Service Manual for Engine KEN660

LXFD090-054



Chongqing Loncin Engine Co.,Ltd.

Feb 2024

Foreword

There are increasingly more motorcycles getting onto market with each passing day, new structure and technologies are also adopted. For all the Loncin

users and service workers know well about the maintenance, adjustment and repair for engine KEN660, we made this service manual and hope it bring you more convenience when you need.

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1. Summary

Rules for maintenance

1. Please adopt the Loncin motor co.ltd. produced or suggested spare parts, lubricant or other auxiliary materials when maintenance is necessary. In case materials were adopted fail to meet

Loncin standard, it may damage your motorcycle.

2. When maintenance is necessary, please adopt the tools, bolt, nut and screw in metric standard, the ones out of metric standard such as imperial standard are not allowed, because they are not interchangeable to metric ones.

3. When parts were replaced or re-assembled, please also replace their washer, o-ring, split pin and locking piece.

4. Please fasten the bolt or nut with bigger diameter or inside first, then fasten the rest in alternative angle sequence, unless there is another specially stipulated sequence.

5. Wash removed parts by cleanser. Coat the moving surface with lubricant

6. When re-assembled, please check and confirm the correct re-assembly and proper operation, turn, move and operate them for checking.

7. Dispose the used oil, lubricant, pollutants and abandoned parts by strictly following laws and other state regulations.

Specification

General specification

	Items	**Data**

Engine	Type	LX467MT
	Displacement	662.8ml
	Cylinders and angle	4 cylinders in line； 30°
	Cylinder bore × Stroke	67mm×47mm
	Combustion chamber (Cylinder head)	8.2±0.2ml
	Compression ration	11.8： 1
	Max. power and its rotation	(68±2%)kW/(11500±1.5%)rpm;
	Max. torque and its rotation	(59±2%)N·m/(10000±1.5%)rpm;
	Air valve kit	Cam at top
	Lubrication system	Forced pressure + Splashing lubrication
	Cooling system	Water cooling
	Engine net weight	59kg
Transmission system	Clutch	Multiple wet layers
	Gear box	International 6 gears
	Primary transmission ratio	1.667
	End transmission ratio	3.067
	Gear transmission ratio	1^{st} ： 3.167 2nd ： 2.353 3rd ： 1.889 4th： 1.600 5^{th} ： 1.407 6^{th} ： 1.250
	Gearshift method	1-N-2-3-4-5-6
Electrical system	Ignition system	Jointly electric ignition: Sequence 1-2-4-3
	Starting system	Electric starting
	Lighting system	Battery
	Spark plug specification	CR9EH-9（NGK）
	Spark plug gap	0.8-0.9mm
	Rectifier regulator	3 phases complete wave regulator

Cooling system specification

Items		Specification
Coolant capacity	Heat radiator and engine	2.1 L
	Tank	0.36 L

Relief pressure for heat radiator cover		108-137kPa
Thermostat	Initial temperature	80-84℃
	Complete temperature	95℃
	Valve rise	7mm
Coolant we suggest		With ethanol without silicate
Standard thickness of coolant		Mixture with distilled water by 1:1

Lubrication system specification

Unit: mm

Items		**Standard**	**Maintenance limit**
Oil capacity	When oil replaced	2.6 L	—
	Drain off and replace element	2.9 L	—
	When engine broke up	3.3 L	—
Oil we suggest		The engine oil we suggest: SL10W-40 API quality grade: SL or higher (Please don't adopt energy saving oil which marked up on API service label)	—
Pressure for oil pressure sensor on or off		At 80℃ or normal temperature : (30±10)Kpa	—
Oil pump rotor	Gap between impeller tips	0.15	0.20
	Middle clearance	0.12-0.21	0.35
	Clearance between sides	0.03-0.095	0.12

Cylinder head/Valve specification

Unit:mm

Items	**Standard**	**Maintenance limit**
Pressure in cylinder of electrical starting	⩾1200KPa	—

Valve gap		Air inlet	0.20±0.03	—
		Air exhaust	0.28±0.03	—
Tappet		Outer diameter	24.467-24.48	24.459
		Hole diameter	24.5-24.521	24.535
Camshaft	Height of protrusion	Air inlet	35.7473-35.8773	35.7173
		Air exhaust	35.7467-35.8767	35.7167
	Gap between journal and hole		0.02-0.062	0.10
	Runout		**≤0.02**	0.04
Valve and its guiding tube	Rod diameter of valve	Air inlet	4.475-4.490	4.465
		Air exhaust	4.465-4.480	4.455
	Inner diameter of guiding tube	In/Exhaust	4.500-4.512	4.54
	Gap between valve rod and its guiding tube	Air inlet	0.01-0.037	0.075
		Air exhaust	0.02-0.047	0.085
	Height of guiding tube	In/Exhaust	13.3-13.6	—
	Width of gate line for base ring	In/Exhaust	0.90-1.10	1.5
Free length of valve spring			39.3	38.34
Flatness of cylinder head			**≤0.05**	0.10

Clutch and gearshift specification

Unit：mm

Items		**Standard**	**Maintenance limit**
Free travel for clutch lever		10-20	—
Clutch	Spring free length	50.3	49.3
	Driving plate thickness	2.92-3.08	2.7
	Driven plate flatness	**≤0.1**	0.30
Clutch collar	Inner diameter	24.992-25.007	25.017
	Outer diameter	30.992-31.005	30.982
Outer diameter at main shaft of clutch collar		24.967-24.980	24.947

Magneto and starting clutch specification

Unit: mm

Items	Standard	Maintenance limit
Outer diameter for shaft jacket of starting gear	51.705-51.718	51.685
Inner diameter for outer case of starting clutch	68.364-68.39	68.354

Case body and transmission specification

Unit: mm

Items			Standard	Maintenance limit
Transmission kit	Inner hole diameter of gear	M5, C1	28.000-28.021	—
		M6	28.020-28.041	—
		C2, C3, C4	33.000-33.025	
	Outer diameter of shaft jacket	M5	27.959-27.980	—
		M6	27.979-28.000	—
		C2, C3, C4	32.950-32.975	—
	Gap between gear and shaft jacket	M5, M6	0.020-0.062	—
		C2, C3, C4	0.025-0.075	—
	Inner diameter of shaft jacket	M5	25.000-25.021	—
		C2	30.000-30.021	—
	Shaft diameter of main shaft	Match to Shaft jacket of M5	24.967-24.980	—
		Match to Shaft jacket of C2	29.959-29.980	—
	Gap between shaft and its jacket	M5	0.020-0.054	—
		C2	0.020-0.062	—
Turning fork and its shaft	Diameter for fork shaft		11.957-11.968	11.947
	Inner diameter for fork		12.000-12.018	12.028
	Fork tip thickness		5.93-6.00	5.92

Specification for crankshaft, piston, and cylinder body

Unit: mm

Items			Standard	Maintenance limit
Crankshaft	Gap at bigger end of connecting rod		0.10-0.25	0.3
	Gap between shaft pad on bigger end of connective rod and the shaft pin		0.030-0.048	0.06
	Gap between journal of crankshaft and shaft pad		0.018-0.036	0.05
	Runout		—	0.05
Cylinder	Cylinder bore		67.000-67.015	67.10
	Roundness loss		—	0.10
	Taper		—	0.10
	Flatness		≤0.05	0.10
Piston, piston pin and piston rings	Diameter of piston skirt (H=7)		66.965-66.985	66.89
	Diameter for pin's hole		16.002-16.008	16.02
	Diameter of piston pin		15.994-16.000	15.98
	Gap between piston and its pin		0.002-0.014	0.04
	Closing gap of piston ring	1st ring	0.10-0.20	0.4
		2nd ring	0.21-0.36	0.5
		Scratching ring	0.20-0.70	1.0
	Gap between piston ring and its groove	Gap between 1st ring and its groove	0.030-0.060	0.10
		Gap between 2nd ring and its groove	0.015-0.050	0.08
Cylinder matching gap			0.015-0.050	0.10

Smaller end of connecting rod and its inner diameter	16.030-16.044	16.05
Matching gap between connecting rod and its pin	0.03-0.05	0.07

Torque

Standard torque

Fastening piece type	**Torque N.m**	**Fastening piece type**	**Torque N.m**
Bolt and nut 5mm	5.2	5mm screw	4.2
Bolt and nut 6mm	10	6mm screw	9.0
Bolt and nut 8mm	22	6mm flange bolt （Head 8mm，smaller flange）	10
Bolt and nut 10mm	34	6mm flange bolt （Head 8mm，bigger flange）	12
Bolt and nut 12mm	54	6mm flange bolt （Head 10mm） and nut	12
		Flange bolt and nut 8mm	27
		Flange bolt and nut 10mm	39

Engine torque

Items	**Qty.**	**Thread diameter mm**	**Torque N.m**	**Note**
Screw of air filter cover	8	Self-tapping screw M5	—	
Screw of air filter element	2	Self-tapping screw M5	—	
Sprocket wheel bolt	1	10	54	
Spark plug	4	10	16	
Right decorative cover	5	6	12	
Engine oil drainage bolt	1	12	28	

Secondary oil filter	1	20	10	Coat seal ring with oil
Tube joint of secondary oil filter	1	24	27	From head as beginning coat length 6.5mm with Loctite
Water-oil heat exchanger	1	20	59	Coat thread and base surface with oil

Cooling system

Items	**Qty.**	**Thread diameter mm**	**Torque N.m**	**Note**
Bolt for fan kit	3	6	10	Coat thread with Loctite
Installation bolt for water pump	3	6	12	
Water pump drainage bolt	1	6	12	
Tube joint bolt for cooling pump (Connect to cooling pump cover)	1	6	12	Coat thread with Loctite
Thermostat cap bolt	2	6	12	

Cylinder head and valves

Items	**Qty.**	**Thread diameter mm**	**Torque N.m**	**Note**
Cylinder head bolt	10	9	47	Coat thread and base surface with oil
Bolt for camshaft bracket	20	6	12	Coat thread and base surface with oil
Bolt for cam sprocket	4	7	20	Coat thread with Loctite

Bolt for exhaust tube joint	1	8	12	Coat thread with Loctite
Bolt for cylinder head cover	4	6	10	
Bolt for tensioner tail	1	6	11	
Connective bolt for cylinder body	2	6	12	

Clutch and gearshift kit

Items	**Qty.**	**Thread diameter mm**	**Torque N.m**	**Note**
Driven wheel bolt for oil pump	1	6	15	Coat thread with Loctite
Locking nut for central case	1	18	128	Coat thread and base surface with oil
Bolt for check plate	1	6	12	Coat thread with Loctite
Location bolt for five-star plate	1	8	23	Coat thread with Loctite
Bolt for clutch lift plate	3	6	12	
Bolt for pressing plate pf gearshift arm seal ring	1	6	12	
Bolt for limit plate of gearshift arm	1	6	12	Coat thread with Loctite
Location bolt for gearshift arm	1	8	28	Coat thread with Loctite
Bolt for right crankcase cover	11	6	12	

Magneto and starting clutch

Items	Qty.	Thread diameter mm	Torque N.m	Note
Starting clutch bolt	3	6	12	Coat thread with Loctite
Magneto rotor bolt	1	12	95-100	Coat thread and base surface with oil
Magneto stator bolt	4	6	12	Coat thread with Loctite
Trigger bolt	1	6	12	
Left front cover bolt	8	6	12	

Case body and transmission system

Items	Qty.	Thread diameter mm	Torque N.m	Note
Check plate for main shaft bearing	3	6	12	Coat thread with Loctite
Location bolt for gearshift drum bearing	2	6	12	Coat thread with Loctite
Bolt for main shaft journal	10	8	15+120°	Coat with oil and replace bolt for a new one
Bolt 10mm for crankcase	1	10	39	
Bolt 8mm for crankcase	2	8	24	
Bolt 6mm for crankcase	14	6	12	

Crankshaft, piston and cylinder body

Items	Qty.	Thread diameter mm	Torque N.m	Note
Nut for connective rod cover	8	8	46	Coat thread and base surface with oil

Positions for sealing and lubrication

Engine

Material		Position	Note
Sealant	1577	Plug bolt for case body oil passage Cylinder head exhaust bolt Thread of water temperature sensor on cylinder head Bolt for sensor base of oil pressure Thread for oil pressure sensor	
	1596	Contact surface between upper and lower crankcase body Side joint place of crankcase (Left front cover, right crankcase cover and right decorative cover) Seal ring of cylinder head	
	1590	Wire outlet joint of magneto	
Oil in engine		Complete surface of inner and outer rotor of oil pump Sliding surface of valve rod and rod end Complete surface of timing chain, rolling surface of camshaft, and all surface of tappet Inner surface of cylinder hole, outer surface of piston, piston pin's hole and groove of piston ring Outer surface of piston pin	

	Complete surface of piston ring Complete surface of clutch friction plate Sliding surface of clutch pushing rod Rod part of gearshift spindle and turning plate Complete surface of double gear shaft Complete surface of starting clutch Complete surface of gearshift fork shaft Inner surface of shaft pad on bigger end of connective rod Inner hole for smaller end of connective rod Gear (Primary, crankcase, starting deceleration) Sliding surface of plate-shaped gear Turning area of each bearing and shaft pad Surface for each o-ring Inner and outer surface of seal ring of oil absorption tube	
Multi-functional lubricant	Seal ring of starting motor	
Degreaser	All contact surface, installation taper surface of rotor on left end of crankshaft	

2. Maintenance

Repair

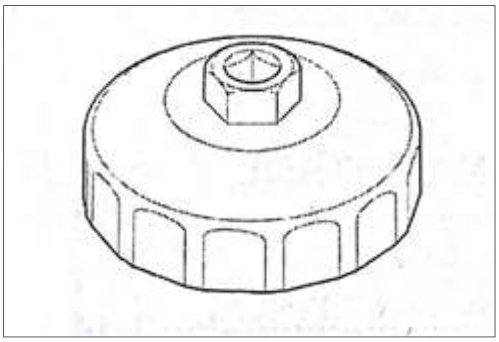
Summary

- Please put motorcycle on flat ground before all the operations.

Tool

Cap-shaped wrench for secondary oil filter

Cap-shaped wrench for secondary oil filter



Specification for maintenance

Please inspect according to <Periodic Maintenance table> in User Manual.

I: Inspection, clean it up, adjust, lubricate or replace when it was necessary. C: Clean up. R: Replace. L: Lubricate.

The maintenance below need you know something about machinery. Some items (Especially with mark * and **), they need more skill or tools and information.

Form list for periodic maintenance

Ref.No.	Period / Items	X1000km	1	6	12	18	24	30	36
		Month	1	6	12	18	24	30	36
*1	Spark plug				I		R		
*2	Oil in engine		R	R	R	R	R	R	R
*3	Secondary oil filter		R	R	R	R	R	R	R
*4	Valve gap						I		
*5	Coolant		I	I	I	I	R	I	I
*6	Cooling system			I	I	I	I	I	I
*8	Fuel tube			I	I	I	I	I	I
9	Breathing tube of crankcase			C	C	C	C	C	C
10	Secondary air supplement system				I		I		I
11	Clutch system		I	I	I	I	I	I	I

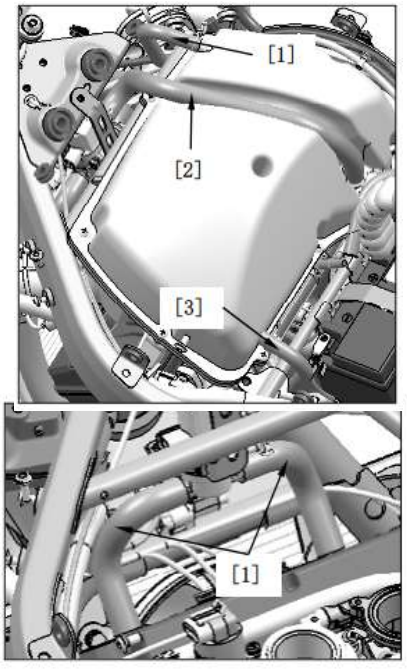
Caution: 1. More frequent maintenance is necessary in case usually drive under dusty or wet conditions.。

2. *Means special tools, data or skill is necessary, which needs be done by Loncin dealer.

Breathing tube/Secondary air tube

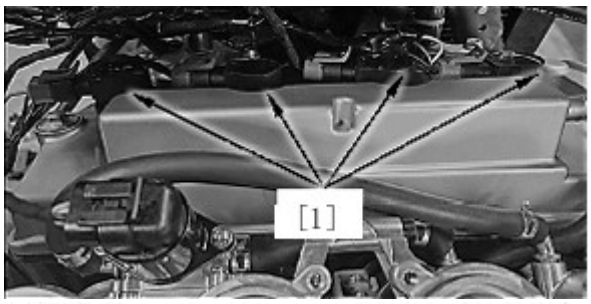
Remove fuel tank.

Check and confirm if there is crack, aging, damage or flexibility on waste gas tube [1], secondary air tube [2] (Valve body and air filter) and breathing tube [3] of throttle valve, please replace the corresponding tubes if it is necessary.



Remove air filter and check and confirm if there is crack, aging, damage or flexibility on secondary air tube [1], please replace corresponding tubes if it is necessary.

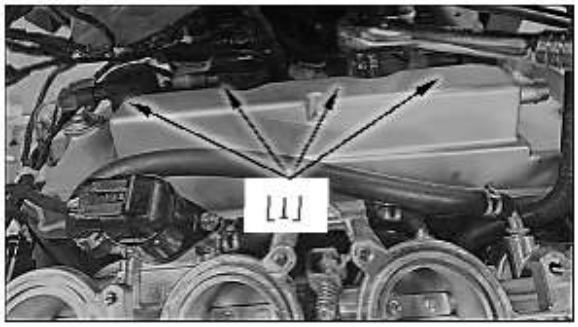
Spark plug



Remove fuel tank and air filter

Remove pressing plate of ignition coil and pull off socket plug of ignition coil.

Remove ignition coil [1].



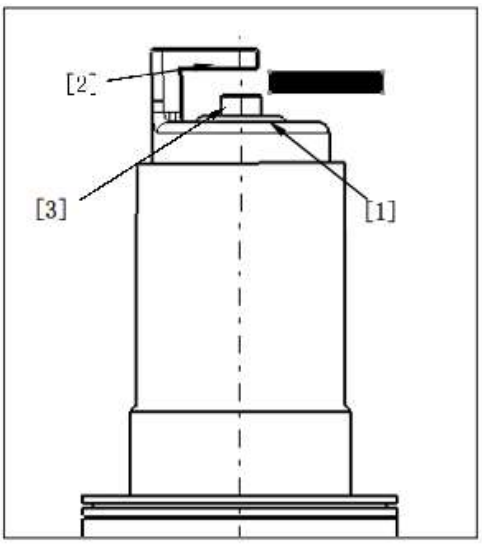
Remove spark plug [1].

Caution:

- Before removing spark plug, blow surroundings of spark plug base by air gun, make sure not any dust drop into combustion chamber.

Check spark plug

Check if there is crack or damage on insulator piece [1], check if there is damage, dirt and color fading on terminals [2]/[3], please replace spark plug for a new one if it is necessary.



Clean up terminal of spark plug by iron wire or its cleaning device. Check gap between central terminal and the side one by feeler gauge.

Gap for spark plug: 0.80-0.90mm.

If it is necessary, adjust gap by getting side terminal bent carefully.

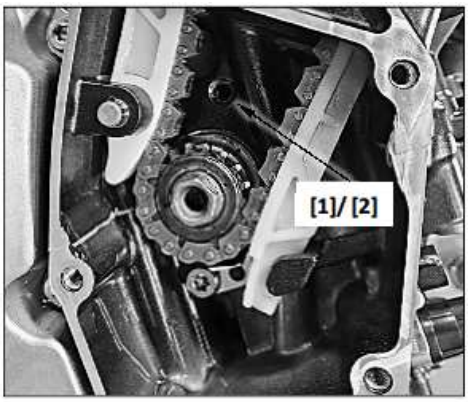
Assemble and fasten spark plug to cylinder head by hand, then fasten the spark plug to given torque.

Torque: 16N·m

Assemble ignition coil and air filter.

Valve gap

Check



Caution:

●Please check and adjust valve gap under cold engine condition (Below 35℃)

Remove parts below:

-Cylinder head cover

-Right decorative cover"



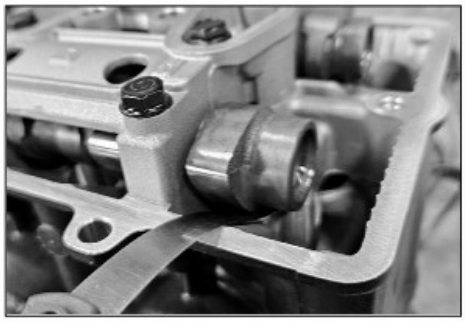
Slowly turn crankshaft clock-wise, align mark "○" [1] on crankshaft to hole [2] on case body.

Make sure timing mark "IN" and "EX" on sprocket wheel align to surface of cylinder head, make sure punching mark face upwards.

If timing mark is not at appointed place, turn crankshaft clock-wise, align once again the mark "○" and mark on sprocket wheel ("IN" and "EX") to case body and cylinder head surface.

Insert feeler gauge between tappet and protrusion on cam.

Check valve gap of cylinder 1 by feeler gauge.



Valve gap:

IN: 0.20±0.03mm

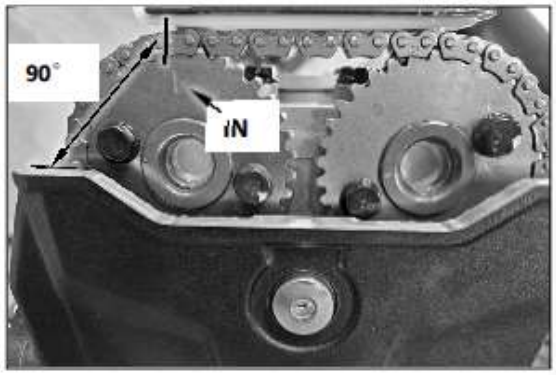
EX: 0.28±0.03mm

Caution:

●Take each valve gap under record for a easy selection of valve washer when gap adjustment was necessary,

Turn crankshaft clock-wise by half round (180°), get mark "IN" on sprocket wheel of air inlet side [1] vertical to cylinder head surface.

Check valve gap of cylinder 2 by feeler gauge.



Valve gap:

IN: 0.20±0.03mm

EX:0.28±0.03mm

Caution:

●Take each valve gap under record for an easy selection of valve washer when gap adjustment was necessary.

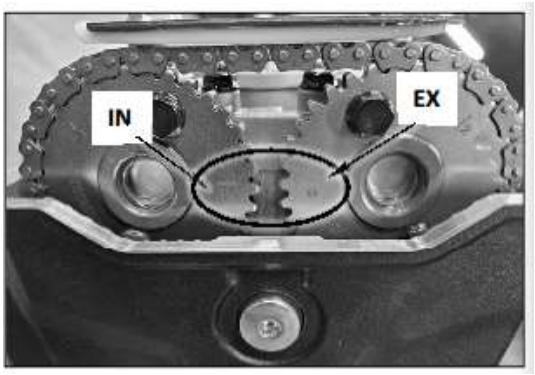
Turn crankshaft clock-wise by half round (180°), get mark “IN” on sprocket wheel of air inlet side aligned to mark “EX” on sprocket of air exhaust side.

Check valve gap of cylinder 4 by feeler gauge.

Valve gap:

IN: 0.20±0.03mm

EX:0.28±0.03mm



Caution:

●Take each valve gap under record for an easy selection of valve washer when gap adjustment was necessary.

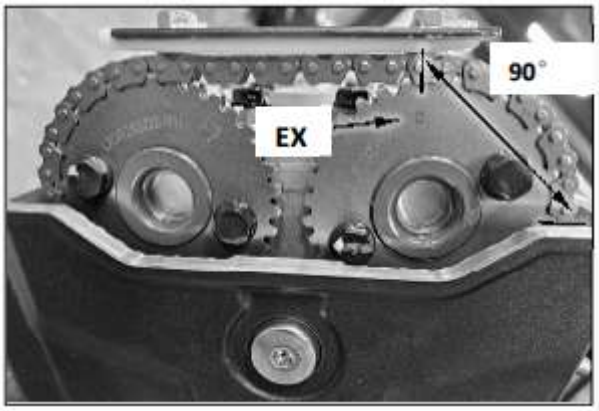
Turn crankshaft clock-wise by half round (180°), get mark “EX” on sprocket wheel of air exhaust side vertical to cylinder head surface.

Check valve gap of cylinder 3 by feeler gauge.

Valve gap:

IN: 0.20±0.03mm

EX:0.28±0.03mm

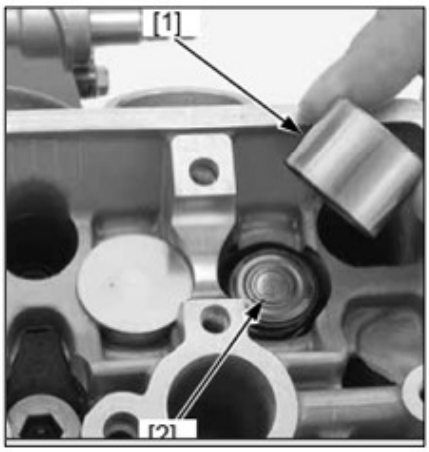


Caution:

●Take each valve gap under record for an easy selection of valve washer when gap adjustment was necessary.

Adjust

Remove camshaft.



Remove tappet [1] and washer [2].

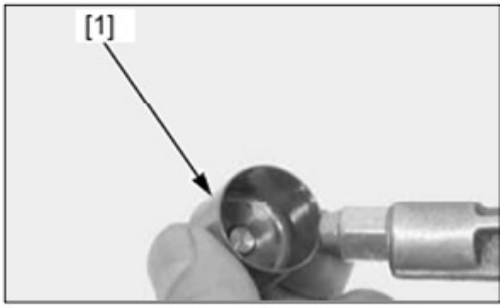
Caution:

●The washer may stick inside tappet, please don't let washer drop into crankcase.

●Mark up all tappets and washers for an easy and correct re-assembly.

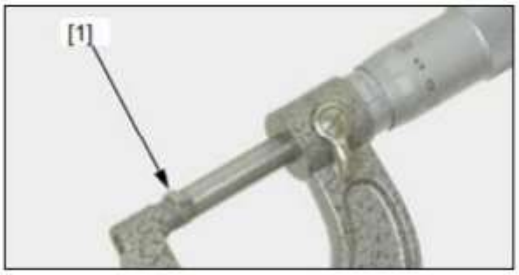
●The tappet and washer could be easily removed by magnetic bar.

Clean up contact place between tappet [1] and washer by compressed air.

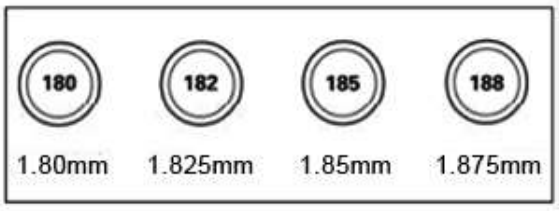


Measure washer thickness and take it under record.

Make sure thickness of washer is correct by micrometer.



There are 69 kinds of thickness of different washer for selection, the thickness difference on adjacent two washers is 0.025mm (1.200-2.900mm)



Work out thickness for new washer by formula below: A=(B-C)+D

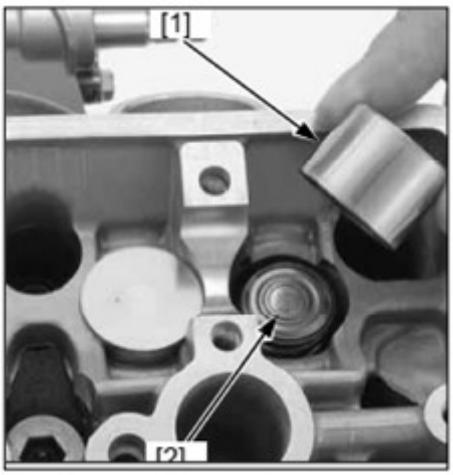
A; Thickness for new washer

B; Take valve gap under record

C: The fixed valve gap

D: Thickness for removed washer

In case the result for calculation is more than 2.9mm due to carbon buildup, please grind the valve base ring by tools to clean up carbon buildup.



Coat end part of valve rod with oil.

Assemble a new washer [1] to valve spring base.

Coat sliding surface of tappet with oil and assemble into its hole, then assemble camshaft.

Turn the crankshaft clock-wise several times then check valve gap once again.

The re-assembly is opposite to disassembly.

Engine oil

Check oil level

Start engine and let it idly run for 3-5 minutes.

Stop engine and wait for 2-3 minutes.



Put motorcycle on flat ground.

Of the oil level is lower than the lowest line [1], remove oil plug [2], and fill up with oil in given specification to upper oil level line [3].

The oil with given specification:

SN 10W-40(Shell)

Quality grade API: SL or above (Please don't adopt energy saving oil marked on round API service label). Synthetic motor oil is recommended.



Check and confirm normal work of o-ring, please replace if it is necessary.

Coat surface of o-ring with oil.

Assemble oil plug.

Oil replacement

Start engine and heat it up.

Remove oil drainage bolt [1] and washer [2], then drain off oil.

When oil completely drained off, assemble the drainage bolt, then replace washer for a new one.

Fasten drainage bolt to given torque.

Torque: 28N·m

Fill up crankcase with oil with given specification.

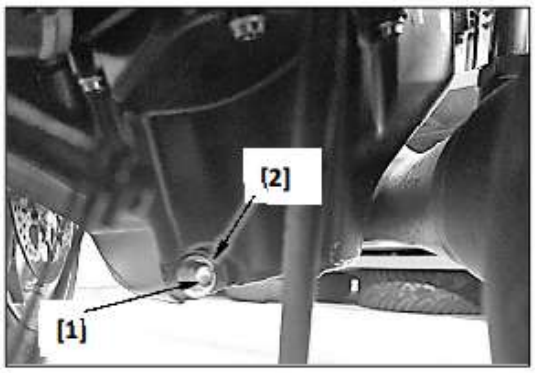
Oil capacity:

Drained off: 2.6 L

When secondary oil filter replaced: 2.9 L.

When broke down: 3.3 L

Check oil level. Make sure there is not oil leak, then stop engine.



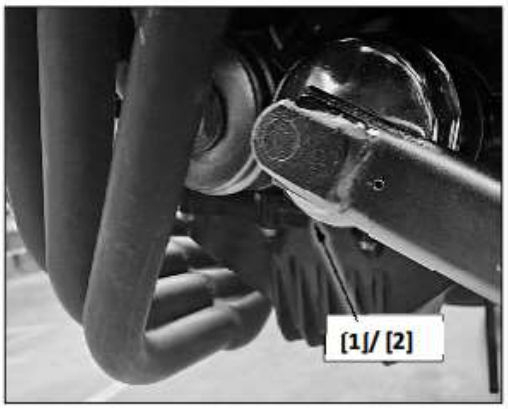
Secondary oil filter

Drain off oil

Remove oil filter [1] by special tools.

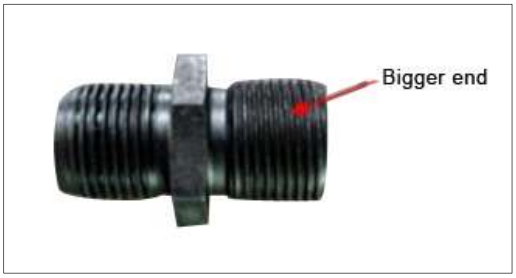
Tool(s):

Cap-shaped oil filter wrench [2].



Coat thread of bigger end of tube joint of secondary oil filter, then fasten to given torque.

Torque: 27N·m



Coat thread of secondary oil filter [1] and o-ring with fresh oil.

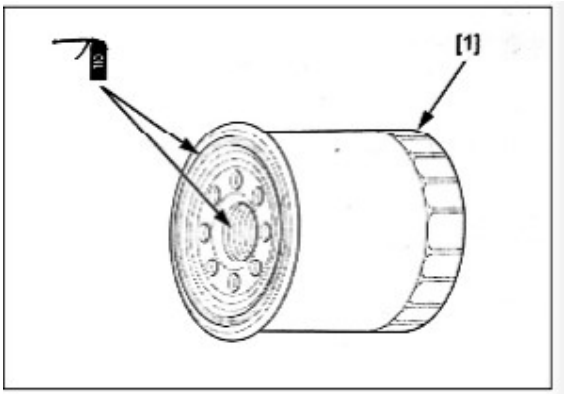
Assemble secondary oil filter and fasten to given torque.

Tool(s):

Cap-shaped oil filter wrench [1]

Torque: 11N·m

Fill crankcase up with oil of given specification.



Engine idling

Caution:

●When all engine maintenance items finished and met demands, then check and adjust idling.

●Before check idling, check items below first:

-- The malfunction indicating light is off

--Working condition of spark plug

--Working condition of air filter

--Throttle switch and free play of accelerator grip

●The idling could be precisely adjusted only when engine is hot.

Start engine and heat it up to normal working temperature, then let it idly run.

Idling speed: 1250±100rpm

If the idling speed is out of maintenance limit, please check parts below:

--Air intake amount or malfunction on engine end

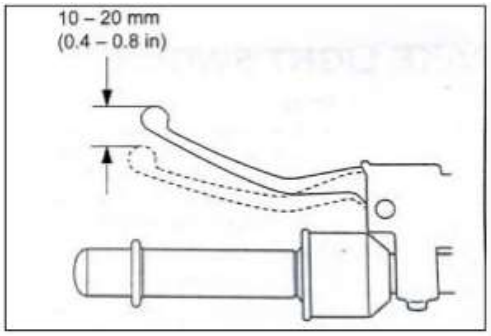
--Operation of idling control valve

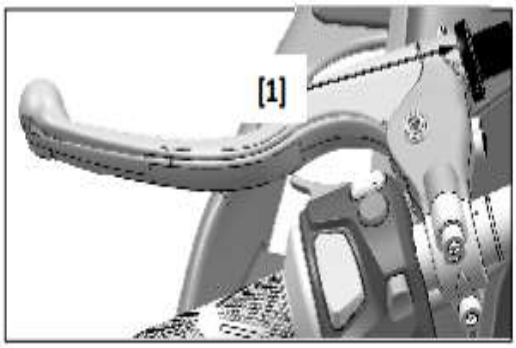
Clutch

Check if there is twist or damage on clutch cable, lubricate it when it is necessary.

Measure free play of clutch lever at its end part.

Free play: 10-20mm.



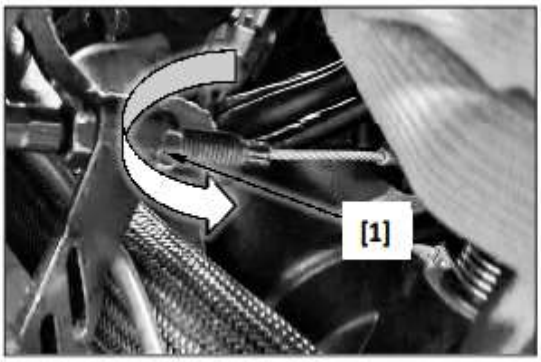


Tiny adjustment could be done by adjustor on clutch lever.

Loosen locking nut [1], turn the adjustor according to demands.

Hold adjustor, meanwhile fastening locking nut.

When it is more than cable play of adjustor, the accurate free play may fail to get, at moments, please adjust the main adjustor.



The main adjustor is adjusted by nut [1] of clutch operation arm.

Loosen locking nut [1], meanwhile fastening the locking nut.

If you failed to get correct cable play, or clutch is skidding in driving, please break down the check clutch.

Coolant

●Caution: When filling up system or sub tank with coolant, or checking coolant level:

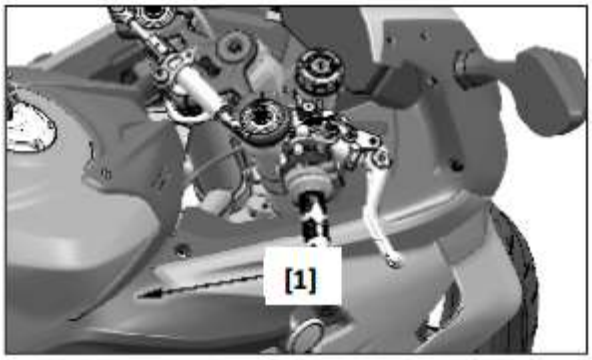
1. Put motorcycle on flat ground.

2. When coolant completely cooled down, check or fill up.

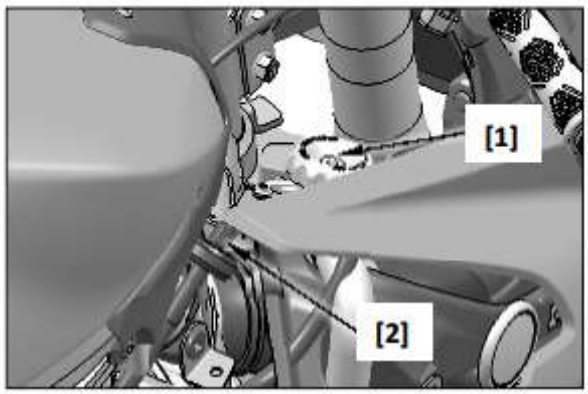
3. Please don't open radiator cap when motorcycle just stopped.

Remove plastic covering parts [1] on the right of motorcycle.

Get radiator cap and plug of cylinder head exhaust water pipe exposed.

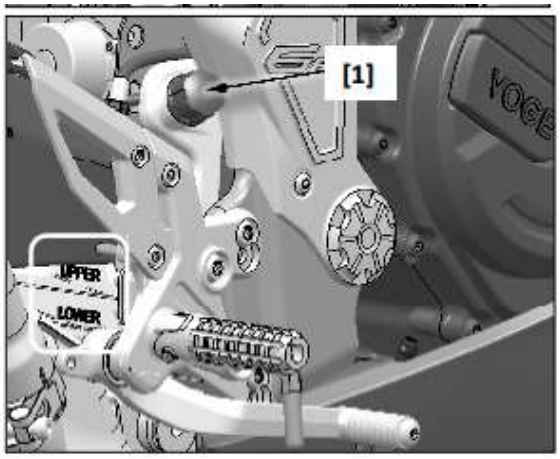


Remove heat radiator cover [1] and water tube plug [2] of air exhaust of cylinder, head, then fill up with coolant to neck of heat radiator, assemble the radiator cover and tube plug.



Remove water tank cap [1] of heat radiator, fill up with coolant to level between LOWER and UPPER.

Assemble heat radiator cap.



3. Cooling system

Maintenance information

Summary

⚠ Warning
Please don't remove the cover of heat radiator when the engine and radiator completely cooled down, otherwise the coolant may inject or splash out and get your injured.

The coolant with silicate solvent of anti-corrosion may accelerate the wear-out of seal ring on water pump and block up the passage of heat radiator.

Use the running water may damage the engine

- Fill up the sub tank with coolant, except filling up of draining off, please don't remove the cover of heat radiator.

- The engine needn't be removed from frame when maintaining the cooling system.
- The coolant touches the painting surface is not allowed.
- Check the leakage when the cooling system was maintained by the tester of cooling system.
- Check by coolant temperature indicator/Water temperature sensor.
- Check the relay of cooling fan's controller.
-

Cooling system specification

Items		Speicification
Coolant capacity	Heat radiator and engine	2.1 L
	Tank	0.36 L
Relief pressure for heat radiator		108-137kPa
Thermostat	Initial temperature	80-84℃
	Complete temperature	95℃
	Valve rise	Not smaller than 7mm
Coolant we suggest		Coolant with ethanol without silicate
Standard density of coolant		Mixture with distilled water by ratio of 1:1

Troubleshooting

Too high the engine temperature

- Malfunction in coolant temperature indicator/Water temperature sensor

- The thermal valve failed to be opened
- Malfunction on heat radiator's cover
- Coolant is not enough
- Passage, soft hose and water tube of heat radiator blocked up
- Air got into circulation system
- Malfunction in motor of cooling fan
- Malfunction in relay of cooling fan's controller
- Malfunction in water pump

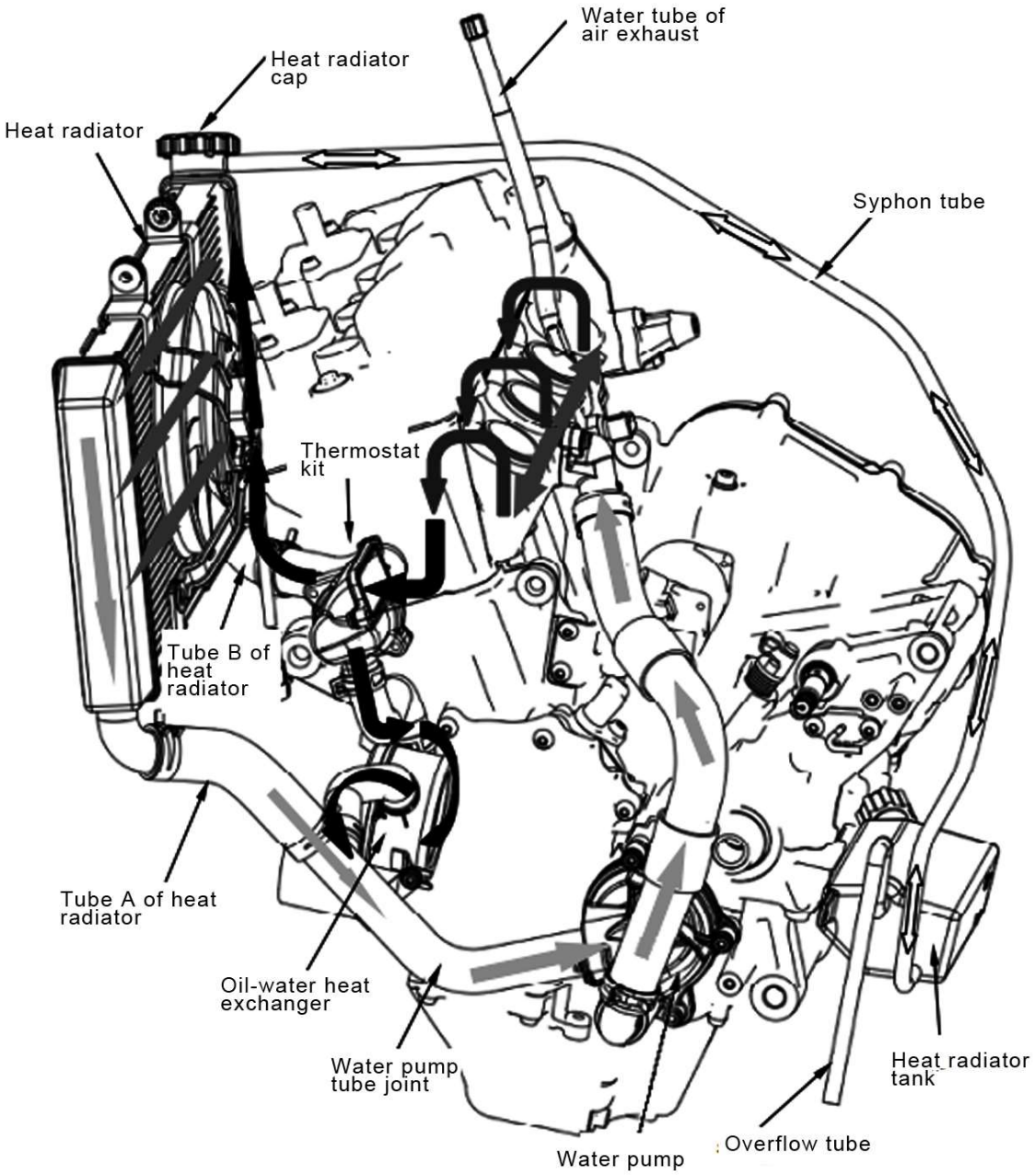
Too low the engine temperature

- Malfunction in coolant temperature indicator/Water temperature sensor
- The thermal valve was opened and seized up without closing
- Malfunction in relay of cooling fan's controller

Coolant leakage

- Defect on machinery structure of water pump
- O-ring gets aged
- Malfunction on cover of heat radiator
- Gasket of cylinder head gets damaged or aged
- The joint of soft hose or tube clamp get loose
- Soft hose gets damaged or aged
- Heat radiator is broken
- The cover of thermostat or tube joint of water pump's cover is flexible.

System procedure mode

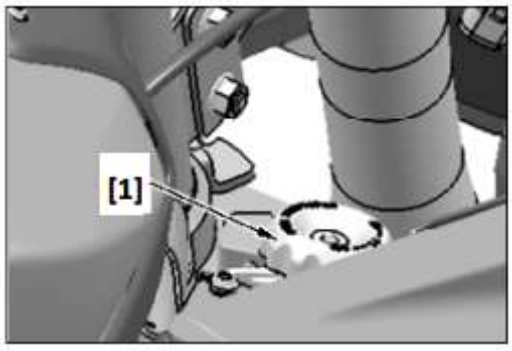


System test

Heat radiator cover/System pressure test

Remove fairing cover on the right side of motorcycle.

Remove heat radiator cover [1]

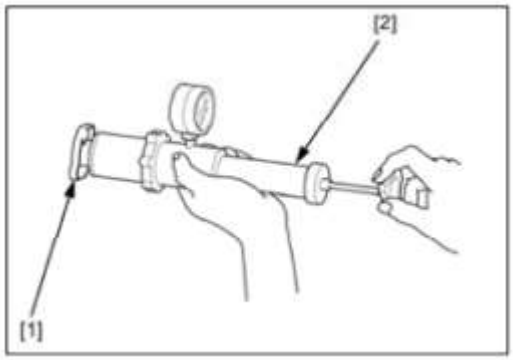


Get gasket of heat radiator cover wet, then assemble cover into tester [2].

Lay pressure on heat radiator cover by tester.

In case the heat radiator cover fails to keep pressure, or too high or low the pressure relief, please replace it.

The heat radiator cover must bear the given pressure at least 6 seconds.



Pressure for heat radiator cover:

108-137 KPa

Connect the tester to heat radiator.

Lay pressure on heat radiator, engine and soft hose by tester to check their air sealing performance.

Caution:

- Overpressure may damage the cooling system, whose pressure shall not be more than 137Kpa.
- In case the system fails to bearing given pressure by at least 6 seconds,

Coolant replacement

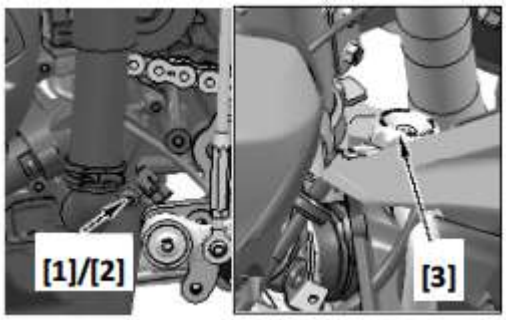
Coolant replacement/Air exhaust

Caution:

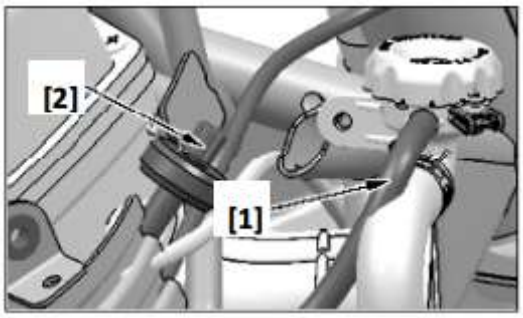
●When filling up the system or sub tank, or check the coolant level, please lay the motorcycle on flat ground and keep it upright.

●When the coolant completely cooled down, then check or fill up with coolant.

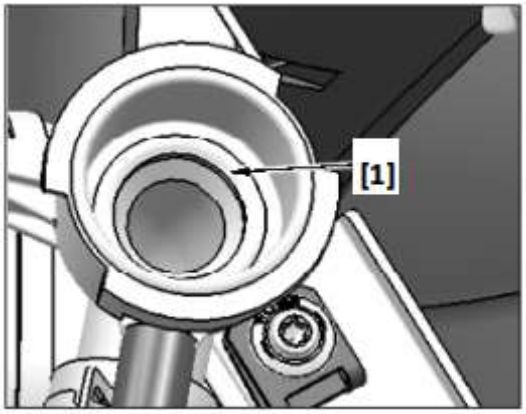
Remove fairing cover on the right of motorcycle
Remove water drainage bolt [3] and flat washer [2].
Remove heat radiator cover [3], then drain off coolant.
Torque:12N·m



Cut off syphon hose [1] in heat radiator.
Remove plug [2] of air exhaust tube on cylinder head.
Pull off syphon hose from its clamp.
Put the hose at lower place out of engine frame, the drain off coolant in tank.
Drain off coolant, then wash internal of tank by water.
Assemble the soft hose into its clamp and heat radiator.



Put breathing hose of cylinder head at lower place than coolant filling port, fill up cooling system with our suggested coolant through the port, when confirmed there was coolant flowing out from soft hose of cylinder head, assemble the plug until coolant reached neck [1] of radiator.
The coolant we suggest is:
With ethanol without silicate
Standard density with coolant:



Mixture with distilled water by ratio of 1:1

Exhaust air in system as operation below:

1. Shift engine to neutral gear.
2. Start engine and let it idly run for 2-3 minutes.
3. Start and stop throttle by 3 or 4 times to exhaust all air in system.
4. Stop engine, when coolant cooled down, open plug of air exhaust hose on cylinder head and cover of heat radiator. Fill up with coolant if it is necessary.
5. Assemble heat radiator cover and plug of air exhaust hose on cylinder head.
6. Fill up the tank with suggested coolant.
   Assemble fairing cover

Thermostat

Disassembly/Re-assembly

Remove the parts below:

--Heat radiator

--Muffler

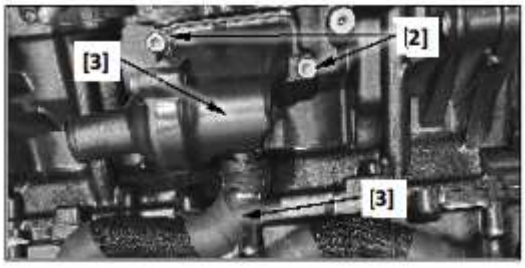
--Water hose of heat radiator

Cut off coolant hose [1] from joint of outer case of thermostat.

Remove 2 pieces of bolt [2] and case kit [3] of thermostat.

The re-assembly is opposite to disassembly.

Torque: 12N·m



Caution:

●Please don't assemble hose clamp at protrusion of connective place.

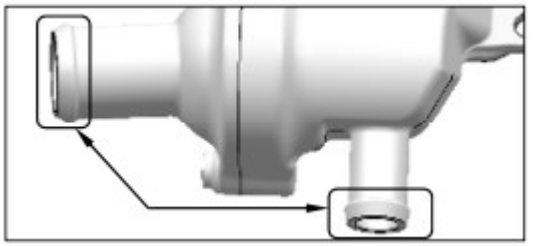
Remove o-ring [1] from case kit [2] of thermostat.

The re-assembly is opposite to disassembly.

●Please replace o-ring for a new one.

●Please don't coat o-ring with oil.

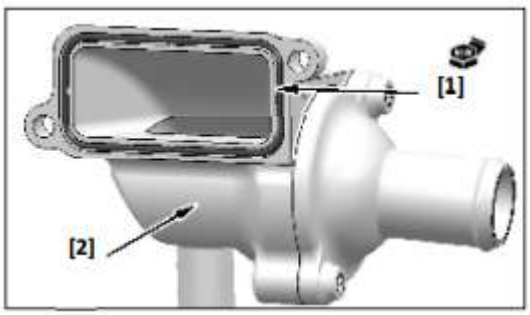
Fill up with and drain off coolant.

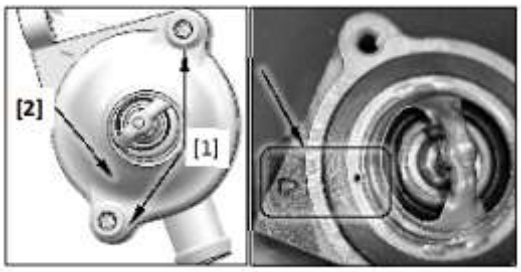


Remove bolt [1] of thermostat cover, remove thermostat [2].

The re-assembly is opposite to disassembly.

Torque: 12N·m





●When assembling, align the tiny hole on thermostat to mark "▲" on its case.

Check/Test

Check if there is damage on outer surface of thermostat [1].

If the valve of thermostat is open under room temperature, please replace it.

Check if the seal ring [2] damaged, replace if it is necessary.



Heat up water by electric furnace to working temperature and keep for 5 minutes.

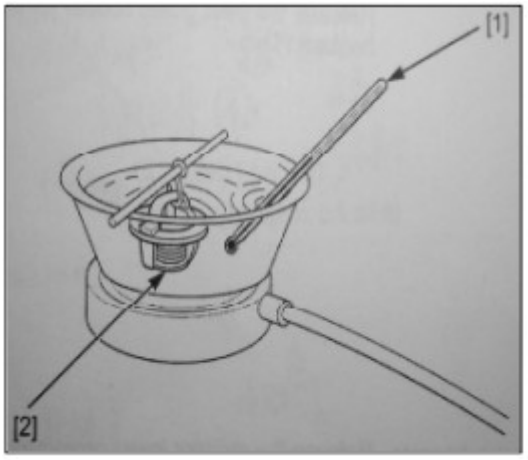
Suspend thermostat [2] on hot water to check its performance.

Caution:

●Please don't let the thermostat and thermometer touched bottom, otherwise the result would be wrong.

●Please wear oven gloves and make suitable protection for eyes.

●Please get combustible material far away from electrical parts.



Thermostat temperature for initial open:80-84℃

Complete height for valve full open: Not lower than 7mm at 95℃. If thermostat got opened out of given temperature, please replace.

Heat radiator/Cooling fan

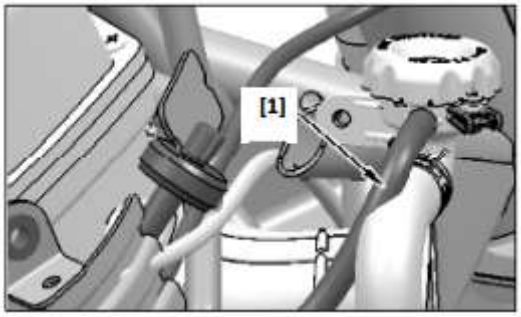
Disassembly/Re-assembly



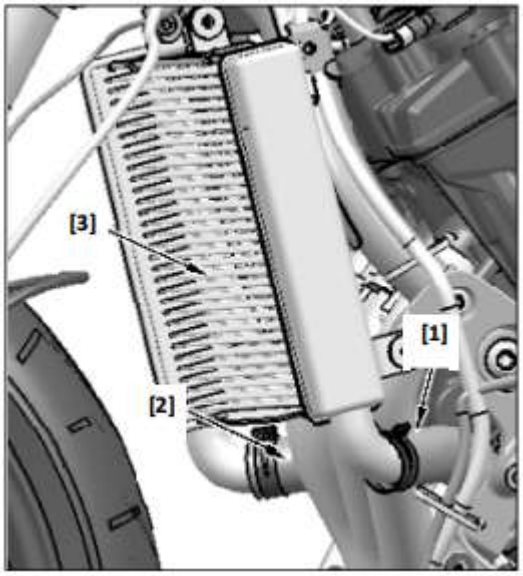
Drain off coolant

Cut off connector [1] of motor 2P(Black) of cooling fan, then remove it from its original condition.

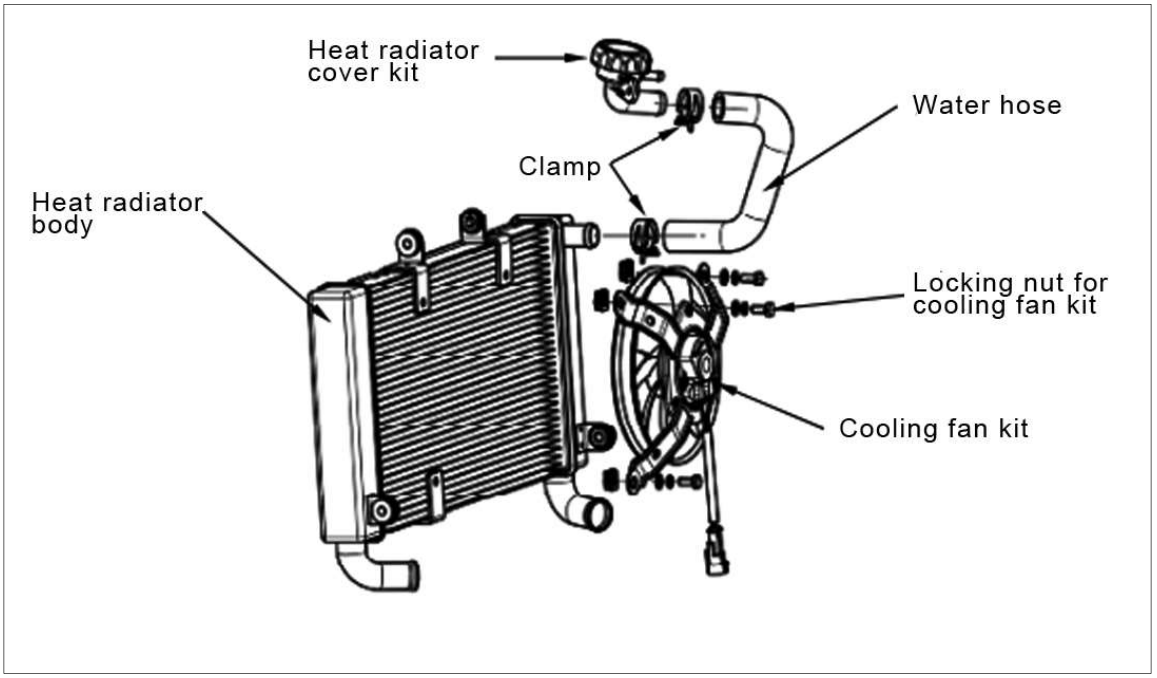
Cut off syphon hose [1].



Cut off water hose A [1] at lower heat radiator and water hose B[2], then remove heat radiator [3].
The re-assembly is opposite to disassembly. Fill up cooling system with coolant and exhaust air in it.

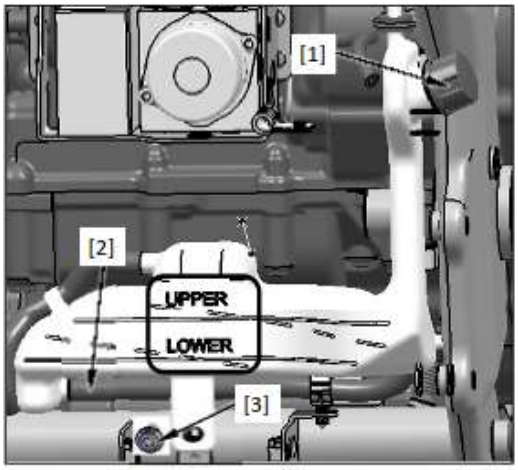


Disassembly/Re-assembly



Water tank for heat radiator
Disassembly/Re-assembly

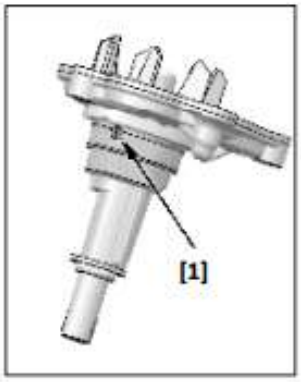
Remove muffler.
Remove tank cover [1] of heat radiator.
Cut off syphon hose [2] and drain off coolant.
Remove bolt [3] of tank, then remove the tank.
The re-assembly is opposite to disassembly.
Fastening torque for tank of heat radiator: 12N·m
Fill up with suggested coolant, get its level reached place between mark **LOWER** and **UPPER**.
Assemble radiator cover.



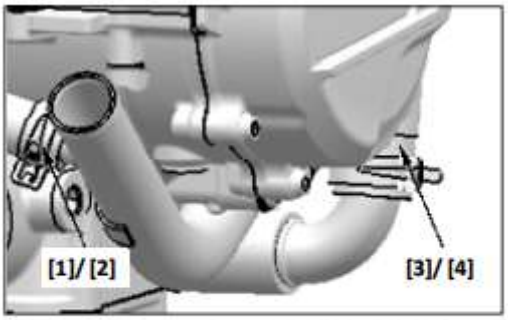
Water pump
Check sealing performance of end surface

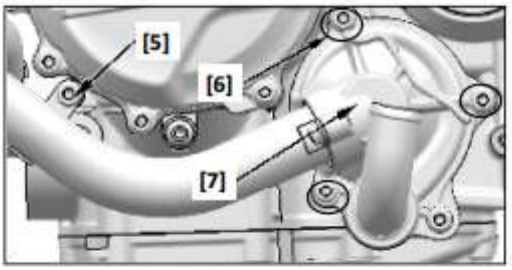
Check overflow hole [1] on water pump and check if there is leakage.
Caution:
●Just a few coolant [2] flow out is normal.
●When engine started, make sure there is not coolant keeping overflow.
Please replace water pump kit if it is necessary.

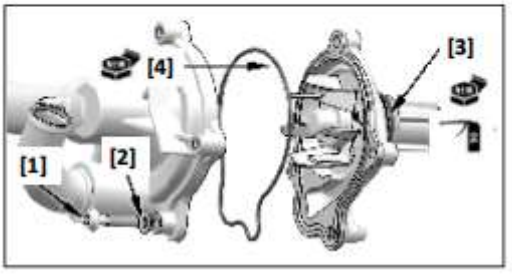




Disassembly/Re-assembly
Caution:
●Put a clean oil tray under engine, when disassembling water pump body, there will be oil flowing out. When re-assembled, please fill up with suggested oil to given place.
Put motorcycle on flat ground and keep it upright.
Drain off coolant before removing water pump, cut off connective hose between pump and radiator, then remove outer case of driving sprocket wheel.
Loosen clamp [1] of sub-circulation, then remove the hose.
Loosen clamp [3] of connective hose between water pump and cylinder head, then remove the hose [4].
Remove bolt [5] for tube joint of water pump.
Remove bolt [6] for mounting water pump cover.
Remove water pump [7].
The re-assembly is opposite to disassembly.

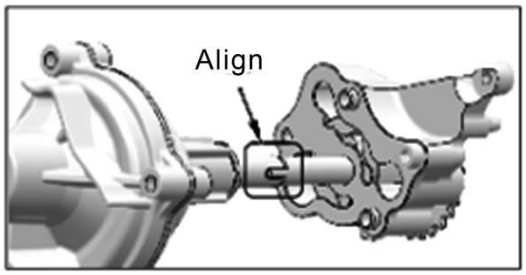






The torque for bolts of tube joint of water pump and that for mounting its cover: 12N·m
Caution:
●Please don't assemble hose clamp on connective protrusion.

Remove water drainage bolt [1] of pump cover and flat washer [2], break apart pump cover and body.
Remove o-ring [3] for pump body.
Remove o-ring [4] for pump cover.
The re-assembly is opposite to disassembly.
Torque for drainage bolt of pump cover: 12N·m
Caution:
●Please don't break down the pump body.
●Replace o-ring for a new one.
●Coat o-ring for pump body with oil.
●Please don't coat pump cover with oil.
●Align groove on pump shaft to shaft tail by turning impeller of pump.



Check oil level.
Check coolant level.

4. Lubrication system

Maintenance information

Summary

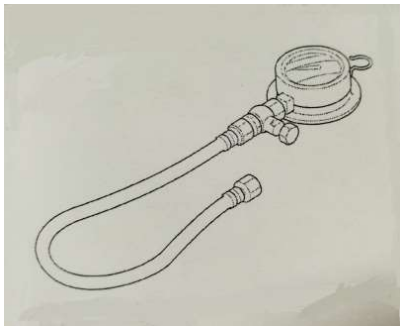
⚠ Warning
Repeatedly touch the engine oil in long time may get skin cancer, but this kind of situation is rarely to be seen, unless your skin touches the engine oil every day, but we still you suggest you wash up your hands by soap and clean water.

- When repairing the oil pump, we needn't remove the engine from frame.
- The pre-condition for all maintenance steps in this Chapter is drain off the oil in engine.
- When disassembling and re-assembling the oil pump, please don't let dust or dirt get into engine.
- Any part in oil pump passed the limit for maintenance, please replace the oil pump as a complete set.

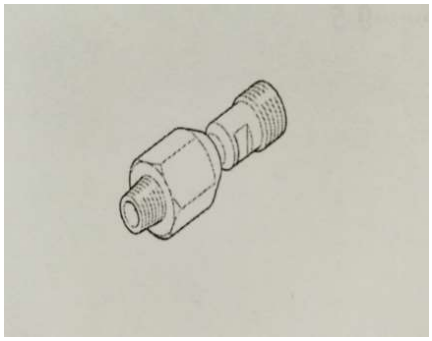
- When the oil pump re-assembled, please check the oil leakage and correct oil pressure.
- Check the oil pressure indicator for engine and the EOP switch.

Tools

Oil pressure gauge

- 

Accessory for oil pressure gauge

- 

Specification for lubrication system

Unit: mm

Items		Standard	Maintenance limit
Oil capacity	After oil replaced	2.6 L	—
	When drained off and element replaced	2.9 L	—
	When engine broke down	33 L	—
The oil we suggest		Recommended oil: SL10W-40 PI quality grade: SL or higher (Don't adopt the one with round label of API service for energy saving)	—
Opening (Cutting off) pressure for oil pressure sensor		80℃or normal temperature: (30±10)kpa	—
Rotor of oil pump	Clearance between tip of impeller	0.15	0.20
	Middle clearance	0.12-0.21	0.35
	Sides clearance	0.03-0.095	0.12

Troubleshooting

Too low the oil level

- Too heavy the oil consumption
- Oil leakage on external components
- Piston ring worn out or without assembling in place
- Cylinder worn out
- The seal of valve base ring worn out
- Valve guiding tube worn out

Too low the oil pressure

- Too low the oil level
- Oil filtering screen was blocked up
- Oil leakage on internal components
- Incorrect use of oil

0 oil pressure

- Too low the oil level
- Safety valve for oil pressure is seized up when getting open
- Transmission chain of oil pump broke up
- Teeth of driving and driven gear of oil pump broke up
- Oil pump damaged
- Oil leakage on internal components

Too high the oil pressure

- Safety valve of oil pressure gets closed
- Oil filtering screen, oil returning hole and jet hole are blocked up
- Incorrect use of oil

Oil gets dirty

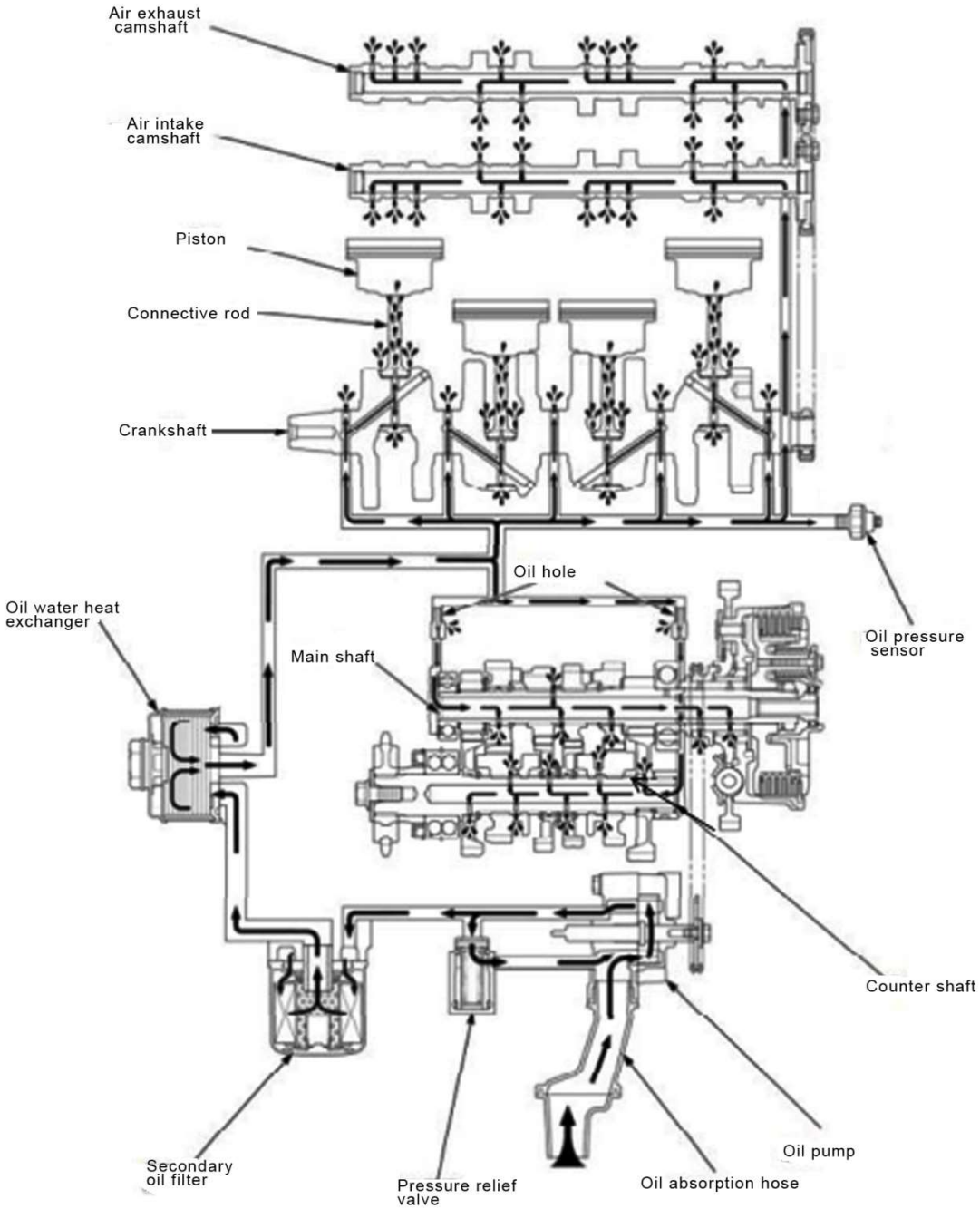
- Didn't replace oil and filtering screen periodically
- Piston ring gets damaged

Oil emulsified

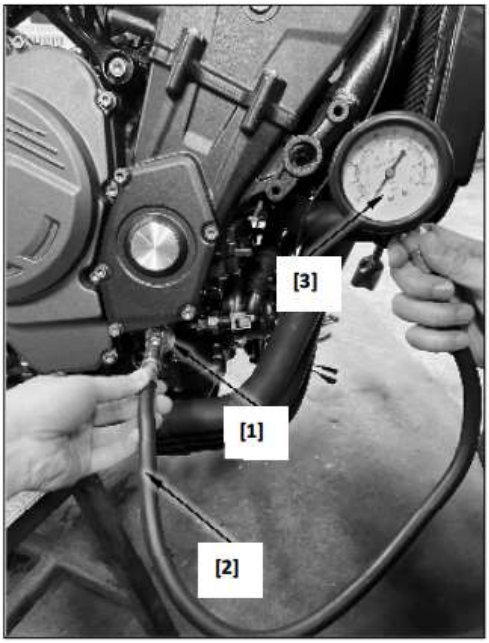
- Cylinder head cover gets expanded and cracked
- Leakage on coolant passage

- Water gets into engine

Lubrication diagram



Check oil pressure



Remove plug [1] of oil passage.

Assemble accessory of pressure gauge [2] into plug of oil passage.

Connect the pressure gauge [3] to its accessory.

Tool(s)::

[3] Oil pressure gauge

[2] Gauge accessory

Check oil level, fill up if it is necessary.

Heat up engine to working temperature （About 80℃）, then speed up engine rotation to 5000r/min, then read oil pressure.

Standard:

When it is at 5000rpm/80℃, the data should not be lower than 450kPa.

Stop engine, remove tools, assemble plug of oil passage.

Caution:

●When engine is working, if oil gauge keeps going on, please check gauge first before oil pressure.

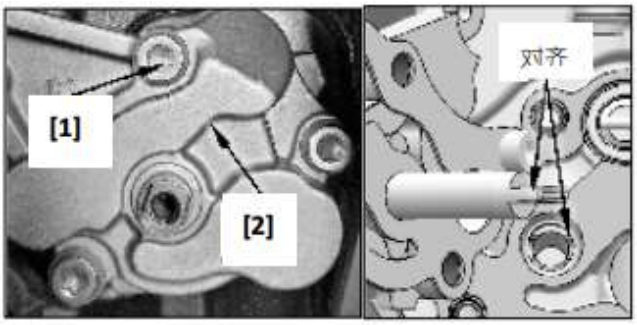
Oil pump

Disassembly/Re-assembly

Remove clutch.

Remove bolt [1] and oil pump [2].

The disassembly is opposite to re-assembly.

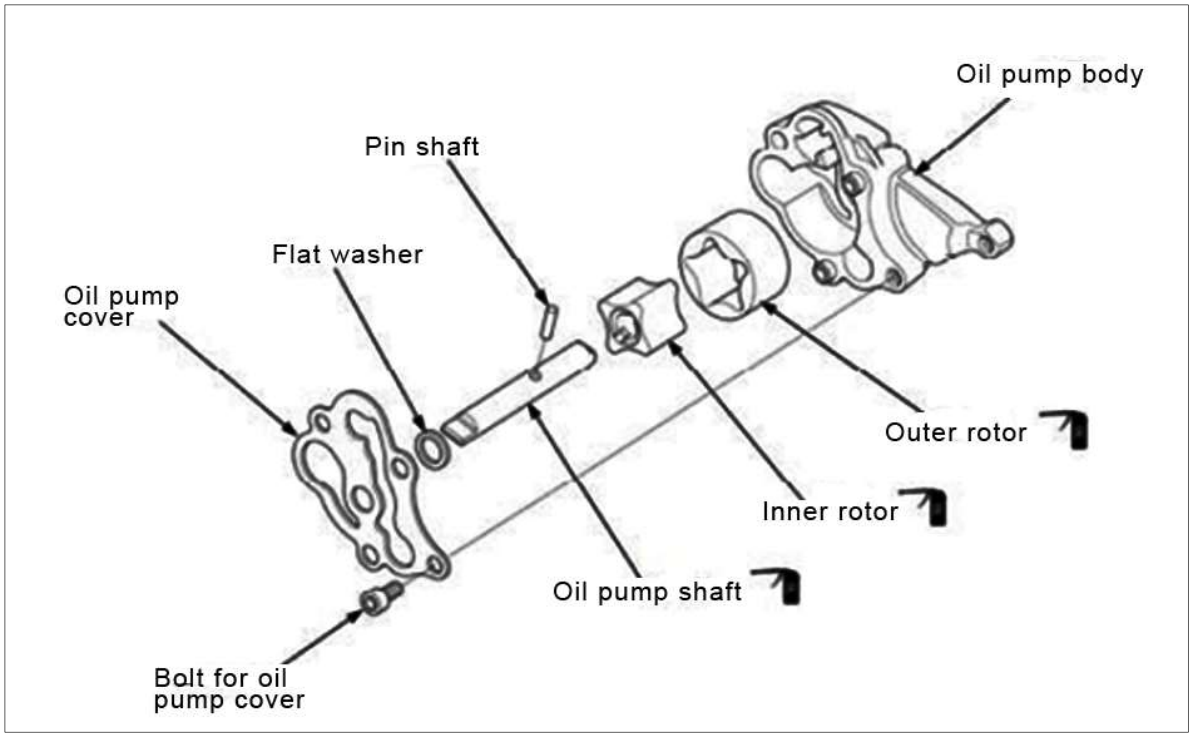


Caution:

●When assembling oil pump, please align oil pump shaft to groove on water pump shaft.

Disassembly/Re-assembly

The disassembly and re-assembly for oil pump are as below:



Check:

Check driving, driven wheel and driving chain on oil pump.

Check if there is damage, wear-out, distortion and burn-out on parts below:

--Oil pump shaft

--Positioning pin

--Inner rotor

--Outer rotor

--Pump base body

Measure gaps for pump according to specification of lubrication kit.

Any part passed maintenance limit, please replace the oil pump kit.

Pressure relief valve

Disassembly/Re-assembly

Remove oil pump.

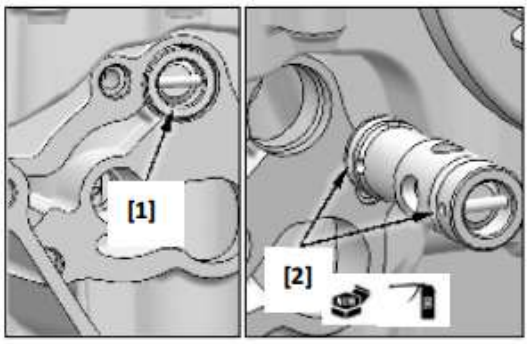
Remove pressure relief valve [1] and o-ring [2].

Replace o-ring for a new one.

Assemble o-ring into groove on relief valve.

Assemble relief valve into groove on crankcase.

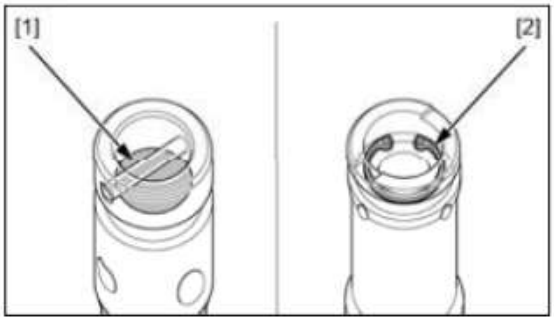
Assemble oil pump.



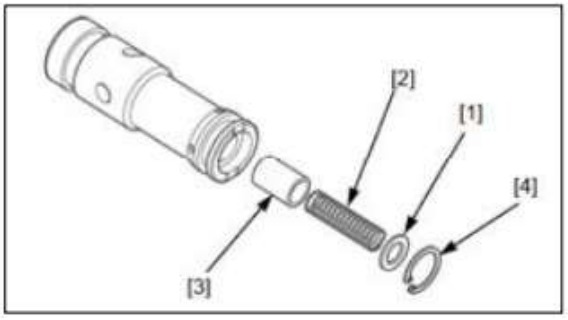
Check

Check relief valve working through pushing its rod [1] of controlling valve.

Remove elastic circlip [2], then break down the valve.



Remove washer [1], spring [2] and piston [3].



The re-assembly is opposite to disassembly.

Caution:

●When assembling elastic circlip, whose chamfer angle faces outwards.

●Make sure elastic circlip assemble in groove and in place.

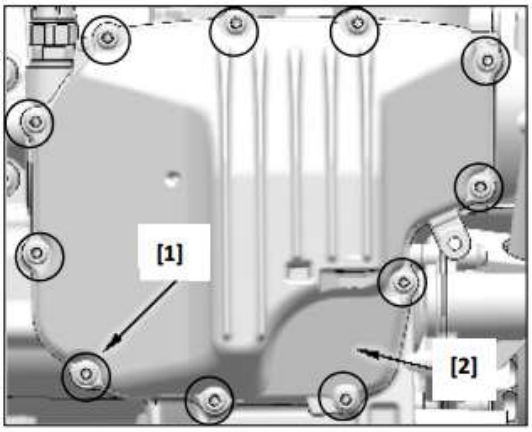
Oil filter

Disassembly

Drain off oil.

Remove muffler.

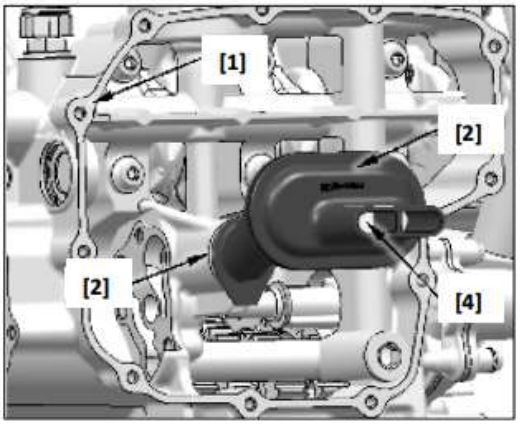
Remove bolts [1] on oil bottom case in diagnosis way, then remove the bottom case [2].



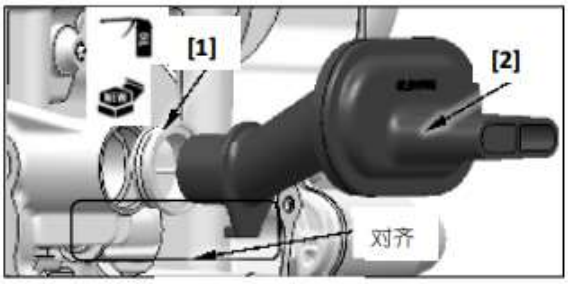
Remove gasket [1] of oil bottom case.

Remove oil filter [2] and seal ring [3].

Clean up filtering screen [4] and check if it is damaged.



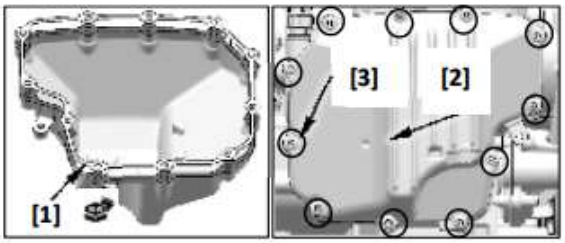
Re-assembly



Clean up residual gasket on mounting surface of oil bottom case.

Replace seal ring [1] for a new one, then assemble it onto oil filter [2].

Assemble filter into crankcase, please align protrusion on filter to groove on crankcase.



Caution:

●Please don't damage the mounting surface.

Clean up residual gasket on oil bottom case.

Replace gasket [1] for a new one and assemble it onto bottom case [2].

Assemble bottom case and bolts [3] onto crankcase.

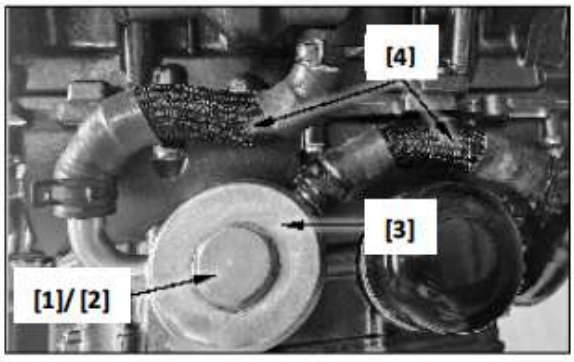
Then fasten the bolts in diagnosis way.

Torque: 12N·m

Fill up engine with suggested oil and check if there is oil leak.

Oil-water heat exchanger

Disassembly/Re-assembly



Drain off oil.

Drain off coolant.

Remove bolt [1], seal ring [2] and heat exchanger [3].

Cut off connection between oil cooling kit and its water hose.

Remove o-ring [1] from oil cooling kit.

The re-assembly is opposite to disassembly.

Coat new o-ring with oil.

Align groove on oil cooling kit to protrusion on crankcase.

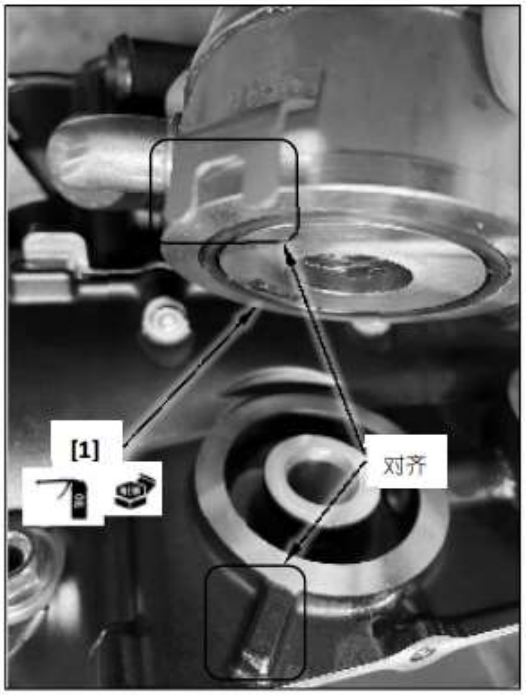
Coat thread of cooling kit bolt and bracket of seal ring with oil.

Torque: 59N·m.

Fill up crankcase with suggested oil.

Fill up cooling kit with coolant and exhaust all air.

Check if there is oil leak.



5 Cylinder head and valve

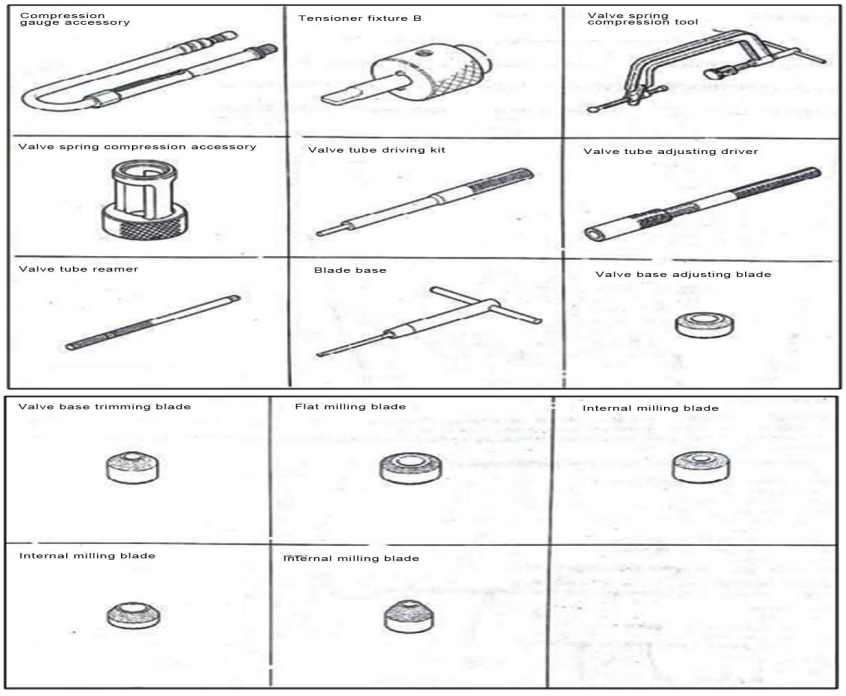
Maintenance information

Summary

- This chapter includes the inspection and maintenance for cylinder head, camshaft and swinging arm.
- When repairing the camshaft and adjusting stud of tensioner, we needn't

remove the engine from frame; But when repairing the cylinder head and valves, we need remove the engine from frame.

- When disassembling the components, mark up the removed parts for a correct re-assembly.
- Before checking, wash up all the removed parts by cleanser, then dry them up by compressed air.
- The lubricant on camshaft is got through the oil passage in cylinder head and its cover, in this case, before re-assembling the cylinder head and its cover, wash up their oil passage first.
- Please don't damage the contact surface when disassembling the cylinder head and its cover.
- Tool(s)



Specification for cylinder head/Valves

Unit: mm

Items			Standard	Maintenance limit
Cylinder pressure under electrical starting			⩾1200KPa	—
Valve clearance		Air inlet	0.20±0.03	—
		Air exhaust	0.28±0.03	—
Tappet		Internal diameter of tappet	24.467-24.48	24.459
		Diameter for tappet hole	24.5-24.521	24.535
Camshaft	Protrusion height of cam	Air inlet	35.7473-35.8773	35.7173
		Air exhaust	35.7467-35.8767	35.7167
	Clearance between journal and hole		0.02-0.062	0.10
	Runout		**≤0.02**	0.04
Valve, guiding tube of valve	Valve rod's diameter	Air inlet	4.475-4.490	4.465
		Air exhaust	4.465-4.480	4.455
	Internal diameter of valve's guiding tube	Inlet/Exhaust	4.500-4.512	4.54
	Gap between valve rod and its guiding tube	Air inlet	0.01-0.037	0.075
		Air exhaust	0.02-0.047	0.085
	Guiding tube's height	Inlet/Exhaust	13.3-13.6	--
	Width for valve base	Inlet/Exhaust	0.90-1.10	1.5
Free length of valve spring			39.3	38.34
Flatness of cylinder head			**≤0.05**	0.10

Troubleshooting

- Malfunction at the top place of engine is usually bad for engine performance. We can find out these malfunctions by compression test, also we can find them by detective rod or stethoscope to know where the engine noise comes from, even can reach the top part of engine.
- In case the power output of engine is weak when it under low speed, please check if there is white smoke in breathing tube of crankcase. In case the soft hose is smoky, please check the jamming on piston ring.

When engine is working under low speed, too low the compressing pressure, difficult starting or poor performance

- Valve
  - Incorrect adjustment for valve gap
  - Valve burned out or got bent
  - Wrong valve timing
  - The valve spring got cracked
- Cylinder head
  - The gasket of cylinder head with leakage or damage
  - Cylinder head gets bow, twist or crack
  - Spark plug is flexible
- Cylinder, piston or piston ring worn out

Compressing overpressure, overheat or cylinder knock

- Too much carbon buildup on piston head or in combustion chamber

Smoky

- Cylinder head
  - Valve rod or guiding tube worn out
  - Sealing piece for valve rod damaged
- Cylinder, piston, or piston ring worn out

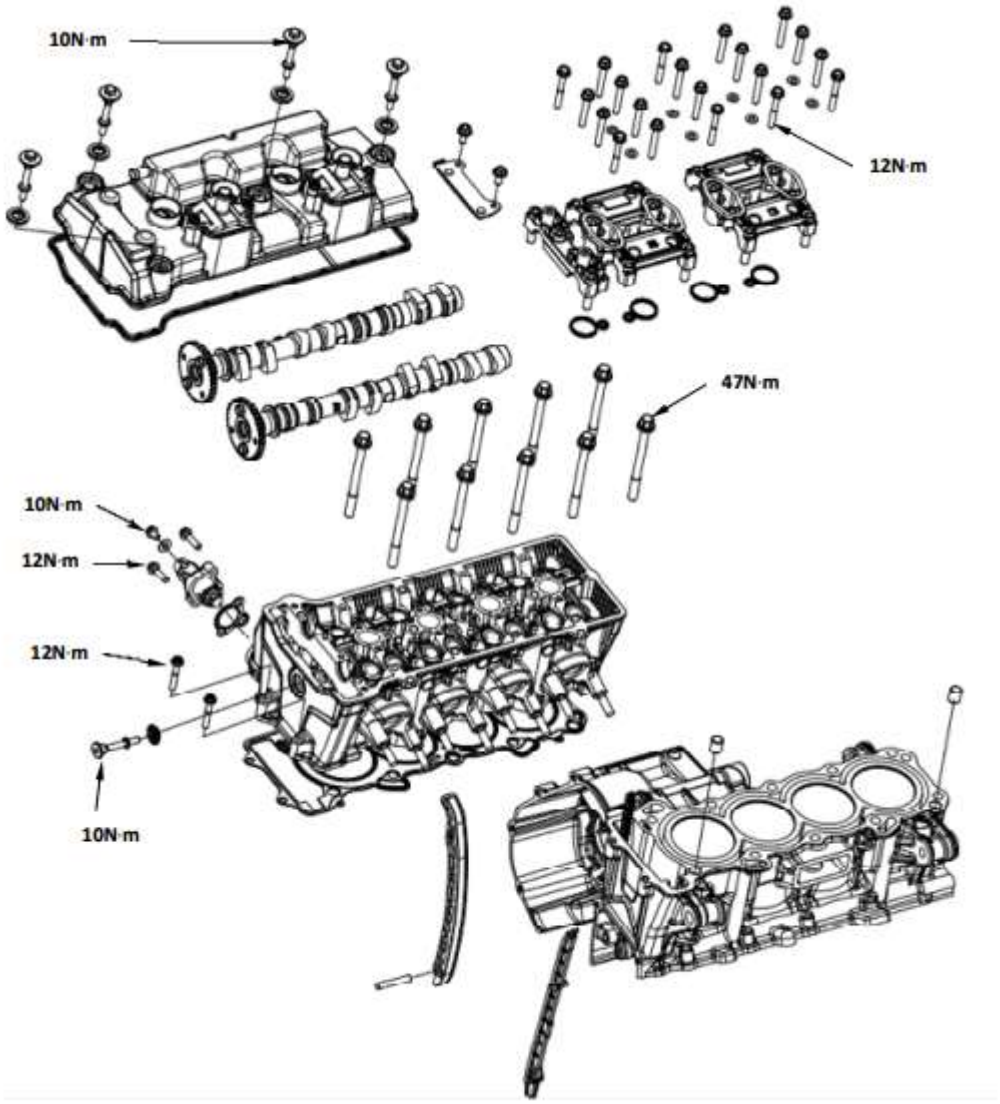
Noisy

- Cylinder head
  - Incorrect adjustment for valve gap
  - Valve gets jammed or its spring cracked
  - Camshaft worn out or damaged
  - End part of valve rod worn out
  - Timing chain gets flexible or worn out
  - Timing chain worn out or damaged
  - Tensioner worn out or damaged
  - Teeth of timing and driven sprocket wheel worn out
- Cylinder, piston and piton ring worn out

Poor idling

- Too low the compressing pressure in cylinder

Components layout



Cylinder compression test

Heat up engine to working temperature.

Stop engine and remove spark plug.

Assemble thread end of cylinder pressure gauge[1] into hole of spark plug.

Tool(s):

[1] Cylinder pressure gauge

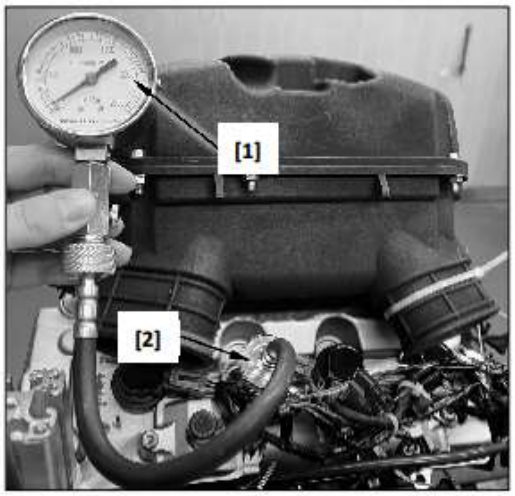
[2] Accessory for compression gauge

Turn ignition switch to “ON”, turn engine switch to

Shift engine to neutral gear.

Keep full throttle until pressure gauge stopped rising.

The highest data usually keeps 4-7 seconds.



Compression force:

Not lower than 1200kPa.

Analysis for low pressure:

--Gasket of cylinder head leaks

--Incorrect adjustment for valve gap

--Valve leaks

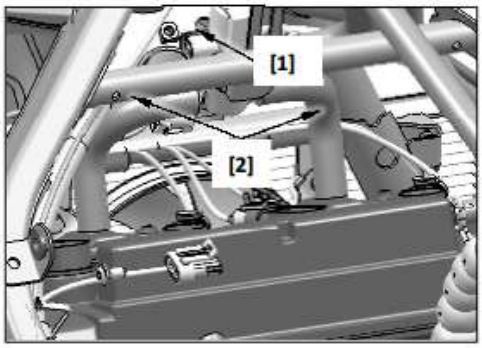
--Piston ring or cylinder wore out

Analysis for high pressure:

--Carbon buildup on piston top or in combustion chamber

Cylinder head cover

Disassembly/Re-assembly



Caution:

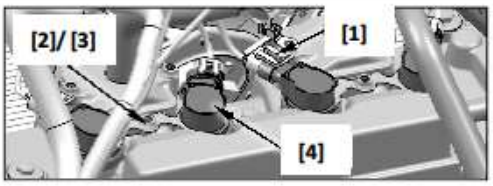
●The repair for cylinder head cover needn't remove engine from frame.

Remove fuel tank and air filter.

Remove parts below:

Remove socket plug [1] of secondary air valve.

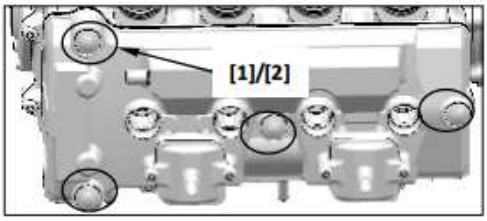
Remove air intake tube [2] for secondary air.



Cut off socket plug [1] for ignition coil (4 pieces in all)

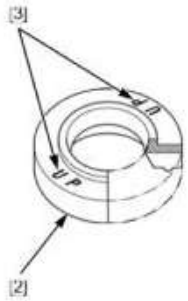
Remove bolts (2 pieces) for pressing plate of ignition coil, then remove the plate [3] (2 pieces in all)

Remove ignition coil [4] (4 pieces in all)





Remove bolt [1] for cylinder head cover and gasket [2].



Caution:

●Please don't forcedly remove positioning pin from cylinder cover shield.

Remove gasket [1] of cylinder cover from its shield.

The re-assembly is opposite to disassembly.

Torque: 10N·m.

Caution:

●Replace gasket of cylinder cover for a new one.

●Assemble gasket into groove on cylinder cover.

●As picture shows, coat semi-round area (2 pieces in all) of gasket with sealant.

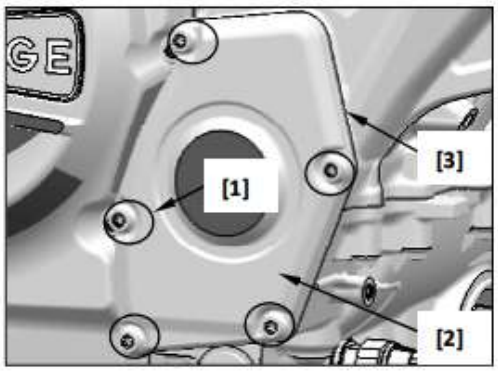
●Check if mounting rubber [2] is fine, please replace if it is necessary.

●The side of mounting rubber with mark "UP" [3] face upwards.

Right decorative cover

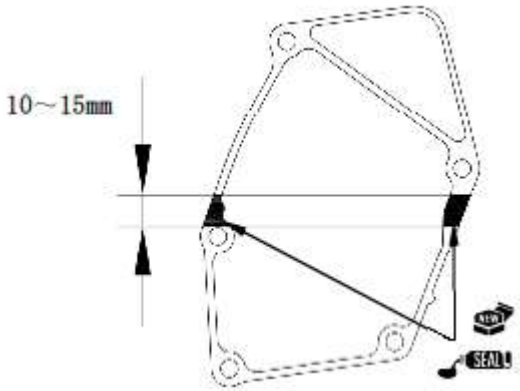
Disassembly/Re-assembly

Remove bolt [1] of decorative cover.



Remove decorative cover [2] and gasket [3].

Clean up all residual gaskets on contact surface of decorative cover and case cover.



The re-assembly is opposite to disassembly,

Torque:**12N·m**

Caution:

●Coat combination area of crankcase with sealant for end surface as picture shows.

●Replace gasket for decorative cover for a new one.

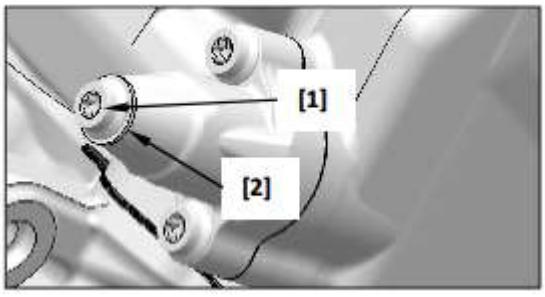
Camshaft

Caution:

●When repairing camshaft, it needn't remove engine from frame.

●Before removing camshaft, remove right decorative cover first for an easy turning of crankshaft.

Remove cylinder head cover and right decorative cover.



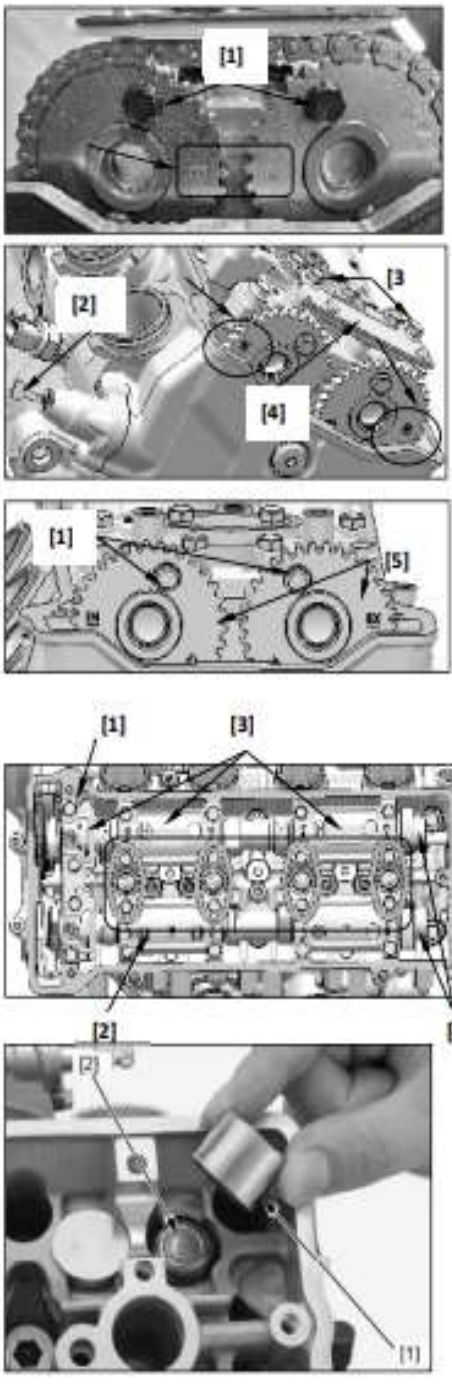
Make sure the piston in cylinder 1 is at upper stopping point of compression stroke.

Remove bolt [1] on tail end of tensioner and flat washer [2].

If camshaft/or timing chain needs be replace, firstly make sure the cylinder 1 is at timing position, then loosen the chain and bolt as below:

1) Turn crankshaft clock-wise by 360°(One round, align mark “IN” and “EX”), then remove fastening bolt [1] for driven sprocket wheel (2 pieces in all).
2) Turn crankshaft anti-clockwise by 360° (One round) to timing position of cylinder 1, insert the pin into hole on case body and crankshaft for fixing crankshaft to avoid turning.
3) Fully move adjustive stud of tensioner backwards by special tool (Clock-wise) Tool: Tensioning fixture [2].
4) Remove bolt [3] and chain limit plate [4].
5) Remove fastening bolt [1] for driven sprocket wheel (Another 2 pieces).
6) Remove timing sprocket wheel [5].

Caution:



●Please don't let bolt of chain limit plate drop into crankcase.

●Please don't let bolt of timing sprocket wheel drop into crankcase.'

●Before removing camshaft, please let piston of cylinder 1 at upper stopping point of compression stroke (Operation step 2).

Caution:

●Fasten bolts for camshaft bracket inwards in alternative way by several times, otherwise the bracket may damage.

Loosen fixing bolt [1] for camshaft in crossing turn by 2-3 times, then remove them and washer [2].

●Please don't forcedly remove positioning pin from camshaft bracket, remove camshaft [4] bypassing timing chain.

●Suspend timing chain by line to avoid it dropping into crankcase.

Remove valve tappet[1] and washer [2].

●Please don't damage hole for tappet.

●The washer may stick internal of tappet. Please don't let washer drop into crankcase.

●Marke up all tappet and washer for a correct re-assembly to their original positions.

●The tappet could be easily removed by valve grinding tools or magnetic bar.

●The washer could be easily removed by tweezers or magnetic piece.

Check

Check if there is damage, wear-out, distortion, burn-out or blocking-up in oil passage on parts below:

--Sprocket wheel of cam/Camshaft

--Camshaft bracket/Positioning pin

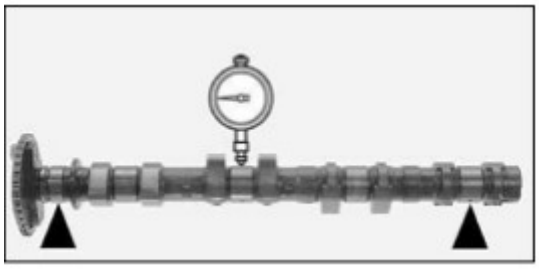
--Pressing plate of timing chain

Measure each part of cylinder head/valve according to specification, any part passed limit, please replace.

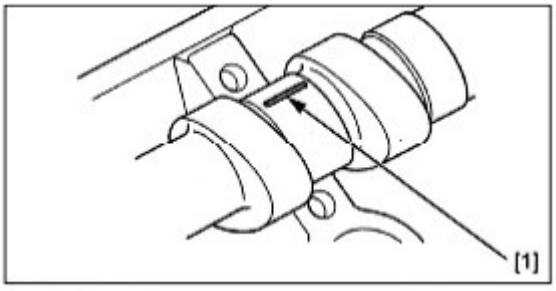
Camshaft runout

Fix both ends of camshaft by V-shaped piece, measure its run-out by dial plate.

Maintenance limit: 0.04mm



Oil gap of camshaft



Wipe up oil on camshaft, cylinder head, bracket and journal.

Assemble camshaft onto cylinder head.

Put a piece of plasticizer [1] on top of camshaft's journal vertically bypassing oil hole.

Caution:

●Please don't turn camshaft when it is in checking.

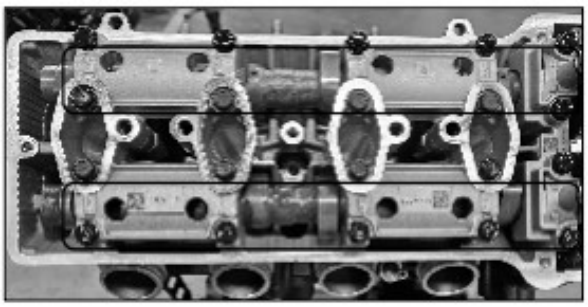
Make sure positioning pin on camshaft bracket align to its hole on cylinder head.

Assemble each bracket of camshaft to correct place by their marking-up.

--Mark "R": Right camshaft bracket [1].

--Mark "M": Middle camshaft bracket [2]

--Mark "L": Left camshaft bracket [3].



Coat thread of camshaft bolt with oil.

Assemble bolt and washer [4].

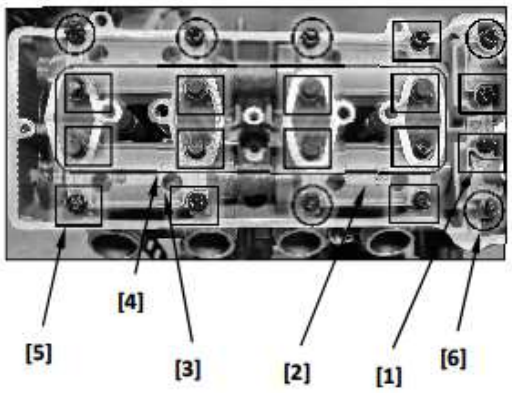
Fasten bolt by hand

Camshaft bracket bolt:

--14X40mm bolt [5]

--6X45mm bolt [6]

Gradually fasten all camshaft bracket bolts by 2-3 times according to their marking up numbers until all bolts assembled in place.



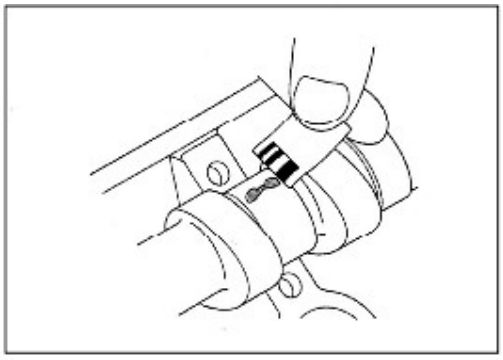
Torque: 12N·m

Caution:

●Fasten all bolts for camshaft bracket according to die casting numbers on the brackets.

●If fastening without number indicating on bracket, it may lead to crack on the bracket.

Remove camshaft bracket, and measure width for each gauge of plastic wire gap. The widest thickness decides oil gap.

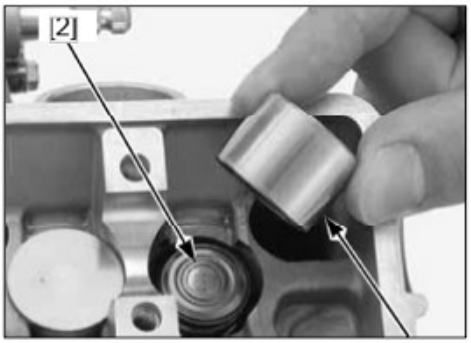


Maintenance limit: 0.10mm.

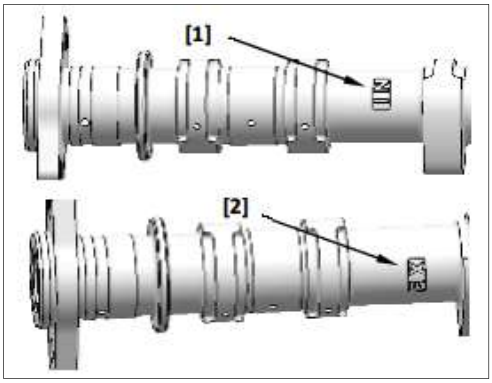
When it passed maintenance limit, please replace camshaft and check oil gap once again.

If oil gap still passed limit, please replace camshaft bracket and cylinder head as a complete kit.

Re-assembly



Assemble adjusting washer [1] for valve back to their original place on valve base ring.



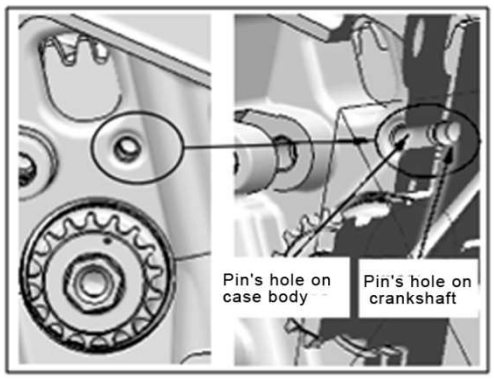
Coat tapper surface with oil and assemble back to their original place.

●Please don't let adjustive washer drop into crankcase.

Each camshaft has its own marking-up:

--Mark [1] "IN": Air intake camshaft.

--Mark [2] "EX": Air exhaust camshaft



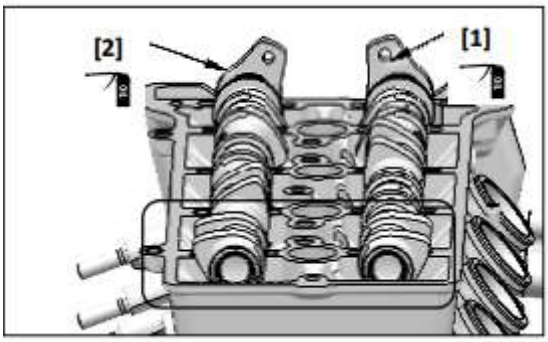
When assembling camshaft, the piston in cylinder 1 must be at upper stopping point of compression stroke. Insert the pin into its hole on crankcase and that on crankshaft to fix crankshaft avoid turning, make sure timing position is correct.

Coat stressing surface of cam, camshaft and journal with oil.

Assemble each air intake camshaft [1] and exhaust camshaft [2] onto cylinder head in correct sequence. (Intake first, then exhaust).

Caution:

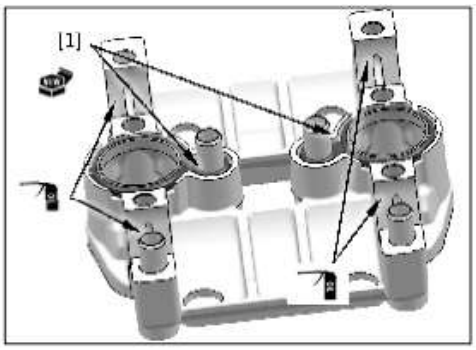
●When assembling intake/exhaust camshaft, please get the side with protrusion on cam in shape of upside down “\ /”.



●When assembling intake/exhaust camshaft, they should get through the timing chain to make sure the chain is outside of camshaft.

Assemble new seal ring [1] for left camshaft bracket and the middle one.

Coat each journal surface of camshaft bracket with oil.



Caution:

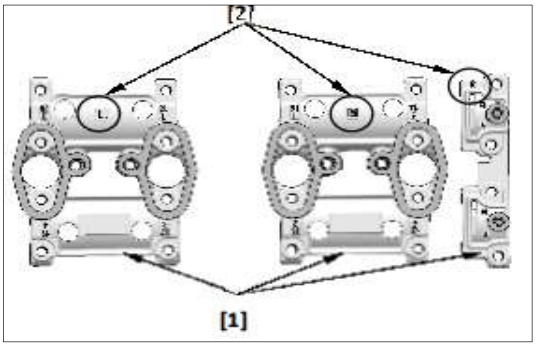
●Correctly assemble seal ring into its groove.

Assemble each camshaft bracket [1] to correct place by their marking-up [2].

--Mark “R”: Right camshaft bracket

--Mark “M”: Middle camshaft bracket

--Mark “L”: Left camshaft bracket



Coat thread of fastening bolt for camshaft with oil.

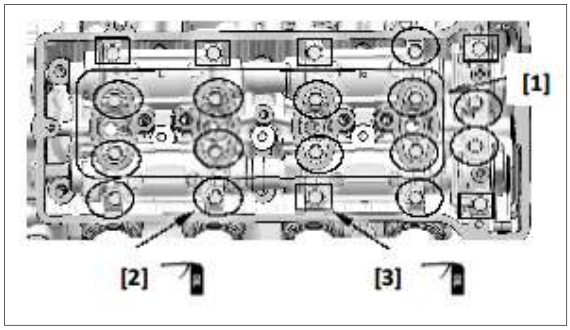
Assemble bolt and flat washer [1].

Fasten bolt by hand.

Bolt for camshaft bracket:

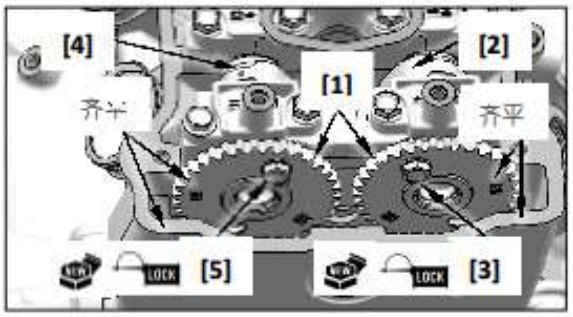
--14X40mm bolt[2]

--6X45mm bolt[3]



Pull the chain straight to the side of air exhaust, align mark “EX” on timing sprocket wheel to cylinder surface and assemble onto chain, then assemble sprocket wheel [1] to camshaft [2] of air exhaust.

Check along right side of engine, slowly turn camshaft of air exhaust clock-wise for a tiny angle, align bolt hole of sprocket wheel on camshaft to bolt hole on the sprocket itself.

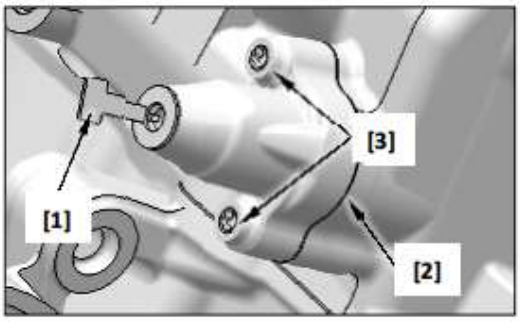




Assemble bolt [3] for sprocket wheel(Pre-fasten).

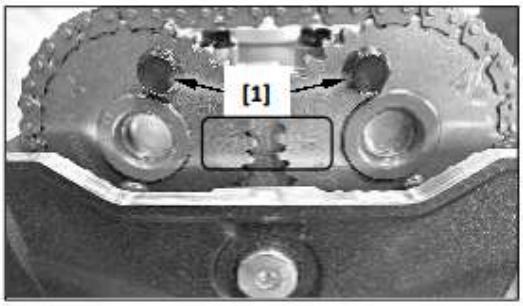
Align mark “IN” on timing sprocket to surface of cylinder head then assemble onto chain, assemble sprocket wheel [1] into camshaft [4] of air intake.

Check along right side of engine, slowly turn camshaft of air intake anti-clockwise for a tiny angle, align bolt hole of sprocket wheel on camshaft to bolt hole on the sprocket itself.



Assemble bolt [5] for sprocket wheel (Pre-fasten).

Caution:



●Please don't let bolt drop into case body.

●When assemble bolt of sprocket wheel, please prevent teeth jump of chain.

●Coat thread of sprocket bolt with Loctite.

Fully move backwards the adjustive stud of tensioner by its fixture [1] (Clock-wise).

Assemble gasket [2] into tensioner.

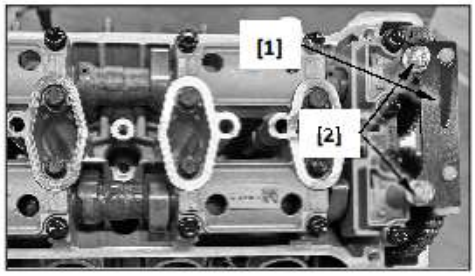
Assemble tensioner and its gasket onto cylinder head, assemble fastening bolt [3].

Torque: 12N·m

Puff out fixing pin for crankshaft timing and tensioner fixture.

Turn crankshaft clock-wise or anti-clockwise for a tiny angle, let the tensioner get chain tension, then the chain shall be tensioned.

Turn the crankshaft of cylinder 1 to timing position.



Turn crankshaft clock-wise for a round 360° (A complete round, at the moment, the mark “IN” and “EX” on sprocket wheel are aligned).

Coat thread of driven sprocket wheel bolt [1] with Loctite, then assemble into threaded hole of air intake/exhaust.

Torque: 20N·m.

Caution:

●Please don’t let bolt drop into case body.

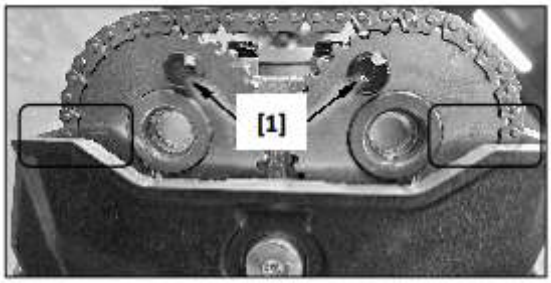
Turn crankshaft anti-clockwise by 360° (A complete round).

Fasten the already pre-fastened bolt [1] for driven sprocket wheel.

Torque: 20N·m

Assemble limit plate [1] for chain.

Assemble bolt [2] for chain limit plate.



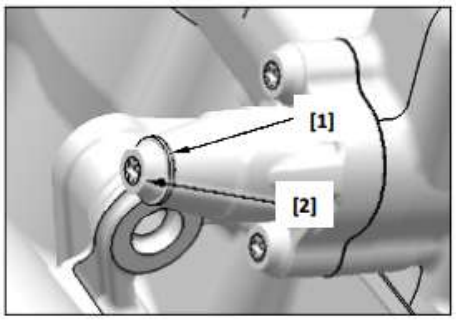
Turn crankshaft clock-wise for several times, then make correction for cylinder 1 timing. Check valve timing once again.

Check valve gap.

Standard valve gap:

Intake: 0.20±0.03mm

Exhaust: 0.28±0.03mm



Replace flat washer [1] for a new one and assemble seal bolt [2], then fasten.

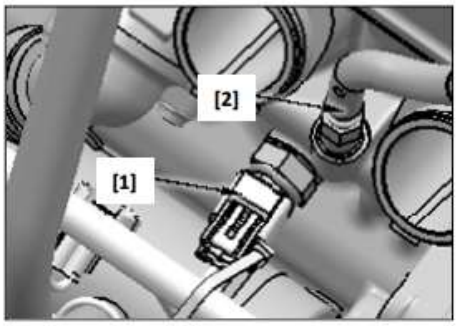
Torque: 11N·m.

Assemble cylinder head cover.

Assemble right decorative cover.

Cylinder head

Disassembly



Remove the parts below:

--Heat radiator

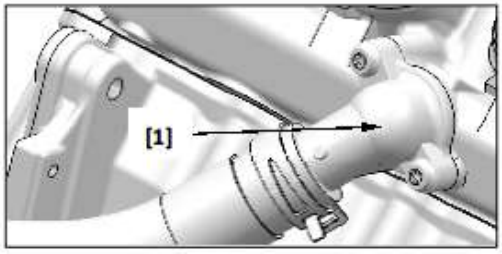
--Muffler

--Air filter and throttle valve kit

--Camshaft

Cut off joint [1] for water temperature sensor and water tube [2] for cylinder head exhaust.

Remove tube joint [1] of outer inlet on cylinder head.

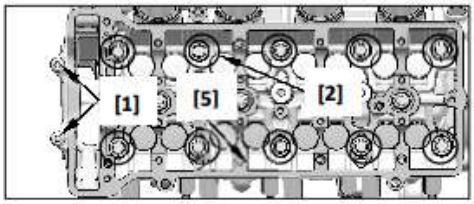


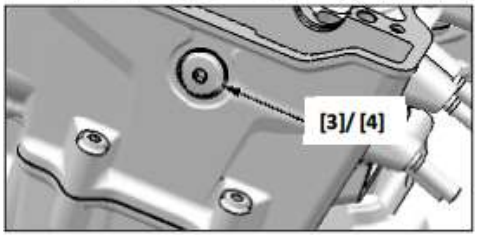
Remove connective bolt [1] (M6) between cylinder head and body.

Loosen connective bolt [2] (M9) between cylinder head and body in crossing way by 2 or 3 steps, then remove them.

Remove silent bolt [3] on cylinder head and seal ring [4].

Remove cylinder head [5].

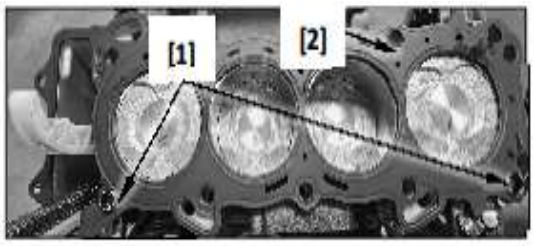




Caution:

●Please pull up the timing chain by line to prevent it dropping into crankcase.

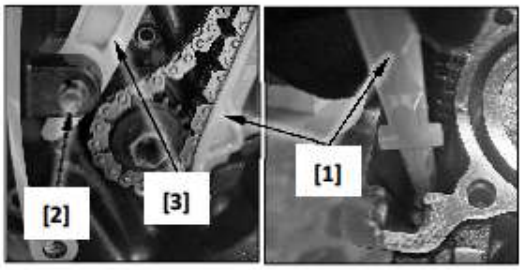
●Please don't powerfully knock the cylinder head, also please don't pry up contact surface by screwdriver.



Remove positioning pin [1] and gasket [2] on cylinder head.

Remove chain guiding plate [1].

Remove pin [2] of chain tensioning plate and the plate [3].



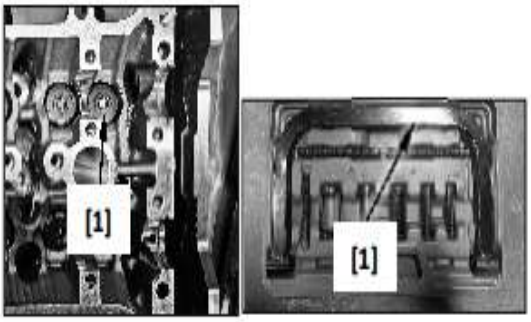
Break down

Remove the parts below:

--Spark plug

--Water temperature sensor

Remove valve clip [1] by special tools.



Tool(s):

[2] Compression tool for valve spring.

Caution:

●To avoid permanent spring distortion, powerfully compress the spring when disassembling is not allowed.

Mark up each parts when disassembling for an easy re-assembly.

Remove valve spring compression tools and parts below:

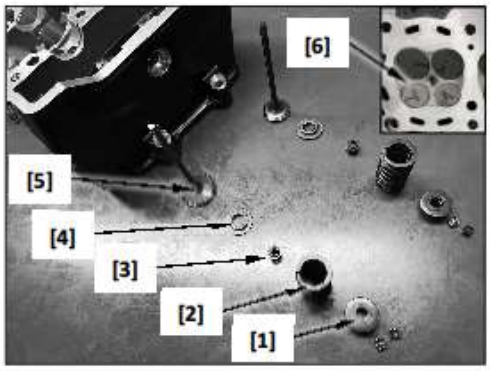
--Upper base [1] of valve base

--Valve spring [2]

--Oil shield cover [3]

--Lower base [4] of valve spring

--Valve [5]



Clean up carbon buildup in combustion chamber, then clean up gasket surface of cylinder head.

Caution:

●Please don't damage contact surface of cylinder head and surface of valve base.

Check

Check if there is damage, wear-out, distortion, burn-out and blocking-up in oil passage in parts below.

--Cylinder head

--Valve spring

--Valve

--Valve guiding tube

--Oil shield cover

--Chain guiding plate

--Chain tensioning plate

Measure each parts and their gap according to specification of **cylinder head/valve.**

Any part passed limit, please replace it.

●Before measuring guiding tube, please clean up internal carbon buildup by reamer.

●Please refer to valve base.

Replace valve guiding tube

Break down cylinder head.

Cool down a new guiding tube in freezer by an hour.

Heat up the cylinder head to 130-140℃ by a hot plate or bake oven.

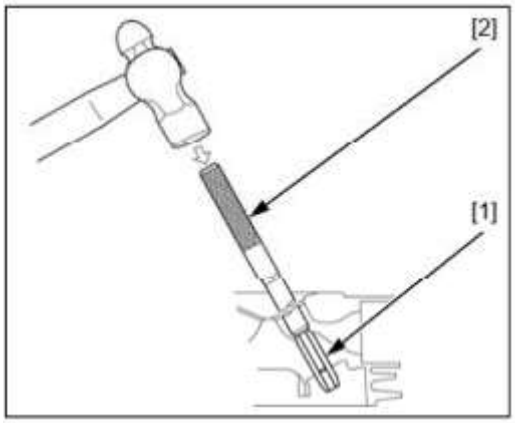
Make sure heat up cylinder head to suitable temperature by a temperature indicator bar, which could be bought from welding tools market.

Caution:

●Please wear oven gloves to avoid scald when operating hot cylinder head.

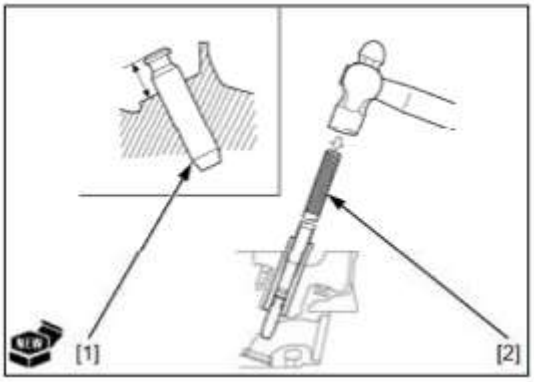
●Heat up cylinder head by fire directly may lead to its distortion.

Hold the cylinder head, push guiding tube [1] out of cylinder head from side of combustion chamber.



Tool: [2] Remover for valve guiding tube (4.5mm)

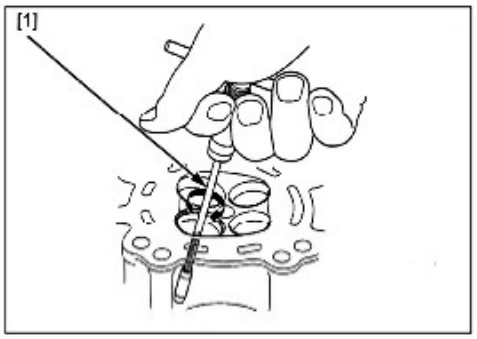
Take new guiding tube [1] out of freezer.



When the cylinder head is still hot, assemble new guiding tube from camshaft until its exposed length reached requirement.

Tool: Adjustor [2] for valve guiding tube

Required height: Intake/Exhaust: 13.3-13.6mm



Get cylinder head cooled down to room temperature.

Assembly requirement:

Mark up depth of guiding tube by marker pen.

Adjust to correct depth by driving kit of guiding tube.

When assembled, adjust new tube by reamer.

Caution:

●When reamer working, inclining or prying up inside tube is not allowed.

●This working needs cutting lubricant.

●Insert reamer from combustion chamber side and always turn the reamer clock-wise.

Tool: Reamer for guiding tube (4.5mm).

Totally clean up cylinder head to remove metallic chips when reamer working finished, then trim the valve base.

Check and trim valve base

Check

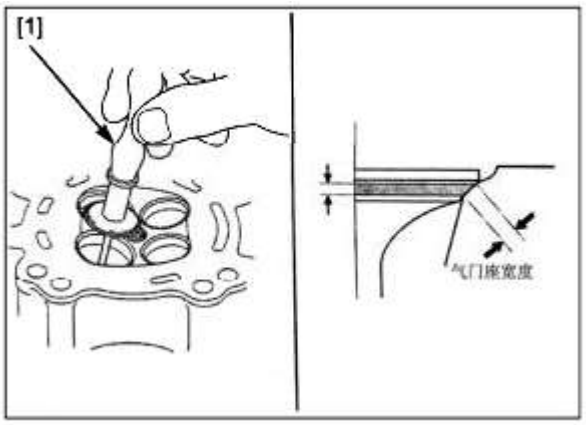
Break down cylinder head.

Totally clean up carbon buildup in air intake/exhaust valve.

Coat a thin layer of iron blue to each valve.

Slightly knock valve by grinding tool [1] by facing to valve base side, check base contact when valve without turning.

Remove valve, check width for each valve base.



The contact width of valve base shall be within required range, and surroundings of valve shall be smooth.

Standard: 0.90-1.10mm

Maintenance limit: 1.5mm.

If width of valve base is out of range, please trim the base.

The valve could not be grinded, if its contact surface burned out or wore out, or the base contact is not flat and smooth, please replace the valve.

Check if there is situation below on base surface:

●Contact surface of base contact is not smooth

--Valve bar bent or folded, replace valve and trim its base.

●Base surface wear-out.

--Replace valve and trim the base once again.

●Contact area (Too high or too low)

--Replace valve base for a new one.

Trim

The trimming tools for valve base are as below:

Tool:

Blade rod clamp, 4.5mm

Trimming blade for valve base, 27.5mm (IN, 45°)

Trimming blade for valve base, 24mm (EX, 45°)

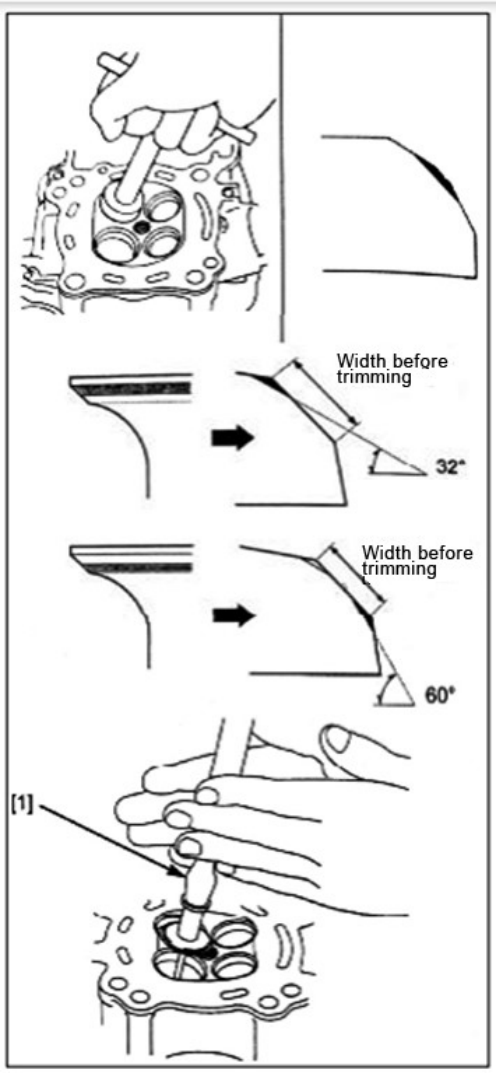
Flat milling blade, 28mm (IN, 32°)

Flat milling blade, 24mm(EX, 32°)

Internal milling blade, (IN, 60°)

Internal milling blade, (EX, 60°)

Width of valve base: 0.90-1.10mm



Caution:

●Please strictly follow the requirement from User Manual of polisher suppliers.

●Too much grinding for valve base is not allowed.

1. Cut off the rough part or irregular part of valve base by trimming blade of 45° first.

2. Cut off upper ring of working surface of valve base by 1/4 by flat milling blade of 32°.

3. Cut off bottom ring of valve base by 1/4 by internal milling blade of 60°.

4. Grind valve base to suitable width by trimming blade of 45°.

5. Make sure all the rough and irregular parts on valve base are grinded.

6. When the grinding for valve base finished, coat valve surface with abrasive to slightly grind valve.

Caution:

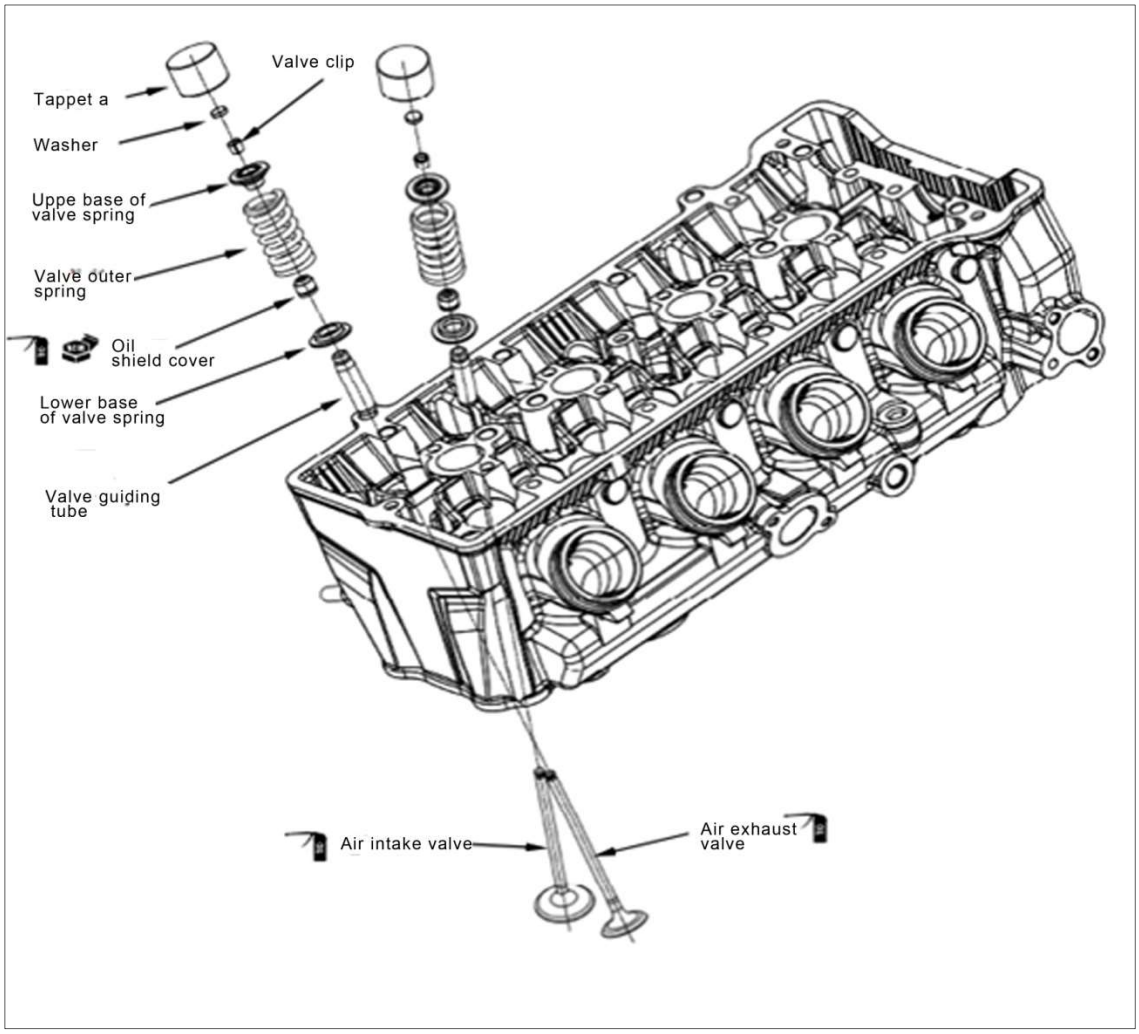
●Powerful grinding may lead to valve base damage or distortion.

●Usually change the grinding angle of tools to prevent unsmooth grinding.

●Please don't let abrasive get into place between valve rod and guiding tube.

When grinding finished, clean up residual abrasive on cylinder head and valve, then check contact surface of valve base once again, then assemble cylinder head.

Re-assembly

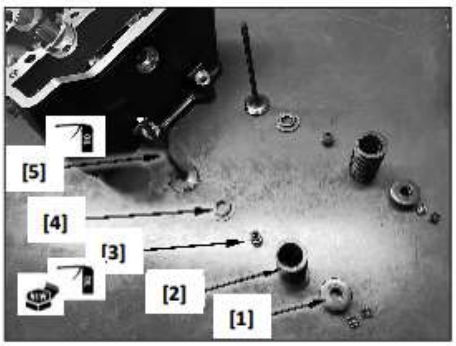


Wash cylinder head kit by solvent, then blow all the oil passage by compressed air.

Lubricate new oil shield cover [3] by oil.

Assemble lower valve base [4] and oil shield cover.

Lubricate sliding surface and rod end of each valve rod by oil.

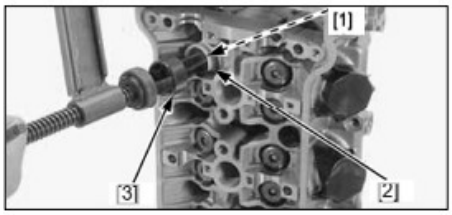


Insert valve [3] into its guiding tube, when inserting,

slowly turn the Valve to prevent damaging oil shield cover.

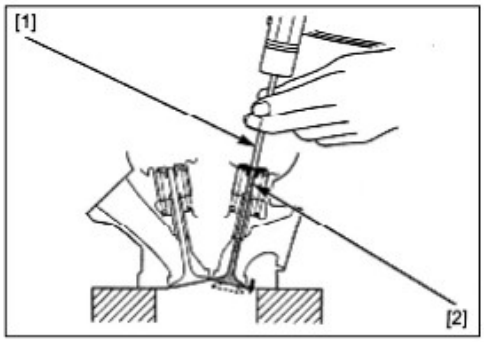
Assemble valve spring [2], the thicker side of coil faces to combustion chamber.

Assemble upper base [1] of valve spring.



Assemble valve clip [1] by special tools.

Lubricate split pin to reduce resistance in assembling, to avoid spring losing its elasticity, please don't heavily compress the spring.



Tool:

[2] Compression tool for valve spring

[3] Accessories for compression tools of valve spring.

Hold cylinder head on working bench to prevent damaging the valve.

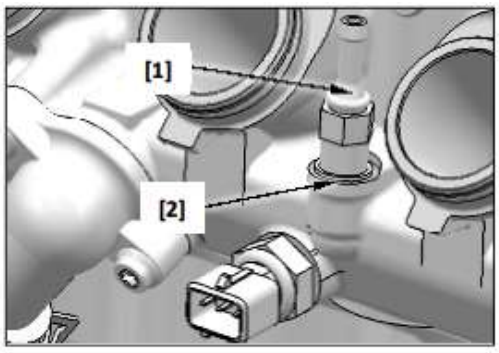
Put suitable tool [1] into guiding tube [2] of valve.

Slightly knock the tools for an firm assembly of valve clip.

Coat thread of exhaust joint [1] with Loctite.

Assemble exhaust joint to cylinder cover by new flat washer [2].

Fasten exhaust joint to required torque.



Torque: 12N·m

Assemble parts below:

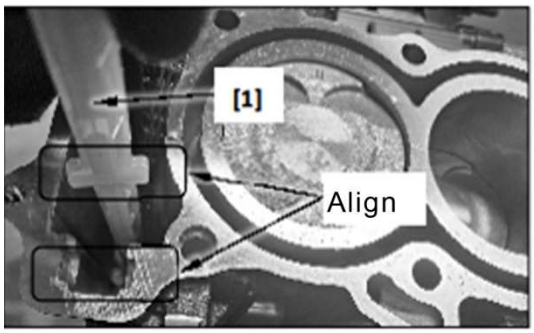
--Temperature sensor

--Spark plug

Assembly

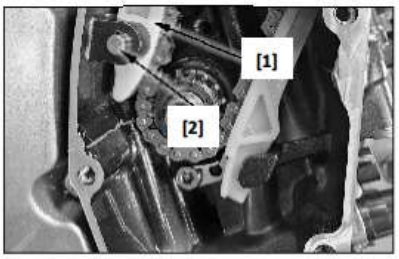
Clean up residual gasket of contact surface of cylinder.

Caution: Please don't let dust and dirt get into cylinder.

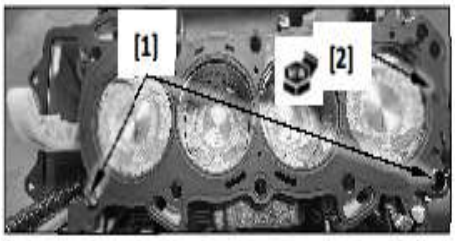


Assemble guiding plate [1] of chain, align its protrusion to groove on cylinder, whose bottom is in groove of crankcase.

Assemble tensioning plate [1] of chain and pin shaft [2] of the plate.



Assemble positioning pin [1] and new gasket [2].

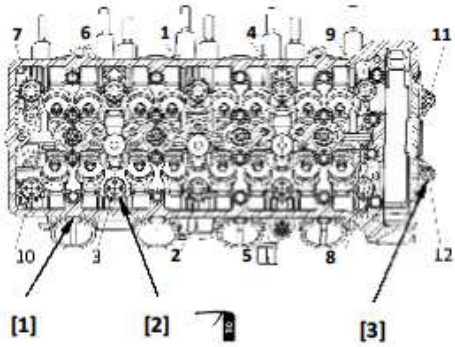


Get timing chain through cylinder head, then assemble cylinder head [1] to cylinder.

Totally clean up thread of cylinder head bolt (9mm) and base surface, then wipe it up.

Coat thread of cylinder head bolt (9mm) and base surface with engine oil.

Fasten cylinder head bolt [2] (9mm) by 2-3 times according to Ref. Number in figure, then fasten it to required torque.



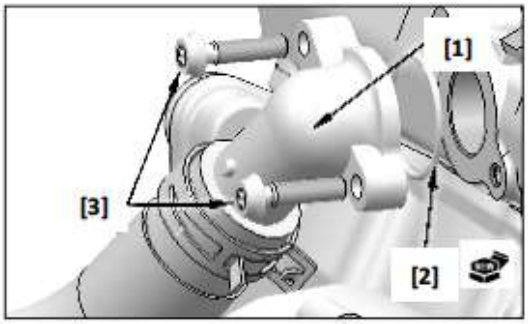
Torque: 47N·m

Assemble and fasten cylinder head bolt [3] (6mm).

Torque: 12N·m

Assemble new seal ring [2] to tube joint [1] of water inlet on cylinder

Head, then fasten the bolt [3] of tube joint.

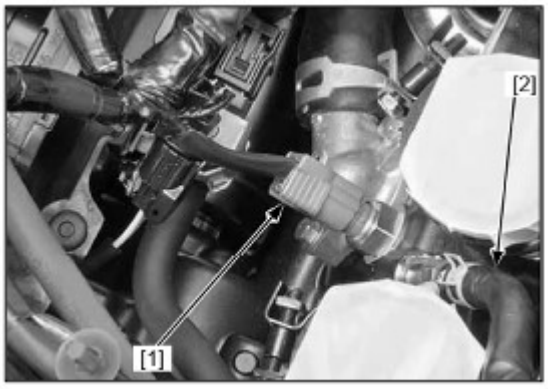


Torque: 12N·m.

Caution:

●Please don't coat seal ring with oil.

Connect water tube [1] of air exhaust to joint [2] of temperature sensor of cylinder.



Assemble parts below:

--Camshaft

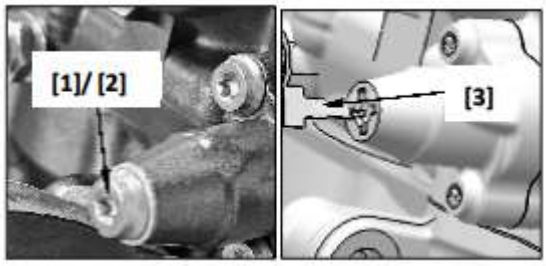
--Throttle valve kit

--Muffler

Tensioner

Disassembly/Re-assembly

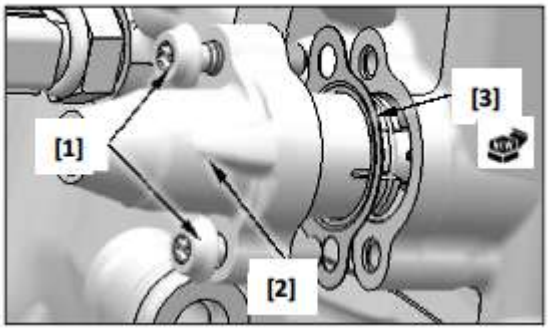
Caution: The maintenance and repair for adjustive stud of tensioner needn't remove engine from frame.



Turn adjustive stud of tensioner clock-wise by special tool to make

sure it get tensioned enough.

Tool: [3] Tensioner fixture



Remove tensioner bolt [1], tensioner [2] and gasket [3].

The re-assembly is opposite to disassembly.

Torque:

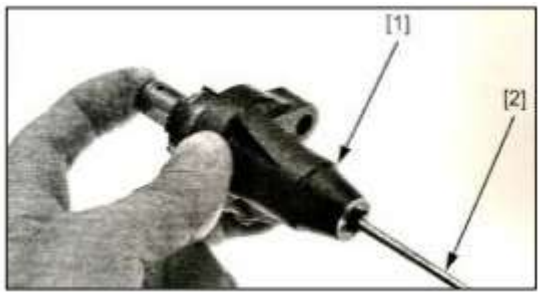
Tensioner bolt: 12N·m

Bolt at tensioner tail: 11N·m

Caution:

●Please replace flat washer and gasket for a new one.

Check

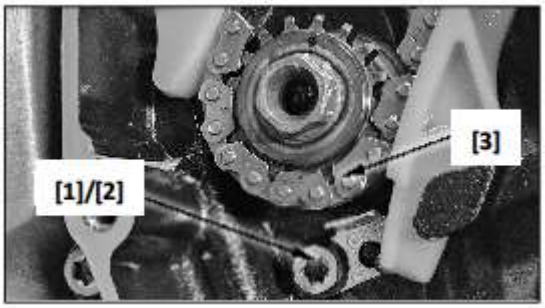


Check operation performance of tensioner [1].

--When pressing adjustive stud, it could not be pressed into adjustor.

--When turning the stud by cross piece or screwdriver [2], the stud should be able to press into adjustor; When moving tools away, the adjustive stud shall eject out of adjustor.

Timing chain



Disassembly

Remove parts below:

--Cylinder head

--Right decorative cover

--Chain tensioning plate/Chain guiding plate

Remove bolt [1], then remove chain check plate [2].

Remove timing chain [3] from crankshaft.

Check

Check if there is scratch, damage, wear-out or distortion on parts below, Please replace if it is necessary.

--Timing chain

--Chain tensioning plate

--Chain tensioning plate

Re-assembly

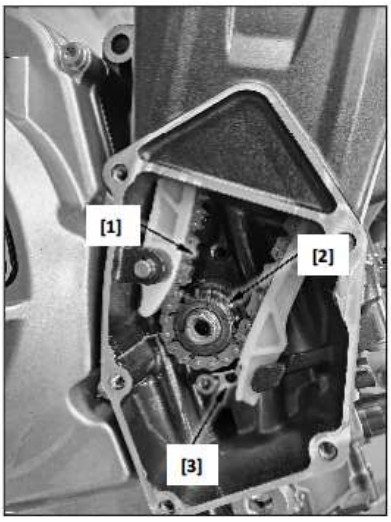
Coat all the surface of timing chain [1] with oil and hang it into timing and driving gear [2] of crankshaft.

Coat thread of mounting bolt of chain check plate with Loctite.

Assemble chain check plate [3], get the hole on plate into protrusion on case body.

The assembling direction of check plate is shown as figure.

Fasten the bolt for check plate to required torque.



Torque: 12N·m

Assemble parts below:

--Chain tensioning plate/Chain guiding plate

--Cylinder head

--Right decorative cover

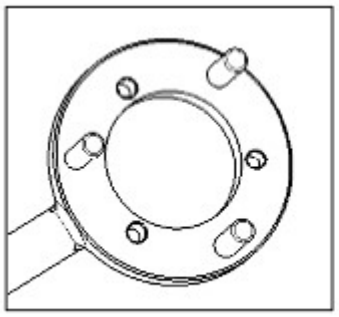
6 Clutch and gearshift

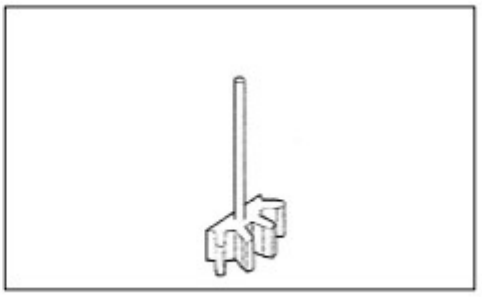
Maintenance

Summary

- The maintenance for clutch and gearshift device in this chapter needn't remove the engine from frame.
- The oil level and viscosity has influence on separation of clutch. When the clutch failed to separate or the motorcycle is still in low speed when clutch separated, please check the oil level before clutch maintenance.

Tool





Specification for clutch and gearshift device

Unit: mm

Items		Standard	Maintenance limit
Free play for clutch lever		10-20	—
Clutch	Spring free length	50.3	49.3
	Friction plate thickness	2.92-3.08	2.7
	Driven plate flatness	**≤0.10**	0.30
Clutch collar	Internal diameter	24.992-25.007	25.017
	External diameter	30.992-31.005	30.982
External diameter at place of clutch collar		24.967-24.980	24.947

Troubleshooting

Difficult to hold clutch lever tightly

- The clutch cable damaged, twisted or too dirty
- Wrong wiring for clutch cable
- The thrust mechanism of clutch got damaged
- Malfunction in bearing of clutch's pushing rod

- Incorrect installation for operational rod of clutch

Clutch skidding in acceleration

- Jamming on clutch's pushing rod
- Driving friction plate worn out
- Poor performance for clutch spring
- Not any free travel on clutch lever
- Molybdenum disulfide or graphite additive gets into oil

When clutch separated or failed to separate, the motorcycle is still under low speed

- Too wide the free travel of clutch lever
- The friction plate of clutch gets warped
- Too high the oil level, wrong viscosity or incorrect additive
- The locking nut on clutch center case gets loosened
- Thrust mechanism of clutch gets damaged
- Incorrect installation for clutch's operational rod
- The inserting groove on clutch outer case and clutch gear worn out
- Wrong operation for clutch

Difficult gearshift

- Incorrect adjustment for clutch cable
- Wrong operation on clutch
- Wrong viscosity of oil

- The gearshift fork gets damaged or bent
- The shaft of gearshift fork gets bent
- The claw of gearshift fork gets bent
- The bolt on five-star shaped plate gets loosened
- The five-star shaped turning plate gets damaged
- The guiding groove on gearshift drum gets damaged
- Five-star shaped turning plate gets worn out or damaged

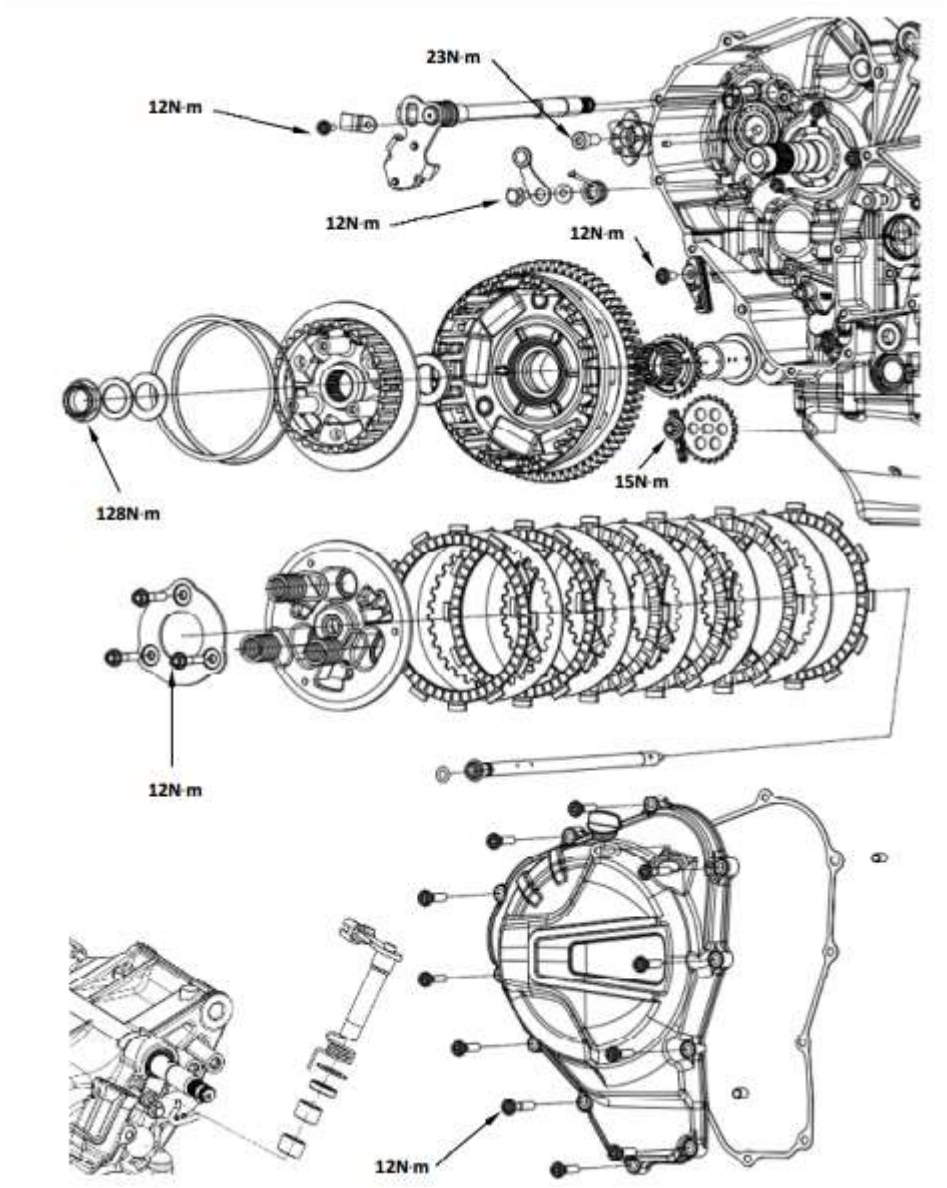
Gear jump in transmission system

- Check plate gets worn out
- Poor performance even damage on returning spring of check plate
- The bolt on five-star shaped turning plate gets loosened
- Five-star shaped turning plate gets damaged
- Shaft of gearshift fork gets bent
- Gearshift fork gets bent or damaged
- The meshing surface or teeth groove gets damaged

Gearshift plate fails to return

- The poor elasticity of returning spring of gearshift spindle or gets cracked
- Gearshift spindle gets bent or damaged

Components layout



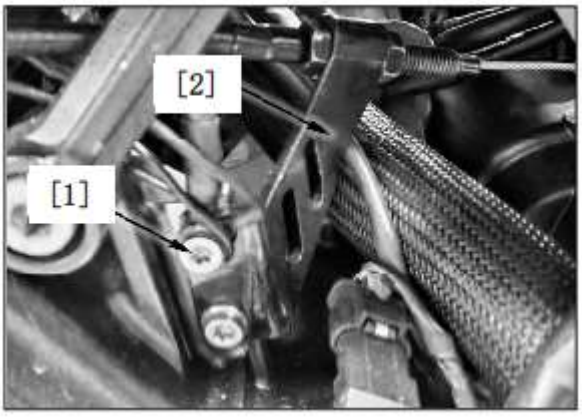
Right crankcase cover

Disassembly/Re-assembly

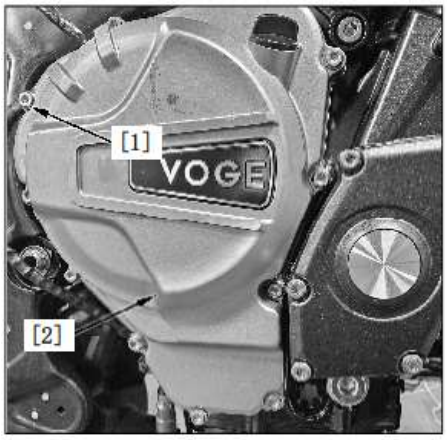
Remove lower windshield cover of motorcycle.

Drain off oil in engine.

Remove bolt [1] and locating plate [2] of



clutch cable.



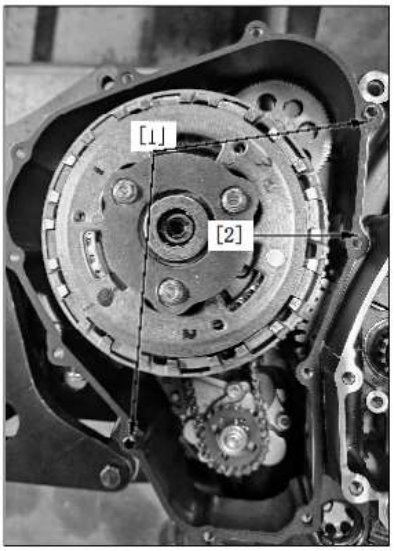
Alternatively loosen bolt [1] (11 pieces in all) on right crankcase cover by 2-3 times.

Remove parts below:

--Bolt

--Right crankcase cover [2].

Remove positioning pin [1] (2 pieces in all) and gasket [2].

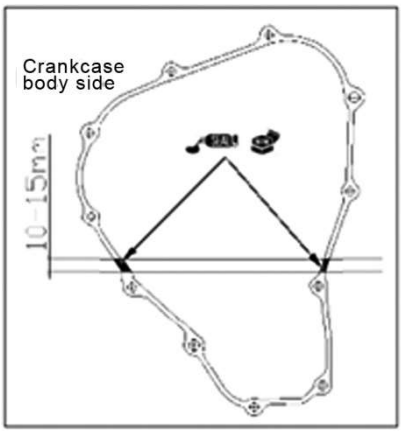


Clean up residual gasket on contact surface between crankcase and its cover.

Please don't damage the contact surface.

The re-assembly is opposite to disassembly.

Torque: 12N·m.



Caution:

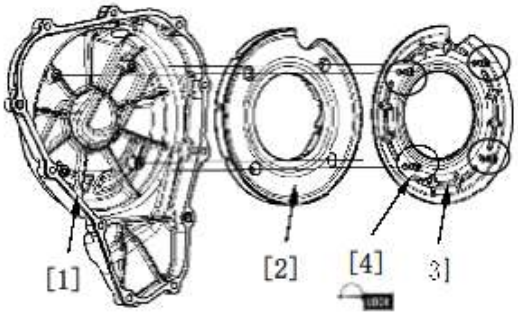
- Coat contact part of crankcase with sealant for end surface as picture shows.
- Replace gasket of right crankcase for a new one.

●Align hole on locating plate of clutch cable to threaded hole on crankcase.

Adjust free play for clutch lever.

Fill up crankcase with suggested oil, then check if there is oil leaks.

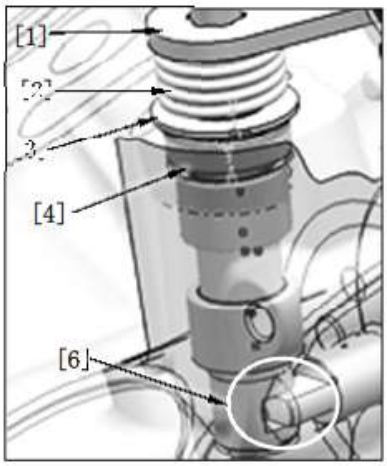
Disassembly/Re-assembly



Assemble damping sheet [2] onto right crankcase cover [1], then assemble damping cover [3] to the sheet, coat head of bolt [4] with Loctite, then fasten.

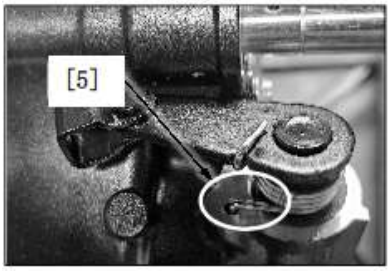
Torque: 6N·m.

Clutch operation arm kit



Remove clutch operation arm kit [1], twist spring [2], flat washer [3] and oil seal [4] from left side of upper case body (The operation arm could be removed only when tapped removed)

The re-assembly is opposite to disassembly.



Caution:

●Coat new oil seal with grease.

●Assemble oil seal until it aligned to root of its chamfer angle.

●Hang the hook on returning spring into hole [5] of upper case body.

●Align returning spring to groove [6] on clutch operation arm.

●Coat the sliding surface between clutch operation arm and pushing rod with oil.

●Get the flat side of tappet left side into groove of clutch operation bar.

Check

Check if there is scratch, damage, wear-out and distortion on parts below:

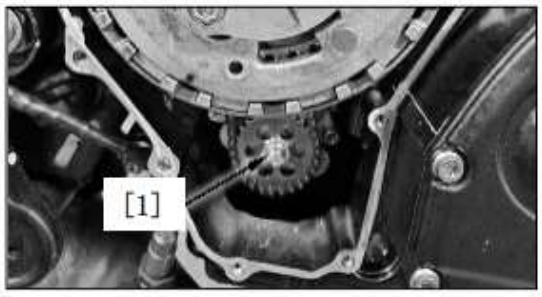
--Clutch operation arm

--Seal ring of tappet

--Returning spring

Clutch

Disassembly



Remove right crankcase cover.

If the clutch collar needs be removed, remove bolt [1] of driven wheel of oil pump, when clutch is under assembling condition.



Loosen bolt [1] for clutch lift plate (3 pieces in all) by 2-3 times in alternative way.

Remove lift plate [2] and spring [3] (3 pieces in all).

Remove parts below:

--Pressing plate [1]

--Tappet [2]

--Driving plate A [3] (3 pieces in all)

--Driving plate B [4] (3 pieces in all)

--Driven plate A [5] (1 piece in all)

--Driven plate B [6] (4 pieces in all)

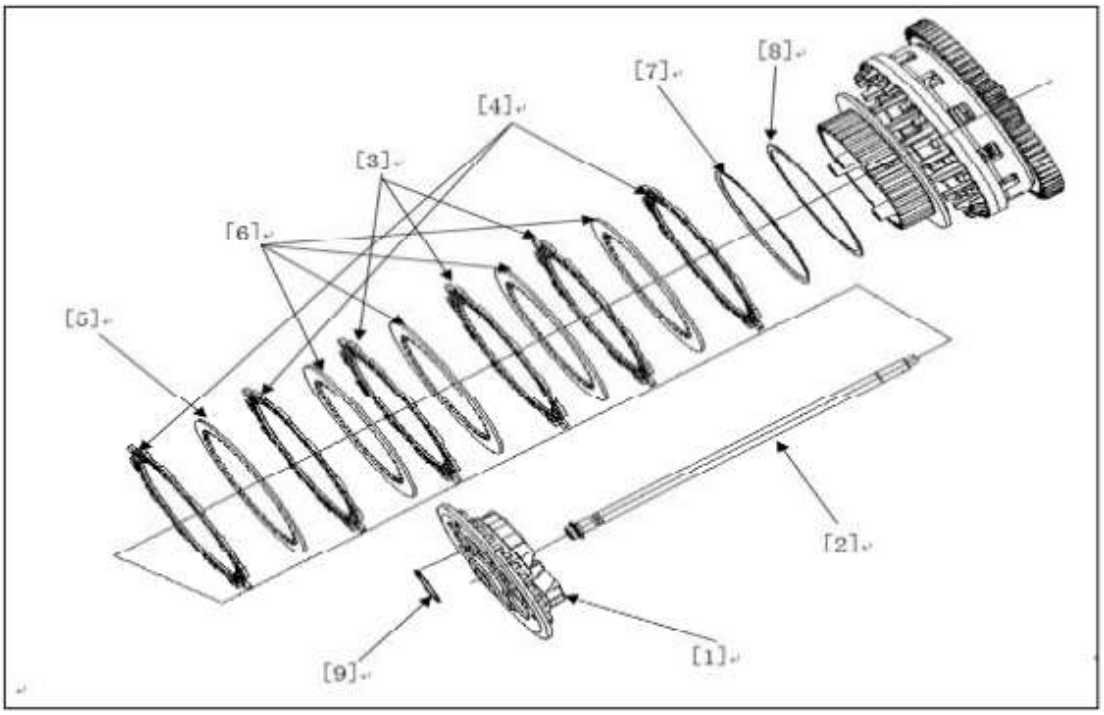
--Butterfly shaped washer [7] (1 piece in all)

--Flat washer [8] (1 piece in all)

--Spring base [9] (3 pieces in all)

Caution:

●When clutch frication plates removed, please keep in mind their assembly sequence and positions, meanwhile paying attention to assembling direction and position for butterfly shaped and flat washer.

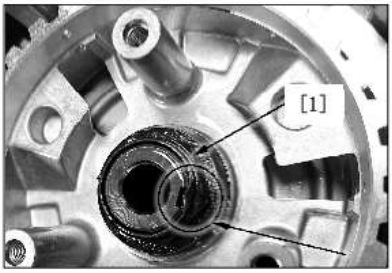


Remove locking edge of locking nut for clutch central case.

Fix clutch central case by tool, meanwhile loosening locking nut [1].

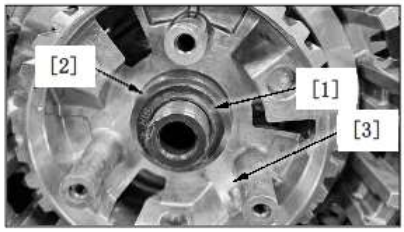
Caution:

●Please don't damage thread part of main shaft.



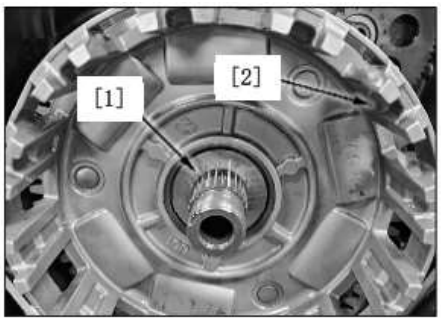
Remove butterfly shaped washer [1] and flat washer [2].

Remove clutch central case [3].



Remove thrust washer [1] and outer case kit [2] of clutch.

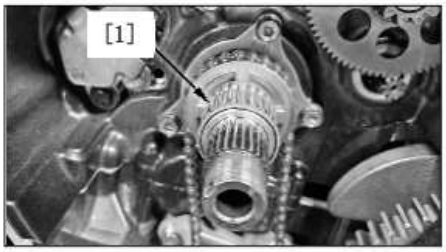
Remove needle bearing [1].

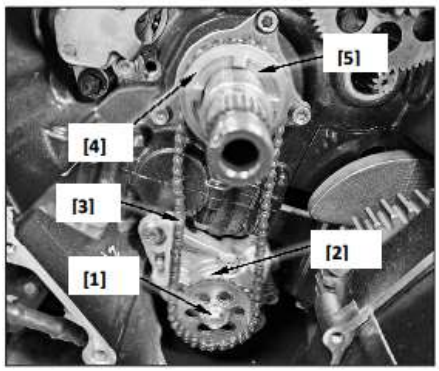


Remove bolt [1] of driven wheel of oil pump and the wheel [2].

Remove chain [3] and driving gear [4] of oil pump.

Remove collar [5].





Check

Check if there is scratch, damage, wear-out and distortion under clutch pressing plate [1].

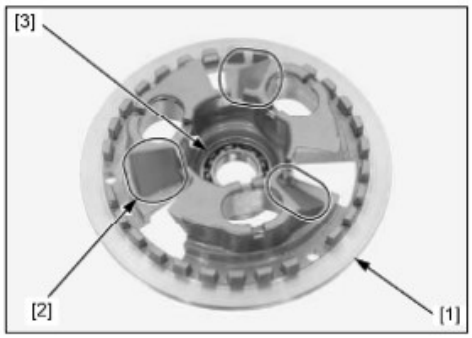
--Inclining and sliding area [2].

--Limit groove of driven plate

--Contact surface of friction plate

--Bearing [3]

Please replace clutch pressing plate for a new one if it is necessary.



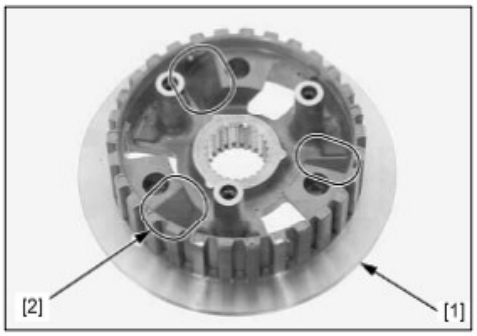
Check if there is scratch, damage, wear-out and distortion under central part [1] of clutch.

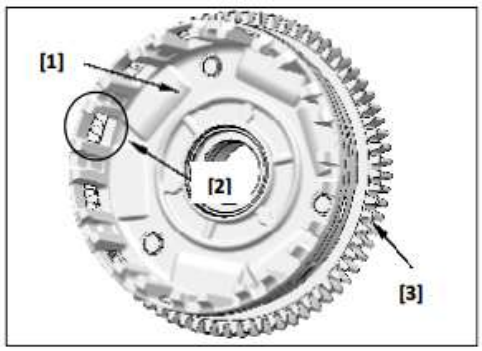
--Inclining and sliding area [2].

--Limit groove of driven plate.

--Contact surface of friction plate.

Please replace central part of clutch for a new one if it is necessary.





Check if there is scratch, damage, wear-out and distortion on outer case [1] of clutch.

--Limit groove [2] on driving plate.

--Primary driven gear [3].

Please replace outer case of clutch for a new one if it is necessary.

Check if there is scratch, damage, wear-out and distortion on parts below, please replace if it is necessary.

--Clutch tappet/Seal ring for tappet

--Bearing for lift plate of clutch

--Clutch lift plate

--Spring

--Central case

--Flat washer

--Disc spring

--Driving and driven plate

--Clutch outer case/Primary driven gear/Needle bearing/Collar

--Driving and driven wheel for oil pump/Oil pump chain

1. Main shaft

Measure each part according to specification of **clutch and gearshift kit.**

Any part passed limit, please replace.

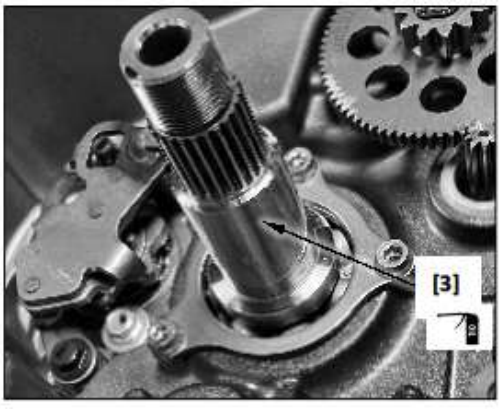
Caution:

●Replace clutch spring as a complete kit.

●Replace driving and driven plate in pairs.

Assembly:

Coat external surface of clutch collar with oil, then assemble it to main shaft.



Coat driving sprocket [1] and driven sprocket [2] of oil pump with oil.

Assemble driving, driven sprocket and chain [3] of oil pump in place.

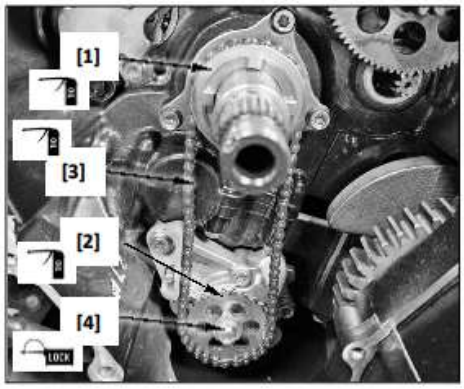
Coat thread of fastening bolt [4] for driven sprocket of oil pump with Loctite (243), then pre-fasten it.

The mark “OUT” on driven sprocket faces outwards.

Coat turning area of needle bearing [1] with oil. Assemble needle bearing onto main shaft.



Coat gear [1] on outer case of clutch and surface [2] of internal hole with oil.
Align hole on outer case of clutch to groove on driven sprocket of oil pump, then assemble outer case kit in place.

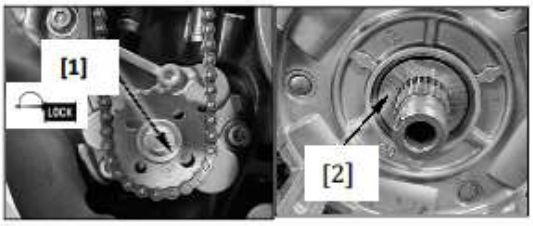


Caution:

●When outer case assembled in place, the height of surface of primary driven gear is a little lower than gear surface of primary driving gear of crankshaft.



●Please don’t let needle bearing of plate shaped-gear drop off.

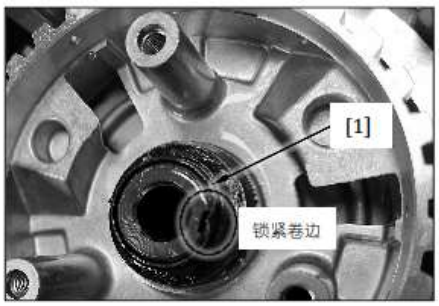


Fasten the bolt [1] for sprocket washer of oil pump to required torque.

Torque: 15N·m.

Assemble thrust washer [2].

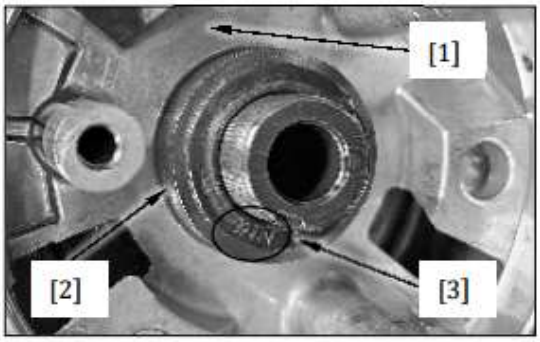
Assemble clutch central case [1], flat washer [2] and disc-shaped washer [3] in turn.



Caution:

●Align spline on central case to that on main shaft, then assemble it in.

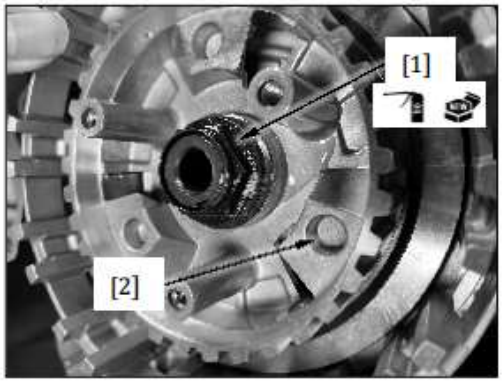
●The mark “OUT” [5] on disc shaped washer [4] face outwards then assemble it.



Coat thread of locking nut [1] for clutch central case with oil, then assemble it onto main shaft.

Fix clutch central case [2] by special tool, then fasten the locking nut to required torque.

Torque: 128N·m



Punch the edge of anti-loosen nut [1] into groove on main shaft by punching head.

Caution:

●Please damage the thread of main shaft.



Coat the surface of tappet [1] with oil and then assemble it into main shaft.

Caution:

●Please correctly put tappet into groove on operation bar of clutch.

As picture shows, assemble flat washer [1] and disc shaped washer [2] of central case onto clutch central case [3].

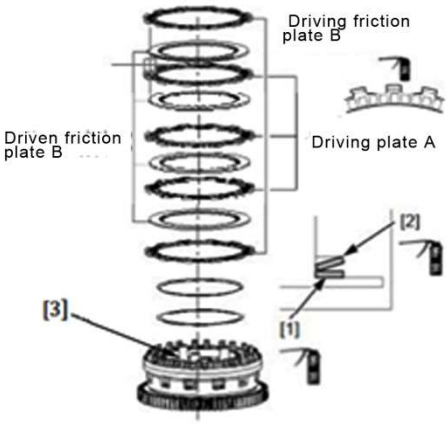
Coat all the surface of clutch plate and driving friction plate with oil.

From driving plate B, assemble the plates to central and outer case of clutch as picture shows.

Caution:

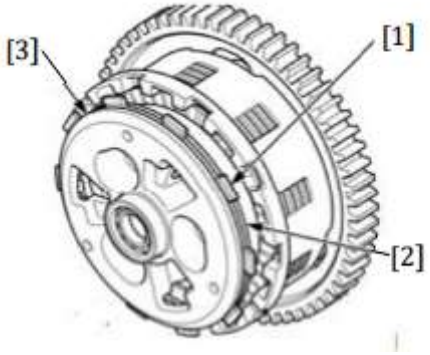
●The direction of disc-shaped spring is show as figure.

●Driven plate A assemble together with the last driving plate B to pressing plate.



Coat driving plate B [1] and driven plate A [2] with oil and assemble into pressing plate, then get the pressing and friction plate as a

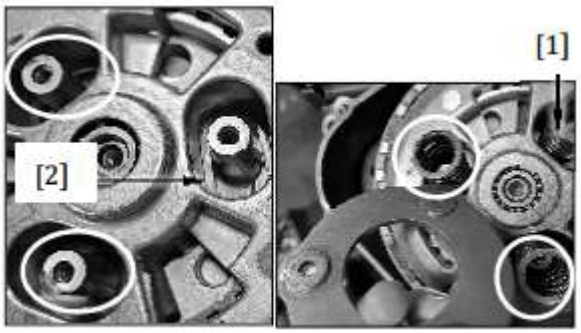
complete kit [3] align to limit groove of clutch driving plate and groove on inclining surface, then turn and assemble it in.



Assemble main spring [1] of clutch.

Caution:

●Check if spring base [2] (3 pieces in all) are assembled on pressing plate when assembling spring.

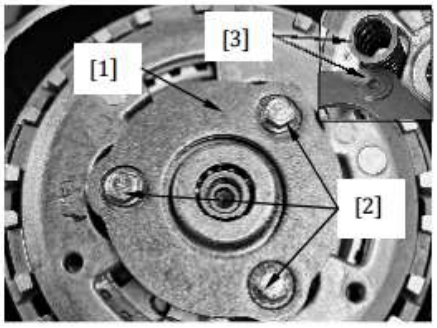


Assemble lift plate [1] and fastening bolt [2].

Torque: 12N·m

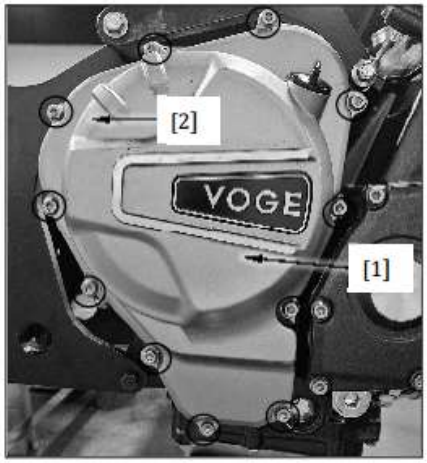
Caution:

●Please don't let end surface of spring press protrusion [3] of lift plate when fastening the bolt, make sure the correct assembly for main spring.



Assemble right crankcase cover [1] and fastening bolt [2].

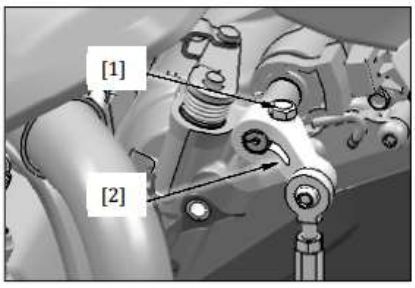
Torque: 12N·m



●Caution: Coat the joint surface between upper and lower case body with sealant (P73).

Gearshift kit

Disassembly

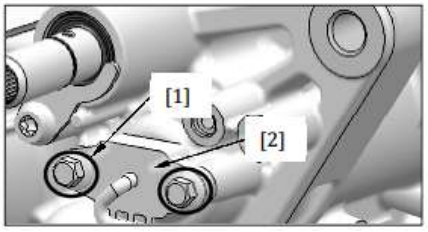


Remove parts below:

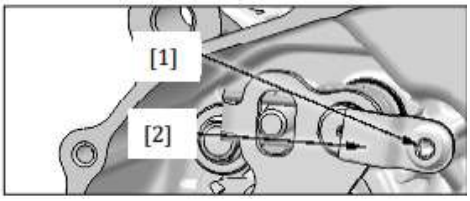
--Clutch

--Gearshift arm

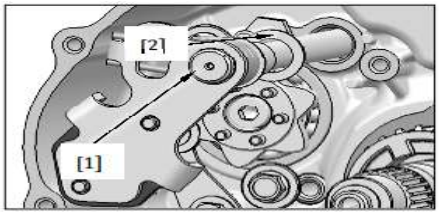
Remove clipping bolt [1], then remove gearshift arm [2] from gearshift spindle.



Clean up spline on gearshift spindle.



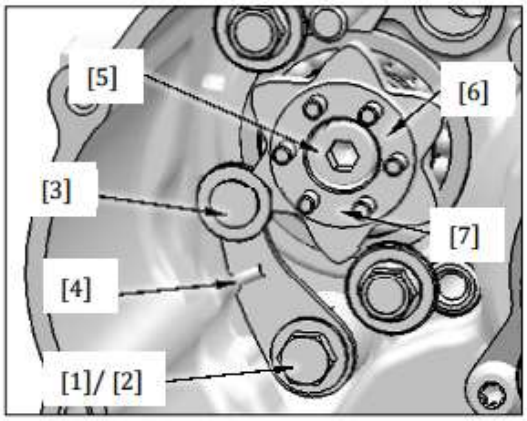
Remove gear indicator bolt [1] and the indicator kit [2].



Remove bolt [1] and limit plate [2].

Pull out gearshift arm kit [1] and thrust washer.

Remove socket bolt [5] of five star plate and parts below:



--Bolt [1] of check plate

--Washer [2]

--Check plate [3]

--Return spring [4].

--Socket hex. bolt [6] for five star plate

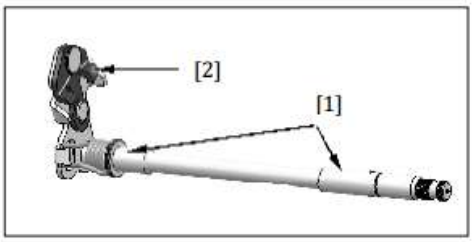
--Five star turning plate

--Pin [7]

Check

Check if there is damage, wear-out and distortion on parts below.

Please replace if it is necessary.



--Five star plate

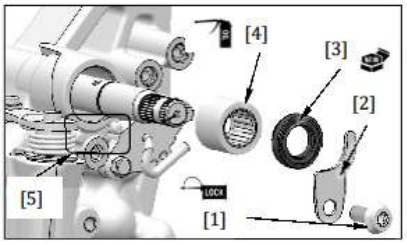
--Check plate

--Return spring of check plate

--Needle bearing of gearshift arm

Check if there is wear-out or bending on gearshift spindle [1].

Check if there is wear-out, damage or distortion on gearshift turning plate [2]. Please replace gearshift spindle as a kit if it is necessary.



Replace needle bearing of gearshift arm

Remove gearshift arm kit.

Remove bolt [1], pressing plate [2] of oil seal of arm, oil seal [3] and needle bearing [4].

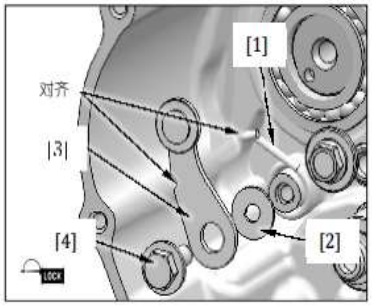
Coat surface of gearshift spindle with suitable oil, then assemble onto case body.

Coat new needle bearing of gearshift arm with oil, then assemble it into crankcase.

Coat the lip of oil seal with lubricant, then assemble it into crankcase by guiding tube of oil seal until it gets aligned to surface of crankcase.

Coat thread of bolt for pressing plate with Loctite.

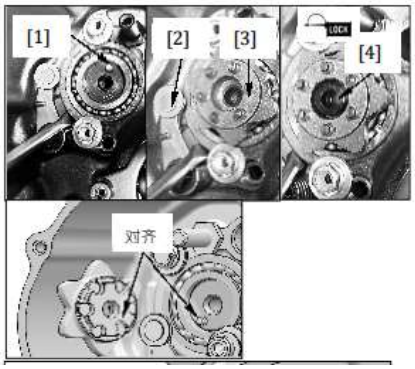
Assemble pressing plate of oil seal to protrusion lug [5] of crankcase as picture shows, then fasten the bolt.



Torque: 12N·m

Re-assembly

Coat thread of bolt for check plate with Loctite.

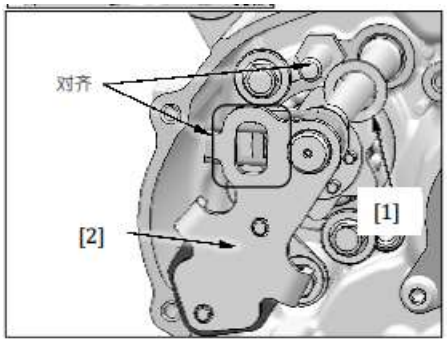


Assemble returning spring [1], washer [2] and check plate [3], then get the hook of returning spring into groove on check plate.

Assemble and fasten bolt [4] of check plate to required.

Torque: 12N·m.

Check and confirm normal work of check plate.



Assemble positioning pin [1] into its hole on gearshift drum.

Fix check plate [2] as picture shows by screwdriver.

Assemble five star plate [3], then align the groove on it to positioning pin.

Coat thread of locating bolt for five star with Loctite.

Assemble locating bolt [4] for five star plate, then fasten to required torque.

Torque: 23N·m

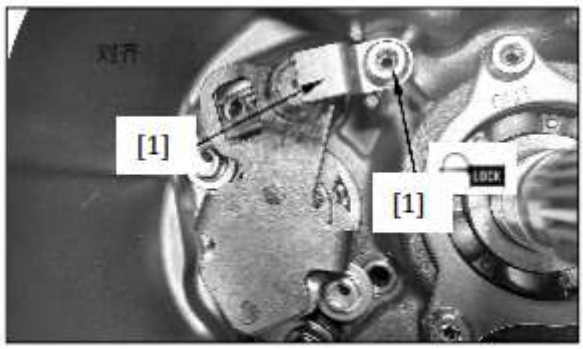
Coat the outer surface of gearshift spindle with clean engine oil.

Assemble flat washer [1] and gearshift arm kit [2] into crankcase, then align end of returning spring to its pin.

Coat thread of bolt for pressing plate with Loctite.

Assemble pressing plate [1] and bolt [2], then fasten to required torque.

Torque: 12N·m



Assemble parts below:

--Gearshift bar

--Clutch

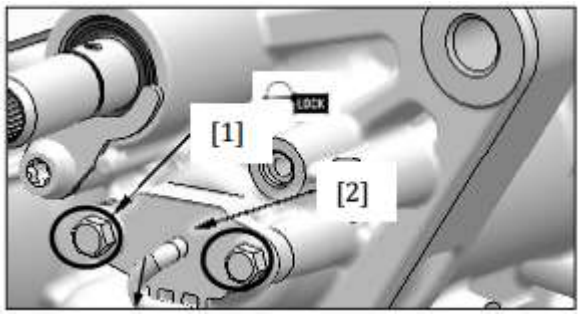
Assemble gear indicator kit [1] and its bolt [2].

Coat thread of indicator bolt with Loctite.

Torque: 6N·m,

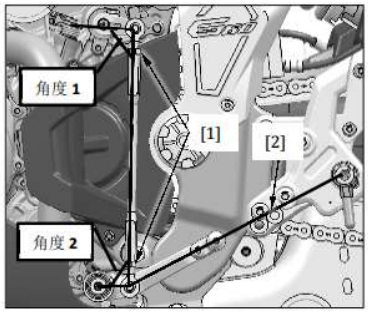
Caution:

Please assemble the indicator wiring as figure shows to prevent gear position information failed.



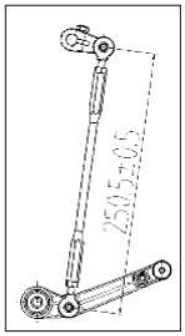
Gearshift pedal

When adjust the height of pedal, please operate through loosen nut [1], please pay attention to points below.



Caution:

●The lower end of locking nut of gearshift arm is left turning thread, while the upper end is positive turning.



●The length of adjustive bar, the distance to both ball joint are standard length as figure shows.

●When adjusted, fasten the locking nut for gearshift pedal.

Caution:

●Fasten the locking nut, and get the ball joint parallel to gearshift arm and gearshift pedal [2].

●Try everything possible to make sure angle 1 and 2 are mutually vertical.

7 Magneto and starting clutch

Summary

- The maintenance for stator and rotor of magneto needn't remove the engine from frame.
- Check about the charging coil of alternative power generator.
- Check about the trigger.

- Maintenance about starting motor.

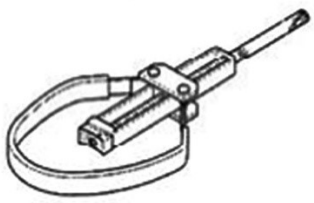
Specification for magneto and starting clutch

Unit: mm

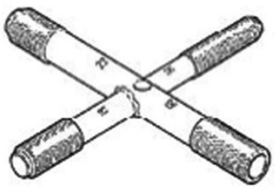
Items	Standard	Limit
External diameter for shaft jacket of starting plate shaped gear	51.705-51.718	51.685
Internal diameter for outer case of starting clutch	68.364-68.39	68.354

Tool(s):

Magneto fixer



Rotor remover



Troubleshooting

Starting motor is run, while engine failed starting

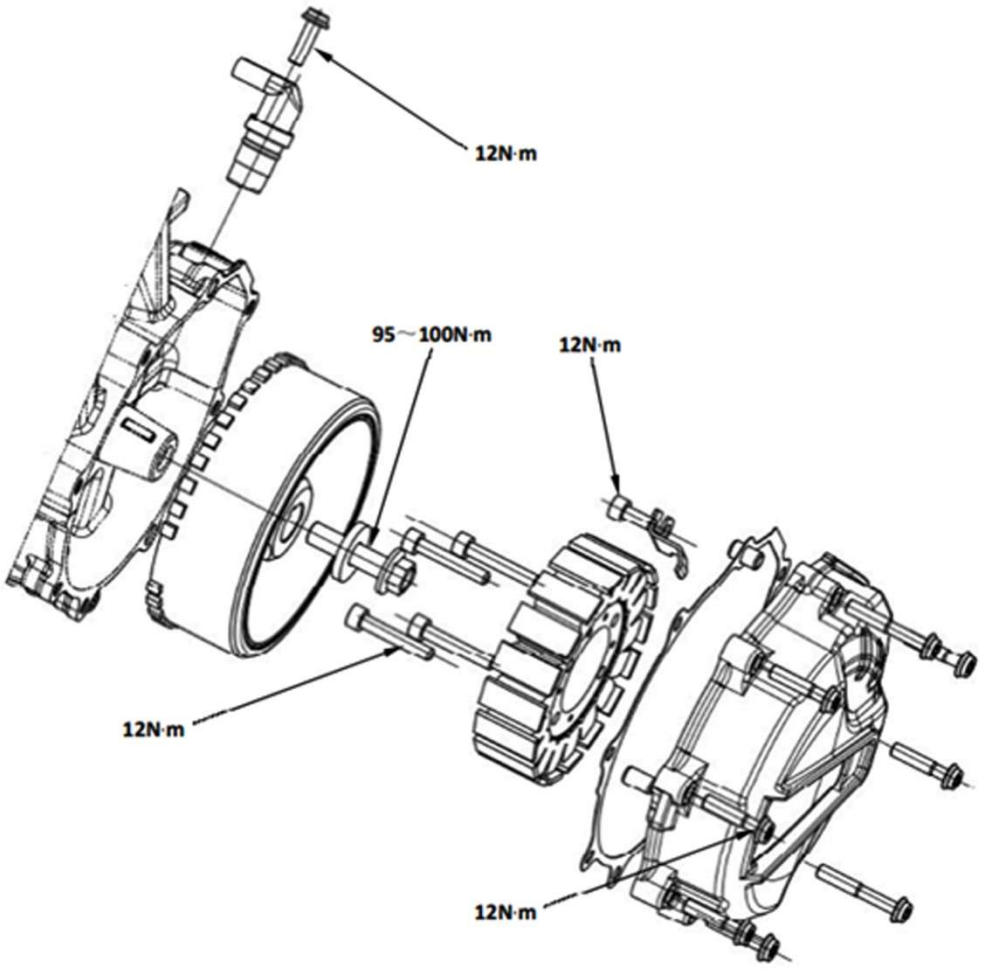
- Malfunction in starting clutch
- Malfunction in double gear or its shaft of starting motor
- Smaller gear of starting motor in malfunction or worn out
- Malfunction in driving gear of starter

Starting motor failed to run or in low rotation speed

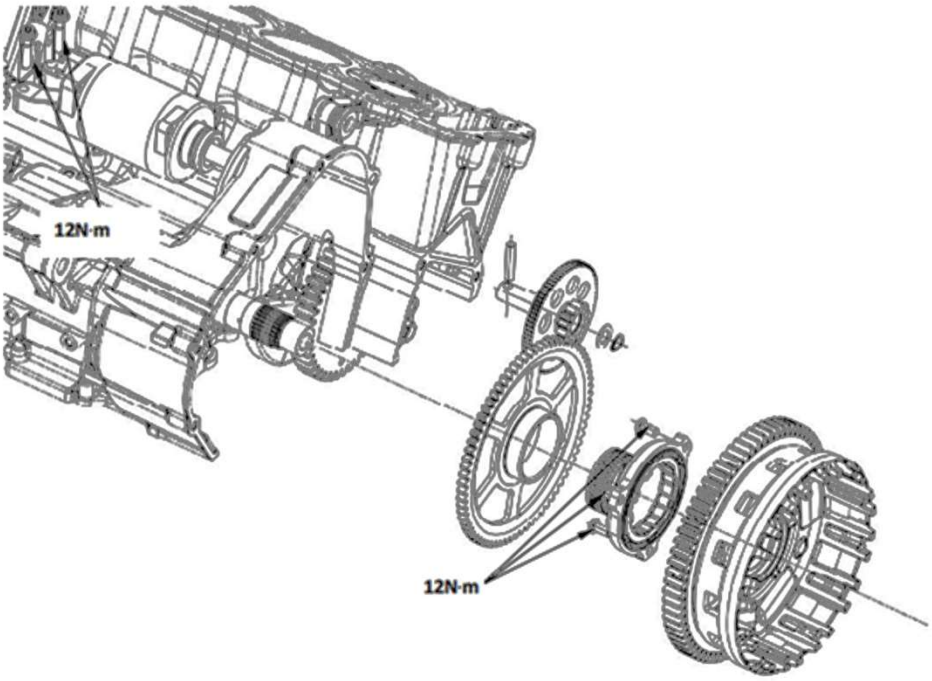
- Relay of starting motor or the motor damaged
- Low voltage of battery or wires with poor contact

Components layout

Magneto



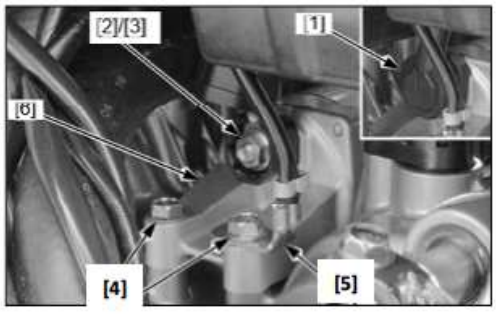
Electric starting



Starting motor

Disassembly/Re-assembly

Cut off negative terminal (-) and its wire of battery.



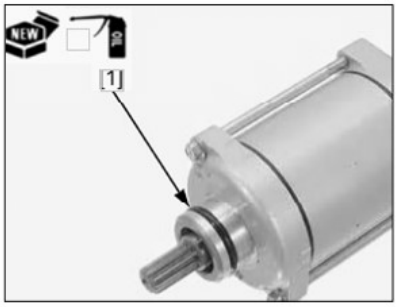
Loosen cover [1] for terminal.

Remove nut [2] for terminal, then cut off wire [3] of starting motor.

Remove 2 pieces of bolt [4] and wire [5] for negative (-) terminal.

Remove starting motor [6] from crankcase.

Remove o-ring [1].



Caution:

- Replace o-ring for a new one and coat it with oil.

  The re-assembly for starting motor is opposite to disassembly.

Left front cover

Disassembly/Re-assembly

Caution:

●When removing left front cover, please lay a clean oil tray under engine to prevent oil outflow. When assembled, please fill up with required oil to required level.

Put motorcycle on flat ground and keep it upright.

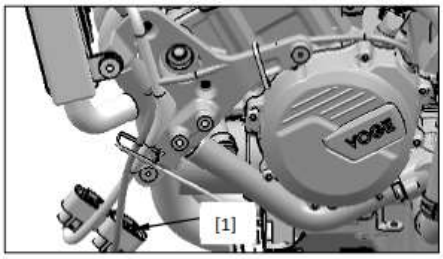
Remove the parts below:

--Protective shield for bottom

--Left rear cover.

--Rectifier regulator

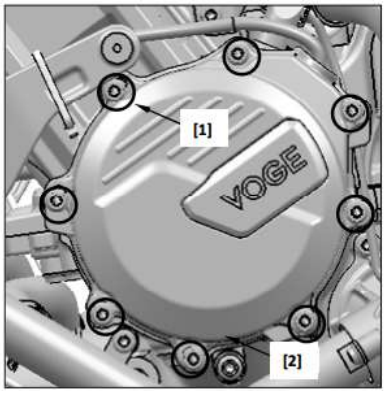




Cut off connector [1] of trigger.

Remove wires [1] of stator of magneto from frame.

Loosen bolt [1] for left crankcase cover in diagnosis sequence by several steps.



Remove the parts below:

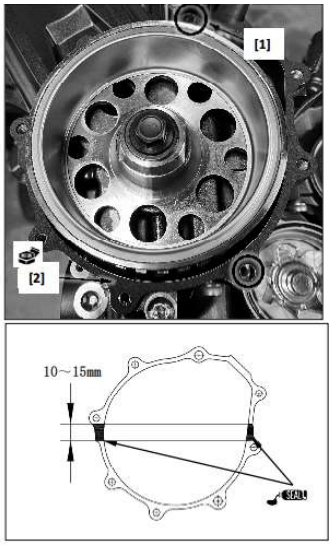
--Bolt

--Left front cover [2]

Caution:

●The left cover (Stator) is under magnetic stress of rotor, please be careful when disassembling or re-assembling to avoid pinching hand.

Remove positioning pin [1] and gasket [2].



Clean up all residual gasket on contact surface between case body and left front cover.

The re-assembly is opposite to disassembly.

Torque: 12N·m

Caution:

●Coat the contact surface of crankcase with sealant for end surface as picture shows.

●Replace gasket of left front cover for a new one.

Check oil level.

Make sure there is not any oil leakage.

Stator of magneto and trigger

Disassembly/Re-assembly

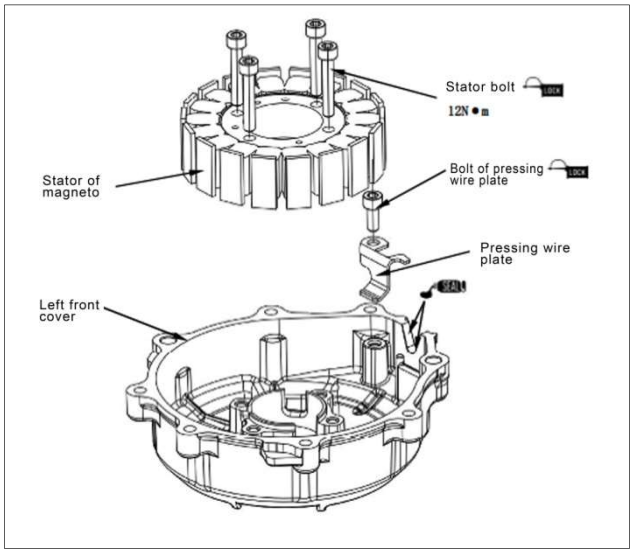
Remove left crankcase cover

The disassembly and re-assembly for stator is shown as figure below.

●Coat thread of pressing plate bolt and stator with Loctite.

●Coat sealing surface of magneto/jacket ring of trigger with sealant for end surface.

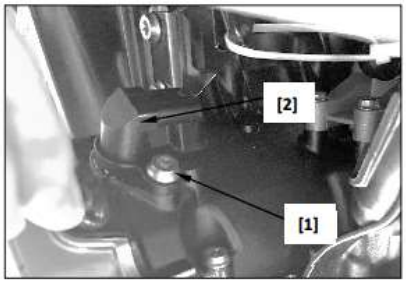
The re-assembly is opposite to disassembly.



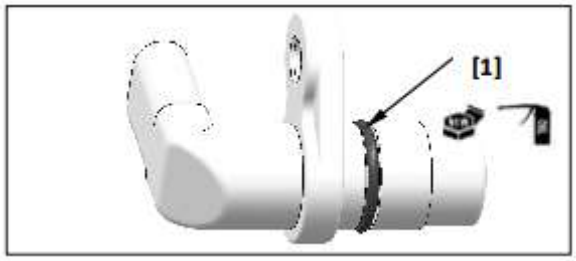
Caution:

●The trigger for this engine is outside trigging, the trigger is at upper side of upper crankcase body.

Remove fastening bolt [1] for trigger, then remove trigger [2].



Remove o-ring [1].



Caution:

●Replace o-ring for a new one and coat it with oil.

The re-assembly for trigger is opposite to disassembly.

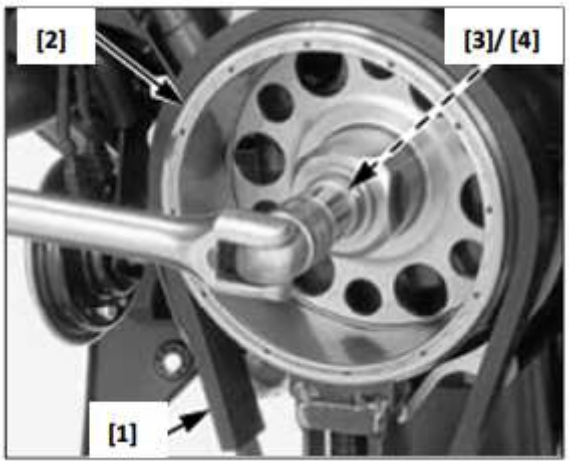
Torque: 12N·m

Rotor of magneto

Disassembly

Remove left crankcase cover.

Fix rotor [2] of magneto by its fixer [1], then loose bolt [3] of rotor.

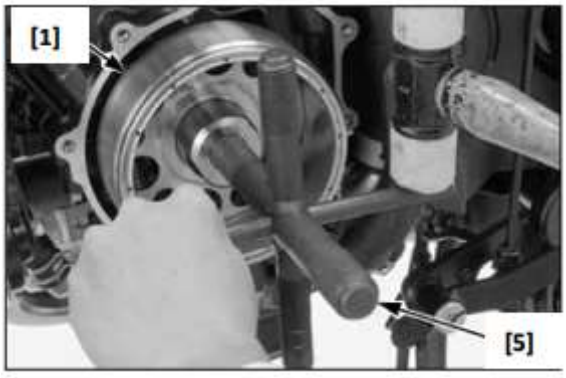


Caution:

●Assemble fixing piece of rotor fixer to prevent turning.

Remove rotor bolt [3] and washer [4].

Remove rotor [1] by rotor remover [5].



Tool(s):

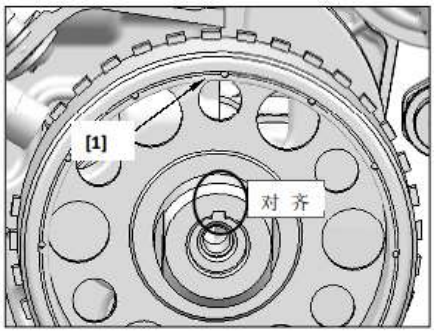
Rotor remover [5]

Magneto fixer [1].

Check

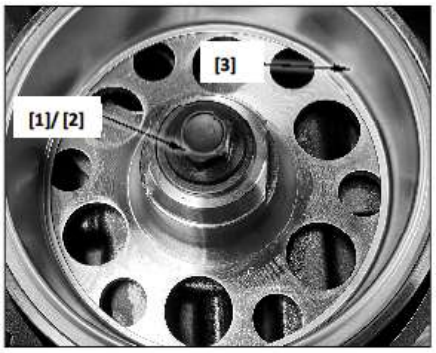
Check if there is scratch, damage, wear-out or distortion on semi-round key. Please replace if it is necessary.

Re-assembly



Totally clean up residual oil on internal hole of rotor and taper surface of crankshaft.

Assemble rotor [1], align semi-round key on crankshaft to its groove on rotor.



Coat thread of rotor bolt and mounting surface with oil.

Assemble washer [1] and rotor bolt [2].

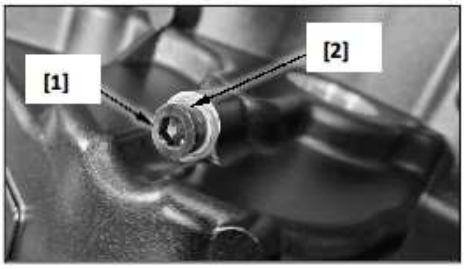
Fix rotor [3] by magneto fixer, then fasten the bolt to required torque by tool.

Caution:

●Assemble fixing piece of rotor fixer to prevent rotor turning.

Torque:

95~100N·m



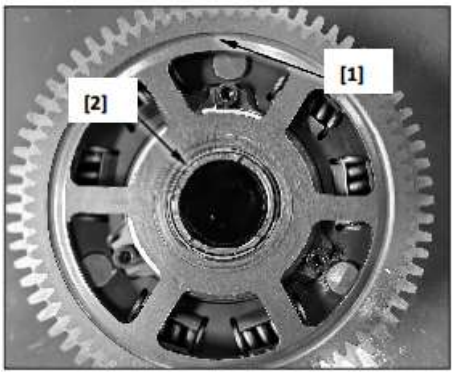
Tool:

Magneto fixer

Assemble left front cover (P91)

Starting clutch

Disassembly



Caution:

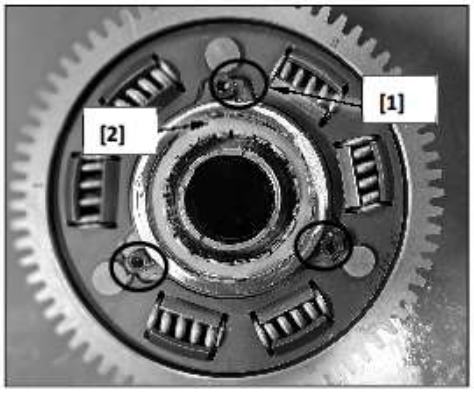
●The starting clutch for this engine is on clutch outer case kit.

Remove outer case of clutch kit (P74~P76)

Remove plate-shaped gear [1] anti-clockwise.

Remove needle bearing [2].

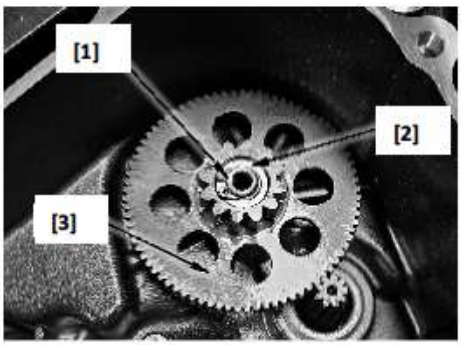
Remove fastening bolt [1] of starting clutch and remove it [2].



Remove circlip [1] of double gear.

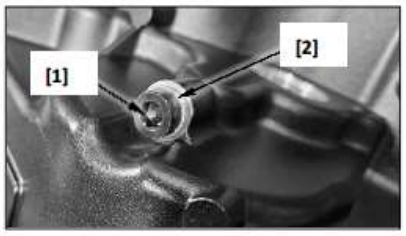
Remove flat washer [2] and circlip.

Remove double gear [3]

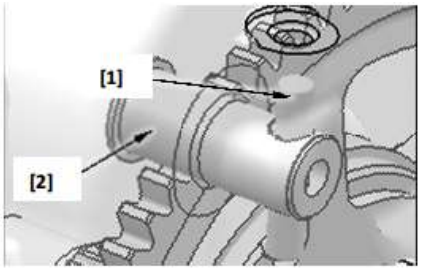


Remove limit bolt [1] of pin shaft.

Remove bolt and flat washer [2].



Remove limit shaft [1] for double gear shaft then pull out the shaft [2]



Check

Check operation of starting clutch: Face to plate-shaped gear, the gear could be turned anti-clockwise, but unable turn clockwise.

Check if there is scratch, damage, wear-out and distortion on parts below. Please replace if it is necessary.

--Plate shaped gear/Double gear

--Double gear shaft/Circlip

--Starting clutch

--Needle bearing

Make sure each part meets **specification of magneto and starting clutch.** Any parts passed limit, please replace the kit.

Assembly

Coat starting clutch with oil, then assemble it to outer case of clutch according to figure below.

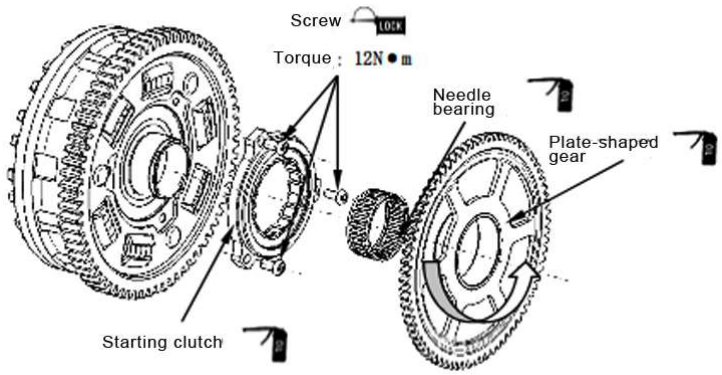
Assemble needle bearing in and the plate-shaped plate.

Caution:

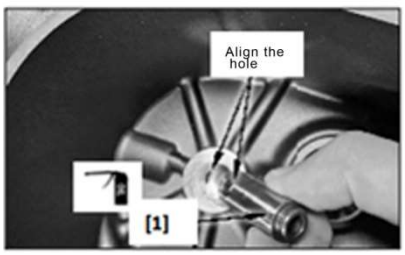
●Coat threaded part of bolt of starting clutch with Loctite.

●Get the stopping end of starting clutch facing to clutch outer case, then assemble it in place.

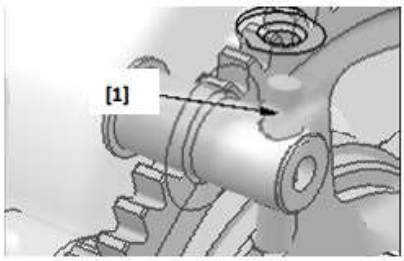
●Assemble plate-shaped gear anti-clockwise. When it assembled, the plate gear could be turn anti-clockwise, but unable to turn clockwise.



Coat the journal of double gear shaft [1] with oil, then insert into case body.



Assemble limit pin shaft [1] of double gear shaft.



Assemble bolt [1] and flat washer [2].

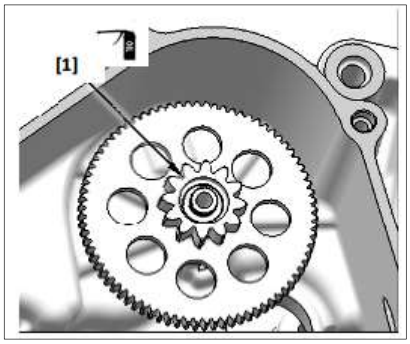
Torque: 12N·m

Assemble double gear [1].

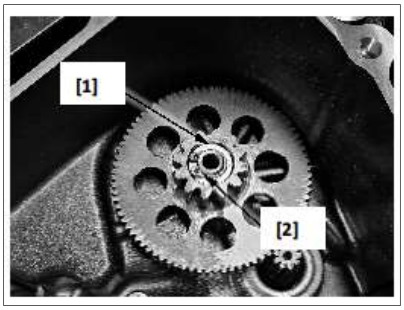
Caution:

●The bigger end of double gear faces downwards and assemble it in place.

●Coat the internal hole and gear surface of double gear with oil.



Assemble flat washer [1] and circlip [2].



8.Case body and transmission kit

Maintenance information

Summary

●The maintenance for crankcase must break up parts below for an easy maintenance:

--Transmission kit

--Crankshaft

--Piston, connective rod and cylinder

●Remove the parts below before breaking up crankcase:

--Engine

--Gearshift kit

--Magneto kit

--Cylinder head cover

--Cylinder head kit

--Tensioner

--Tensioning plate and guiding plate

--Primary oil filter kit

--Clutch

--Oil pump

--Pressure relief valve

--Secondary oil filter

--Oil bottom case

--Oil-water heat exchanger

--Water pump

--Water tube

--Oil pressure sensor

--Gear indicator switch kit

--Right crankcase cover

--Left front cover

--Right decorative cover

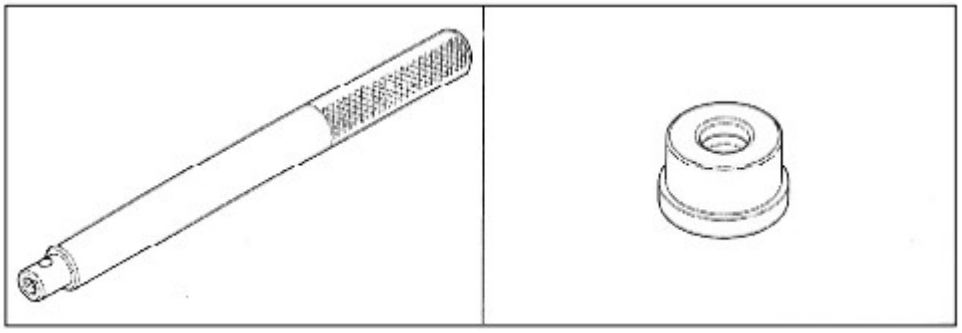
●Please don't damage contact surface of case body when maintaining.

●Wash oil passage before assembling crankcase.

●Before case combination, coat the contact surface with sealant evenly, the residual sealant needs be cleaned up.

●The selection for shaft pad on bigger end of shaft and main shaft pad shall be marked by correct color, the selection for shaft pad shall be done according to requirement from Pad Matching-up Form list, when the shaft pad assembled, check the free gap, the incorrect free gap may lead to heavy damage on engine.

Tool(s):



Specification for case body and transmission system

Unit: mm

Items			Standard	Maintenance limit
Transmission device	Internal hole diameter for gear	M5, C1	28.000-28.021	--
		M6	28.020-28.041	--
		C2, C3, C4	33.000-33.025	--
	External diameter for shaft sleeve	M5	27.959-27.980	--
		M6	27.979-28.000	--
		C2, C3, C4	32.950-32.975	--
	Gap between gear and shaft sleeve	M5, M6	0.020-0.062	--
		C2, C3, C4	0.025-0.075	--
	Internal diameter of shaft sleeve	M5	25.000-25.021	--
		C2	30.000-30.021	--
	Main shaft diameter	Match up with shaft jacket M5	24.967-24.980	--
		Match up with shaft jacket C2	29.959-29.980	--
	Gap between shaft and its sleeve	M5	0.020-0.054	--
		C2	0.020-0.062	--
Turning fork and its shaft	Diameter for turning fork shaft		11.957-11.968	
	Internal diameter for turning fork		12.000-12.018	
	Thickness for fork tip		5.93-6.00	

Troubleshooting

Difficult gearshift

- Wrong operation on clutch
- Wrong viscosity of oil
- Gearshift fork got distorted
- Gearshift's shaft got distorted
- Ratchet of gearshift's fork got distorted
- Guiding groove on gearshift drum got damaged
- Gearshift arm got distorted

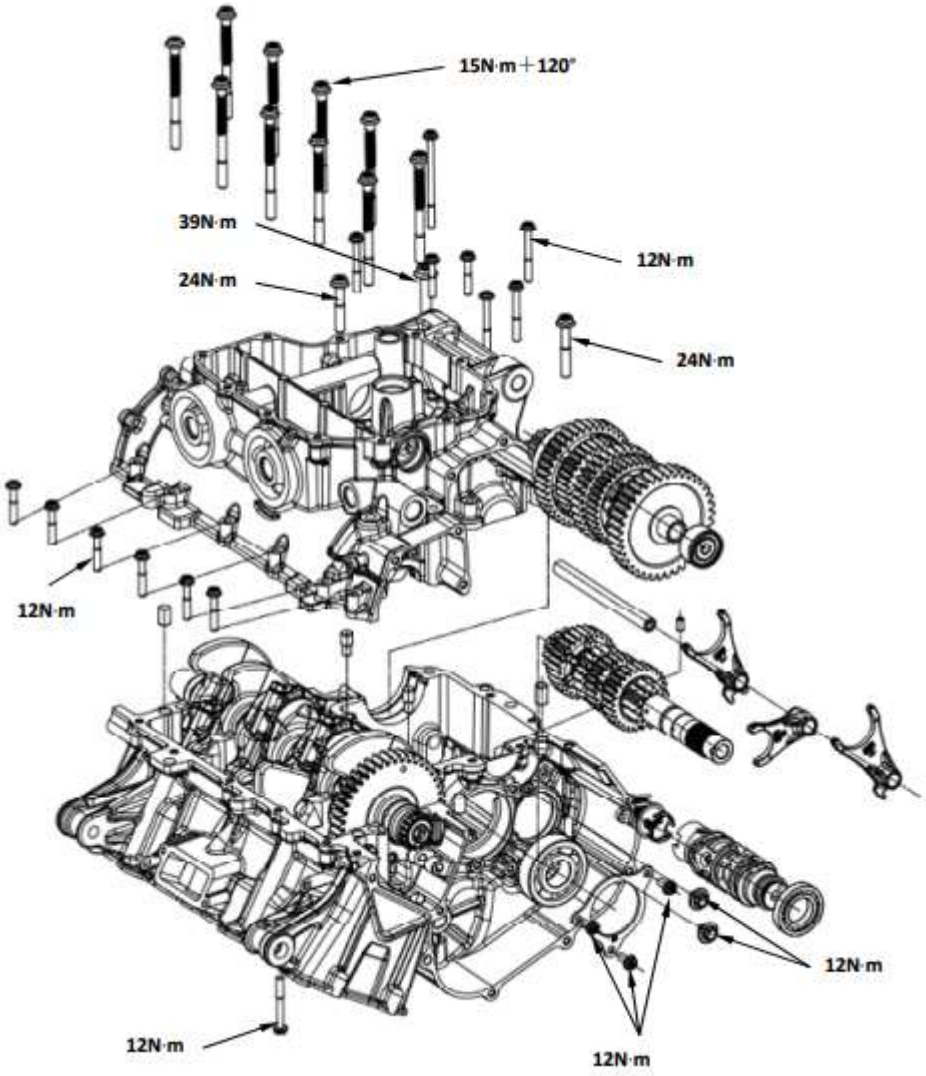
Gear jump in transmission system

- Gear got worn out
- Guiding groove of gearshift drum got worn out
- Gearshift fork's shaft got distorted
- Gearshift drum got damaged
- Twist spring of locating plate got damaged
- Gearshift fork got worn out or distorted
- Gearshift arm got damaged

Noisy engine

- Transmission gear got worn out or damaged
- Transmission bearing got worn out or damaged

Components layout



Case body

Disassembly

Before removing crankcase, please remove parts below.

--Cylinder head

--Oil bottom case

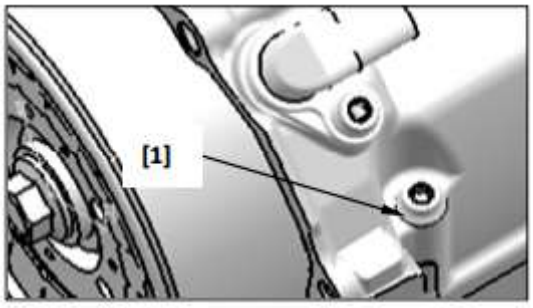
--Cooling system

--Secondary oil filter

--Left front cover

--Right crankcase cover

--Right decorative cover



Remove bolt M6X50 [1] on upper side of crankcase.

Put the engine upside down.

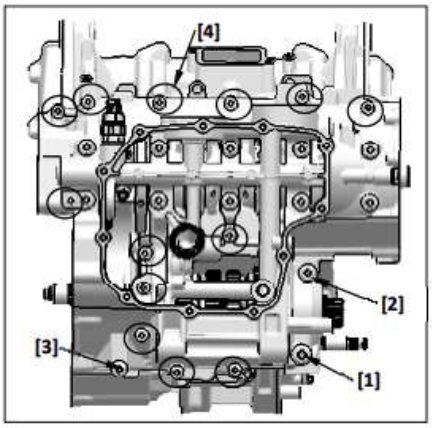
Loosen bolts on case body by 2-3 times;

Bolt [1] M10

Bolt [2] M8X45

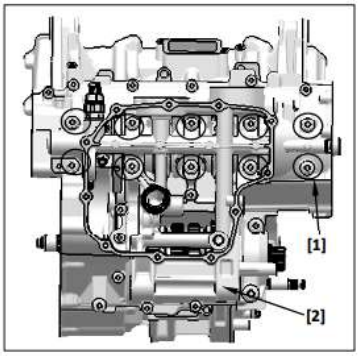
Bolt [3] M8X50

Bolt [4] M6



Loosen bolts [1] on main shaft of case body by 2 or 3 times, then remove bolt.

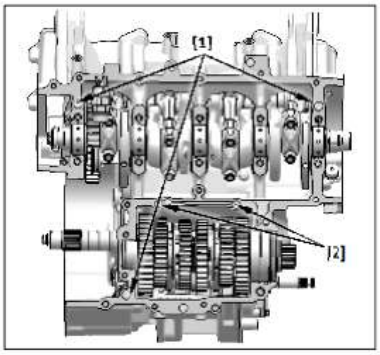
Remove the lower crankcase body [2] from the upper one.



Caution:

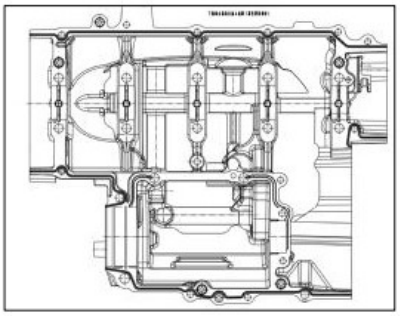
●Please don't pry up contact surface of crankcase by screwdriver.

Remove positioning pin [1] and plug [2] for oil passage.



Assembly

Wash contact surface between upper and lower crankcase body, please don't damage the contact surface.



Check if there is blocking-up in oil passage. Please wash and clean up oil passage when it is necessary.

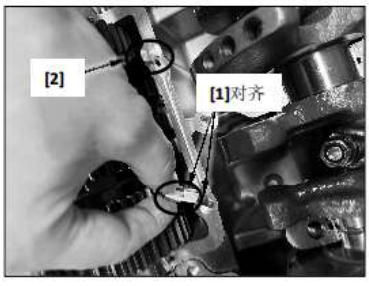
As picture on the right shows, evenly coat contact surface of lower case body with sealant for end surface.

Caution:

●Coat with too much sealant is not allowed.

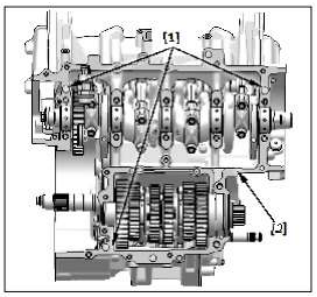
●Please don't coat bolt of main shaft journal and oil passage hole with sealant.

Totally clean up oil hole for plug. Check if there is blocking-up in oil hole. Please replace if it is necessary.

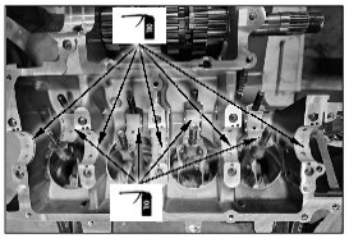


Align the cut opening of oil passage plug [1] to groove on upper crankcase to assemble the plug [2].

Assemble positioning pin [1] into upper crankcase body [2].



Coat the pad of main shaft journal and internal surface of pad for crankshaft pin with oil.



Assemble the lower crankcase body [1] to the upper one.

Assemble new bolt [2] for main shaft journal.

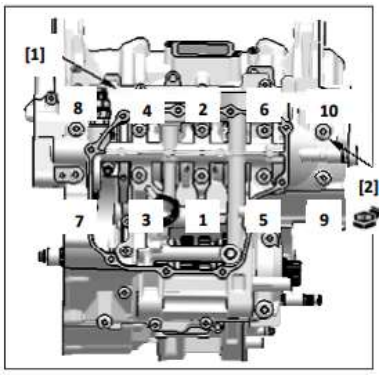
Caution:

- Fasten bolts of main shaft journal in crossing sequence.
- Please don't adopt the replaced bolt due to its wrong axial stress.
- Before assembling the bolt of main shaft journal, please coat it with oil to increase its axial stretching stability.
- When re-assembling, please don't wipe up oil on bolt surface.

Please confirm the firm assembly between upper and lower crankcase body.

As picture show, please fasten bolts for main shaft journal to required torque by 2~3 times.

Turn the bolt of main shaft journal by 120° for further fastening.



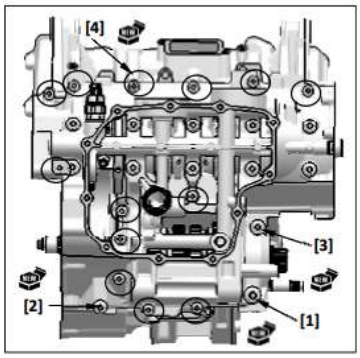
Torque: 15N·m+120°

Assemble all bolts for crankcase.

Replace case combination bolt for a new one.

Fasten case combination bolts to required torque in crossing way by 2~3 times.

T**orque:**



Bolt [1] M10: 39N·m

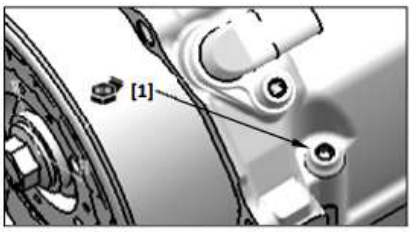
Bolt [2] M8X50: 24N·m

Bolt [3] M8X45: 24N·m

Bolt [4] M6: 12N·m

Turn the engine upside down to get its bottom facing downwards.

Assemble new case combination bolt [1] of M6X50.



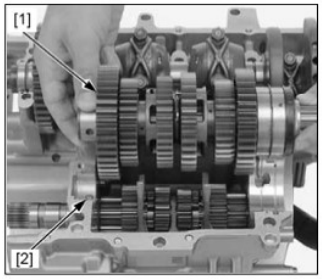
Torque: 12N·m

The re-assembly is opposite to disassembly.

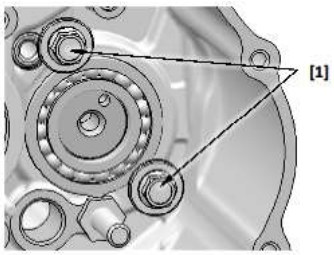
Transmission kit

Disassembly and re-assembly

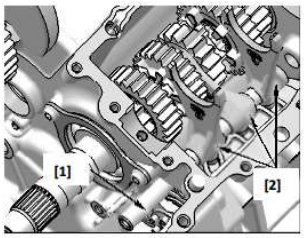
Remove counter shaft kit [1] and pin shaft [2].



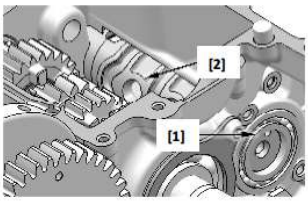
Remove limit bolt [1] of bearing for gearshift drum.



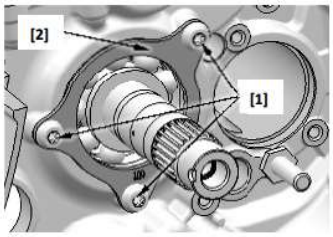
Remove turning fork shaft [1] and the fork [2].



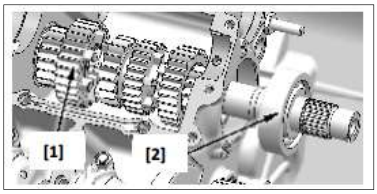
Remove gearshift drum [1] and its bearing [2].



Remove bolt [1] and pressing plate [2] of main shaft bearing.



Slide main shaft kit [1] out of upper crankcase, then



remove its bearing [2] on the right.

Remove main shaft kit.

Check

Check and confirm if there is scratch, damage, wear-out or distortion on parts below. Please replace parts when it is necessary.

--Transmission gear

--Transmission shaft sleeve

--Transmission bearing

--Gearshift drum/Gearshift drum bearing.

--Gearshift turning fork

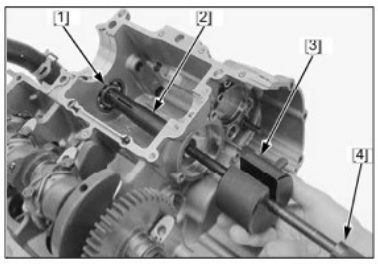
--Turning fork shaft

Measure size for each part, calculate matching gap according to standard.

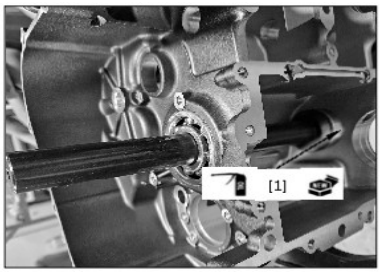
If matching gap passed standard limit, please replace the part.

Replace left bearing of main shaft

As figure shows, please remove bearing [1] of main shaft by the tools for this work only.



Knock the new left bearing [1] into lower crankcase completely in place front its upper side by tools for this work only.

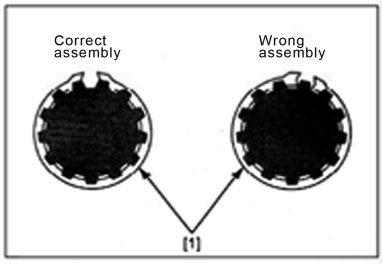


Tool(s):

Extension bar

Caution:

●Assemble dust proof cover of left bearing by facing to case body.



Disassembly/Re-assembly

Break down main and counter shaft kit.

Caution:

●Put the removed gear, collar, washer and circlip in a line and in a container for them only.

●Please don't excessively extend the circlip, when removing it, extend it first, then push it out by gear behind it.

Wash all parts by solvent and totally dry them up.

Coat the gear surface, turning surface and bearing place with oil.

Coat all surface of spline jacket of gear, gear collar, turning area of needle bearing and groove of gearshift kit with oil.

Assemble main and counter shaft kit.

Caution:

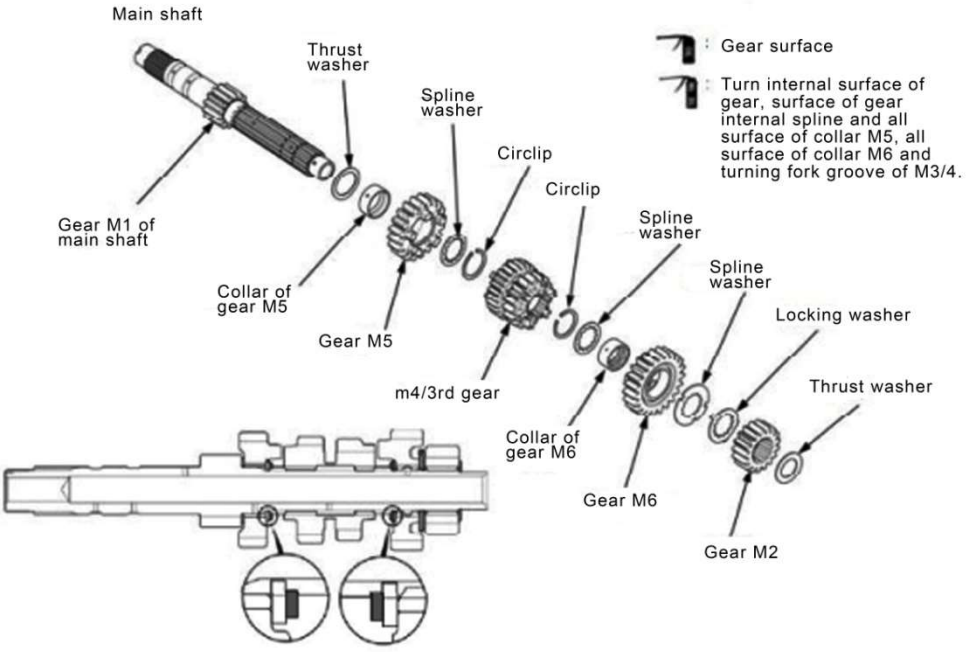
●Coat every gear with oil and check its stable turning.

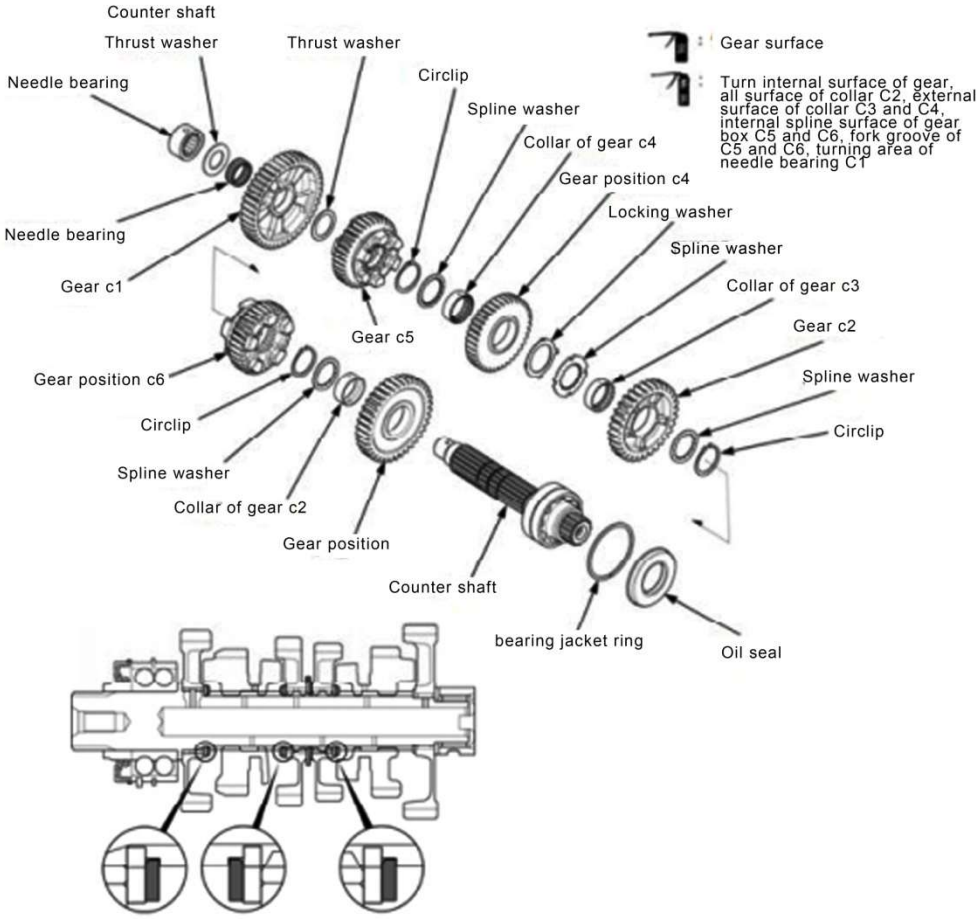
●Align spline of washer to its groove.

●When assembling thrust washer, please always along the thrust surface of gear shaft.

●When assembling circlip, please align its opening to groove [1] of spline.

●Make sure the circlip is completely in the shaft groove when it was assembled.





Re-assembly

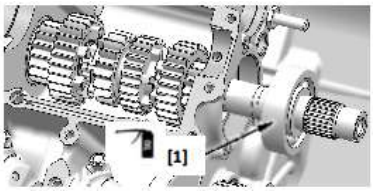
Assemble main shaft kit [1] into upper crankcase body.



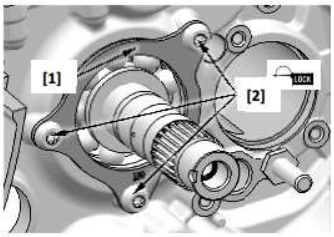
Caution:

●Please avoid collision on longer journal of main shaft. When re-assembling, insert the longer journal end through bearing hole of main shaft on case body first, then insert the left journal into bearing hole.

Coat inner hole of main shaft right side bearing and outer surface with oil, then assemble right side bearing [2] into upper crankcase body. When assembling right bearing of main shaft, its side with mark face outwards.



Assemble pressing plate [1] of main shaft bearing and bolt [2], before assembling, please coat the threaded part with Loctite.

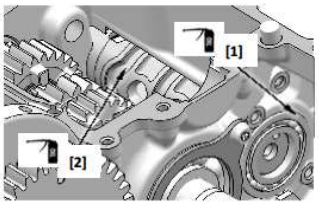


Fasten the bolt to required torque.

Torque: 12N.m

Caution:

●The side of pressing plate with letter faces upwards.



Coat bearing [1] of gearshift drum and outer surface of journal [2] of the drum with oil.

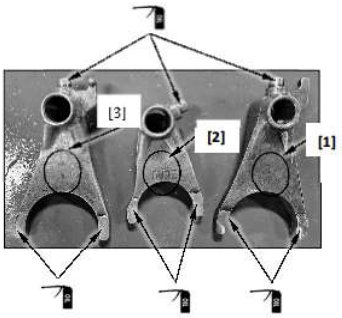
Assemble gearshift drum bearing onto the drum.

Assemble gearshift drum/bearing kit into upper crankcase body.

The turning forks are with marks below:

--“L”[1]: Left fork

--“C”[2]: Central fork

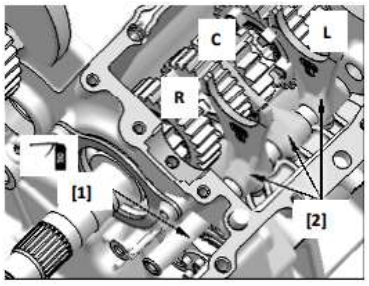


--“R”[3]: Right fork

Coat the guiding area of turning fork and guiding pin’s place with oil.

Coat surface of fork shaft [1] with oil.

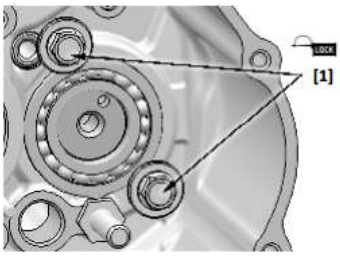
Assemble fork [2] to guiding groove and shift groove (Central fork), then get the identification mark facing right side of engine, then insert the fork shaft.



Coat the threaded part of bolt for washer of gearshift drum bearing with Loctite.

Assemble the washer of gearshift drum bearing and bolt [1] in place, then fasten the bolt to required torque.

Torque: 12N·m



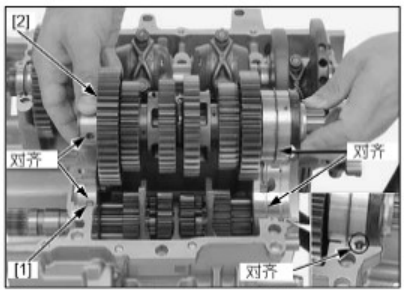
Assemble the pillar pin [1] into upper crankcase body.

Assemble counter shaft kit [2] into upper crankcase body, assemble oil seal and stopping ring into groove on case body, align the hole on outer ring of needle bearing to pillar pin.

Caution:

●Make sure the groove for outer ring of right needle bearing of counter shaft fall into pillar pin.

●Assemble crankcase body.



9 Crankshaft, piston, and cylinder body

Maintenance information

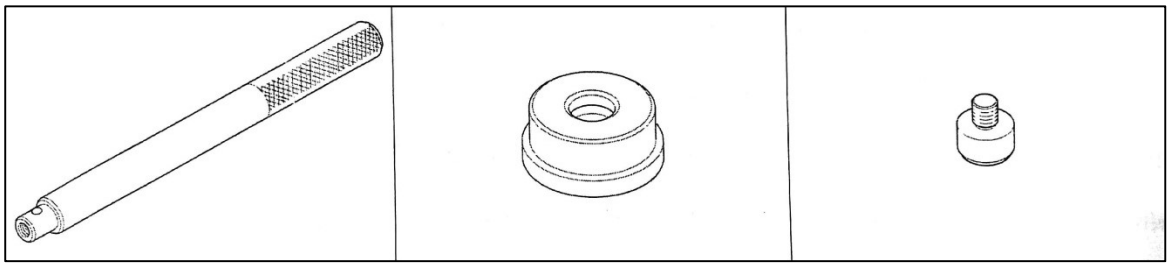
Summary

When maintaining the crankshaft, cylinder body, piston and connecting rod, the crankcase must break up. How to break up the crankcase refers to its corresponding chapter.

Mark up the bigger end of connecting rod, cover of rod and crankshaft pads to make sure correct re-assembly.

The crankshaft's pin and pad of main shaft's journal gets matched according to their color, select the crankshaft's pad according to its color. When the new pad selected, confirm the gap of oil film by plastic feeler gauge, the wrong gap of oil film may heavily damage the engine.

Tool(s):



Specification for crankshaft, piston and cylinder body

Unit: mm

Items			Standard	Limit
Crankshaft	Gap in bigger end of connecting rod		0.10-0.25	0.30
	Gap between pad on bigger end of connective rod and crankshaft pin		0.030-0.048	0.06
	Gap between journal of crankshaft and pad		0.018-0.036	0.05
	Runout		—	0.05
Cylinder	Cylinder bore		67.000-67.015	67.10
	Roundness loss		—	0.10
	Taper		—	0.10
	Flatness		—	0.10
Piston, piston pin and piston ring	Diameter for piston skirt (H=7)		66.965-66.985	66.89
	Diameter of pin's hole		16.002-16.008	16.02
	Diameter for piston pin		15.994-16.000	15.98
	Gap between piston and piston pin		0.002-0.014	0.04
	Closing gap for piston ring	1st ring	0.10-0.20	0.4
		2nd ring	0.21-0.36	0.5
		Scratching ring	0.20-0.70	1.0
	Gap between piston ring and ring groove	Gap between 1st ring and groove	0.030-0.060	0.10
		Gap between 2nd ring and groove	0.015-0.050	0.08
Cylinder matching gap			0.015-0.050	0.10
Internal diameter of smaller end of connecting rod			16.030-16.044	16.05
Matching gap between connecting rod and crankshaft pin			0.03-0.05	0.07

Troubleshooting

Too low the cylinder pressure, difficult starting or poor performance under low speed

- Air leakage of cylinder head's gasket
- Wear-out, jamming or damage on piston ring
- Cylinder head/Piston worn out or damaged

Too high the pressure in cylinder, cylinder body overheat or cylinder knocking

- Too much the carbon buildup on the top of piston

Too much waste gas

- Cylinder body, piston or its ring got worn out
- Wrong assembly for piston ring
- Scratch on piston or cylinder wall

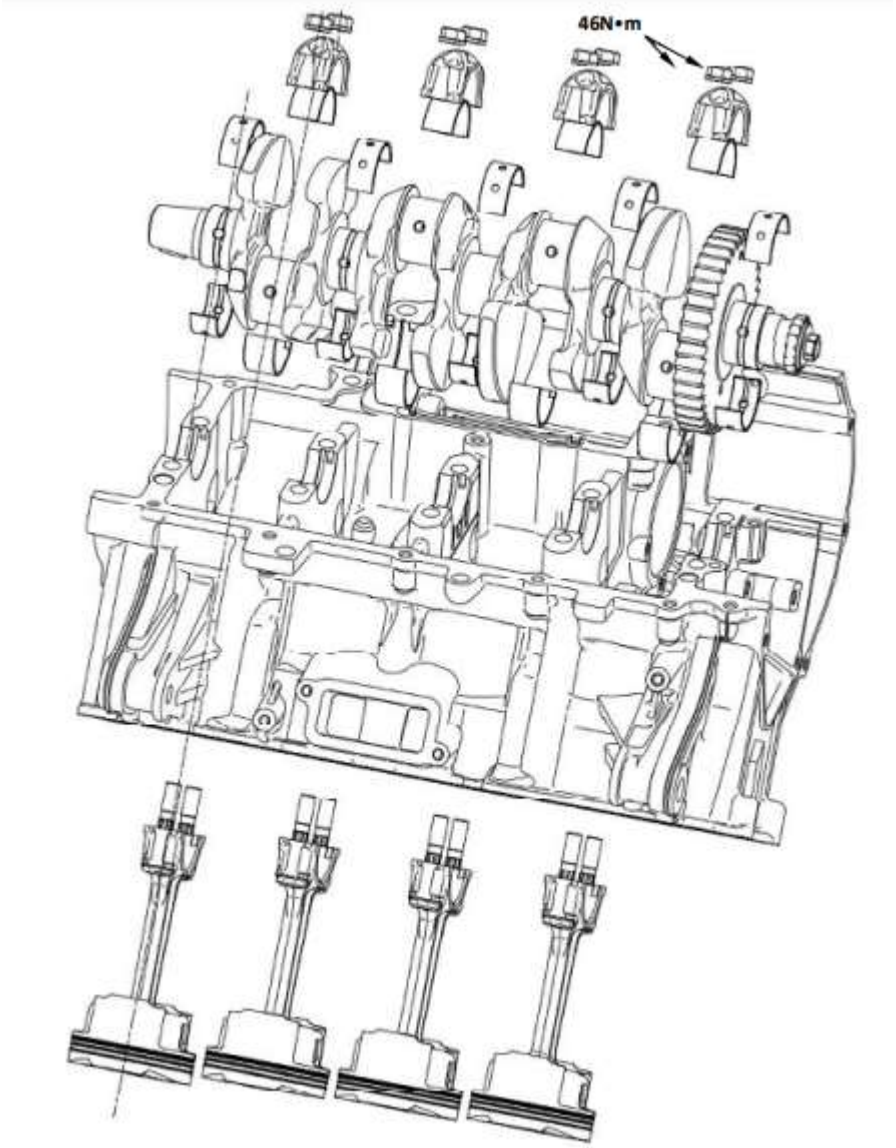
Engine noisy

- Piston pin or the hole for pin got worn out
- Smaller end of connecting rod got worn out
- Cylinder body, piston or its ring got worn out
- Crankshaft pin's pad got worn out

Engine vibration

- Too strong the runout of crankshaft

Components layout

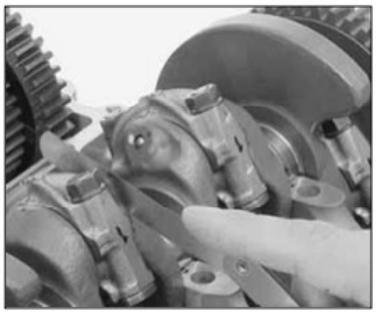


Crankshaft

Check side gap

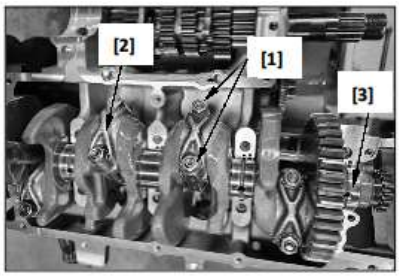
Break up upper and lower case body.

Measure side gap of connective rod.

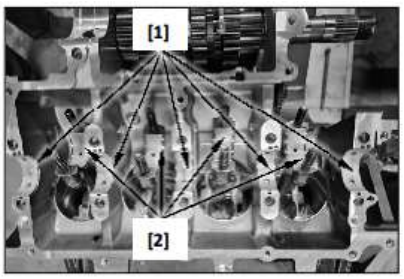


Maintenance limit: 0.30mm.
If the gap passed maintenance limit, please replace the connective rod.
Confirm side gap once again, if it still passed limit, please replace crankshaft.

Disassembly
Break up upper and lower case body.
Mark up cover of connective rod and shaft pad before removing for a correct re-assembly.
Remove nut [1] of connective rod cover and the cover [2].
Please don't damage crankshaft pin, main shaft journal and shaft pad.
If the connective rod cover is difficult to be removed, slightly knock side of the cover, then remove crankshaft [3].



Caution:
● *Please don't change position of shaft pad, the shaft pad must be assembled in its initial position, otherwise it may break correct gap for oil film and get engine damaged.*



Remove shaft pad [1] of main shaft journal from upper and lower crankcase body.
Remove crankshaft pad [2] from bigger end of connective rod and its cover.
Caution:
● *Before removing crankshaft, push piston to upper stopping point to avoid damaging crankshaft pin.*
● *Please don't change position of shaft pad, the shaft pad must be assembled in its initial position, otherwise it may break correct gap for oil film and get engine damaged.*

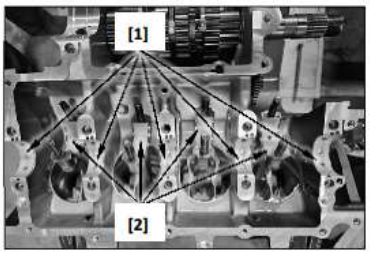
Check
Hold up crankshaft journal both sides.
Put a micrometer right above middle of main shaft journal, get it bypassing of oil groove and oil hole.
Turn crankshaft by 2 rounds（720°）, read its runout.
Maintenance limit: 0.05 mm



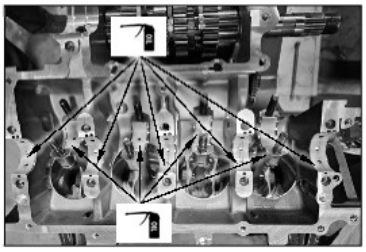
Re-assembly
Clean up residual oil on mounting surface of shaft pad, then assemble pad [1] of main shaft journal and shaft [2] of crankshaft pin back to their initial place.

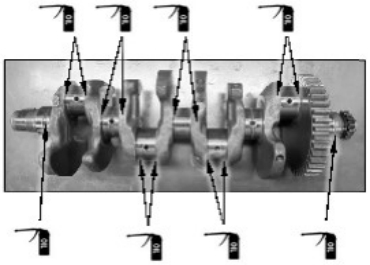
1. Pad of main shaft journal
2. Pad of crankshaft pin.

● *Please don't change position of shaft pad, the shaft pad must be assembled in its initial position, otherwise it may break correct gap for oil film and get engine damaged.*



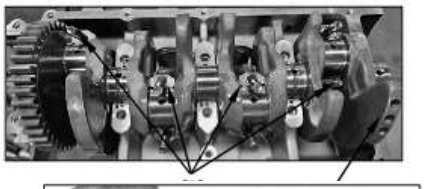
Coat internal surface of pads of main shaft journal and crankshaft pin with oil.
As figure shows, coat thrust surface of crankshaft with oil.





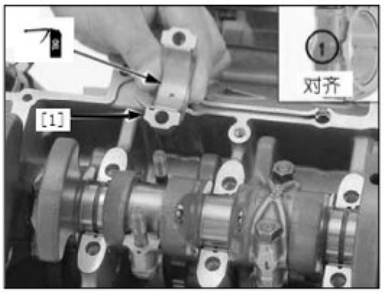
Push all pistons to upper stopping point to avoid connective rod damaging crankshaft pin.
Assemble crankshaft [1] into upper crankcase body.
Put bigger end [2] of connective rod into crankshaft pin.

Clean up contact surface between bigger end of connective rod and rod cover, then dry it up by compressed air.

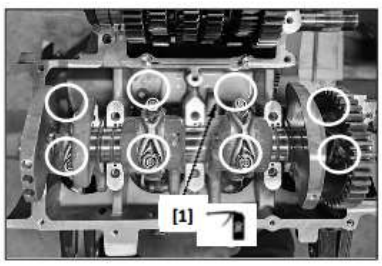




Coat internal surface of crankshaft pad on cover of connective rod with oil.
Assemble cover [1] of connective rod by matching up code number for inner diameter on bigger end of rod and cover.
Caution:
● *Make sure each parts are re-assembled to their original place as sign when they were removing.*



Coat threaded part of nut for connective rod cover and its base with oil.
Assemble connective bolt [1] of connective rod and fasten to given torque by 2-3 times.
Torque: 46N·m
Assemble lower crankcase (P102~P103)



Shaft pad of journal for main shaft

Caution:

- *Please don't change the position of shaft pad. The shaft pad must be assembled*

in its initial position, otherwise the oil film gap will be wrong, which lead to engine

damage.



Check shaft pad

Remove crankshaft.

Check if there is wear-out or spalling of shaft pad [1] for journal of main shaft.

Check if there is damage on protrusion [2] of shaft pad.

In case there is damage on shaft pad for journal of main shaft, please choose the correct one for replacement.



Check oil gap

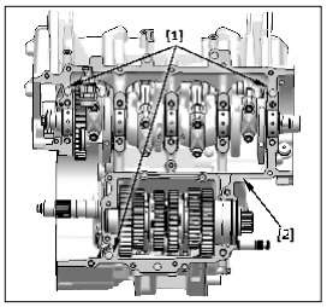
Remove crankshaft.

Wipe up all the oil on shaft pad and journal of main shaft.

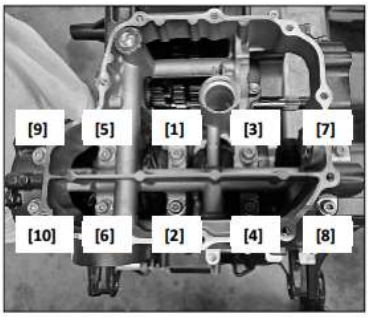
Re-assemble main shaft into upper crankcase.

Put a plastic gap gauge [1] on each journal of main shaft bypassing oil hole.

(During the inspection of oil gap, please don't turn the crankshaft).



Assemble positioning pin [1] into upper crankcase [2].



Re-assemble lower crankcase [1] onto upper crankcase.

Wash case combination bolt by cleanser (Repeatedly use for 10 pieces of M8X98), then totally dry it up by blowing.

Coat threaded part and base surface of case combination bolt for main shaft journal with oil.

Assemble case combination bolt [2] of main shaft journal.

Make sure upper and lower crankcase are firmly assembled.



Fasten case combination bolt main shaft journal by 2-3 times according to code number in showing figure to required torque.

Turn further by 120° to fasten combination bolt of main shaft journal.

Torque: 15N·m+120°



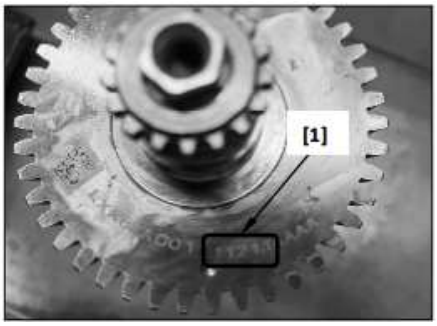
Remove case combination bolt of main shaft journal and lower crankcase.
Measure each widest width for plastic gap gauge on main shaft journal when it was squeezed to confirm oil gap.

Maintenance limit: 0.05 mm

In case oil clearance passed maintenance limit, select correct shaft pad for replacement.

Shaft pad selection

Take the number [1] for inner diameter for installation hole of shaft pad on left side of upper crankcase into record.
As picture shows (Number on left side of upper crankcase (A, B or C). Which means the number for inner diameter of installation hole for shaft pad from left to right).



If crankshaft needs be replaced, please take its corresponding code [1] of weight into record.
As figure shows:
The number on crankshaft weight (1, 2 or 3) means code for outer diameter of main shaft journal from left to right.
Choose shaft pad color [1] by mutual reference for code number between main shaft journal and shaft pad.

Thickness for shaft pad of main shaft journal:

A: Black: Thick
B: Brown:
C: Green:
D: Yellow:
E: Pink: Thin



Form list for matching-up of journal for main shaft:

			Code number for inner installation hole of shaft pad		
			A	B	C
			37.000-37.006mm	37.006-37.012mm	37.012-37.018mm
Code number for outer diameter of main shaft journal	1	34.000-34.006mm	Pink 1.5(-0.012, -0.015)	Yellow	Green
	2	33.994-34.000mm	Yellow 1.5(-0.009,-0.012)	Green	Brown
	3	33.988-33.994mm	Green 1.5(-0.006, -0.009)	Brown 1.5(-0.003, -0.006)	Black 1.5(0, -0.003)

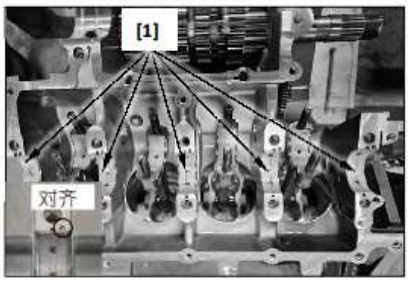
Caution:

When new shaft pad was chosen, please check gap once again by plastic gap gauge.

Re-assemble shaft pad

Clean up outer surface of shaft pad and installation hole for shaft pad on crankcase.
Re-assemble shaft pad [1] for journal of main shaft into its installation hole on crankcase, align

each protrusion to groove.



Shaft pad for crankshaft pin

Caution:

Please don't change the position of shaft pad. The shaft pad must be assembled in its initial position, otherwise the oil film clearance will be wrong, which lead to engine damage.



Remove crankshaft

Check if there is wear-out or spalling for shaft pad [1] of crankshaft pin.

Check if there is damage on protrusion [2] of shaft pad.

In case the shaft pad for crankshaft pin gets damaged, select shaft pad for replacement.

Check oil gap

Remove crankshaft.

Wash contact surface between bigger end of connective rod and rod cover by cleanser,

then dry it up by compressed air.

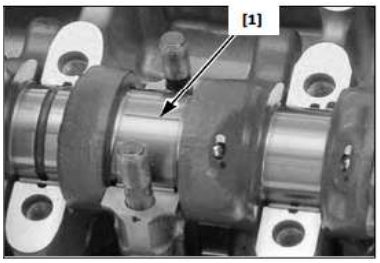


Wipe up all the oil on shaft pad and crank shaft pin.

Re-assemble crankshaft into upper crankcase.

Assemble bigger end of connective rod into crankshaft pin.

Vertically lay a plastic gap gauge [1] on each journal of main shaft bypassing oil hole (Please don't turn crankshaft during inspection for oil gap).



Assemble connective rod cover [1] by mutual reference for code number between the cover and bigger end of rod.

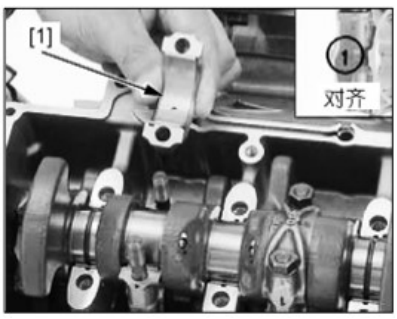
Caution:

Make sure each part is re-assembled back to initial position as the same to marking-up when removing.

Coat threaded part of connective rod's nut and its base surface with oil. Assemble connective rod's bolt [1] and fasten by 2-3 times.

Torque: 46N·m

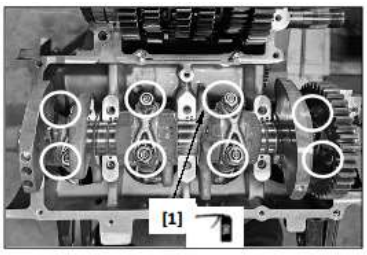
Remove cover of connective rod.

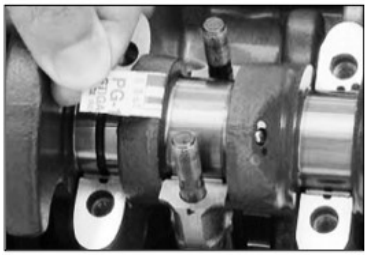


Measure each squeezed widest width of plastic gap gauge on crankshaft pin to confirm the oil clearance.

Maintenance limit: 0.06mm

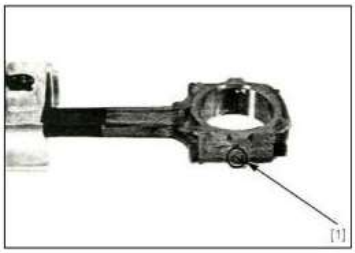
In case the oil clearance passed maintenance limit, please choose the correct shaft pad for replacement.





Selection for shaft pad

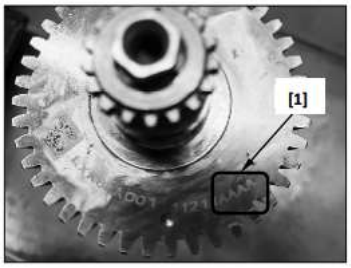
Take number [1] at inner diameter for bigger end of connective rod into record (The number on bigger end of connective rod (1, 2 or 3) means the number for inner diameter for bigger end of connective rod), or assemble the cover onto connective rod, measure inner diameter without shaft pad.



If crankshaft needs be replaced, take its corresponding number [1] on weight into record.

The letter on weight piece (A, B, or C) means number for outer diameter of crankshaft pin from left to right side.

If the crankshaft needs be repeatedly used, please measure its outer diameter by micrometer.



Choose color [1] for replaceable shaft pad by mutual reference for code number between bigger connective rod and crankshaft pin.

Thickness for shaft pad of crankshaft pin:

A: Blue: Thick

B: Black:

C: Brown:

D: Green:

E: Yellow: Thin



Matching-up form list for shaft pad of crankshaft pin:

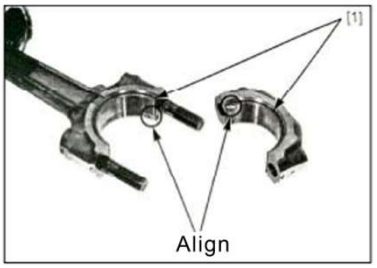
			Code number for inner diameter for bigger end of connective rod		
			1	2	3
			39.000-39.006mm	39.006-39.012mm	39.012-39.018mm
Code number for outer	A	35.994-36.000mm	Yellow 1.5(-0.015, -0.018)	Green	Brown

diameter for crankshaft pin	B	35.998-35.994mm	Green 1.5(-0.012, -0.015)	Brown	Black
	C	35.982-35.998mm	Brown 1.5(-0.015, -0.018)	Black 1.5(-0.006, -0.009)	Blue 1.5(-0.003, -0.006)

Caution:

When new shaft pad was chosen, please check clearance once again by plastic gap gauge.

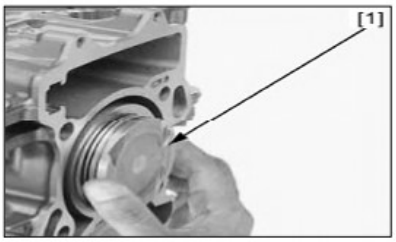
Re-assemble shaft pad



Clean up outer surface of shaft pad, connective rod cover and bigger end of rod.

Re-assemble shaft pad [1] for crankshaft pin into bigger end of connective rod and cover, align each protrusion to groove.

Piston/Cylinder body



Removal for piston/Connective rod kit

Caution:

●*Before removing piston, wrap bigger end of connective rod by a clean fibreless fabric to prevent damaging cylinder hole.*

●*Please don't try to remove piston/connective rod kit from bottom of cylinder hole, which will be seized up at joint between cylinder sleeve and upper crankcase body.*

●*Please don't change the position for shaft pad, the pad must be re-assembled back to initial position, otherwise the oil film clearance will be wrong, which lead*

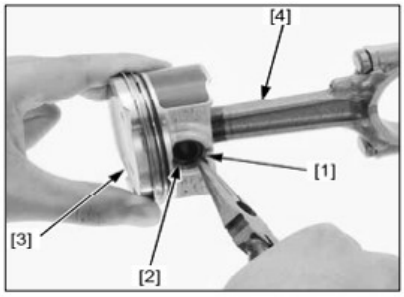
to engine damage.

Remove the parts below:

- Transmission kit
- Crankshaft

Remove piston/connective rod kit [1] from top of cylinder body.

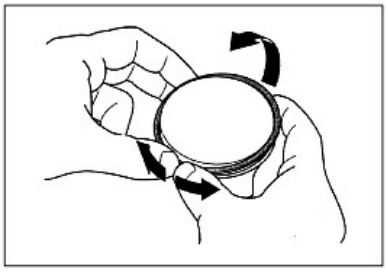
Removal for piston



Remove circlip [1] of steel wire by tweezers.

Push out piston pin [2] from piston [3] and smaller end [4] of connective rod, then remove the piston.

Removal for piston ring



Get opening for each piston ring apart, then remove the ring upwards along the opposite position to opening of piston ring。

Caution:

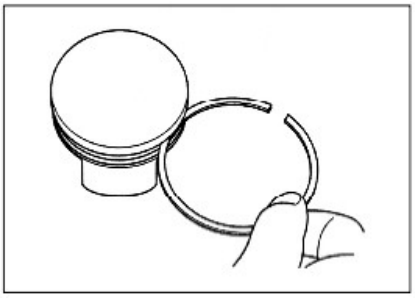
●*Please don't separate the opening apart too far to prevent damaging the piston ring.*

●*Please avoid scratch on piston when removing its rings.*

Clean up carbon buildup in groove of piston ring by piston ring which is about throwing away.。

Caution:

Please don't use steel brush to avoid scratching groove of piston ring.



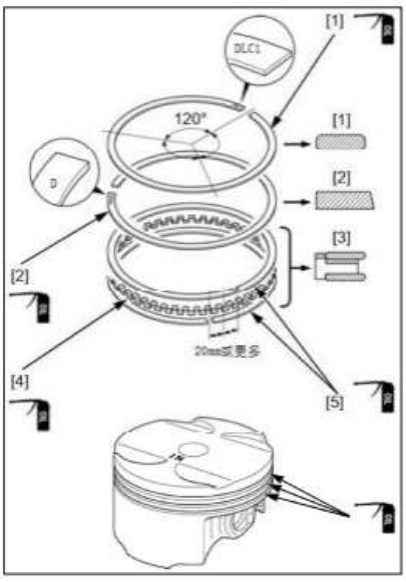
Check

Check if there is scratch, damage, wear-out, distortion, burn-out or oil passage blocking-up on parts below.

- Cylinder body
- Piston
- Piston ring
- Piston pin
- Smaller end of connective rod

Measure each parts according to technical **specification for crankshaft/piston/cylinder body** and calculate their clearance.

Any parts passed maintenance limit must be replaced



Re-assemble piston ring

Totally clean up groove of piston ring then re-assemble piston ring.

Coat the complete surface of piston rings and

their grooves with engine oil.

Please don't damage piston and its rings during re-assembling.

When re-assembling, get the side of piston ring with mark facing upwards。

- Mark "DLC1": Ring 1st [1].
- Mark "D": Ring 2nd [2].

– When re-assembling oil ring [3], assemble liner ring [4] first, then the scratching ring [5].

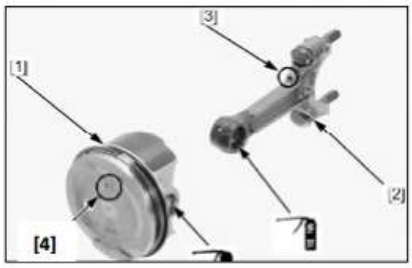
Get mutual crossing angle for piston ring opening by 120°.

The dislocation for position of opening for scratching ring is shown as picture.

When re-assembled, the piston ring shall be freely turned in its groove.

Re-assemble piston

Re-assemble shaft pad of crankshaft pin back to its initial position.



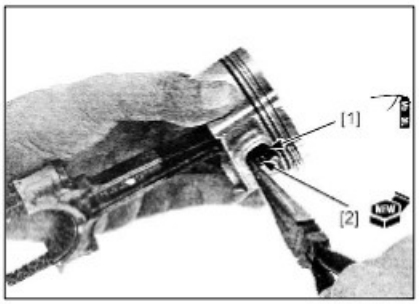
Coat internal surface of hole for piston pin with oil.

Coat internal surface of smaller end of connective rod with oil.

Assemble piston [1] and connective rod [2], get oil hole [3] facing to mark [4] "IN" on piston.

Coat external surface of piston pin with oil.

Re-assemble piston pin [1], then fix it by new circlip [2] of steel wire.



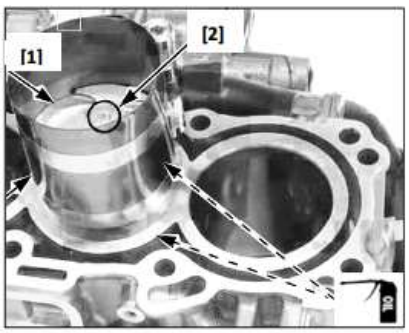
Caution:

●*Make sure circlip of steel wire assembled in place.*

●*Please don't align opening on circlip to gap on piston。*

Coat cylinder wall and thrust surface of piston with oil.

Assemble piston/connective rod kit [1] into cylinder by compression tools could be bought from market (When assembling, the side on piston with mark 【2】"IN" facing to air intaking direction).



When repeatedly using connective rod, they must be re-assembled to their original position.

Caution:

●*When re-assembling piston, please don't damage its top surface, especially don't damage matching place to cylinder hole.*

●*Please don't damage cylinder sleeve and crankshaft pin by connective rod.*

●*Slightly knock piston into cylinder body by plastic hammer (Make sure*

compressing tools for piston ring is flatly put on upper surface of cylinder body).

Re-assemble parts below:

- Crankshaft
- Transmission kit