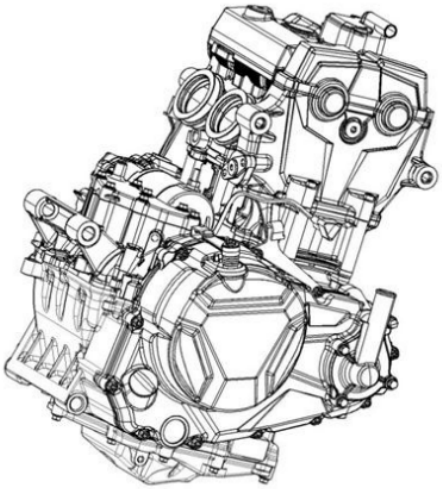
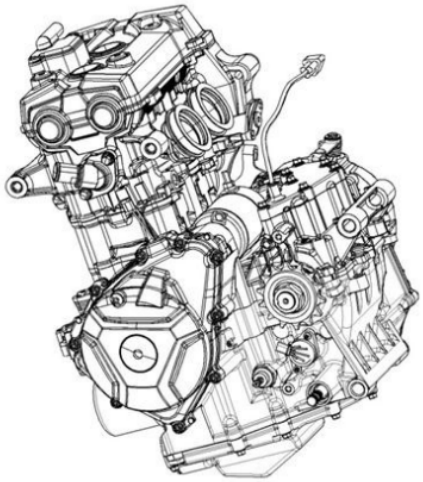
Service manual

for engine KEL350





Loncin Engine co.ltd. Chongqing
Oct. 2021

Foreword

Thanks to the motorcycle family get expanding, a growing number of new structures and technologies have been adopted with each passing day. For a better maintenance, adjustment or repair of engine KEL350 to Loncin users and service staff, we made this manual, who brings convenience and guidance for them when it got necessary.

Up to the moment of this user manual printing, all its data, diagrams, and performances are the latest. Loncin motor keeps the right for any revision on this manual without further notice.

Content list

1 Summary

Regulation of maintenance

1. Please use the origin parts, lubricant or other auxiliary materials from Loncin motor or the ones meet Loncin standard or recommended by Loncin. In case the materials you choose falling short of meeting Loncin specification or requirement, it may damage the mtorocycle.

2. When maintenance or repair is needed, adopt metric tools. The bolt, nut or screw of metric is not inter-changeable with the fastening parts under imperial system.

3. After disassembly or re-assembly, please replace the washer, o-ring, split pin or locking shim.

4. When screwing up the bolt or nut, fasten the ones with bigger diameter or at internal position first, then fasten them by sequence of opposite angles to stipulated torque, unless there are other fixed or special sequences.

5. Clean up the removed components by cleanser. Coat the surface of moving parts with lubricant before re-assembly.

6. After re-assembled, confirm the correct re-assembly for each part, check their operation, turn and move them for further inspection.

Specification of engine

The normal specification

	Items	Data
Engine	Type	LX268MN
	Displacement	322ml
	Cylinders and angle	Twin cylinders in line, 14 °
	Cylinder bore X Stroke	68X44.3mm
	Capacity of combustion chamber	11.8m
	Compression ratio	11.2:1
	Valve equipment	Double top cam
	Air inlet valve	Inlet valve open (rise of 1mm): 7 °BTDC
		Inlet valve closed (rise of 1mm): 40 °ABDC
	Air exhaust valve	Exhaust valve open (rise of 1mm): 30 °BBDC
		Exhaust valve closed (rise of 1mm): 2 °ATDC
	Lubricating system	Forced pressure lubrication + Splashing lubrication
	Cooling system	Water cooling
	Net weight of engine	39.4 kg
Gear transmission system	Clutch	Multiple layers and wet
	Gear box	International gear of 6
	Primary transmission ratio	3.043
	End transmission ratio	3.071
	Gear transmission ratio	1st gear: 2.5 2nd gear: 1.824
		3rd gear: 1.348 4th gear: 1.087
		5th gear: 0.920 6th gear: 0.800
	Gearshift	1-N-2-3-4-5-6
Electrical system	Ignition system	FTI 1-2
	Starting system	Electrical starting
	Lighting system	Battery
	Spark plug	CR8E(NGK)
	Clearance of spark plug	0.7-0.8mm
	Rectifier regulator	Complete wave of rectifier regulation by 3 phases

Specification of cooling system

Items		Specification
Coolant capacity	Heat radiator (With all the water passage)	0.96 L
	Sub water tank (Passed the Max. mark line)	0.25 L
Relief pressure of heat radiator cover		108.0-137kPa
Thermostat	Initial opening temperature	82℃
	Complete opening temperature	95℃
	Rise of valve	3mm

Specification of lubrication system

Items		Standard	Limit for repair
Oil capacity	Oil capacity (New engine or breaking down)	2.4 L	---
	Without replacing secondary filtering element	1.8 L	---
	Replace the element	2.1 L	---
The oil we suggest	Brand	For Loncin motorcycle only	---
	Type	SAE: 10W-30, 10W-40, 10W-50, 15W-40, 20W-40, 20W-50	---
	Grade	Quality grade of API: SG or higher, the ones of energy saving on its round label of API service are not allowed JASO T903 standard: MA	---
Opening pressure of oil pressure sensor		Under the normal temperature or 80℃; with pressure of 15-19.6Kpa	---
Rotor of oil pump	Clearance between inner and outer rotors	0.07-0.12	0.20
	Clearance between outer rotor and its base	0.12-0.22	0.30
	Clearance between inner rotor and its base	0.06-0.09	0.17

Specification of cylinder head/valves

Unit: mm

Items			Standard	Limit for repair
Cylinder pressure of electrical start			1200-1600kPa/390r/min	---
Clearance of valves		Inlet valve	0.15-0.20	---
		Exhaust valve	0.20-0.25	---
Tappet	Protrusion height	1.95-2.05		1.990
	Outer diameter	24.467-24.48		23.45
Camshaft	Cam protrusion height	Inlet	32.65-32.750	32.550
		Exhaust	30.750-30.850	30.650
	Clearance between journal and bracket		0.028-0.062	---
	Runout		0.02	0.03
Valve and its guiding tube	Valve rod diameter	Inlet	4.466-4.48	4.436
		Exhaust	4.456-4.47	4.426
	Inner diameter of guiding tube	Inlet/Exhaust	4.500-4.512	4.550
	Clearance between valve rod and guiding tube	Inlet	0.020-0.046	0.080
		Exhaust	0.03-0.056	0.100
	Width of valve base	Inlet/Exhaust	1.3-1.4	---
Free length of valve spring		Inlet/Exhaust	38.2	36.30
Installation length of valve spring		Inlet/Exhaust	32.00	---
Flatness of cylinder head				0.05

Specification of clutch and gearshift device

Unit: mm

Items		Standard	Limit for repair
Free travel of clutch lever		10.0-15.0	---
Clutch	Free length of spring	48.5	46.3
	Thickness of friction plate	2.9-3.1	2.8
	Flatness of driven plate	---	0.10
Clutch collar	Inner diameter	22.000-22.018	22.031
	Outer diameter	27.965-27.98	28
Outer diameter of main shaft at clutch collar		20.186-20.204	21.95

Specification of magneto and clutch

Unit: mm

Items	Standard	Limit for repair
Outer diameter of gear sleeve on starting plate	42.195-42.208	30.855
Inner diameter of outer case of starting clutch	58.854-58.88	58.89

Specification of crankcase and gear transmission system

Unit: mm

Items			Standard	Limit for repair
Gear transmission system	Inner diameter of hole on gear	M5	24.02-24.033	24.053
		M6	20.226-20.237	20.257
		C3, C4	24-24.021	24.401
		C1	23-23.015	23.035
	Outer diameter of shaft sleeve	C1	22.97-22.995	22.95
	Inner diameter of shaft sleeve	C1	20-20.021	20.041
	Diameter of main and counter shaft	Match with sleeve of size M5	23.979-24	23.959
		Match with sleeve of size M6	20.186-20.204	20.166
		C3, C4	23.975-23.99	23.955
		C1	19.974-19.987	19.954
	Diameter of gear shifting fork's shaft		13.966-13.984	13.946
	Inner diameter of gear shifting fork		14-14.018	14.038
	Thickness of gear shifting fork's tip		5.93-6.00	5.9

Specification of crankshaft, piston, cylinder body and balancing shaft

Unit: mm

Items			Standard	Limit for repair
Crankshaft	Side clearance of bigger end of connecting rod		0.2-0.32	0.35
	Side clearance of crankshaft		0.05-0.234	0.254
Cylinder body	Cylinder bore		68.000-68.010	68.06
Piston, Piston pin, and Piston rings	Diameter of basic circle of piston		67.962-67.985	67.900
	Diameter of pin's hole		15.002-15.006	15.02
	Diameter of piston pin's hole		14.994-15	14.984
	Closed clearance of piston ring	1st ring	0.15-0.3	0.5
		2nd ring	0.3-0.5	0.7
		Scratch ring	0.1-0.5	0.8
	Clearance between piston rings and their groove	Clearance between 1st ring and its groove	0.030-0.065	0.10
		Clearance between 2nd ring and its groove	0.02-0.055	0.08
Cylinder matching clearance			0.015-0.048	0.60
Inner diameter of smaller end of connecting rod			15.006-15.017	15.04
Matching clearance between connecting rod and pin			0.006-0.023	0.043

Torque

Standard

Fastening parts	Torque N.m	Fastening parts	Torque N.m
Nut and bolt of 5mm	5.2	Screw of 5mm	4.2
Nut and bolt of 6mm	10	Screw of 6mm	9.0
Nut and bolt of 8mm	22	Flange bolt of 6mm (head of 8mm, small flange)	10
Nut and bolt of 10mm	34	Flange bolt of 6mm (head of 8mm, big flange)	10
Nut and bolt of 12mm	54	Flange bolt of 6mm (head of 10mm) and nut	10
		Flange bolt of 8mm and nut	27
		Flange bolt of 10mm and nut	39

Torque of engine

Items	Quantity	Thread diameter mm	Torque N.m	Note
Spark plug	2	10	14	
Left decorative cover	1	32	5	
View hole cap	1	8	10	
Engine oil drainage bolt	1	12	20	
Secondary oil filter	1	20	12	Spread suitable oil on seal ring's position
Tube joint of secondary oil filter	1	20	27	Loctite

Cooling system

Items	Quantity	Thread diameter mm	Torque N.m	Note
Water drainage bolt	1	6	10	
Bolt on thermostat cover	2	6	10	
Bolt of water chamber	3	6	10	
Water temperature sensor	1	10	17	

Cylinder head and valves

Items	Quantity	Thread diameter mm	Torque N.m	Note
Cylinder head bolt	6	10	Refer to the Chapter later	Coat the thread and end surface with oil
Cylinder head bolt	2	6	Refer to the Chapter later	
Bolt of bracket for camshaft	12	6	10	Coat the thread and base's surface with oil, whose fastening please refer to the Chapter later
Bolt on cylinder head cover	4	6	10	
Tensioner bolt	2	6	10	
Bolt of tensioner cap	1	6	7	
Bolt of timing driven gear	4	7	22	
Tensioning bolt of chain chamber (Right side of cylinder head)	1	6	10	

Clutch and gear shifting device

Items	Quantity	Thread diameter mm	Torque N.m	Note
Clutch nut	1	18	100	
Clutch spring's bolt	4	6	10	
Bolt of primary driving gear	1	10	60	Coat the thread with oil
Bolt of locating plate of clutch cable	2	6	10	Coat the thread with sealing glue
Bolt of right crankcase cover	7	6	10	
Bolt of star-shaped plate	1	8	22	Coat the thread with sealing glue

Magneto and starting clutch

Items	Quantity	Thread diameter mm	Torque N.m	Note
Fastening bolt of starting clutch	3	8	29	Coat the thread with sealing glue
Bolt on rotor of magneto	1	10	60	Coat the thread and base's surface with sealing glue
Bolt on stator of magneto	3	6	10	Coat the thread with sealing glue
Fixing bolt of trigger	2	5	7	Coat the thread with sealing glue
Bolt on left crankcase	9	6	10	Coat the thread with sealing glue

Case body and gear transmission system

Items	Quantity	Thread diameter mm	Torque N.m	Note
Check plate of chain	2	6	10	Coat the thread with sealing glue
Tension plate bolt	2	6	10	Coat the thread with sealing glue
Bolt of pressing plate of gearshift drum's bearing	2	6	10	Coat the thread with sealing glue
Case combination bolts on both sides of crankshaft	6	8	24	Coat it with oil, replace the bolt, whose fastening refer to the Chapter later
Case combination bolts on both sides of balancing shaft	2	8	26	Coat it with oil, replace the bolt, whose fastening refer to the Chapter later
Crankcase bolt of	10	6	10	

6mm				
Pressure sensor of oil	1	Thread of taper tube of R1/8	9	Coat the thread with sealing glue

Crankshaft, piston, cylinder body and balancing shaft

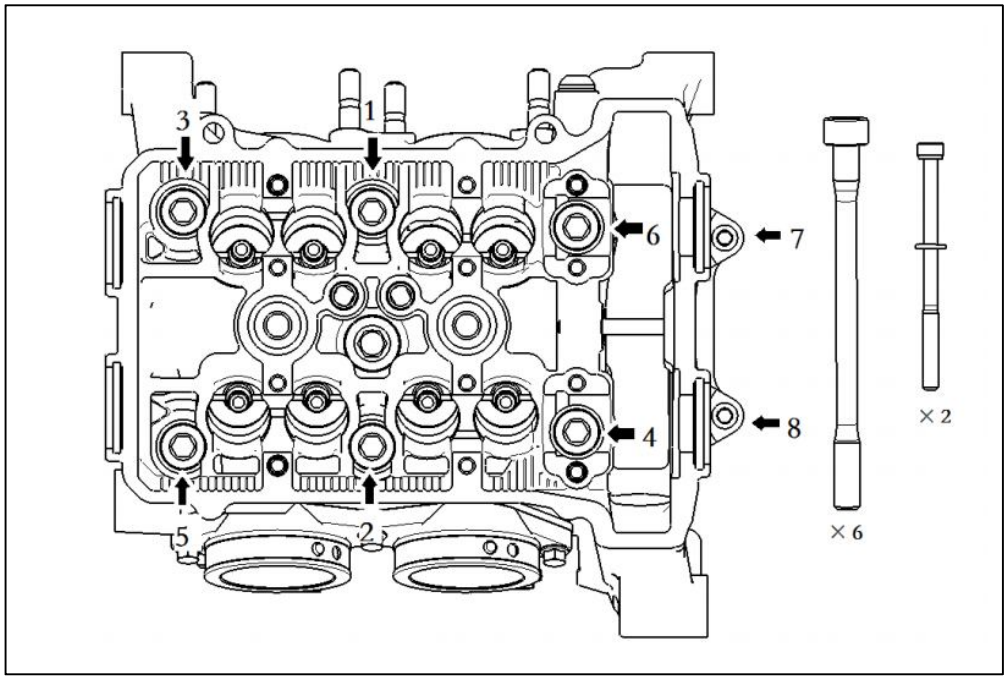
Items	Quantity	Thread diameter mm	Torque N.m	Note
Nut of connecting rod cap	4	7	15N.m+150 °	Coat the thread and base's surface with oil, whose fastening refer to the Chapter later
Fastening bolt of driven gear of balancing shaft	1	8	35	

Positions for lubrication and sealing

Engine

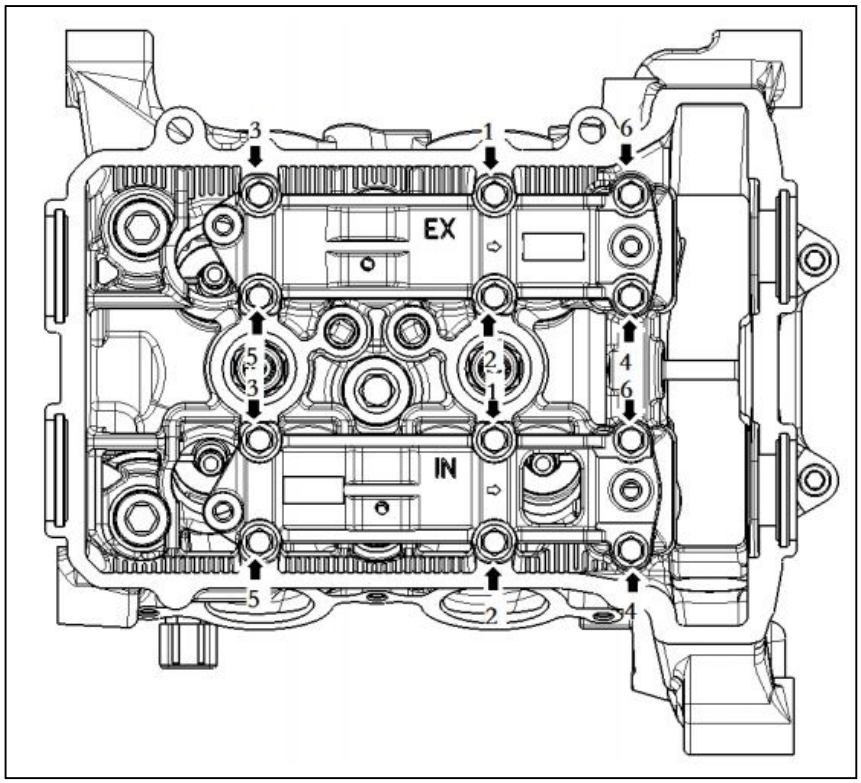
Material		Position	Note
Sealing	1596	Combination surface of crankcase	
	1590	Way out port of magneto wire	
Engine oil		In the oil pump, all the surface of outer rotor Sliding surface of valve rod and rod's end All the surface of timing chain Rolling surface of camshaft Inner surface cylinder hole Outer surface of piston, pin's hole of piston, and grooves of piston rings Outer surface of piston pin All the surface of piston rings All the surface of friction plate of clutch Sliding surface of clutch drawing rod Rod of gearshift shaft and its turning plate All surface of double gears All surface of starting clutch All surface of turning fork shaft inner surface of crankshaft pad at its bigger end of connecting rod Inner hole of smaller end of connecting rod of crankshaft Turning gear (Primary transmission, crankcase, deceleration of starting Sliding surface of plate-shaped gear Turning area of each bearing Surface of each o-ring	
Oil of molybdenum disulfide		Tappet Surface of camshaft Hole of camshaft at cylinder head	
Multiple function lubricant grease		Seal ring of starting motor Seal ring of speed sensor Seal ring of left decorative cover	
Degreasing agent		All the combination surface	

The fastening of the bolts on cylinder head



1. Coat the thread and combination surface of the number 1-6 bolts with size M10X142 with oil;
2. Fasten the number 1-6 bolts to torque of 10N.m according to the sequence in picture above;
3. Fasten the number 1-6 bolts to torque of 30N.m according to the sequence in picture above;
4. Loosen and fasten again the bolts from 1-6 (Loosen one, then fasten the next one, then loosen the next). The steps:
5. Loosen the bolts on cylinder head
6. Fasten to torque 12N.m.
7. Fasten to 120 °±5 °
8. Fasten the number 7-8 bolts (M6X90) to 10N.m.

The fastening of bolts on camshaft bracket

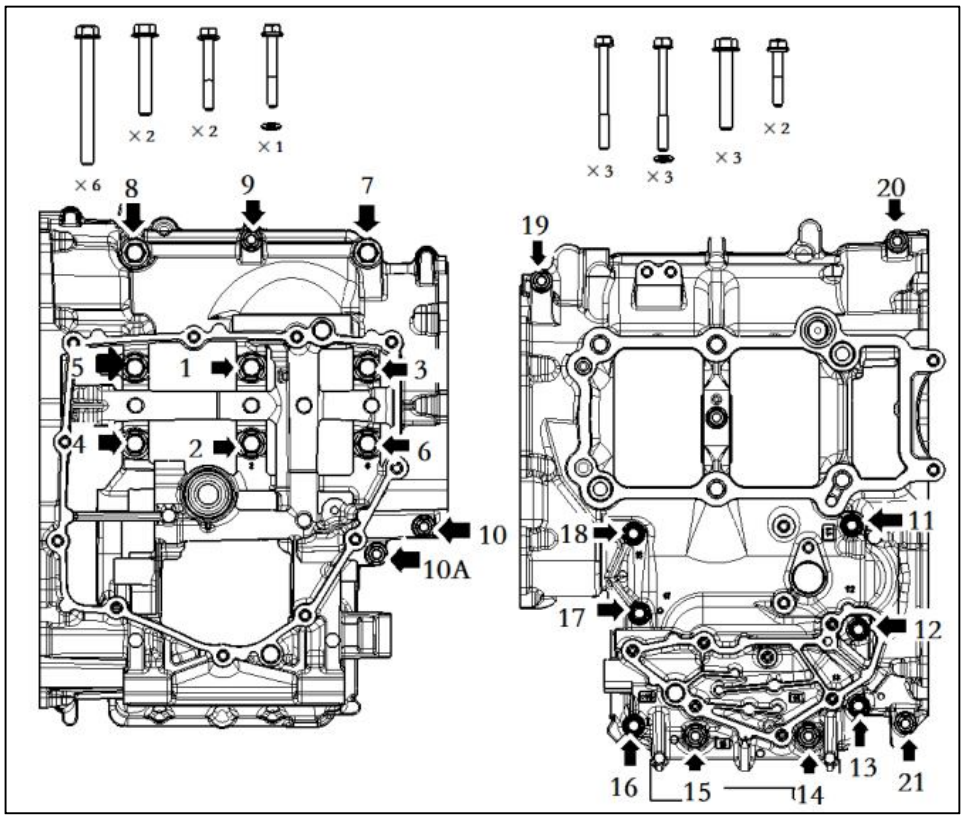


1. Coat all the thread and combination surfaces with oil;
2. Pre-fasten the bolts of number 1-6 to 5N.m according to sequence in picture above.
3. Pre-fasten the bolts of number 1-6 to 10N.m according to sequence in picture above.

The fastening of bolts on connecting rod

1. Coat the thread part of connecting rod and combination surface with oil;
2. Fasten to each bolts to 5N.m.
3. Fasten to each bolts to 10N.m.
4. Fasten to each bolts to 15N.m.
5. Fasten to 150 °±5 °.

Fastening for bolts on crankcase



1. Coat all the thread of bolts and their combination surface with oil;
2. Fasten the bolts (M8X80) of number 1-6 to 10N.m according to sequence in picture above.
3. Fasten the bolts of number 1-6 to 20N.m according to sequence in picture above.
4. Loosen and fasten the bolts of number 1-6 to 24N.m; (Loosen one, then the next, then loosen the next)
5. Fasten the bolts (M8X50) of number 7-8 to 10N.m according to picture above;
6. Fasten the bolts of number 7-8 to 20N.m according to picture above;
7. Loosen and fasten each bolts of number 7-8 according to their sequence to 26N.m; Loosen one, then fasten the next one, then loosen the next.
8. Fasten the bolts of number from 9-21 to 10N.m according to sequence in picture above.

2 Maintenance

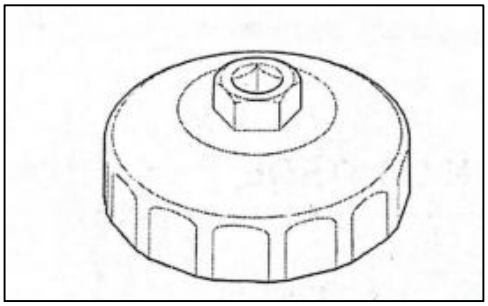
The information for maintenance

Summary

Before all the operations, please hold the motorcycle upright on the horizontal ground.

Tools

The spanner of cap-shaped for oil filter



The socket wrench for removing spark plug

Specification for maintenance

For keeping the power and economic performance of motorcycle, please check and inspect the motorcycle periodically according to the requirement in <Use manual>.

From the first 36000km or the 36th Month, make maintenance each 12000km or 12 months.

I: Inspection, and clean up, adjust, lubricate or replace in case it is necessary; C: Clean up; R: Replace; L: Lubrication.

The maintenance below need some specialization in machine, specially the items with *, it may need more technological information or tools.

Maintenance period table

Ref.No.	Period	X1000km	1	6	12	18	24	30	36
	Items	Month	1	6	12	18	24	30	36
*1	Spark plug				R		R		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 clearance		Each 42000km, I						
*5	Coolant		I	I	I	I	I	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
12	Driving sprocket wheel of countershaft			I	R	I	R	I	R

Please pay attention to:

1. In case the motorcycle works under wet, dusty or worse conditions, the more frequent maintenance is necessary.
2. The items with mark * need special tools, data or skills of specialization, which shall be done by Loncin dealers.
3. The mileage or using years in the Maintenance table, who arrived first the maintenance shall be started.

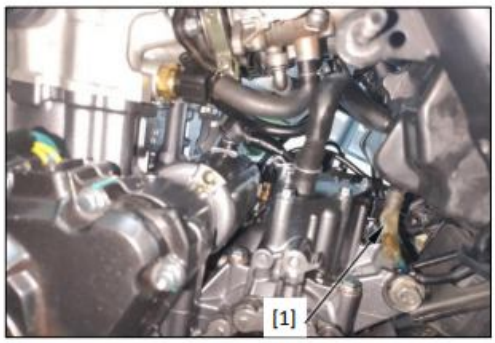
Breathing tube of crankcase

Pay attention to:

More maintenance is necessary when the motorcycle running in the rain or full speed, also after washed or oppositely put,

Check the sediment in the transparent part in the breathing tube.

Pull off the plug [1] for cleaning tube of air filter, then dump the sediment in suitable container. Then set once again the plug of tube.



Remove the fuel tank and hold it on.

Check and confirm the crack, ageing, damage or flexibility on waste gas tube [1] on crankcase.

Please replace the waste gas tube if it is necessary.

Install the fuel tank again.

Spark plug

Remove the fuel tank.

Remove the spark plug [1].

Blow and wash the surroundings of spark plug's base by air gun before removing, meanwhile make sure there is no dust dropping into the combustion chamber.

Check the damage or crack on insulator, also check the damage, crack, dirt or color fading on terminals, in case it is, please replace the spark plug.

Check the spark plug

Wash up the terminal of spark plug by iron wire or spark plug's cleaner.

Check the clearance between the terminal and its side by feeler gauge.

The clearance of spark plug: 0.70-0.80mm

In case it is necessary, please slightly and carefully get the terminal bent to adjust the clearance, then screw up the spark plug to appointed torque.

The torque: 14·m

Install the fuel tank.

Valve clearance

Check

Please pay attention to:

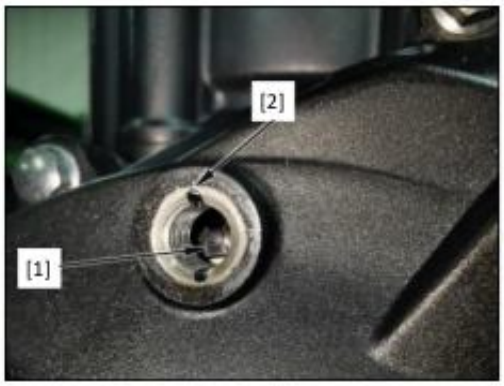
Please check and adjust the valve clearance when the engine is cold (Lower than 35℃).

Remove the parts below:

Cylinder head cover

Left decorative cover and o-ring

View window's cap and copper shim



The installation: Turn the crankshaft anticlockwise by socket wrench of size 14mm, make sure the mark "II" on magnetic cylinder in bolt's hole on view window's cap, and then get align with scale line [2] on left front crankcase.

Make sure the timing mark "IN" on sprocket wheel align with "EX" on cylinder surface as picture shows, in case the status is no in this situation, turn 360 ° again once more.

Pay attention to:

When the engine is under this condition, which means the status for installation, the 90 ° after the 1st cylinder got its upper stopping point, the 2nd cylinder

the 90 ° before getting upper stopping point, at this moment, the tips of 8 cam haven't touched the tappet, which make it is easy for installation.

The timing of left cylinder: Turn the crankshaft clockwise, until the scale mark "IL" on magneto get aligned with the gap of timing mark on the edge of left view window's cap, meanwhile the scale mark "EX" on end surface of driven sprocket wheel of air inlet camshaft gets parallel with the installation surface of cylinder head cover and face to right side.

Insert the feeler gauge between the cam of left cylinder and tappet, to check the valve clearance of valve.

The valve clearance:

IN: 0.15-0.20mm

EX: 0.20-0.25mm

Pay attention to:

Take record for each valve clearance to select shims when the adjustment is needed.

The right cylinder timing: Turn the crankshaft by 180 ° anticlockwise when the engine is under condition above, until the scale mark "IL" on magneto get aligned with the gap of timing mark on the edge of left view window's cap, meanwhile the scale mark "IN" on the end surface of driven sprocket wheel of air exhaust valve gets parallel with the installation surface of cylinder head cover and face to left side.

Insert the feeler gauge between the cam of right cylinder and tappet, to check the valve clearance of valve.

The valve clearance:

IN: 0.15-0.20mm

EX: 0.20-0.25mm

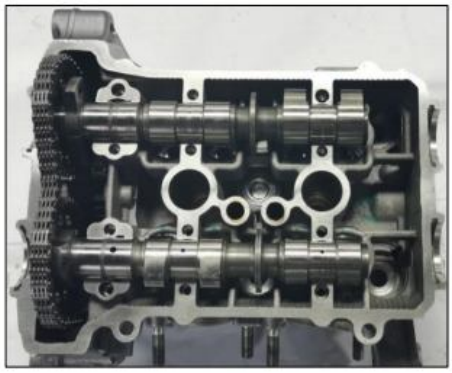
Pay attention to:

Take record for each valve clearance to select shims when the adjustment is needed.

Adjustment

Pay attention to:

The adjustment for valve clearance needs to remove the camshaft. Adjust the engine to the condition of assembly as description above.

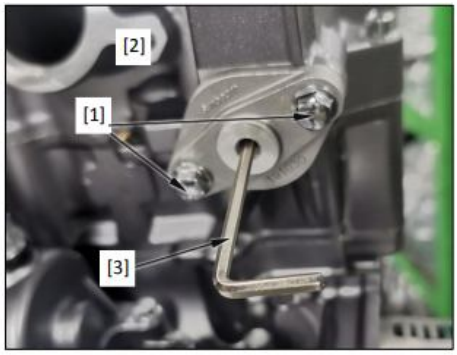


Remove the parts below:

Tensioner bolt [1] and shim [2].

Insert the socket hexagon wrench into tensioner.

Get the tensioner back clockwise.



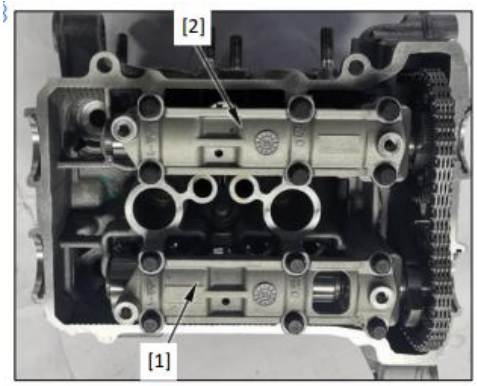
Remove the parts below:

Bracket [1] of air inlet camshaft.

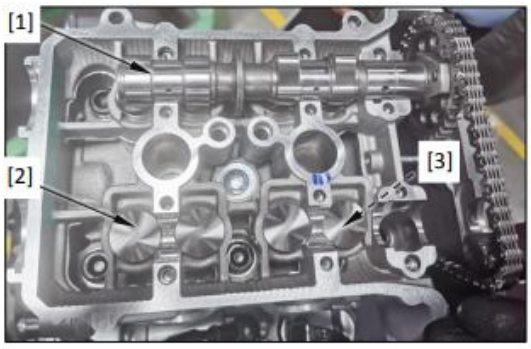
Bracket [2] of air exhaust camshaft.

Pay attention to:

To avoid the damage on cylinder head, camshaft and its bracket, please loosen the bracket bolts by sequence of opposite angle inwards.

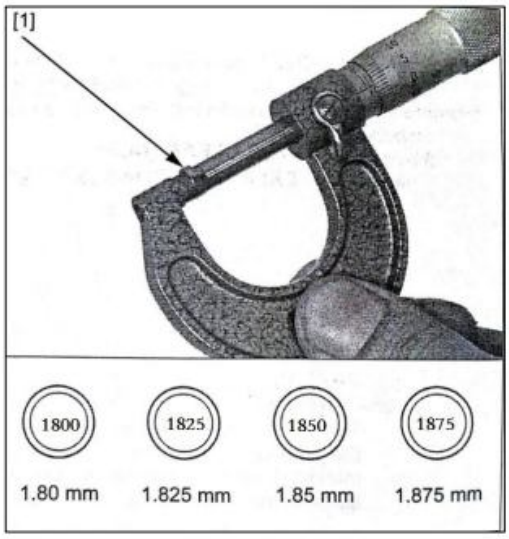


Remove the parts below:
Air inlet and exhaust camshaft [1]
Tappet [2]
Adjusting shim [3] of valve



Pay attention to:
Well put the removed tappet and shim in their order, and take record to their sequence for installation.

Measure the thickness of shim [1] and take its record.
Pay attention:
There are 69 kinds of shim with different thickness for selection, whose thickness of adjacent ones with difference of 0.025mm (1.200-2.900mm)
A=(B-C)+D
A; The thickness of new shim
B: Take record for valve clearance
C: The stipulated valve clearance
D: Thickness of removed shim.
Measure them by micrometer to ensure their correct thickness.



Coat the end of valve rod with oil.
Install new shim [1] to spring base of valve.
Coat the sliding and pushing surface of tappet with oil.
Install the tappet back to its origin position.

Make sure the crankshaft is under the condition for installation, install the camshaft for air exhaust first, meanwhile keeping the timing mark “EX” on the sprocket wheel get parallel with surface of cylinder head and face to the side of air exhaust, then install the air inlet camshaft, meanwhile getting the timing mark “IN” on the sprocket wheel align with surface of cylinder head and face to the side of air inlet.

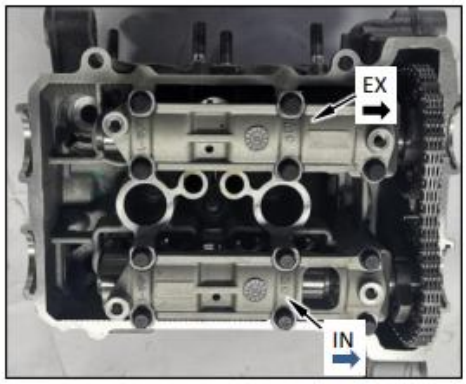
Install the bracket of camshaft and turn its bolt to fixed torque, turn the tensioner anticlockwise and take it out.

Torque: 10N.m

Pay attention to:

The camshaft with groove on its limiting shoulder is the air exhaust one.

Please pay attention to the marks of :EX” and “IN” on the bracket of camshaft, then make the arrow point to the chain chamber.



Turn the crankshaft more than 2 rounds, measure the valve clearance once again.

Replace for a new o-ring and coat it with oil, then install the left decorative cover [1].

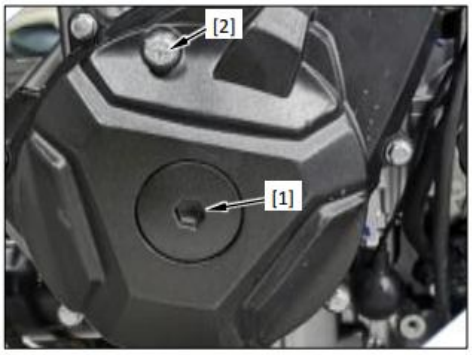
Replace for a new shim and install the bolt [2] of view window’s cap.

Fasten the left decorative cover and view window’s cap to fixed torque.

The torque for left decorative cap: 5N.m

The torque for view window cap: 10N.w

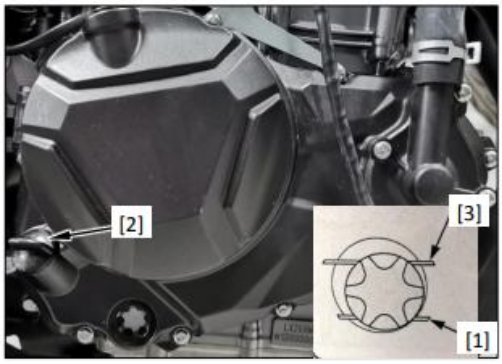
The installation for cylinder head’s cover (Please refer to the Section 5th).



Oil of engine

Check the oil capacity

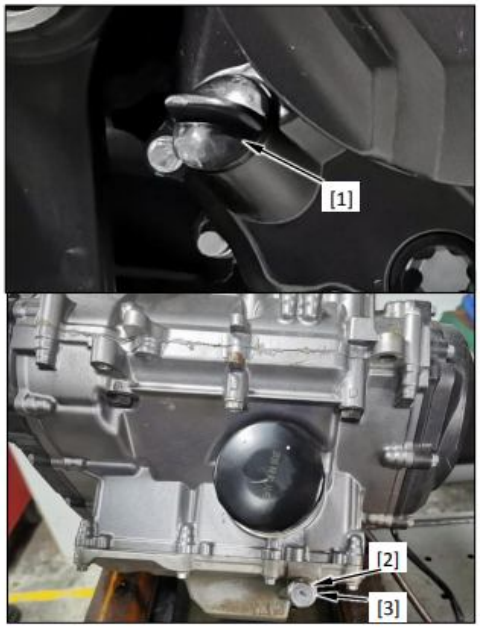
Start the engine and idly run for 3-5 minutes.
Turn off the engine and wait for 2-3 minutes.
Hold the motorcycle upright on the horizontal ground.
Check the oil capacity through oil view window.
In case the oil level is lower than the minimum line [1], remove the oil plug [2], and fill up with appointed brand of oil to crankcase to upper oil level [3].



The appointed oil: For Loncin motorcycle only.
The quality grade of API: SG or higher, without use the round label for energy saving of API service.
Standard of JASO T903: MA
The specification:
SAE10W-30, 10W-40, 10W-50, 15W-40, 20W-40, 20W-50
Check the o-ring for oil plug, and replace if it is necessary.
Coat the surface of -oring with oil.
Re-install the oil plug.

Replacement for oil

Turn off the engine and remove the oil plug of [1].
Remove the oil drainage bolt [2] and washer [3], the drain off the oil.
After the oil drained off, install oil drainage bolt [2] and replace for a new washer.
Fasten the oil drainage bolt to fixed torque.
Torque: 20·m



Fill up the oil to upper scale mark.
After drained off: 1.8 L.
After replaced the secondary oil filter: 2.1 L
After broke up: 2.4 L
Check the oil capacity.
Make sure there is without oil leakage.

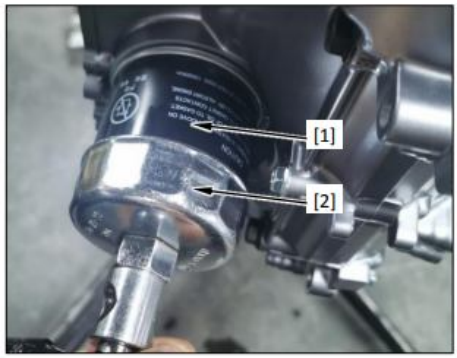
Secondary oil filter

Drain off the oil first.

Remove the oil filter [1] by special tool.

The tool:

[2] Cap-shaped wrench for oil filter



Coat the thread of new secondary oil filter [1] and 0-ring with oil.

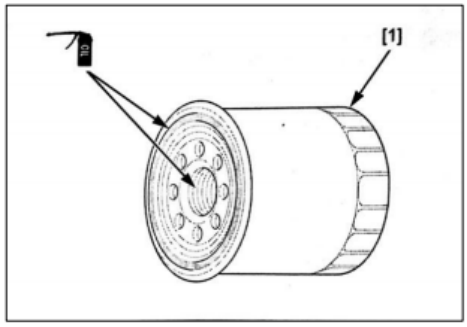
Install the secondary oil filter and fasten the fixed torque.

Tool:

[2] Cap-shaped wrench for oil filter

Torque: 12N·m

Fill up with oil to the upper scale line.



The idling for engine

Pay attention to:

Check the idling of engine when all the maintenance are finished and met requirement.

Check the items below before checking the idling of engine:

The malfunction indicator light is not flashing.

Spark plug.

The element of air filter

The free travel of throttle switch or lever.

Check and adjust the idling precisely when the engine is hot.

Start the engine and heat it to working temperature, then make it run idly.

Check the idling speed.

Idling speed: **1400±100**

In case the idling speed is out of the limit for maintenance, check the parts below:

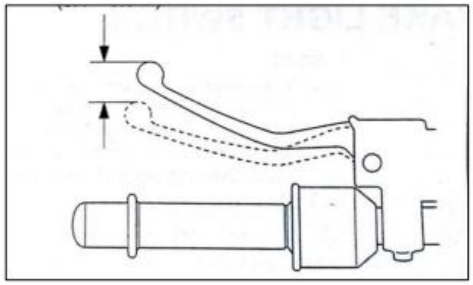
The problem for air inlet capacity and end of engine

Operation valve for idling speed

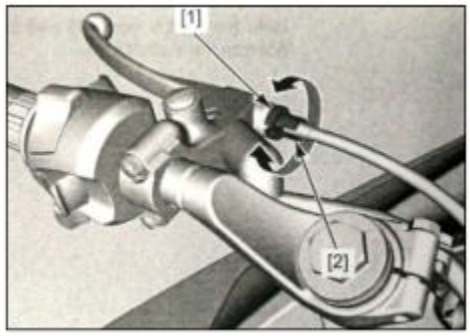
Wires and connectors or socket plugs

Clutch

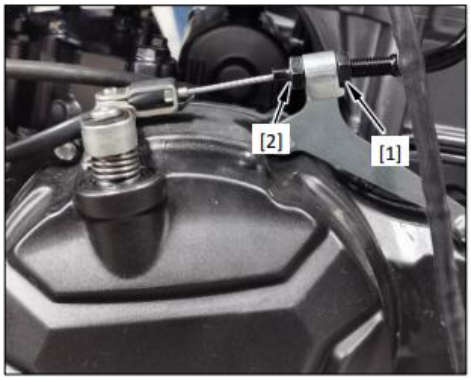
Check the distortion or damage on clutch cable, in case it is necessary, please lubricate the clutch cable.
Measure the free travel of clutch lever at its end.
The free travel: 10-15mm



Adjustment in a small range could be done by the adjustor on clutch lever.
Loosen the locking nut [1], and turn the adjustor according to your needs.
Hold the adjustor, meanwhile screwing up the locking-up.
When it passed the limit of adjusting wire, the correct free travel would be failed to get, under this situation, please turn the main adjustor.



The main adjustor is operated by adjusting nut [1] on operation arm of clutch.
Loosen the locking nut [1], and turn the adjustor according to needs.
Hold the adjustor, meanwhile screwing up the locking nut.
In case failed to get correct clutch travel, or the clutch get skidding during trial riding, please break it up and check.



3 Cooling system

Information for maintenance

Summary

Warning
Remove the cover of heat radiator before the engine and radiator cooling down is not allowed, to avoid the splash of hot coolant and make injury.

Pay attention to:

Use the running water may damage the engine.

Fill up the sub water tank with coolant. Besides filling-up or drain-off, remove the cover of heat radiator is not allowed.

When repairing the cooling system, remove it from the frame is unnecessary.

The coolant touches the painting surface is not allowed.

Inspection and maintenance for temperature indicator of coolant/water.

Inspection for controlling relay for fan.

Specification for cooling system

Items		Specification
Coolant capacity	Heat radiator(All the water passage)	0.96 L
	Sub water tank (Passed the maximum mark)	0.25 L
Relief pressure for heat radiator's cover		108.0-138kPa
Thermostat	Initial opening temperature	82℃
	Completely opened temperature	95℃
	Rise of valve	3mm

Troubleshooting

Too high the engine temperature

Failure of coolant/water temperature indicator/sensor
The thermal valve fails to open
Malfunction of heat radiator cover
Insufficient coolant
Blocked heat passage of radiator, soft hose or water tube
Air inlet of circulation system
Malfunction of cooling fan
Malfunction for controlling relay of fan
Malfunction of water pump

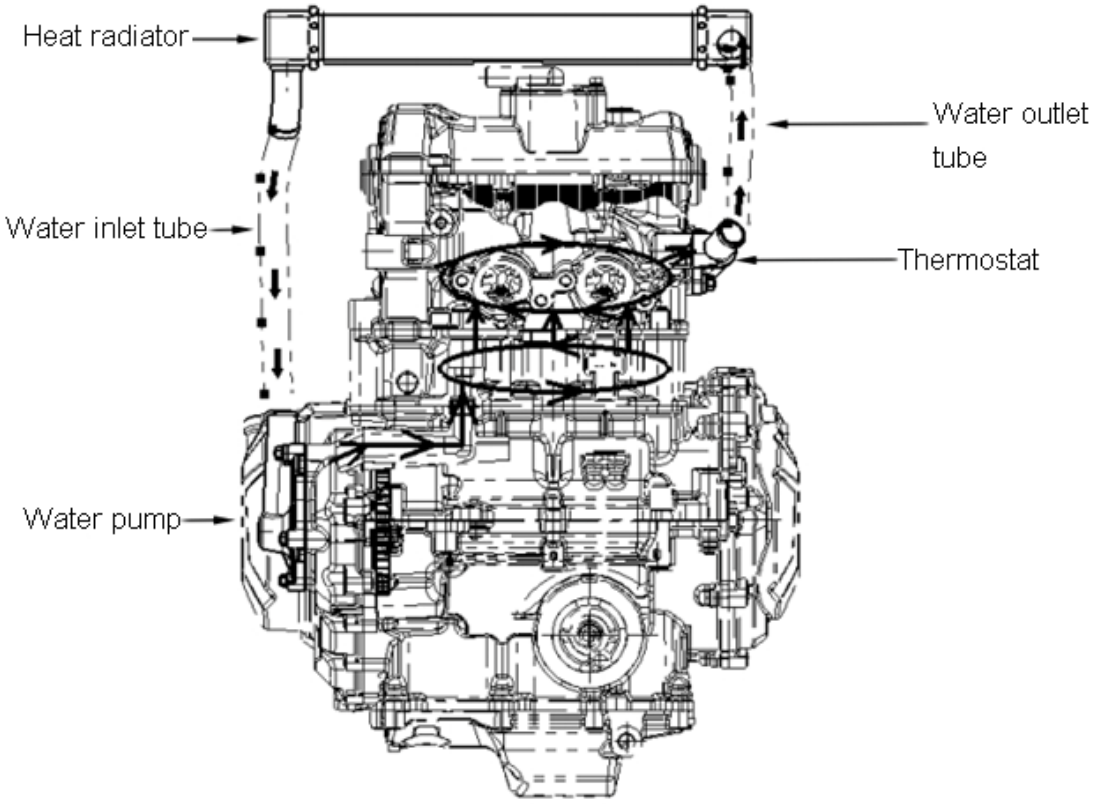
Too low the engine temperature

Failure of coolant/water temperature indicator/sensor
The thermal valve gets opened
The malfunction of controlling relay of fan

Coolant leakage

Defects on water pump system
The aged o-ring
Malfunction of heat radiator's cover
Loosened soft hose joint or the tube clamp
The soft hose gets aged or damaged
The heat radiator gets damaged
The flexible thermostat cover and tube joint of water pump cover

Procedure mode of system



System test

Pressure test for heat radiator cover/system

Remove the fairing of right middle impeller

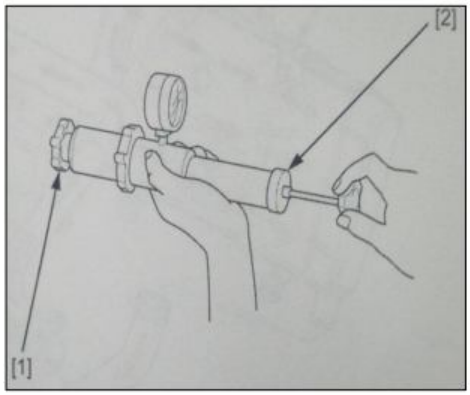
Remove the heat radiator cover [1]

Get the gasket of heat radiator cover wet, then install the cover into inspector [2].

Get pressure on radiator cover by inspector.

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

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



The pressure of cover of heat radiator:

108-137 kPa

Connect the inspector to the heat radiator.

Get pressure on heat radiator, engine and soft hose by inspector, to check their air tightness.

Pay attention to:

Too high the pressure may damage the cooling system, whose strength shall be lower than 137 kPa.

In case the system fails to bear the pressure for 6 seconds, please repair or replace failed parts.

Replacement for coolant

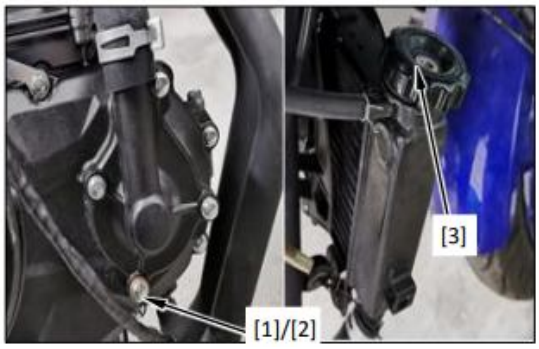
Replace the coolant/Air exhaust

Pay attention to:

Please hold the motorcycle upright on horizontal ground when filling-up or checking coolant in system or sub water tank.

Remove the fairing cover of fan

Remove the water drainage bolt [1] and flat washer [2] of water pump.



Remove the heat radiator's cover [3], then drain off the coolant inside.

Torque:

Water drainage bolt of cooling pump: 10N.m

Drain off the coolant.

Fill up with the suggested coolant through water filling port into cooling system until it reached its neck [1].

T**he coolant we suggested:**

With ethanol but without silicate

Exhaust the air in the system according to steps below:

1. Shift the engine to neutral gear.
   Start the engine for idling running for 2-3 minutes.
2. Turn on or off the throttle for 3-4 times, and totally exhaust the air inside.
3. Turn off the engine, in case it is needed, please fill up with coolant.
4. Install the cover of heat radiator.

Fill up the storage tank with our suggested coolant.

Install the fairing cover.

Thermostat

Disassembly/Re-assembly

Drain off the coolant.

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

Remove the thermal valve from cylinder head.

The re-assembly is just opposite to disassembly.

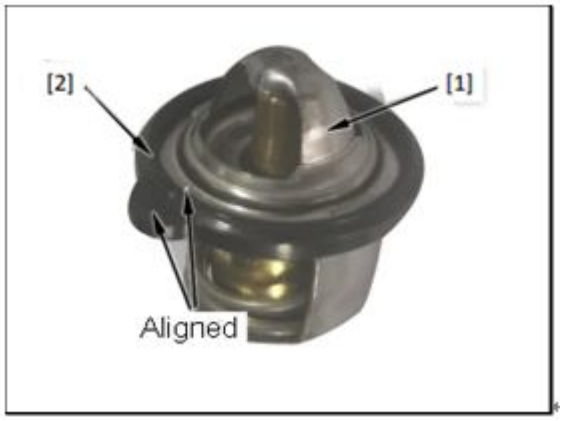
Torque:

When re-assembling the thermostat, pay attention to the protrusion on

seal ring must install into the groove on thermostat cover, the protrusion

on thermostat cover must get align with that on cylinder head.

Check/Inspection



Check the damage of surface of thermostat [1].

In case the thermal valve gets opened under room temperature, please replace.

Check the damage on seal ring [2], in case there is damage or distortion, please replace.

Pay attention to:

When re-assembling, the protrusion on seal ring must be aligned with any air exhaust

hole on thermostat.

Pay attention to:

Wear the oven gloves and make suitable eye protection.

Keep the combustible materials far apart electrical parts.

The thermostat or thermometer touches the bottom plate is not allowed,

otherwise the data you get may be wrong.

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

Suspend the thermostat [2] in hot water and check its performance.

The initial opening temperature of thermostat:

80.5-83.5℃

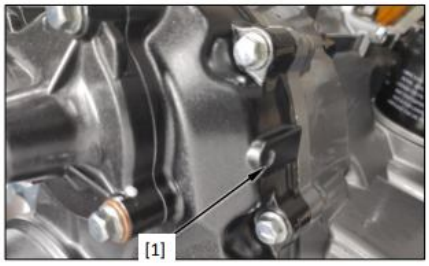
The complete opened temperature of valve:

Under 95℃ with rise wider than 3mm

In case the thermostat opens under abnormal temperature, please replace

Cooling system

Check the sealing performance for end surface



Check the water overflow hole [1] of water pump, to confirm the leakage of coolant.

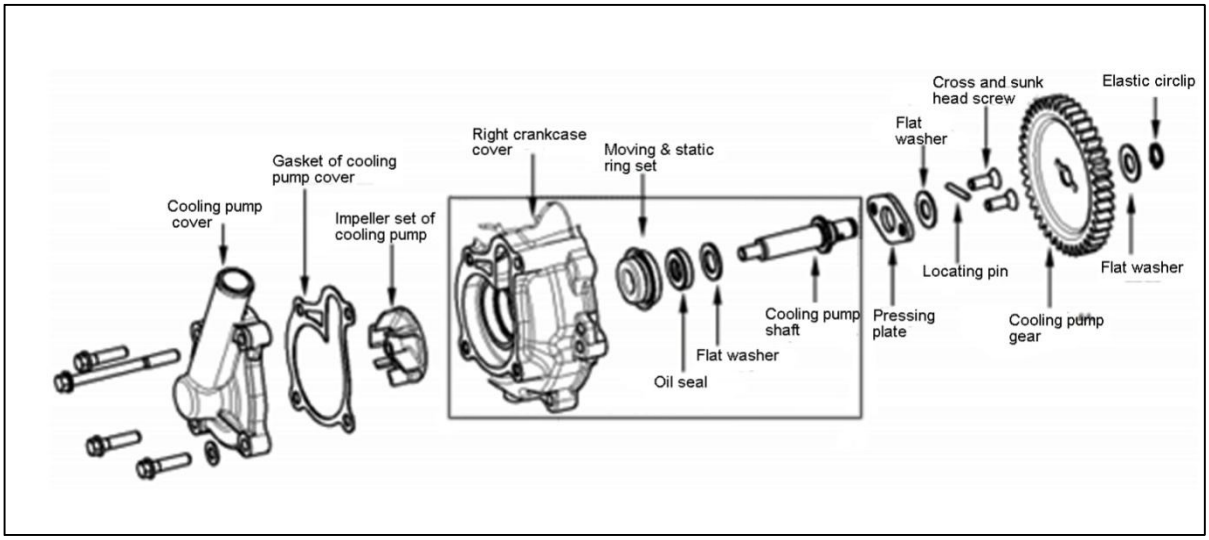
The tiny leakage of coolant is normal.

When the engine was started, make sure there is not sustained coolant leakage.

In case it is necessary, please replace the right crankcase cover.

Disassembly/Re-assembly

The disassembly and re-assembly for cooling system is as picture below:



Disassembly

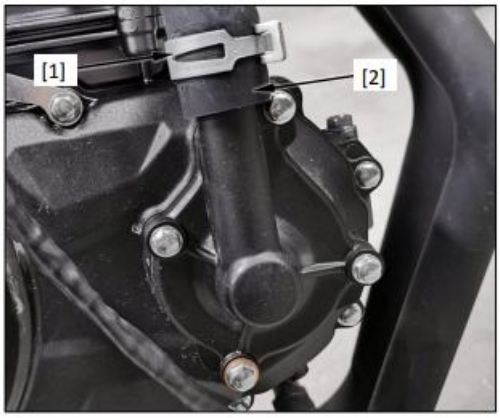
Pay attention to:

Lay a clean oil tray under the engine, when disassembling the right crankcase, there may have some oil flow out. After re-assembled, filling up with our suggested oil to stipulated level (Refer to the Maintenance for Lubrication system)

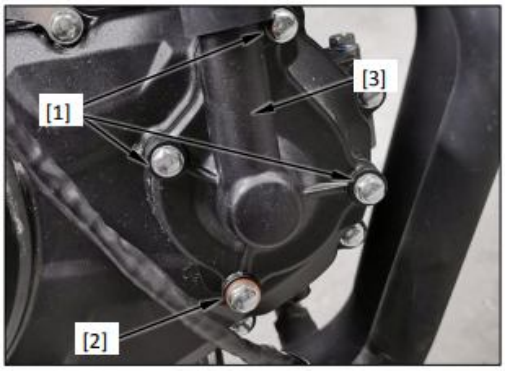
Drain off the coolant.

Hold the motorcycle upright on the horizontal ground.

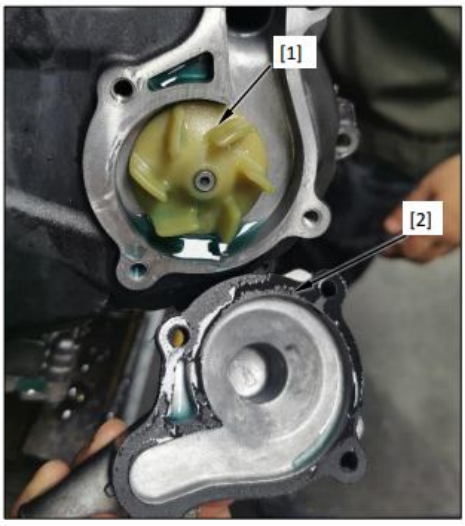
Loosen the tube clamp [1] first, then loosen the wa ter inlet tube [2] from cooling system



Remove the parts below:
3 pieces of installation bolt [1]
Water drainage bolt and washer [2].
Cooling pump cover [3].



Check the impeller [1] and gasket [2] of cooling pump cover, confirm their distortion, in case it is, please replace.
Turn the impeller anticlockwise to remove it down.



The disassembly for cooling pump set

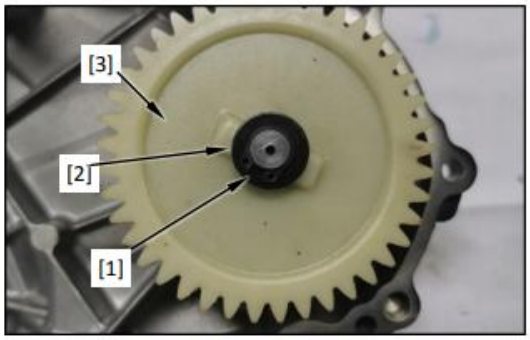
Remove the right crankcase cover

Turn the cooling pump gear [3], to check the jamming, then remove the elastic circlip [1] and flat washer [2].

Remove the cooling pump gear [3] to check its wear-out, in case there is, please replace.

Pay attention to:

When turning the cooling pump gear, slight resistance is normal, but sustained jamming means malfunction.



Remove the positioning pin [1] and flat washer [2].

Remove the cooling pump bolt [3] and pressing plate [4].

Check and confirm distortion on cooling pump shaft, oil seal, moving & static rings set (Refer to the section 3-9 in dotted line)., in case there is, please replace the right crankcase cover set.

The re-assembly is just opposite to disassembly.

Torque:

The torque for installation bolt of water pump: 10N.m.

Check the oil capacity

4 Lubricating system

Information for maintenance

Summary

Warning
The skin repeatedly touches the replaced engine oil may get cancer, but this kind of situation is rarely found, unless you touches the oil every day, but we still suggest you wash up your hands by soap and pure water as soon as possible when you finished your work with oil.

Pay attention to:

When repairing the oil pump, it is unnecessary to remove the engine from frame.

The pre-condition for operations in this Chapter is the oil in engine drained off.

Dust or dirt gets into engine when disassembling or re-assembling is not allowed.

In case any parts of oil pump passed limit for repairing, please replace the oil pump set.

After the oil pump re-installed, check the oil leakage or pressure.

Check the oil pressure indicator of engine and the EOP switch.

Tool:

Oil pressure gauge

Specification for lubricating system

Unit: mm

Items		Standard	Limit for repair
Oil capacity	Oil capacity (New engine or break down)	2.4 L	---
	Without replacing oil element	1.8 L	---
	Replace the oil element	2.1 L	---
Suggested oil	Brand	For Loncin motorcycle only	---
	Type	SAE 10W-30, 10W-40, 10W-50, 15W-40, 20W-40, 20W-50	
	Grade	The quality grade of API: SG or higher, without using the round label for energy saving of API service. Standard of JASO T903: MA	
Opening pressure for oil sensor		At 80℃ or normal temperature:15-19.6kPa	---
Rotor of oil pump	Inner rotor's clearance	0.07-0.12	0.20
	Clearance between outer rotor and base body	0.12-0.22	0.30
	Clearance between inner rotor and base body	0.06-0.09	0.17

Troubleshooting

Too low the oil level
Too heavy the oil consumption
Outer part' oil leakage
Incorrect installation or wear-out of piston ring
Cylinder body worn-out
The guiding tube of valve worn out

Too low the oil pressure
Too low the oil level
The blocked oil screen net
Inner part's oil leakage
Incorrect using of oil

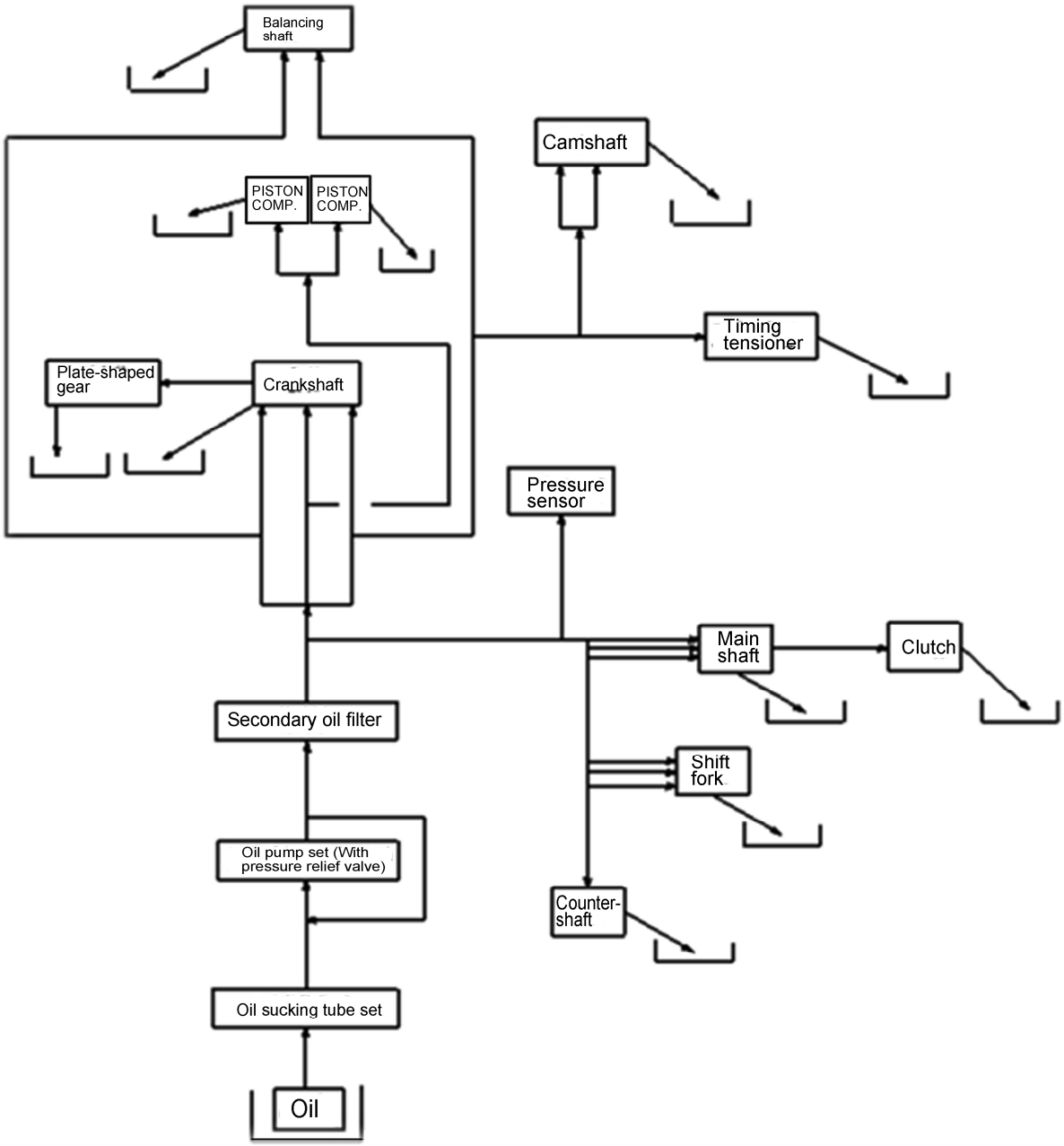
0 oil pressure
Too low the oil level
The oil pressure relief valve seized-up
The driving or driven gear of oil pump gets broken
The oil pump damaged
Inner parts' oil leakage

Too high the oil pressure
The safe valve of oil pressure gets closed
Incorrect use of oil

Dirty oil
Without periodic replace for oil or its screen net
The piston ring gets damaged

The oil get thick
Leakage on coolant passage
Water gets into engine

Diagram for lubricating system



Checking for oil pressure

Pay attention to:
When the engine is running, in case the oil pressure in engine keeps rising, check the pressure system gauge before inspecting the oil pressure.

Remove the oil pressure sensor.
Install the oil pressure gauge into main oil passage [1].
Tool:
Oil pressure gauge

Check the oil level, in case needed, fill up with oil.

Heat the engine until its working temperature about 80℃, then

accelerate the engine rotation to 1400r/min, then read the indication of oil pressure.

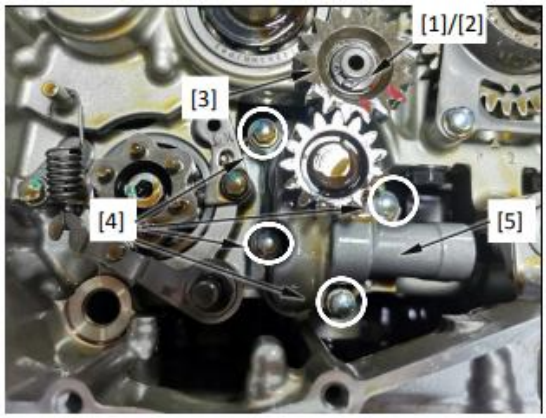
Standard:

When it at 1400rpm/80℃, whose indication is more than 50kpa and stable.

Turn off the engine and remove the tools.
Install the oil pressure sensor.

Oil pump

Disassembly-re-assembly



Remove the right crankcase cover set.

Remove the clutch set.

Remove the elastic circlip [1] and flat washer [2], remove the bridge gear [3] of oil pump, remove the fastening bolt [4] and oil pump [5].

The re-assembly is precisely opposite to disassembly.

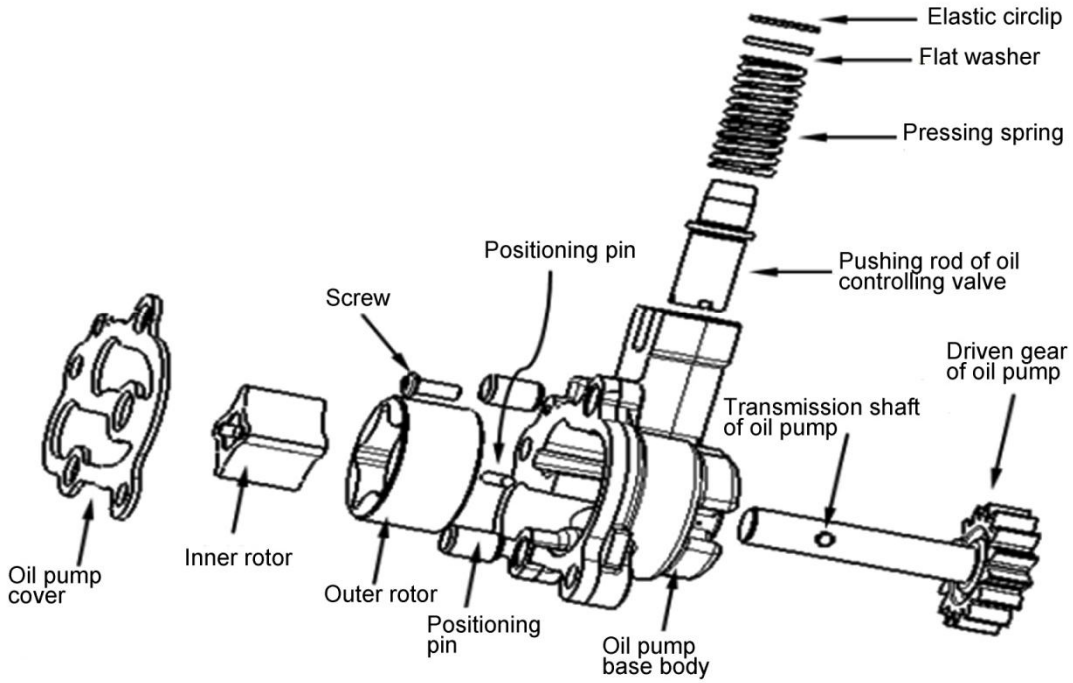
Pay attention to: After re-assembled, turn the oil pump gear or bridge gear by hand above 2 rounds to make sure without jamming.

Torque:

Bolt of oil pump: 10N.m

Disassembly/Re-assembly

The disassembly and re-assembly of oil pump is shown as below:



Check:

Check the driving and driven gear of oil pump.

Check the damage, wear-out, distortion or burn-out on components below:

Oil pump shaft

Positioning pin

Inner rotor

Outer rotor

Oil pump base' body

Measure the oil pump's clearance according to Specification of Lubricating System.

In case any measured indication passed the limit for repair, please replace the whole oil pump set

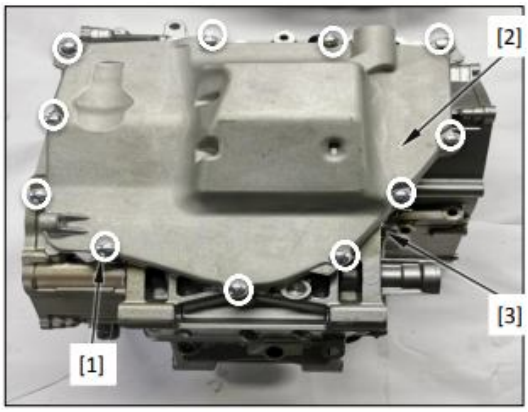
Oil sucking tube

Disassembly

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

Remove the sheltering parts such as muffler set.

Remove the bolts [1] on oil bottom case in sequence of opposite angle, then remove the oil bottom case [2] and its gasket [3].



Remove the oil sucking tube [1] and seal ring [2], then check the damage on oil filtering screen net.

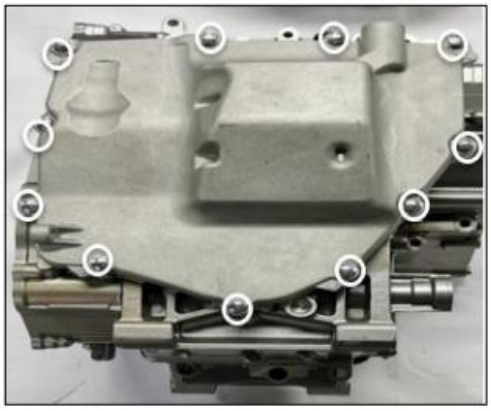
Re-assembly

Install the sucking tube and seal ring into crankcase.

Pay attention to:

Align the groove on sucking tube with protrusion on crankcase.

When re-assembling, coat the seal ring's outer and inner diameter with oil for easy installation, make sure there is no distortion or pressing on seal ring.



Install the oil bottom case and its gasket.

Install the oil bottom case onto crankcase.

Fasten the bolts in sequence of opposite angle.

Install the oil drainage bolt and flat washer.

Torque:

Installation bolt of oil bottom case: 10N.m

Oil drainage bolt: 20N.m

The maintenance of secondary oil filter please refer to Chapter 2nd [Maintenance].

5 Cylinder head and valves

Information for maintenance

Summary

This chapter introduces the maintenance and checking for cylinder head, valves, camshaft and tappet.

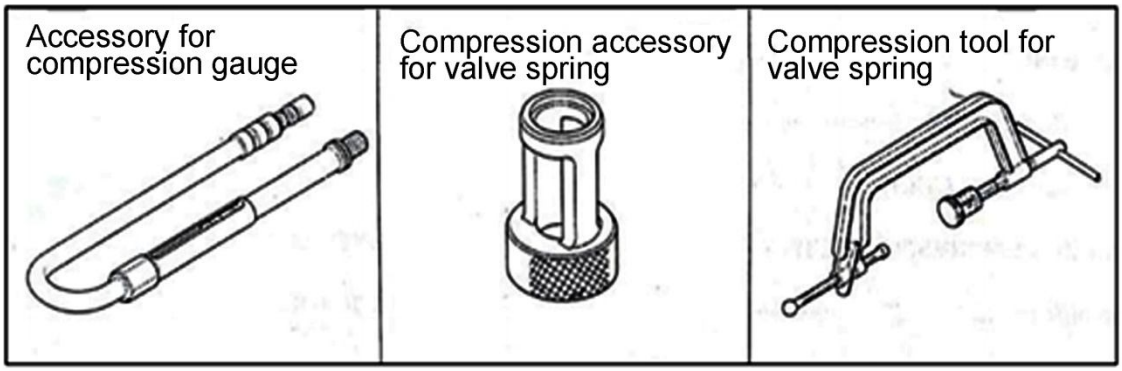
When repairing the cylinder head cover, camshaft or tensioner, judging from the sheltering parts and then decide if remove the engine from frame.; When repairing the cylinder head and valves, remove the engine from frame.

When breaking down the components, mark up the disassembled parts and well put for easy re-assembly.

Before checking, wash up the removed parts by cleanser, then dry them up by compressed air from air gun.

The camshaft gets lubricant from oil passage on its bracket and 气门 cylinder head, in this case, clean up the oil passage before re-assembling the cylinder head and camshaft's bracket.

When disassembling or re-assembling the cylinder head or its cover, damage on combination surface is not allowed.



Specification for cylinder head/Valves

Unit: mm

Items			**Standard**	**Limit for repair**
Cylinder pressure under electrical starting			1200-1600kPa/390r/min	---
Valve clearance		Air inlet	0.15-0.20	---
		Air exhaust	0.20-0.25	---
Tappet	Protrusion height			1.990
	Tappet outer diameter			23.45
Camshaft	Protrusion height of camshaft	Air inlet	32.65-32.750	32.550
		Air exhaust	30.750-30.850	30.650
	Clearance between journal and bracket		0.028-0.062	---
	Runout		0.02	0.03
Valve and its guiding tube	Valve rod diameter	Air inlet	4.466-4.48	4.436
		Air exhaust	4.456-4.47	4.426
	Inner diameter of guiding tube	Inlet/Exhaust	4.500-4.512	4.550
	Clearance between valve rod to guiding tube	Air inlet	0.020-0.046	0.080
		Air exhaust	0.03-0.056	0.100
	Width of valve base	Inlet/Exhaust	1.3-1.4	---
Free length of valve spring		Inlet/Exhaust	38.2	36.30
Installation length of valve spring		Inlet/Exhaust	32.00	---
Flatness of cylinder head				0.05

Troubleshooting

The malfunction on the top of engine is usually bad for its performance. We can diagnose these malfunctions through compression test, also can know the origin of noise by detective rod or stethoscope.

In case the engine is with poor performance in low rotation, please check the white smoke in breathing tube of crankcase. In case the soft hose is smoky, please check the jamming for piston rings.

When engine is in low rotation, too low the compression force, hard starting or poor performance

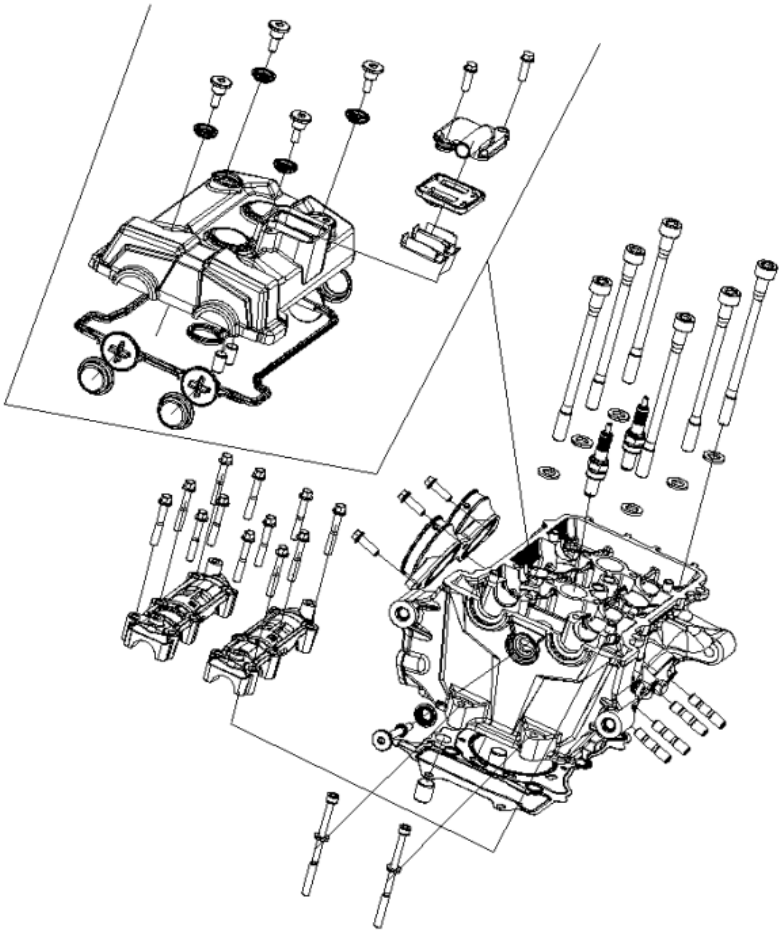
Valves
Incorrect adjustment of valve clearance
Valve burned out or bent
Wrong valve timing
Valve spring cracked
Cylinder head
Gasket of cylinder head leakage damage
Cylinder head distorted or cracked
Flexible spark plug
Cylinder, piston or piston ring worn out
Too high the compression force, overheat or knocking
Too much carbon buildup on piston head or in combustion chamber

Smoky
Cylinder head
Valve rod or guiding tube worn out
Sealing parts of valve rod got damaged
Cylinder, piston or piston rings worn-out

Noisy
Cylinder head
Incorrect adjustment for valve clearance
Valve jamming or valve spring cracked
Camshaft worn out or damaged
Swinging arm or its shaft worn out
Tappet and end of valve rod worn out
Flexible cam's chain or worn out
Timing chain worn out
Gear of cam's sprocket wheel worn out
Cylinder, piston or piston rings worn out

Bad idling
Too low the compression in cylinder

Components’ position



Compression test for cylinder

Start the engine for minutes to pre-heat the engine.

Stop the engine, remove the spark plug for both cylinders.

Install the threaded end of cylinder pressure gauge into the hole of spark plug.

Tool:

Cylinder compression gauge.

Turn the ignition switch to “ON”, then turn then engine switch to “ON” also.

Turn the gear position to neutral.

Turn the throttle to the highest position, start engine until the indication from compression gauge stopped its rising.

The maximum indication may usually keep for 4-7 seconds.

The compression:

1200-1600kPa/390rpm

Analysis for low compression:

Leakage on cylinder head gasket

Incorrect adjustment for valve clearance

Valve leakage

Piston ring or cylinder worn out

The loss of battery makes weak starting

Analysis for high compression

Carbon buildup on piston top or in combustion chamber

Cylinder head cover

Disassembly/Re-assembly

Remove the sheltering parts such as fuel tank.

Remove the parts below:

Remove the soft hose joint [1] of secondary air supplement.

Remove the inlet tube [2] of secondary air supplement.

Remove the cylinder head bolt [1] and seal ring [2].

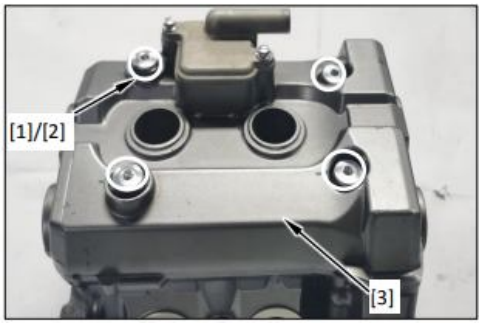
Remove the cylinder head cover [3] from the cylinder head.

Pay attention to:

Forcedly remove the positioning pin from cylinder head cover is not allowed.

The decorative cover and limit plate in cylinder head cover drops into cylinder head shall be avoided.

After the limit plate of chain removed, the cylinder head cover may get loose, which is normal situation.



Remove the seal ring [1] of cylinder head cover from the cover itself, also remove the decorative cover [2].

Remove the limit plate [3] of chain from the cylinder head cover.

The re-assembly is precisely opposite to disassembly.

Torque:

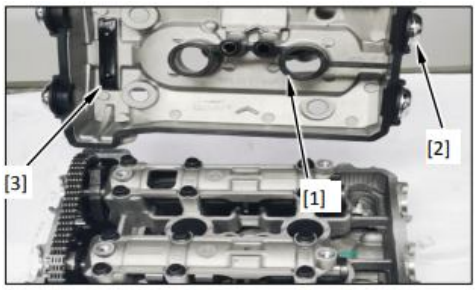
Cylinder head cover's bolt: 10N.m

Pay attention to:

Replace also the seal ring and limit plate of chain for cylinder head cover.

When re-assembling, install the seal ring of cylinder head cover onto decorative cover, then install into the groove on the cylinder head cover.

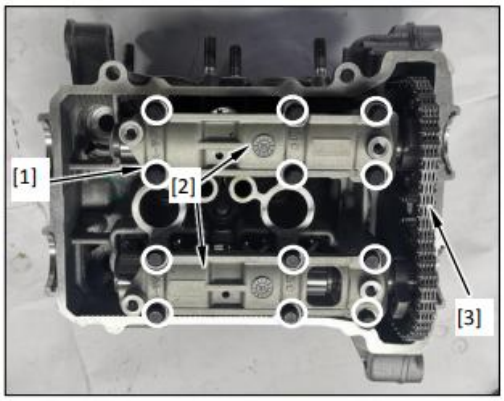
Be careful, the limit plate of chain drops into engine is not allowed.



Camshaft/Tappet

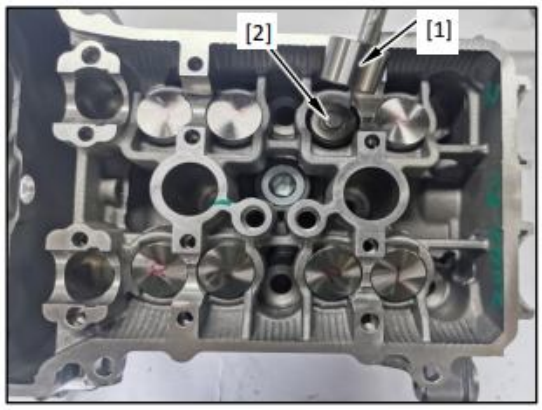
Remove the cylinder head cover.
Make sure the crankshaft and cam are under condition for installation..
Remove the seal bolt [1] and seal washer [2].
Turn the tensioner anticlockwise by socket hexagon wrench with size of S3.

Alternatively loosen the bolt [1] for camshaft bracket by 2-3 times, then remove the camshaft bracket [2] from the cylinder head.
Pay attention to:
Alternatively loosen the bolts on camshaft bracket inwards by several times, otherwise the camshaft bracket may damage.
Forcedly remove the positioning pin form camshaft bracket is not allowed.



Move apart the chain [3] from sprocket wheel, then remove the camshaft.

Lift up the tappet[1]
Remove the adjusting shim [2] for valve.
Pay attention to::
Be careful, the adjusting shim of valve drops into engine is not allowed.
Mark up the shim and tappet for correct re-assembly.
Take out the shim by magnet rod or tweezers will be easier.



Check

Check the damage, wear-out, distortion, burn-out or blocked passage for parts below;

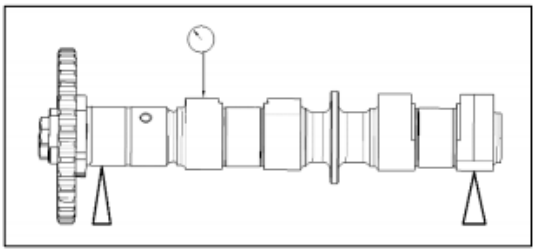
Sprocket wheel for cam/Camshaft

Camshaft's bracket/Positioning pin

Adjusting shim for air valves

Tappet

Measure each part according to specification of cylinder head/valves.



Runout of camshaft

Fix the both ends of camshaft by V-shaped piece, then measure its runout by dial scale.

Limit for repair: 0.03mm.

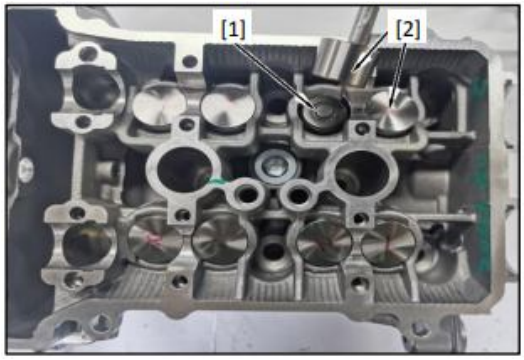
Re-assembly

Make sure the crankshaft is under the condition for re-assembly.

Pay attention to:

Draw the chain to tension when camshaft haven't installed, the tensioner is out, and turning the crankshaft, the chain makes jamming for crankshaft is not allowed.

Install the adjusting shim [1] of air valve and tappet back to base ring of valve in turn on their origin position.



Pay attention to:

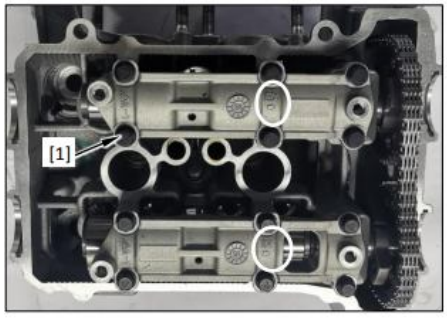
The shaft shoulder without groove [1]: The air inlet camshaft

The shaft shoulder with groove [2], The air exhaust camshaft

When re-assembling, draw the chain on air exhaust side to tension, and install the air exhaust camshaft first.

Coat the cam, journal, and working surface of camshaft with oil.
Coat all the surface of cam's chain with oil.
Matching and install the chain of cam to its sprocket wheel, then install the camshaft onto the cylinder head.

Align the mark I [1] on cam's sprocket wheel, mark E [2] on exhaust cam and upper surface of cylinder head as picture shows.

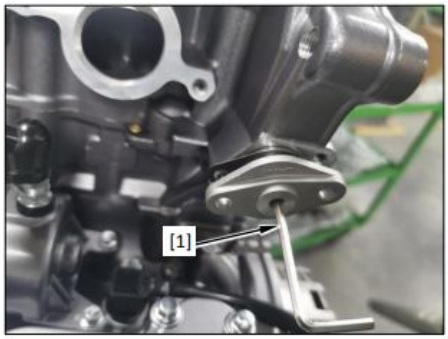


Make sure the pin's hole on cylinder head align with positioning pin on camshaft's bracket.
Install each camshaft's bracket in their place, and make sure the arrow point at the chain chamber as picture shows.
Camshaft's bracket for air inlet ("IN"➔)
Camshaft's bracket for air exhaust ("EX"➔)

Bolts on camshaft's bracket: M6X40mm [1]
Fasten the bolts on camshaft's bracket to fixed torque by 2-3 times in alternative sequence. The torque and fastening please refer to Page 1-16.

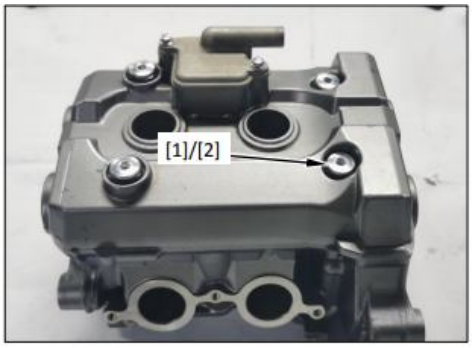
Pay attention to:
Replace the camshaft's bracket with cylinder head as a complete set.
The code on camshaft's bracket must be the same with that on cylinder head.
Coat the thread and seal surface of bolts on camshaft's bracket with oil..

Pull off the socket hexagon wrench [1] at the tail of tensioner, then turn the crankshaft for several rounds, then adjust again to the condition for installation, then check again the valve's timing.



Check the adjusting clearance for valves (Refer to the page 2-5)

Install the bolt [1] on cylinder head cover, and replace the gasket [2] for a new one.



Install the cylinder head cover.

Cylinder head

Disassembly

Remove the parts below in turn:

Muffler

Air filter and air inlet tube

Water tube joint for engine

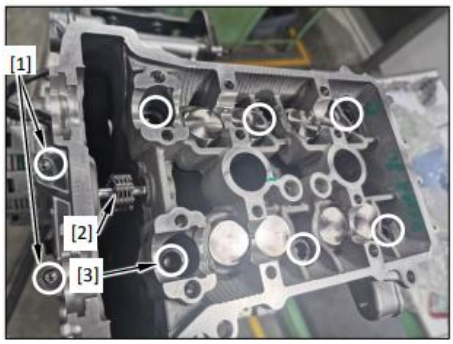
Connectors for electrical parts

Other sheltering parts on the motorcycle

Remove the engine from motorcycle and put it on the working bench, then remove the cylinder head cover, camshaft, tappet and adjusting shim for valves according to the description in the last section

Remove the bolt [1] of 6mm.

Remove the tensioning bolt [2] for chain chamber in cylinder head.



Before removing the bolts, suck out the oil in the groove of bolt with size of 8mm.

Loosen the bolts [3] on cylinder head by 2-3 times in alternative sequence, then remove the bolts.

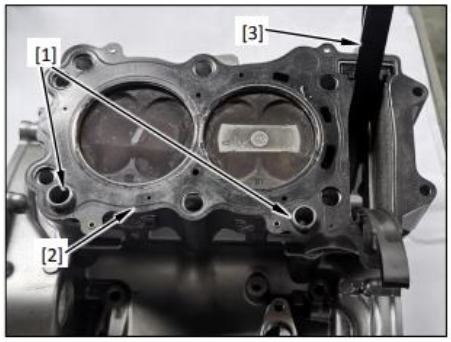
Remove the cylinder head.

Pay attention to

Heavily knock the cylinder head is not allowed, damage the combination surface by some tools like lever is not allowed either.

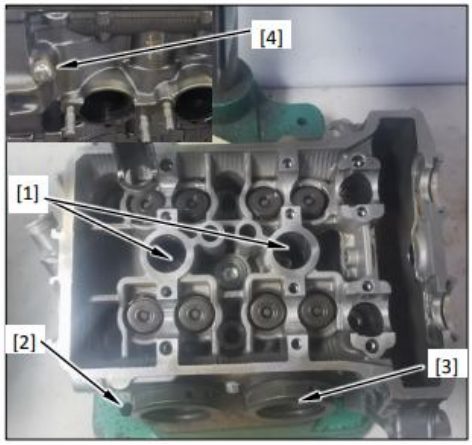
Remove the positioning pin [1] and gasket [2].

Remove the guiding plate [3] of chain.



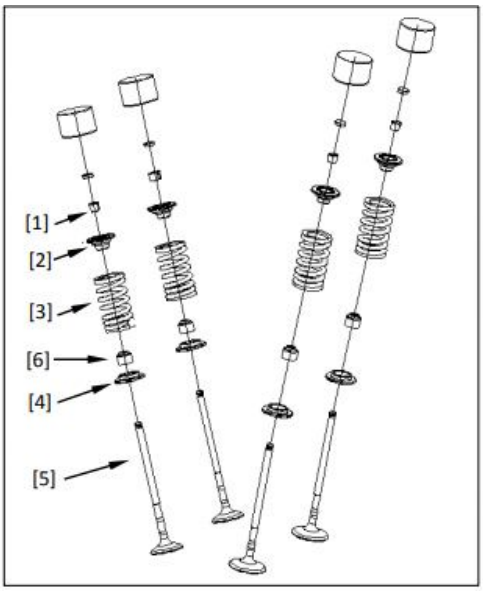
Disassembly

Remove the parts below:
Spark plug [1]
Water temperature sensor [2]
Air inlet tube and its seal ring [3]
Oil viewing bolt and flat washer [4]



Remove the valve locking clip by the tool for it only
Tool:
Compression tool for valve spring
Compression accessories for valve spring

Remove the compression tool for valve spring and the parts below:
Locking clip [1]
Spring base [2] of upper valve spring
Outer spring [3] for valve
Base ring [4] for lower valve spring
Air valve [5]
Oil shield cover [6].

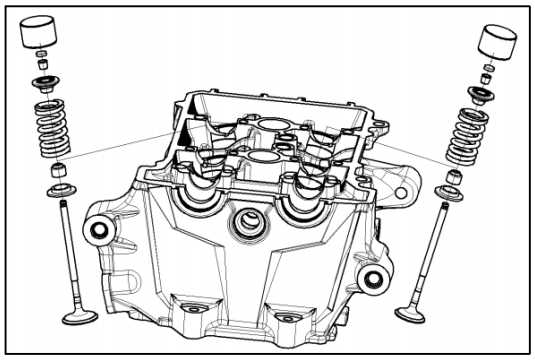


Pay attention to:
Damage the surface of valve base and combination surface of cylinder body is not allowed.
Too strong the force on valve spring is not allowed to avoid its permanent distortion.
Mark up each removed parts when removing for a easy re-assembly.
Clean up the carbon buildup in combustion chamber and the surface of cylinder head gasket.

Check

Check and confirm the damage, wear-out, distortion, burn-out or oil passage block for the parts below.
Cylinder head
Outer spring
Air valve
Valve guiding tube
Guiding plate for chain

Re-assembly



Wash up the cylinder head set by solvent, then blow and wash up all the oil passage by compressed air.

Lubricate the oil shield cover [1] by oil.

Re-assemble the spring base [2] of lower valve and then the oil shield cover.

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

Insert the valve [3] into its guiding tube, slowly turn the valve when inserting to avoid damage the oil shield cover.

Re-assemble the outer valve spring [4], the side with more coil concentration faces to combustion chamber.

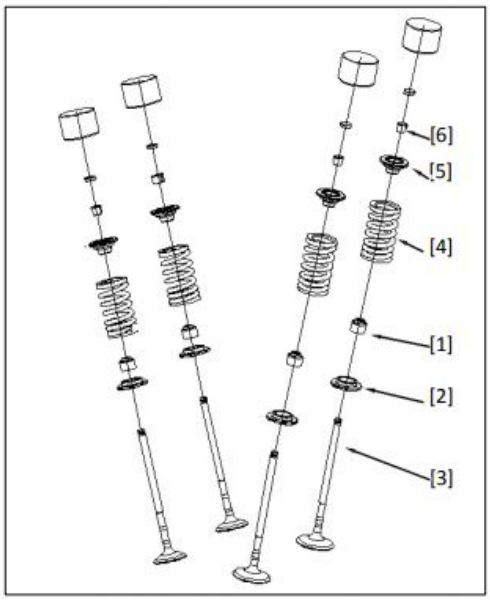
Re-assemble spring base ring [5] for upper valve.

Re-assemble the valve locking clip [6] by the tool for it only.

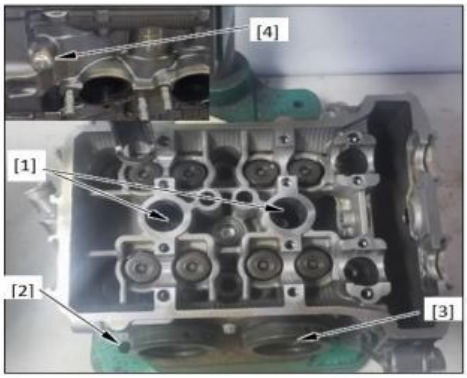
Tool:

Compression tool for valve spring

Compression accessory for valve spring



Re-assemble the parts below:
Spark plug [1]
Water temperature sensor [2]
Air inlet tube and its seal ring [3]
Oil viewing bolt and flat washer [4]



Re-assembly

Clean up all the residual gasket material on combination surface of cylinder.
Pay attention to:
The dust and dirt get into cylinder are not allowed.

Pull up the chain, assemble the guiding plate [1] of chain, while making its protrusion align with the groove on cylinder.

Re-assemble the positioning pin [1] and new gasket [2].

Get the timing chain through the cylinder head, then install the cylinder head to cylinder body.
Coat the thread of cylinder head fastening bolt (8mm) and its base surface with oil for engine only.
Install the fastening bolts for cylinder head by 2-3 times in alternative way and then fasten them to required torque.
The required torque: Refer to Page 1-5

Tensioner

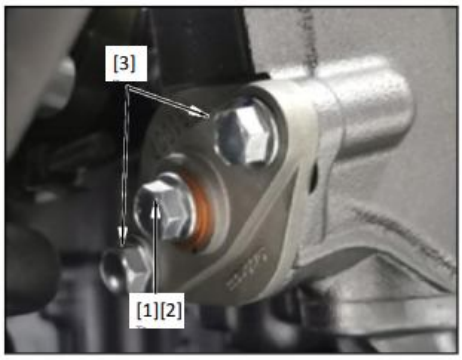
Disassembly/Re-assembly

Remove the seal bolt [1] and flat washer [2].

Turn the tensioner anticlockwise by the tool for it only, and make sure the tensioner completely moves back.

Tool:

The socket hexagon wrench of size 3mm.



Remove the installation bolt [3] for tensioner.

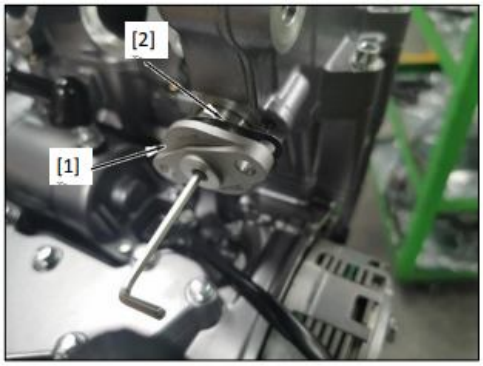
Remove the tensioner [1] and gasket [2].

The re-assembly is precisely opposite to disassembly.

Fastening torque: 10N.m

Pay attention to:

Replace the gasket for a new one

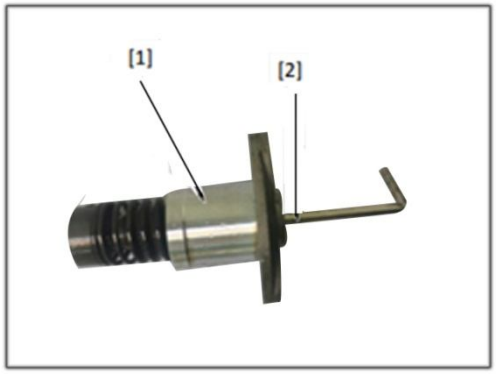


Check

Check the working performance for tensioner.

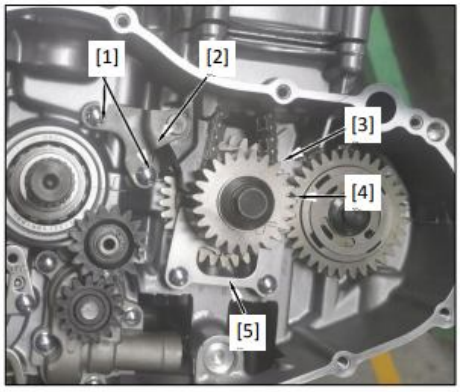
When pressing the adjusting rod of tensioner, whose rod pressed into the adjustor is not allowed.

When turning the adjusting rod by socket hexagon wrench [2] of 3mm anti clockwise, the rod shall get back to tensioner; When removed the tools, the adjusting rod shall jump out immediately.



Timing chain/Sprocket wheel

Disassembly



Remove the parts below:
Cylinder head cover
Camshaft
Tensioning bolt for chain chamber of cylinder head
Right crankcase cover set
Clutch set
Bolt for primary driving gear and its shim
Primary driving gear
Remove the bolt [1], tensioning plate [2] of chain.
Remove the timing chain [3] and timing sprocket [4] from crankshaft, then remove the check plate [5] of timing sprocket wheel.

Check

Check and confirm the scratch, damage, wear-out or distortion on the parts below, replace if it is necessary.
Timing chain
Tensioning plate for chain
Timing sprocket wheel

Re-assembly

Re-assemble the timing and driving sprocket wheel
Coat all the surface of timing chain with oil, then match and assemble with timing and driving sprocket wheel.

Coat the thread of installation bolt for tensioning plate with Loctite.
Re-assemble the chain's tensioning plate and bolts.
Fasten the installation bolts of chain's tensioning plate to required torque.
Torque: 10N.m
Re-assemble the parts below:
Primary driving gear
Outer case of clutch
Right crankcase cover set
Camshaft
Cylinder head

6 Clutch and gearshift device

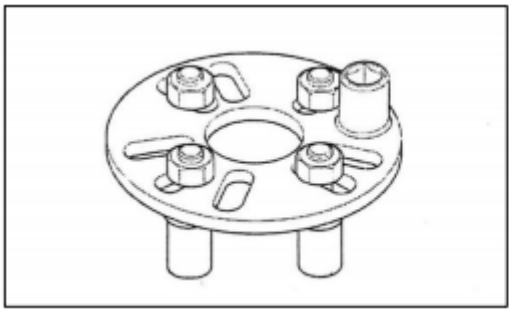
Information for maintenance

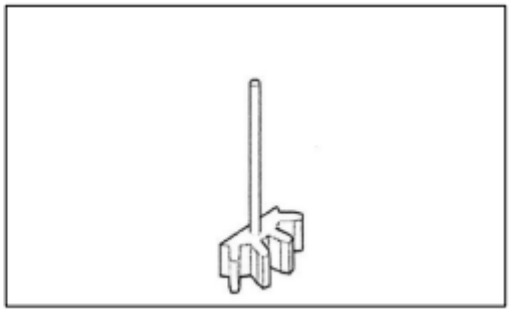
Summary

This chapter mainly introduce the maintenance or repair for clutch and gearshift system. All the operation in this chapter needn't remove the engine from frame.

The thickness and level of oil may have influence on clutch's separation. In case the motorcycle runs slow when clutch separated or failed to separate, check the oil level before inspecting the clutch system.

Tool





Specification for clutch and gearshift system

Unit: mm

Items		Standard	Limit for repair
Free travel of clutch lever		10.0-15.0	---
Clutch	Free length of spring	48.5	46.3
	Thickness of friction plate	2.9-3.1	2.8
	Flatness of driven plate	---	0.10
Clutch collar	Inner diameter	22.000-22.018	22.031
	Outer diameter	27.965-27.98	28
Outer diameter of main shaft at clutch collar's position		21.993-21.980	21.95

Troubleshooting

Difficult fast holding for clutch lever
Damaged, intertwisted, or dirt clutch cable
Incorrect wiring for clutch cable
The pushing device for clutch damaged
The bearing of clutch pushing rod get failed
Incorrect installation for clutch operation lever

Clutch goes skidding when it is in acceleration
The clutch pushing rod gets jamming
The driving friction plate goes wear-out
Poor performance of clutch spring
The clutch lever without free travel
The molybdenum disulfide or graphite got into oil

The motorcycle runs slow when clutch goes separated or failed to separate
Too long the free travel of clutch lever
The warping on friction plate
Too high the oil level, wrong oil thickness or adopted some oil additives
The locking nut of clutch center case goes loosened
The pushing device of clutch damaged
Incorrect installation of clutch operation lever
The inserting groove of clutch outer case and gear groove of clutch worn out
Incorrect clutch operation

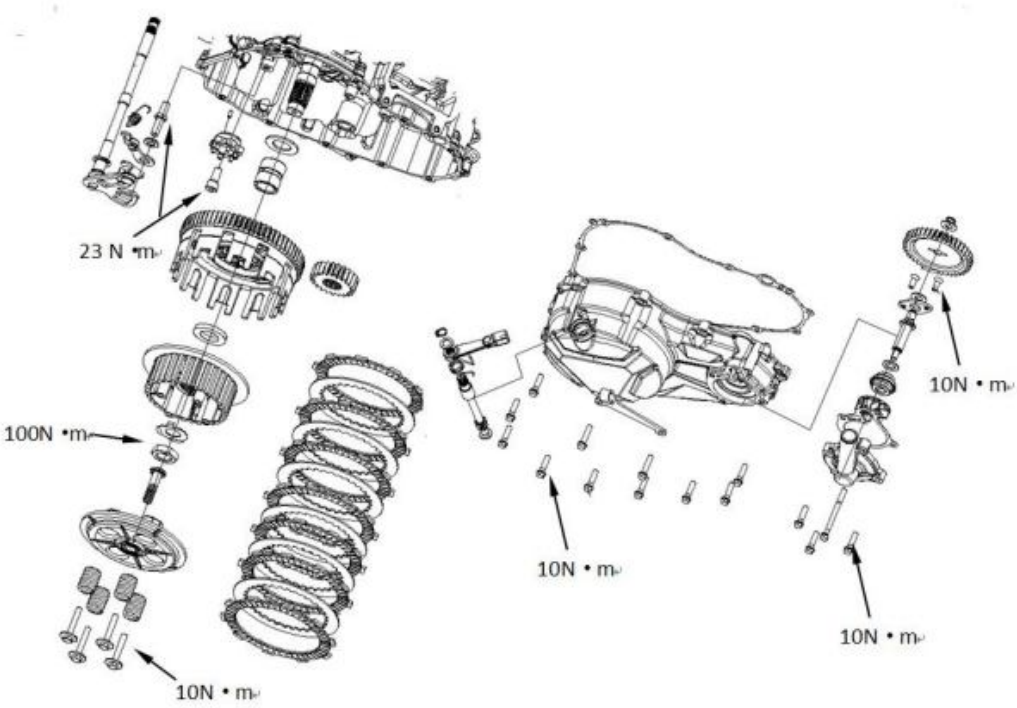
Hard gearshift
Incorrect adjustment for clutch cable
Incorrect clutch operation
Wrong oil thickness
The shifting fork gets damaged or bent
The shifting fork's shaft gets bent
The shifting fork's claw gets bent
The bolt of shifting fork's plate gets loosened
The shifting fork's plate damaged
Guiding groove of gearshift drum damaged
The shifting fork's plate worn out or damaged

The transmission gear runout
The check plate worn out
The poor performance for returning spring of check plate or damaged
The bolt on shifting fork's plate gets loosened
The shifting fork's plate damaged
The shifting fork's shaft goes bent

The shifting fork damaged or gets bent
The meshing surface between gears of gear groove damaged

The gear shift pedal fails to get back
The poor performance of returning spring of gearshift shaft
The gearshift shaft gets bent or damaged

The layout of components



Right crankcase cover

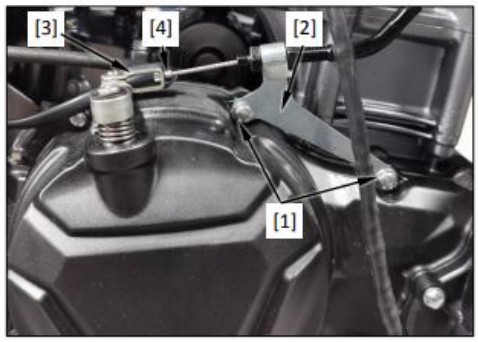
Disassembly

Remove the sheltering part on the motorcycle.

Drain off the oil in the engine and the coolant.

Remove the bolt [1] and locating plate [2] on the clutch cable.

Remove the clutch cable [4] from the clutch operating arm [3].



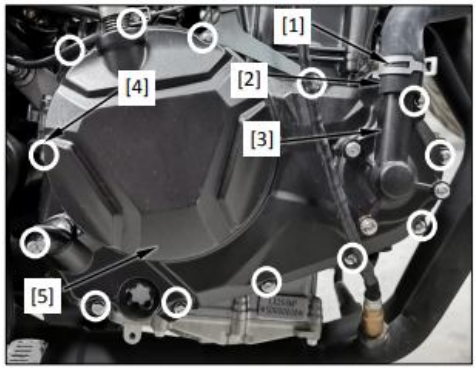
Remove the clamp [1] pf water tube, then remove the water inlet tube [2] from the cover [3] of cooling pump.

Loosen the bolts [4] on right crankcase cover alternatively by 2-3 times.

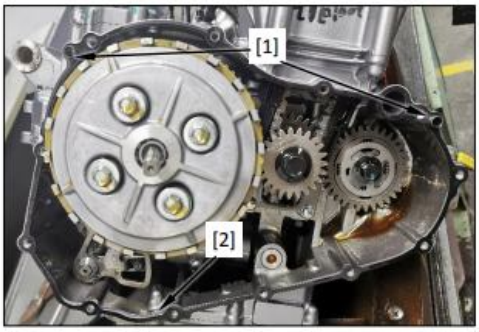
Remove the parts below:

Bolt

Right crankcase cover [5].

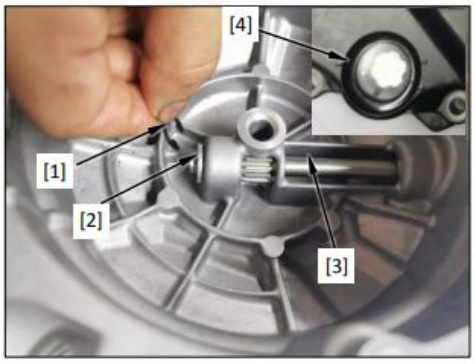


Remove the positioning pin [1] and gasket [2].



Disassembly/Re-assembly

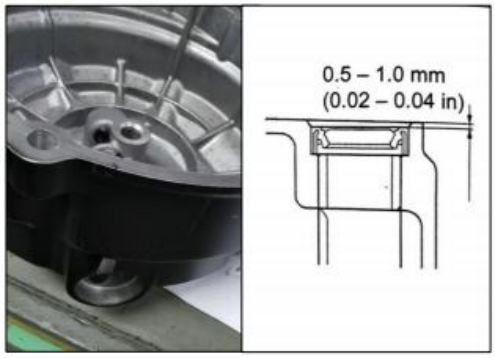
Remove the elastic circlip [1], then remove the shim [2].



Please pay attention to:
The removed circlip must be replaced for a new one when latter re-assembling.

Remove the operating rod [3] of clutch.
Remove the view window [4].
Remove the oil seal from right crankcase cover.

The re-assembly is precisely opposite to disassembly
Please pay attention to:
Re-assemble the oil seal and oil view window to the given depth as picture shows.
Coat the clutch operating arm and sliding surface of pushing rod with oil.



The removal of each part of cooling pump refer to the Page 3-9.

Re-assembly

Make the angle of gear rack of clutch drawing rod face backwards and align with the combination surface of crankcase.
Install the gasket and positioning pin;
Assemble the right crankcase cover;
Install the locating plate of cable and fasten the bolt.
Torque:
Bolts on right crankcase cover: 10N.m

Remove again the circlip [1] and flat washer [2]

Remove the operating arm [3] and twisting spring [4], adjust their angle and assemble again as right picture shows, turn the operating arm clockwise, let the concave point on clutch operating arm align with the triangle mark on right crankcase cover when it just contacted the clutch.

Please pay attention to:

Replace the gasket on right crankcase cover for a new one.

Replace the removed circlip for a new one.

The two bolts on the locating plate of clutch cable are with different length with the surroundings, who must be coated with Loctite.

Adjust the free travel of clutch lever.

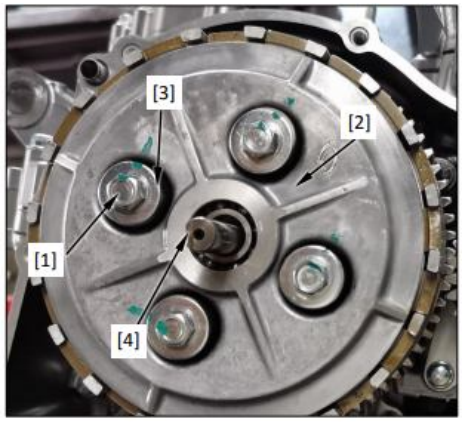
Fill up the crankcase with our suggested oil, then check and confirm the leakage.

Clutch

Disassembly

Remove the right crankcase cover.

Loosen and remove the bolt [1] of clutch lifting plate alternatively by 2-3 times, then remove the pressing plate [2], clutch spring [3] and clutch pushing rod [4].



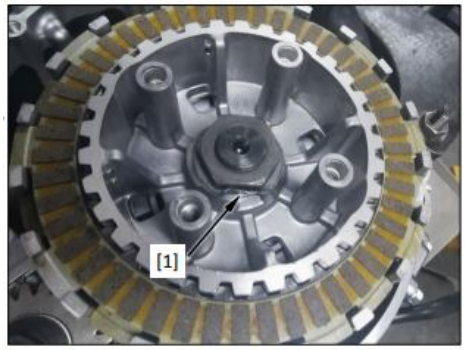
Please pay attention to:

Under this kind of situation, the driving or driven friction plate could be replaced alone.

Break up the locking flange of washer [1] of clutch central locking nut.

Please pay attention to:

Damage the surroundings of clutch is not allowed, and please keep it clean.

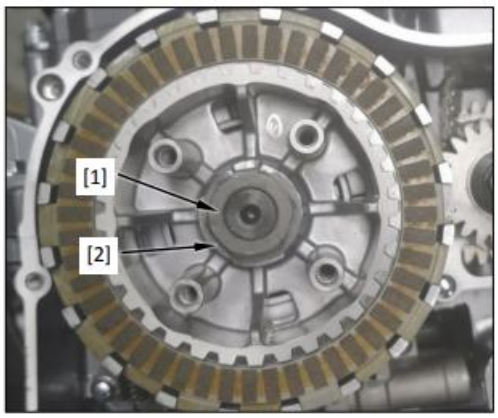


Fix the pressing plate of clutch by tools, meanwhile loosen the locking nut.

Tools:

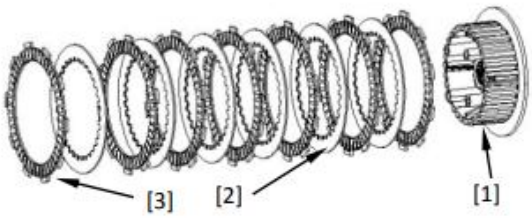
[1] The locating plate for central case

Remove the locking nut [1] and shim [2].

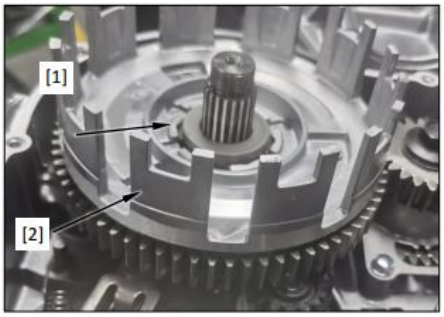


Remove the central case [1] set of clutch.

Remove the parts below:
Central case [1]
Driving friction plate [2] of clutch
Driven friction plate [3] of clutch.



Remove the thrusting washer [1].
Remove the outer case [2] of clutch.



Remove the collar [1] of clutch and its washer [2].

Check

Check and confirm the scratch, damage, wear-out or distortion on parts below, in case there is, please replace.

Clutch lifting plate

Spring

Central case

Flat washer.

Disc spring

Driving and driven friction plate

Clutch outer case/Primary driven gear

Clutch collar

Measure each part according to the specifications of clutch and gear shifting device.

In case any part passed the limit for maintenance, please replace.

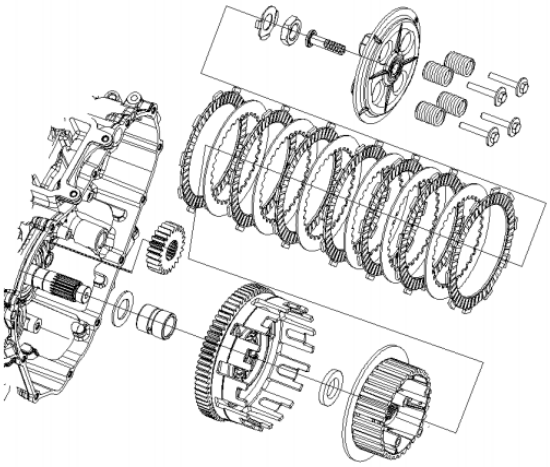
Please pay attention to:

Replace the springs of clutch as a complete set.

Replace the driving and driven friction plate as a complete set.

Replace the removed locking nut and its washer for new ones when re-assembling.

Re-assembly

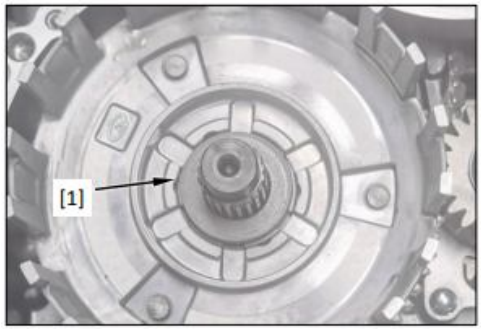


Coat the outer surface of outer collar of clutch with oil, then install the flat washer [1] and clutch collar [2] to the main shaft.

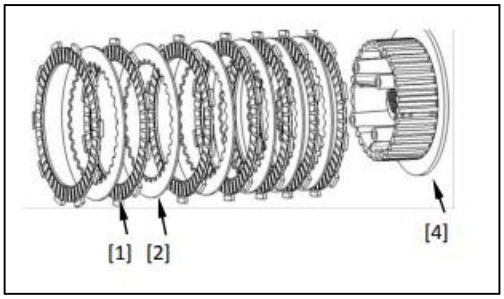
When re-assembling the outer case, turn the bridge gear [1] of oil pump to make sure its smooth meshing and matching.

Please pay attention to:
Make sure assemble the outer case in place, the upper end surface of plate-shaped gear on clutch outer case shall be aligned with that primary driving gear.

Install the thrusting washer [1].

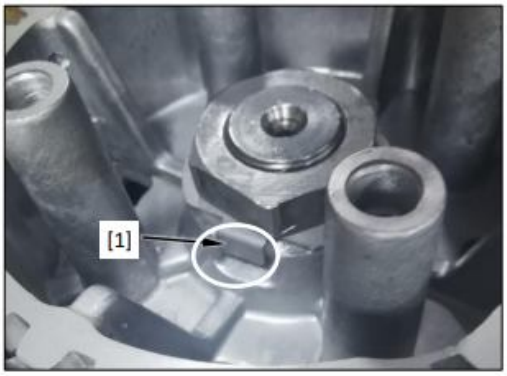


Install the central case [4] onto the main shaft, start from the driving friction plate [1], install the driving friction plate and the driven friction plate [2] in turn.



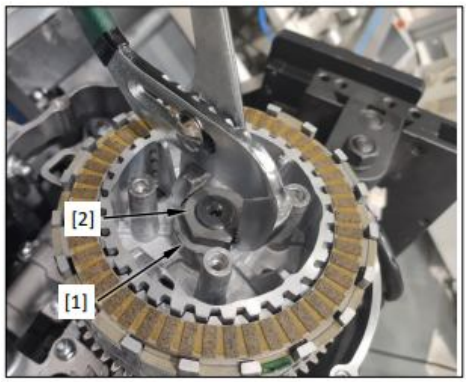
Please pay attention to:
Get the teeth on driving friction plate with the tooth's groove on outer case one by one, the driving friction plate on the top align with the short tooth's groove of clutch as picture shows.

Install the locking washer [1]. Please align the clip of locking washer with groove on central case.
Coat the locking nut of clutch, thread and base surface with clean oil, then install the locking nut onto main shaft

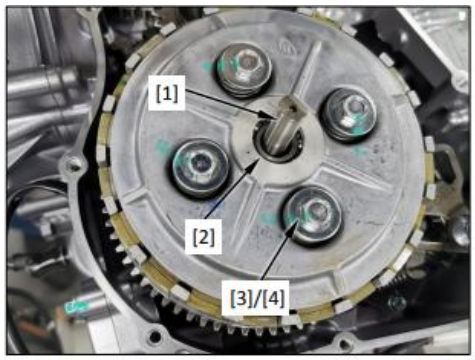


Fix the central case of clutch by tools, then fasten the locking nut to given torque.
Tool:
Fixing plate of central case
Torque: 100N.m

Pry up the part between & aligning with the ridge edge of locking nut [2] and clip on locking washer [1] by tool, make it tightly stick to locking nut.



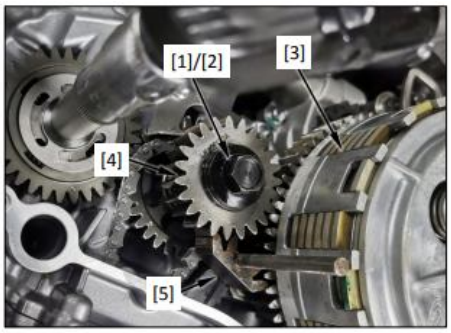
Get the drawing rod [1] through the bearing hole of lifting plate [2] and install in place.
Install the clutch spring [3] and fastening bolt [4].
Slowly and alternatively fasten the bolts of lifting plate, then fasten to the given torque.
Torque: 10N.m



Install the right crankcase cover

The primary driving gear

Disassembly



Remove the right crankcase cover.

Fix the primary driving gear and outer case of clutch by tool [5], then remove the bolt [1] and washer [2] of primary driving gear.

Remove the outer case set [3] of clutch.

Remove the primary driving gear [4].

Tool:

[5] Tooth stopper, m=2

Check

Check and confirm the scratch, damage, wear-out or distortion on parts below, in case it is, please replace.

Primary driving gear

Bolt

Washer

Re-assembly

Is precisely opposite to disassembly.

Please pay attention to:

Install the primary driving gear first, then the outer case of clutch.

Tool:

Tooth stopper, m=2

Torque: 60N.m

Re-assembly of right crankcase cover

Gearshift device

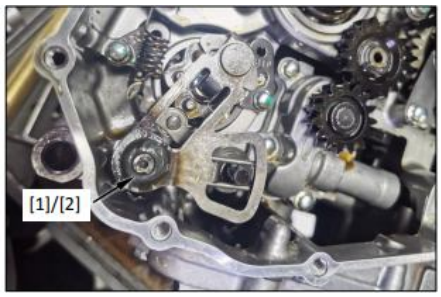
Disassembly

Drain off the oil, and remove the parts below:

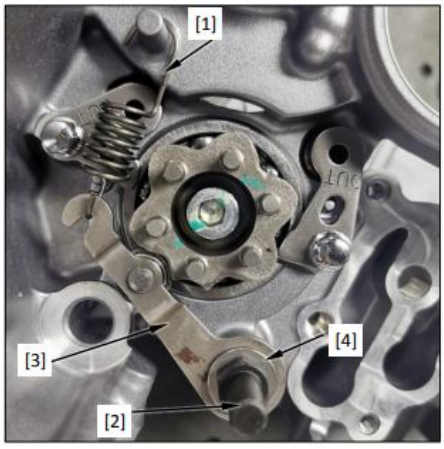
Clutch set [1]

Remove the gearshift pedal and clean up the spline.

Pull out the gearshift shaft set [1] and thrusting washer [2] from the crankcase.

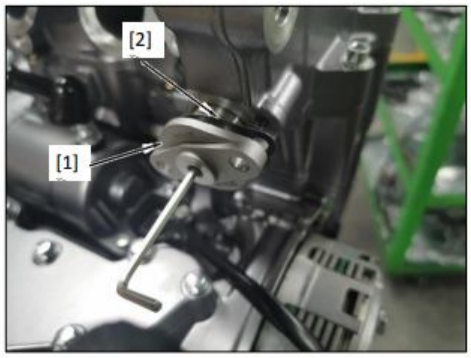


Remove the return spring [1] and bolt [2] of check plate, then remove the check plate [3] itself and its washer [4].



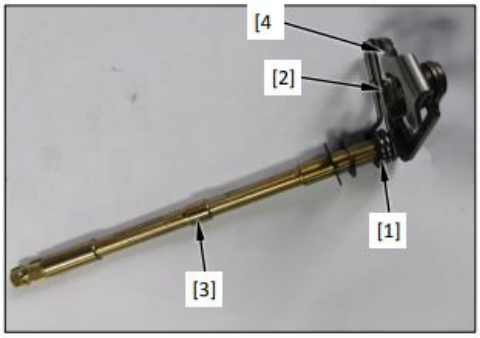
Remove the oil seal [1] of gearshift shaft from the lower crankcase body.

Remove the parts below:
Socket hexagon bolt [1] of five star-shaped turning plate.
Five star-shaped turning plate [2].



Check

Check and confirm the damage, wear-out or distortion on the parts below, in case it is, please replace:
Five star-shaped turning plate
Check plate
Returning spring of check plate



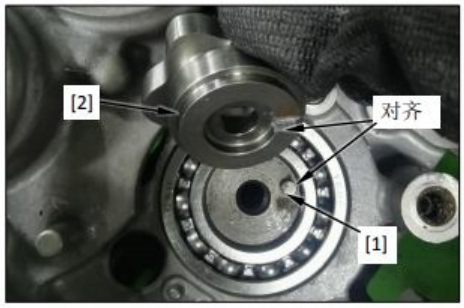
Check and confirm the wear-out or fatigue on twisting spring [1] of gearshift arm and that [2] of gearshift turning plate; Check and wear-out and distortion of gearshift spindle; Check and confirm the wear-out, damage or distortion on gearshift turning plate [4]; In case it is, please replace the gearshift arm as a complete set.

The re-assembly

Coat the thread of locating bolt of five star-shaped turning plate with Loctite.

Install the positioning pin [1] into its hole on gearshift drum. Install the five star-shaped plate and align its narrow groove with positioning pin. Install the locating bolt onto five star-shaped turning plate, then fasten the given torque.

Torque: 24N.m



Install the collar [1] of check plate and the plate [2] itself to the bolt of the check plate, then coat the thread of check plate's bolt [3] with Loctite, re-assemble to crankcase body, then fasten the given torque.

Torque: 22N.m

Please pay attention to:

When re-assembling, the protrusion of collar face to the crankcase body, the rolling wheel of check plate face to the case body.

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

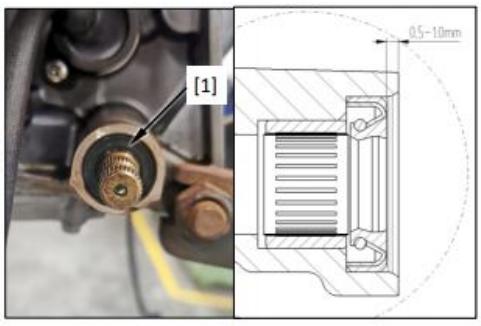
Install the thrusting washer and gearshift arm set into crankcase, then align them with gearshift twisting spring and bolt of check plate.

Install the oil seal [1] of gearshift spindle onto lower crankcase body.

Please pay attention to:

Install the oil seal to given depth as picture shows.

Install the clutch set and right crankcase cover, then check the oil volume.



7 Magneto and starting clutch

Information for maintenance

Summary

This chapter mainly introduce the maintenance for stator and rotor of magneto. All the operation in this chapter needn't remove the engine from frame.

The checks relate to charging coil of alternative motor.

The checks about the trigger.

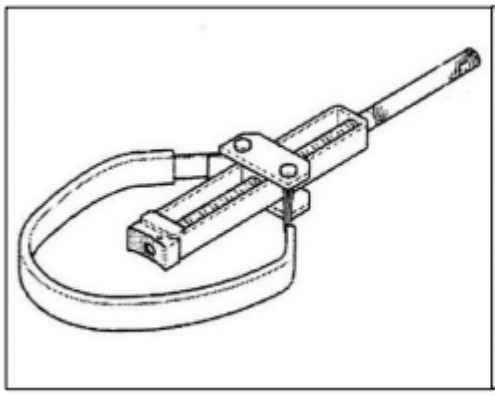
The maintenance and repair about the starting motor.

Specification of magneto and starting clutch

Items	Standard	Limit for repair
Outer diameter of starting plate shaped gear	42.195-42.208	42.175
Inner diameter of outer case of starting clutch	28.02-28.41	28.061

Tools:

Fixture for rotor



Fixture of removal for magneto

Troubleshooting

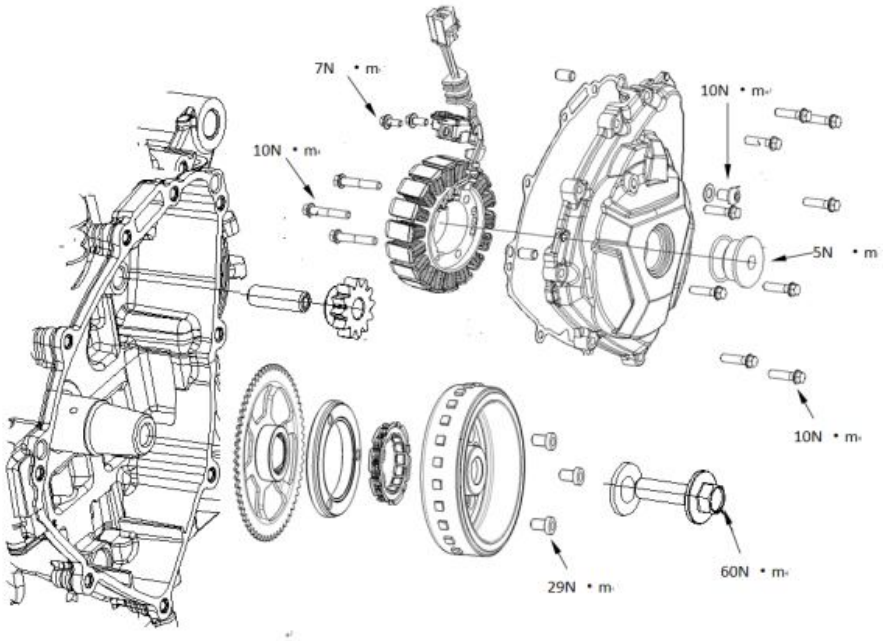
The starting motor is working while engine not

The failure of starting clutch

The failure of double gear of shaft of starting motor

The failure or wear-out on smaller gear of starting motor

Position of components



Left crankcase cover

Disassembly/Re-assembly

Please pay attention to:

Lay a clean oil tray under the engine when disassembling the left crankcase cover to prevent the outflow of oil. After re-assembled, fill up with our suggested oil to give volume.

Put the motorcycle on flat ground and keep it upright.

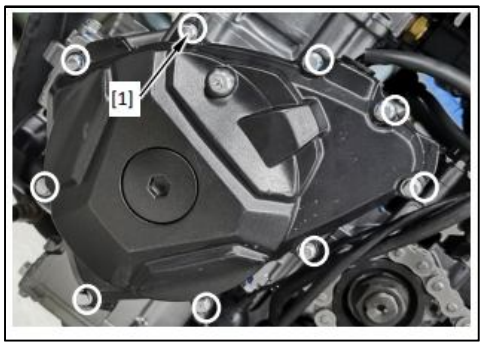
Remove the parts below:

The parts sheltering the motorcycle.

The socket plug of rectifier regulator.

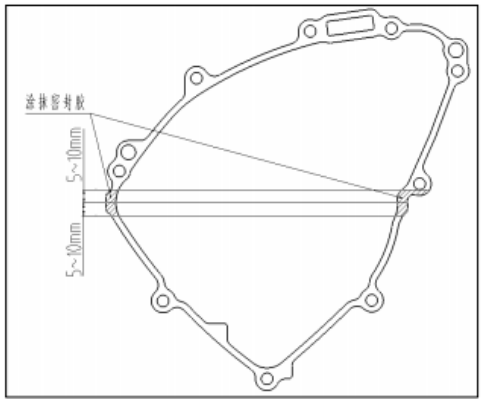
The socket plug of trigger.

Loosen the bolts [1] on left crankcase cover by steps in opposite angle way.
Please pay attention to:
The left crankcase cover (stator) bears the absorbing force from rotor, be careful when disassembling or re-assembling.



Remove the positioning pin [1] and gasket [2].
The re-assembly is precisely opposite to disassembly.
Torque:
Bolt on left crankcase cover: 10N.m

Please pay attention to:
Coat the combination surface of crankcase with sealing glue for end surface as picture shows.
Replace the gasket of left crankcase for a new one.
Check the oil level.
Make sure there is no oil leakage.



Stator of magneto and trigger

Disassembly/Re-assembly

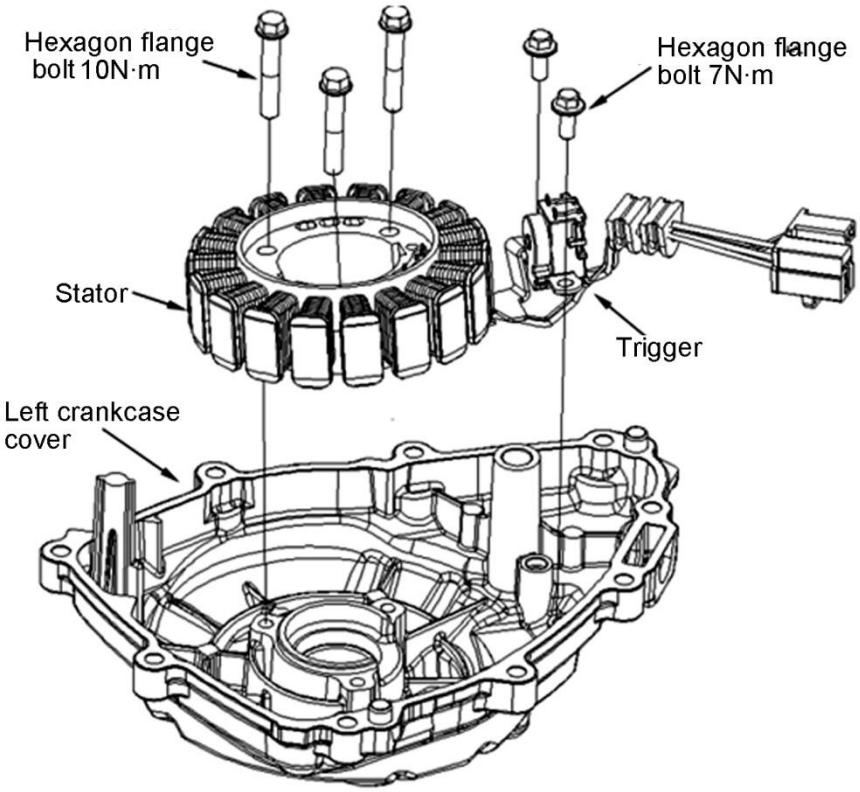
Remove the left crankcase cover.

The disassembly and re-assembly for stator and trigger are shown as below.

Coat the thread of bolt on stator and trigger with Loctite.

Coat the sealing surface of wire joint ring connecting magneto/trigger with sealing glue for end surface.

The re-assembly is precisely opposite to disassembly.

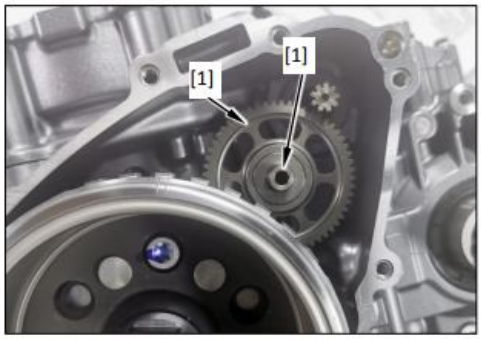


The rotor of magneto

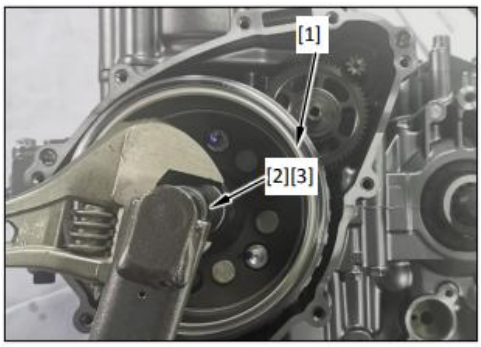
Disassembly

Remove the left crankcase cover.

Remove the double gear [2] and its shaft [1].



Fix the rotor [1] of magneto by its fixture, then loosen the bolt [2] and washer [3], then loosen the bolt outwards by 5-10mm, without complete removing for easy disassembly for rotor by fixture latter.



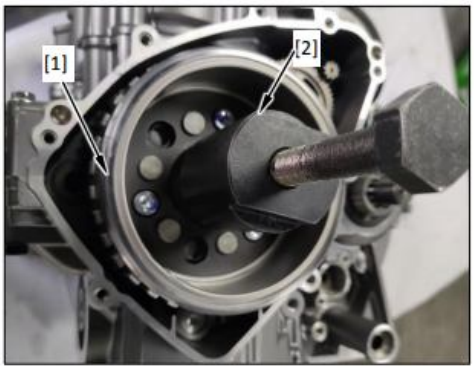
Remove the rotor [1] by tool.

Tool:

The removing fixture for rotor [2].

Please pay attention to:

To avoid the damage on thread of coning taper end by tool or fixture, the tool can't contact its top on crankshaft, contact the top of tool on the head of bolt.



Remove the bolt of rotor

Check

Check the scratch, damage, wear-out or distortion on the parts below, in case it is, please replace.

Shaft of double gear

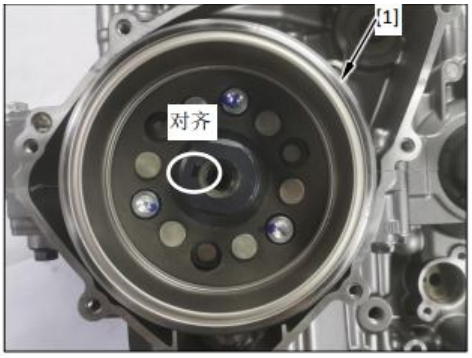
Double gear

Re-assembly

Check and confirm the damage on semi-key [1].

Totally clean up the oil and impurity on coning taper surface of crankshaft and inner hole of rotor.

Re-assemble the rotor [1], please align the semi-key on crankshaft with its groove on rotor.

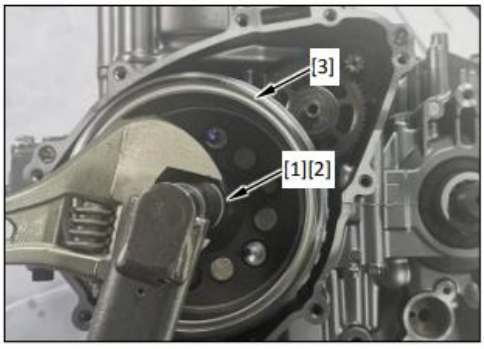


Coat the thread of bolt of rotor and its installation surface with clean engine oil.

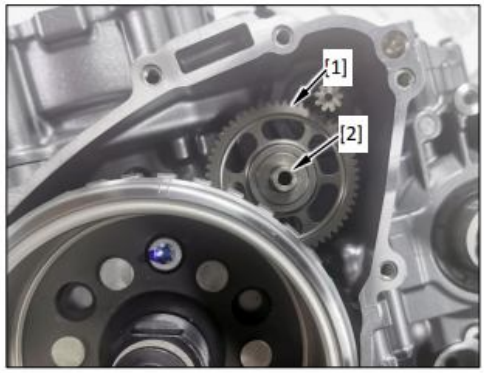
Install the shim [1] and bolt [2] of rotor.

Fix the rotor [3] by its fixture and fasten the given torque.

Torque: 60.Nm



Re-assemble the double gear [1] and its shaft [2].
Re-assemble the left crankcase cover.



Starting clutch

Check the operation for starting clutch

Remove the rotor.

Check the operating performance for starting clutch by turning the plate-shaped gear [1].

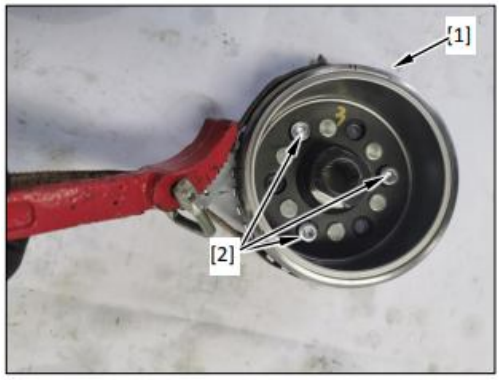
Turn the plate-shaped gear anticlockwise to confirm if it is smooth, and confirm if there is clockwise turn.

Disassembly

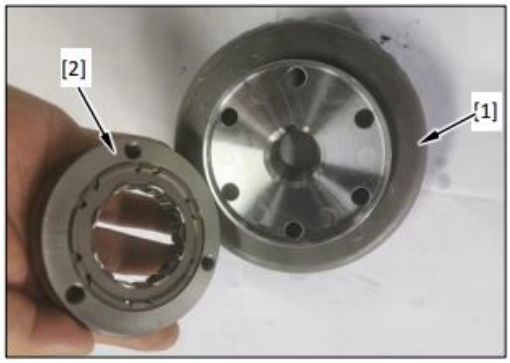
Remove the rotor.

Turn the plate-shaped gear [1] anticlockwise and remove it.

Fix the rotor [1] by its fixture.
Remove the fastening bolt [2] of starting clutch.



Remove the starting clutch set
Remove the starting clutch set [2] from rotor [1].



Check

Check and confirm the scratch, damage, wear-out or distortion on the parts below, in case it is, please replace.

Plate-shaped gear

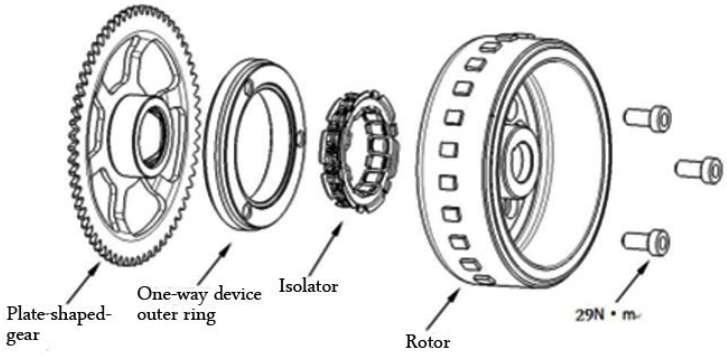
Roller path on outer case of starting clutch

Rolling ball of starting clutch

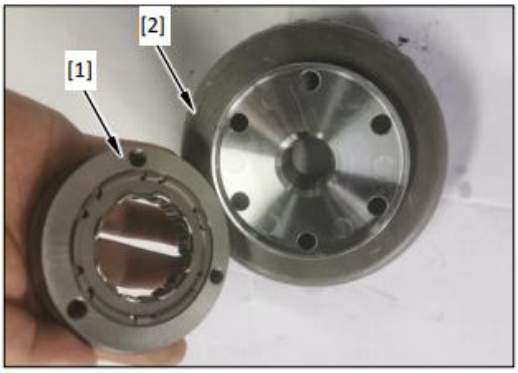
Please make sure every part meets the specification of magneto and starting clutch.

In case passed the limit for repair, please replace.

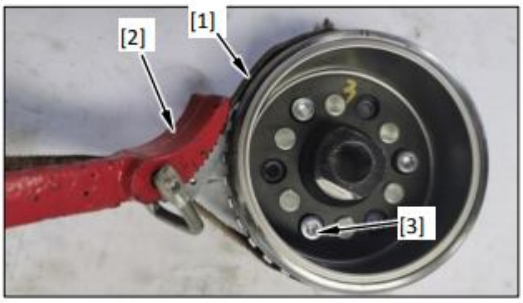
Re-assembly



Coat the contact surface of clutch with clean engine oil.
Install the starting clutch set body [1] onto the rotor [2].



Fix the rotor [1] by its fixture [2].
Please pay attention to:
Coat the thread of fastening bolt for clutch with Loctite.
Install the fastening [3] and screw it up to given torque.
Torque: 29N.m



Turn the plate-shaped gear [1] anticlockwise, then install it into the outer case of starting clutch.
Check the operating performance of starting clutch.

Re-assemble the rotor.

8 Crankcase and gear box

Information for maintenance

Summary

The crankcase must be opened to maintain or repair the parts below:

1. Gear transmission system

2. Crankshaft and connecting rod set

Remove the parts below before opening the crankcase:

1. Cylinder head set

2. Cylinder body set

3. Valves and relative parts

4. Oil bottom case and oil sucking tube

5. Oil pump set

6. Secondary oil filter

7. Right crankcase cover set

8. Left front cover set

9. Starting motor set

10. Clutch set

11. Bridge gear of oil pump

12. Cover of breathing groove

Damage the combination surface of crankcase body is not allowed when repairing.

Wash the combination surface and oil passage before re-assembling the crankcase.

Before the combination of crankcase, evenly spread the sealing glue on the combination surface, and the surplus glue need be cleaned up.

Mark up the crankshaft pads by suitable colors, select the pads according to its table of requirement, the incorrect color of crankshaft pad may lead to heavy damage on engine.

The specification for crankcase and gear box

Unit: mm

Items			Standard	Limit for repair
Gear box	Inner hole's diameter of gear	M5	24.02-24.033	24.053
		M6	20.226-20.237	20.257
		C3, C4	24-24.021	24.041
		C1	23-23.015	23.035
	Outer diameter of shaft jacket	C1	22.97-22.995	22.95
	Inner diameter of shaft jacket	C1	20-20.015	20.035
	Diameter of main shaft	Matching with shaft jacket of size M5	23.979-24	23.959
		Matching with shaft jacket of size M6	20.186-20.204	20.166
		C3, C4	23.975-23.99	23.955
		C1	19.974-19.987	19.954
Turning fork and its shaft	Diameter of turning fork shaft		13.966-13.984	1.946
	Inner diameter of turning fork		14-14.018	14.038
	Thickness of turning fork's tip		5.93-6.00	5.9

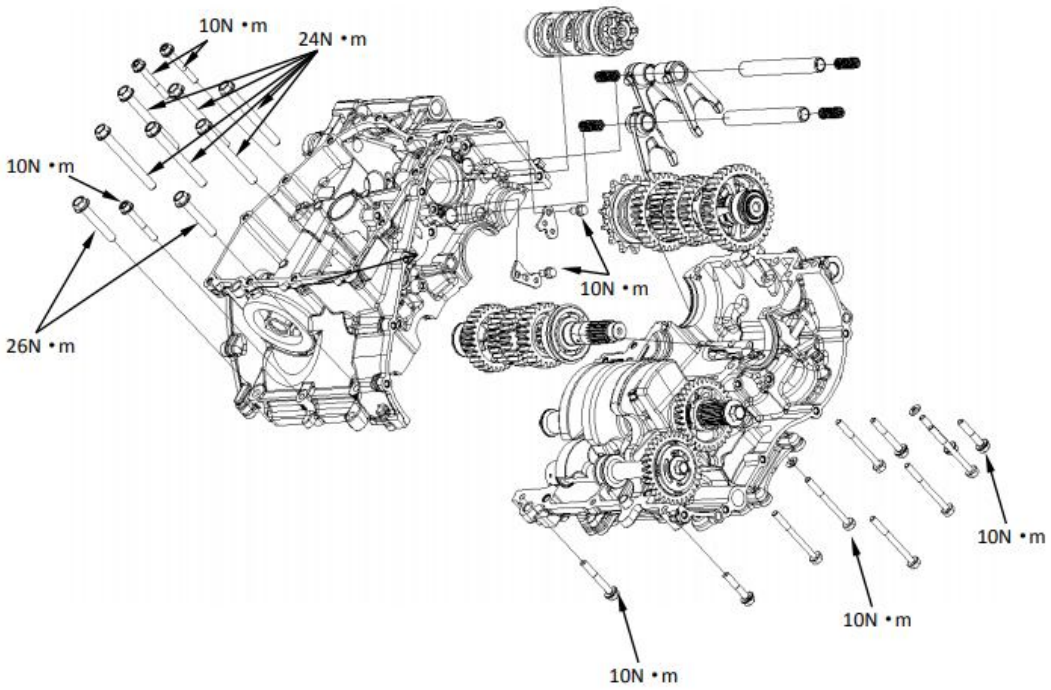
Troubleshooting

Noisy engine

The transmission gear worn out or damaged

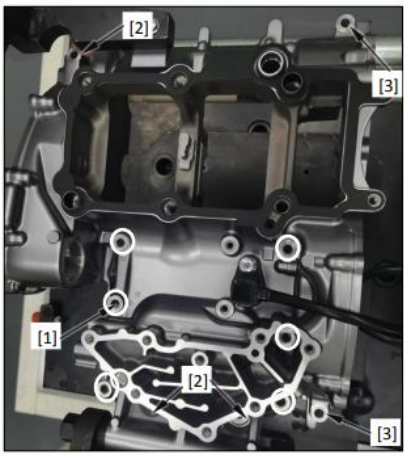
Transmission shaft worn out r damaged

Components‘ layout



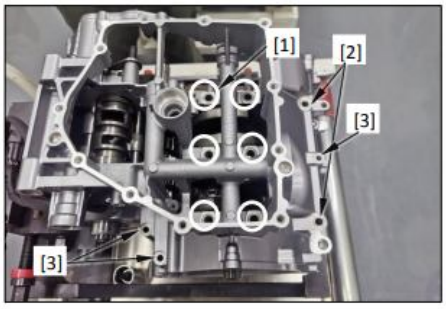
Crankcase body

Disassembly and re-assembly

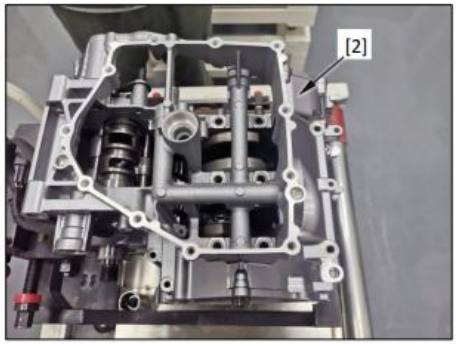


Remove the parts below
Left crankcase cover set
Right crankcase cover set
Starting motor set
Secondary oil filter
Oil bottom case
Oil sucking tube set
Clutch set
Oil pump set
Bridge gear of oil pump
Covering plate of breathing groove
Loosen the case combination bolts M6X65 [1], M6X45 [2] and M6X35 [3] by 2-3 times

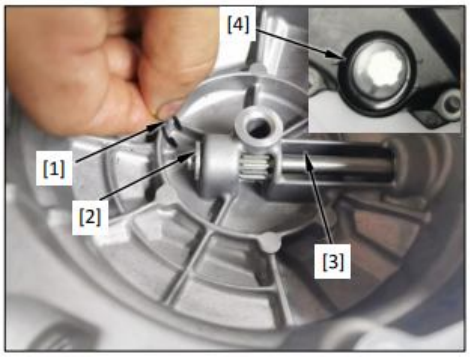
Turn over the engine
Loosen the case's bolts M8X80 [1], M8X50 [2] and M6X45 [3] by 2-3 times, then remove all the bolts and flat washers.



Remove the lower crankcase body [2] from the upper one (Prying up the combination surface of crankcase is not allowed, slightly knock the none-machining surface by rubber hammer is an easy way for removal).



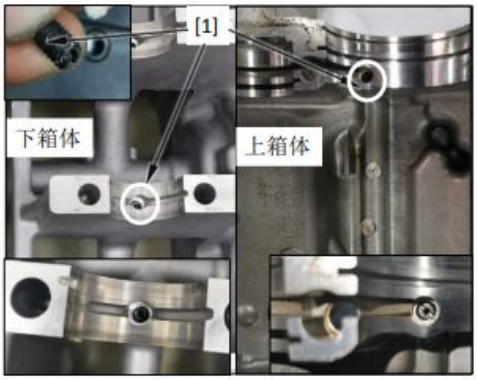
Remove the positioning pin [1]. Remove the main and countershaft set [2], whose disassembly and re-assembly refer to the chapter later), remove the crankshaft [3] and balancing shaft [4], whose disassembly and re-assembly refer to Chapter 9th.



Disassembly and re-assembly for crankcase body

Wash up the combination surface between the upper and lower crankcase body, please pay attention to the damage on the case combination surface is not allowed.

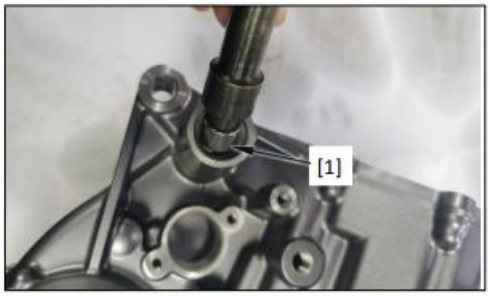
Check and confirm the block of oil passage in crankcase body, wash up the oil passage if it is necessary.



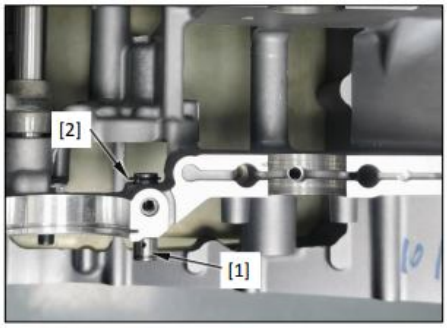
Install the plug [1] with thread into its hole on upper and lower crankcase body.

Please pay attention to: After installed, the upper end of threaded plug shall be 1-5mm lower than the bottom of oil groove.

Install the bearing [1] of gearshift spindle, then press-fit it to lower crankcase body.

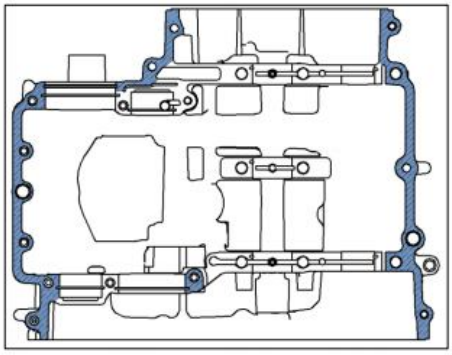


Install the bridge gear shaft [1] of oil pump and elastic washer [2] into lower crankcase body.



Case combination

Install the main & countershaft set, crankshaft and balancing shaft to the upper crankcase body (The main & countershaft, crankshaft and balancing shaft refer to the Chapter 9th).



Install the gearshift drum set, turning fork and its shaft into lower crankcase body (Refer to the part below).

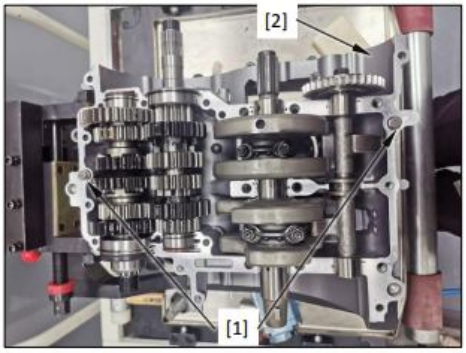
Evenly spread the end sealing glue on the combination surface of lower crankcase body as right picture shows.

Please pay attention to:

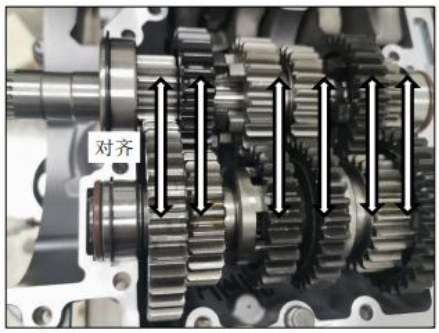
Coat with too much end sealing glue on combination surface is not allowed.

Coat the end sealing glue on the position of bolt of main shaft journal and oil passage is not allowed.

Install the positioning pin [1] into upper crankcase body [2].

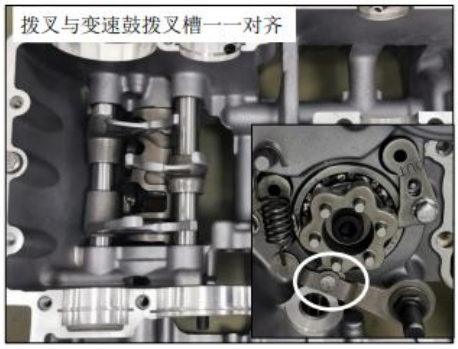


Align every tooth between main and countershaft, and make it in neutral gear, check and confirm all the parts of crankcase in place.

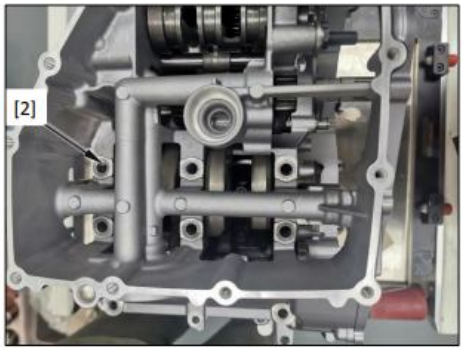


Adjust the five star-shaped turning plate and the turning fork to neutral gear.

Align the turning fork with its groove on gearshift drum.



Install the lower crankcase body onto the upper one.
Install the new bolt [2] for journal of main shaft.
Please pay attention to:
Adopt the used bolt for journal of main shaft is not allowed.
Coat the bolt for journal of main shaft with oil before re-assembling to increase its extensive performance, when re-assembling, don't wipe up the oil on bolt's surface.



Check and confirm the upper and lower crankcase body are firmly installed.
Replace the flat washer and case combination bolt for new ones, then fasten the case combination bolts to given torque.
Torque: The given torque and their fastening please refer to page 1-16.

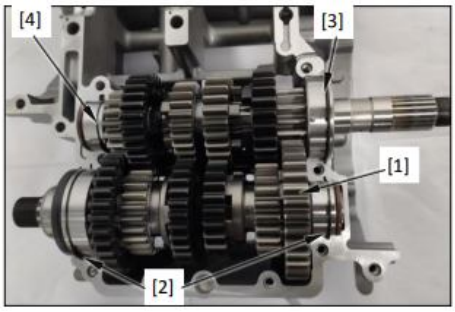
Gear box

Disassembly

Break apart the crankcase body.

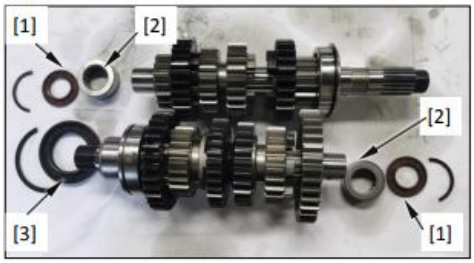
Remove the countershaft set [1] and stopping ring [2].

Remove the main shaft set [3] and stopping ring [4].

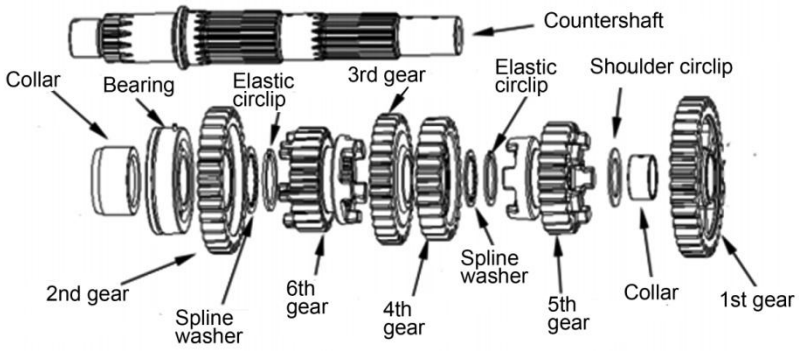


Remove the oil seal [1] on main shaft and bearing set [2].

Remove the oil seal [3] of countershaft. Check and confirm the wear-out on bearing set, in case it is, please replace.



The breaking up for countershaft



Please pay attention to:

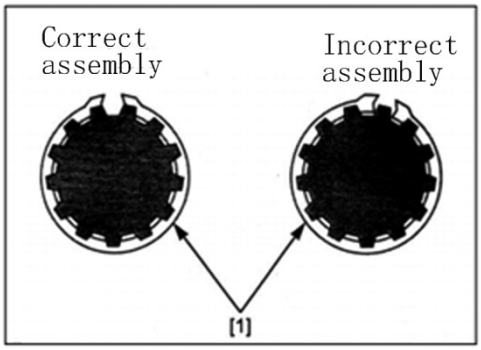
Put the removed gear, collar, washer and elastic circlip in the container for them only or lay them in a line. Expand the elastic circlip over its limit is not allowed, when removing it, expand the elastic circlip first, then push it out by the gear behind the elastic circlip.

The gears of main shaft adopt the matching of interference, which could not be disassembled and replaced, in case damaged, please replace the main shaft as a complete set.

The assembly for main and countershaft

Wash up all the parts by solvent and totally dry them up. Coat the surface of gear's tooth, turning surface and bearing with oil.

Coat the outer surface of gear's spline jacket, all the surface of gear's collar, turning surface of needle bearing and groove part on gearshift device with oil.



The re-assembly is precisely opposite to disassembly.

Please pay attention to:

Check and confirm the smooth turning for every gear coated with oil.

Align the inner spline of its washer with the groove of key.

Install the thrusting washer and always along the pushing surface of gear and its shaft.

Align the opening of clipping circlip with spline groove [1] when re-assembling it.

After assembled, make sure the circlip is completely in the groove on shaft.

Check

Check and confirm the scratch, damage, wear-out or distortion on the parts below, in case it is, please replace.

Transmission gear

Transmission bearing

Measure the size of every part, then calculate their matching clearance according to standard. In case the matching clearance is bigger than the standard limit, please replace it.

Re-assembly

Install the bearing set [1] and oil seal [2] onto the main shaft.

Please pay attention to:

The side with groove on bearing set face to the gear tooth, the lips

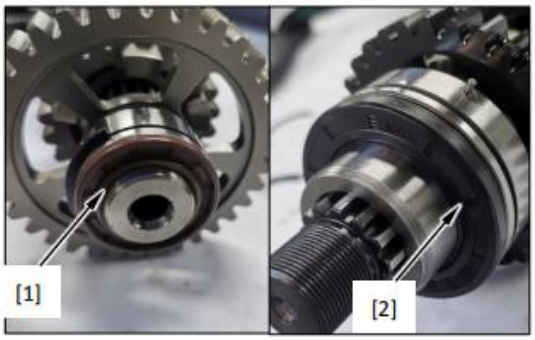
of oil seal turn its back to the gear tooth.

Install the bearing set [1] and oil seal onto the countershaft.

The side with groove on bearing set turn its back to the gear tooth.

The lips of oil seal [1] turn its back to the gear tooth.

The lips of oil seal [2] face to the gear tooth.



Install the main shaft onto upper crankcase body.

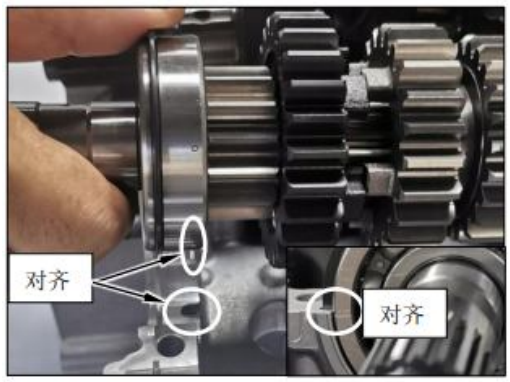
Align the marking line on the side of bearing with the combination surface,

the positioning pin on the bearing face to the upper crankcase body, then

install the main shaft set into the upper crankcase body.

Make sure the correct installation of stopping ring on smaller bearing into the ring-shaped

groove.

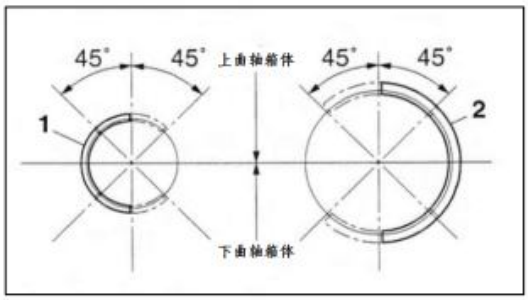


Insert the positioning pin on bearing into locating groove on crankcase body,

Install the countershaft set [1] onto the upper crankcase body, meanwhile

making sure the stopping ring on the both ends of bearing assemble in place.

Correctly insert the semi stopping ring of main and countershaft into its groove on upper crankcase body, whose angle shows as picture below.

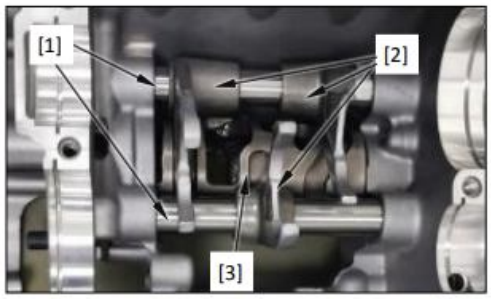


Gearshift system

Disassembly:

Remove the bolt of pressing plate and the pressing plate [1] and plate [2].

Remove the turning fork [2] and its shaft [1].
Remove the gearshift drum set [3].



Re-assembly

The turning forks are with marks as below:

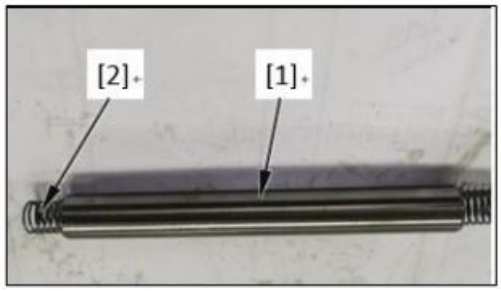
L: The left turning fork

C; The middle turning fork

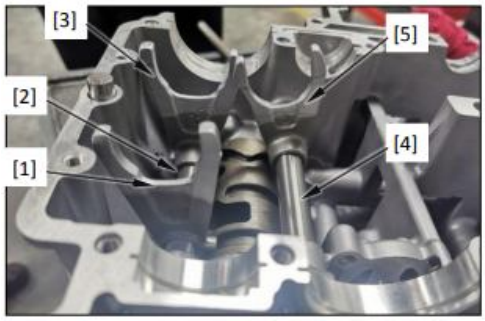
R: The right turning fork

Coat the guiding area of gearshift of turning fork and position of guiding pin with oil.

Turn and install the pressing spring [2] on the both sides of turning fork's shaft [1]., then coat the surface of turning fork shaft with oil.

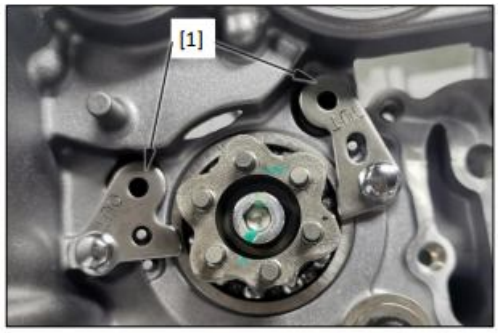


Install the right turning fork [1] and left one [3] into the guiding groove on gearshift drum, and face its mark to the right side of engine, then insert the fork's shaft in, install the middle fork [4] and its shaft [5] in the same way.



Fasten the pressing plate [1] of bearing on gearshift drum to lower crankcase body by bolt, then coat the bolt with Loctite, then fasten the bolt to given torque.

Torque: 10N.m



Install the bolt of check plate and the plate itself. (Refer to 6-15). Then adjust the five star-shaped plate to neutral gear.

9 Crankshaft, piston, cylinder body and balancing shaft

Information for maintenance

Summary

When maintaining the crankshaft, balancing shaft, cylinder body, piston and connecting rod, the crankcase must be opened. The breaking apart of crankcase please refer to the chapter of crankcase.

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

Select and match the pads of crankshaft, balancing shaft and connecting rod though their colors. Select the pads for their corresponding shafts according to the Color Table. The wrong color may lead to incorrect clearance of pad, which may badly damage the engine.

Tool:

Gear stopper

Specification for crankshaft, piston, cylinder body and balancing shaft Unit: mm

Items			Standard	Limit for repair
Crankshaft	Side clearance of bigger end of connecting rod		0.2-0.32	0.35
	Side clearance of crankshaft		0.05-0.234	0.254
Cylinder body	Cylinder bore		68.000-68.010	68.06
Piston, piston pin and piston rings	Diameter of basic circle of piston		67.975-67.985	67.955
	Diameter of hole for the pin		15.002-15.006	15.02
	Diameter of piston pin		14.994-15	14.984
	Clearance of piston ring's opening	1st ring	0.15-0.3	0.5
		2nd ring	0.3-0.5	0.7
		Oil ring	0.1-0.5	0.8
	Clearance between piston ring and its groove	Clearance between the 1st ring and its groove	0.030-0.065	0.10
		Clearance between the 2nd ring and its groove	0.02-0.055	0.08
Cylinder matching clearance			0.015-0.035	0.06
Inner diameter of smaller end of connecting rod			15.006-15.0177	15.04
Matching clearance between connecting rod and pin			0.006-0.023	0.043

Troubleshooting

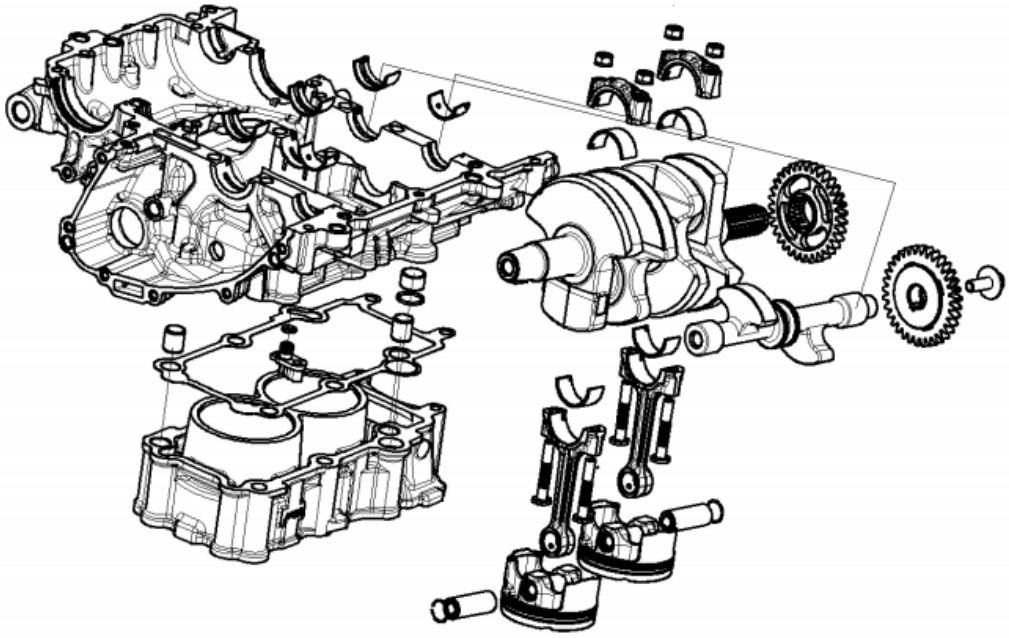
Too low the cylinder pressure, hard starting or poor performance at low speed
Piston ring worn out, jamming or damaged
Cylinder head/Piston worn out or damaged

Cylinder overheat or cylinder knocking
Cylinder body, piston or its ring worn out
Incorrect installation of piston ring
Scratch on piston or cylinder wall

Noisy engine
Piston pin or its hole worn out
Cylinder body, piston or its ring worn out
Connecting rod's pad worn out

Engine shaking
Too strong the crankshaft's runout

Components‘ layout



Crankshaft

Check the side clearance

Break apart the upper and lower crankcase body.

Measure the side clearance of connecting rod.

The limit for maintenance: 0.35mm.

In case the clearance is wider than the limit for maintenance, please replace the connecting rod. Confirm again the side clearance, in case still wider than the limit, please replace the crankshaft.

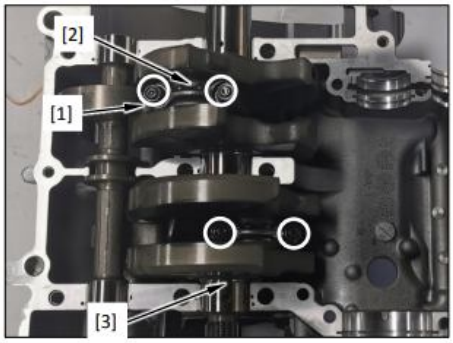
Disassembly

Please pay attention to:

Change the position of shaft pads is not allowed. The shaft's pad must be installed at its initial position, otherwise the clearance of oil film will be incorrect, even lead to the engine damage.

Break apart the upper and lower crankcase body.

Mark up the cover of connecting rod and its pad before removing to make sure the correct re-assembly.



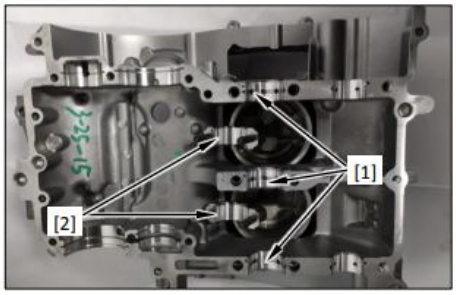
Remove the cover [2] of connecting rod and its nut [1].

Damage the journal of crankshaft and its pad is not allowed.

In case the cover of connecting rod is difficult to be removed, slightly knock the side of cover.

Remove the crankshaft [3].

Remove the crankshaft pads [1] from the upper and lower crankcase body.



Remove the connecting rod's pad [2] from the bigger end of connecting rod and its cover.

Please pay attention to:

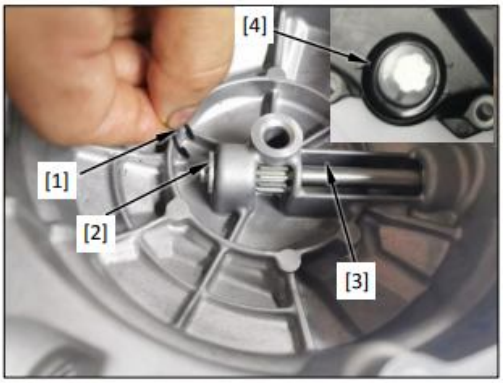
Change the position of shaft pads is not allowed. The shaft pads must be installed at its initial Position, otherwise，the clearance of oil film will be incorrect, even lead to engine damage.

Check

Support up the journal at both ends of crankshaft. Lay a micrometer above the middle journal of main shaft, and the micrometer need to avoid the position of oil groove and oil hole.

Turn the crankshaft by two rounds of 720 °, check the runout.

Limit for maintenance: 0.05mm



Re-assembly

Install the crankshaft pad [1], balancing shaft pad [2] and connecting rod's pad [3] at their initial position.

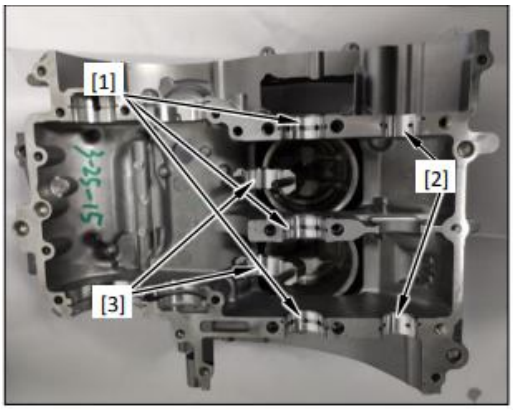
Please pay attention to:

Change the position of shaft pads is not allowed. The shaft pads must be installed at its initial

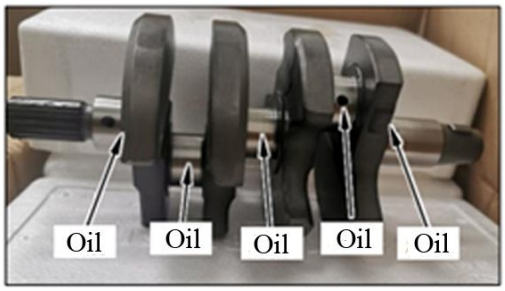
Position, otherwise , the clearance of oil film will

be incorrect, even lead to engine damage.

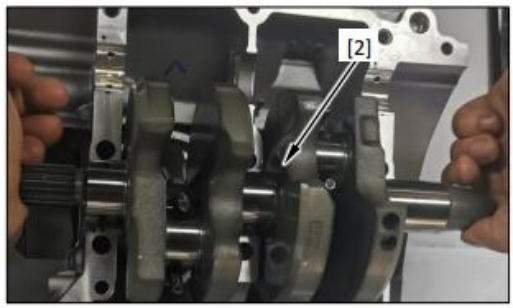
Wipe up the back part of shaft pad and its install hole, any residual oil or impurity are not allowed.



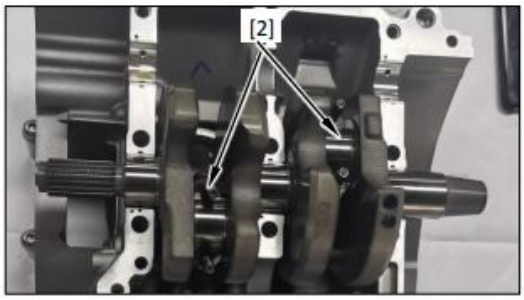
Coat the pad of main shaft journal at upper crankcase and the connecting rod's pad in the bigger end of the rod with oil.



Lay the crankshaft above the crankcase, then put the crankshaft into the bigger end of connecting rod.
Please pay attention to:
Damage the crankshaft's pin, main shaft's journal and pads is not allowed.
Install the crankshaft into the upper crankcase as picture shows.



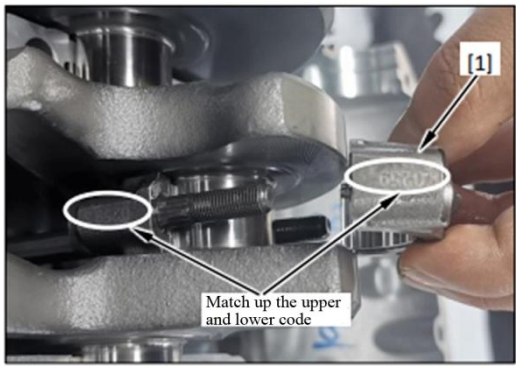
Put the bigger end [1] of connecting rod into the pin of crankshaft.



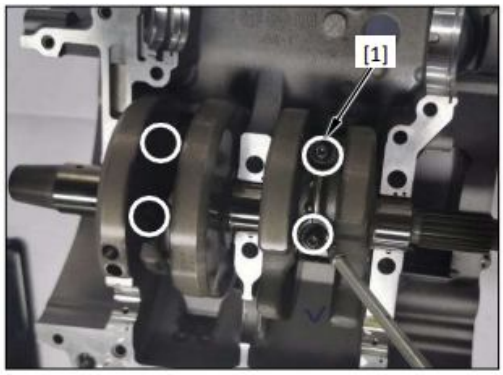
Clean up the combination surface between the bigger end of connecting rod and the cover of the rod, then dry it up by compressed air.

Coat the inner surface of connecting rod's pad on the cover of the rod with oil.
Match the connecting rod's cover and the bigger end of connecting rod by their code by
letters to install the connecting rod's cover [1].

Please pay attention to:
Re-assemble every part to its initial position as its mark when disassembling.



Replace the nut for a new one and coat the thread of connecting rod cover's nut and nut base with oil. Install and fasten the connecting rod cover's nut [1], whose fastening refer to 1-15.



Torque: 15N.m·m+150 °

Re-assemble the upper and lower crankcase (13-6).

Please pay attention to:

In case removed the connecting rod's nut when maintaining, replace it for a new one when re-assembling, then fasten it strictly according to angle control.

Pad of main shaft's journal

Please pay attention to:

Change the position of shaft's pad is not allowed. The pad must be installed at its initial position, otherwise, the clearance of oil film will be incorrect, even lead to engine damage.

Check the shaft's pad

Remove the crankshaft

Check the wear-out or dropping off of pad [1] of main shaft journal.

Check the damage of protrusion [2] of shaft pad.

In case the pad of main shaft journal damaged, select another one for replacement.

Selection of shaft pad

Take a record for the letter code [1] of inner diameter of installation hole on shaft's pad at the left side of upper crankcase as picture shows (The letters at left side of upper crankcase are A, B, or C), which means the sequence of inner diameter's code for shaft's pad installation is from the left to right. The first 3 bits are the matching code for pad of main shaft journal, the latter 2 bits are for the balancing shaft's pad).

In case the crankshaft need be replaced. Take a record for the corresponding code [1] on the weight piece on crankshaft (The number code 1, 2 or 3 on weight piece of crankshaft, means the sequence of outer diameter's code for main shaft journal is from left to right, whose the first 3 bits are the matching code for main shaft journal's pad, the later 2 bits are the codes for connecting rod's pad)

Select the replaceable shaft pad's color [1] according to the code of installation hole for main shaft journal and shaft's pad.

The thickness of main shaft journal's pad:

A: Blue The thickest

B: Black

C: Brown

D: Green

E: Yellow The thinnest

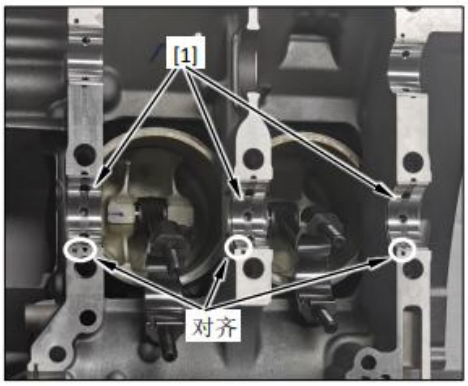
The matching table for main shaft journal

Bearing's hole diameter Shaft's pad Crankshaft journal	A	B	C
1	Yellow	Green	Brown
2	Green	Brown	Black
3	Brown	Black	Blue

The re-assembly of shaft's pad

Clean up the outer surface of shaft pad and its installation hole on crankshaft.

Install the pad [1] of main shaft journal to its installation hole on crankcase, align every protrusion with groove.



Please pay attention to:

Clean up the back part of shaft pad and its installation hole when re-assembling, but coat with oil is not allowed.

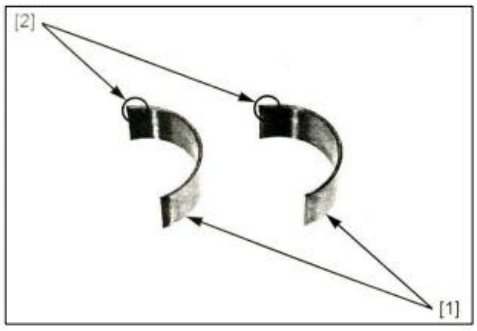
Align the protrusion on the pad with the opening on its installation hole first when re-assembling, then press down the pad on the other side to assemble it in place;

After the pads matched, pay attention to their sequence for installation, match the letters on the crankcase to the installation hole of pads, whose sequence is from left to right.

Connecting rod's pad

Pay attention to:

Change the position of pad is not allowed. The pad must be installed at its initial position, otherwise, the clearance of oil film will be incorrect, even lead to the engine damage.



Remove the crankshaft.

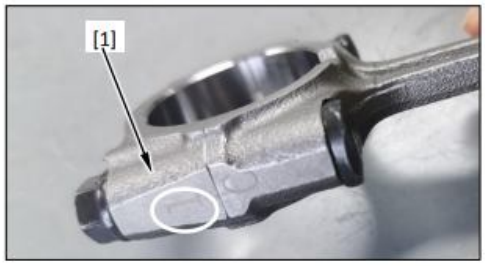
Check the wear-out or dropping off of connecting rod's pad [1].

Check the damage on protrusion [2] of shaft's pad.

In case the connecting rod's pad damaged, select the correct pad and replace.

The selection for pad

Take a record of inner diameter's code [1] on the connecting rod's cover (The number code 1, 2, or 3 on connecting rod's cover indicates the code for the inner diameter of bigger end of connecting rod), or install the connecting rod's cover on the rod, without the measured inner diameter of shaft pad.



In case the crankshaft need be replaced, take a record for the corresponding code [1] on the weight piece of crankshaft, the letter code A, B, or C means the code of outer diameter for crankshaft's pin, whose sequence is from left to right).

In case the crankshaft needs to repeatedly use, measure its outer diameter by micrometer.

Select the color of replaceable shaft pad by referring to code for bigger end of connecting rod and crankshaft's pin.

The thickness for connecting rod's pad:

A: Blue The thickest

B: Black

C: Brown

D: Green

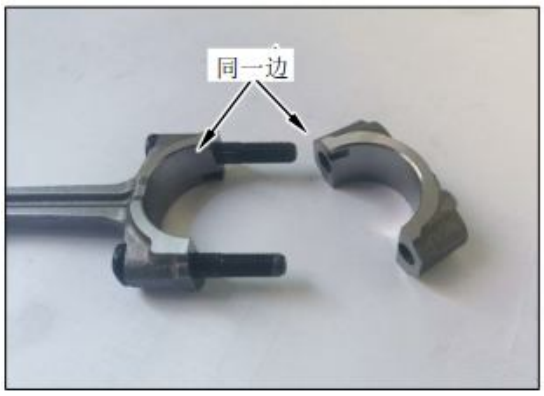
E: Yellow The thinnest

The Table for connecting rod's pad matching

Bigger hole on connecting rod Shaft pad Crankshaft journal	1	2	3
1	Yellow	Green	Brown
2	Green	Brown	Black
3	Brown	Black	Blue

Re-assembly for the shaft pad

Clean up the outer surface of pad, connecting rod's cover and the bigger end of connecting rod. Install the pad into connecting rod's cover and bigger end of connecting rod. The re-assembly refer to the pad for main shaft journal.



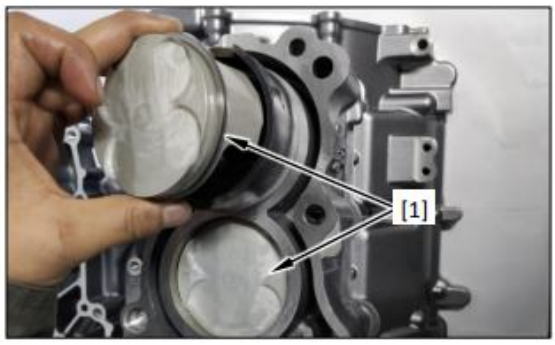
Piston/Cylinder body

Remove the piston/Connecting rod set

Please pay attention to:

Before removing the piston, pack the surrounding of bigger end of connecting rod by a clean non-woven fabrics to avoid damage on cylinder sleeve.

Change the position of shaft pad is not allowed.



Remove the parts below:

Balancing shaft

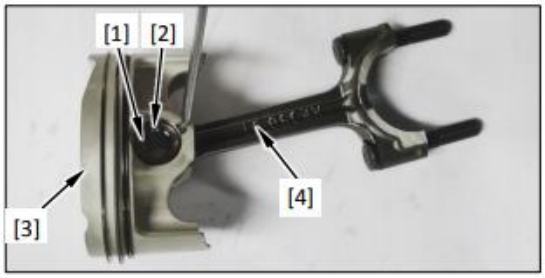
Crankshaft

Take put the piston/connecting rod set [1] from the top of cylinder.

Removal for piston

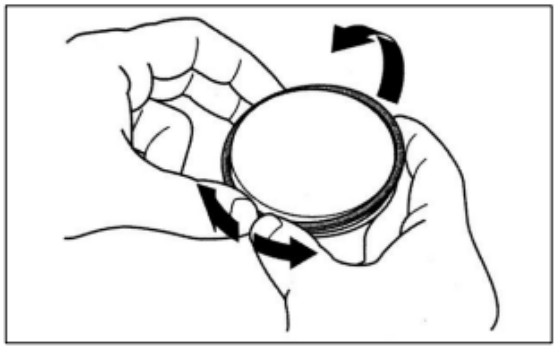
Remove the steel circlip [1] by tweezers.

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



Remove the piston ring

Get the end opening of every piston ring apart, then remove the ring upwards along the opposite position of the opening of piston ring.

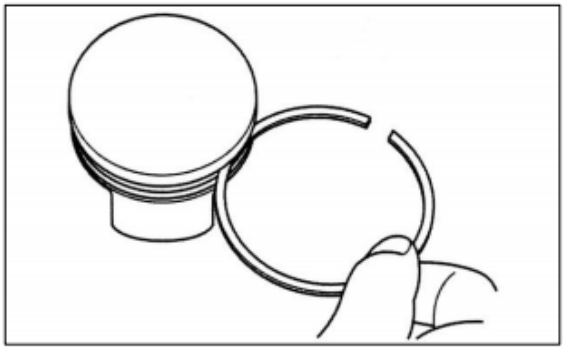


Please pay attention to:

Separate apart the opening of piston ring too much is not allowed, otherwise the piston ring may damage.

Scratch the piston when removing its ring is not allowed.

Clean up the carbon buildup in the groove of piston ring by the replaced one which plan to throw away.



Please pay attention to:

Use the steel wire brush is not allowed to avoid scratch on piston ring.

Check

Check and confirm the scratch, damage, wear-out, distortion, burn-out or block in oil passage on the parts below.

Cylinder body

Piston

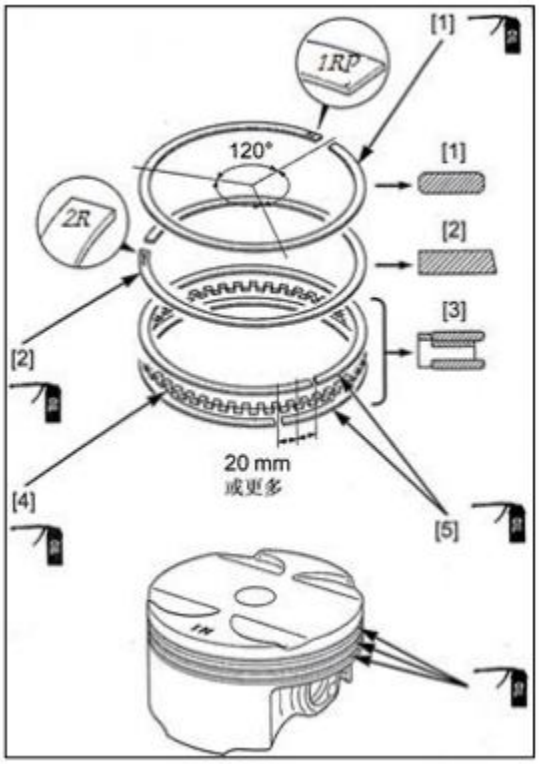
Piston ring

Piston pin

Smaller end of connecting rod

Measure every part and calculate its clearance according to technological specification of crankshaft/piston/cylinder body/balancing shaft.

Any parts passed the limit for maintenance need be replaced.



Re-assembly for piston ring

Totally clean up the groove of piston ring, then assemble the piston ring.

Coat the all surface of piston ring and its groove with oil.

When re-assembling the piston ring, damage the piston and its rings are not allowed.

When re-assembling the piston ring, its side with mark face upwards.

Mark "1RP": The 1st ring [1]

Mark "2R": The 2nd ring [2]

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

Get the piston ring across by 120 ° mutually.

The position of crossing opening of scratching ring as picture shows.

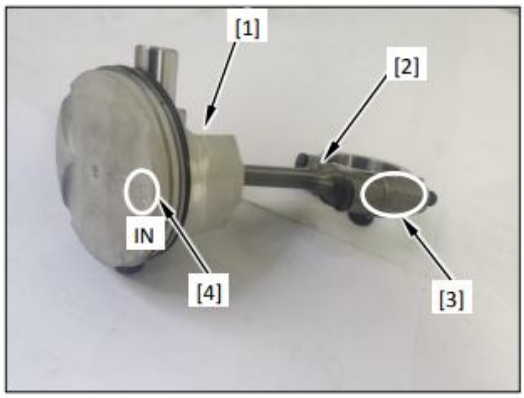
Re-assembling for piston

Install the connecting rod's pad to its initial position.

Coat the inner surface of the hole of piston pin with oil.

Coat the inner surface of smaller end of connecting rod with oil.

When matching the piston [1] and connecting rod [2], the side [3] of grouping letter mark (For example 1 C) for weight and hole diameter of connecting rod faces to the mark "IN" [4] on piston.



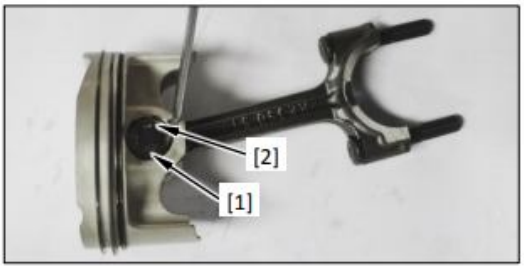
Coat the outer surface of piston pin with oil.

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

Please pay attention to:

Please make sure assemble the steel wire circlip in place.

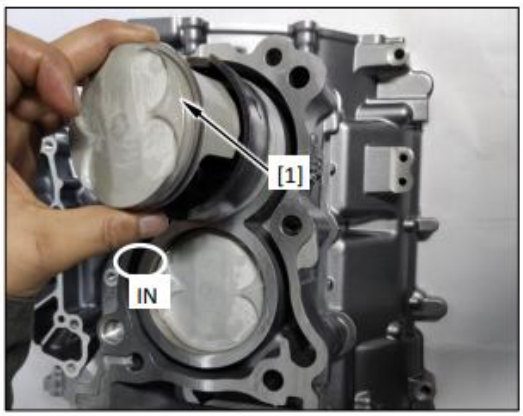
Align the opening on steel wire circlip with the gap on piston is not allowed.



Coat the cylinder wall and pushing surface of piston with oil.

Assemble the piston/connecting rod set [1] into cylinder body by the press-fitting tool for piston ring which could be bought from market (When assembling, the mark "IN" on the piston face to the direction of air inletting.)

When repeatedly use the connecting rod, please re-assemble it to its initial position.



Please pay attention to:

When re-assembling the piston, damage its upper surface is not allowed, especially the matching area with cylinder bore.

Damage the cylinder sleeve and crankshaft pin by connecting rod is not allowed.

Make sure the grouping marks for weight of connecting rod in both cylinders are the same (Mark A, B…….)

Re-assemble the parts below:

Crankshaft

Balancing shaft

Nozzle of piston

Removal/Re-assembly

Remove the cylinder body/Piston/Connecting rod set.

Draw out the nozzle by tweezers from the installation hole on crankcase body, please avoid damaging the hole of nozzle.

Remove the o-ring from nozzle.

Totally clean up the nozzle by solvent.

Check if the nozzle blocked, in case it is necessary, please replace.

Blow up the oil passages of upper crankcase and nozzle by compressed air.

Install a new o-ring at the groove on nozzle, please coat it with oil before re-assembling.

Assemble the nozzle into upper crankcase in its place. Align the groove on nozzle with the protrusion point on crankcase.

Re-assemble the removed parts by the opposite sequence of disassembly.

Please pay attention to:

When the piston, nozzle and cylinder body maintaining by the skillful worker, it needn't break apart the crankcase, remove the cylinder upwards is enough, shows as picture.

When re-assembling the cylinder body down wards, please pay attention to the dropping off of piston ring, move the cylinder body left and right is not allowed to avoid the dislocation of piston rings.

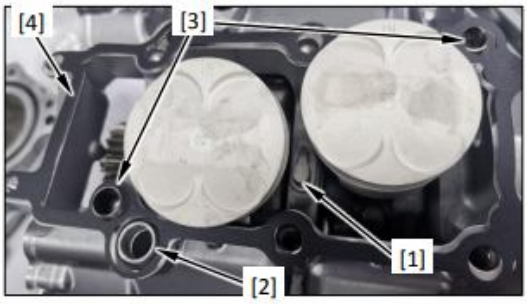
When re-assembling the cylinder body, make sure the parts below are in their place:

Nozzle [1]

Collar for water passage and washer [2]

Positioning pin [3]

Gasket [4] of cylinder body



Balancing shaft

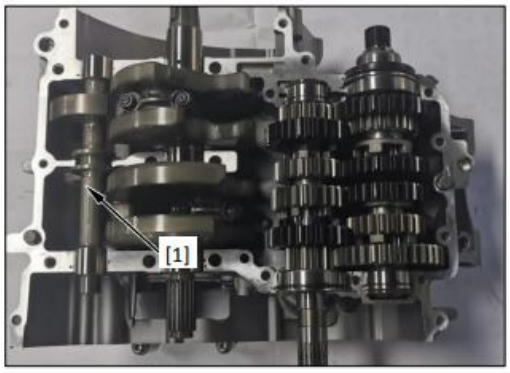
Removal

Break apart the upper and lower crankcase

Remove the balancing shaft [1].

Check and confirm the damage on journal of balancing shaft.

Remove the balancing shaft's pads, and make sure its correct re-assembling.



Please pay attention to:

Change the position of shaft pads is not allowed, the pad must be re-assembled to its initial position, otherwise the clearance of oil film will be incorrect, even lead to damage on engine.

Check

Check and confirm the scratch, damage, wear-out or distortion on the parts below, in case it is, please replace.

Driven gear and pressing spring of balancing shaft.

Balancing shaft

Balancing shaft's pad

Balancing shaft pad

Please pay attention to:

Change the position of shaft pads is not allowed, the pad must be re-assembled to its initial position, otherwise the clearance of oil film will be incorrect, even lead to damage on engine.

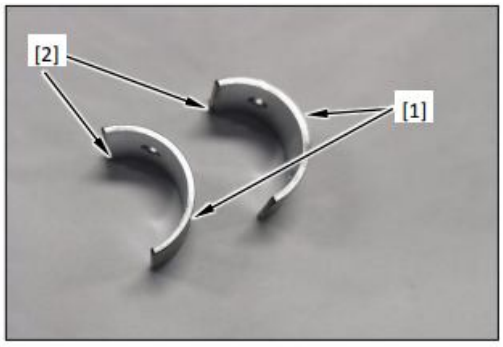
Check and shaft pad

Remove the balancing shaft.

Check he wear-out of dropping off of the shaft pad [1].

Check the damage on protrusion [2] of shaft pad.

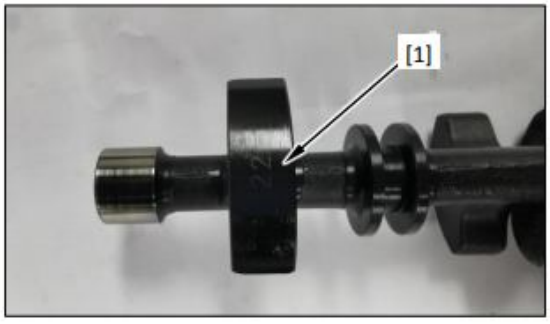
In case the pad of main shaft's journal get damage, select the correct pad and replace.



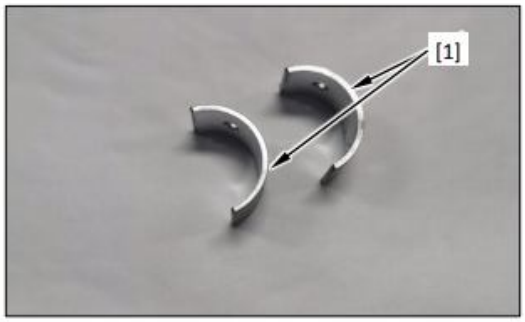
Select the correct pad

Take a record for letter code [1] of inner diameter of installation hole for shaft pad at the left side of upper crankcase as picture shows, (The letters A, B or C at the left side of upper crankcase means the sequence of inner diameter's code of installation hole for shaft pad is from left to right, the first 3 bits are matching code for journal of main shaft, while the later 2 bits are for matching of balancing shaft's pad)

In case the balancing shaft need be replaced, please take a record the corresponding code [1] on weight piece of balancing shaft.



Select the replaceable color [1] of shaft pad by referring code of installation hole for journal and shaft pad.



The thickness of balancing shaft pads:

A. Blue The thickest

B. Black

C. Brown

D. Green

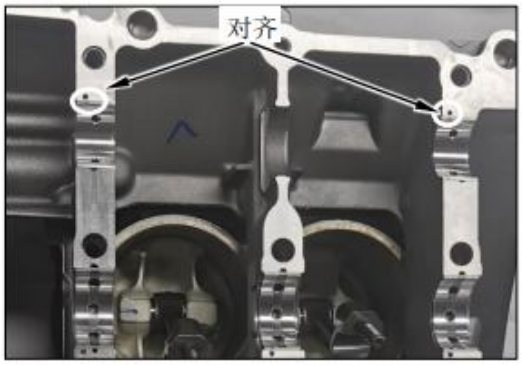
E: Yellow The thinnest

The table for the matching of balancing shaft's pads

Hole diameter of bearing Shaft pad Balancing shaft	A	B	C
1	Yellow	Green	Brown
2	Green	Brown	Black
3	Brown	Black	Blue

Re-assembly for shaft pads

Refer to the pads for main shaft journal



Disassembly

It is unnecessary to break apart the crankcase body when maintaining the driving and driven gear of balancing shaft.

Remove the right crankcase cover, when the clutch and primary driving gear haven't been removed, loosen the bolt [1] on driven gear of balancing shaft.

Remove the parts below:

Clutch set

Primary driving gear

Check plate for chain

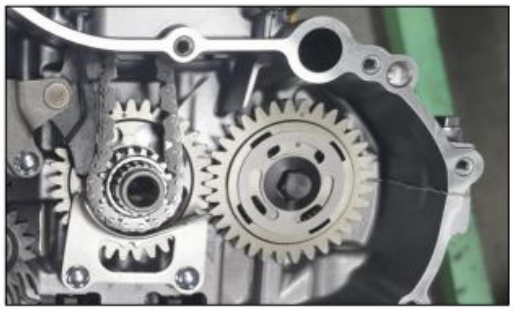
Timing driving wheel

Timing chain

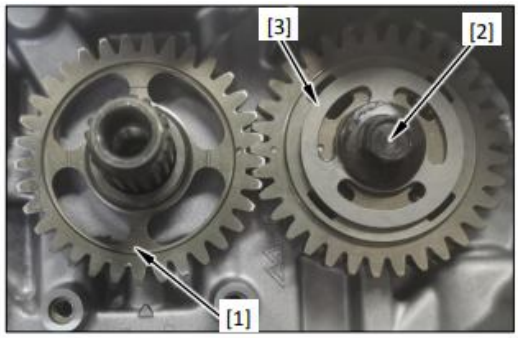
Tensioning plate of chain

Please pay attention to:

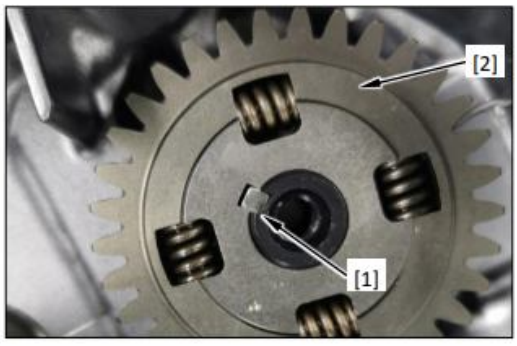
Loosen the tensioner before removing the chain and sprocket wheel.



Remove the driving gear [1] of balancing shaft, bolt [2] of balancing shaft, washer [3] on the driven gear of balancing shaft, and check the damage or wear-out on gears, in case there is, please replace.



Remove the square key [1] on driven gear of balancing shaft and driven gear [2], haft, and check the damage or wear-out on gears, in case there is, please replace.



Re-assembly

The re-assembly is precisely opposite to disassembly.

Fasten the bolt on driven gear of balancing shaft to given torque.

Torque: 35N.m

Tool: Gear stopper

Please pay attention to:

When re-assembling, install the driven gear first, then the driving gear.

Align the punching marks on the driving and driven gear as picture shows.