 |

## CVT Specification

Unit: mm

| Item | | Standard value | Service limit |
|---|---|---|---|
| Belt | Belt width | 25.8±0.2 | 25.0 |
| Active Pulley | Outside diameter of bushing | 35.000-35.025 | 34.990 |
| | Roller weights | 20g | 18g |
| Driven pulley | Spindle shaft diameter | 24.987-25.000 | 24.967 |
| | Clutch outer disk inner diameter | Φ160(+0.2 0) | 160.3 |

## Box, cylinder and gear train specification

Unit: mm

| Item | | Standard value | Service limit |
|---|---|---|---|
| Transmission mechanism | Main journal of crankshaft | 25.927-25.960 | 25.907 |
| | | 24.987-25.000 | 24.967 |
| | Intermediate journalcrankshaft | 24.980-24.993 | 24.960 |
| | Countershaft journal | 24.980-24.993 | 24.960 |
| | | 31.995-32.011 | 31.975 |

| | | | |
|---|---|---|---|
| Cylinder | Cylinder diameter | 80.002-80.012 | 80.10 |
| | Out-of-roundness | 0.008 | 0.10 |
| | Cylinder taper | — | 0.10 |
| | Flatness | 0.05 | 0.10 |

## Crankshaft, piston and balance shaft specification

Unit: mm

| Item | | | Standard value | Service limit |
|---|---|---|---|---|
| Crankshaft | Connecting rod big end side clearance | | 0.130-0.312 | 0.36 |
| | Clearance between connecting rod big end shank and shaft shank pin | | 0.032-0.056 | 0.07 |
| | Journal runout | | — | 0.05 |
| Piston, Piston pin Piston ring | Piston base circle diameter | | Φ79.98±0.007 | 79.900 |
| | Pin bore diameter | | 18.007-18.012 | 18.025 |
| | Piston pin diameter | | 17.995-18.000 | 17.98 |
| | Clearance between piston and piston pin | | 0.007-0.017 | 0.04 |
| | Piston ring closure clearance | First Ring | 0.15-0.25 | 0.5 |
| | | Second ring | 0.25-0.40 | 0.6 |
| | | Oil ring | 0.15-0.5 | 0.8 |
| | Clearance between piston and piston pin | Clearance between first ring and groove | 0.040-0.080 | 0.12 |
| | | Clearance between second ring and groove | 0.020-0.060 | 0.10 |
| Connecting rod small endinner diameter | | | 18.006-18.017 | 18.03 |
| Clearance between first ring and groove | | | 0.006-0.022 | 0.05 |

# Torque value

## Standard torque value

| Fastener Type | TorqueValueN·m | Fastener Type | Torque ValueN·m |
|---|---|---|---|
| 5mmbolts and nuts | 5.2 | 5mmScrews | 4.2 |
| 6mmbolts and nuts | 10 | 6mmScrews | 9.0 |
| 8mmbolts and nuts | 22 | 6mmFlange bolts（8mm head, small flange） | 10 |
| 10mmbolts and nuts | 34 | 6mmFlange bolts（8mm head, big flange） | 12 |

| | | | |
|---|---|---|---|
| 12mmbolts and nuts | 54 | 6mmFlange bolts(10mm head) and nut | 12 |
| | | 8mmFlange bolts and nuts | 27 |
| | | 10mmFlange bolts and nuts | 39 |

## Engine torque value

| No. | Applicable part | Torque valueN·m |
|---|---|---|
| 1 | Bolts for engine left right center cases assembly | 10 N·m |
| 2 | Cylinder head connecting bolts | 10 N·m |
| 3 | Cylinder head nuts | First preload10±1N·m<br>Second preload35±1 N·m<br>Third tightening135°±5° |
| 4 | Timing sprocket nuts | 45 ± 5 N·m |
| 5 | Cylinder block box connecting bolts | 10 N·m |
| 6 | Tensioner bolts | 10 N·m |
| 7 | Timing chain cover bolts | 10 N·m |
| 8 | Engine oil pump cover bolt | 10 N·m |
| 9 | Engine oil level sensor bolts | 5 ± 1 N·m |
| 10 | Water pump cover bolts | 10 N·m |
| 11 | Water drain bolts | 9N·m |
| 12 | Starter motor mounting bolts | 10 N·m |
| 13 | Gearbox cover bolts | 10 N·m |
| 14 | CVT cover bolts | 10 N·m |
| 15 | Crankshaft speed sensor | 10 N·m |
| 16 | Magneto cover | 10 N·m |
| 17 | Thermostat cover bolts | 10 N·m |
| 18 | Water temperature sensor | 15 ± 1 N·m |
| 19 | Connecting rod bolts | First preload5N·m<br>Second preload20±1 N·m<br>Tightening 90°±5° |
| 20 | Magneto nuts | 150 ±10 N·m |
| 21 | Engine oil pump sprocket nuts | 25 N·m |

| | | |
|---|---|---|
| 22 | Engine oil and gas separator nuts | 40±3 N·m |
| 23 | Front CVT nuts | 100±7 N·m |
| 24 | CVT friction disc nuts | 100±7 N·m |
| 25 | Cylinder head chain chamber oil passage nozzle | 3 N·m |
| 26 | Crankshaft oil passage plug 1 | 8±1N·m |
| 27 | Crankshaft oil passage plug 2 | 8±1 N·m |
| 28 | Air filter fastening bolt M6x40 | 10 N·m |
| 29 | Magneto spindle M6x40 | 10 N·m |
| 30 | Cylinder head cover hexagonal bolt with disk M6 × 18.5 | 10N·m |
| 31 | Spark plugs | 12±1N·m |
| 32 | Crankcase oil drain plug bolts | 38±5.7 N·m |
| 33 | Gearbox oil drain plug bolts | 38±5.7 N·m |
| 34 | Engine oil filter | 11±1 N·m |

# II. Maintenance

## Maintenance information

**Overview**

- Before all operations, place the motorcycle on a level surface.

## Maintenance specification

To ensure that the motorcycle operates with good power and economy, it is necessary to perform maintenance as required in the table below.

Starting from 100000km, repeat the maintenance intervals and items starting from 10000km.

I: Inspect and clean, adjust, lubricate or replace if necessary; C: Cleaning; R: Replacement; L: Lubrication.

The following maintenance items require a certain level of mechanical knowledge. Some items (especially those marked with the * symbol) may require additional technical information as well as tools.

**Table of Maintenance Interval**

| No. | Mileage / Item | X1000km | 1 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Month | | | | | | | | | | | |
| *1 | Spark plug | | | | R | | R | | R | | R | | R |
| *2 | Engine oil | | R | R | R | R | R | R | R | R | R | R | R |
| *3 | Engine oil filter | | R | R | R | R | R | R | R | R | R | R | R |
| 4 | Air filter element replacement | | | R | R | R | R | R | R | R | R | R | R |
| *5 | Valve clearance | | | | I | | I | | I | | I | | I |
| *6 | Clean and inspect CVT | | | I | I | I | I | I | I | I | I | I | I |
| *7 | Replace CVT belt | | | | R | | R | | R | | R | | R |
| *8 | Check the clutch | | | | | | I | | | | I | | |
| 9 | Cooling system | | | I | I | I | I | I | I | I | I | I | I |
| 10 | Fuel line | | | I | I | I | I | I | I | I | I | I | I |
| 11 | Crankcase breather tube | | | C | C | C | C | C | C | C | C | C | C |

Caution：

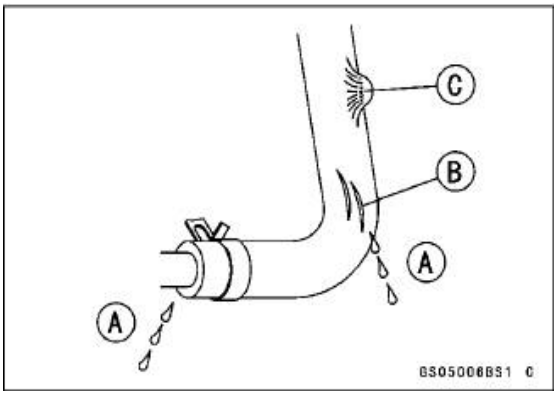
1. If the motorcycle is used in harsher conditions such as unusually humid and dusty conditions, maintenance should be performed more frequently.
2. *2 and *3 are replaced annually or every 10,000km, whichever conditions are met first.
3. *Marking items require special tools, data and professional skills and must be carried out by

Loncin dealers.

## Water pipe

1. Check the water pipes.

If the water pipe is not properly maintained, high pressure in the water pipe may lead to coolant leakageA or rupture of the water pipe. Visually inspect the water pipe for signs of damage. Squeeze the water pipe, which should be neither hard and brittle nor soft and swollen.




2. If you find any wear, crack B or bulge C, replace the water pipe.

3. Check that the water pipe connection is secure and properly tightened

## Spark plug

Remove the spark plug.

Caution:

Before removing the spark plug use an air gun to blow around the spark plug base and also make sure no dust has fallen into the combustion chamber.

Check the insulator for cracks or damage, and the electrodes for damage, dirt, and discoloration. Replace the spark plugs if necessary.

**Check spark plug.**

Clean the spark plug electrodes with wire or a special spark plug cleaner.

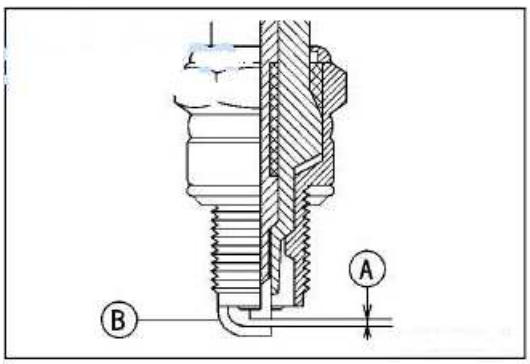
Check the clearance between the center electrode and the side electrode with a plug ruler.

**Spark plug clearance A: 0.80-0.90mm**

If the clearance is not correct, please carefully bend the side electrode B with a suitable tool to obtain the correct clearance.

Install and hand tighten the spark plug to the cylinder head, then tighten the spark plug to the specified torque value.

**Torque value: 12±1N·m**



# Valve clearance

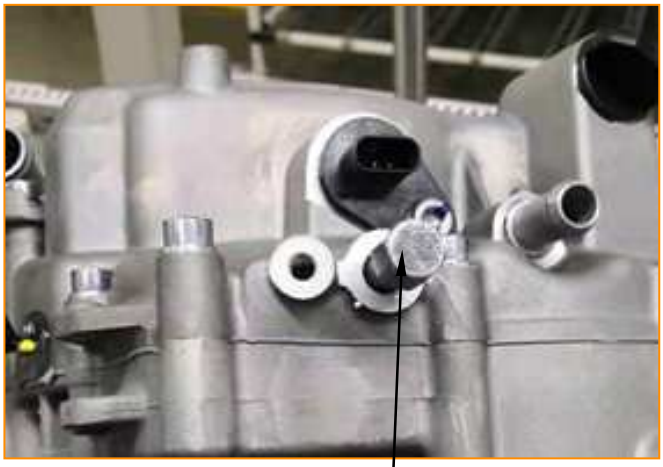
## Check

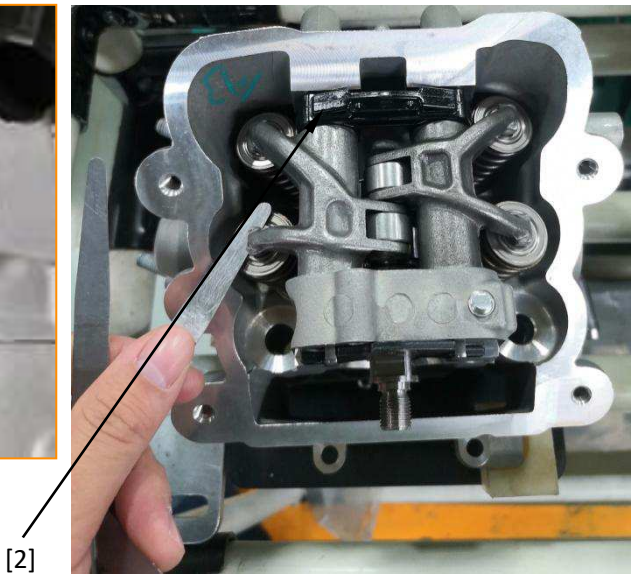
Please check and adjust the valve clearance in cold condition (below 35°C).
Remove the following parts.

-Cylinder head cover

-Right crankcase cover timing hole bolt

Turn the crankshaft clockwise with a wrench so that the round hole on the side of the rotor aligns with the hole in the right crankcase cover M10×1. Screw in the rotor timing stop tooling [1] so that the cam and rocker arm fit is in the base circle position.
Insert a standard gauge between the intake and exhaust valve rocker arm and camshaft to detect the intake and exhaust valve clearance and make a record.
Intake valve clearance standard: **0.16-0.24mm**
Exhaust valve clearance standard: **0.34-0.42mm**




Caution:

The crankshaft should not be rotated counterclockwise.

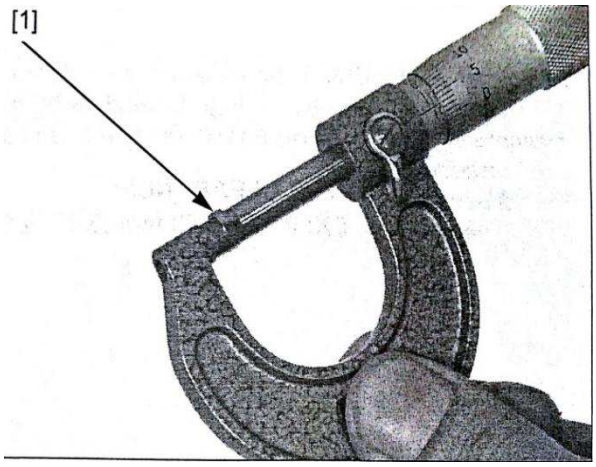
Record each valve clearance for easy reference of shim selection when valve clearance needs to be adjusted.

## Adjustment

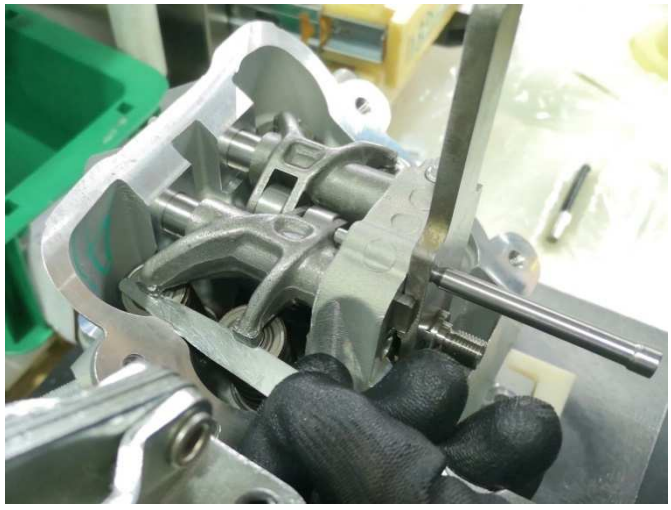
Valve lash adjustment is made by removing the rocker arm pads [2].
Move therocker arm out to the right by about 10 mmto expose the valve adjustment .
Use a suction bar to pull out the valve adjustment shims.

Caution:

- Take care to prevent gasket points from falling into the crankcase.
- Mark all gaskets to ensure that they fit in place during installation.
- Use tweezers or magnets, the shims will be easier to remove.




Measure the shim [1] thickness and record it.
Caution:
Shims are available in different thicknesses, with a difference of0.01mm (1.72 - 2.60mm)
Calculate the thickness of the new shimusing the following equation: A = (B-C) + D
A: new shim thickness
B: Recorded valve clearance value
C: specified valve clearance value
D: Removed shim thickness
Use a micrometer to ensure the correct shim thickness.
Then move the rocker arm left to reset and check the valve clearance. Repeat this procedure to finally adjust the intake and exhaust valve clearances to the specified range.
Install the rocker arm spacer on the rocker arm shaft by pressing it firmly.



Tighten the right crankcase cover timing hole bolt.
**Torque: 15±2N·m.**
Install the cylinder head cover
**Torque: 10±1N·m.**

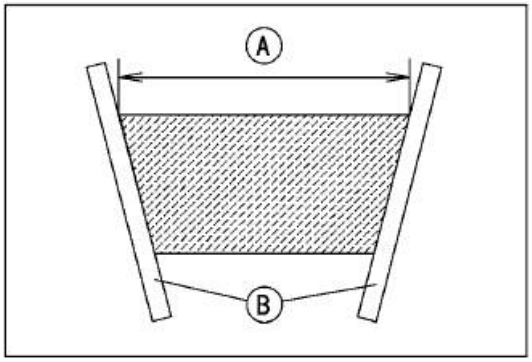
# Belt

## Belt wear check

Remove the CVT case cover.

Measure the width A of the belt at several positionswith a pair of suitable straightedge stands as shownin the figure.

If the measured value is less than the use limit, please replace the belt.



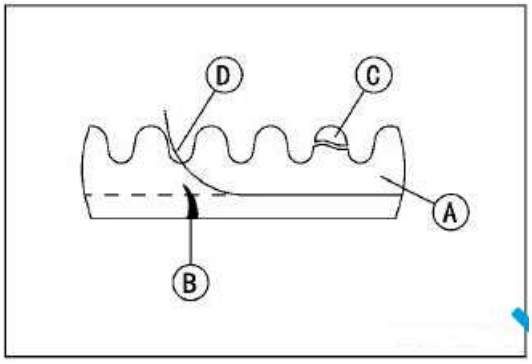

Belt width

**Standard: 25.6～26.0mm**
**Use limit: 25.0mm**

Check the belt for cracks, breaks or peeling.
Replace the belt if necessary.

Belt A

Cracked B
Broken C
Spalling D




Caution:

- When replacing the belt, check the active pulley parts and drivenpulley components.

# Engine oil

## Engine oil level check

Start the engine and idle for 3-5 minutes.
Turn off the engine and wait 2-3 minutes.
Put the motorcycle in an upright position on a horizontal surface.
Take out the dipstick and dry the engine oil on the lower surface of the dipstick.
Put the dipstick into the engine again, placing it only horizontally on the hole.
Remove the dipstick and observe the engine oil level.
If the engine oil level is lower than the minimum engine oil level, use the specified engine oil.
Fill the crankcase to the standard oil level.

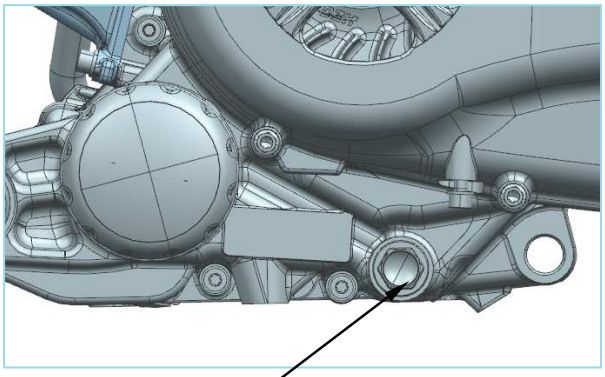
**Specified engine oil: SAE 5W/40**
API quality grade: SJ/JASO MA2
Check whether the O-ring of the oil dipstick is in good condition, and if necessary, replace it.

Apply engine oil to the O-ring surface.
Install the dipstick.



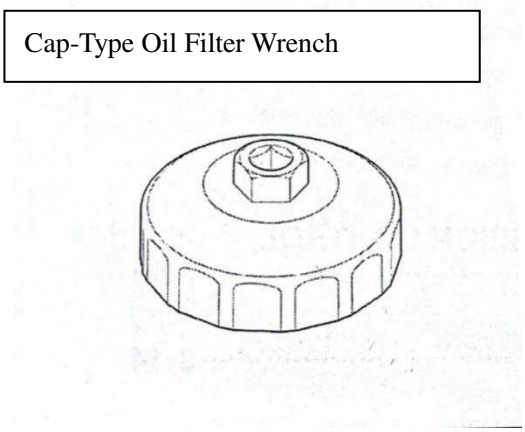
### Engine oil change

Warm up the engine.
Turn off the engine and remove the engine oil filter.
Remove the engine oil drain plug [1] and gasket and drain the engine oil.
After completely draining the engine oil, install the oil drain plug and replace the gasket with a new one.
Tighten the engine oil drain plug to the specified torque and install the rubber sleeve.
**Torque: 38 ± 5.7 N·m**
Fill the crankcase with the specified engine oil.
Engine oil capacity:
After draining the engine oil: 1.7 L
After replacing the engine oil filter: 1.8 L
After disassembling the crankcase: 1.9 L
Check the engine oil level to make surethere is no engine oil leakage.



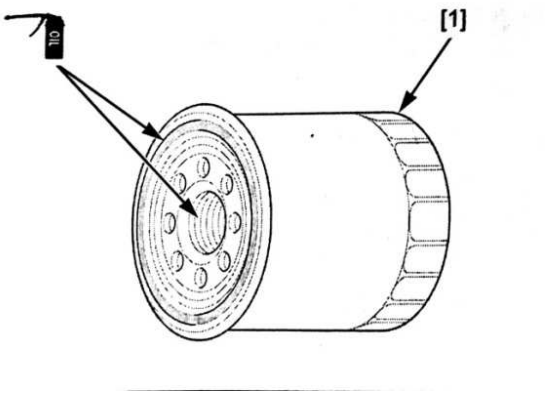

## Engine oilfilter

Cap-Type Oil Filter Wrench



Drain the engine oil.
Remove the engine oil filter with a tool.
Tools:
Cap-Type Oil Filter Wrench

Install the engine oilfilter pipe joint and tighten to the specified torque.
**Torque: 28 ± 3N·m**
Apply engine oil to the new oil filter thread and the O-ring.
Install engine oil filter and tighten to the specified torque.
**Torque: 11 ± 1N·m**
Fill the crankcase with the specified engine oil.




## Engine idle speed

Caution:：

- After completing all maintenance items of the engine and confirming that it is in the specified range, check and adjust the idle speed.
- Before checking the idle speed, please check the following items:
  - No fault indicator flashes
  - Spark plug state
  - Air filter element state
- Check and adjust the idle speed accurately only when the engine is warm.
  Start the engine, heat it to normal operating temperature, and let it idle.
  Check the idle speed.
  **Idle speed: 1450±100 r/min**

If the idle speed is not within the service limit, please check the following components:

- Intake volume or engine bottom end

# III. Cooling system

## Maintenance information

### Overview

| ⚠ Warning |
| --- |
| Do not remove the radiator cover before the engine and radiator are cooled, in case the coolant spurts out and burns you. |

**Caution**

Usingcoolant with silicate corrosion inhibitor can lead to premature wearof water pump seal ring or blockage of radiator channel.

Using tap water can cause engine damage.

- Add coolant to the auxiliary water tank.Do not remove the radiator cover except to add or drain coolant.
- The engine does not need to be removed from the frame when servicing the engine cooling system.
- Avoid coolant leaks to the painted surface(coating).
- After system maintenance, please check for leakage with cooling system tester.
- Check coolant temperature indicator and water temperature sensor.

## Cooling system specification

| Item | | Specification |
| --- | --- | --- |
| Thermostat | Opening temperature | 82℃ |
| | Fully open temperature | 95℃ |
| | Valve lift | ≥5mm |
| Recommended coolant | | BASF Glysantin G48-24 |

# Troubleshooting

### High engine temperature

- Coolant temperature indicator or water temperature sensor failure
- The thermostat valve is stuck open
- Radiator cover failure
- Insufficient coolant
- Blockage of radiator channels, hoses and water pipes
- Air enters the circulation system
- Cooling fan motor failure
- Fan control relay failure
- Water pump failure

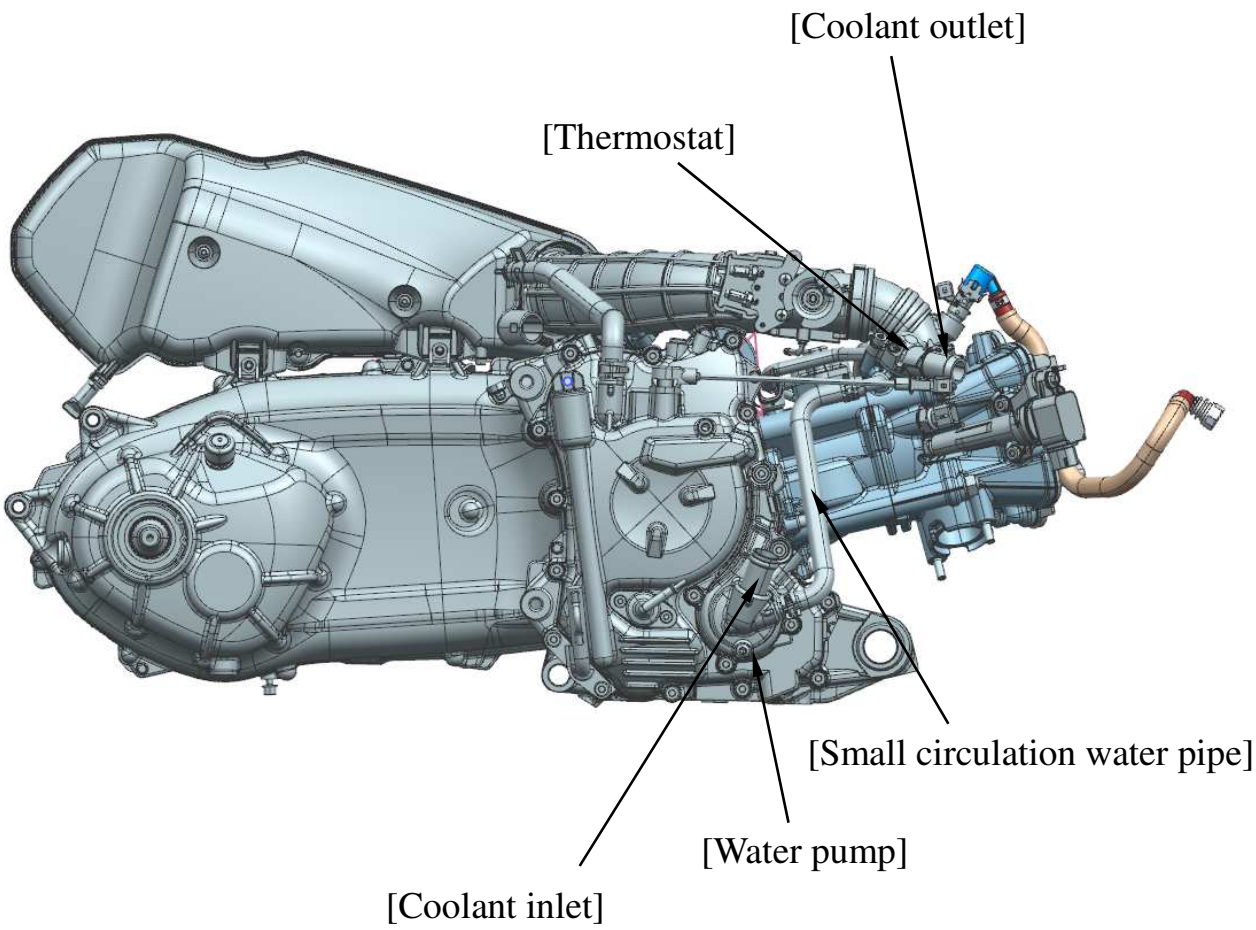
### Low engine temperature

- Coolant temperature indicator or water temperature sensor failure
- The thermostat valve is stuck open
- Fan control relay failure

### Coolant leakage

- Defects in mechanical mechanism of the water pump
- Aging of the O-ring
- Radiator cover failure
- Damage or aging of cylinder head cover
- The hose connection is loose or the pipe clamp is not clamped
- Damage or aging of the hose
- Radiator damage
- Thermostat cover and water pump cover pipe joint is loose

# System process model

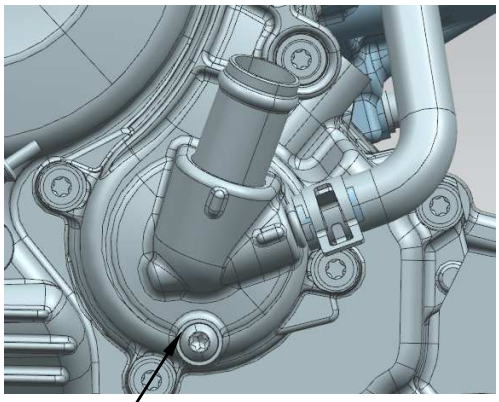


# Coolant change

## Coolant change/Exhaust

**Caution:** When adding coolant to the engine cooling system or auxiliary water tank or checking the coolant dose, place the motorcycle on thehorizontal level and keep it upright.

Remove the drain plug and the gasket of the water pump.



[Drain bolt]

Remove the radiator cover and drain the coolant.

After replacing the new gasket, install the drain plug.

Tighten the drain plug to the correct torque.

**Torque:**

**Water pump drain plug:9N·m**

Fill the cooling system with the recommended coolant up to the radiatorneck through the water injection hole.

**Recommended antifreeze:**

BASF Glysantin G48-24

Exhaust air from the cooling system as follows:

1. Start the engine and let it idle for 2-3 minutes.
2. Open and close the throttle three to four times to exhaust the air from the engine cooling system.
3. Turn off the engine and top up the coolant if necessary.
4. Install the radiator cap.

Fill the reservoir with the recommended coolant.

# Engine thermostat

## Removal and installation

Drain the coolant.

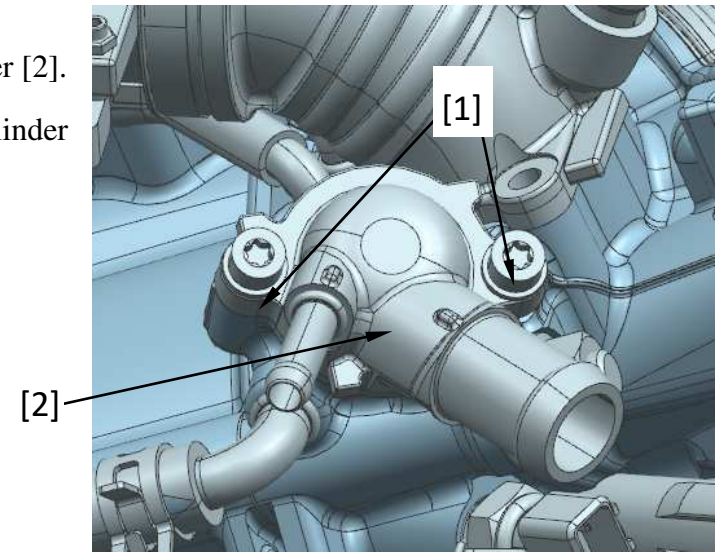
Remove the bolts [1] and the thermostat cover [2].

Remove the thermostat valve from the cylinder head.

Installation is the reverse process of removal.

**Torsion:**

**Thermostat cover bolt: 10N·m**

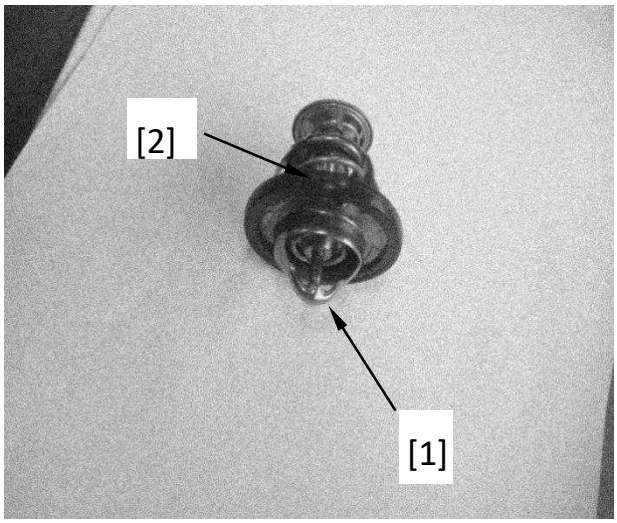



## Check and inspection

Check the exterior of the thermostat [1] for damage.

If the thermostat valve is open at room temperature, please replace it if necessary.

Check the seal [2] for damage and replace it if necessary.




Caution:

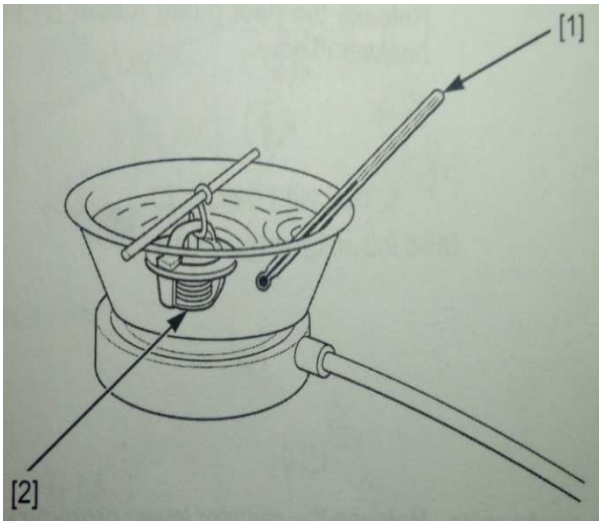
Wear heat resistant glovesand take appropriate eye protection measures.

Keep flammable materials away from electrical components.

Do not let the thermostat and thermometer [1] touch the bottom, or you will get the wrong reading.

Heat the water to the working temperature with an electrothermal furnace and keep it for 5 minutes.

Hang the thermostat [2] in hot water to check whether its function is abnormal.




Opening temperature of the engine thermostat:

82 ℃ (179.6 ℃)

Valve fully open height:

Not less than 5mm at 95 ℃ (203 ℃)

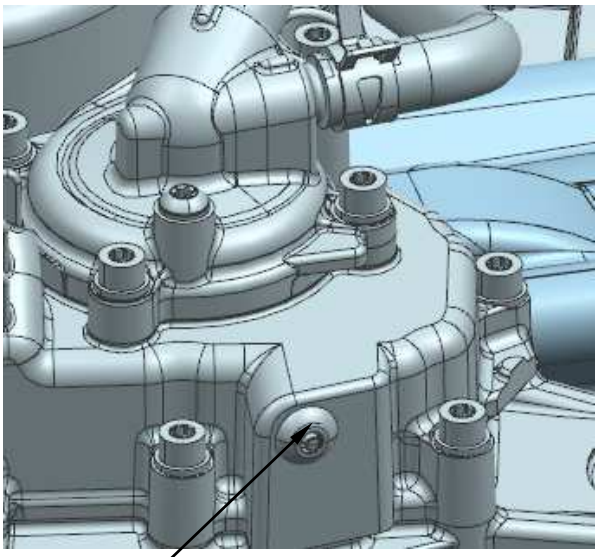
If the thermostat is not turned on at the specified temperature, please replace it.

## Engine coolant pump

**The end surface mechanical seal check**

Check the pump overflow bore [1] to confirm whether there is coolant leakage.

- A small amount of coolant flow is normal.
- Make sure there is no continuous coolant leakage when starting the engine.




## Removal and installation

Drain the coolant.

Keep the motorcycle upright on the horizontal level.

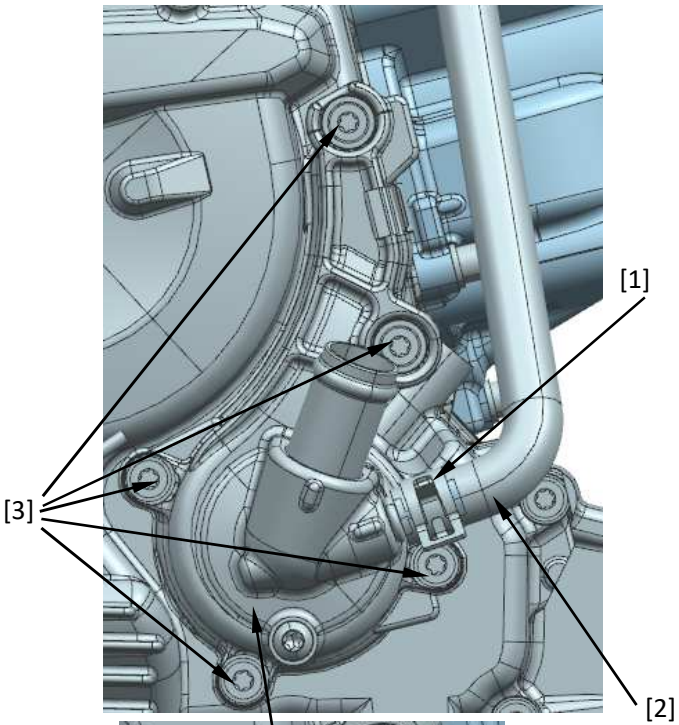
Remove the inlet pipe clamp and the inlet pipe.

Loosen the pipe clamp [1] and take out the lower end of the small circulating water pipe [2].

Remove 5 cooling pump cover bolts [3] and take out the cooling pump cover [4].

**Torsion:**

**Cooling pump cover bolt: 10N·m**



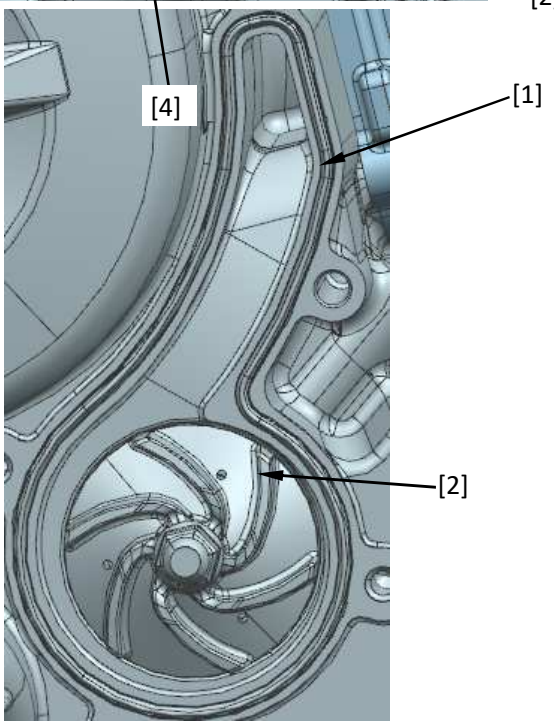

Remove the cooling pump cover sealing ring [1] from the cooling pump.

Clockwise screw out the coolant pump impeller [2].

Installation is the reverse process of removal.

**Torsion:**

**Cooling pump impeller:7±1N·m**



Caution：

- The cooling pump impeller is left-hand thread, unscrew the impeller by turning clockwise and tighten it by turning counterclockwise.
- If the surface is corroded or the blades aredamaged, please replace the impeller immediately.
- Do not smear engine oil on the sealing ring of cooling pump.

# IV. Lubrication system

## Maintenance information

### Overview

**△,! Warning**

Repeated, long-term skin contact with used engine oil may lead to skin cancer.This is rare unless you are exposed to used engine oil every day.However, we still recommend that you wash your hands with soap and water as soon as possible after handling the used engine oil.

- When repairing the engine oil pump, it is necessary to remove the engine and repair it after breaking the crankcase (see Chapter 8 section Crankcase maintenance guide).
- The premise of each maintenance step in this chapter is to drain the engine oil.
- Do not allow dust and dirt to enter the engine when removing and installing the oil pump.
- If any engine oil pump components wear out beyond the specified service limit, please replace the components and the inner and outer rotors of the engine oil pump need to be replaced together.
- After installing the engine oil pump, check for oil leakage.

## Lubrication system specification

Unit：mm

| Item | | Standard value | Service limit |
|---|---|---|---|
| Oil capacity | After engine oil change | 1.7 L | — |
| | After removing the engine oil filter | 1.8 L | — |
| | After removing the engine | 1.9 L | — |

| | | | |
|---|---|---|---|
| Recommended engine oil | | Recommended engine oil: SAE 5W/40<br>API Quality Level:SJ/JASO MA2 | — |
| Gearbox oil capacity | | 0.25 L | — |
| Recommended gearbox oil | | HYPOIDOEL TITAN EG 4218 DR HRNS | |
| Engine oil pump rotor | Tip clearance | 0.15 | 0.20 |
| | Case clearance | 0.005-0.23 | 0.35 |
| | Side clearance | 0.04-0.09 | 0.12 |

# Troubleshooting

**Lowoil level**

- High engine oil consumption
- Oil leakage from external components
- Piston ring wear or improper installation
- Cylinder wear
- Arbor seal wear
- Valve guide wear

**Lowoil pressure**

- Low engine oil level
- Clogged engine oil filter
- Oil leakage from internal components
- Incorrect use of engine oil
- No oil pressure

**No oil pressure**

- Low engine oil level
- The engine oil pressure safety valve is stuck
- The drive chain of the oil pump is broken
- Oil pump driving and driven wheel gear broken
- Engine oil pump damage
- Oil leakage from internal components

**High oil pressure**

- Oil pressure safety valve closed
- Engine oil filter screen, oil return hole and oil measuring hole are blocked
- Incorrect use of engine oil

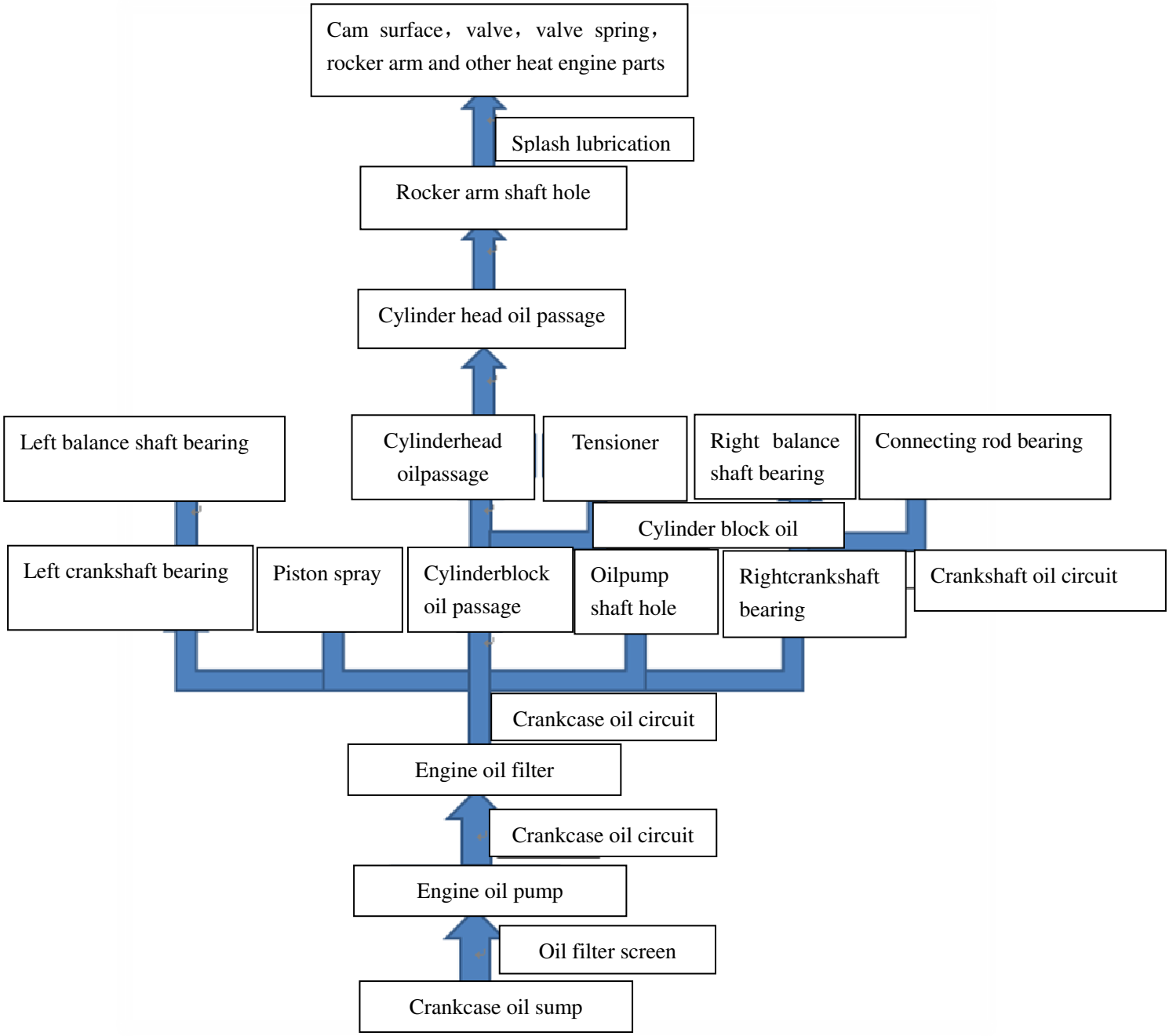
**Dirty engine oil**

- The engine oil and filter screen are not changed regularly
- Piston ring damage

**Oil emulsification**

- Cylinder head cover expansion cracking
- Coolant channel leakage
- Water enters the engine

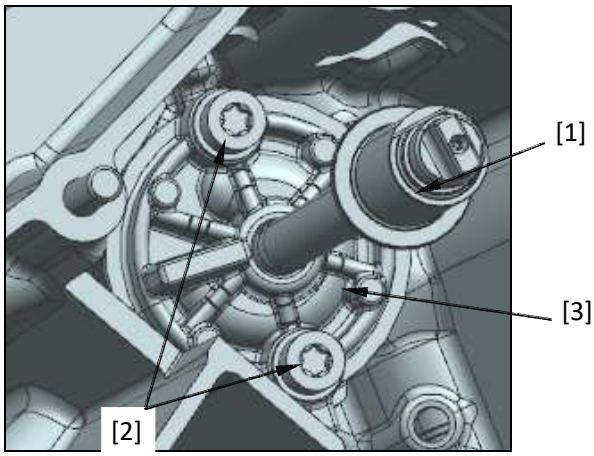
## Lubrication system diagram



# Engine oil pump

## Removal and installation

Remove the left and right crankcase from the tank. (See chapter 8 section Crankcase maintenance guide)




Remove the engine oil pump shaft [1], the engine oil pump shaft bolt [2], and the engine oil pump cover [3].

Remove the inner and outer rotors of the engine oil pump.

Installation is the reverse process of removal.

## Caution:

- Align the engine oil pump shaft with the block on the pump shaft.
- Apply the engine oil when assembling the inner and outer rotors of the engine oil pump.

**Check：**

- Check theengine oil pump driving, driven wheel and driving chain.

Check the following parts for damage, abnormal wear, deformation and combustion:

- Engine oil pump shaft
- Inner rotor
- Outer rotor
- Oil pump rotor hole

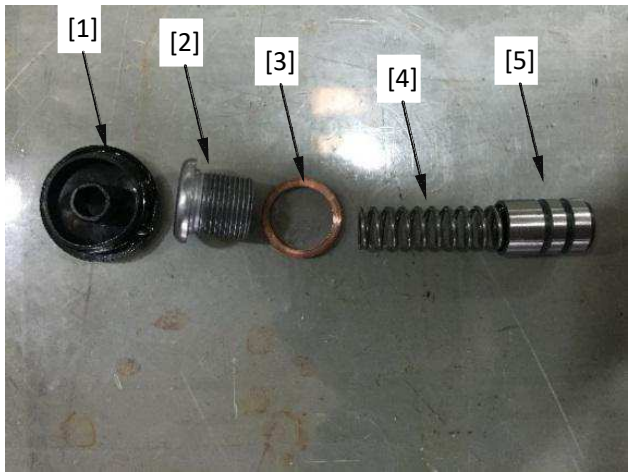
Measure the engine oil pump clearance according to the lubrication system specification.

If any measured value exceeds the specified service limit value, please replace the worn parts and replace the inner and outer rotors of the engine oil pump together.

# Pressure relief valve

## Removal

Remove the rubber plug [1], the engine oil



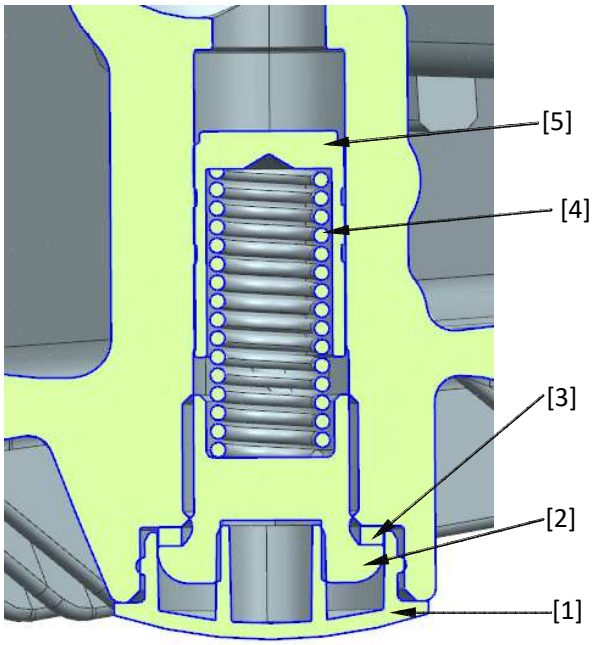
reducing valve body [2] and the gasket [3].
Remove the pressure spring [4] and the engine oil pressure relief valve core [5] with a suction iron bar.

### Check

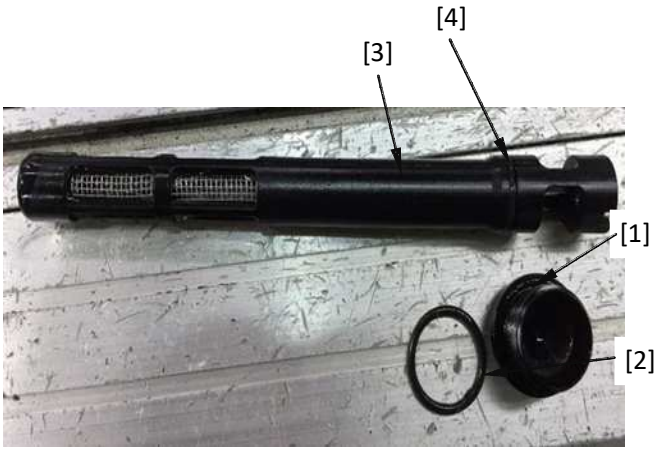
Check the force value of the pressure spring [4].
Standard:
Free length LO=44mm
F1=32.4N，L1=32mm
F2=56.5N，L2=23mm
Service limit:
F1≤29.2N，F2≤50.85N
Check the surface of the engine oil reducing valvecore [5] whether it·is worn.

### Installation

Applythe engine oil to the outer surface of oil reducing valve core [5], and assemble it into the bore of the left crankcase with the through-bore side facing outward.
Install the pressure spring [4] in the oil pressure reliefvalve core [5].
Install the gasket [3] on the engineoil pressure valve body [2],screw and tighten it into the bore of the left crankcaseby 2 to 3 pitches(Torque: 28±2N·m).




## Oilfilter screen




### Removal and installation

Remove sealing plug [1] and sealing ring [2].
Remove the oil filter screen [3] and the oil filter screen sealingring [4].

### Check

Check the engineoil filterscreen [3] for damage.
Clean the engine oil filterscreen with a high ignition point solvent to remove particles stuck on the engine oil filter.
Check whether the sealing ring surface is damaged. If it is damaged, please replace it.

### Installation

Assemble the oil filter screen sealing ring [4] in the ring groove of the filter screen [3], and apply the engine oil to the entire sealing ring.

Install the oil filter screen with the sealingring outward and the notch without the sealing ring downward into the bore of the left crankcase.
Install the sealing ring [2] on the sealing plug [1], screw and tighten it into the bore of the left crankcase by 2 to 3 pitches(Torque: 15±1N·m).
Press the rubber plug [1] into the bore in the direction shown on the right.

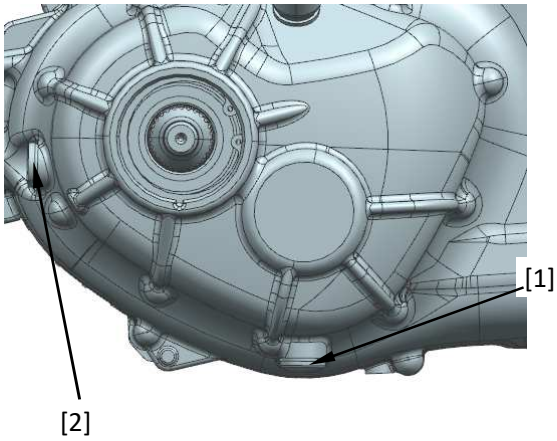
# Gearbox oil

**Caution：**

The gearbox oil is for lifespan use and maintenance only required under abnormal conditions. If the gearbox needs to bedisassembled and inspected for other reasons, drain the gearbox oil and add new gearbox oil as described below.

Place the motorcycle on asame level and keep it upright.

Remove the gearbox oil drain plug [1] and gasket and drain the gear oil.




After completely draining the engine oil, install the oil drain plug and replace the gasket with a new one.

Tighten the engine oil drain plug to the specified torque.

**Torque: 38 ± 5.7 N·m**

Remove the gearbox oil filler bolt [2] and gasket, and fill the gearbox with the designated gearbox oil.

Gearbox oil capacity: 0.25L

Gear oil: HYPOIDOEL TITAN EG 4218 DR HRNS

Replace the gasket with a new one and tighten the oil fillerplug.

**Torque:28±2 N·m**

Make sure no oil leaks.

# V. Cylinder head and valve

## Maintenance information

### Overview

- This chapter contains the maintenance and check of the cylinder head, valve, camshaft and rocker arm.
- When repairing the camshaft, rocker arm and tensioner, there is no need to remove the engine from the frame. When repairing cylinder heads and valves, the engine must be removed from the frame.
- When disassembling, the disassembled parts should be marked and put away to ensure correct homing during reassembly.
- Before inspection, clean all removed parts with detergent and use compressed air to blow them dry.
- Camshaft surface lubricating oil is injected through the oil pipe in the cylinder head and cylinder head cover, so clean the oil pipe before assembling the cylinder head and cylinder head cover.
- Do not to damage the joint surface when removing the cylinder head and cylinder head cover.

## Troubleshooting

- Heat engine failure usually affects engine performance.These faults can be diagnosed by compression tests, and engine noise sources can be traced up to the top using a probe rod or stethoscope.
- If the engine is running poorly at low speeds, please check whether there is white smoke in the crankcase ventilation pipe.If the hose smokes, please check whether the piston ring is stuck.

**When the engine is running at low speed, the compression pressure is too low, it is difficult to start or the performance is poor.**

- Valve
  - Improper valve clearance adjustment
  - Burnt or bent valves
  - Improper valve timing
  - Broken valve spring
- Cylinder head
  - Leakage or damage of cylinder head gasket
  - Warped or cracked cylinder head
  - Loose spark plug
- Wear of cylinder, piston and piston ring

**Compression pressure is too high, overheating or making popping sounds**

- Excessive smoke

**Excessive smoke**

- Excessive smoke
  - Valve stem or valve guide wear
  - Valve stem seal damage
- Cylinder, piston, piston ring wear

**Excessive noise**

- Cylinder head
  - Improper valve clearance adjustment
  - Valve stuck or valve spring broken
  - Camshaft wear or damage
  - Rocker arm or rocker arm shaft wear
  - Rocker arm and valve stem end wear
  - Timing chain wear
- Cylinder, piston, piston ring wear

**Poor idle speed**

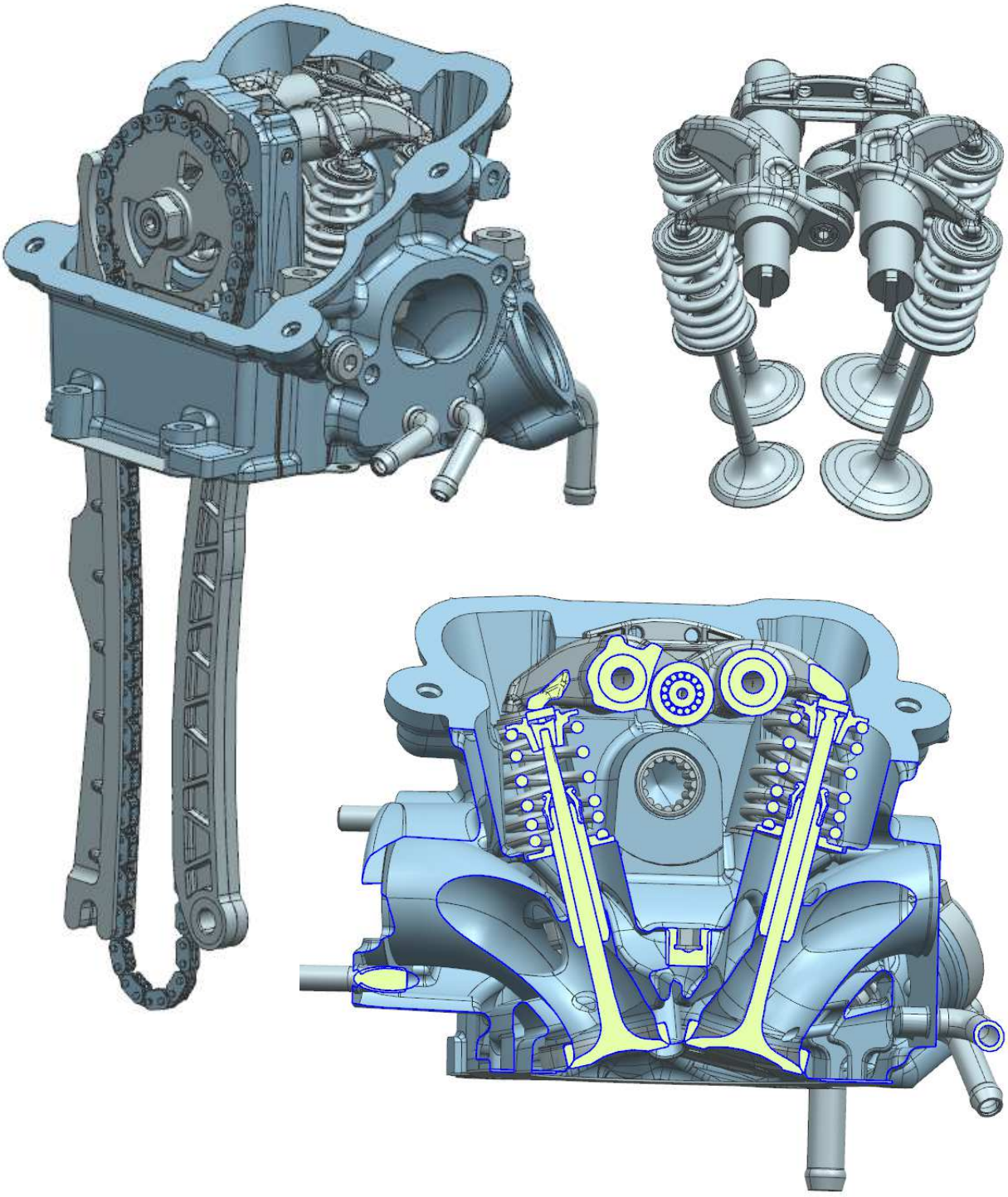
- Low cylinder compression pressure

## Cylinder head and valve specifications

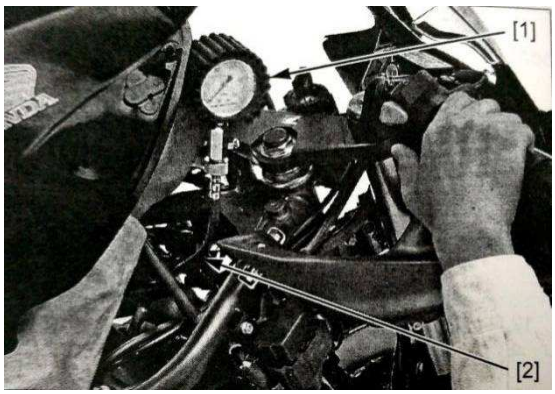
Unit：mm

| Item | | | Standard value | Service limit |
|---|---|---|---|---|
| Electric starter cylinder pressure | | | 700-900kPa | — |
| Valve clearance | | Intake valve | 0.16-0.24 | — |
| | | Exhaust valve | 0.34-0.42 | — |
| Rocker arm, rocker arm shaft | Rocker bore inside diameter | Intake/Exhaust | 13.006-13.024 | 13.10 |
| | Rocker roller outside diameter | Intake/Exhaust | 16.95-17.00 | 16.85 |
| | Clearance of rocker arm and rocker arm shaft | Intake/Exhaust | 0.012-0.048 | 0.10 |
| Camshaft | Camprotrusion height | Intake | 36.47 | 36.40 |
| | | Exhaust | 36.03 | 35.95 |
| Valve, valve guide | Valve stem diameter | Intake | 4.973±0.007 | 4.956 |
| | | Exhaust | 4.963±0.007 | 4.946 |
| | Valve guide inside diameter | Intake/Exhaust | 5.000-5.012 | 5.05 |
| | Valve stem-to-guide clearance | Intake | 0.02-0.046 | 0.08 |
| | | Exhaust | 0.03-0.056 | 0.09 |
| | Valve line width | Intake | 1.2-1.4 | 2.0 |
| | | Exhaust | 1.3-1.5 | 2.0 |
| Valve spring free length | | | 40.1 | 39.0 |
| Cylinder head flatness | | | 0.04 | 0.10 |

# Component location



# Cylinder compression test




Heat the engine to normal operating temperature.
Stop the engine and remove the spark plug.
Connect the cylinder pressure gauge [1] and the adapter [2] securely in the spark plug hole.
**Tools：**
**[2]Accessories for compression instruments**

Start the engine electrically, open the throttle valve fully until the cylinder pressure gauge no longer rises, at which point the gauge reads the maximum cylinder pressure.The maximum reading usually lasts between 4-7 seconds.
**Compression Pressure：**
**700kPa-900kPa,** above 1000kPa check the cylinder head combustion chamber, piston and piston ring section.
Analysis of the causes of low pressure：
- Leaking cylinder head gasket
- Improper valve clearance adjustment
- valve leaks
- Worn piston ring or cylinder

Analysis of high pressure causes：
- Carbon buildup in thecombustion chamber or on top of the piston
- Failure of the Camshaft decompression mechanism

# Cylinder head cover

## Removal/Installation

Caution：
- The cylinder head cover can be repaired without the engine being removed from the frame.

Remove the parts of the complete vehicle that cover the engine.
Remove the following components：
1. Clamp open the fuel pipecable tie with a tool [1].
2. Remove the fuel pipe plug and remove the fuel pipe[2].
3. Remove the carbon tube valve bracket plug and remove the carbon tube valve bracket [3].
4. Remove thecylinder head cover plug [4], remove thecylinder head cover plug Sealing gasket and remove the cylinder head cover [5], Sealing ring and contact spring.

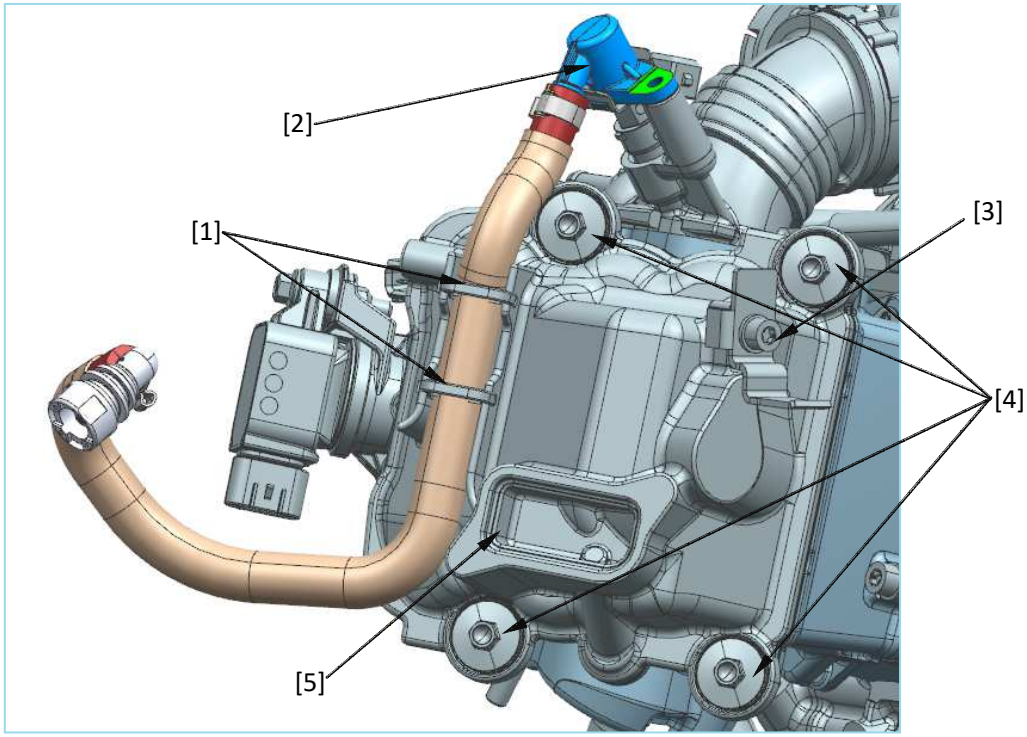
Installation is the reverse order of removal.
**Torque：**
**The cylinder head coverplug: 10N·m**

**Fuel pipe plug stud: 5.5±1N·m**

**Carbon pipe valve bracket plug: 10N·m**

caution：

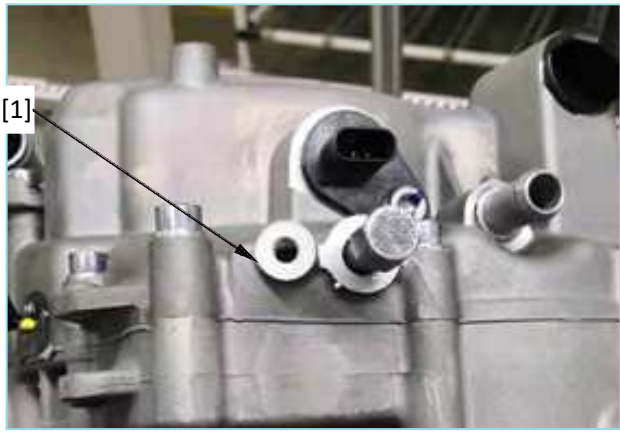
- Replace the cylinder head cover sealing ring with a new one.
- When installing, take care to install the cylinder head cover Sealing ring into the cylinder head cover Grooves.
- Note the orientation of the carbon tube valve bracket mounting, refer to the diagram below.
- Beware of contact springs falling into the crankcase.




# Camshaft

**Caution：**

- It is not necessary to remove the engine from the frame when servicing the camshaft.




## Removal

Unscrew the right cover timing hole plug.
Turn the left end face of the crankshaft clockwise with a spanner so that the round hole in the side of the rotor is aligned with the hole in the right crankcase cover M10 x 1. Screw in the rotor timing anti-rotation device [1] so that the cam and rocker arm fit in the base circle position.

**Tools：**

Rotor timing anti-rotation device [1]

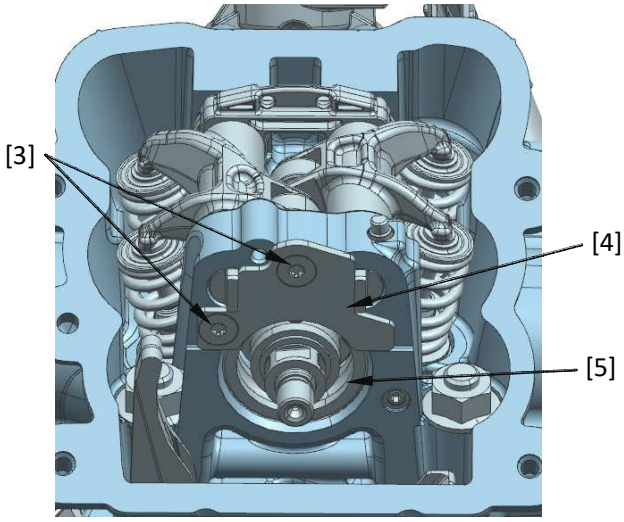
Remove the cylinder head cover according to the cylinder head removal procedure. Assemble the camshaft timing tooling [1] to the camshaft, install the cardboard location pin [2].


Unscrew the timing sprocket nut.
Remove the timing sprocket.

**Caution：**

- prevent the chain from slipping down into the crankcase
- Prevent nuts, tools, etc. from falling into the crankcase.

Unscrew the countersunk head screws [3] and remove the rocker shaft stopper [4].
Remove the camshaft assembly and pull out the camshaft bearings [5].



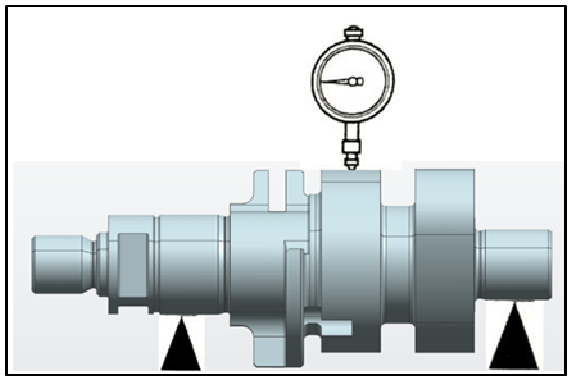

## Check

Measure each part according to the cylinder head/Air valve specification.

**Camshaft run-out**

Fix both ends of the camshaft with V-blocks and measure the base circle run-out with a micrometer.If the service limit are exceeded, replace the camshaft combination.

**Service limit: 0.08m**

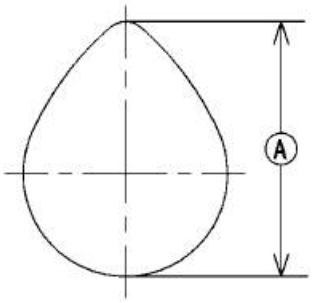


Check the camshaft cam package height A with a micrometer.

**Standard: Intakevalve 36.47Exhaust valve 36.03**

**Service limit: Intake valve 36.40 Exhaust valve 35.95**

Check camshaft deep groove ball bearing 6203.Clean the bearing with a solvent cleaning of high combustion point, blow dry the bearing with high pressure gas (do not rotate the bearing while drying) and lubricate with the engine oil. Check the condition of the bearing by quickly rotating it by hand. If the bearing makes a abnormal sound, does not rotate smoothly or stops violently in any way, replace the bearing.

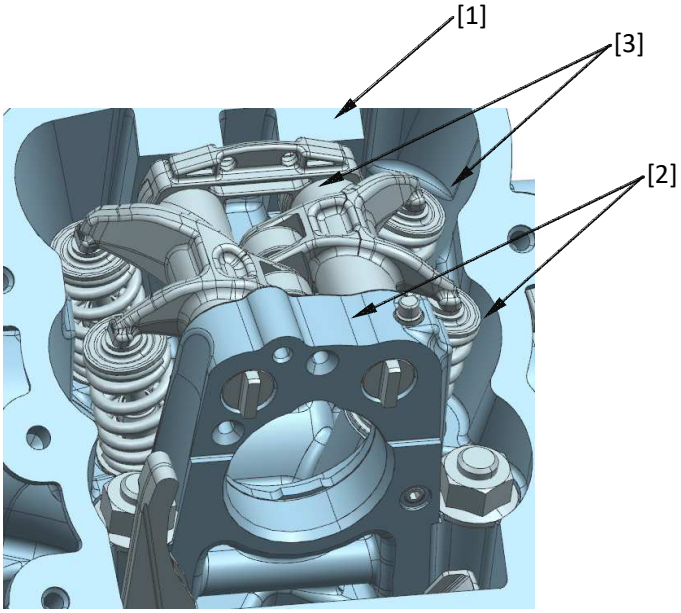



## Installation

Keep the right cover anti-rotation device to Lock up the crankshaft stop.
Fit the camshaft bearing to the camshaft, using a glue hammer to gently tap the inner ring into place.
Fit the camshaft assembly in the cylinder head mounting holes, fit the rocker shaft stopper to the cylinder head and tighten the two countersunk head screws.
**Tightening torque:：5.5±1N·m**

Install the camshaft timing tooling, on the cylinder head camshaft.
Hook the timing chain onto the timing sprocket, using the sprocket hook the timing sprocket is fitted to the camshaft with the timing sprocket engraved line parallel to the cylinder head face.
Install the cardboard location pin.
Clean the camshaft thread grease pre-fit the timing chain nut by 2-3 screw pitches and tighten.
**Tightening torque：45±5N·m**

# Rocker arm




## Removal/Installation

caution：

- It is not necessary to remove the engine from the frame when servicing the rocker shaft.
- The intake valve rocker shaft is repaired in the same way as the exhaust valve rocker shaft.

Remove the camshaft.
After removing the rocker shaft barrier, remove the rocker packing block [1], remove the rocker shaft [2] and take out the intake and exhaust valve rocker arm [3].

Installation is the reverse order of removal.

### Check

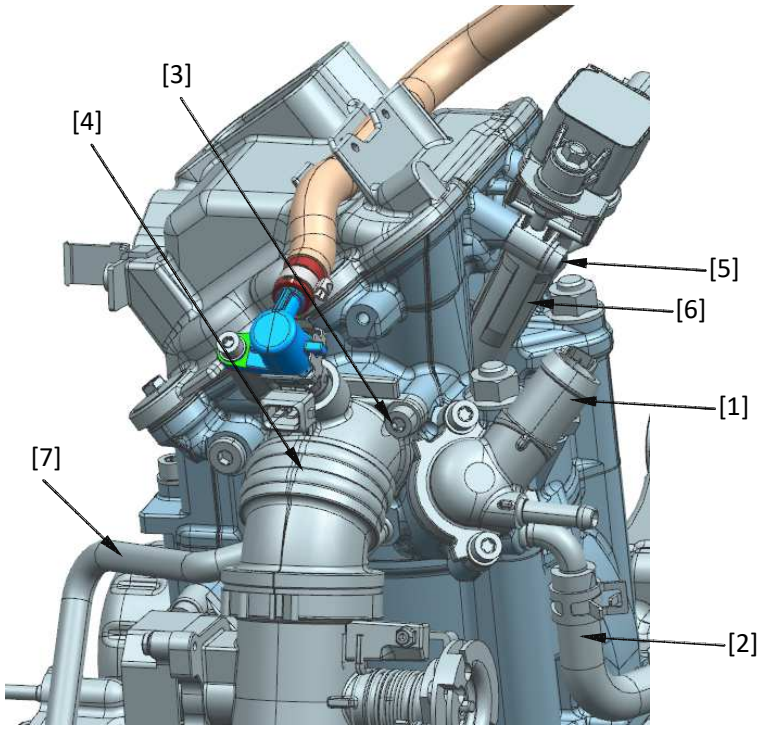
Check the following components for damage, abnormal wear, deformation, burning or blocked oil passages and replace if abnormal.

- Rocker arm
- Rocker shaft
- Roller bearing

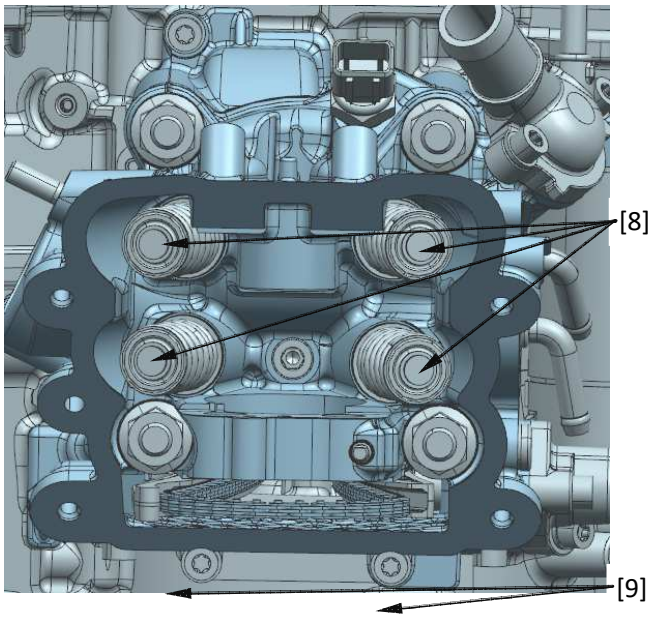
Measure each part and clearance according to cylinder head and valve specifications.
If any part exceeds the service limit, replace the corresponding part.

## Cylinder head

### Removal




Remove the following components in turn:
Remove the outlet pipe clamp [1] and remove the outlet pipe from the cylinder head.
Remove the small circulation hose clamp [2]
and remove the small loop water pipe.
Remove the fuel line, injectors and cylinder head cover parts as per the head cover removal procedure.
Unscrew the two air inlet pipe plug [3] and remove the air inlet pipe [4].
Unscrew the two ignition coil plug [5] and pull out the ignition coil [6].
Pull the ventilation tube [7] out of the cylinder head fitting.
Remove the camshaft and timing sprocket in the same way as the camshaft.
Remove the rocker arm and rocker shaft in the same way as the rocker arm.
Remove thegearset gap adjustment [8] in the order of the intake and exhaust valve and mark them so that they can be used by number during assembly.




**Caution：**

- prevent the gearset gap adjustment from

falling into the crankcase, it is recommended that they are sucked up with a suction rod.

- Prevents nuts, tools, etc. from falling into the crankcase

Unscrew the two chain cavity plug [9].
Unscrew the four cylinder head nuts.
Remove the cylinder head assembly, remove the cylinder head Sealing gasket and the chain guide plate.

## Decomposition

Remove the following components:

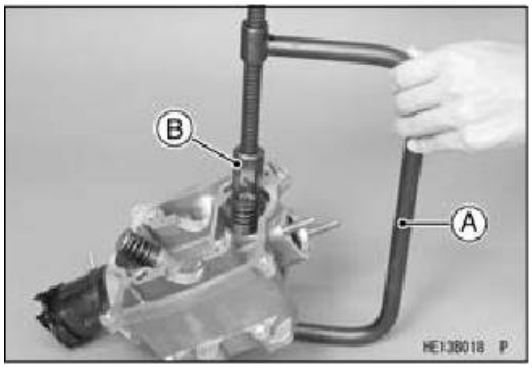
- Spark plug
- Water temperature sensor
- Unscrew the thermostat cover plug and remove the thermostat cover and note: to prevent permanent deformation of the valve springs, do not over-compress the starters when removing them.

*Caution: To prevent permanent deformation of the valve spring, do not compress the spring excessively when removing it.*

Remove the valve locking clip with a special tool [1].

**Tools:**

**Valve spring compression tool**



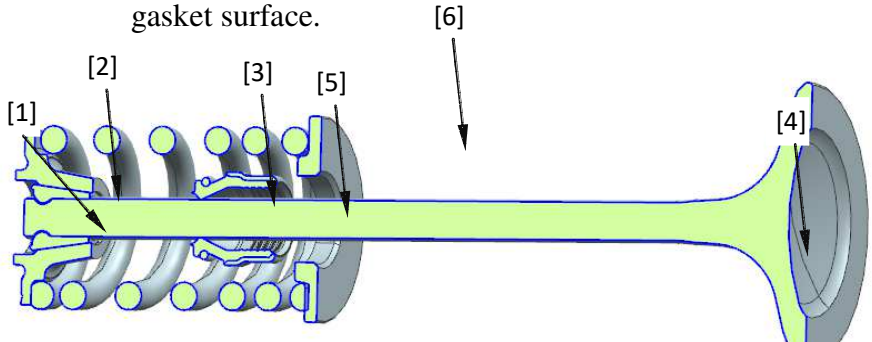

*When disassembling, take care to mark the individual parts for easy installation.*

Remove the valve spring compression tool and the following components.

- Upper valve spring seat [2]
- Valve spring[3]
- Valve[4]
- Engine oil hood [5]
- Lower valve spring seat [6]

*Take care not to damage the cylinder block Junction surface and the valve seat surface.*

Clean the combustion chamber of Carbon deposition and the cylinder head Sealing gasket surface.



**Check**

Check the following components for damage, abnormal wear, deformation, burning or blocked Oil channel

- Cylinder head
- Spring
- Valve
- Valve guide
- Chain guide plate

Measure the outside diameter of each valve lever section and the inner diameter of each valve guide and subtract the outer diameter of the valve lever section from the corresponding inner diameter of the valve guide to obtain the clearance between them. If the clearance exceeds the service limit, replace the cylinder head.

Measure each part and clearance according to cylinder head/ air valve specifications.

If any part exceeds the service limit, replace the corresponding part.

**Assembly**

Clean the cylinder head components with solvent and blow all oil channel with compressed air.

Clean the valves, springs, upper and lower valve spring seats and other parts.

Lubricate the new engine oil hood with engine oil.

Install the lower valve spring seat and engine oil hood.

Lubricate the sliding surfaces and rod ends of each valve lever with engine oil.

Insert the intake and exhaust valves into the valve guides with a small amount of engine oil on the end of the Valve lever and turn the valves slowly as you insert them. To prevent damage to theengine oil hood.

The valve spring is assembled with the dense end down on the valve seat ring.

Each of the two locking clips is placed in the round hole of the upper seat of one valve spring, assembling the 4 air valves in turn.

Spring upper seat , placed on the valve spring.

The cylinder head is placed smoothly on the locking clamping and press fitting positioning tooling.

The 4 valve springs are pressed down in turn with the hand trigger press, the locking clips are fitted in place and the clips are not dislodged after press fitting.

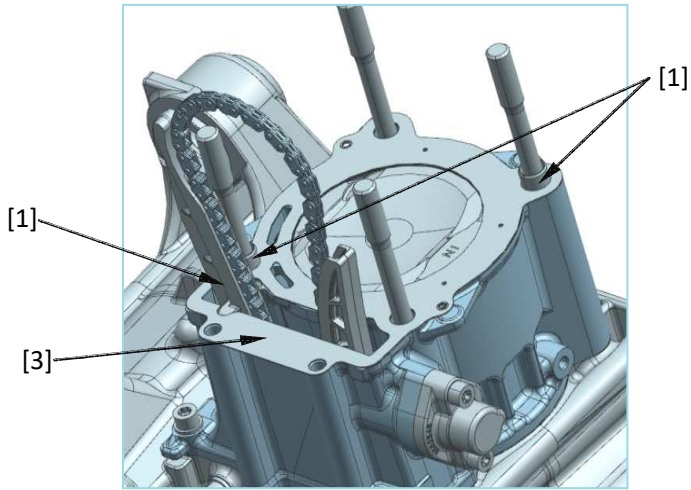
To prevent the spring from losing its elasticity, do not over-compress the spring.

Install the following components:

- Water temperature sensor tightening torsion force: **15±1N·m**
- Spark plug Tightening torsion force: **12±1N·m**
- Thermostat Reference cooling system thermostat assembly

## Installation

Remove the sealing gasket material from the cylinder junction surface .



*Caution: Do not allow dust and dross to enter the cylinder.*

Install the chain guide plate [1] with its projection aligned with the grooves on the cylinder and its bottom in the crankcase grooves .

Check the location pin [2] for damage, deformation, etc. If abnormal replace with a new one.

Replace the cylinder head gasket with a new one [3].

Pass the timing chain through the cylinder head and install the cylinder head [1] onto the cylinder block.

Thoroughly clean the threads and mounting surfaces of the cylinder head sealing plug and wipe dry.

Apply engine oil to the threads and mounting surfaces of the cylinder head sealing plug

Pre-torque the four cylinder head nuts by hand with 2-3 screw pitches, and tighten in diagonal order first torsion force: **10 N·m**

Tighten the four cylinder head nuts in diagonal order to a second torsion force: **30N·m**

Tightening of the four cylinder head nuts in diagonal order for the third torsion force: **135°±5°**

Install and tighten the chain chamber plug to a torsion force: **10±1N·m.**

Install the following components:

- Camshaft
- Rocker arm
- Cylinder head cover

Insert the ignition coil onto the spark plug and tighten the ignition coil plug to a torsion force：**10±1N·m.**

Apply lubricating oil to the surface of the cylinder head fitting and insert the breather tube into the cylinder head fitting.

Align the intake pipe and air filter assembly with the cylinder head inlet and tighten the intake pipe bolts to a torsion force: **10±1N·m.**

# Hydraulic tensioner

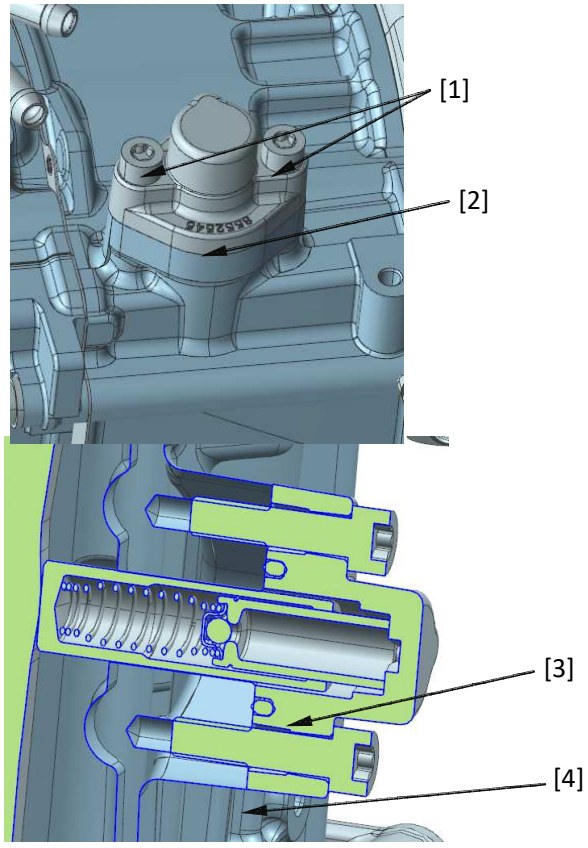
## Removal and installation

Caution：

- The tensioner can be serviced and checked without removing the engine from the frame.

Remove the tensioner plug [1] and take out the tensioner cover [2] and sealing ring [3].

Remove the hydraulic tensioner [4].




Installation is the reverse order of removal.

Caution：

- Replace the sealing ring with a new one.

## Check

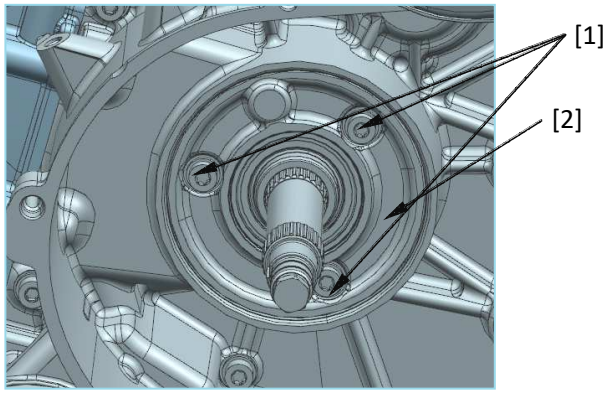
Check the outer surface of the tensioner and the inner hole surface of the tensioner cover for damage, abnormal wear, etc.Replacement parts are required in case of abnormalities.

# Timing chain

**Removal**

Remove the following components:

- Cylinder head
- Chain tension
- CVT cover
- CVT driving wheel (refer to chapter 6 section)



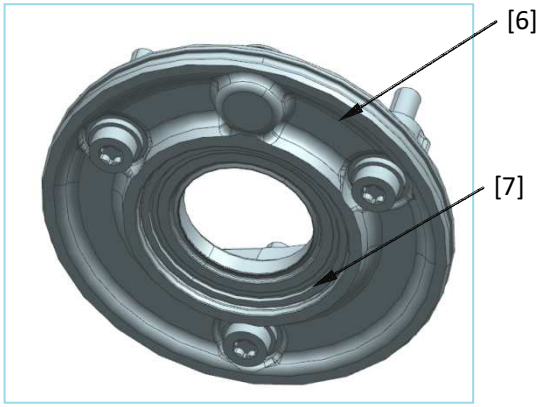

Unscrew the timing chain cover plug [1] at the left crankshaft end and remove the timing chain cover [2].Remove the guide plate location pin [3] and remove the chain guide plate [4] from the cylinder block.

Remove the timing chain [5].

## Check

Check the following components for scratches, damage, abnormal wear and distortion, oil leakage, etc. If abnormalities exist, replace components.

- Timing chain
- Chain tension plate、Guide plate
- Timing sprocket
- Timing chain cover sealing ring [6] and oil seal [7]




## Installation

Installation is the reverse order of removal. Fit the chain guide plate through the cylinder block and insert the guide plate retaining pin. Apply engine oil to the entire surface of the timing chain and hang it on the crankshaft timing sprocket. The chain is sucked out of the cylinder block chain cavity with a suction iron bar and the chain engages the sprocket. After assembling the camshaft alignment, assemble the timing chain cover to the box body. Apply lubricating oil to the sealing ring of the timing chain cover and the lip of the oil seal, put the oil seal protection sleeve on the crankshaft and gently tap it into place with a rubber hammer, then assemble the timing chain cover plug, tightening torque: **10±1N·m.**

Install the following components:

- Cylinder head, cylinder head cover

- CVT driving wheel (refer to chapter 6 section) [5]
- CVT cover

# VI. CVT transmission system

## Maintenance information

### Overview

- This chapter explains the repair of the CVT transmission system.All actions do not require the engine to be removed from the frame.
- Engine Oil viscosity and engine oil level affect clutch release.When the clutch does not disengage or the motorbike still moves forward slowly when disengaged, the engine oil level should be checked before servicing the clutch system.

## CVT transmission system specifications

Unit：mm

| Items | | Standard value | Service limit |
|---|---|---|---|
| Belt | Belt width | 25.8±0.2 | 25.0 |
| Driving wheel belt | Outer diameter of bushing | 35.000-35.025 | 34.990 |
| | Roller weight | 20g | 18g |
| Driven pulley | Spindle shaft diameter | 24.987-25.000 | 24.967 |
| | Clutch outer disc inner diameter | Φ160(+0.2 0) | 160.3 |

## Troubleshooting

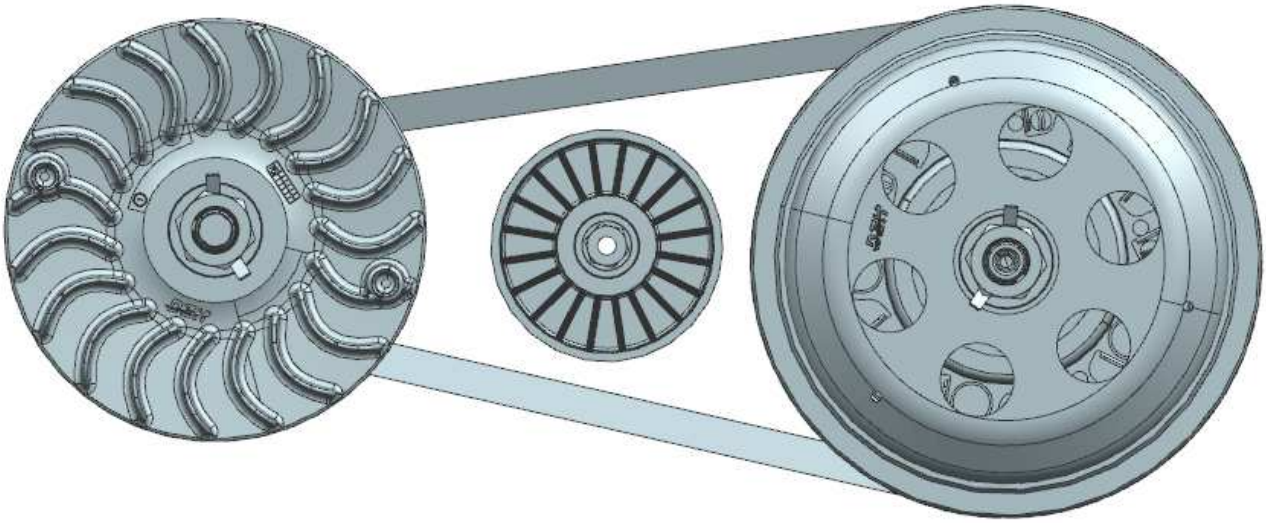
**CVT abnormal sound**

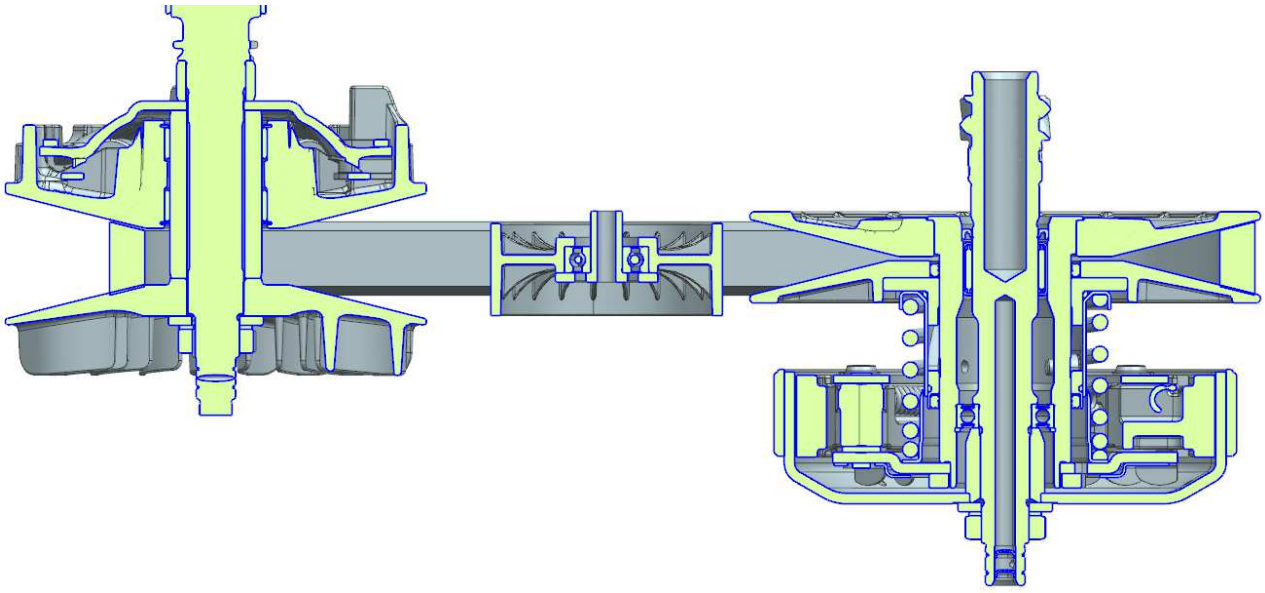
- Poor moving disc reset
- Excessive belt length
- Belt width wear
- Unstable idle speed
- Excessive foreign matter impurities

**CVT slipping during acceleration**

- Belt wear
- Engine oil present in CVT chambers
- CVT driving wheel wear
- Clutch shoe wear
- Excessive foreign matter impurities

# Component arrangement

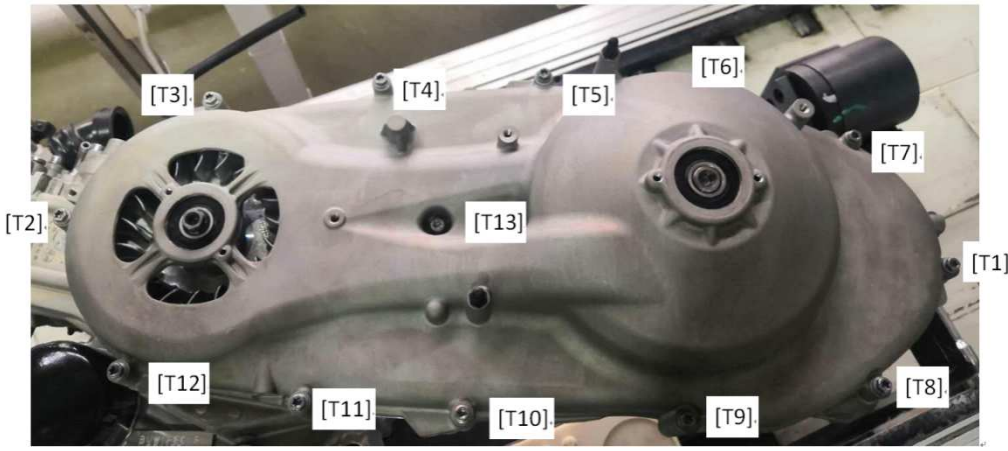




# CVT cover

## Removal and installation

Remove the CVT trim cover.
Remove the CVT fastening plug.
Removethe CVT cover assembly.
Installation is the reverse order of removal.
**Torque：**
**CVT cover plug：10±1N·m**




Caution：
Fastening plug in the order shown in the serial number on the right picture.

## Check

Check the following components for abnormalities such as scratches, damage, abnormal wear, deformation, grease and oil leakage.

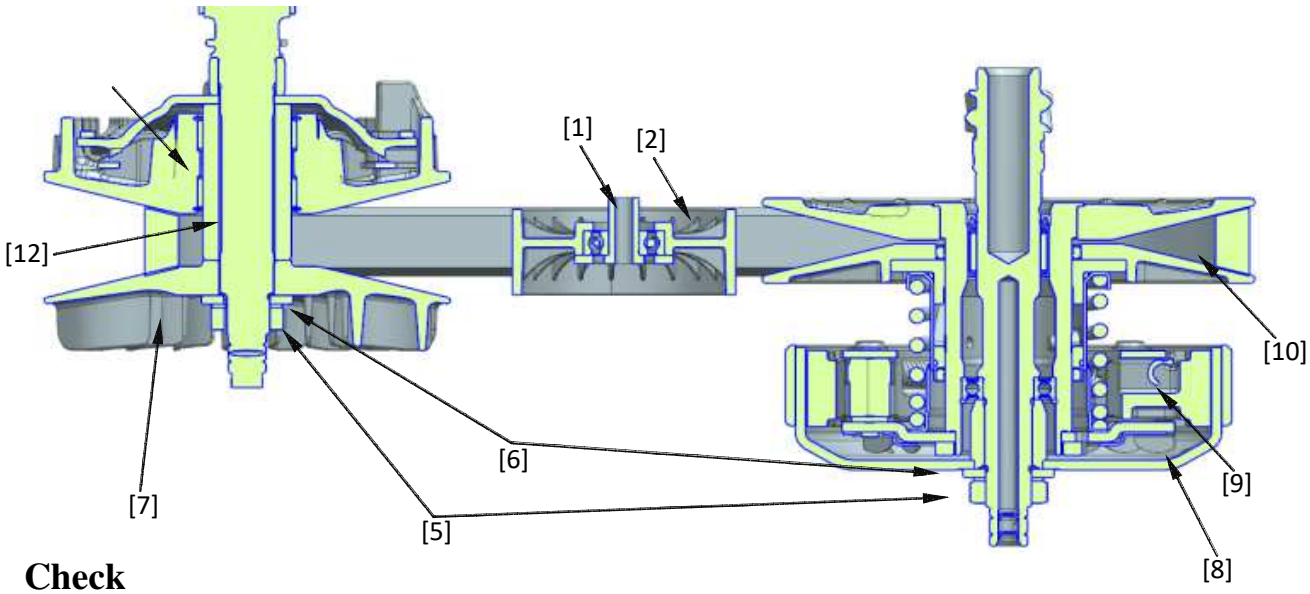
- CVT cover closing box surface
- Crankcase and CVT cover assembly plane
- CVT cover upper bearing

The crankcase and CVT cover assembly surfaces are scratched and bruised, etc, and are assembled after lightly sanding with sandpaper.If abnormal wear exists on the bearing, unscrew the bearing lever plug and replace the bearing.

# CVT assembly

## Removal

Remove the CVT cover.
Remove the belt idler gear fixing screw [1] and take out the belt idle gear [2]. Pry open the locking gasket with a screwdriver [3]
The CVT anti-rotation device [4] is fitted to the CVT with the front end stuck in the Driving wheel hole and the rear end stuck in the weight-reducing hole of the moving wheel clutch housing, and the middle screw of the tooling tightened in the threaded hole of the crankcase mounting belt idler gear.
Unscrew the master and slave wheel fastening nuts [5] and remove the lock up spacer [3]and washers [6].
Remove the Driving wheel fixed disc [7] and the driven wheel clutch outer bushing [8].
Remove the driven pulley [9] and the belt [10].
Remove the Driving wheel moving disc [11] and the bushings [12].




## Check

Check the belt according to chapter 2 Belt Maintenance.

Check the surfaces of the driving wheel fixed and moving discs of the driving wheel in contact with the belt. If there are abnormalities such as scratches, bruises, damage, abnormal wear and deformation on the surface, replace the driving wheel assembly.If there are impurities and traces on the surface, clean the surface with de-oiling cleaning agent and dry it with a clean cloth.

Check the Driving wheel fixed disc and moving disk splines and replace the driving wheel assembly if abnormal damage exists.

Check the outer diameter of the bushing and the inner and outer surfaces of the bushing for abnormalities such as scratching, bruising, damage, abnormal wear and deformation, and replace the driving wheel assembly.

Check the appearance and weight of the roller and replace the driving wheel assembly if abnormal wear is present.

Check the surfaces of the fixed disc and moving disc of the driven wheel in contact with the belt, and replace the driven wheel assembly if there are abnormalities such as scratch, bruise, damage, abnormal wear and deformation on the surface. If there are impurities and marks on the surface, clean the surface with de-oiling cleaning agent and dry with a clean cloth.

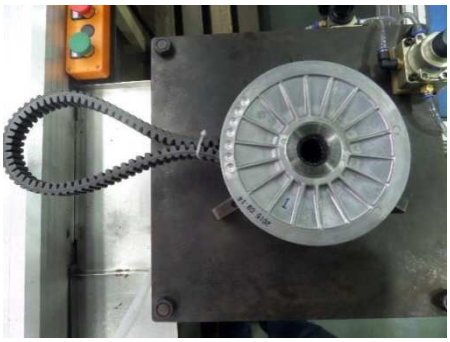
Check the surface of the clutch shoe of the driven wheel, if there is abnormal wear and material loss, replace the driven wheel assembly.

Check the O-rings on the crankshaft and input shaft and replace them if there are any abnormalities such as damage, deformation and rupture.

Check the grease on the crankshaft bore and input shaft bore. If the grease is low or there are impurities, clean it with cleaning agent, wipe it dry and fill it with NBU30PTMlubricating grease.

Measurements were taken on each part according to the CVT driveline specifications.

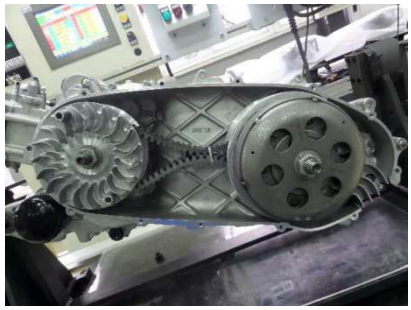
If any part exceeds the service limit, please replace it.



## Installation

Installation is the reverse order of removal.
Place the driven wheel on the rubber mat, press the driven wheel moving disc down hard to assemble the belt in the disc and tie the belt with a tie to prevent the belt from being pressed out by the driven wheel moving disc.
Caution：
The arrows on the outer surface of the belt are in the same direction as the belt runs, counter-clockwise when viewed from the left.
Install the main wheel moving disc and bushing into the crankshaft and the driven wheel and belt into the input shaft.

Caution：
Do not touch the splines and threads of the crankshaft and input shaft, just gently introduce them and fit them in place.



Install the moving wheel clutch housing and the driving wheel fixed disc.
Assemble the washer, Lock up spacer and fastening nut on the crankshaft and input shaft in turn. Pre-tighten the fastening nut manually by 2-3 screw pitches.Remove the rolling tape.
Caution：
The spacer projection needs to be aligned in the notch between the crankshaft and the input shaft.

Fix the CVT stop-rotation tooling to the master and slave pulleys as disassembled, with the middle screw of the tooling tightened in the threaded hole of the crankcase mounting belt idler.
**Tighten the main and driven wheel fastening nuts to a torque of 100±7 N·m.**
Remove the CVT anti-rotation device and loosen the belt from the slave pulley groove without jamming it. Rotate the crankshaft twice, fit the CVT anti-rotation device again, tighten the CVT active wheel fastening nut to 100±7N-m and remove the CVTanti-rotation device.
Bend the locking gasket of the master and slave wheel to fit the nut completely.
Install the CVT cover.

# VII. Magneto and starter motors

## Maintenance information

### Overview

- This chapter explains the repair of magneto stator and rotor.All actions do not require the engine to be removed from the frame.
- For the removal and installation of the speed and oil level sensors.
- Repair of the Starting motor in question.

## Troubleshooting

**Starting motor turns, engine does not start**

- Overrunning clutch failure
- Starter motor duplex gear or shaft failure
- Starter motor pinion failure or wear

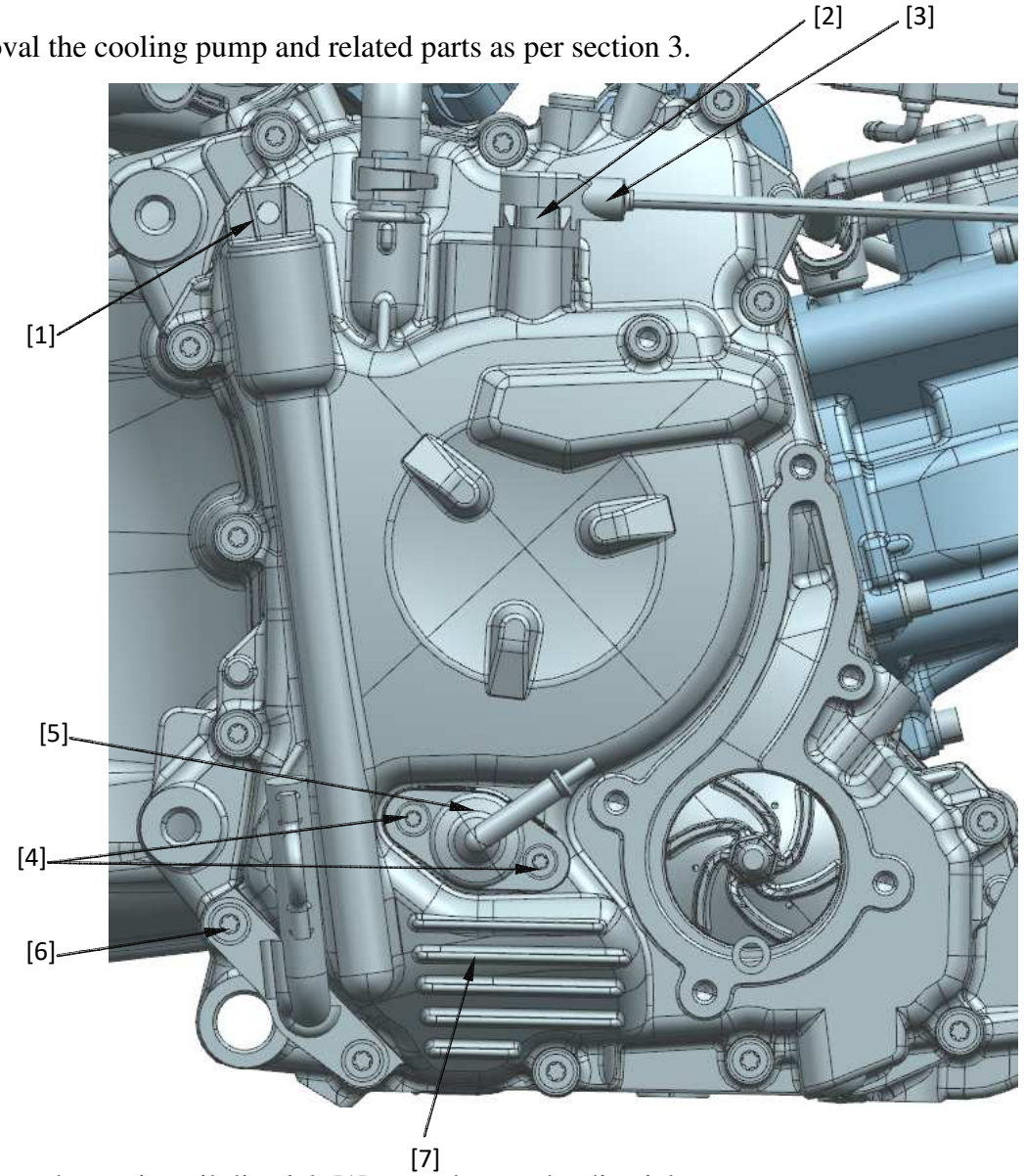
**The starter motor does not turn and the engine does not start**

- Corrosion of starter motor
- Starter motor duplex gear jammed

# Right crankcase cover and starting motor

## Removal and installation

Removal the cooling pump and related parts as per section 3.




Unscrew the engine oil dipstick [1] and take out the dipstick.

Unscrew the speed sensor plug [2] and remove the speed sensor [3].

Unscrew the engine oil level temperature sensor plug [4] and remove the engine oil level temperature sensor [5].

Unscrew the Starting motor fixing plug and remove the Starting motor.

Unscrew the remaining 13 right crankcase cover plug [6] and remove the right crankcase cover [7].Note that there are tiny O-rings on the Closing box surface to prevent falling into the box body.

Installation is the reverse order of removal.

Clean the sealant on the junction surface of the right crankcase, dry it and then reapply the sealant.

Assemble the O-ring in the O-ring groove on the junction surface of the right crankcase.

Assemble the two process guide bolts in the 3rd and 6th threaded holes in the right figure, then install the corresponding screw holes of the right crankcase through the process bolts to the junction surface of the right crankcase, and remove the process guide bolts.


Pre-install the pump cover on the right cover and pre-install the spring pendant plate and bolt in the threaded hole of the right cover, pre-tightening2-3 pitches. Tighten the bolt of the right cover according to the order showed in the right figure. **Tightening torque: 10±1N·m**.

Apply lubricant to O-ring of the speed sensor and rotate it into the right cover hole, then tighten the speed sensor bolt. **Tightening torque: 10±1N·m**.

Assemble temperature sensor of the oil level in the right cover hole, and then tighten the bolt of it. **Tightening torque: 5.5±0.5N·m**.

Tighten the dipstick into the right cover hole with the dipstick face closely against the surface of right cover.

Apply lubricant to the O-ring of starting motor, gently rotate it to assemble in the box hole and tighten the starting motor bolt. **Tightening torque: 10±1N·m**.

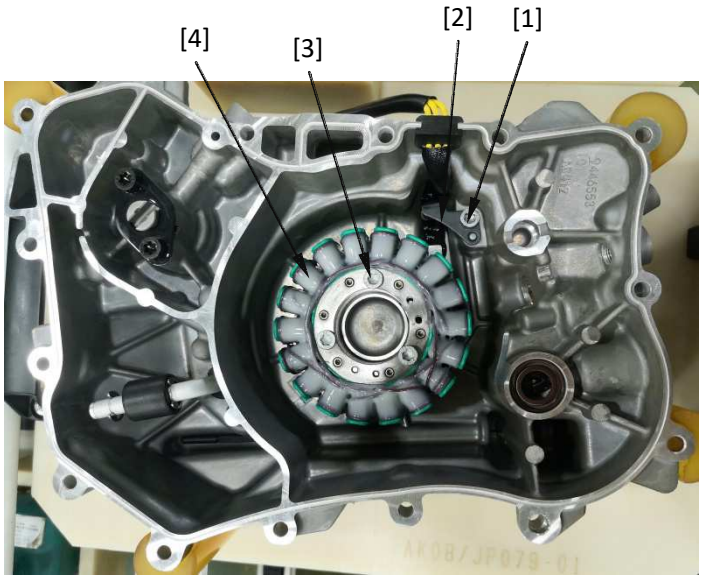
## Magneto spindle

**Removal and installation**

Remove the cover of right crankcase.

Unscrew the bolt of tension disc [1] and then remove the disc [2].

Unscrew the fastening bolt of magneto spindle [3] and then remove the spindle [4].




Installation is the reverse order of removal.

Assemble the magneto spindle in the right cover hole with the bolt through the hole aligned with the right crankcase cover threaded hole.

Assemble the magneto spindle fastening bolts in the spindle screw holes with 2 to 3 pitches pre-installed.

Assemble the tension disc in the position of right cover shown in the figure, install the bolt on the tension disc and pre-tighten 2-3 pitches.

Tighten the bolts of magneto spindle and the tension disc, the tension disc must be pressed against the wire harness when tightening. **Tightening torque: 10±1N·m**.

# Magneto rotor and oil pump sprocket

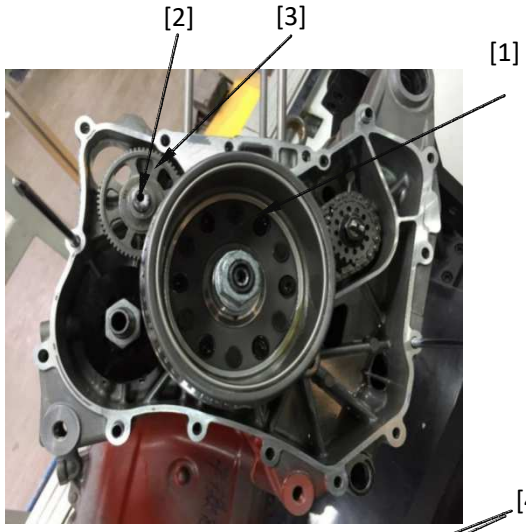
**Removal**

Remove the cover of right crankcase.

Install and fix the rotor anti-rotation device. Unscrew the nuts of magneto rotor [1].

Assemble the magneto rotor puller on the crankshaft to pull the rotor out. Remove the plate gear and disassemble the magneto rotor puller fixture.

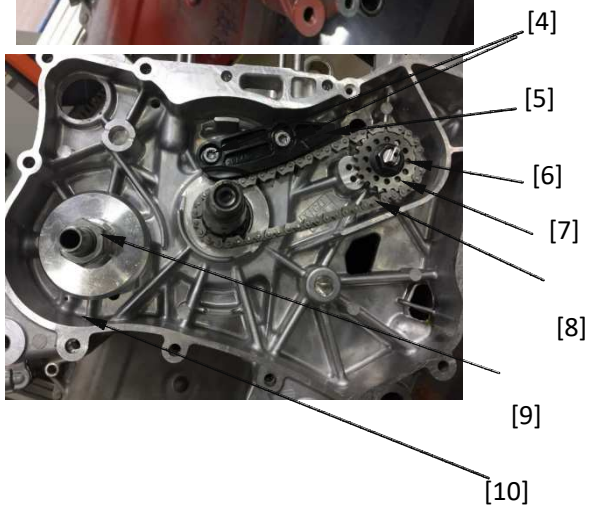
Take out the dual gear shaft [2] and the dual gear [3].



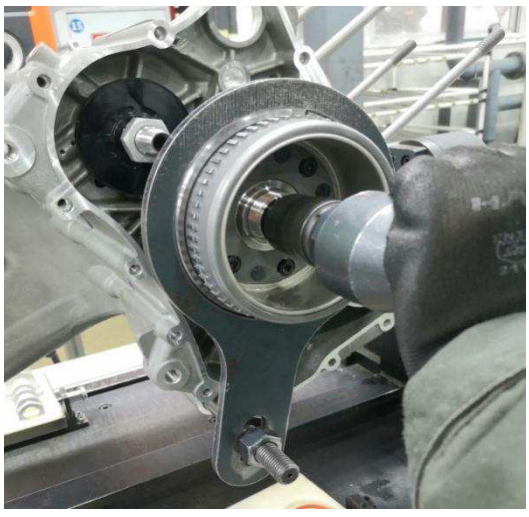

Unscrew the tension plate bolt of oil pump chain [4] and remove the plate [5].

Assemble the anti-rotation device of oil pump sprocket on it, unscrew the oil pump sprocket nuts [6], take out the oil pump sprocket [7], and then take out the oil pump chain [8].

Assemble the oil and gas separator anti-rotation device on the left side of the crankshaft and the box, unscrew the nut of it [9], and take out the oil and gas separator [10]. Take out the anti-rotation device.




Special tools:



Rotor anti-rotation device

Oil and gas separator anti-rotation device

Magneto rotor puller

Oil pump sprocket anti-rotation device

## Check

Check the following parts for scratches, damage, abnormal wear or deformation. If necessary, replace them.

- Dual gear and its shaft
- Magneto rotor cone
- Straight pin on crankshaft
- Plate gear
- Tension plate of oil pump chain
- Oil pump chain and sprocket

## Installation

Installation is the reverse order of removal.

Assemble the oil and gas separator anti-rotation device on the crankcase, and install the oil and gas separator with the small end facing upward on the balance shaft.

Clean the oil on the balance shaft thread and dry it with a blow gun.

Replace the new oil and gas separator nut and pre-install it on the balance shaft with 2-3 pitches,

tightening the oil and gas separator nut. **Tightening torque: 40±3N·m**. Remove the oil and gas separator anti-rotation device.

Assemble the oil pump chain on the oil pump sprocket, with the oil pump chain on the crankshaft gear tooth, and oil pump sprocket on the oil pump shaft.

Clean the oil on the pump shaft thread with cleaning agent and dry it with high pressure gas.

Install the oil pump sprocket anti-rotation device on the right box, fix the oil pump sprocket, preload the oil pump sprocket nut with 2-3 pitches, and tighten the oil pump sprocket nut. **Tightening torque: 25.5±2.55N·m**.

Assemble the oil pump chain tension plate in the bolt hole at the oil pump chain, pre-install the its bolt in the threaded hole, pre-tightening 2-3 pitches, and tighten it. **Tightening torque: 8±0.8N·m**.

Assemble the dual gear on the right crankcase, and insert its shaft through the dual gear hole into the box bore.

Assemble the plate gear bore on the crankshaft after applying lubricant in it, clean the crankshaft cone and oil on thread with cleaning agent, and dry it with industrial paper.

Clean the oil on the rotor bore cone and dry it with industrial paper.

Assemble the magneto rotor key way in place against the crankshaft cone locating pin. Replace the magneto nut with a new one and assemble it on the crankshaft with 2-3 pitches pre-tightened.

Tighten the plugs of magneto motor spindle and the tension disc, the tension disc must be pressed against the wire harness when tightening. **Tightening torsion force: 10±1N.m**.

# VIII. Crankcase, cylinder block and pinion unit

## Maintenance information

### Overview

- The crankcase must be separated in order to serve the following components:
  1. Crankshaft
  2. Balance shaft
  3. Piston, connecting rod, and cylinder block
- Take care not to damage the junction surface of the box when repairing.
- Clean the oil passages before assembling the crankcase.
- Before closing the box, apply the end sealant evenly on the closing surface, and clean up the excess sealant.
- Big end bearing shell and main bearing shell should be marked with proper color, bearings should be selected according to the requirements of the selection table. Then check whether the oil clearance is correct after the installation of the bearings, otherwise it will lead to significant damage to the engine.

## Crankcase, cylinder block and pinion unit specification

Unit: mm

| Item | | Standard value | Service limit |
|---|---|---|---|
| Transmission mechanism | Main bearing journal | 25.927-25.960 | 25.907 |
| | | 24.987-25.000 | 24.967 |
| | Intermediate journal | 24.980-24.993 | 24.960 |
| | Countershaft journal | 24.980-24.993 | 24.960 |
| | | 31.995-32.011 | 31.975 |
| Cylinder | Bore | 80.002-80.012 | 80.10 |
| | Out-of-circularity | 0.008 | 0.10 |
| | Taper | — | 0.10 |
| | Flatness | 0.05 | 0.10 |

## Troubleshooting

**Abnormal gearbox sound**

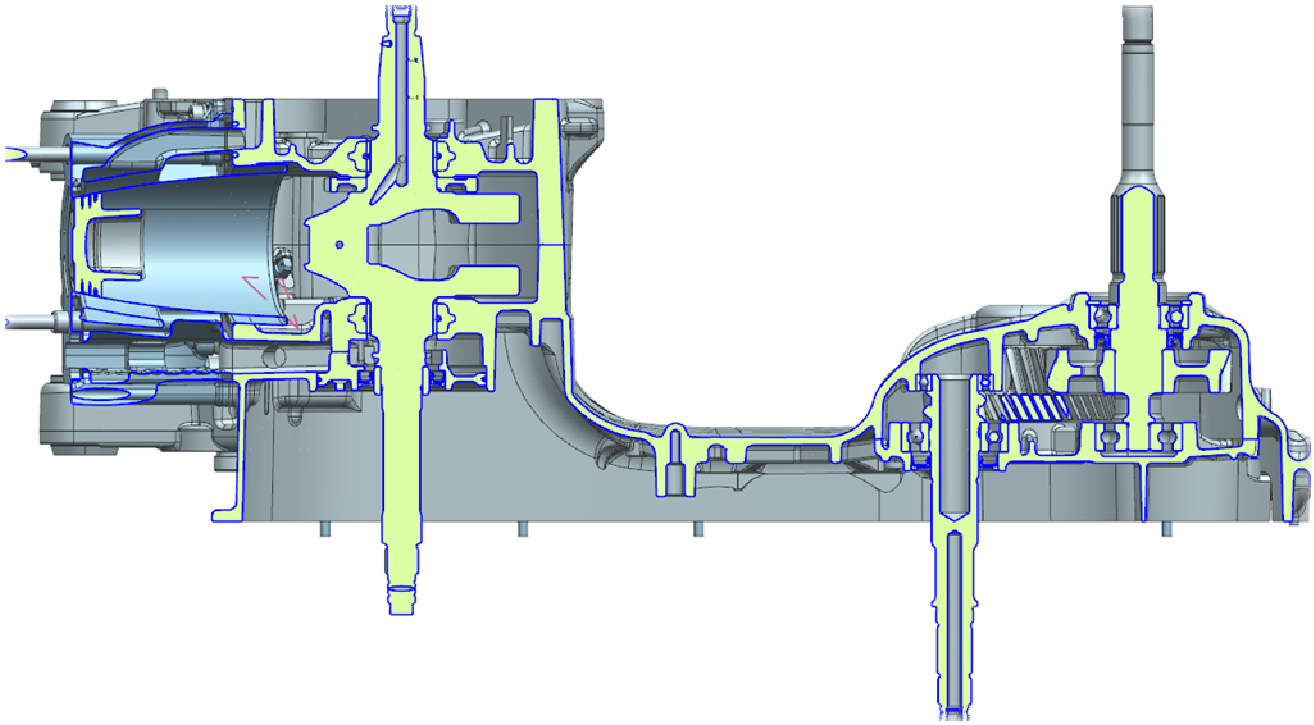
- Worn or damaged transmission gears

- Worn or damaged transmission shafts
- Gearbox gear oil does not meet the requirements
- Foreign objects and impurities in the gearbox

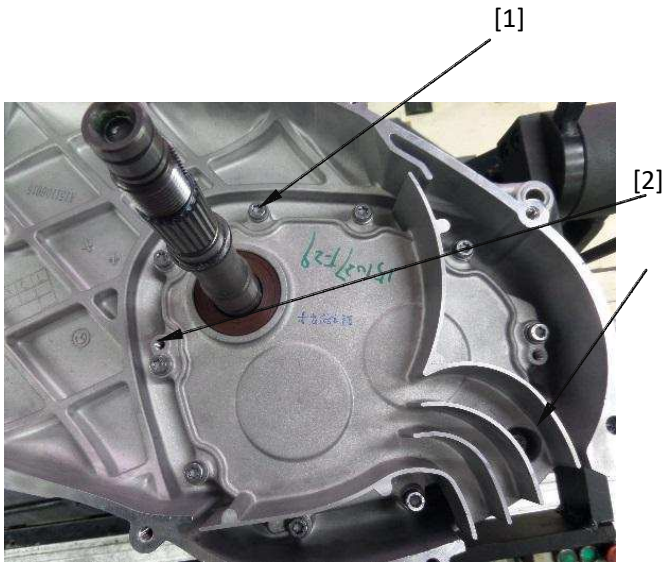
**Abnormal engine crankcase sound**

- Abnormally worn or damaged crankshaft bearing
- Abnormally worn or damaged balance shaft bearing
- Abnormal wear or damage to the driving gear of balance shaft
- Foreign objects and impurities in the crankcase
- Engine lubricant does not meet requirements
- Engine lubricant impurities are relatively high

# Component arrangement



# Gearbox

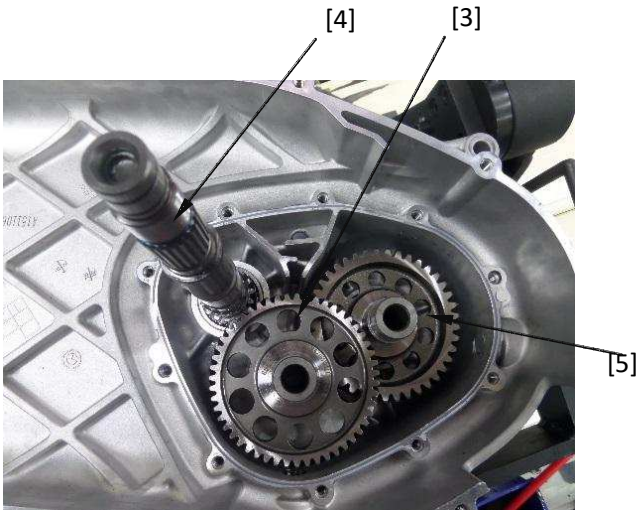



**Removal and installation**

Unscrew the fastening bolt of the gearbox cover [1], screw the removal bolt of it into the removal threaded hole [2], push out the gearbox cover, remove it, and unscrew the removal bolt.

Caution:

When screwing the bolt into the disassembly threaded hole, it should be screwed in both sides evenly and symmetrically to prevent damage to the gearbox cover.




The drive countershaft [3], main drive shaft [4] and output shaft [5] should be taken out in turn.

Installation is the reverse order of removal.

Cool the main drive shaft, drive countershaft and output shaft to below -10°C. Assemble the main drive shaft, output shaft and drive countershaft into the gearbox bearing holes in turn.

Clean the sealant on the closing surface of the gearbox, dry it and reapply sealant to the sealing surface of the cover.

Assemble the oil seal protection sleeve on the main drive shaft, install the gearbox cover through the shaft on the left crankcase gearbox, then, take out protection sleeve and use a nylon hammer to hit the punch to make the gearbox cover completely combined with the case surface.


Pre-tighten the gearbox cover bolts by 2-3 pitches in the threaded holes, pre-tighten the T4/T5/T10 bolts to **3±1N·m** first, then tighten them in order according to the right figure to a torque of **10±1N·m**.

**Check**

Check the following parts for scratches, damage, abnormal wear or deformation. If necessary, replace them.

- Main drive shaft, drive countershaft and output shaft
- Bearings
- Oil seal

Measure each part according to the **box, cylinder block and power train specification**, and replace any part that exceeds the maintenance threshold.

# Cylinder block

## Removal

Removal of the cylinder head.
Use a rubber hammer and a screwdriver to gently pry the cylinder block and pull it out from the top so that the piston comes out of the cylinder bore, thus removing the cylinder block.

## Check

Check the cylinder block for abrasion, damage, abnormal wear, deformation, burns, and blocked oil passages. Measure each part according to the **box, cylinder block and power train specification**, and replace any part that exceeds the maintenance threshold.

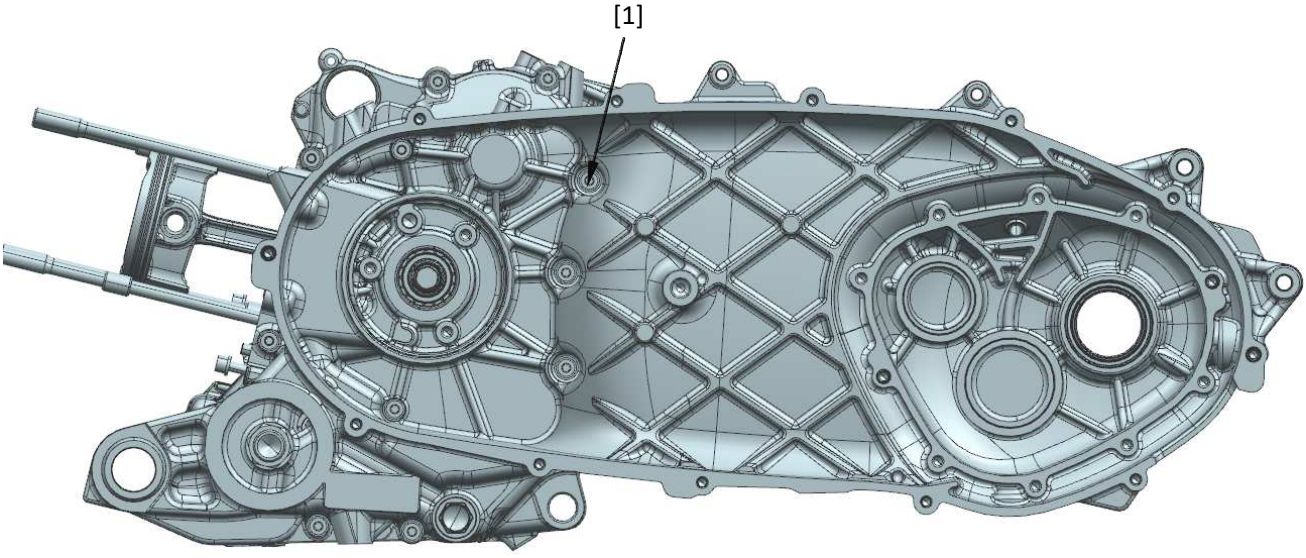
## Installation

Cylinder block installation is described together with the piston installation section.

# Crankcase

## Removal

After completing all the disassembly described in the previous section, the status is as shown below.



Unscrew 11 assembling bolts [1].
Use a rubber hammer and a screwdriver to gently pry open the crankcase, remove the right crankcase, the balance shaft assembly, and the crankshaft connecting rod assembly.

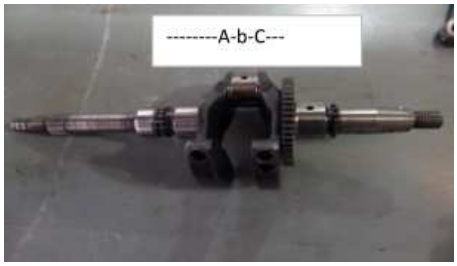
## Check

Check the box for abrasion, damage, abnormal wear, deformation, burns, and blocked oil passages. Check the crankshaft bearing and balance shaft bearing for abnormal wear, abrasion, damage, deformation and burn and other abnormal conditions, if so, please replace the box and re-press-fit the bearing.
The mating group information for crankshaft bearing and balance shaft bearing is as follows:

| Box Crankshaft Bore 8552168 | | | | |
|---|---|---|---|---|
| Crankshaft Journal 8552228 | | 1 | 2 | 3 |
| | | Up/Down | Up/Down | Up/Down |
| | A | Yellow/Purple | Green/Purple | Purple/Purple |
| | B | Yellow/Green | Green/Green | Purple/Green |
| | C | Yellow/Yellow | Green/Yellow | Purple/Yellow |

| Box Balance Shaft Bore 8552168 | | | | |
|---|---|---|---|---|
| Balance Shaft Journal 8552228 | | 5 | 6 | |
| | | Up/Down | Up/Down | |
| | A | Yellow/Green | Yellow/Yellow | |
| | B | Green/Green | Green/Yellow | |
| | | | | |

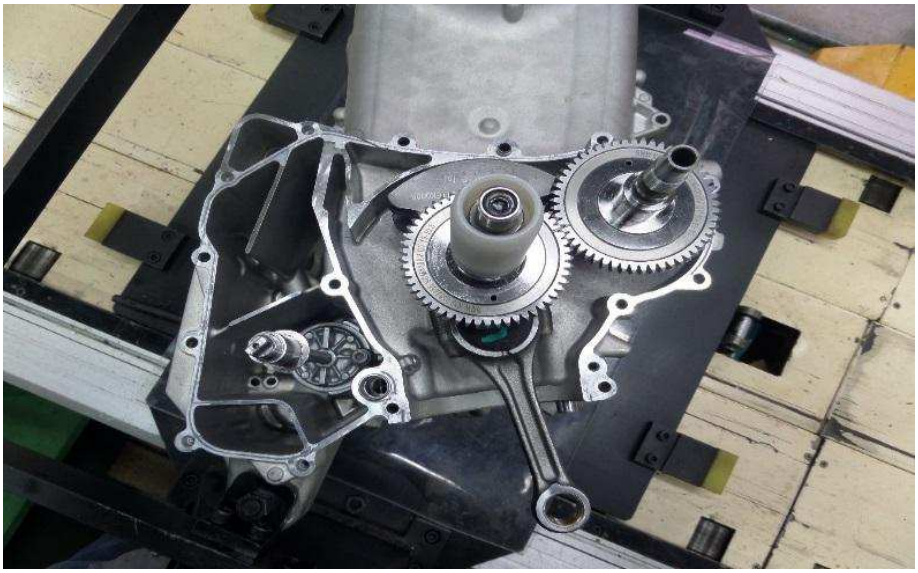
The two rear digits of the box QR code feedback the grouping information of the crankshaft bore and the balance shaft bore of the box. The grouping information of the crankshaft feedback the grouping information of the left crankshaft journal, the journal at the connecting rod and the right crankshaft journal in turn. And the balance shaft feedback the grouping information of the left and right journal of the balance shaft on the left and right side of the balance block respectively.




Measure each part according to the **box, cylinder block and power train specification**, and replace any part that exceeds the maintenance threshold.

## Installation

Refer to chapter 4, the lubrication system to assemble the oil pump in place.
Clear the sealant of the sealing surface, the oil passage and impurities inside the box with cleaning agent, then dry it with high pressure gas.

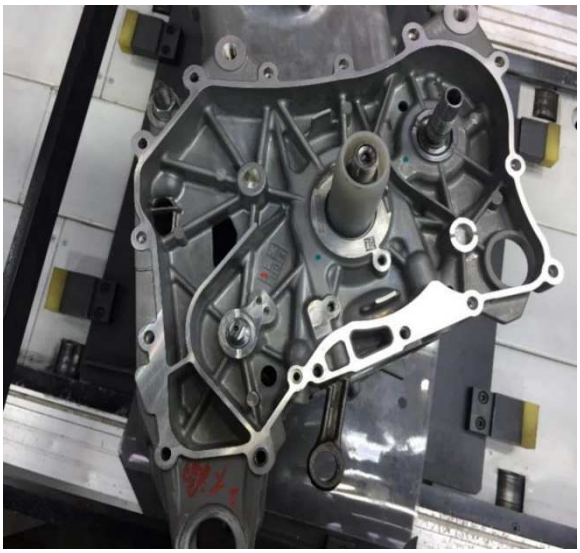


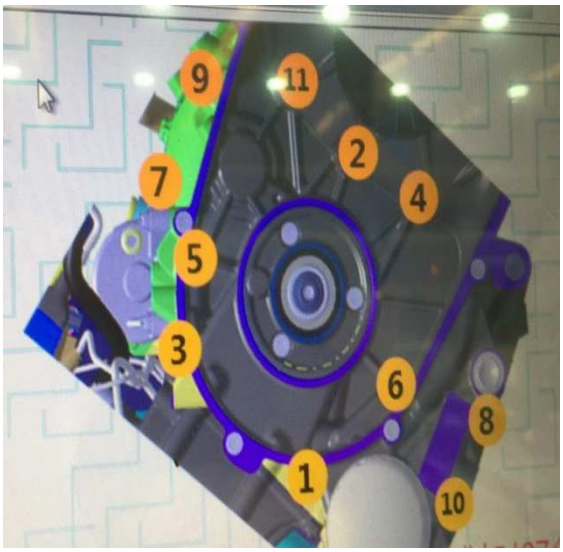
Align the rotor bore inside oil pump with the oil pump cover bore, apply lubricant to the left and right ends of the oil pump transmission shaft and assemble it in the oil pump cover bore, and rotate the oil pump transmission shaft to ensure flexible rotation.

Install protective sleeves for the crankshaft left and right ends of the crank, then apply lubricant to the left and right journals, assemble the left end of the crankshaft through the crankshaft mounting hole in the left crankcase, and remove the protective sleeve of the left end.

The left and right journals of the balance shaft are coated and lubricated, the driving and driven gears of the balance shaft are aligned, and the balance shaft is assembled in the balance shaft mounting hole of the left crankcase.

Apply sealant to the sealing line of the right crankshaft box closing surface, and assemble the right crankshaft box through the crankshaft on the left one. Turn over the crankcase assembly with the boxes closed, so that the left crankcase body is upturned, and then take out the crankshaft protection sleeve.





Pre-tightening 8 pieces of M6×60 assembling bolts with 2-3 pitches in the bolt holes of crankcase T2\T4\T6\T7\T8\T9\T10\T11, and pre-tightening 3 pieces of M6×120 assembling bolts with 2-3 pitches in the bolt holes of crankcase T1\T3\T5.
Pre-tighten the bolts at T7/T10/T4 by **3±1N·m**, and then tighten the box bolts in the order of the above figure with a torque of **10±1N·m**.

# IX. Crankshaft, piston and balance shaft

## Maintenance Information

### Overview

To maintain the crankshaft, balance shaft, cylinder block, pistons and connecting rods, the crankcase must be separated. For the method of separating the crankcase, see the section on box.
Mark and store the big end, cap and bearing of connecting rod to ensure that the above parts are in the correct position when reassembled.
Crank pins and main journal bearings are selected and matched by color. Select the bearing according to the color matching table. After selecting it is selected, re-check the oil clearance with a plastic plug gauge. Incorrect oil clearance can lead to severe engine wear.

## Crankshaft, piston and balance shaft specifications

Unit：mm

| Item | | | Standard Value | Service limit |
|---|---|---|---|---|
| Crankshaft | Connecting rod big end side clearance | | 0.130-0.312 | 0.36 |
| | Big end bearing shell and shaft, shank and pin clearance | | 0.032-0.056 | 0.07 |
| | Journal round-out | | — | 0.05 |
| Piston, piston pin and piston ring | Piston base diameter | | Φ79.98±0.007 | 79.900 |
| | Pin hole diameter | | 18.007-18.012 | 18.025 |
| | Piston pin diameter | | 17.995-18.000 | 17.98 |
| | Piston and piston pin clearance | | 0.007-0.017 | 0.04 |
| | Piston ring end gap clearance | The first ring | 0.15-0.25 | 0.5 |
| | | The second ring | 0.25-0.40 | 0.6 |
| | | Oil-control ring | 0.15-0.5 | 0.8 |
| | Piston ring and ring groove clearance | First ring and groove clearance | 0.040-0.080 | 0.12 |
| | | Second ring and groove clearance | 0.020-0.060 | 0.10 |
| Connecting rod little end inner diameter | | | 18.006-18.017 | 18.03 |
| Connecting rod and pin fit clearance | | | 0.006-0.022 | 0.05 |

# Troubleshooting

**Low cylinder pressure, difficult starting or poor low speed performance**

- Cylinder head gasket leakage
- Piston rings are worn, stalled or damaged
- Cylinder head/piston is worn or damaged

**Overhigh cylinder pressure, cylinder overheating or cylinder- knocking**

- Excessive carbon in the top of the piston or in the combustion chamber
- Cam decompression mechanism failure

**Excessive exhaust gas**

- Wear of cylinder, piston or piston ring
- Incorrect piston ring assembly
- Scratched piston or cylinder-wall

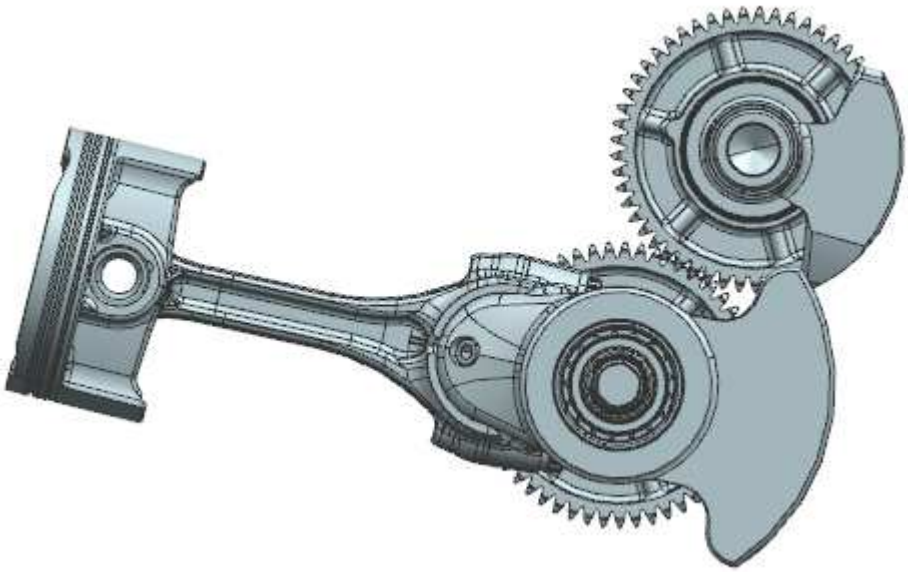
**Engine noise**

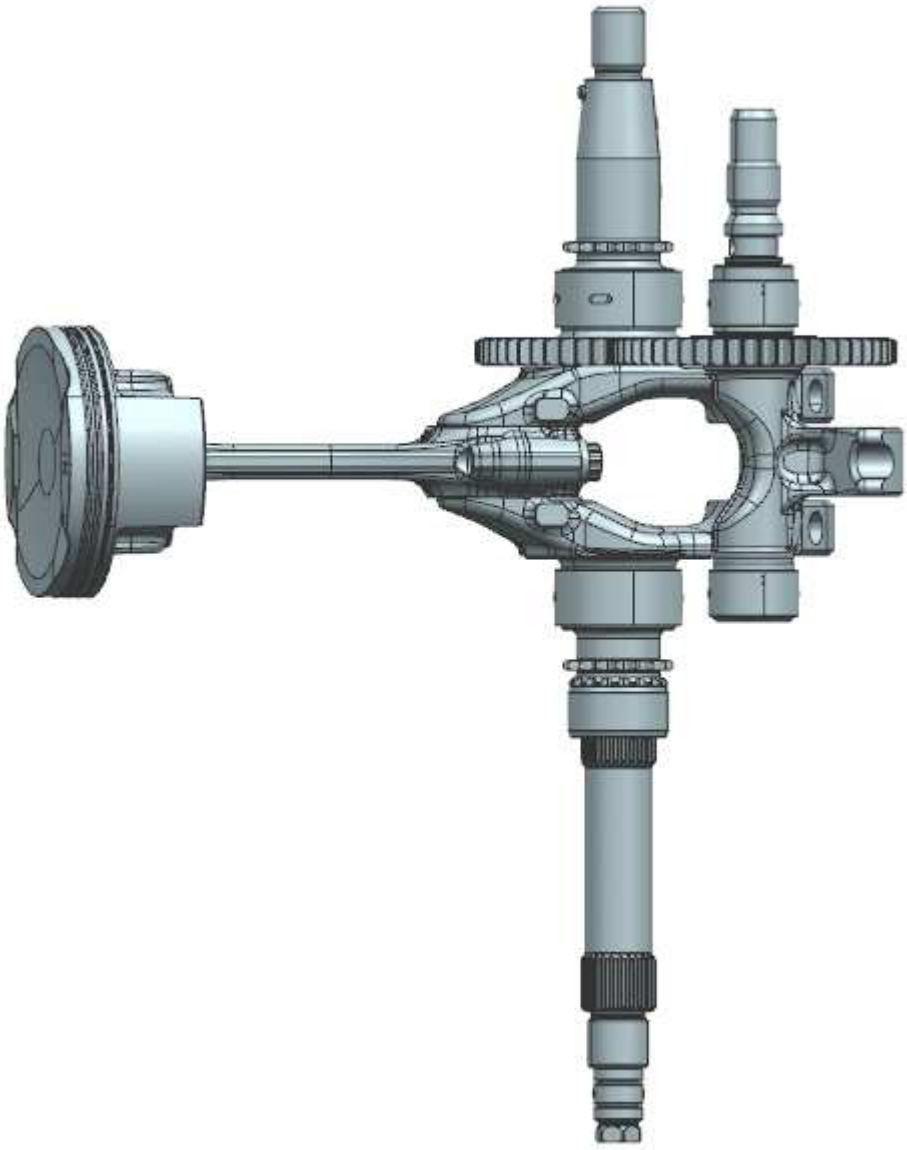
- Wear of piston pin or piston pin hole
- Wear of the connecting rod little end
- Wear of cylinder, piston or piston ring
- Wear of crank pin bearing

**Engine vibration**

- Excessive crankshaft runout

# Component arrangement

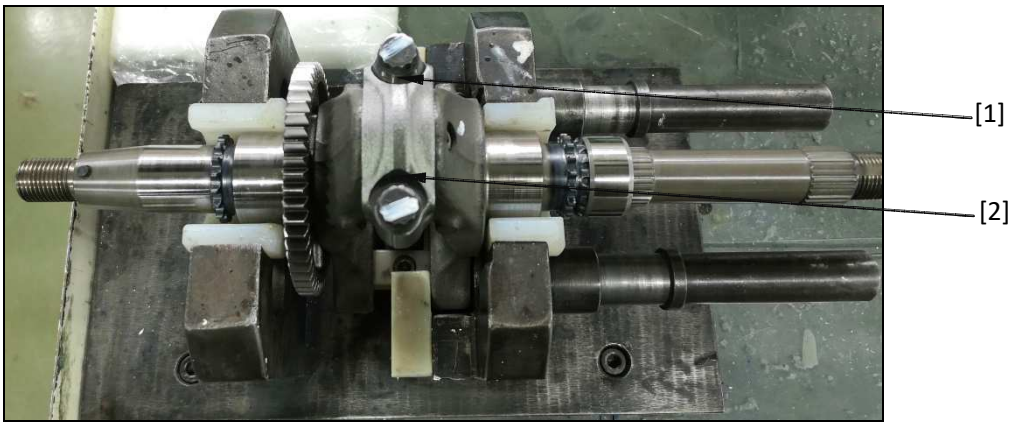




# Crankshaft &connecting rod

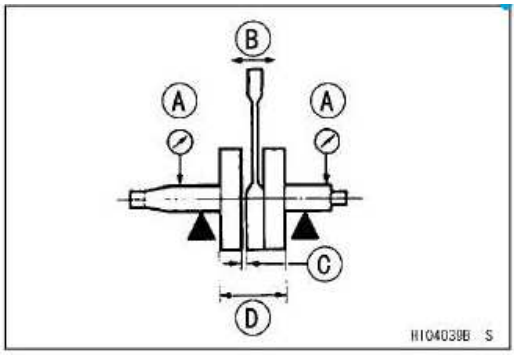
## Removal

Remove the connecting rod cover nut [1] and the cover [2]. Be careful not to damage the crank pin, main journal and bearing.
If the connecting rod cover is difficult to remove, gently tap the side of it.



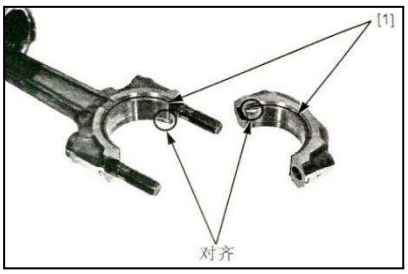

## Check

To test the crankshaft journal round-out A, support the journals at both ends of the crankshaft. Place a micrometer above the middle main journal, avoiding the oil groove and oil hole when placing it. Rotate the crankshaft two times (720°) and read the round-out data. **Service limit: 0.05mm**
Detect the free swing B of the little end of the connecting rod for abnormalities or sticking.
Measure the connecting rod big end side clearance C with a stopper. **Service limit: 0.40mm**. If the clearance exceeds the value, replace the connecting rod. Reconfirm the side clearance, if the result is the same, replace the crankshaft.
Test the crank width D. If the limit is exceeded, replace the crankshaft.
Check the balance shaft driving gear [1] for abnormal wear or damage.




| Crankshaft 8552228 | | | | |
|---|---|---|---|---|
| | | a | b | c |
| | | Up/Down | Up/Down | Up/Down |
| Connecting Rod 8552234 | A | Red/Blue | Red /Purple | Red / Red |
| | B | Purple/Blue | Purple/Purple | Purple/Red |
| | C | Blue/ Blue | Blue /Purple | Blue /Red |

Check the connecting rod little head for abrasion, damage, abnormal wear, deformation and burns, etc. Then check the connecting rod little head bore diameter, if it exceeds the service limit, replace the connecting rod.
Check the connecting rod bearing for abnormal wear, abrasion,



damage, deformation and burn and other abnormalities, if so, please replace and reassemble it. See the table above for the information of the connecting rod bearing assembly. The letters in the middle of the crankshaft grouping mark provide feedback on the crankshaft journal grouping information, and the letters at the big end of the connecting rod provide feedback on its bore grouping information.

Install the connecting rod bearing into the connecting rod cover and connecting rod big head, with each tab and groove aligned.

Measure each part according to the **crankshaft, piston and balance shaft specifications**, and replace any part that exceeds the maintenance threshold.

### Assembly

Clean the crankshaft journals, connecting rod threads and bearings with cleaning agent and dry it with high pressure gas.

Apply lubricant evenly to the crankshaft at the connecting rod mounting location (upper side of the crankshaft shaft diameter and at the lower half of the connecting rod bearing).

Assemble the connecting rod cover locating pin towards the left end of the crankshaft with the connecting rod cover on the crankshaft.

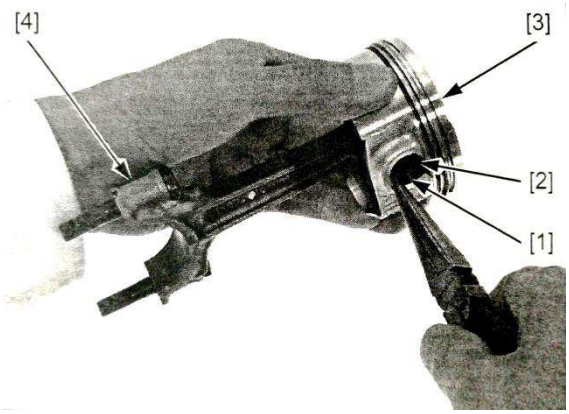
Fix the crankshaft and connecting rod on the crankshaft fixture, after it is stable and without shaking, apply a little lubricant to the connecting rod threaded hole, connecting rod cover end and bolt in turn.

Replace the two new connecting rod bolts, put them into the connecting rod bolt holes and pre-install to the end.

Tighten the two connecting rod bolts in turn. Tighten them to **5±1N·m** for the first time, to **20±1N·m** for the second time and to **90°±5°** for the third time.

## Piston

### Removal

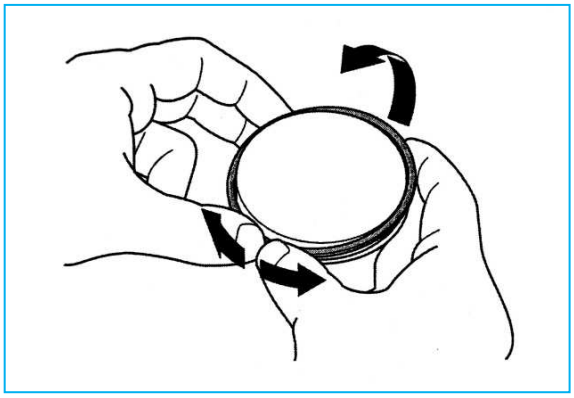



Remove the steel cable baffle ring with tweezers [1].

Push the piston pin [2] out of the piston [3] and connecting rod little head [4]， then remove the piston.

## Removal of piston ring

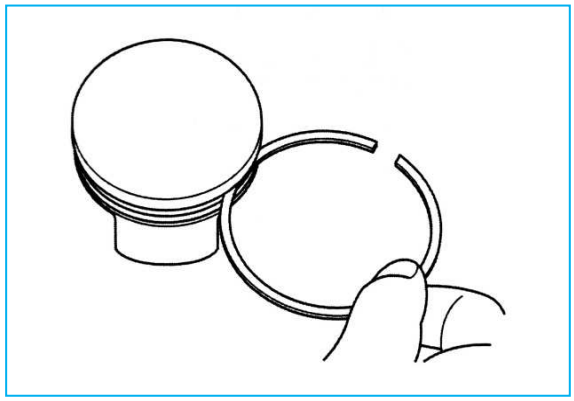
Separate the end of each piston ring, then remove the ring up along the opposite side of its opening.



**Caution:**

- Do not separate the end too far apart to avoid damaging the piston rings.
- Be careful not to scratch the piston when removing the piston ring.

Remove carbon from piston ring grooves with piston rings ready to bediscarded.

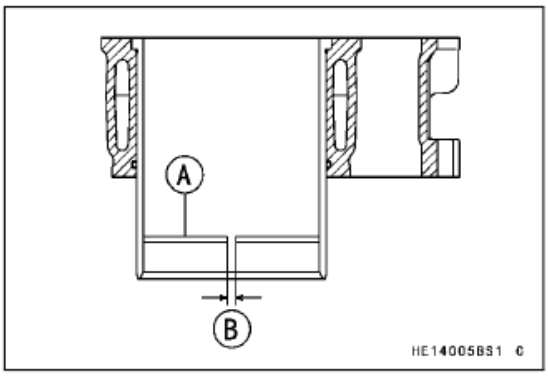


**Caution:**

- Do not use steel brushes as they may scratch the piston rings.

## Check

Check the following parts for scuffing, damage, abnormal wear, deformation, burns, and blocked oil passages.




- Cylinder block
- Piston
- Piston ring
- Piston pin
- Connecting rod little head

Check the piston ring end gap clearance, put the piston ring A into the cylinder and use the piston to position the piston ring to the proper position by setting it near the bottom of the cylinder, where the cylinder wear is less. Measure the gap between the ring ends ([B] piston ring end gap clearance) with a thickness gauge. If the end play of any of the rings exceeds the use limit, replace all piston rings.

Check the piston ring groove width and piston ring thickness to determine the piston ring and ring groove clearance. If it exceeds the service limit, replace the new piston ring and re-measure, if it still fails, replace the piston with a new one.

Measure each part and calculate clearances based on **crankshaft, piston and balance shaft specifications** and replace any parts that exceed the service limits.

## Assembly of piston rings


Clean the piston ring grooves thoroughly to install the piston rings.
Apply lubricant to the entire surface of the piston ring as well as the piston ring groove.
Put the left end of the open of oil-control ring backing ring [1] into the groove, rotate it into the oil-control ring groove, and fit the oil-control ring [2] in the piston oil-control ring groove. Put the left end of the open of the second oil-control ring into the groove and screw it into the oil ring groove, and install the two backing rings on both sides of the oil-control ring, and stagger the it and expansion ring about 90°, then rotate the oil-control ring and backing rings to confirm whether they rotate smoothly and without stalling.
Turn the lettering facing of the opening of the second ring [2] upward, and screw the left end of the opening into the second ring groove. The second piston ring should be misaligned with the oil-control ring opening by about 180°, and then rotate the second ring and confirm that the rotation is flexible and the piston is not scratched.

## Assembly of the piston

Clean the sealant on cylinder block junction surface and apply lubricant to the cylinder wall and piston thrust surface.
Assemble the steel cable baffle ring on the left side of the piston in the piston ring groove first, with the opening misaligned 180 ° from the piston nick.

Place the cylinder block on the platform, with the junction surface of it and the cylinder head facing down and that of the cylinder block and the box facing up.
Install the piston guide sleeve on the cylinder block with the head of the piston facing downward into it, noting that the mark "IN" is facing the direction of the engine intake.

Apply sealant evenly at the sealing line of the cylinder head sealing surface and pay attention to prevent the piston from coming out of the cylinder bore.
Assemble the cylinder piston combination through the stud on the box; be careful not to touch the sealant when assembling and the tensioner mounting hole towards the air inlet direction.
Apply lubricant to the surface of the piston pin and thread it through the left hole of the piston and the little end of the connecting rod to the right hole of the piston.
Assemble the piston steel cable baffle ring on the right side in the piston ring groove with the opening misaligned 180 ° with the piston nick, being careful to prevent the piston steel cable baffle ring from dropping into the box.
Gently tap the cylinder block with a rubber hammer in the direction of the box to install the it in place, and the bonding surface is in full contact with the box bonding surface. Then assemble the cylinder head part.

**Balance shaft**

**Check**

Check the journals at both ends of the balance shaft for scuffing, damage, abnormal wear and deformation, replacing the balance shaft assembly if necessary.
Check the balance shaft driving gear for pitting, failure of gear teeth, slipping, abnormal wear and deformation, replacing the balance shaft assembly if there is any abnormality.
Check whether the balance shaft driving gear and balance shaft assembly hole are aligned, if relative rotation is produced, please replace the balance shaft assembly.

**Assembly**

The assembly of the balance shaft is shown in chapter 8, the assembly of box.