ZY125 发动机
维修手册
ZY125 Engine Maintenance Manual

编制：	校对：	审核：	批准：
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主要性能技术参数
Main Technical Parameters

项目 Item				规格 Specification
发动机 Engine	型号 Model number			ZS152FMI-5
	型式 Type			单缸、风冷、四冲程、顶置单凸轮式 Single-cylinder, air -cooling, four-stroke, camshaft upward
	缸径×行程 Bore × stroke			Φ52.4×57.8mm
	汽缸工作容积 Displacement			125ml
	压缩比 Compression ratio			9.2:1
	配气相位 Valve Timing	进气 IN	开启 OPEN	上止点前 5° （ 5°BTDC）
			关闭 CLOSE	下止点后 37° （37°ABDC）
		排气 EX	开启 OPEN	上止点后 50° （50°BBDC）
			关闭 CLOSE	下止点前 3° （3°ATDC）
	最大功率/相应转速 Max. power/corresponding speed			7.2(1±5%)kW/7500(1±5%) r/min
	最大扭矩/相应转速 Max. torque/corresponding speed			9.2(1±5%)N.m/6000(1±5%) r/min
	怠速 Idle speed			（1400±100） r /min
传动系统 Transmission System	离合器 Clutch			手动湿式多片式 Manual wet multi-plate
	变速器 Transmission			常啮合两级传动五档变速 Constant mesh, two-stage transmission, 5-speed gearshift
	变速方式 Gearshift method			1-N-2-3-4-5
	初级减速比 Primary reduction ratio			3.35（67/20）
	齿轮速比 Gear ratio	一档 1st		3.077（40/13）
		二档 2nd		1.789(34/19)
		三档 3rd		1.304(30/23)
		四档 4th		1.091(24/22)
		五档 5th		0.929(26/28)

保养参数：
Parameters of maintenance

项目 Item			标准值 Standard	维修极限值 Service Limit
发动机机油 Engine oil	规格 Specification		SJ 10W/40	1.2L
	容量 Capacity	不更换精滤器 when filter is not removed	1	
		更换精滤器 when filter is removed	1.1L	
		新机 when engine is completely dry	1.2	
火花塞 spark plug	标准情况下 Standard		CPR8EA-9(NGK)	
	长时间高速驾驶时 Long hours at high speed		CPR9EA-9(NGK)	
	火花塞间隙 Spark Plug Gap		(0.8-1.0)mm	
发动机怠速 Engine idle speed			（1400±100）r /min	

缸头、气门
Cylinder Head and Valve

单位：mm
unit: mm

项目 Item		标准值 Standard	维修极限值 Service Limit
气门间隙 Valve Clearance	进气 Inlet	0.04-0.06	0.10
	排气 Exhaust	0.04-0.06	0.15
气门杆外径 Valve Stem Diameter	进气 Inlet	4.975-4.990	4.92
	排气 Exhaust	4.955-4.970	4.90
气门导管内径 Valve Guide Inside Diameter	进气 Inlet 排气 Exhaust	5.000-5.012	5.04
气门与气门导管配合间隙 Valve/Valve Guide Clearance	进气 Inlet	0.010-0.037	0.07
	排气 Exhaust	0.030-0.057	0.09
气门密封带宽度 Width of valve sealing strip		0.9-1.1	1.5
气门弹簧自由高度 Valve Spring Free Length	内簧 In	38.5-39.5	37.8
	外簧 Outer	41.5-42.5	40.8
摇臂孔直径 Rocker arm hole diameter		10.000-10.012	10.1

摇臂轴直径 rocker shaft diameter			9.973-9.984	9.91
摇臂与摇臂轴的配合间隙 With the rocker arm and rocker arm shaft clearance			0.016-0.039	0.10
凸轮轴 Camshaft	凸轮高 Cam Height	进气 Inlet	31.830-31.930	31.8
		排气 Exhaust	31.559-31.659	31.5

汽缸及活塞
Cylinder and Piston

单位：mm
unit: mm

项目 Item			标准值 Standard	维修极限值 Service Limit
汽缸 Cylinder	汽缸内径 Inner diameter of cylinder		Φ52.400~φ52.410	Φ52.5
	圆度 Roundness		0.004	0.10
	缸面平面度 Planeness of cylinder face		0.03	0.10
活塞活塞环活塞销 Piston, Piston Ring and Piston Pin	活塞外径 Outer diameter of piston		Φ52.38~φ52.39	Φ52.3
	活塞销孔内径 Inner diameter of piston pin hole		φ14.002~φ14.008	φ14.04
	活塞环闭合间隙 Closure clearance of piston ring	一环 Top	0.1~0.25	0.35
		二环 second	0.15-0.30	0.4
		油环 Oil	0.2~0.7	0.85
	活塞环与活塞环槽间隙 Piston Ring/Groove Clearance:	一环 Top	0.02~0.06	0.10
		二环 second	0.02~0.06	0.10
	汽缸与活塞间隙 Piston/Cylinder Clearance		0.01~0.03	0.07
	活塞销外径 Outer diameter of piston pin		φ13.994~φ14	φ13.96
	活塞销与活塞销孔间隙 Clearance between piston pin and piston pin hole		0.002~0.014	0.04
连杆小端 Small End of Connecting Rod	内径 Inner diameter		φ14.015~φ14.028	φ14.06
	连杆小端与活塞销间隙 Clearance between small end of connecting rod and piston pin		0.015~0.03	0.10

离合器
Clutch

单位：mm
unit: mm

项目 Item		标准值 Standard	维修极限值 Service Limit
离合器 Clutch	离合器分离弹簧自由长度 Clutch Spring Free Length	41.1-41.9	40
	摩擦片厚度 Friction Plate Thickness	2.92-3.08	2.6
	离合器从动片平面度 Planeness of clutch driven plate		0.20
	从动齿轮内孔直径 Driven gear inner hole diameter	Φ23.000~φ23.021	φ23.08
轴套 Shaft sleeve	轴套外径 Collar diameter	Φ22.960~φ22.975	Φ22.93
	轴套孔径 Bushing aperture	Φ16.990~φ17.008	φ17.04
	主轴外径 The spindle diameter	Φ16.966~φ16.984	Φ16.95

传动系统
Drive Train

单位：mm
unit: mm

项目 Item			标准值 Standard	维修极限值 Service Limit
曲柄连杆 Crankshaft, Connecting Rods	连杆大头 Connecting Rod Big End:	径向间隙 Radial Clearance	0~0.008	0.03
		侧隙 Side Clearance	0.1~0.35	0.5
	曲轴跳动 Crankshaft Runout		0.03	0.08
拨叉 fork	拨叉轴外径 Outer diameter of fork shaft		Φ9.966~φ9.984	Φ9.93
	拨叉内径 Inner diameter of fork		Φ10.000~φ10.018	φ10.05
	拨叉爪部厚度 Shift Fork Ear Thickness		4.93~5.00	4.5
主副轴 Transmission	档齿内孔直径 Gear tooth inner hole diameter	M4	Φ20.000~φ20.021	Φ20.04
		M5	Φ20.000~φ20.021	Φ20.04
		C1	Φ20.500~φ20.521	Φ20.55
		C2	Φ23.000~φ23.021	Φ23.04
		C3	Φ23.025~φ23.046	Φ23.06
	衬套外径 Bushing diameter	M4	Φ19.959~φ19.980	Φ19.93
		M5	Φ19.959~φ19.980	Φ19.93
		C1	Φ20.459~φ20.480	Φ20.41
		C2	Φ22.984~φ23.005	Φ22.95
	衬套内径 Bushing inside diameter	M4	Φ17.000~φ17.018	φ17.04
		C1	Φ17.000~φ17.018	φ17.04
		C2	Φ20.000~φ20.021	Φ20.04

	主副轴外径 The shaft diameter	M4	φ16.966~φ16.984	φ16.93
		C1	φ16.966~φ16.984	φ16.93
		C2	φ19.974~φ19.987	φ19.94
		C3	φ19.979~φ20.000	φ19.95

紧固扭力标准
Requirement of tightening torque

火花塞：16N•m
Spark plug: 16N•m

放油螺栓：24N•m
Oil drain bolt: 24N•m

气门间隙调节螺母：10N·m
Valve clearance adjusting nut: 10N·m

摇臂轴紧固螺栓：5N.m

Rocker arm shaft fastening bolt：5N.m

正时链轮螺栓：10N•m

Timing sprocket bolt：10N•m

缸头缸体连接螺栓：10N•m

Cylinder head cylinder block connecting bolts：10N•m

定位板紧固螺栓：10N.m
Fastening bolt of locating plate: 10N.m

离合器盖紧固螺栓：10N.m
Fastening bolt of clutch cover: 10N.m

张紧器螺钉：10N•m

Tensioner screw：10N•m

AB 栓的紧固标准：11N.m
Tightening torque of AB bolt: 11N.m

AB 栓紧固螺母：35N•m

AB bolt fastening nuts：35N•m

离合器锁紧螺母： 45N.m
Locknut of clutch: 45N.m

曲轴锁紧螺母：65N.m
Locknut of crankshaft: 65N.m

平衡齿锁紧螺母： 45N.m
Locknut of balanced gear: 45N.m

磁电机锁紧螺母：65N.m
Locknut of magnetor: 65N.m

GB5783 螺栓的紧固标准：10N.m
Tightening torque of GB5783 bolt: 10N.m

GB5789 螺栓的紧固标准：10N.m
Tightening torque of GB5789 bolt: 10N.m

GB16674 螺栓的紧固标准：10N.m
Tightening torque of GB16674 bolt: 10N.m

正常维护及保养
Normal Maintenance and Care

一、发动机维护周期

I. Maintenance interval of engine

周期 Interval / 保养项目 ITEM	行驶前检查 Check before driving	行驶里程（×1000 公里） Odometer reading (×1000km)			
		1	4	8	12
火花塞 Spark plug			I	R	I
气门间隙 Valve clearance		I	I	I	I
发动机机油 Engine oil	I	R	R	R	R
机油滤网 Oil Strainer		C			C
发动机怠速 Idle speed		I	I	I	I

I:必要时请进行检查、清洗、调整、润滑或更换；C: 清洗　R: 更换

I: INSPECT,CLEAN,ADJUST,LUBRICATE OR REPLACE IF NECESSARY；C: CLEAN　R: REPLACE

发动机机油的质量是影响发动机使用寿命的主要因素。请按照保养表中规定的保养周期进行机油的更换。当在灰尘大的地区驾驶时，机油的更换要比保养中的规定更频繁。

Engine oil quality is the chief factor affecting engine service life. Change engine oil as specified in the maintenance schedule (page 47). When running in very dusty conditions, oil change should be performed more frequently than specified in the maintenance schedule.

请处理好用过的机油使其不要对环境造成污染。我们建议您将废油装进密封的容器内送到当地的回收中心或服务网点以回收再用。不要将其倒进垃圾桶内或者直接泄到地面上和下水道。

Please dispose of used engine oil in an environmental-friendly manner. We suggest you keep it in a sealed container to your local recycling center or service station for reclamation. Do not discard it in the trash or pour it into the soil or down a drain.

皮肤长时间接触使用过的机油会导致皮肤癌。我们建议您在处理过机油后，尽快用肥皂和清水彻底洗干净双手。

Used engine oil may cause skin cancer if it contacts skin for prolonged periods. It is suggested that you should wash you hands wit soap and clean water as soon as possible after you handle used engine oil.

二、发动机维护标准
II. Maintenance standard of engine

项目 Item			标准值 Standard	维修极限值 Service Limit
发动机机油 Engine oil	规格 Specification		SJ 10W/40	1.2L
	容量 Capacity	不更换精滤器 when filter is not removed	1	
		更换精滤器 when filter is removed	1.1L	
		新机 when engine is completely dry	1.2	
气门间隙 Valve Clearance	进气 Inlet		(0.04-0.06)mm	0.10mm
	排气 Exhaust		(0.04-0.06)mm	0.15mm
火花塞 Spark plug	标准情况下 Standard		CPR8EA (NGK)	
	长时间高速驾驶时 Long hours at high speed		CPR8EA (NGK)	
	火花塞间隙 Spark Plug Gap		(0.8-1.0)mm	
发动机怠速 Engine idle speed			（1400±100）r/min	

三、紧固扭力标准
III. Requirement of tightening torque

火花塞：16N•m
Spark plug: 16N•m

放油螺栓：24N•m
Oil drain bolt: 24N•m

滤清器盖螺栓：4N•m
Oil filter cover bolt: 4N•m

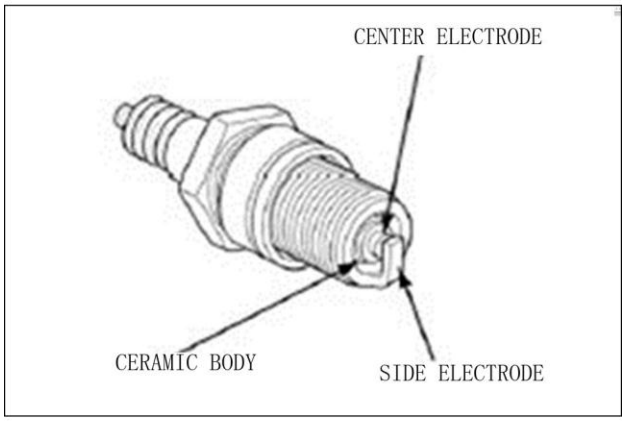
气门间隙调节螺母：14N·m
Valve clearance adjusting nut: 14N·m

四、火花塞的保养
IV. Maintenance of spark plug

建议使用的火花塞
Spark plug recommended

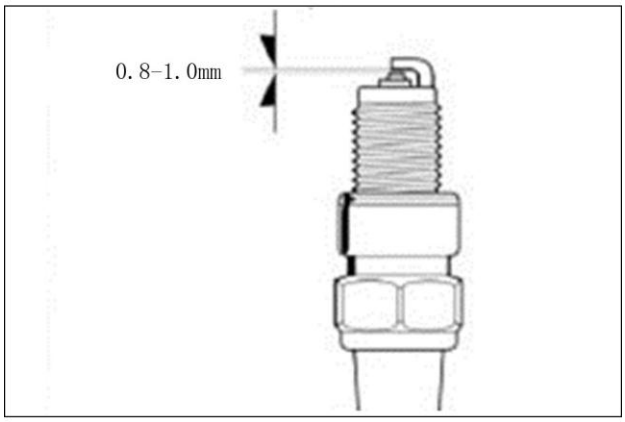
标准情况下 Under standard condition	CPR8EA (NGK)
长时间高速驾驶时 When driving at high speed for long time	CPR8EA (NGK)

注意：
Note:
使用热值不合适的火花塞，会严重的损坏发动机。
If spark plug with unsuitable calorific value is used, the engine will be damaged severely.



如果电极和中心电极损蚀、积碳情况严重，需要对火花塞进行清理或更换
If the electrodes and center electrode are eroded or covered with heavy carbon deposit, the spark plug shall be cleaned or replaced.

火花塞间隙应为：（0.8-1.0）mm
Spark plug gap: (0.8-1.0) mm



火花塞装配力矩：16N•m
Tightening torque of spark plug: 16N•m

注意：
Note:
一个没有适当拧紧的火花塞可能会导致发动机损坏。如果火花塞太松，那么则可能导致活塞损坏。如果火花塞太紧，则可能导致螺纹损坏。
If the spark plug is not tightened appropriately, the engine may be damaged. If the spark plug is not tightened sufficiently, the piston may be damaged; if the spark plug is tightened excessively, the threads may be damaged.

五、气门间隙的调整
V. Valve clearance adjustment

气门间隙过大会产生噪音，并最终导致发动机损坏。气门间隙过小或无间隙，则会导致气门关闭不严引起气门损坏、发动机功率损失。

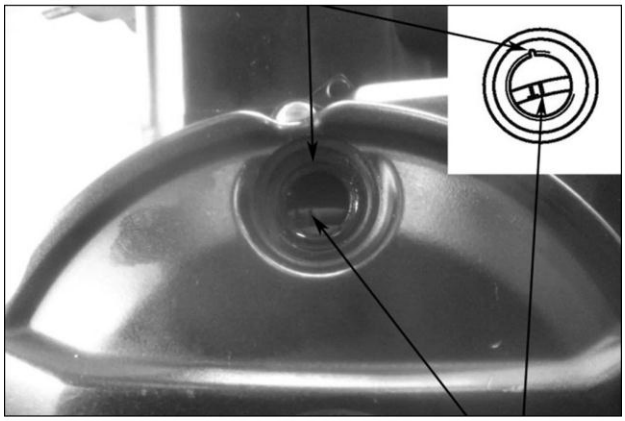
Too large valve clearance will result in noise and ultimately in damage of engine. Too small valve clearance or no clearance will result in that valves are not closed tightly, thus causing damage of valve, power loss of the engine.

拆下发动机的大小视孔盖

Remove caps with big and small eyehole respectively from engine.

转动曲轴，使发动机处于正时位置(磁电机转子上的“T”标记刻线对准观察窗口的中心)

Turn crankshaft until the engine is at timing position (Markline T on rotor of magnetor is aligned with center of eyehole.)

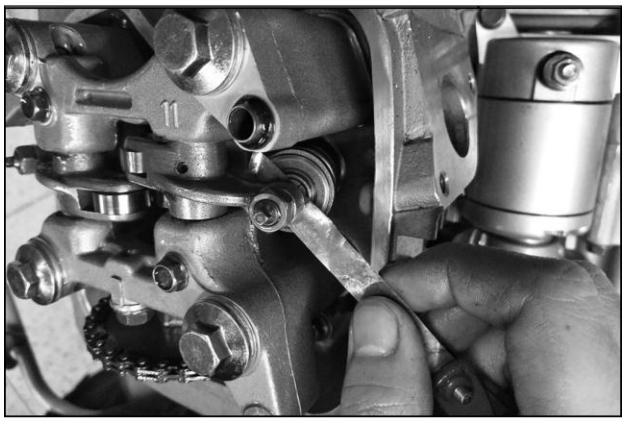


拆除头盖（参考 4-4）

Remove upper cover of cylinder head (refer to 4-4)

检查气门间隙是否符合要求

Check if valve clearance meet the requirement.



注意：
Note:
气门间隙的检查与调整须在发动机“冷机”状态下进行。间隙会随着发动机温度升高而改变
Valve clearance shall be checked and adjusted when the engine is in Cold state. The clearance will change with temperature rise of the engine.

调整气门间隙

Adjust valve clearance

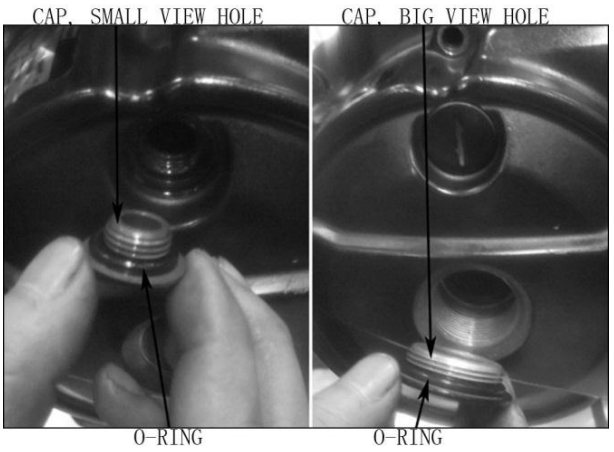
进排气门间隙：（0.04-0.06）mm

Clearance of inlet and exhaust valve: （0.04-0.06）mm

调节螺母紧固扭矩：14N.m

Tightening torque of adjusting nut: 14N.m

检查视孔盖的 O 型圈是否变形、损坏，如有则需要更换新的 O 型圈；更换新的 O 型圈后，在装配前需要涂抹适量的润滑油；
Check O-ring of eyehole cap for deformation and damage. If there is, replace the O-ring with a new one. Apply appropriate amount of lube oil on the new O-ring before install it.



拧紧大小视孔盖
Tighten caps of large and small eyeholes respectively.

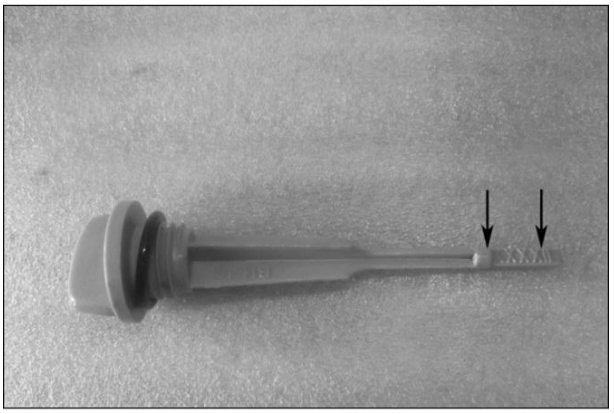
装配好头盖（参考 4-5），检查发动机有无渗漏
Install upper cover of cylinder head (refer to 4-5) and check the engine for leakage.

六、机油量的检查
VI. Check of engine oil volume

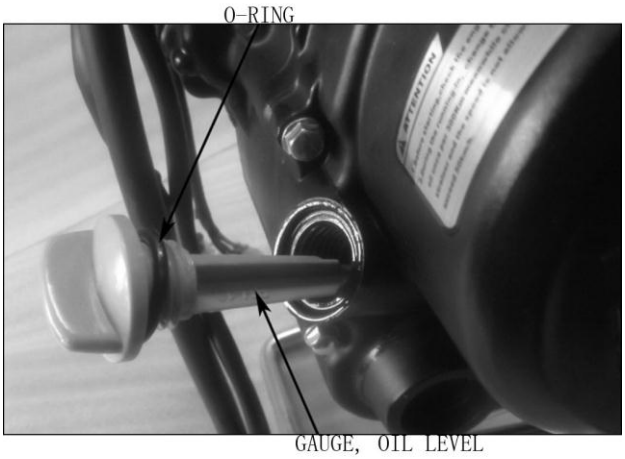
在每天驾驶前检查发动机机油。机油液位必须保持在油标尺的上限标记和下限标记之间。
Check engine oil prior to driving everyday. Engine oil level must be kept between the upper and the lower limits on the oil level gauge.

检查：
Check:

1. 启动发动机并让其怠速空转 3-5 分钟；
   Start the engine and let it runs at idle speed for 3-5minutes.
2. 停止发动机，用主支架撑起车辆停放在平坦地面。发动机熄火 2-3 分钟后，拆下机油尺，擦拭干净后重新安装机油尺，然后取出机油尺并检查机油液位。机油液位必须保持在机油尺的上限和下限标记之间。
   Stop the engine and support the vehicle with main stand on flat ground. After the engine kills for 2~3 minutes, remove oil level gauge, wipe it up and reinsert it. Then put it out again to check oil level, which must be kept between the upper and lower limits on the gauge.



3. 如果需要，请将专用机油添加到机油尺的上限标记处，不可超过上限。
Fill engine with dedicated engine oil until the level reaches upper limit on the gauge if necessary. Never exceed the upper limit.

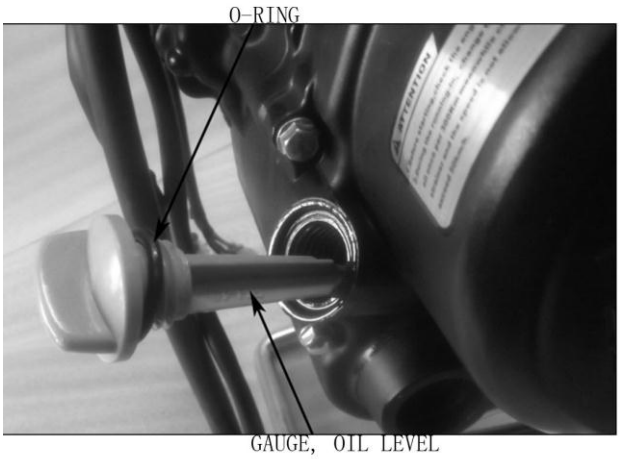


4. 装配机油尺和 O 型圈，拧紧机油尺。
Install oil level gauge and O-ring, and tighten the gauge.

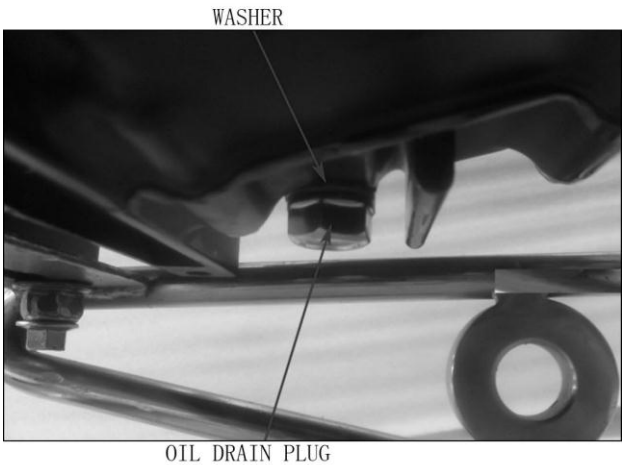
七、机油和机油滤清器的更换
VII. Renewal of engine oil and replacement of oil filter

更换机油时要保持发动机的温度是使用状态时的温度，并使用侧支架，便于完整快速的放出机油。
Renew engine oil with the engine at normal operating temperature and the vehicle resting on its side stand to ensure complete and rapid draining.

1. 在曲轴箱下面放置一个放油盆。
Place a drain pan under the crankcase.



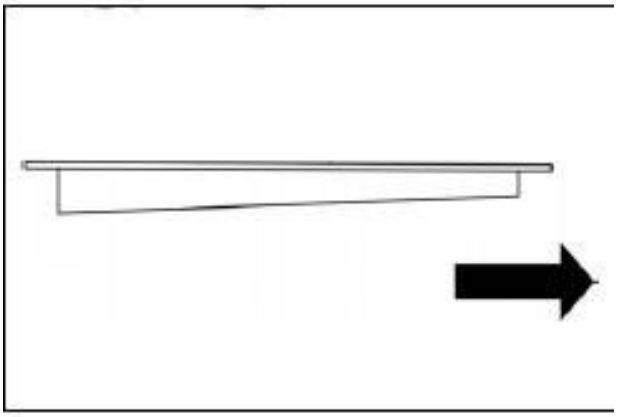
2. 拆下机油尺、放油螺栓和密封垫，放油；
Remove oil level gauge, drain bolt and sealing washer to drain off the oil.



3. 必要时需要对机油粗滤网进行清洗（参考保养周期）
If necessary, clean the oil screen (refer to maintenance interval).

拆除右盖，右盖的拆卸参考 6-5：
Remove the right cover. Refer to Page 6-5 for removal of right cover.

取出机油粗滤网，清理干净上面的杂物，按图示方向重新装入。
Take out oil screen to clean foreign matters from it. Then reinstall it according to direction shown in the figure.



注意
Note

从机油滤网上的杂物可以初步判断发动机是否有异常损坏，如果有过多的金属残渣需要对发动机进行检查。
Foreign matters on the oil screen can be used to determine preliminarily if there is abnormal damage on the engine. If too much metallic dust is detected, the engine shall be subject to inspection.

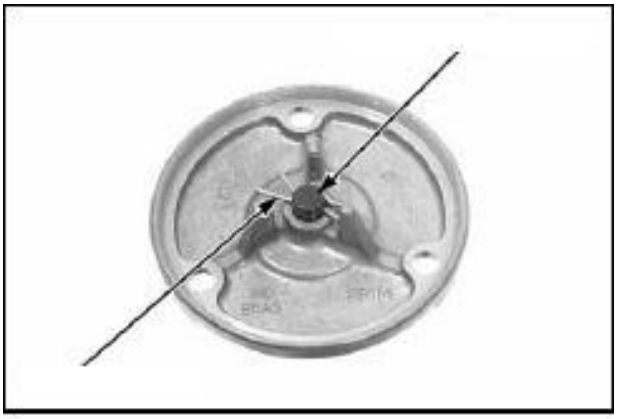
机油滤网不能使用汽油或其他可对橡胶造成损伤的溶液清洗；
The oil screen shall not be cleaned with gasoline or other solvents that may damage rubber.

4. 拆除机油滤清器盖螺栓，取下滤清器盖、密封垫。
Dismantle bolt from oil filter cover to remove the filter cover and paper gasket.

5. 清理剩余机油。
Clean up the remaining oil

6.拆除开口销、机油滤清器出油管及弹簧

Remove the open pin. Oil filter outlet pipe and spring.

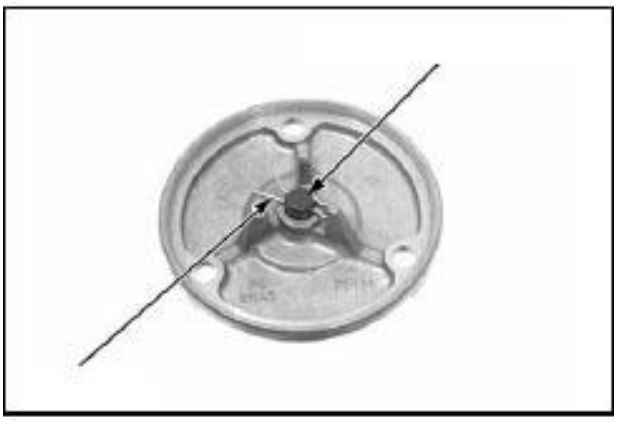


7. 检查开口销、机油滤清器出油管及弹簧是否有损坏，如果有则需要更换新的。

Check if the open pin Oil filter outlet pipe and spring are damaged. If they are, replace them with new ones.

8 装配开口销、机油滤清器出油管及弹簧

Assemble the open pin. Oil filter outlet pipe and spring.



9 装配纸垫、机油滤清器盖，并有螺栓紧固

Assemble the filter cover and paper gasket. Tighten bolt

紧固扭力：4 N.m

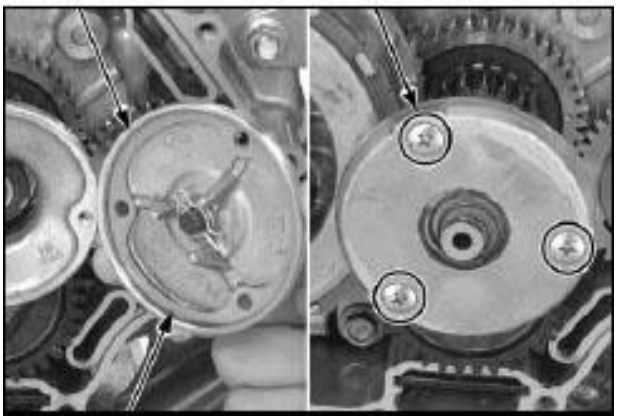
Tightening torque: 4 N.m

注意

Note

装配时检查密封垫否有损坏，如果有则需要更换新的。

Check if the sealing washer are damaged. If they are, replace them with new ones.



安装好右盖（参考 6-7）
Reinstall the right cover (refer to Page 6-7).

10. 检查放油螺栓、垫圈是否完好，必要时更换新的放油螺栓和垫圈，紧固螺栓。每次更换机油时都要更换一个新的垫圈；
Check if drain bolt and sealing washer are in good condition. Replace the drain bolt and sealing washer with new ones if necessary, then tighten the bolt. Always replace the sealing washer whenever renewing the engine oil.

放油螺栓紧固扭力：24N.m
Tightening torque of engine oil drain bolt: 24N.m

11. 按保养要求添加同等级的机油（SJ/10W-40）；
Fill the engine with oil of equivalent grade according to requirements of maintenance (SJ/10W-40);

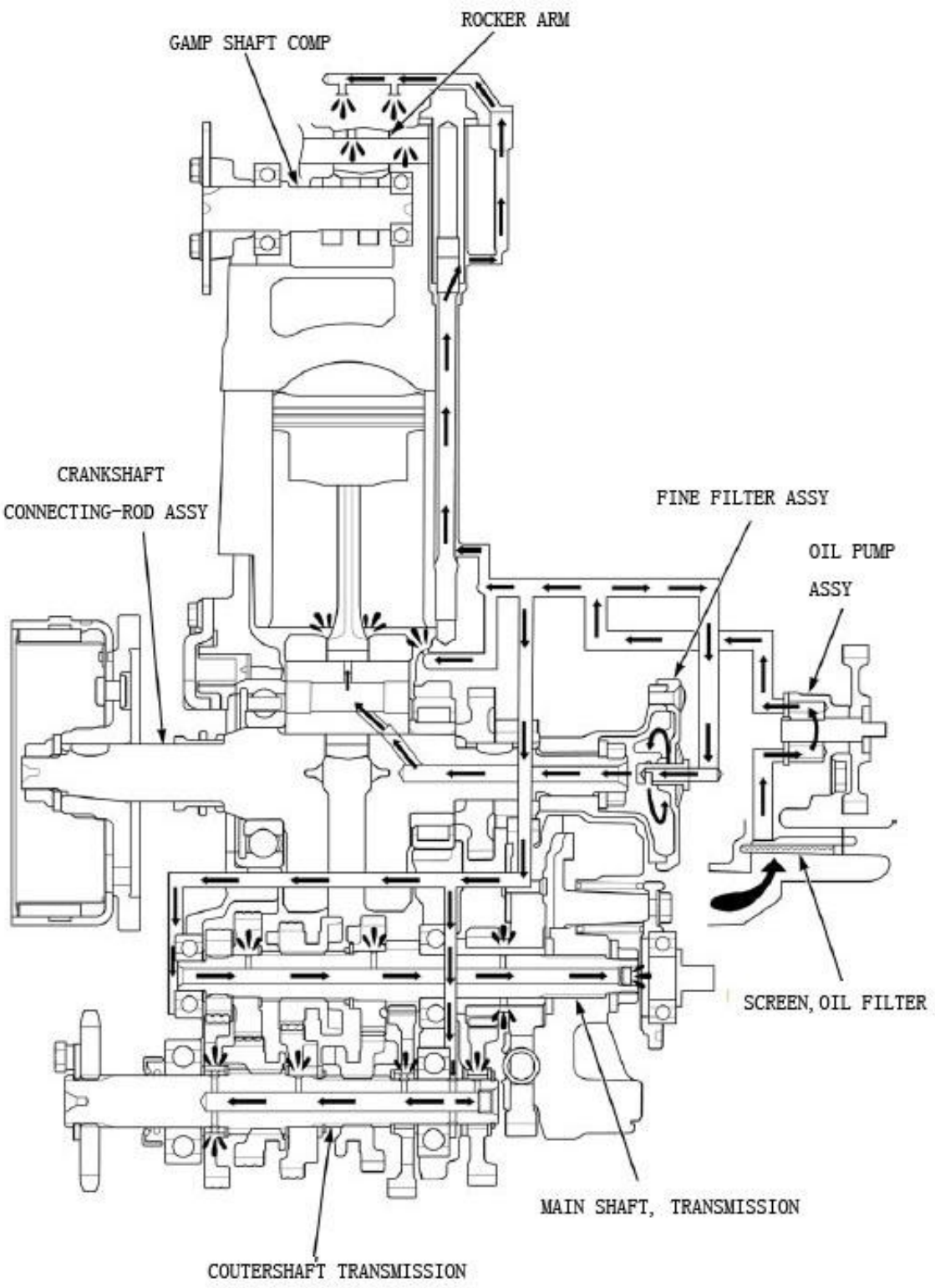
12. 装配好机油尺。
Reinstall the oil level gauge.

13. 按 2-6 的要求检查机油量是否正确，并确认发动机无渗漏油的情况。
Check if oil level is correct according to Page 2-6 and confirm the engine free of any leakage.

润滑系统
Lubrication system

一、润滑系统示意图

I. Schematic diagram of lubrication system



二、润滑系统技术标准
II. Technical specifications of lubrication system

单位：mm
Unit: mm

项目 Item			标准值 Standard	维修极限值 Service Limit
发动机机油 Engine oil	规格 Specification		SJ 10W/40	
	容量 Capacity	不更换精滤器 when filter is not removed	1L	
		更换精滤器 when filter is removed	1.1L	
		新机 when engine is completely dry	1.2L	
机油泵 Oil pump	外转子与泵体的侧隙 Backlash between outer rotor and pump body			0.28
	外转子与内转子的侧隙 Backlash between inner and outer rotors			0.20
	转子与泵体轴向间隙 Axial clearance between rotor and pump body			0.15

扭力紧固标准：
Requirements of tightening torque:

机油泵紧固螺栓：10N.m
Fastening bolt of oil pump: 10N.m

机油泵盖板螺钉：3N.m
Screw on cover plate of oil pump: 3N.m

三、故障排除：
III.Troubleshooting:

部件名称 Name of component	损坏形式 Type of damage	部件故障现象 Symptom of component	发动机故障现象 Symptom of engine	维修方法 Remedy
机油泵 Oil pump	机油泵内外转子过度磨损 Excessive wear of inner and outer rotors of oil pump	泵油不畅或不泵油 Oil is not pumped freely or no oil is pumped.	发动机过热、动力不足； Engine overheats and is insufficient in power.	更换机油泵 Replace the oil pump.
机油过滤网 Oil screen	杂物过多或堵塞 Too much foreign matters on it or clogged.			清理滤网 Clean the screen
润滑系统 Lubrication system	油道堵塞 Clogged passage			清洗、疏通油路 Clean and unblock the oil path.

四、机油泵的拆卸与安装
IV. Removal and installation of oil pump

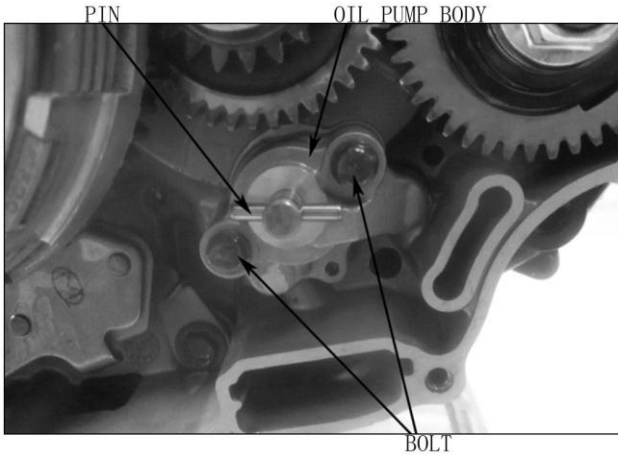
一）机油泵拆卸

I)Removal of oil pump

1. 拆除右盖（参考 6-5）；
Dismantle right cover (refer to Page 6-5);

2. 拆除开口卡圈，取出机油泵齿轮；
Dismantle circlip and take out gears of oil pump.

3. 取出销子，拆除机油泵紧固螺栓，取出机油泵；
Take out the pin and remove fastening bolt of oil pump. Take out oil pump.

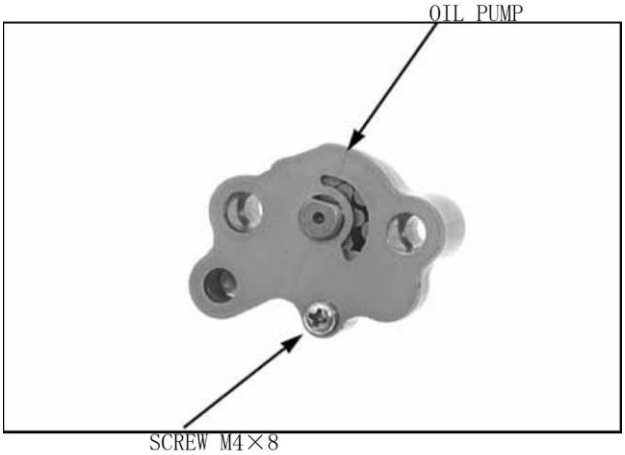


4. 取下两颗定位销。
Remove the two locating pins.

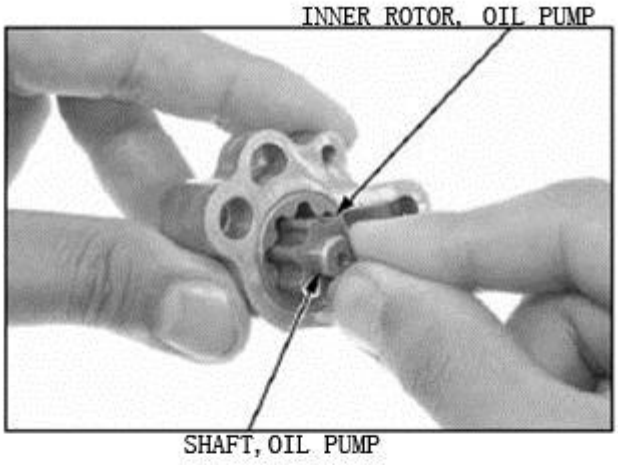
二）机油泵的拆解

II)**Disassembly of oil pump**

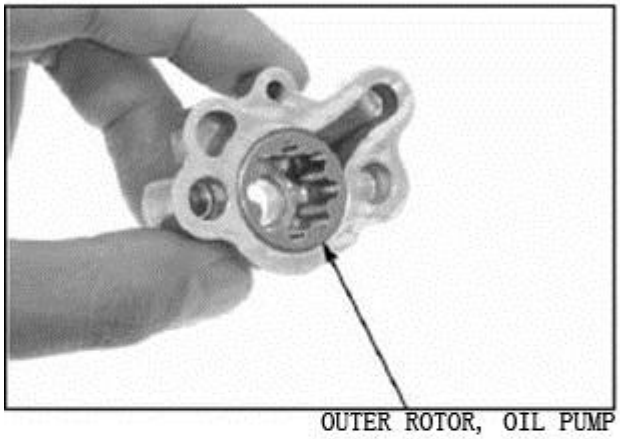
1. 拆除盖板上的紧固螺钉；
Remove set screw from cover plate.



2. 取出机油泵内转子、销子、销轴；
Remove the inner rotor, pin and pin shaft from oil pump.

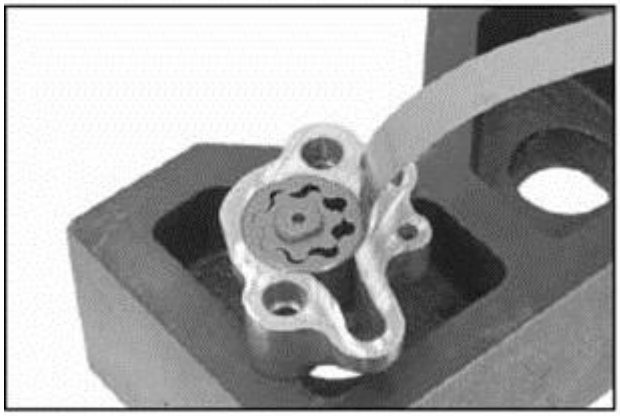


3. 取出机油泵外转子。将拆卸下的零部件全部清洗干净。
Take out outer rotor of oil pump and clean the components disassembled thoroughly.



三）机油泵的检测
III)Check of oil pump

注意 Note: 检测时要转动转子多测量几个点，判断是否超过使用极限； When checking oil pump, turn the rotor to measure it at multiple points, so as to judge if its wear is beyond service limit. 如果机油泵任何一个部位超过使用极限，都需要更换一个新的机油泵。 If wear measured at any point is beyond the service limit, the oil pump shall be replaced with a new one.



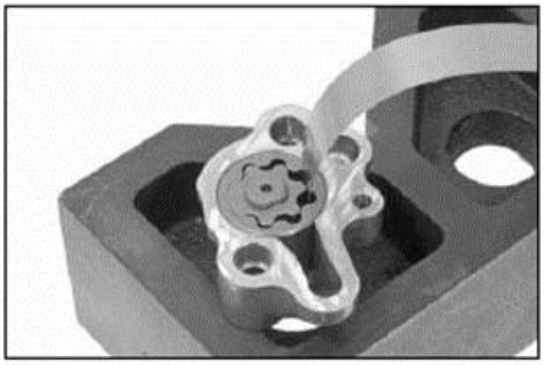
1. 装配好机油泵内转子、外转子、销轴、销子；
Assemble inner and outer rotors, pin shaft, pin of the oil pump.

检测外转子与壳体的侧隙
Check side clearance between outer rotor and casing

维修极限值 Service limit	0.28mm

2. 检测机油泵外转子与内转子的配合间隙；
Check fit clearance between outer and inner rotors of oil pump;

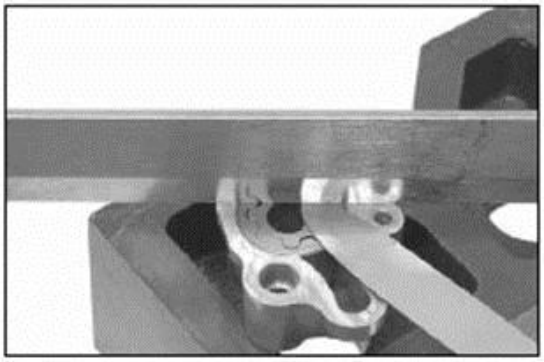
维修极限值 Service limit	0.20mm



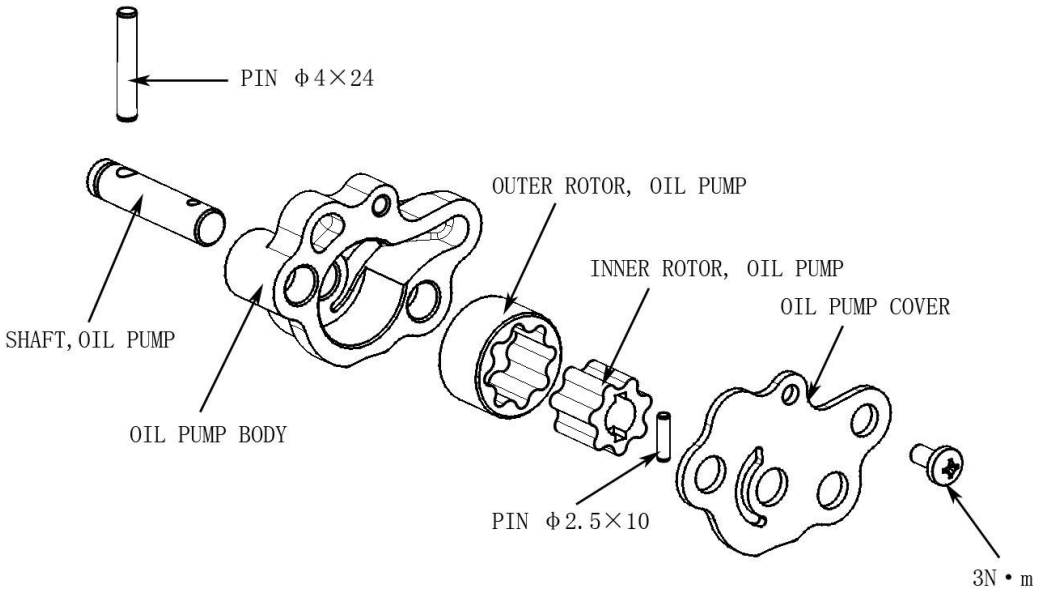
3. 取出机油泵轴、销子；
Take out the shaft and pin from the oil pump;

使用刀口尺和塞尺测量转子与机油泵壳体的轴向间隙
Use knife straight edge and feeler gauge to measure axial clearance between rotor and casing of the oil pump.

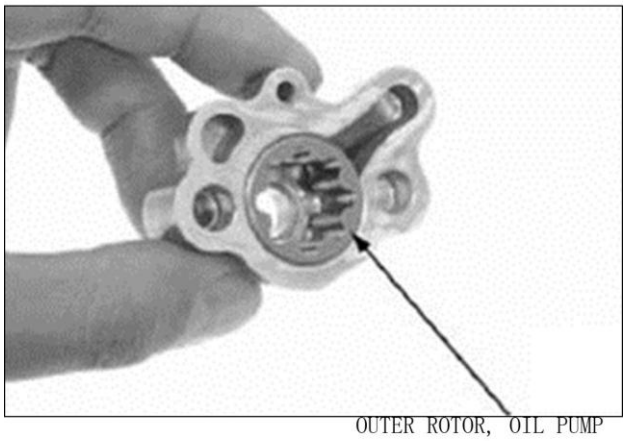
维修极限值 Service limit	0.15mm



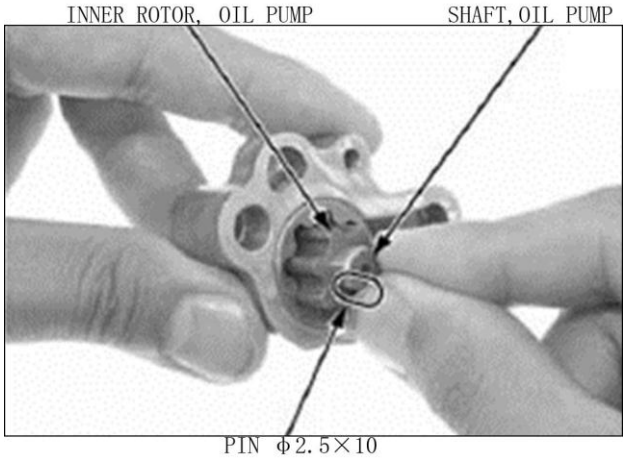
四、机油泵的安装
IV) Installation of oil pump



1. 将外转子外圈涂抹润滑油后装入机油泵壳体内；
Apply lube oil on the circumference of outer rotor and install the rotor into casing of oil pump.

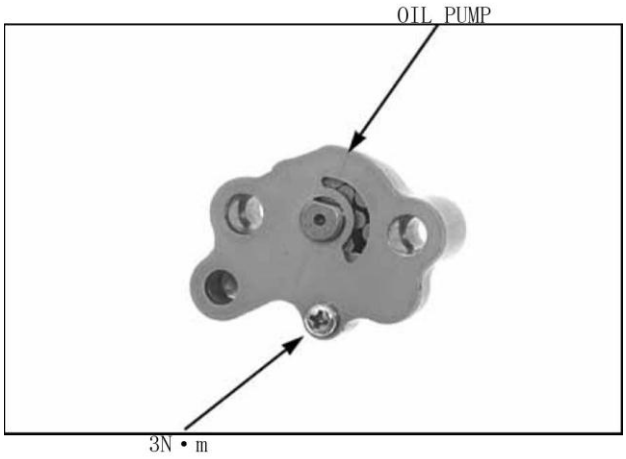


2. 将机油泵内转子、销轴、销子外圈涂抹润滑油后装入机油泵壳体内；
Apply lube oil on the circumference of inner rotor, pin shaft and pin and install them into casing of oil pump.



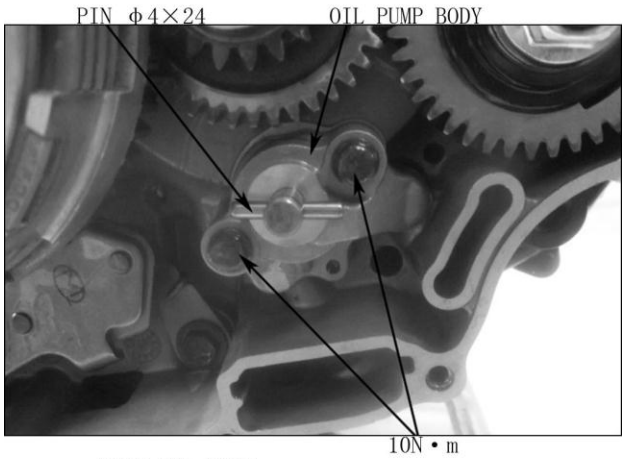
3. 装配机油泵盖板并紧固螺钉；
Install cover plate of oil pump and tighten the screw.

紧固扭力：3N.m
Tightening torque: 3N.m



4. 将定位销装配在发动机上；
Install locating pin on the engine.

5. 装配机油泵并紧固螺栓，装配销子；
Assemble oil pump and tighten the bolt. Assemble the pin.



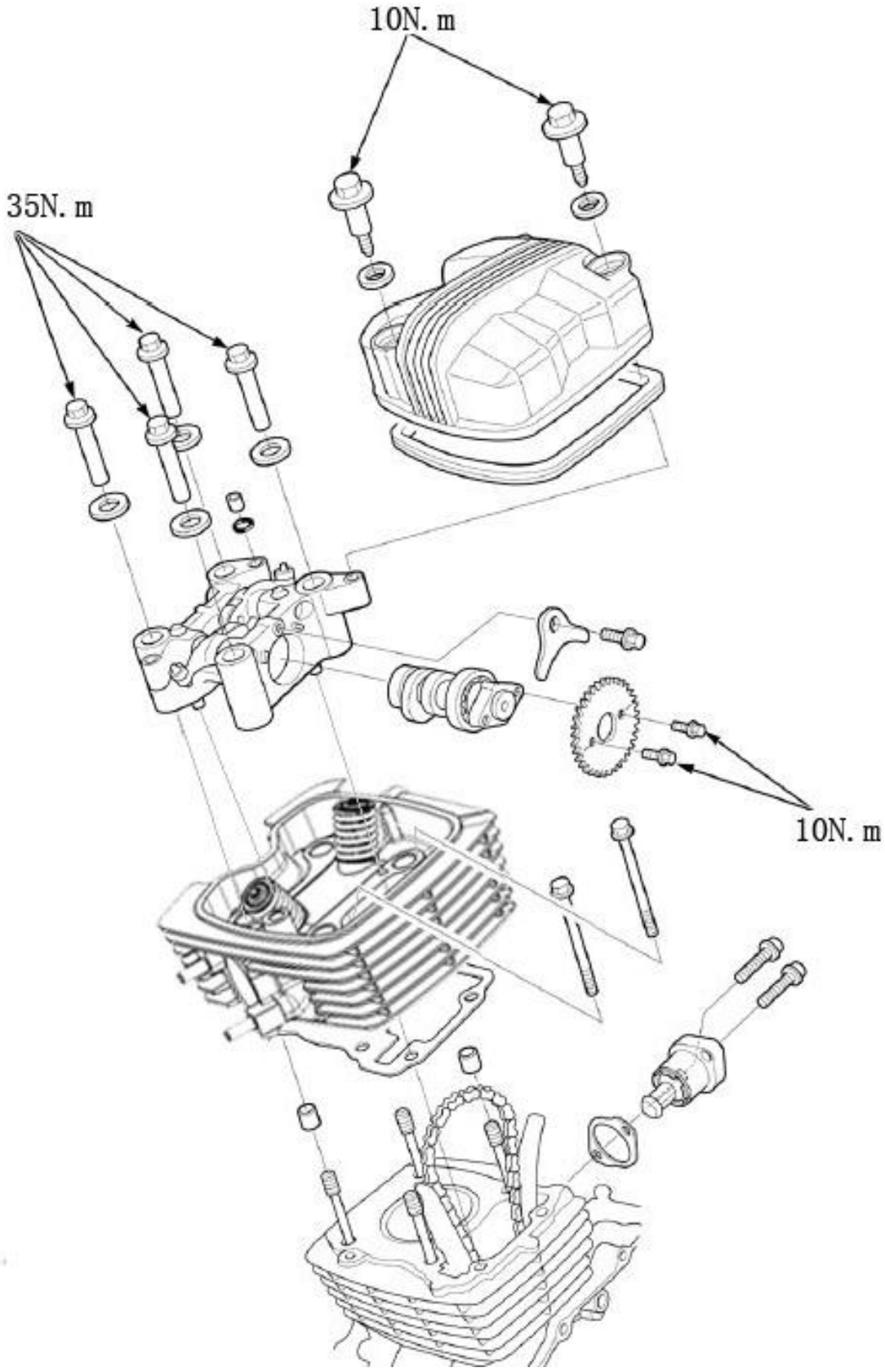
6. 将机油泵齿轮装配到销轴上并装好开口卡圈，齿轮部位涂抹适量润滑油。
Install gears of oil pump onto pin shaft and install circlip. Apply appropriate amount of lube oil on the gears.

7. 将右盖装配到发动机上（6-7 页）
Install the right cover of onto engine (Page 6-7).

缸头部件维修
Maintenance of Cylinder Head Assembly

一、缸头部件分解图

I. Exploded view of cylinder head assembly



二、使用标准

Ⅱ. Limits for service

单位：mm
unit: mm

项目 Item			标准值 Standard	维修极限值 Service Limit
气门间隙 Valve Clearance		进气 Inlet	0.04-0.06	
		排气 Exhaust	0.04-0.06	
气门杆外径 Valve Stem Diameter		进气 Inlet	4.975-4.990	4.92
		排气 Exhaust	4.955-4.970	4.90
气门导管内径 Valve Guide Inside Diameter		进气 Inlet 排气 Exhaust	5.000-5.012	5.04
气门与气门导管配合间隙 Valve/Valve Guide Clearance		进气 Inlet	0.010-0.037	0.07
		排气 Exhaust	0.030-0.057	0.09
气门密封带宽度 Width of valve sealing strip			0.9-1.1	1.5
气门弹簧自由高度 Valve Spring Free Length		内簧 In	38.5-39.5	37.8
		外簧 Outer	41.5-42.5	40.8
摇臂孔直径 Rocker arm hole diameter			10.000-10.015	10.1
摇臂轴直径 rocker shaft diameter			9.972-9.987	9.91
摇臂与摇臂轴的配合间隙 With the rocker arm and rocker arm shaft clearance			0.013-0.043	0.10
凸轮轴 Camshaft	凸轮高 Cam Height	进气 Inlet	31.0059-31.1059	31.8
		排气 Exhaust	30.8002-31.9002	31.5

紧固扭力标准

Requirement of tightening torque

GB5789 螺栓的紧固标准：10N.m
Tightening torque of GB5789 bolt: 10N.m

GB16674 螺栓的紧固标准：10N.m
Tightening torque of GB16674 bolt: 10N.m

摇臂轴紧固螺栓：5N.m

Rocker arm shaft fastening bolt：5N.m

AB 螺母：35N•m

AB nuts：35N•m

缸头缸体连接螺栓：10N•m

Cylinder head cylinder block connecting bolts：10N•m

缸头盖固定螺栓：10N.m

Fastening bolt of upper cover: 10N.m

张紧器螺钉：10N•m

Tensioner screw：10N•m

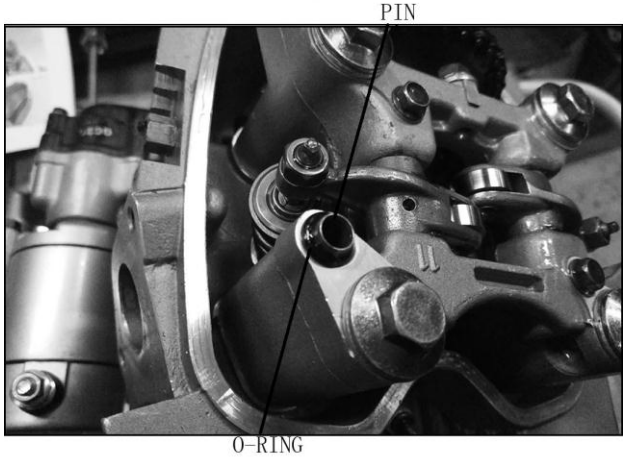
三、头盖的维修

III. Maintenance of upper cover of cylinder head

1. 拆开头盖上的两颗头盖螺栓
   Remove two bolts from upper cover of cylinder head.

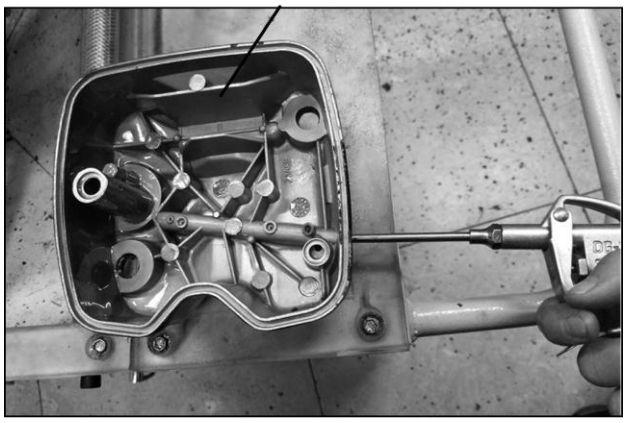
2. 取下头盖和头盖密封圈
   Take out upper cover and corresponding seal ring.

3. 取下油道位置的定位销和 O 型圈
   Remove locating pin of oil path and O ring.



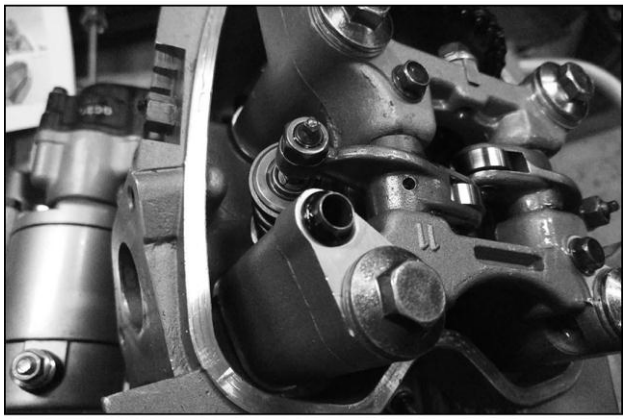
4. 拆开头盖上的泵油螺栓及垫圈
   Remove oil-pumping bolt and washer from upper cover of cylinder head

5. 用吹枪检测头盖油道是否畅通
Use air gun to check oil path in upper cover for blockage.



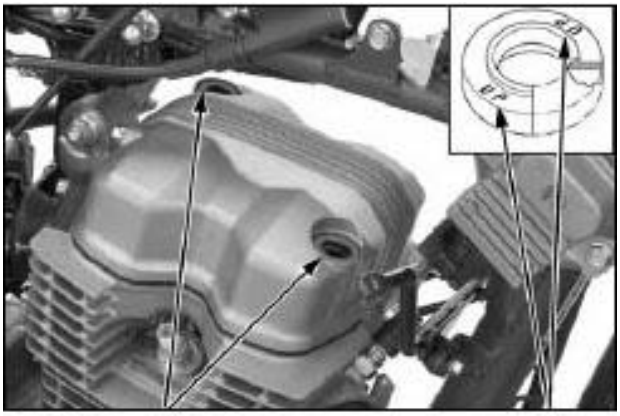
6. 头盖检查完毕后，装配螺栓和垫圈（需要更换新的垫圈）
After upper cover is checked, reinstall bolt and washer (replace the washer with new one).

7. 装配定位销及一个新的 O 型圈
Install locating pin and a new O-ring.



8. 将一个新的头盖密封圈装入头盖上的密封圈槽后，一起装配到缸头上。
Fit a new seal ring into the seal ring groove on upper cover, then install the upper cover onto cylinder head.

9. 确认头盖装配到位后，装配头盖螺栓胶垫（“UP”标记面朝上）
After confirming that the upper cover is installed on right place, install rubber gasket of bolt of cylinder head (with mark UP upwards).



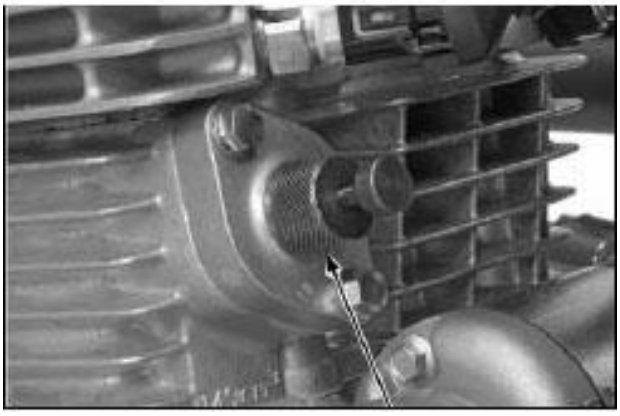
10. 装配头盖螺栓并紧固
Install and tighten bolt of upper cover
紧固扭力: 10N•m
Tightening torque: 10N•m

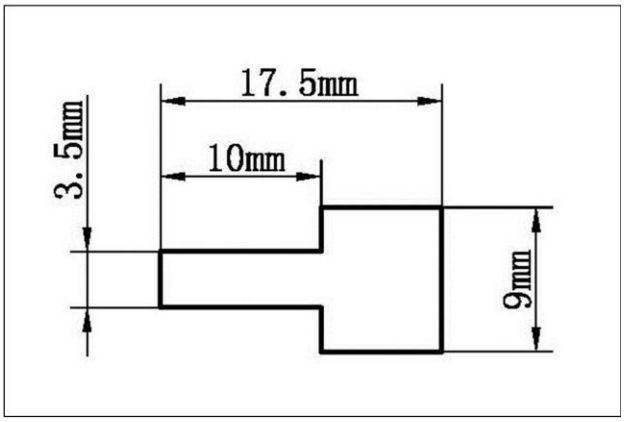
三、摇臂组合的维修
III. Maintenance of rocker arm assembly

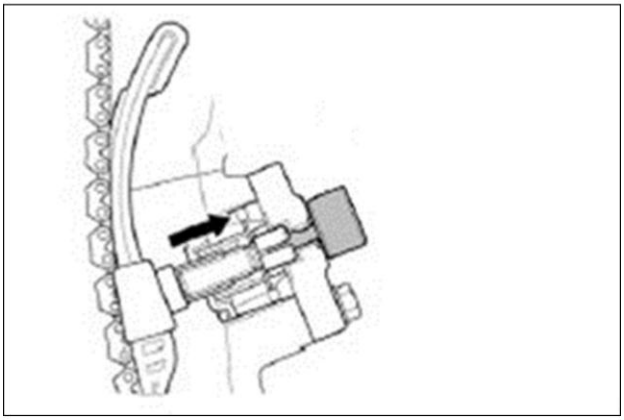
一）摇臂组合的拆卸
I) Removal of rocker arm assembly

1. 拆开张紧器螺钉
Dismantle screw of tensioner.

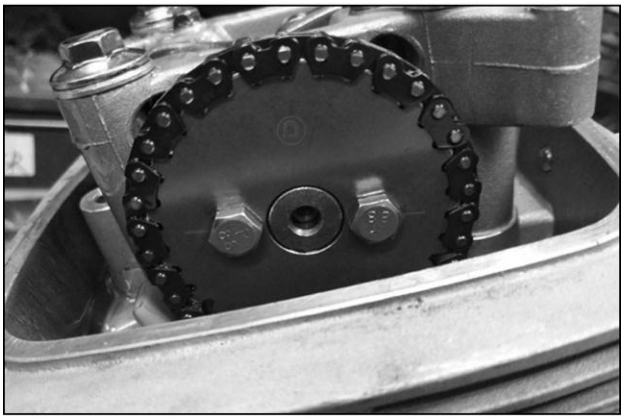
2. 调节张紧器到松开的位置；
Adjust tensioner until it becomes loose.



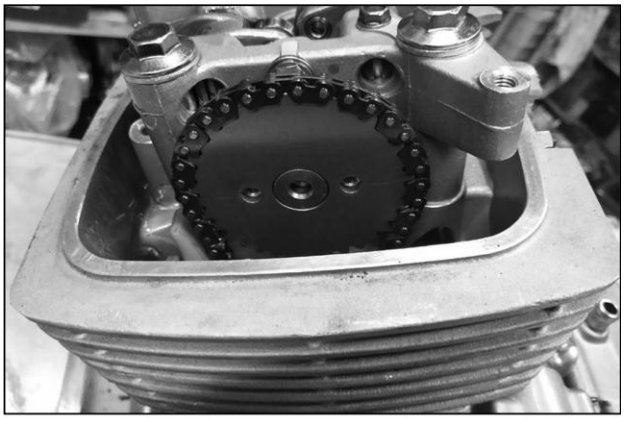




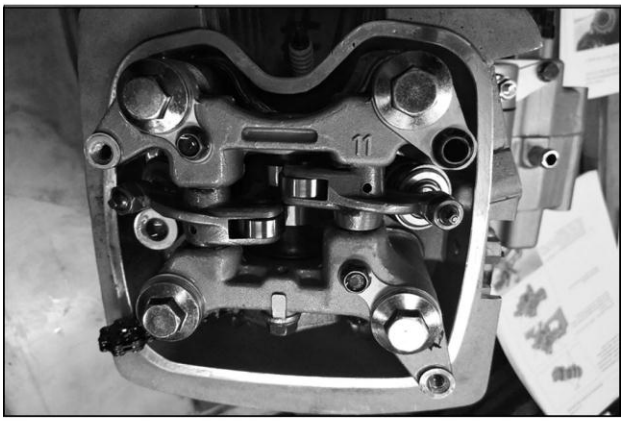
3. 拆下正时链轮上的紧固螺栓；
Remove the fastening bolt from timing sproket chain.



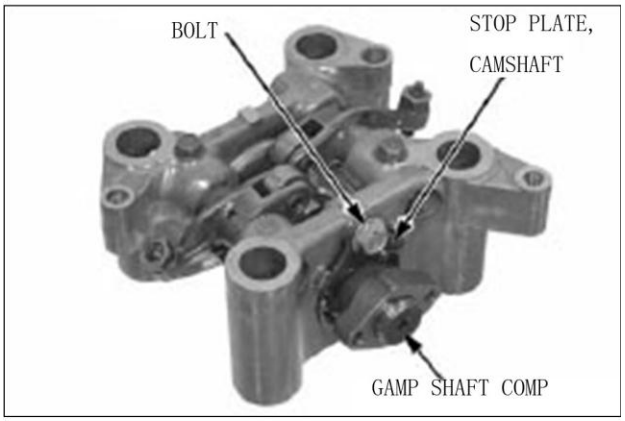
4. 取下正时链轮，注意链条要用工具固定好避免掉入曲轴箱内。
Remove the timing sprocket chain. Care shall be taken when using a tool to fix the chain so as to avoid dropping it into the crankcase.



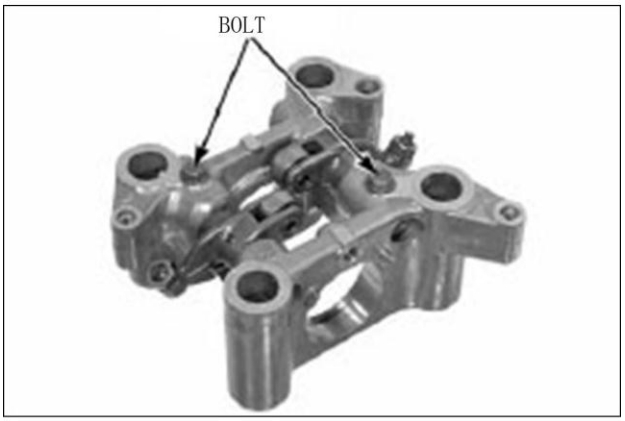
5. 拆下 AB 栓螺母，取出摇臂组合
Remove AB nut to take out rocker arm assembly.



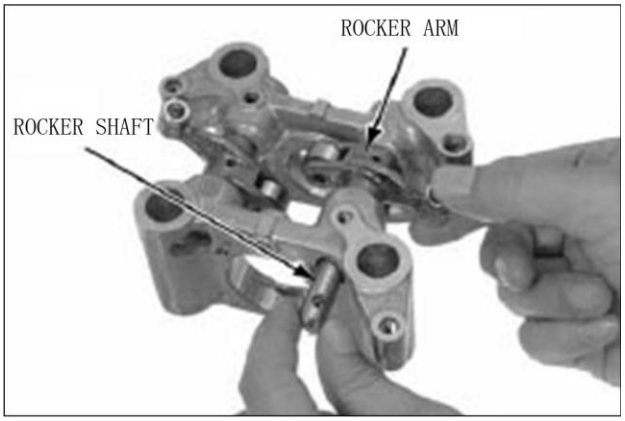
6. 拆除挡板上的紧固螺栓，取下挡板取出凸轮；
Loosen fastening bolt on stop plate and remove the stop plate. Then remove camshaft.



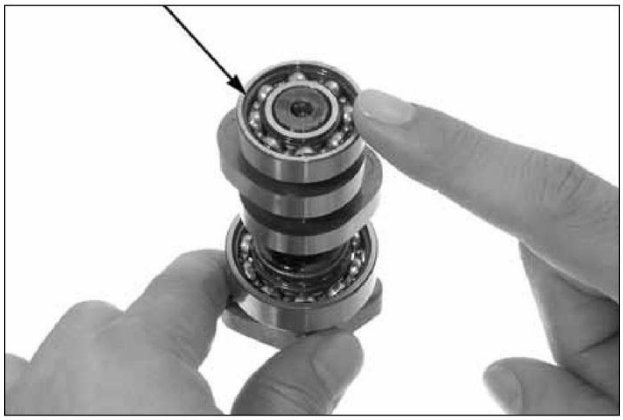
7. 拆除摇臂轴紧固螺栓
Remove fastening bolt of rocker arm shaft.



8. 取出摇臂轴和摇臂
Take out rocker arm shaft and rocker arm.



9. 检查凸轮轴两端轴承是否转动灵活
Check bearing at both ends of camshaft for free rotation.

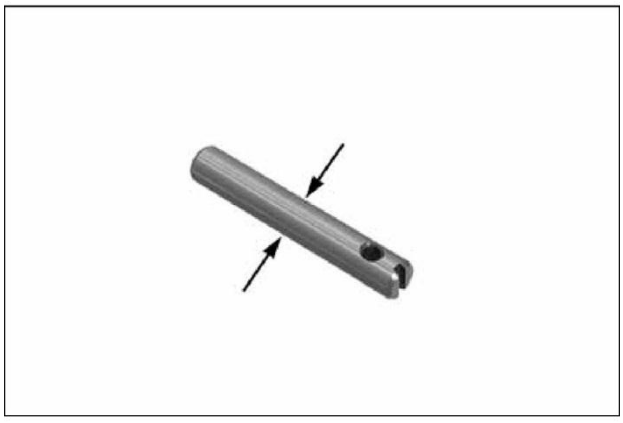


10. 检查凸轮是否磨损
Check camshaft for wear.

极限值 Service limit	进气 Inlet：31.8mm
	排气 Exhaust：31.5mm

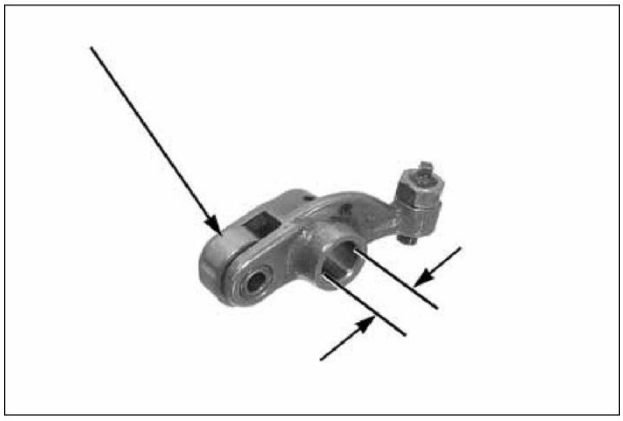
11. 检查摇臂轴是否磨损
Check rocker arm shaft for wear.

极限值 Service limit	9.91mm



12. 检查摇臂轴孔是否磨损，摇臂滚轮间隙是否正常。
Check rocker arm shaft hole for wear; check if rocker arm roller clearance is correct.

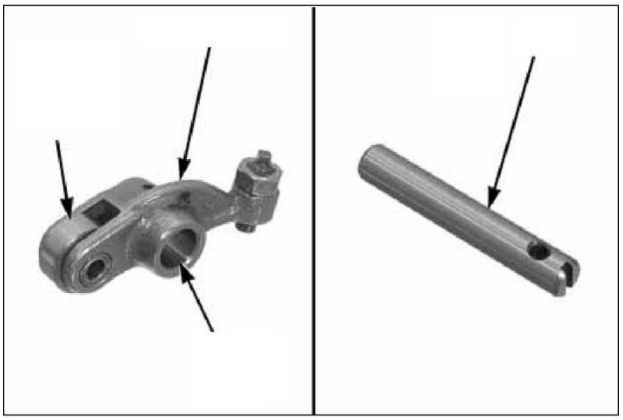
极限值 Service limit	10.1mm



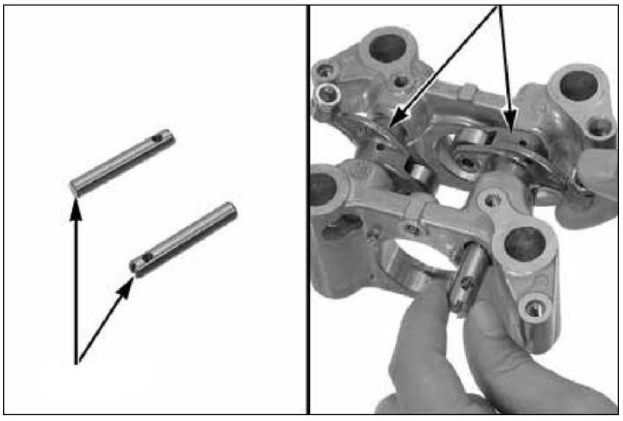
二）摇臂组合的装配

II) Installation of rocker arm assembly

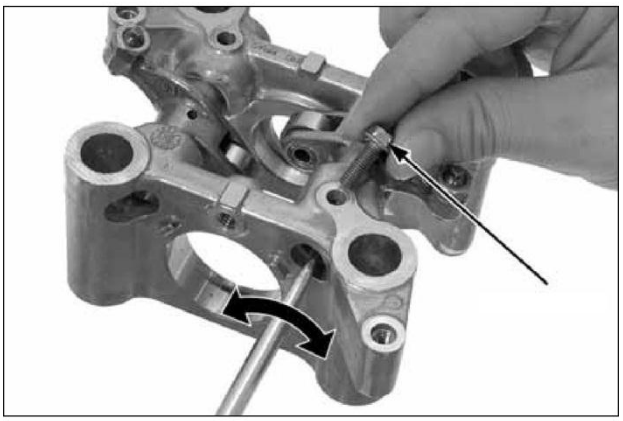
1. 摇臂轴孔、滚轮部位及摇臂轴转配前涂抹适量的润滑油。
Apply appropriate amount of lube oil on rocker arm hole, roller and rocker arm shaft before installing them.



2. 按图示顺序装配摇臂及摇臂轴
Install rocker arm and rocker arm shaft in accordance with sequence shown in the figures.

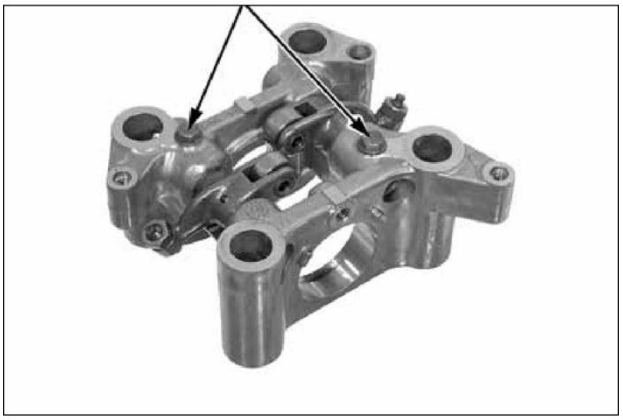


3. 用平口起子转动摇臂轴，使摇臂轴上的螺纹孔与摇臂支架上的过孔对其，然后再用手装入紧固螺栓。
Use flat screwdriver to turn rocker arm shaft so that screw hole on rocker arm shaft is aligned with through hole on rocker arm bracket. Then install fastening bolt manually.

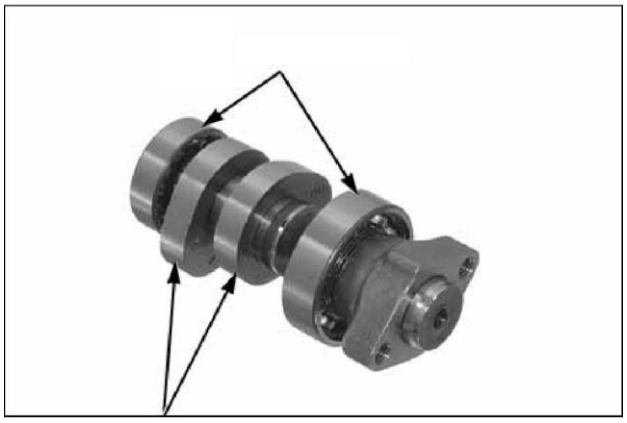


4. 确认螺栓装配到位后，再用扭力扳手紧固螺栓到规定扭力
After confirming that the bolts are installed to their right position, use tightening spanner to tighten the bolts to specified torque.

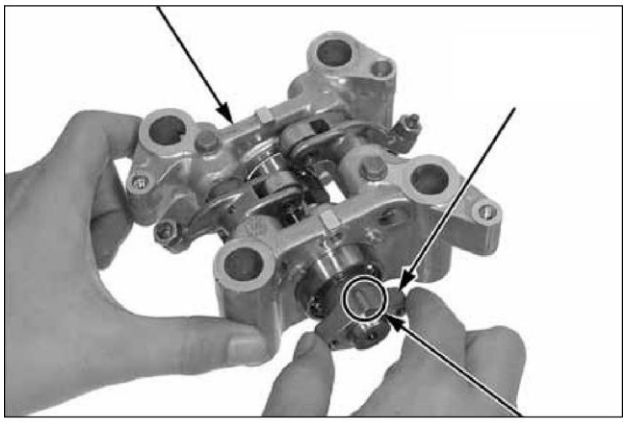
紧固扭力: 5N•m
Tightening torque: 5N•m



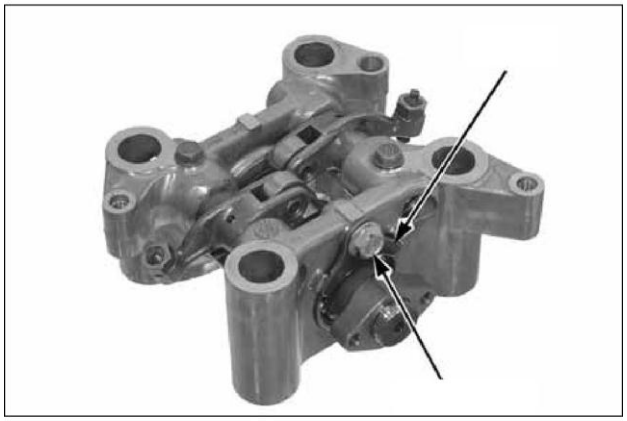
5. 凸轮轴在装配前，两端轴承外圈要涂抹适量的润滑油，凸轮部位涂抹适量的二硫化钼润滑脂。
Before installing camshaft, apply appropriate amount of lube oil on circumference of bearings at both ends. Apply appropriate amount of SO_2 grease onto cams.



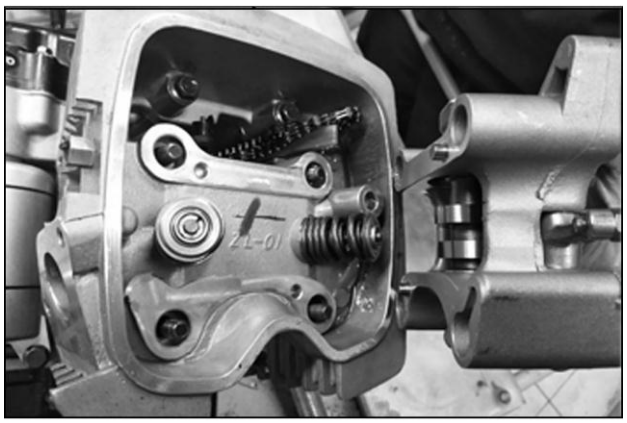
6. 将凸轮装入摇臂支架，注意法兰盘上的凸点要朝上，如图所示。
Install camshaft into rocker arm bracket. Care shall be taken that projected point on flange shall be upward, as shown in the figure.



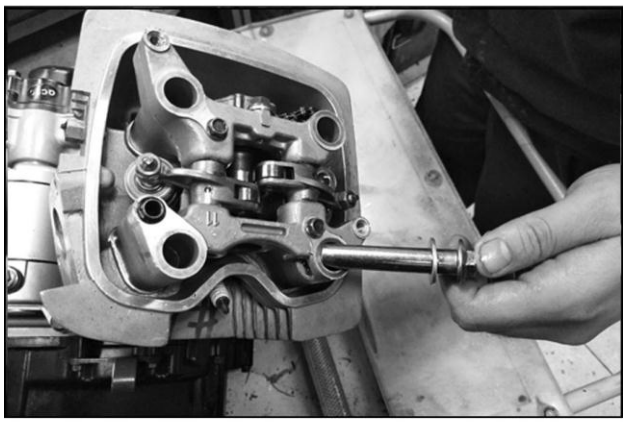
7. 装配挡板及紧固螺栓
Install stop plate and fastening bolt.
紧固扭力: 10N•m
Tightening torque: 10N•m



8. 将部装好的摇臂组合装配到缸头上装配前要注意检查两颗定位销是否完好。
Install the completed rocker arm assembly onto cylinder head. Care shall be taken to check if two locating pins are in good condition before installation.



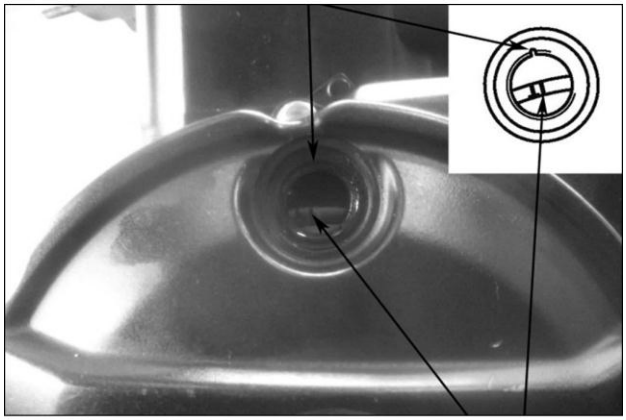
9. 垫片两端及螺母外部转涂抹适量润滑油后装入摇臂支架
Apply appropriate amount of lube oil onto both sides of gasket and external surface of nut, then install them into rocker arm bracket.



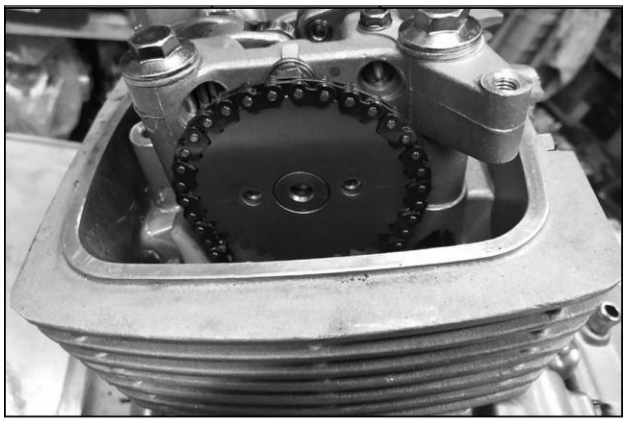
10. 依次紧固 AB 栓螺母
Tighten AB nuts in turns.

紧固扭力：35N•m
Tightening torque: 35N•m

11. 依照前面的步骤将发动机调整到上止点。
Adjust the engine to TDC in accordance with sequence above-mentioned.

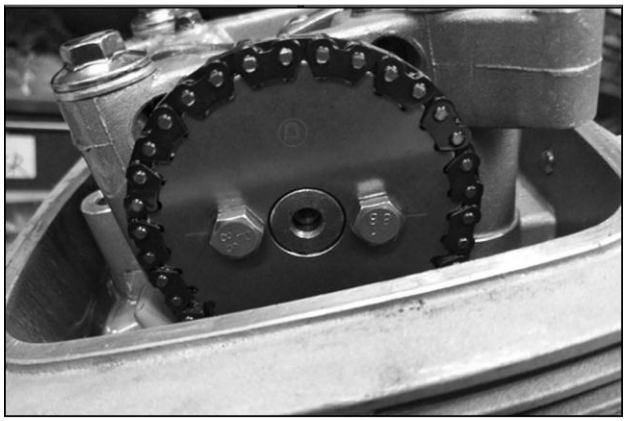


12. 装配链条和正时链轮，调整链轮到如图所示的位置。
Install chain and timing sprocket, and adjust the sprocket to position as shown in the figure.

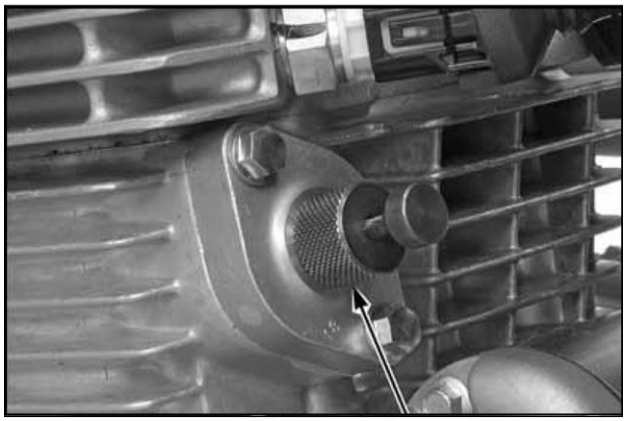


13. 装配紧固螺栓
Install fastening bolt.

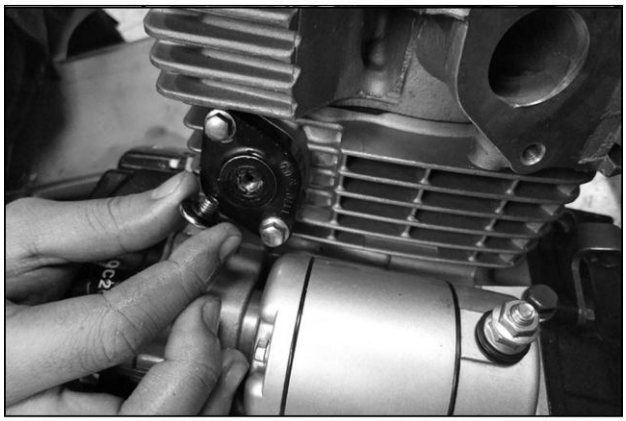
紧固扭力：10N•m
Tightening torque: 10N•m



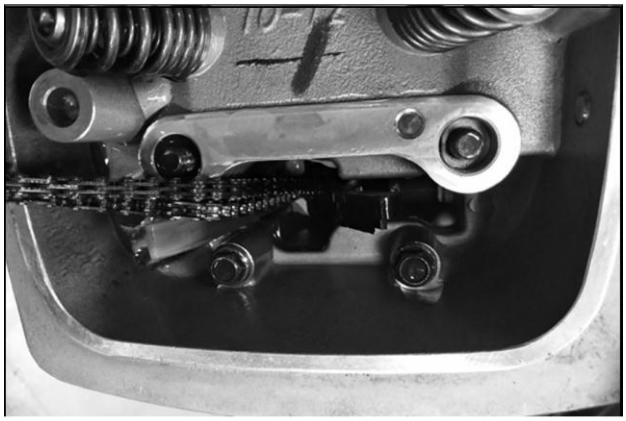
14. 松开张紧器，检查链条是否绷紧。
Loosen tensioner to check if chain is tensioned.



15. 更换一个新的 O 型圈，装配张紧器螺钉。
Replace O-ring with a new one, then install tensioner screw.



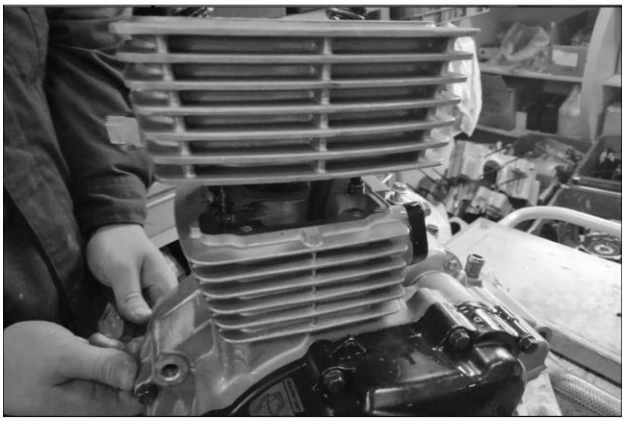
四、缸头组合的维修
IV. Maintenance of cylinder head assembly



一）缸头的拆卸
I) Removal of cylinder head

1. 拆除两颗缸头缸体连接螺栓
Dismantle two bolts connecting cylinder head with cylinder block.

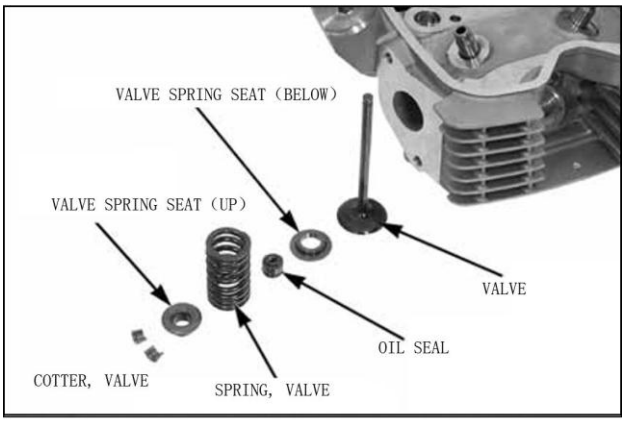
2. 取下缸头组合
Dismantle cylinder head assembly.



3. 取下缸头密封垫和两颗定位销
Take out cylinder head seal gasket and two locating pins.

4. 采用专用工装拆除缸头上的气门锁夹座圈、气门、挡油罩、气门弹簧；
Use special tooling to dismantle valve collet seat ring, valve, valve stem seal, and valve spring respectively.

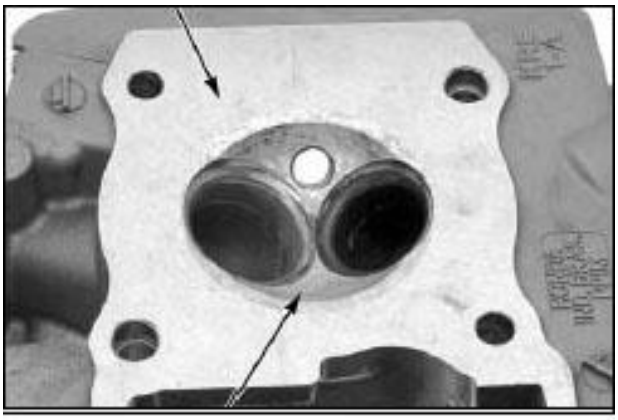
5. 拆除下来的部件要依次摆放好；
Place the components dismantled in order.



二）缸头组合的检查

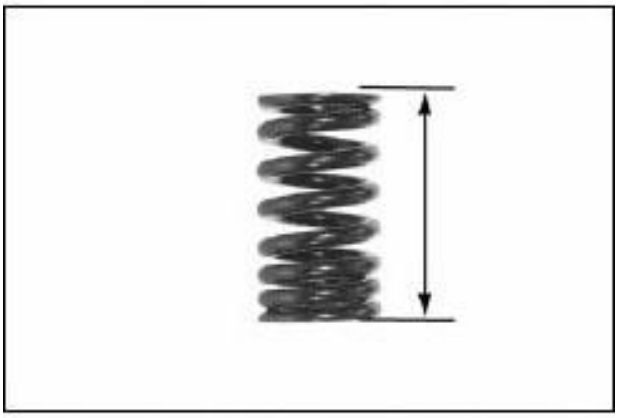
II) Check of cylinder head assembly

1. 检查缸头燃烧室，清除积碳；
Check combustion chamber of cylinder head and clean off carbon deposit.



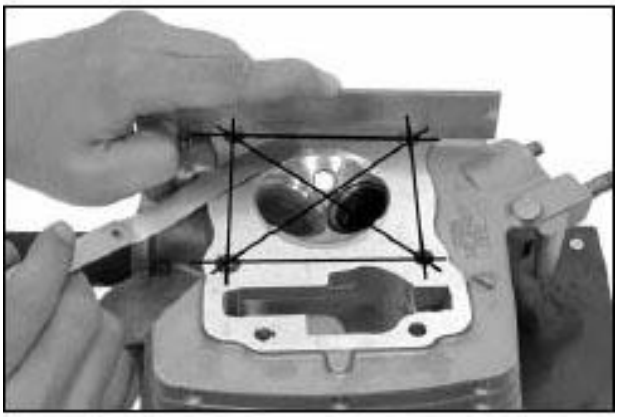
2. 气门弹簧自由高度检查
Check valve spring for free length.

极限值 Service limit	内簧 In：37.8mm
	外簧 Outer：40.8mm

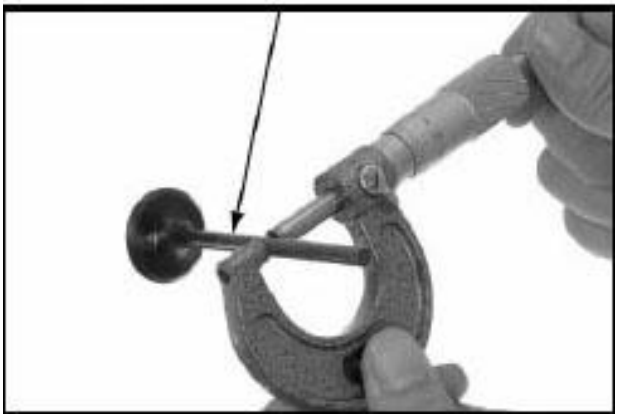


3. 缸头端面平面度检查
Check planeness of end face of cylinder head.

极限值 Service limit	0.04



4. 气门杆部的磨损检查
Check valve stem for wear.

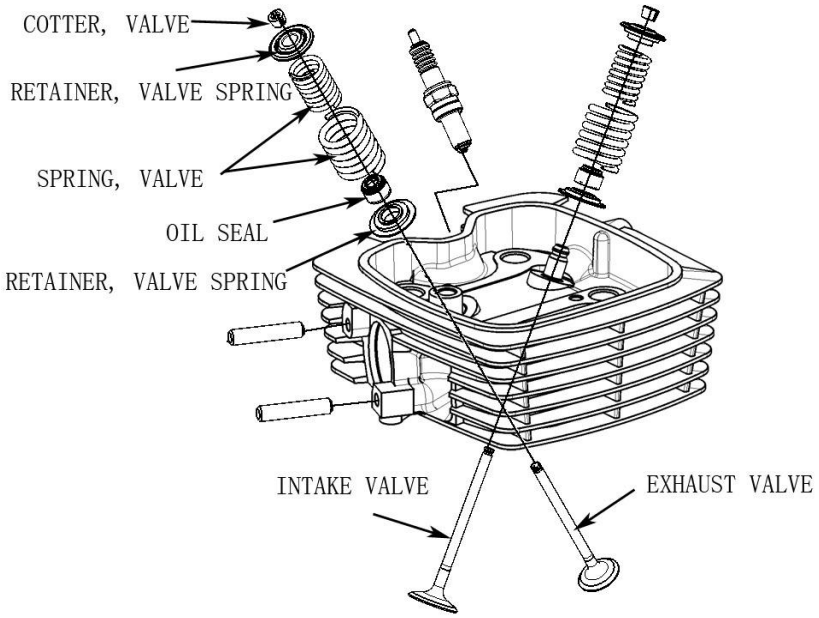


三）缸头组件的装配

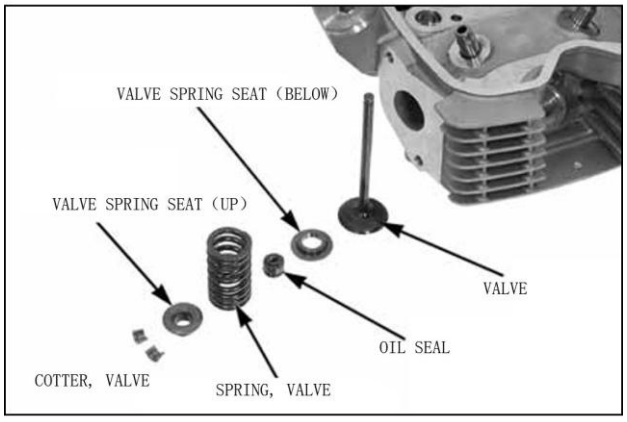
III) Installation of cylinder head assembly

缸头组件分解图

Exploded view of cylinder head assembly



1. 按照分解视图的顺序装配各组件；
Assemble the components in accordance with the sequence shown in exploded view.



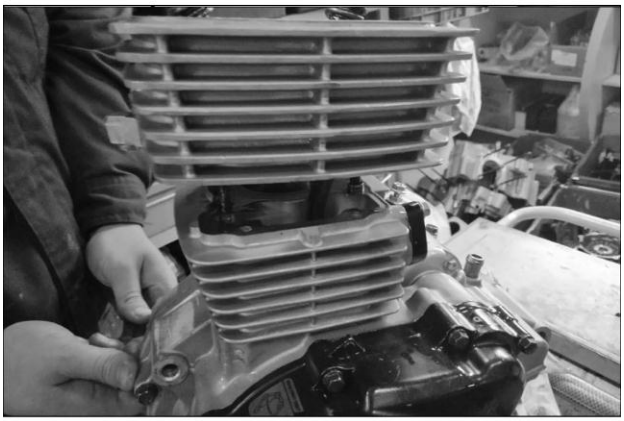
2. 气门弹簧安装是要注意，弹簧紧密的一段朝下
When installing valve spring, care shall be taken that the dense coil end of spring shall be directed downwards.

3. 采用专用工装装配气门锁夹
Use special tool to install valve collet.

对组装好的汽缸头组合进行气密性检测，若汽缸头组合无泄露则可进行下一步操作。
The completed cylinder head assembly shall be subject to air tightness test. Next operation shall not be done unless the cylinder head assembly is confirmed air-tight.

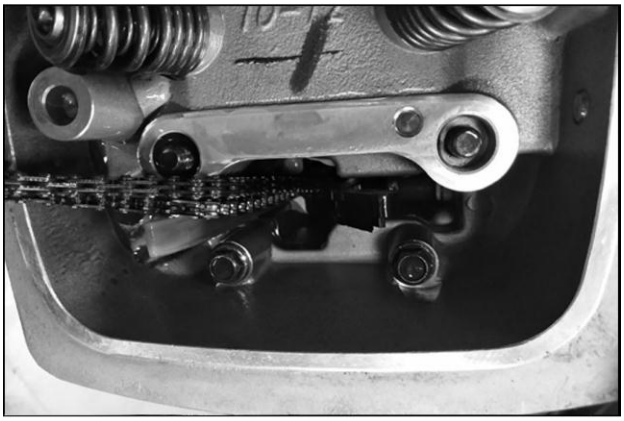
4. 装配定位销和一张新的缸头密封垫
Install locating pin and replace sealing gasket of cylinder head with a new one.

5. 将组装好的缸头组合装配上
Install the completed cylinder head assembly.



6. 紧固好两颗连接螺栓
Tighten the two connecting bolts.

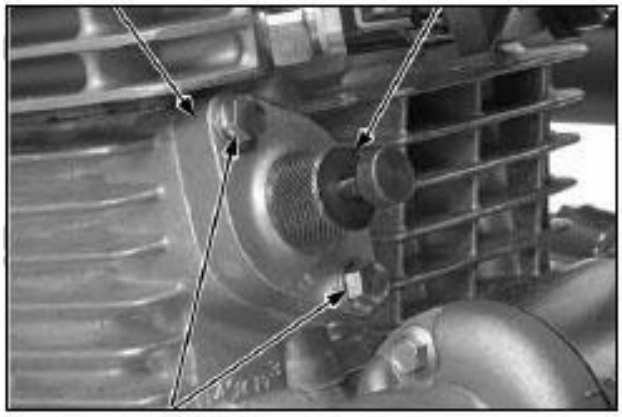
紧固扭力：10N•m
Tightening torque: 10N•m

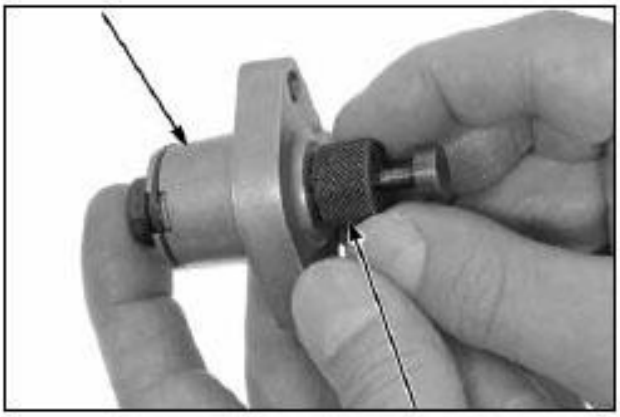


五、张紧器的拆除与安装
V. Removal and installation of tensioner

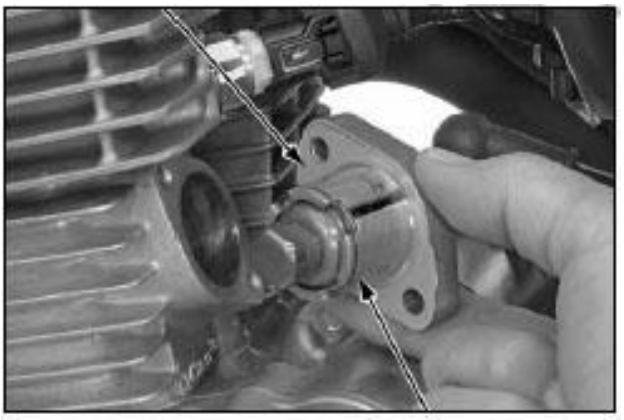
1. 拆除张紧器螺钉
Remove screw of tensioner.

2. 用工具调节张紧器到松开位置
Use tools to adjust tensioner until it becomes loose.



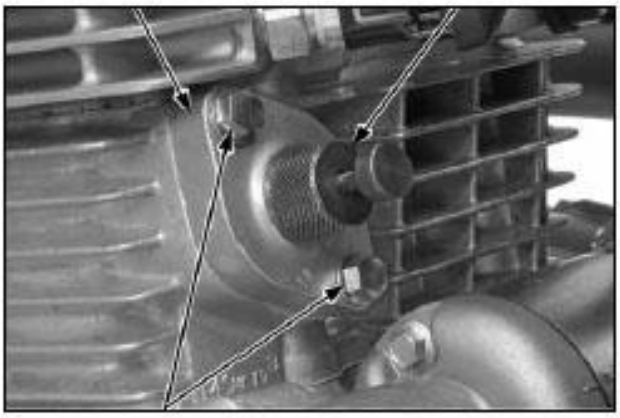


3. 张紧器的装配
Install tensioner.

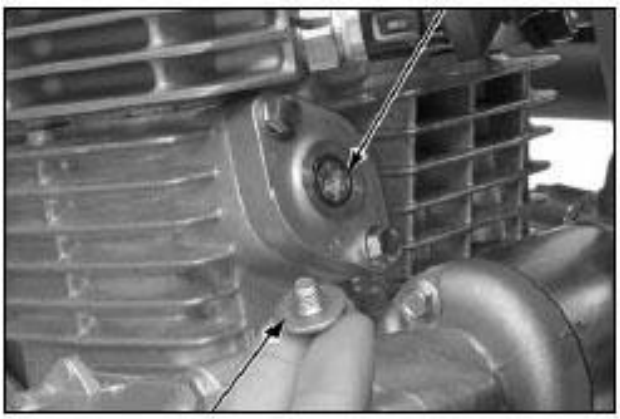


4. 紧固螺栓，用工具调节张紧器至张紧
Tighten the bolt，Use tools to adjust tensioner until it was tight.

紧固扭力：10N•m
Tightening torque: 10N•m



5. 更换新的 O 型密封圈
Replace O-ring with a new one.



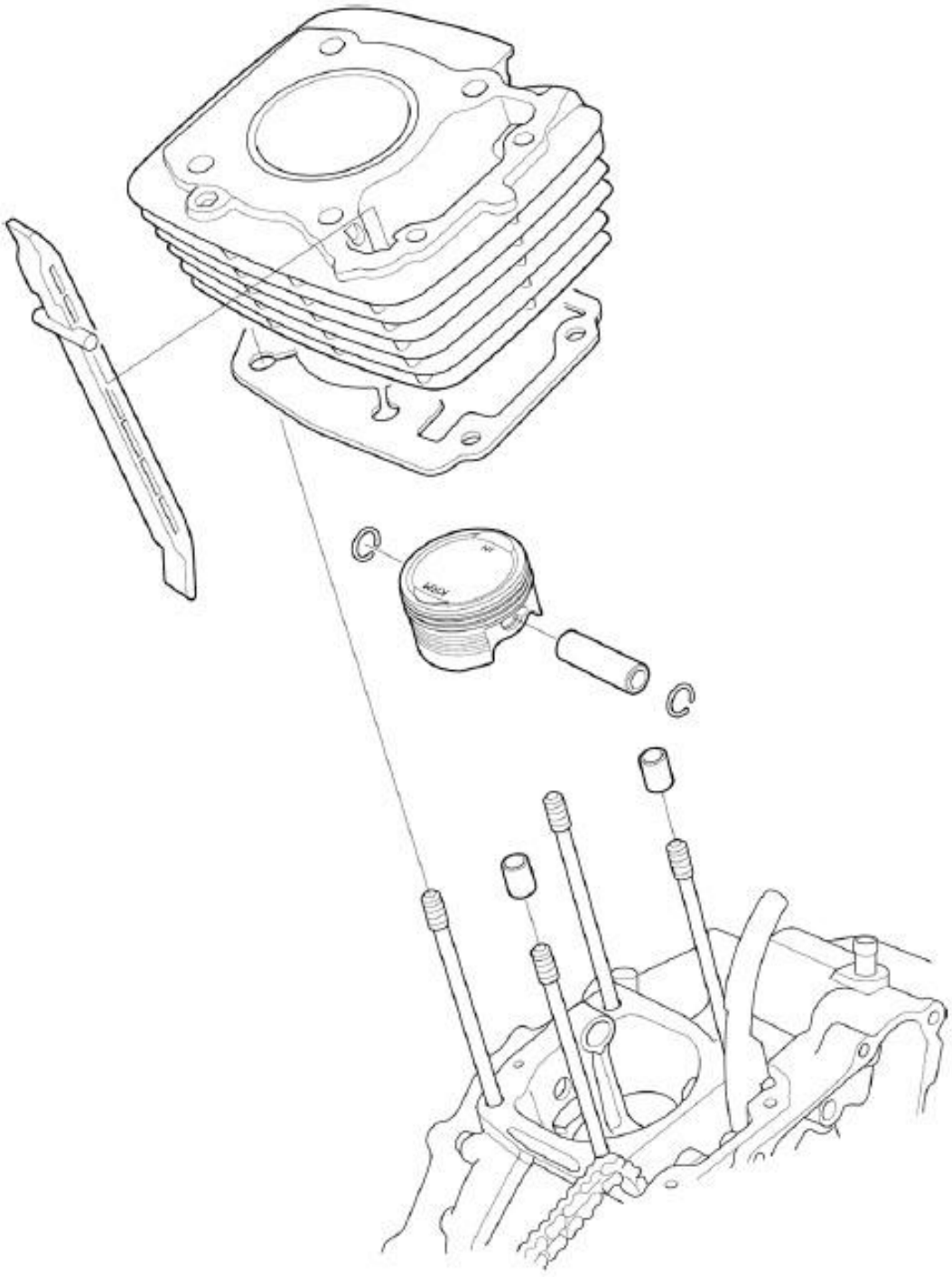
6. 紧固螺钉
Tighten the screw.

紧固扭力：10N•m
Tightening torque: 10N•m

缸体/活塞维修
Maintenance of Cylinder block/ piston

一、缸体活塞分解图

Ⅰ Exploded view of cylinder block and piston



二、使用标准

Ⅱ. Limits for service

单位：mm
unit: mm

项目 Item			标准值 Standard	维修极限值 Service Limit
汽缸 Cylinder	汽缸内径 Inner diameter of cylinder		Φ52.400~φ52.410	Φ52.5
	圆度 Roundness		0.004	0.10
	缸面平面度 Planeness of cylinder face		0.03	0.10
活塞活塞环活塞销 Piston, Piston Ring and Piston Pin	活塞外径 Outer diameter of piston		Φ52.38~φ52.39	Φ52.3
	活塞销孔内径 Inner diameter of piston pin hole		φ14.002~φ14.008	φ14.04
	活塞环闭合间隙 Closure clearance of piston ring	一环 Top	0.1~0.25	0.35
		二环 second	0.15-0.30	0.4
		油环 Oil	0.2~0.7	0.85
	活塞环与活塞环槽间隙 Piston Ring/Groove Clearance:	一环 Top	0.02~0.06	0.10
		二环 second	0.02~0.06	0.10
	汽缸与活塞间隙 Piston/Cylinder Clearance		0.01~0.03	0.07
	活塞销外径 Outer diameter of piston pin		φ13.994~φ14	φ13.96
	活塞销与活塞销孔间隙 Clearance between piston pin and piston pin hole		0.002~0.014	0.04
连杆小端 Small End of Connecting Rod	内径 Inner diameter		φ14.015~φ14.028	φ14.06
	连杆小端与活塞销间隙 Clearance between small end of connecting rod and piston pin		0.015~0.03	0.10

AB 栓的紧固标准：11N.m
Tightening torque of AB bolt: 11N.m

三、故障处理

Ⅲ. Trouble remedy

缸压太低或没有、低速性能差：
Cylinder pressure is too low or there is no cylinder pressure. Performance at low speed is not acceptable.

活塞环磨损严重或者破裂
Severely worn or broken piston ring

缸体、活塞损坏、破裂
Damaged or broken cylinder block or piston

缸压太高、发动机过热
Cylinder pressure is too high. Engine overheats.

活塞顶部积碳过多
Too much carbon deposit on piston top

机油消耗大、冒烟
Engine oil is consumed significantly, and engine smokes heavily.

缸体、活塞磨损严重或损坏
Severely worn or broken cylinder block and piston

活塞环装配不正确
Improper assembly of piston ring

异响
Abnormal noise

活塞装配不正确
Improper assembly of piston

活塞、活塞销的配合间隙太大缸体、活塞严重磨损
Fit clearance is too large between piston and piston pin, and the cylinder block and piston are severely worn.

四、缸体/活塞拆卸与装配

Ⅳ. Removal and installation of cylinder block/piston

一）缸体的拆卸与检测

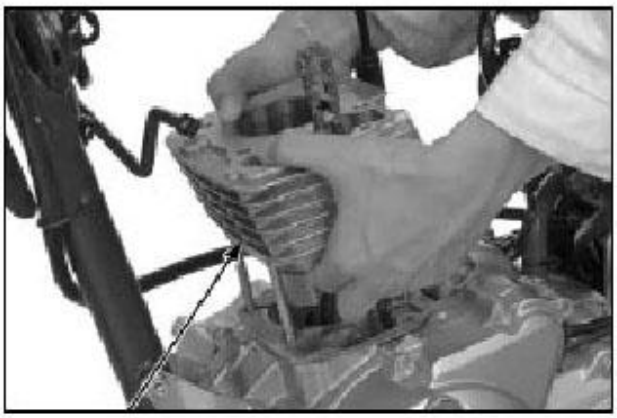
Ⅰ)Disassembly and inspection of cylinder block

1. 拆除缸头部分（4-13 页）;
Dismantle cylinder head (Page 4-13);

取出导向板
Take out guide plate.

2. 用胶榔头轻轻敲击缸体，是缸体和曲轴箱分离，向上取出缸体。
Knock cylinder block slightly with rubber hammer to separate cylinder block from crankcase. Take out cylinder block upwards.

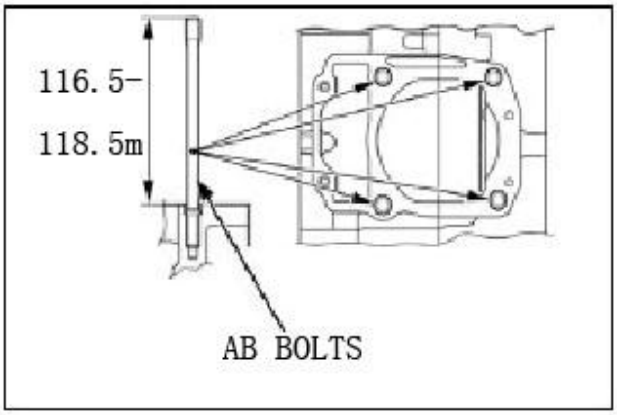
拆卸缸体的时候要避免损伤活塞
Care shall be taken not to damage piston when dismantling cylinder block.



3. 取出定位销和缸体纸垫
Take out locating pin and paper gasket of cylinder block.

4. 检查 AB 栓，如果更换新的 AB 栓，要注意检查 AB 栓的装配后的伸出长度，要求如图所示。
Check AB bolts. When replace AB bolts with new ones, pay attention to check projection length of the installed AB bolt, which shall meet requirements shown in the figure.

紧固扭力: 11N•m
Tightening torque: 11N•m

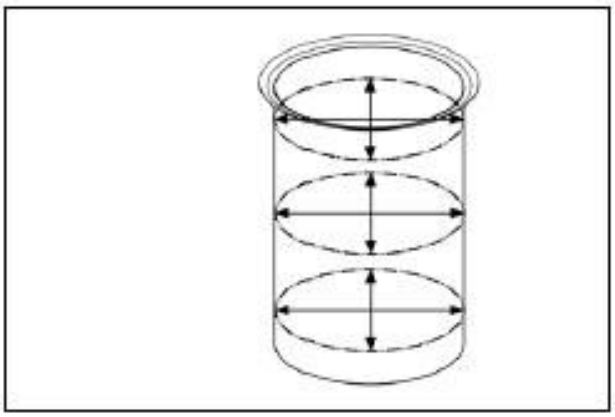


二）检查气缸体

Ⅱ)Check cylinder block

1. 缸孔直径测量，测量汽缸内径，应量取三个位置，即活塞行程的顶部、中部和底部，测量时应对互成直角的两个方向进行测量。
Check diameter of cylinder bore. When doing that, measure the diameter at three layers respectively, i.e. top, middle and bottom of piston stroke, and measurement shall be taken at two directions mutually perpendicular at every layer.

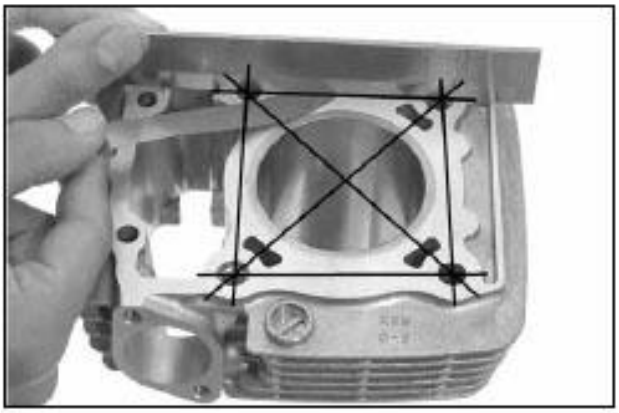
极限值 Service limit	Φ52.5mm



2. 根据各个位置测量出的最大值，计算出缸孔的圆柱度
Calculate cylindricity of cylinder bore in accordance with the maximum value measured at the positions.

极限值 Service limit	0.10mm

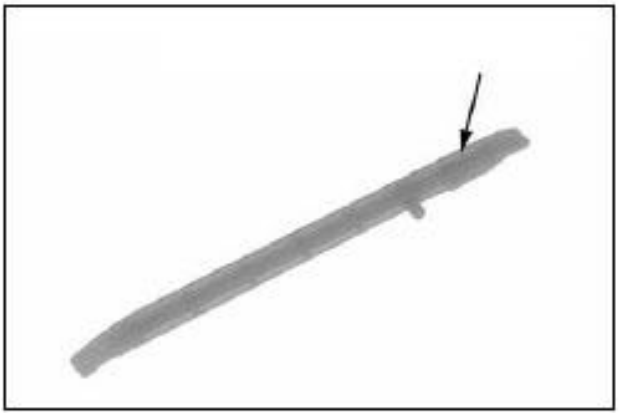
如果检查出来的值超过极限值就必须要更换新的缸体
If the measurement exceeds the service limit, the cylinder block must be replaced with a new one.



3. 采用刀口尺和塞尺检测缸体平面度；
Use knife straight edge and feeler gauge to check planeness of cylinder block;

极限值 Service limit	0.10mm

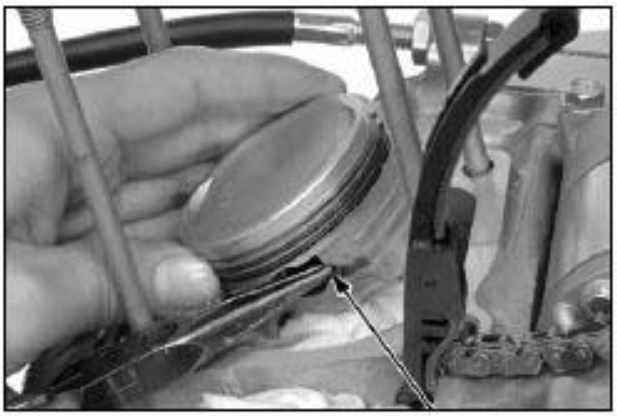
4. 检查链条导向板是否有严重的磨损和损坏，如果有则需要更换新的；
Check guide plate of chain for evident wear or damage. If there is, replace the plate with a new one.



三）活塞的拆卸

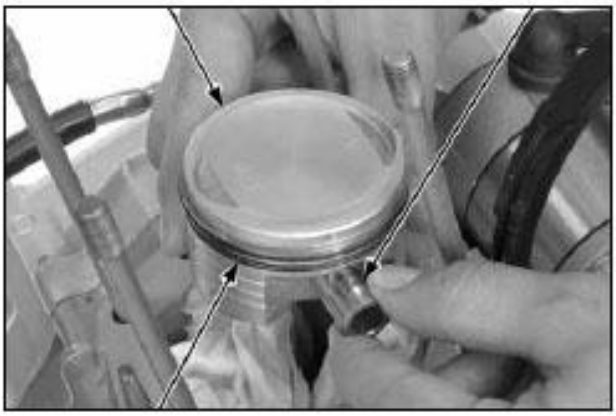
Ⅲ）Remove piston

1. 取一块干净的布垫到活塞下方，避免活塞销挡圈在拆卸的过程中调入曲轴箱；
Place a clean cloth under the piston to guard against that circlip of piston pin falls into crankcase during removal.



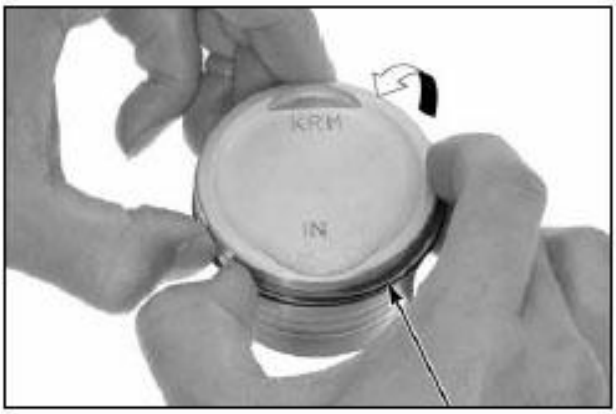
2. 用尖嘴钳拆下活塞销挡圈；
Use long-nose pliers to remove circlip of piston pin.

3. 取出活塞销；
Take out piston pin.



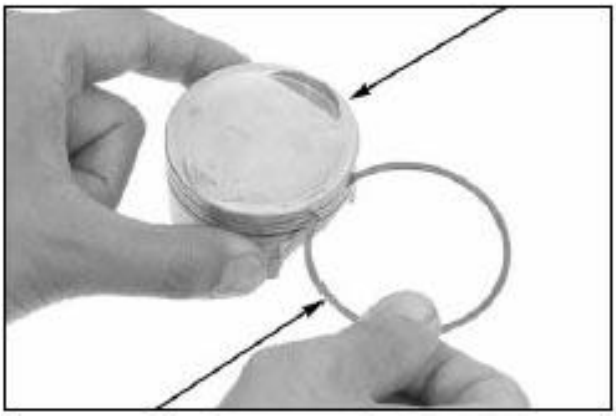
4. 用手转动活塞环，检查活塞环在活塞上的转动是否灵活，有无卡致的故障
Turn piston rings manually to check if the piston rings can rotate freely on the piston without seizure.

用拇指从活塞环的开口位置轻轻搬开活塞环取出
Use thumbs to increase gap slightly between ends of the piston ring to take out the piston ring.



注意
Note

在取活塞环的时候要避免损伤活塞和活塞环
Do not damage piston and piston ring when taking out piston ring.



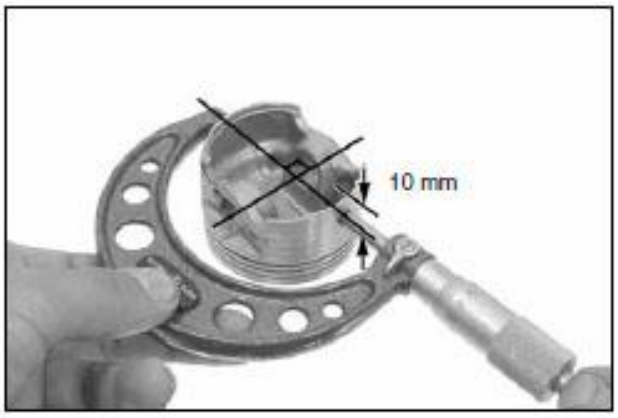
可使用报废的活塞环清理活塞环槽里面的积碳
Clean off carbon deposit from piston ring groove with the aid of discarded piston ring.

四）活塞的检测
Ⅳ）Check piston

检查活塞是否有损伤或破裂
Check piston for damage or break.

检测活塞 8mm 高度位置活塞群部的直径
Check diameter of skirt at 8mm height.

极限值 Service limit	Φ52.3mm



缸孔直径和活塞群部直径检测完成后，计算出他们的配合间隙：
After measure diameters of cylinder bore and piston skirt, calculate their fit clearance.

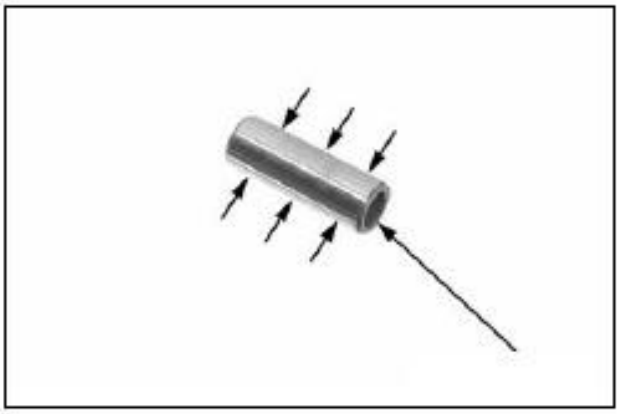
极限值 Service limit	0.09mm

活塞销孔直径检测
Measure diameter of piston pin hole

极限值 Service limit	φ14.04mm

活塞销直径检测
Measure diameter of piston pin

极限值 Service limit	φ13.96mm

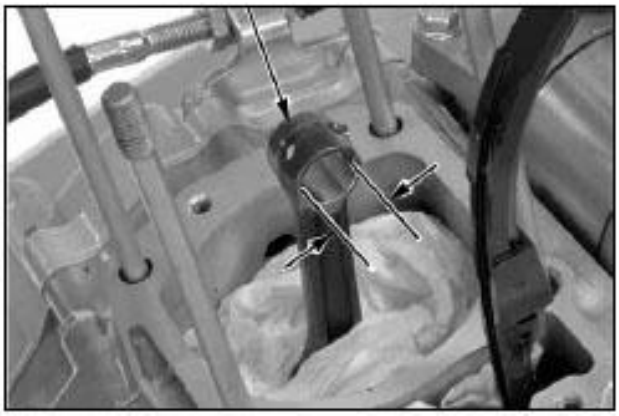


活塞销与活塞销孔的配合间隙
Fit clearance between piston pin and piston pin hole

极限值 Service limit	0.04mm

连杆小头销孔直径检测
Check diameter of pin hole at small end of connecting rod

极限值 Service limit	φ14.06mm

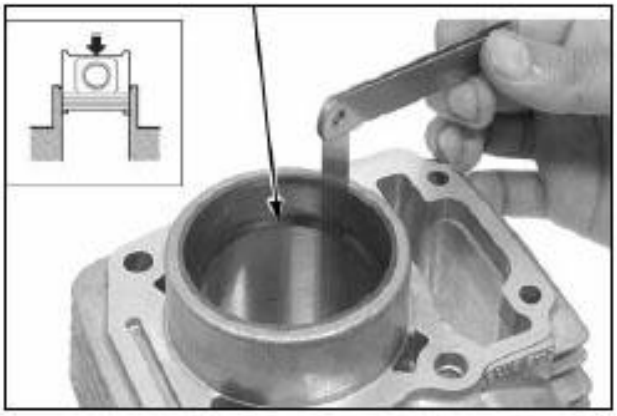


连杆与活塞销的配合间隙
Fit clearance between connecting rod and piston pin

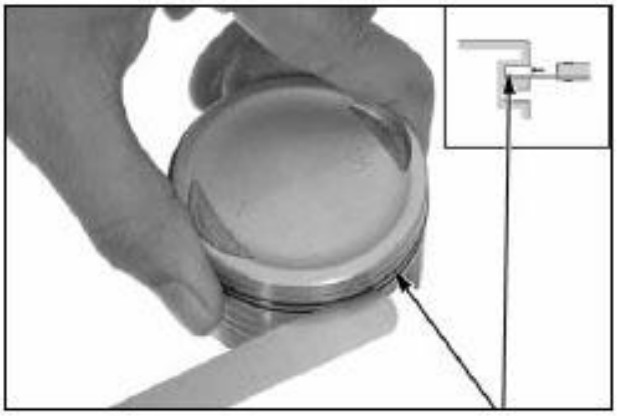
极限值 Service limit	0.10mm

活塞环开口间隙检测
Check gap of piston ring

将活塞环装入缸体内，并用活塞压平，用塞尺检测每个活塞环开口间隙
Install piston ring into cylinder block, and press them down with piston. Check gap of each piston ring with feeler gauge.



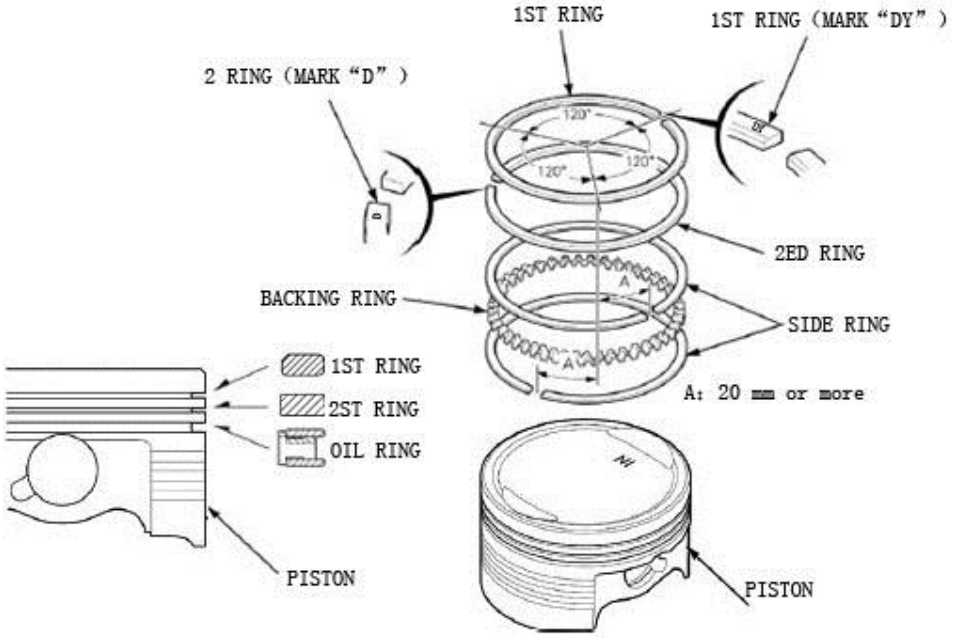
极限值 Service limit	1 环 1st ring	0.40mm
	2 环 2nd ring	0.40mm
	刮片环 Scraper ring	0.85mm



活塞环与活塞环槽间隙检测
Check for clearance between piston ring and ring groove

极限值 Service limit	1 环 1st ring	0.10mm
	2 环 2nd ring	0.10mm

活塞环装配示意图
Schematic diagram of installation of piston ring



注意：
Note:

活塞环在装配时不要损伤活塞和活塞环；
Do not damage piston and piston ring during assembling;

活塞环装配后要检查活塞环在活塞上的转动是否灵活、不能有卡致；
Check if piston ring can rotate freely on the piston without any seizure after rings are assembled.

活塞环装配后必须要如图所示，相互之间错开 120°；
After piston rings are assembled, the splits of piston rings must staggered away from each other by 120°.

活塞环的不正确装配会直接导致烧机油，活塞异常磨损等故障；
Improper assembly of piston rings will result directly in burning engine oil, abnormal wear of piston, etc.

五)活塞/缸体装配

Ⅴ) Installation of piston/cylinder block

注意
Note

在检测缸体、活塞时，在曲轴箱部位垫一块干净的布，避免灰尘和异物进入曲轴箱内。
When checking cylinder block and piston, place a clean cloth at crankcase to guard against dust and foreign matters falling into crankcase.

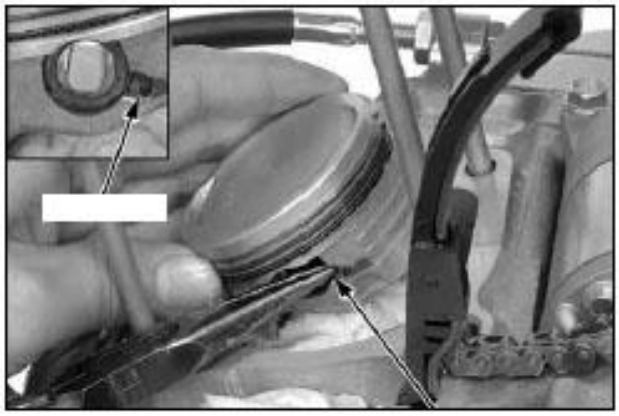
装配缸体、活塞前要将曲轴箱缸体结合面上的残留纸垫、机油等异物清理干净
Clean off paper gasket, oil and other foreign matters from mating surface between crankcase and cylinder block before installing cylinder block and piston.

活塞装配时“IN”标记面朝向进气方向，装入活塞销
When assembling piston, direct face with mark IN towards intake side. Then assemble piston pin.

活塞销及活塞销孔、活塞群部在装配前涂抹适量的润滑油；
Apply appropriate amount of lube oil on piston pin, piston pin hole, piston skirt before assembling.

安装新的活塞销挡圈
Installing new piston ping circlip

注意 Note
在活塞下面垫一块干净的布，避免挡圈调入箱体内；活塞销挡圈不能重复使用，否则会造成发动机的损坏；
Place a clean cloth under the piston to guard against circlip falling into crankcase. It is forbidden to reuse circlip; otherwise, the engine may be damaged.
活塞销挡圈一定要安装到位；
Piston pin circlip must be installed to its place.
挡圈开口要与活塞上的安装位置错开，保持开口向下
Split of circlip shall be alternated away from the installing position on the piston. Split of circlip must be kept downwards.



装配定位销及新的缸体密封垫
Install locating pin and new sealing gasket of cylinder block

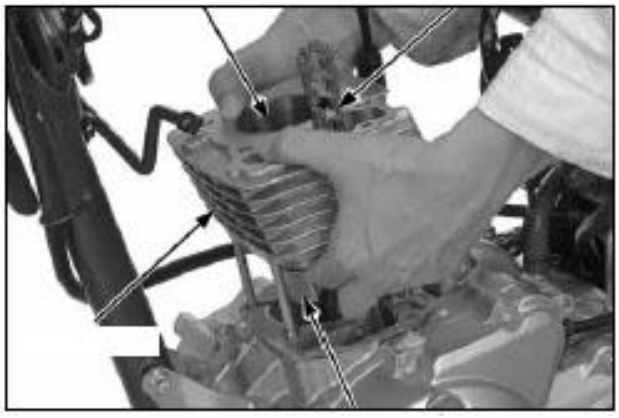
纸垫装配前需要将曲轴箱端面的机油清理干净，避免造成漏油的假象。
Clean off engine oil from end face of crankcase before installing paper gasket to avoid false phenomena of oil leakage.

注意 Note
缸体纸垫不能重复使用，必须更换新的
Paper gasket of cylinder block is forbidden to reuse. It must be replaced with a new one.

装配缸体
Install cylinder block,

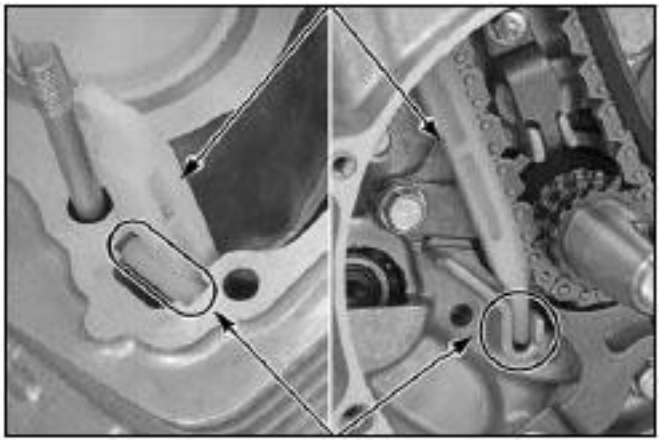
在汽缸体、活塞及活塞环表面均匀的涂抹适量的润滑油；
Apply appropriate amount of lube oil evenly on surface of cylinder block, piston and piston ring.

依次将活塞、活塞环卡入缸体后，将缸体装配到位；
Install piston and piston ring into cylinder block, then install the block assembly in the right position.



注意 Note
不要损伤活塞表面和缸孔
Do not damage piston surface and cylinder block.

将链条导向板装入缸体。
Install guide plate of chain into cylinder block



注意：
Note:

导向的装配要如图所示装配到位，否则会造成导向板的异常磨损。
Guide plate shall be installed to its place as shown in the figure; otherwise, the plate may be damaged abnormally.

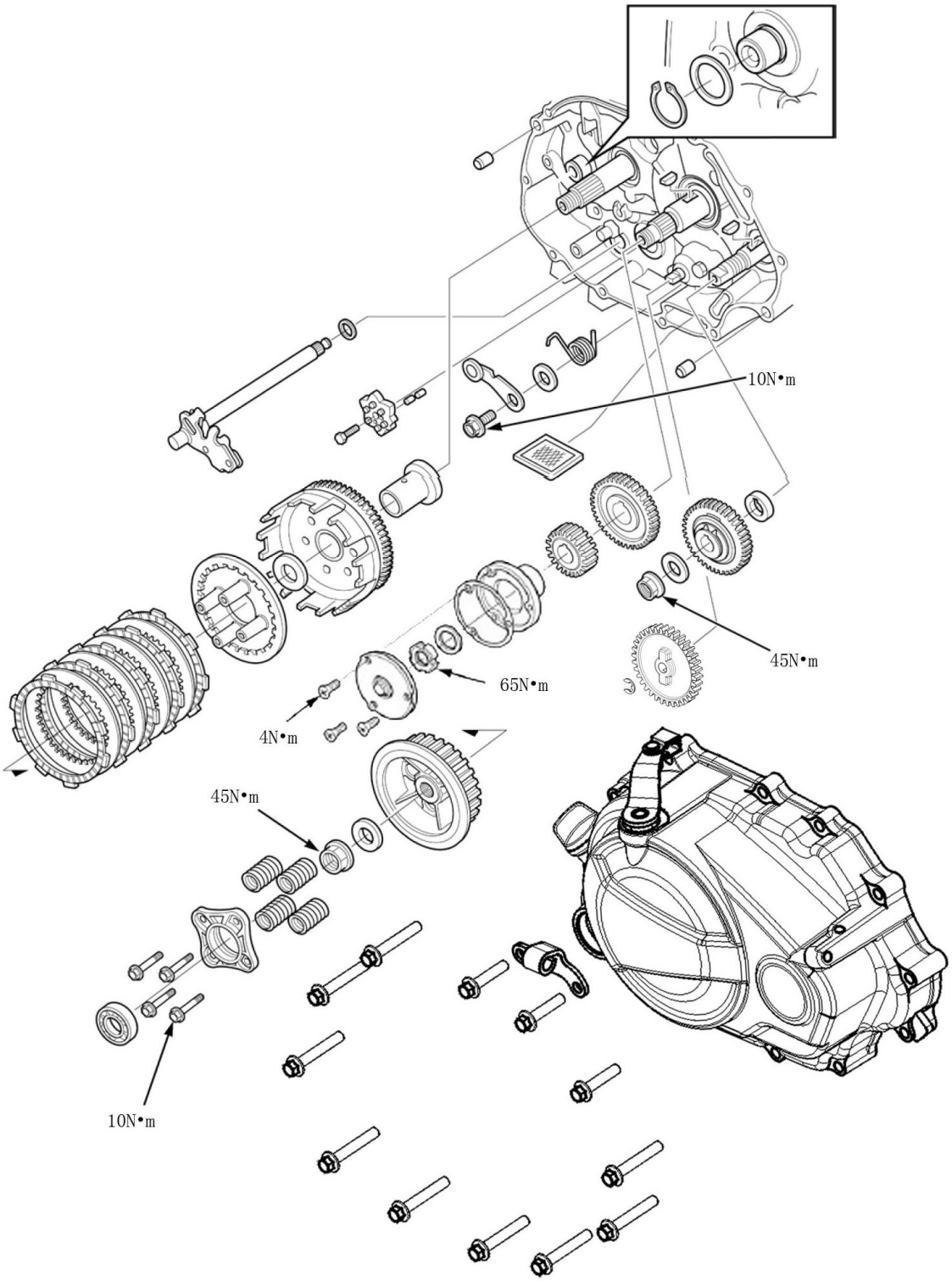
装配缸头部件、张紧器
Assemble cylinder head and tensioner.

（4-16）

右盖/离合器/平衡齿/变档
Right Cover / Clutch / Balanced Gear / Gearshift

一、右盖/离合器/平衡齿/变档分解图

I. Exploded view of right cover/ clutch/ balanced gear/ gearshift



二、离合器技术标准
II. Technical specifications of the clutch

单位：mm
unit: mm

项目 Item		标准值 Standard	维修极限值 Service Limit
分离手把的自由行程 Free Travel of Separate Handle			
离合器 Clutch	离合器分离弹簧自由长度 Clutch Spring Free Length	41.1-41.9	40
	摩擦片厚度 Friction Plate Thickness	2.92-3.08	2.6
	离合器从动片平面度 Planeness of clutch driven plate		0.20
	从动齿轮内孔直径 Driven gear inner hole diameter	Φ23.000~φ23.021	φ23.08
轴套 Shaft sleeve	轴套外径 Collar diameter	Φ22.960~φ22.975	Φ22.93
	轴套孔径 Bushing aperture	Φ16.990~φ17.008	φ17.04
	主轴外径 The spindle diameter	Φ16.966~φ16.984	Φ16.95

三、紧固扭力标准：
III. Requirement of tightening torque

离合器锁紧螺母：45N.m
Locknut of clutch: 45N.m

滤清器锁紧螺母：65N.m
Locknut of crankshaft: 65N.m

平衡齿锁紧螺母：45N.m
Locknut of balanced gear: 45N.m

定位板紧固螺栓：10N.m
Fastening bolt of locating plate: 10N.m

离合器盖紧固螺栓：10N.m
Fastening bolt of clutch cover: 10N.m

机油滤清器盖紧固螺栓：4N.m
Fastening bolt of filter cover cover: 4N.m

GB5783 螺栓的紧固标准：10N.m
Tightening torque of GB5783 bolt: 10N.m

GB16674 螺栓的紧固标准：10N.m
Tightening torque of GB16674 bolt: 10N.m

四、故障诊断：
IV. Troubleshooting

1. 离合器的分离不开、分离不彻底：
Clutch does not release or not fully release.

操纵臂自由行程不合适；
Improper free travel of control arm;

操纵臂、分离轴承、推杆损坏；
Damaged control arm, declutch bearing or pushing rod;

离合器主动摩擦片严重变形；
Severely deformed drive friction plate of clutch;

分离轴套、分离垫圈与从动齿轮抱死；
Lock-up of separate shaft sleeve, separate washer and driven gear;

离合器外罩严重磨损；
Severely worn outer case of clutch;

2. 离合器打滑：
Clutch skids:

摩擦片严重磨损；
Severely worn friction plates;

分离机构卡死；
Seizure of declutch mechanism;

操纵臂自由行程不合适；
Improper of free travel of control arm;

3. 变档发卡、不顺畅
Gearshift becomes difficult and seized.

离合器分离不彻底；
Clutch does not disengage thoroughly;

变档臂弯曲变形、严重磨损；
Gearshift arm bends, deforms and severely wears;

变档臂拨板变形不回位；
Fork plate of gearshift arm deforms and does not return;

定位板弹簧断裂
Break of spring of locating plate.

五、右盖的拆卸与安装

V. Removal and installation of right cover

一）先将发动内的机油放干净；

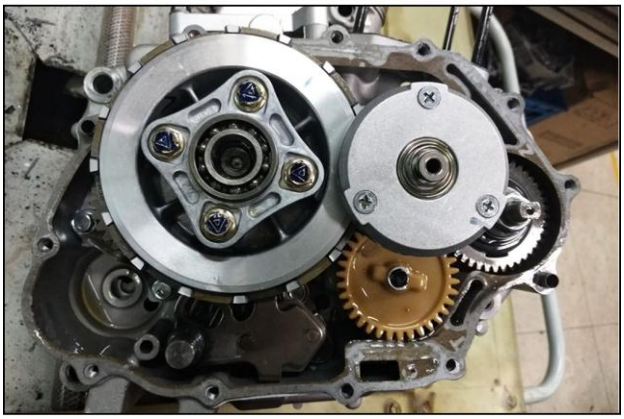
I) Drain off engine oil from engine.

二）拆除右盖上螺栓；

II) Remove bolt from right cover.

三）取下纸垫和定位销

III) Remove paper gasket and locating pin.

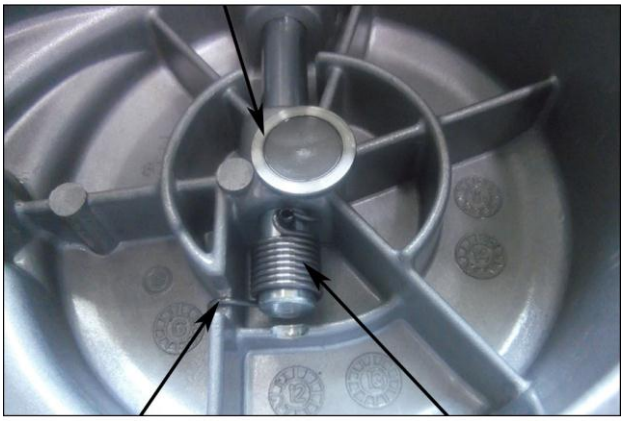


四）右盖的拆卸

IV) Removal of right cover

1.取出离合器推杆

Take out pushing rod of clutch.



2.用工装取出操纵臂上的开口销，取出弹簧

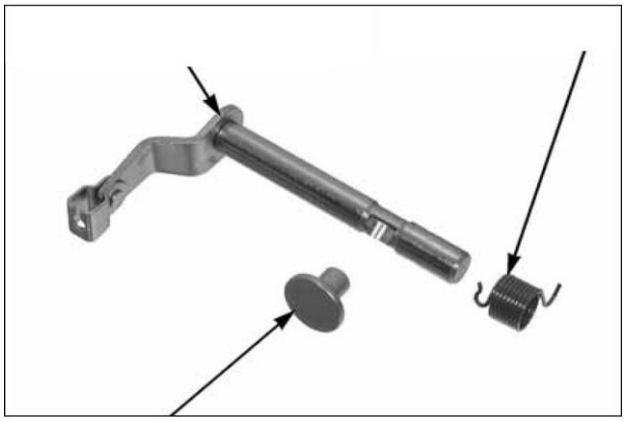
Use tools to dismantle cotter pin on control arm and take out spring.

3.取出离合操纵臂、油封

Take out clutch control arm and oil seal.

4.检查离合器操纵臂是否变形，推杆、弹簧是否有损坏如果有则需要更换新的。

Check clutch control arm for deformation; check if pushing rod and spring are damaged. If they are, replace them with new ones.



五）右盖的部装

V) Partial assembly of right cover

1.更换新的操纵臂油封，操纵臂杆部涂抹适量润滑油，入右盖中

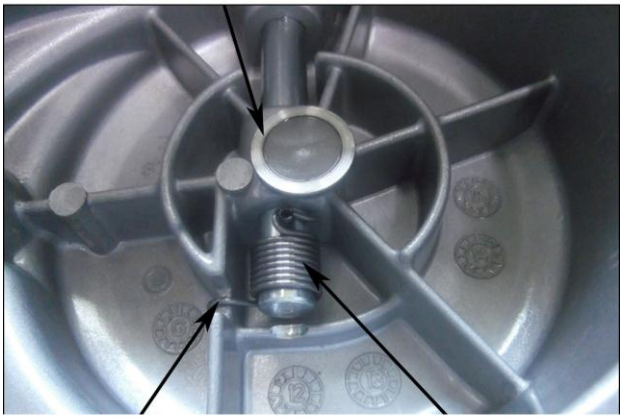
Replace oil seal of control arm with new one. Apply appropriate amount of lube oil onto lever of control arm, then install the arm into right cover.

2.用工装将开口销敲入操纵臂上的销孔

Use tools to knock cotter pin into corresponding hole of control arm.

3.旋转操纵臂，使弹簧卡入如图所示的位置，装入离合器推杆

Rotate control arm, so that spring falls into position as shown in figure. Then install pushing rod of clutch.

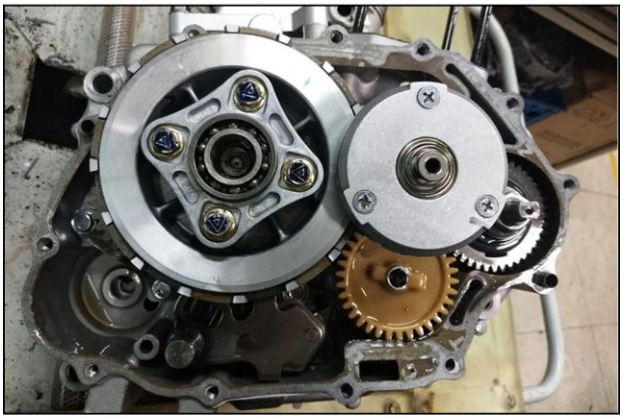


六）安装定位销及新的纸垫

VI) Assemble locating pin and new paper gasket.

安装前要将曲轴箱上的残留纸垫、机油清理干净

Clean off residual paper gasket and engine oil from crankcase before assembling.



七）安装好右盖及支架、螺栓，先预紧定位销位置的螺栓，然后按对角位置紧固其余螺栓。

VII) Assemble right cover, bracket, bolts. First, tighten the bolt at locating pin, then tighten other bolts alternatively.

紧固扭力值：10N.m

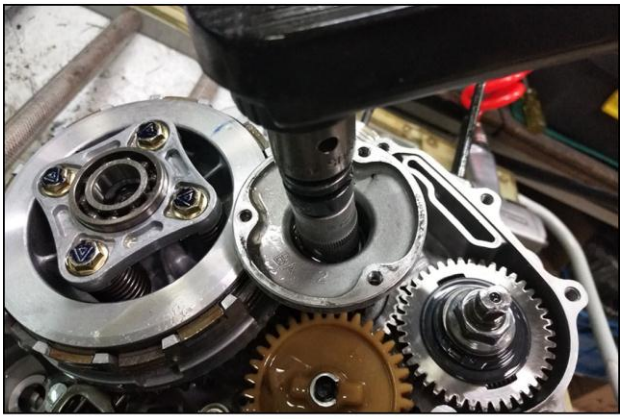
Tightening torque: 10N.m

六、离合器的拆卸和安装

VI. Removal and installation of clutch

一）拆除机油滤清器及机油泵齿轮

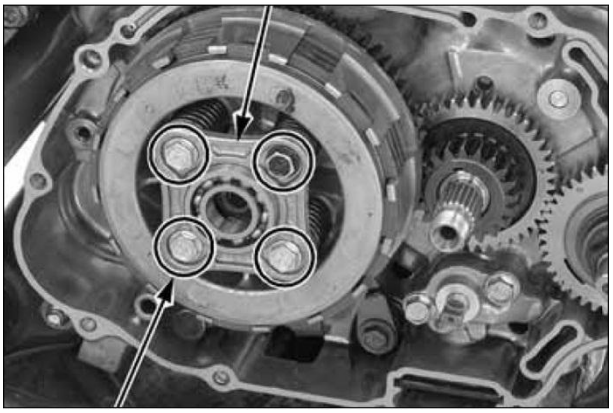
Dismantle the oil filter and gears of oil pump.



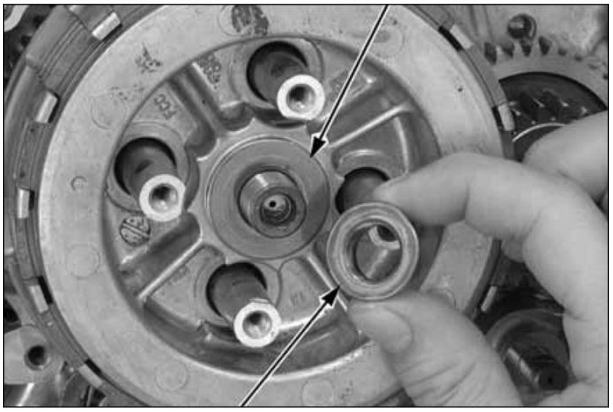
二）离合器的拆卸

II) Removal of clutch

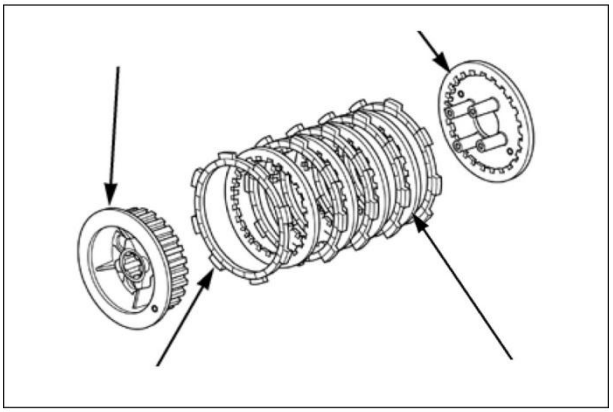
1. 拆下 4 颗离合器端盖螺栓，取出离合器端盖、轴承、分离弹簧。
Dismantle 4 bolts from end cover of clutch, then take out end cover of clutch, bearing, declutch spring.



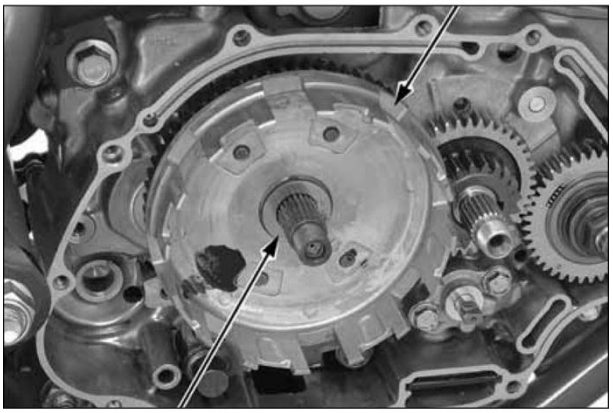
2. 拆下离合器锁紧螺母、垫圈
Dismantle locknut and washer of clutch.



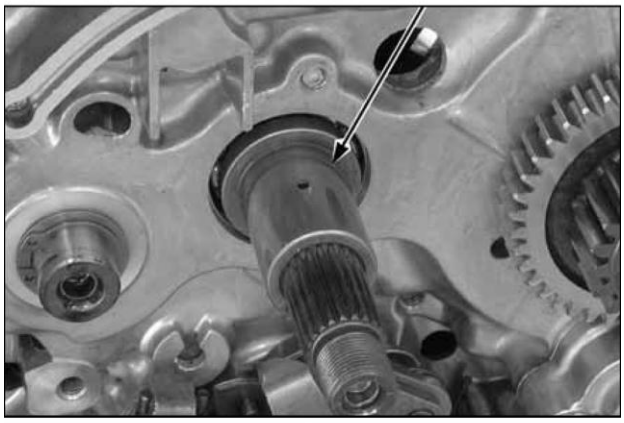
3. 取出离合器上下压盘、主从动摩擦片；
Take out upper and lower pressure plate of clutch, drive and driven friction plate.



4. 取出分离垫片及离合器外罩
Take out declutch gasket and outer case of clutch.

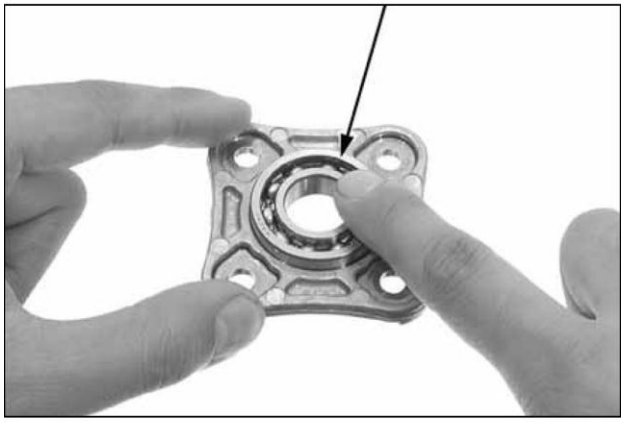


5. 取出分离轴套
Take out declutch shaft sleeve.



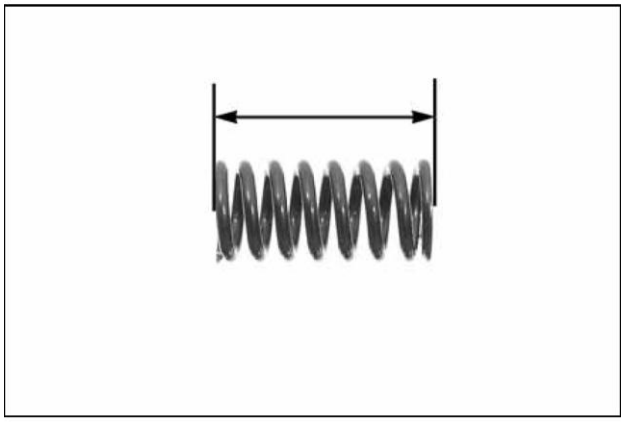
三）离合器的检查
III) Check of clutch

1. 检查离合器轴承转动是否灵活；
Check bearing of clutch for free rotation.

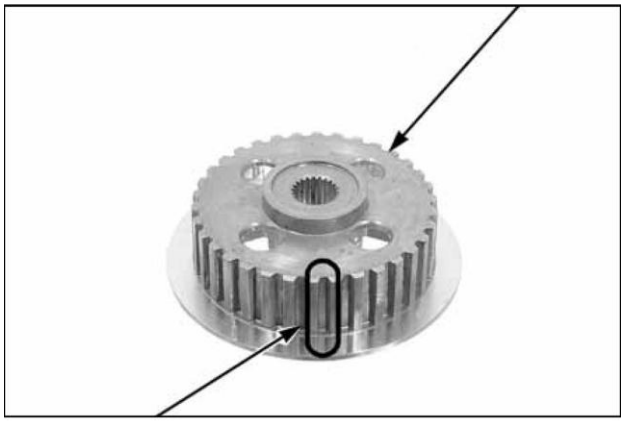


2. 检查离合器分离弹簧是否损坏，测量弹簧的自由长度；
Check declutch spring of clutch for damage. Measure free length of spring.

使用极限值 Service limit	40.0mm



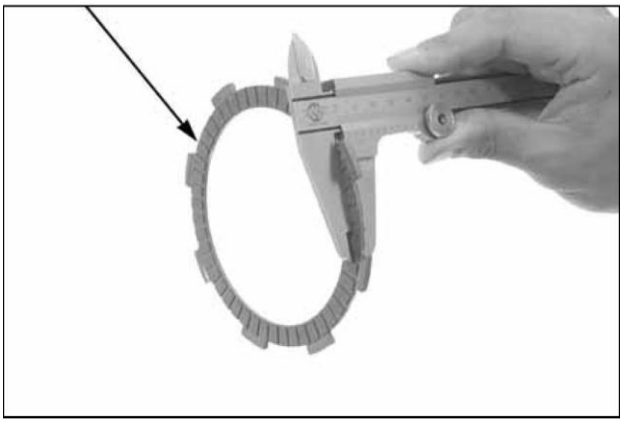
3. 检查压盘上卡槽内有无异常磨损
Check retaining groove of pressure plate for abnormal wear.



4. 检查主动摩擦片是变色
Check if drive friction plates discolors.

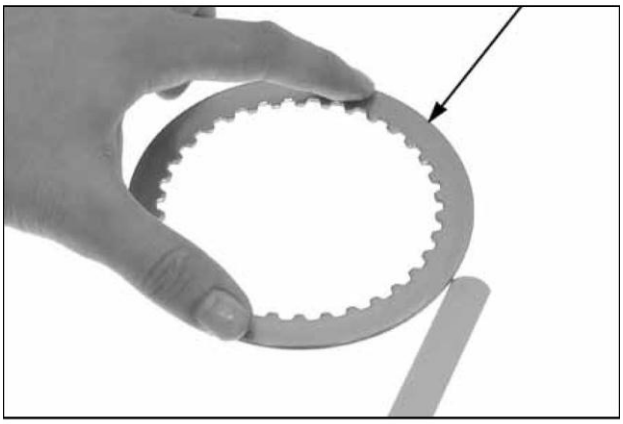
测量主动摩擦片的厚度
Measure thickness of drive friction plate.

使用极限值 Service limit	2.6mm



5、检查从动摩擦片的平面度
Check planeness of driven friction plates.

使用极限值 Service limit	0.20mm

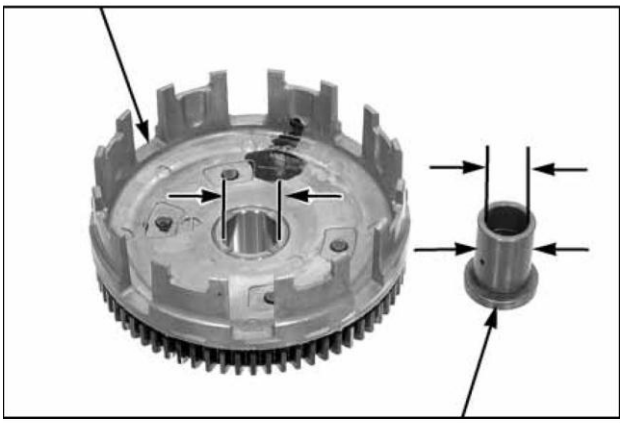


6. 检查离合器外罩、轴套有无异常的磨损测量外罩上从动齿的内孔直径
Check outer case of clutch and shaft sleeve for abnormal. Measure diameter of inner hole of driven gear on outer case.

使用极限值 Service limit	23.08mm

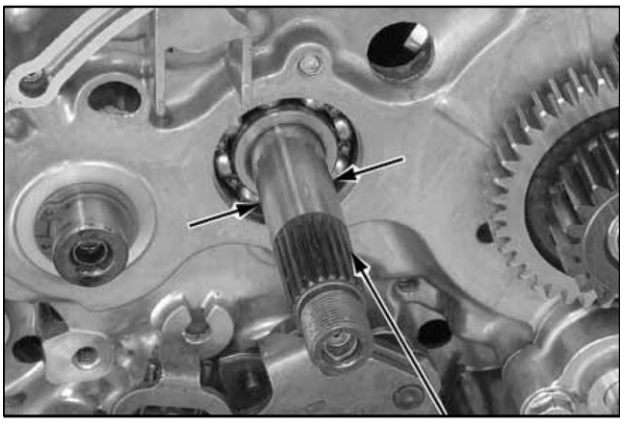
测量轴套的外径和内径
Measure inner and outer diameters of shaft sleeve.

使用极限值 Service limit	内径 Inner diameter	17.04mm
	外径 Outer diameter	22.93mm



7. 测量主轴的直径
Measure diameter of main shaft.

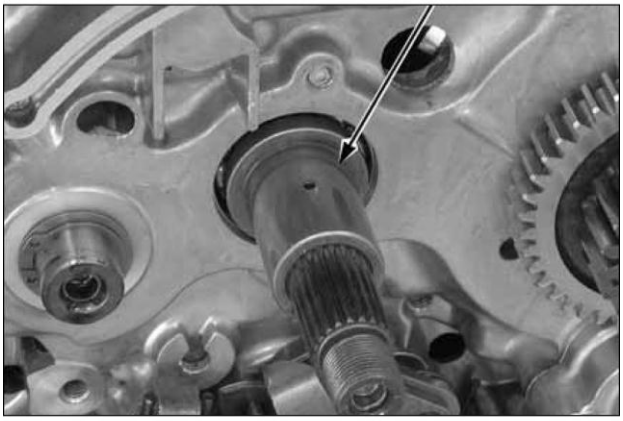
使用极限值 Service limit	16.95mm



三）离合器的装配

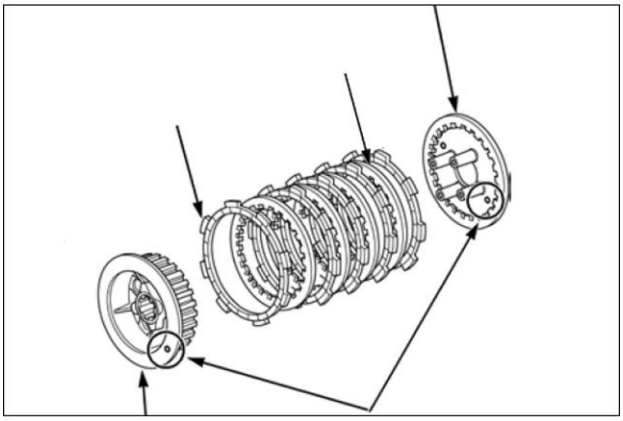
III) Assembly of clutch

1. 轴套内外原涂抹适量的机油，将分离轴套装配到主轴上；
Apply appropriate amount of engine oil onto internal and external surface of shaft sleeve, then assemble declutch shaft sleeve onto main shaft.

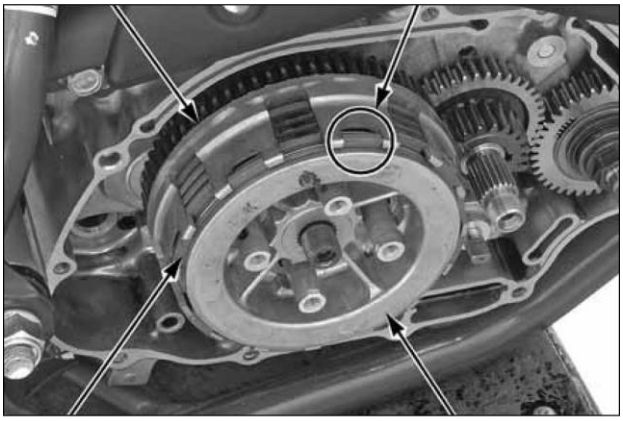


2. 齿轮部位涂抹适量的润滑油装配离合器外罩和分离垫圈
Apply appropriate amount of lube oil onto gears. Assemble outer case and declutch washer of clutch.

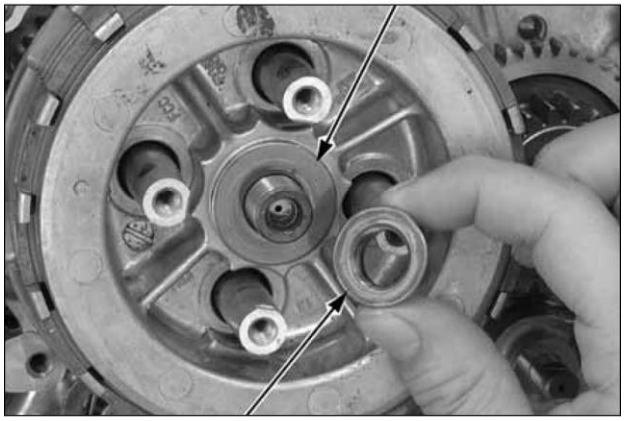
3. 新的摩擦片在装配前要浸泡机油，离合器中心套的组装，注意上下压盘在装配时需要将标记点对齐；
New friction plates shall be immersed in engine oil before assembly. When assemble central sleeve of clutch, care shall be taken to align mark on upper pressure plate with that on lower pressure plate.



4. 装配中心套，离合器最上面的摩擦片要与其他的错开。
When assemble central sleeve, the upmost friction plate on clutch shall be staggered from other friction plates.

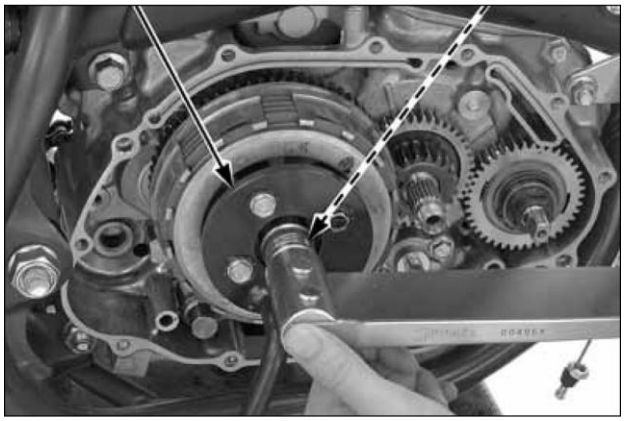


5. 装配垫片及螺母、螺母端面涂抹适量的机油。
Assemble gaskets and nut. Apply appropriate amount of engine oil onto end face of nut.



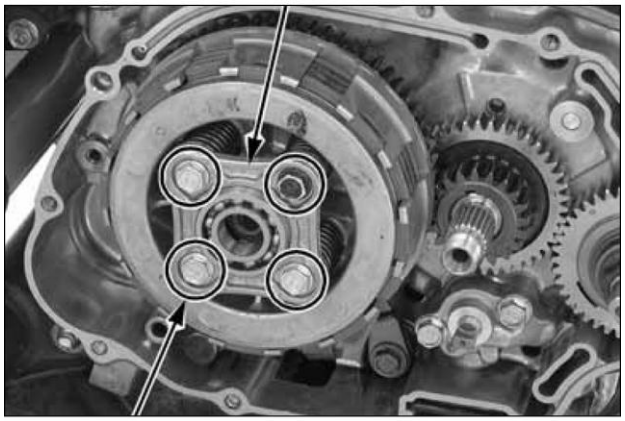
6. 用工装固定压盘，紧固离合器锁紧螺母，扭力要达到标准要求；
Use tools to fix pressure plate and tighten locknut of clutch. Tightening torque shall meet specified requirement.

紧固扭力值：45N.m
Tightening torque: 45N.m



7. 装配弹簧、离合器端盖，并依次紧固端盖螺栓；
Assemble spring and clutch end cover, and tighten bolts on the end cover in sequence.

紧固扭力：10N.m
Tightening torque: 10N.m



七、变档臂的拆卸与安装
VII. Removal and installation of gearshift arm

1. 取出换挡臂部件
Take out components of gearshift arm.

注意 不要将垫圈掉落进曲轴箱内 Note: Do not fall washer into crankcase.

2. 拆除五星板螺栓，取出五星板
Remove bolt of star-shaped plate, then dismantle the plate.

3. 依次拆除以下零部件：
Dismantle components and parts in turns:

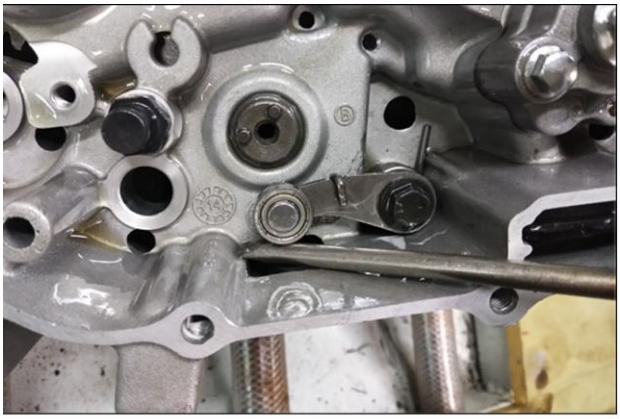
销子
Pin

定位板
Locating plate

定位板螺栓
Bolt of locating plate

定位板弹簧
Spring of locating plate

垫圈
Washer

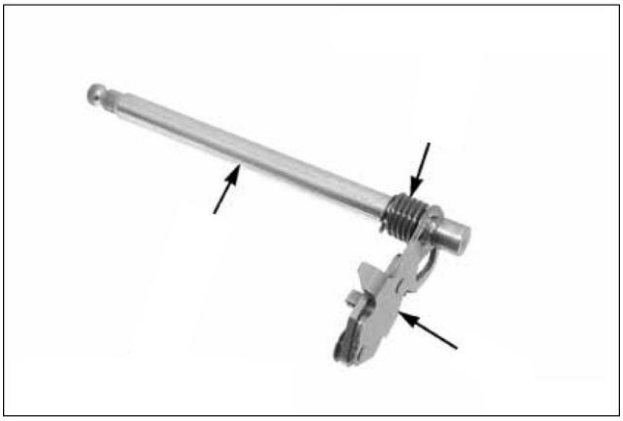


4. 换挡臂的检查
Check of gearshift arm

检查杆部是否弯曲变形，有无异常磨损；
Check if lever of arm bends, deforms or wears abnormally;

检查弹簧是否损坏、断裂；
Check spring for damage and break;

拨板否弯曲、变形；
Check if fork plate bends or deforms.



5. 装配定位板、弹簧、螺栓、垫圈，弹簧弯钩处要卡入定位板上的凹槽内。
Assemble locating plate, spring, bolt and washer. Hook of spring shall be snapped into groove of locating plate.

紧固定位板螺栓
Tighten bolt of locating plate.

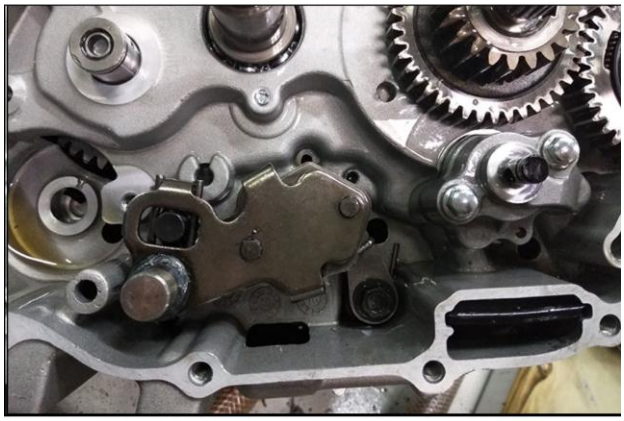
紧固扭力: 10N.m
Tightening torque: 10N.m

6. 用平口起子撬开定位板，装配销子和五星板，五星板上的销孔要与两颗圆柱销对齐。
After displace locating plate with flat screwdriver, assemble pin and star-shaped plate. Pin holes on the star-shaped plate shall be aligned with two cylindrical pins.

7. 紧固五星板螺栓
Tighten bolt on star-shaped plate.
紧固扭力：10N.m
Tightening torque: 10 N.m

8. 在换挡臂轴上涂抹润滑油；
Apply lube oil on to gearshift arm shaft.

9. 将换挡臂回位弹簧装入定位螺栓上，转动换挡臂确认装配到位；
Insert return spring of gearshift arm on locating bolt. Rotate gearshift arm to confirm that it is installed to its position.



八、主动齿、平衡齿的拆卸与安装
VIII. Removal and installation of drive gear and balanced gear

一）平衡主动齿的拆卸
I) Removal of balanced drive gear

1. 按 6-7 的要求拆除机油滤清器及离合器；
Dismantle the oil filter and clutch to Page 6-7.

2. 取出主动齿
Take out drive gear.

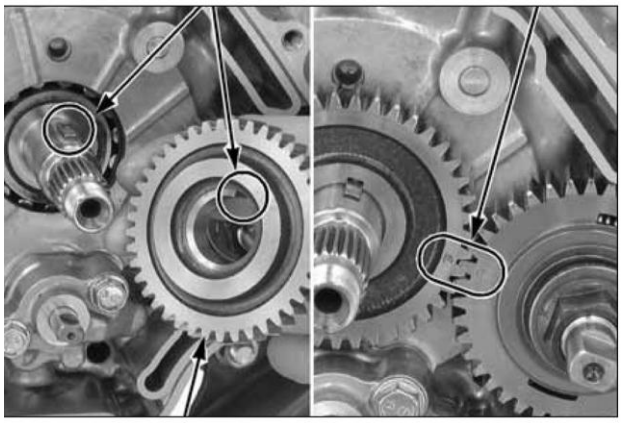
3. 取出平衡主动齿
Take out balanced drive gear

> 注意
> Note
>
> 拆除主动齿、平衡主动齿的时候不要损伤半圆键和曲轴外圆
> Do not damage woodruff and circumference of crankshaft when removing drive gear and balanced drive gear.

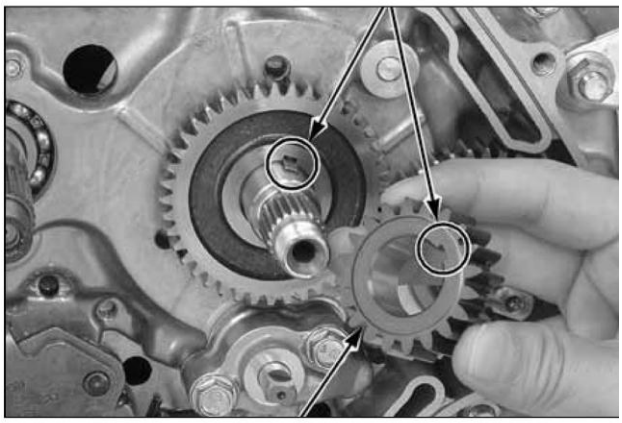
二）主动齿、平衡主动齿的装配
II) Assembly of drive gear and balanced drive gear

1. 检查半圆键是否完好、有无异常的磨损；如果半圆键有损坏需要更换新的；
Check woodruff key for soundness, abnormal wear. If the key is damaged, replace it with a new one.

2. 平衡主齿的键槽与曲轴上的半圆键对齐装配，同时对齐平衡主从动齿上的正时标记点；
When assemble, align keyway of balanced drive gear with woodruff key on crankshaft, and with timing mark on balanced drive gear.

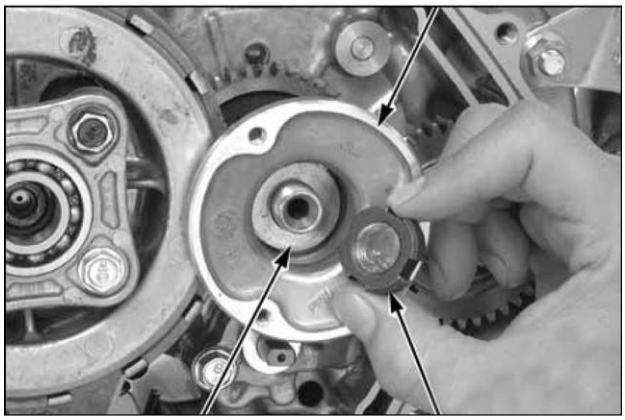


3. 在平衡齿齿轮部位涂抹适量的机油；
Apply appropriate amount of engine oil on balanced gear.



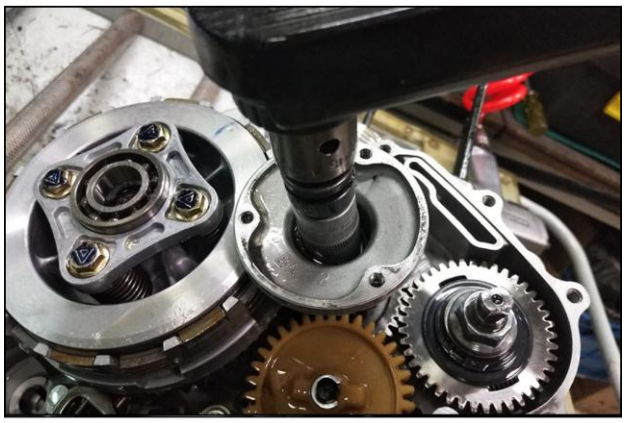
4. 将主动齿上的键槽与曲轴上的半圆键对齐装配，齿轮部位涂抹适量的机油
Align keyway on drive gear with woodruff key on crankshaft and assemble them. Apply appropriate amount of engine oil on gears.

5. 安装机油滤清器、垫圈和锁紧螺母；
Assemble oil filter, washer and locknut.



6. 紧固螺母到要求的扭矩；
Tighten nut to specified torque;

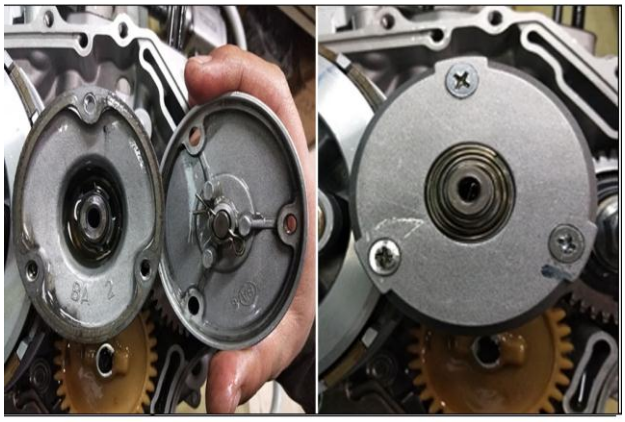
紧固扭力值：65N.m
Tightening torque: 65N.m



7. 装配机油滤清器盖，并用螺栓紧固

Assemble the filter cover and paper gasket. Tighten bolt

紧固扭力：4 N.m
Tightening torque: 4 N.m



三）平衡从动齿的拆卸

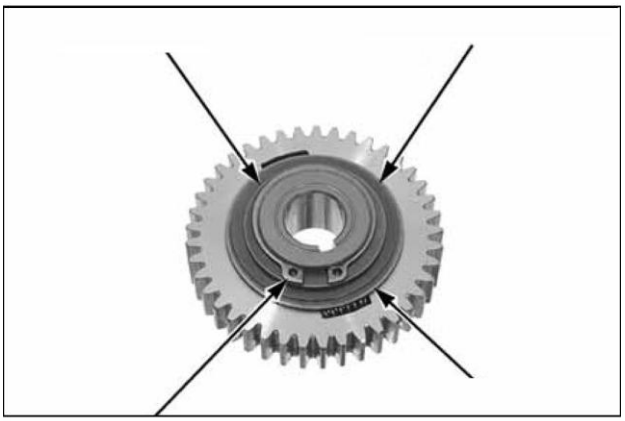
III) Removal of balanced driven gear

1. 拆除锁紧螺母、垫圈；
Dismantle locknut and washer;

2. 取出轴套、半圆键
Take out shaft sleeve and woodruff key.

3. 平衡从动齿的分解及装配
Disassembly and assembly of balanced driven gear

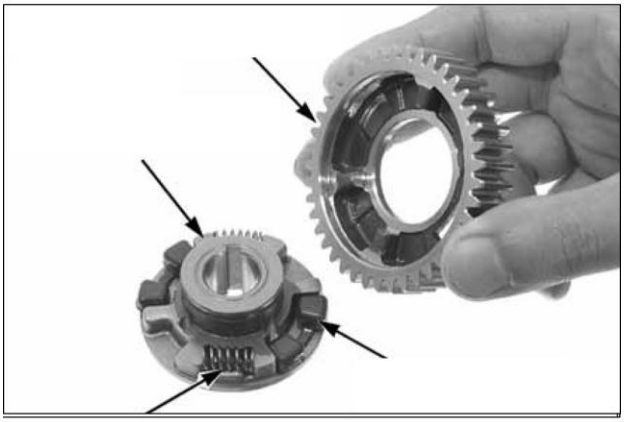
1) 依次拆除卡圈、垫圈、碟形垫圈、平垫圈；
Dismantle circlip, washer, disc washer, flat washer in turn;



2) 取出平衡齿从动齿轮、两根弹簧、两个缓冲胶套；
Take out balanced driven gear, two springs, two buffer rubber bushing.

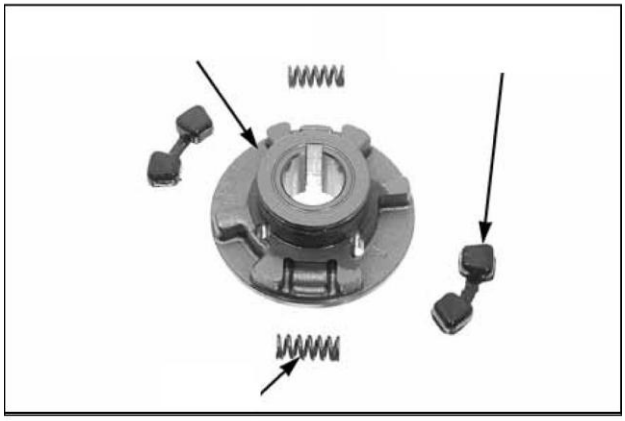
3) 检查弹簧是否有断裂、损坏；
Check spring for break and damage;

检查胶套是否硬化、损坏、变形；
Check rubber bushing for hardening, damage and deformation;



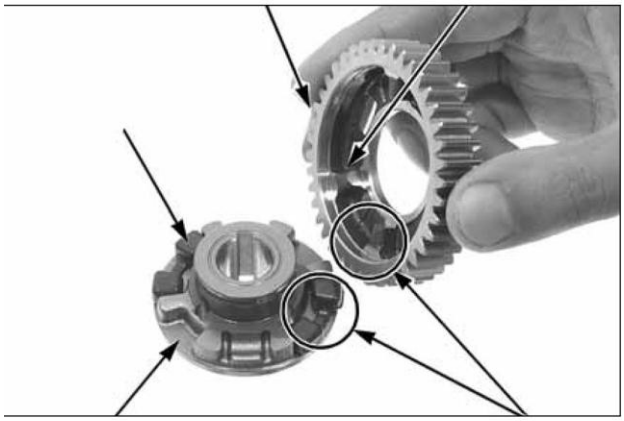
检查从动齿轮毂是否磨损；
Check driven gear hub for wear;

检查从动齿轮是否损坏、磨损；
Check driven gear for damage or wear.

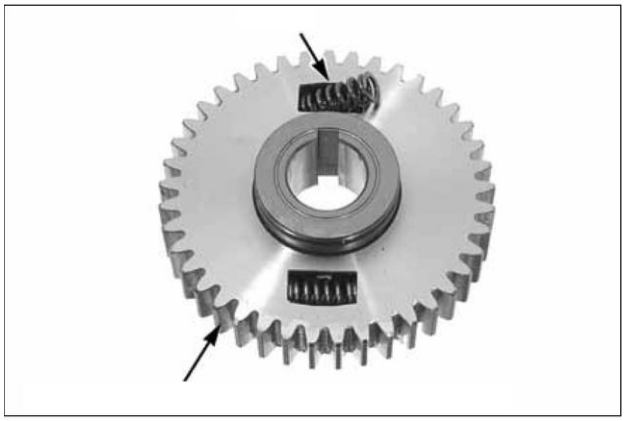


4) 齿轮与轮毂配合处涂抹机油；
Apply engine oil on mating face between gear and hub;

5) 将缓冲胶套装在轮毂的相应位置上；
Install buffer rubber bushing on corresponding position on the hub;

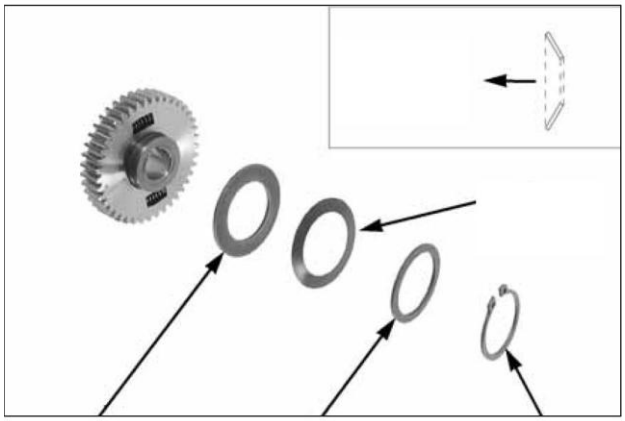


6) 将从动齿轮安装在轮毂上；
Install driven gear onto the hub;



7) 将缓冲弹簧装入齿轮中；
Install buffer spring into gear.

8) 如图所示依次安装垫圈、碟形垫圈、垫圈、卡圈；
Install washer, disc washer, washer, circlip in turn according to sequence shown in figure.

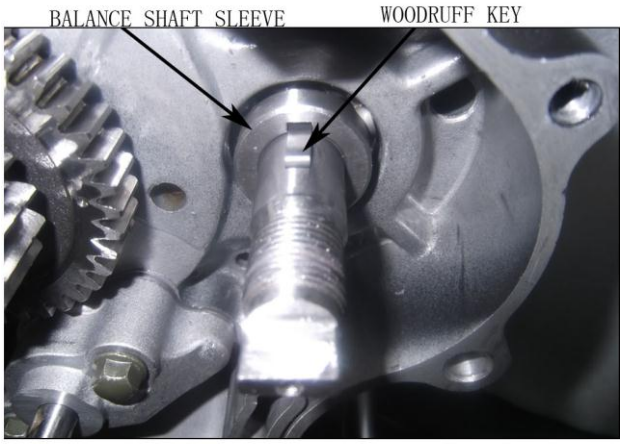


注意 Note
碟形垫圈的凹面要朝向从动齿轮 Concave face of disc washer shall be directed toward driven gear.

四）平衡轴从动齿轮的装配

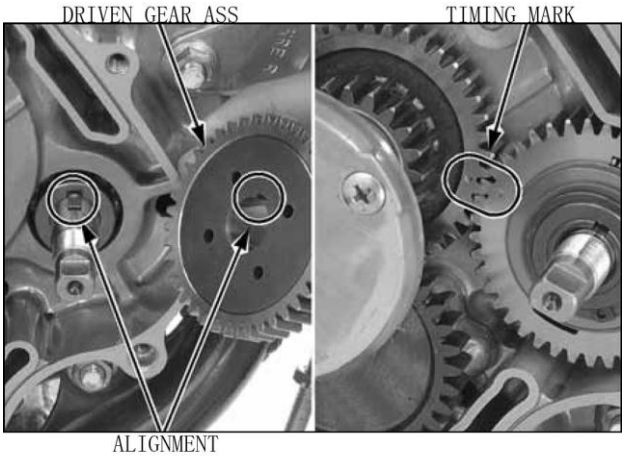
IV) Assembly of driven gear of balanced shaft

1. 将轴套、半圆键装配到平衡轴上
Assemble shaft sleeve and woodruff key onto balanced shaft.

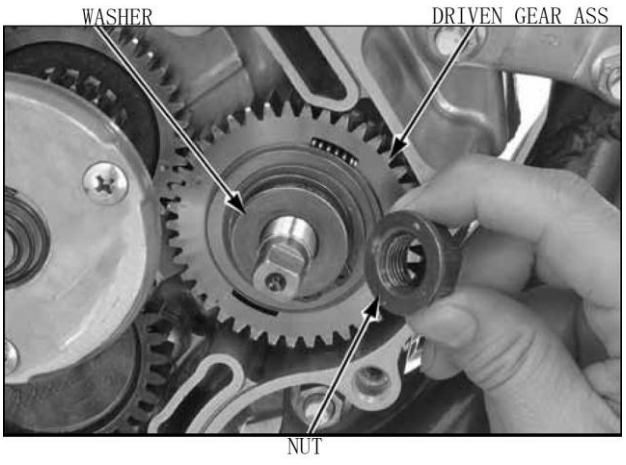


> 注意
> Note
> 安装半圆键的时候不要损伤平衡轴外圆和键槽
> Do not damage circumference of balanced shaft and keyway

2. 平衡从动齿上的键槽与平衡轴上的半圆键对正，同时转动平衡从动齿对齐平衡主动齿的正时标记点
Align keyway of balanced driven gear with woodruff key on balanced shaft. Meanwhile, rotate balanced driven gear to align the keyway with timing mark on balanced drive gear.

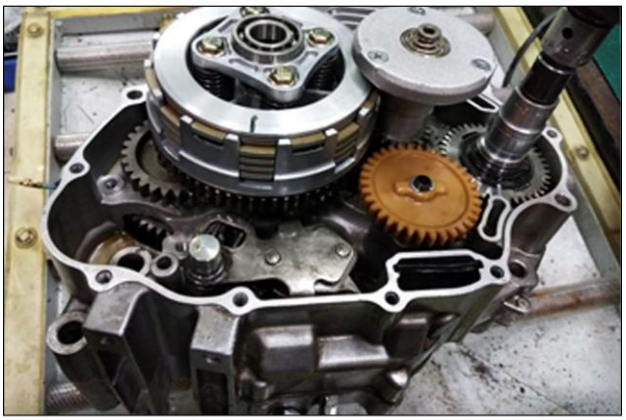


3. 安装垫圈、锁紧螺母，螺母的法兰面涂适量机油；
Assembly washer and locknut. Apply appropriate amount of engine oil onto flange face of the nut.



4. 紧固螺母到要求的扭力值
Tighten the nut to specified torque.

紧固扭力值：45N.m
Tightening torque: 45N.m

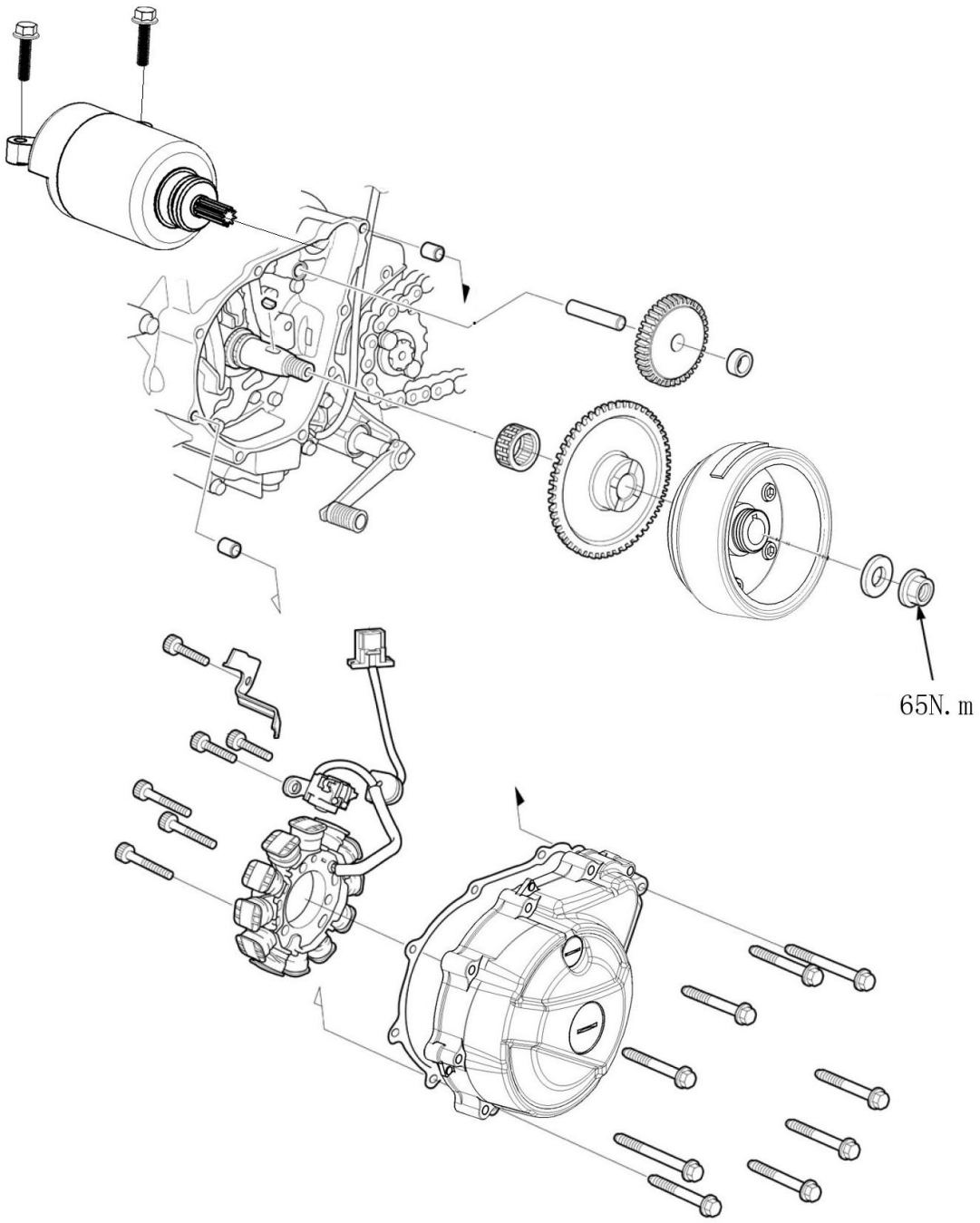


5. 装配右盖（见 6-7 页）
Assemble right cover (refer to Page 6-7).

左盖/电启动系统/磁电机
Left Cover / Starting motor System / Magnetor

一、左盖/电启动系统/磁电机分解图

I. Exploded view of left cover/ starting motor system/ magnetor



二、紧固扭力标准：

II. Requirement of tightening torque

磁电机锁紧螺母：65N.m

Locknut of magnetor: 65N.m

GB5783 螺栓的紧固标准：10N.m

Tightening torque of GB5783 bolt: 10N.m

GB16674 螺栓的紧固标准：10N.m

Tightening torque of GB16674 bolt: 10N.m

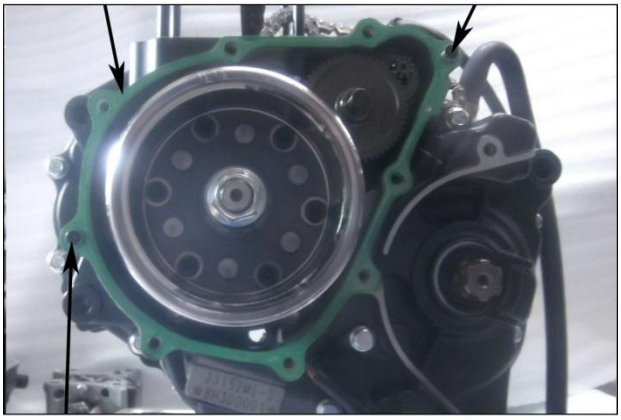
三、左盖的拆卸与安装

III. Removal and installation of left cover

1. 取出卡在线槽内的档显线束
Take out gearshift switch harness from harness groove.

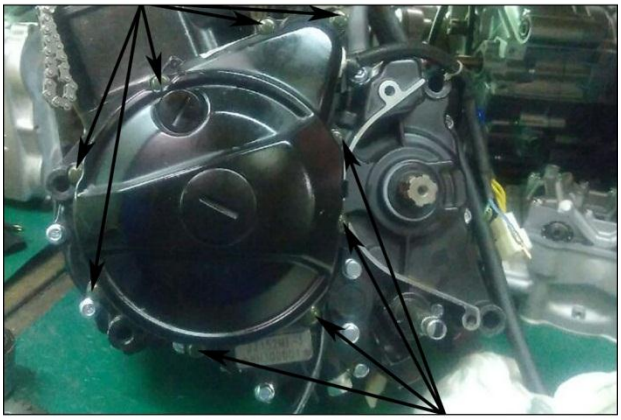
2. 拆除左盖上的紧固螺栓，取下左盖
Loosen fastening bolt on left cover and remove left cover.

3. 取下定位销、纸垫装配定位销及新的纸垫
Take out locating pin and paper gasket. Assemble locating pin and new paper gasket.



4. 装配左盖并按顺序紧固螺栓
Install left cover and tighten fastening bolt in accordance with specified sequence.

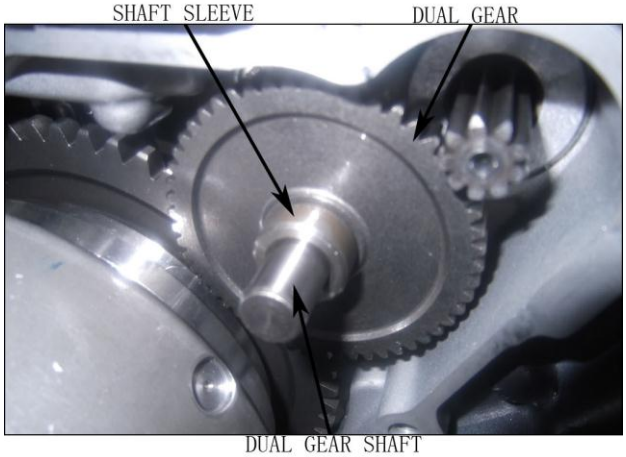
紧固扭力：10N.m
Tightening torque: 10N.m



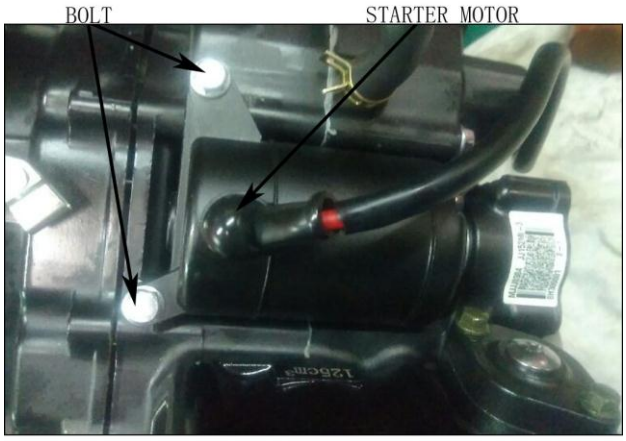
5. 将档显线束卡入左盖上的线槽内
Insert gearshift switch harness into harness groove on left cover.

三、电启动系统的拆卸与装配
III. Removal and installation of starting motor system

1. 拆除左盖 取出轴套、双联齿轮轴、双联齿
Dismantle left cover and take out shaft sleeve, dual gear shaft and dual gear.

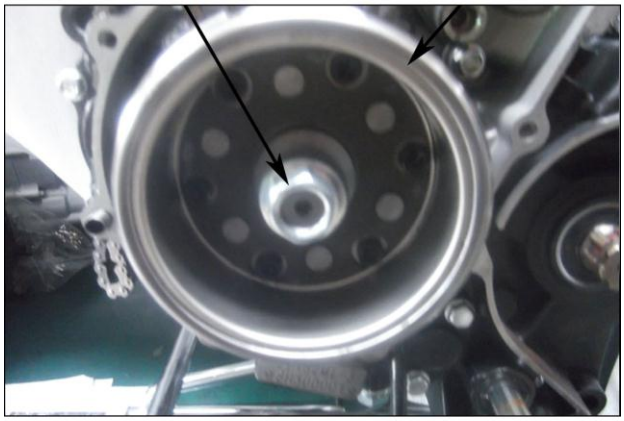


2. 拆除启动电机螺栓
Dismantle bolt of starting motor.

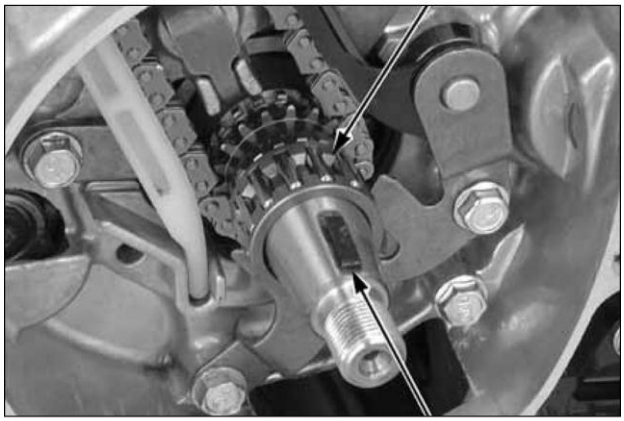


3. 检查 O 形圈状况
Check O-ring for condition.

4. 拆除磁电机上的锁紧螺母用专用工装拆除磁电机转子
Dismantle locknut on magnetor. Use special tools to dismantle magnetor rotor.



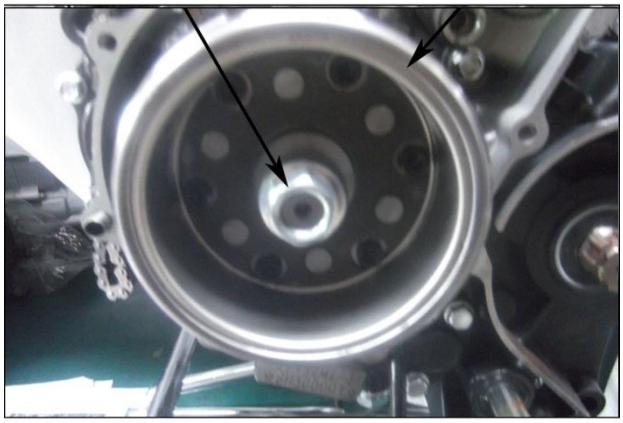
5. 取下盘齿，检查滚针轴承、曲轴上的半圆键是否损伤
Take out turning gear.Check needle bearing, woodruff key on crankshaft for damage.



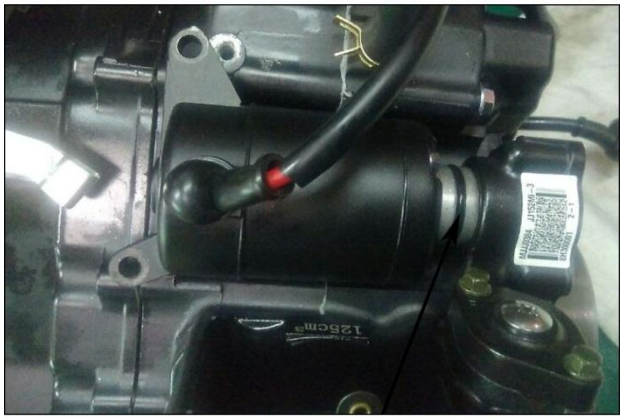
6. 将曲轴锥面上的机油清理干净；装配磁电机转子、盘齿在曲轴上，键槽与半圆键对齐；
Clean off engine oil from tapered face of crankshaft. Install magnetor rotor and turning gear on crankshaft, and align keyway with woodruff key.

7. 安装垫圈、锁紧螺母
Install washer and locknut.

8. 采用工装固定磁电机并按照要求紧固螺母
Use tools to fix magnetor and tighten nut to specified torque.
紧固扭力值：65N.m
Tightening torque: 65N.m

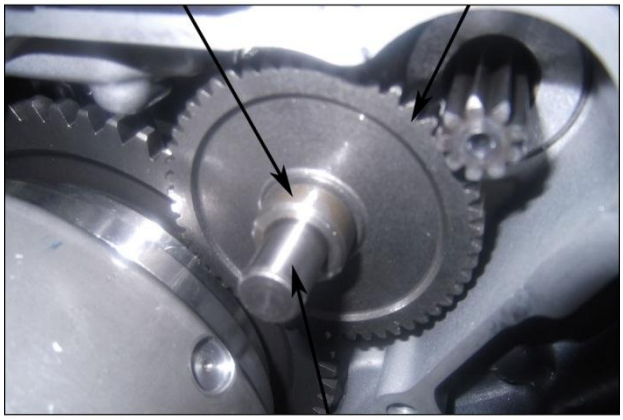


9. 更换新的 O 形圈 装配前需在 O 形圈处涂抹适量润滑油，
Replace O-ring with a new one. Apply appropriate amount of lube oil onto O-ring before assemble it.



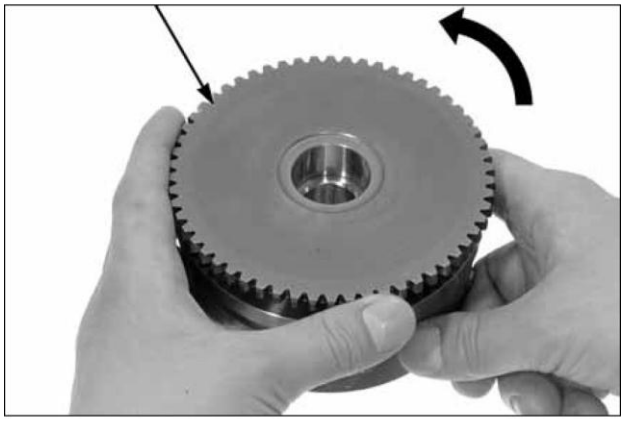
10. 装配启动电机，锁紧螺栓
Assemble starting motorand lock bolt.
紧固扭力：10N.m
Tightening torque: 10N.m

11. 装配双联齿、双联齿轮轴、轴套，装配前双联齿轮轴要涂抹适量润滑油，双联齿齿部涂抹适量润滑脂
Apply appropriate amount of lube oil onto dual gear shaft, then assemble dual gear, dual gear shaft and shaft sleeve. Apply appropriate amount of lube oil onto teeth of the dual gear.



12. 电启动系统的检查
Check of starting motor system

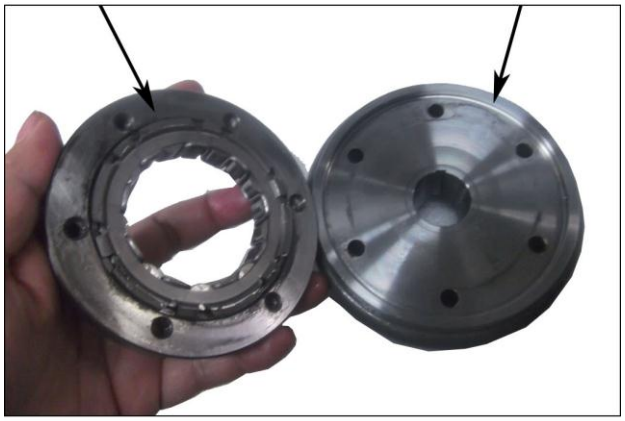
将启动大齿轮装配到磁电机转子上，逆时针旋转齿轮检查是否正常
Assemble large starting gear onto magnetor rotor, then check if the gear can rotate normally by rotating it counterclockwise.



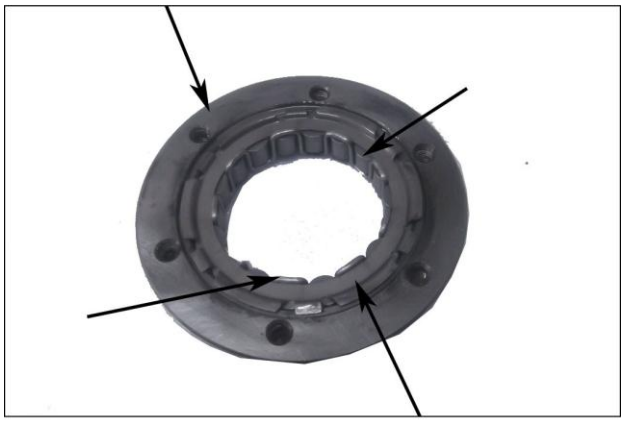
13. 磁电机转子的拆解
Disassembly of magnetor rotor

1) 用专用工装固定好转子，拆除转子内的紧固螺栓
Use special tools to fix rotor, then dismantle fastening bolt in the rotor.

2) 取出超越离合器
Take out overrunning clutch.



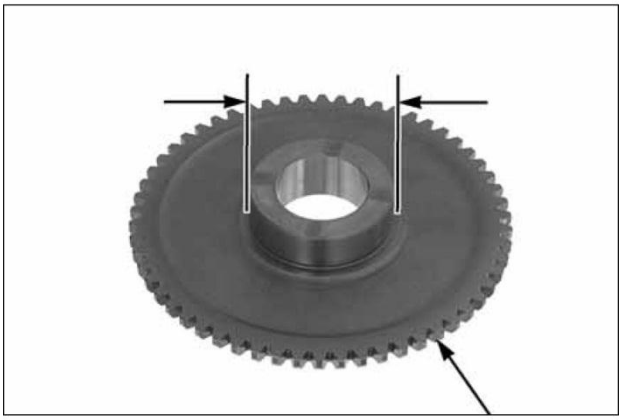
3) 检查保持架、锲块是否损坏
Check holder and wedge block for damage.



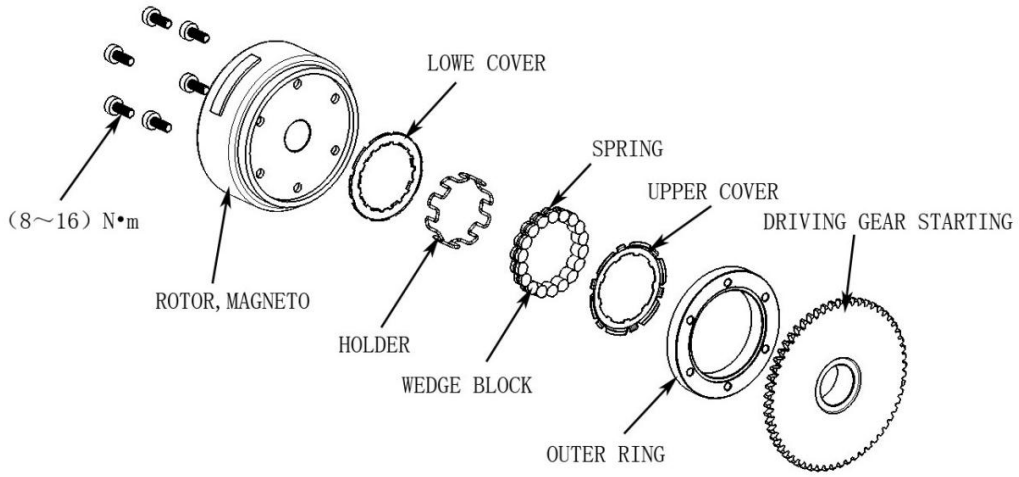
4) 检查启动大齿轮齿部是否有损伤
Check teeth of large starting gear for damage.

测量启动大齿轮的安装外径
Measure outer diameter of large starting gear

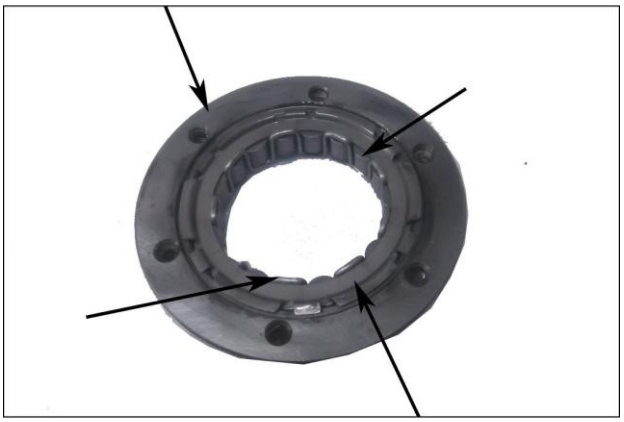
使用极限值 Service limit	45.60mm



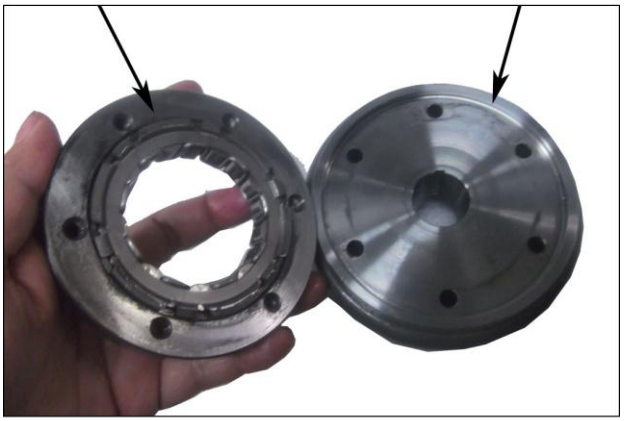
5) 磁电机转子装配分解图
Exploded view of magnetor rotor



6) 将超越离合器组装好
Assemble overrunning clutch.



7) 将超越离合器安装到磁电机转子上，过孔与螺纹孔对齐；
Install overrunning clutch onto magnetor rotor, and align through hole with threaded hole.



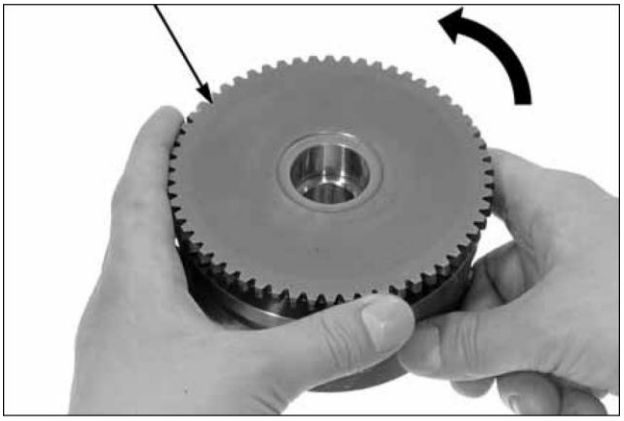
8) 螺栓的螺纹部位打适量的螺纹紧固胶，采用工装定位后紧固螺栓
Apply appropriate amount of fastening adhesive onto threads of bolt, then use tools to locate and tighten the bolt.

紧固扭力值：16N.m
Tightening torque: 16N.m

9) 将启动大齿轮安装到装好的磁电机转子上，并逆时针转动齿轮；
Install large starting gear onto assembled magnetor rotor, and rotate gear counterclockwise.

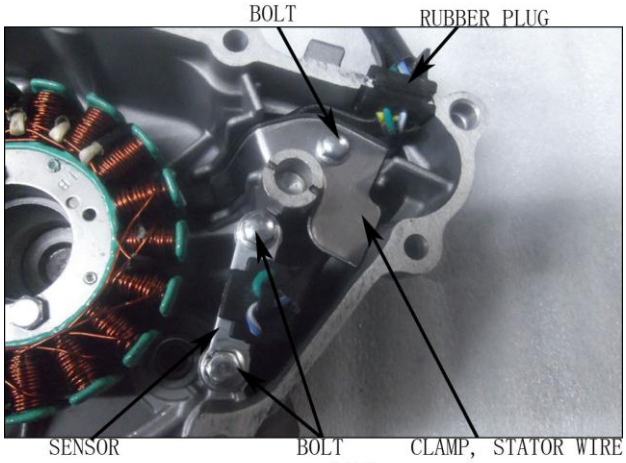
齿轮部位需要涂抹适量的润滑油；
Gear shall be coated with lube oil properly;

确保齿轮逆时针转动灵活，但是不能顺时针转动。
Ensure that the gear can rotate freely counterclockwise, but cannot rotate clockwise.

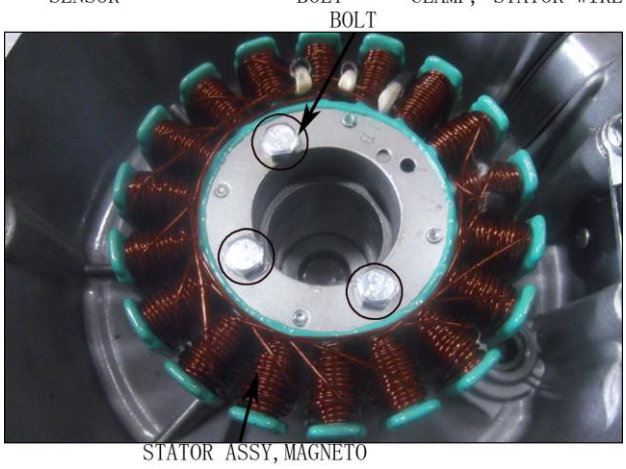


四、磁电机定子的拆除与安装
IV. Removal and installation of magnetor stator

1. 拆除胶塞、磁电机线夹、传感器
Remove rubber plug, magnetor cable clip and sensor.

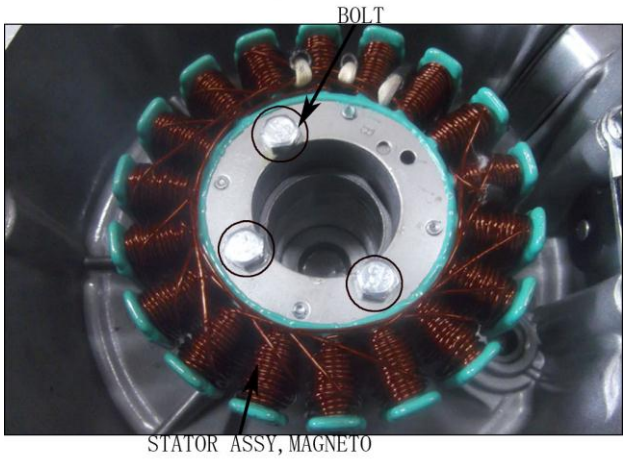


2. 拆除定子上的紧固螺栓，取出磁电机
Dismantle fastening bolt on stator and take out magnetor.



3. 取一个新的磁电机安装在左盖上，紧固螺栓
Install a new magnetor onto left cover, then tighten bolts.

螺栓紧固扭力:10N.m
Tightening torque of bolt: 10N.m

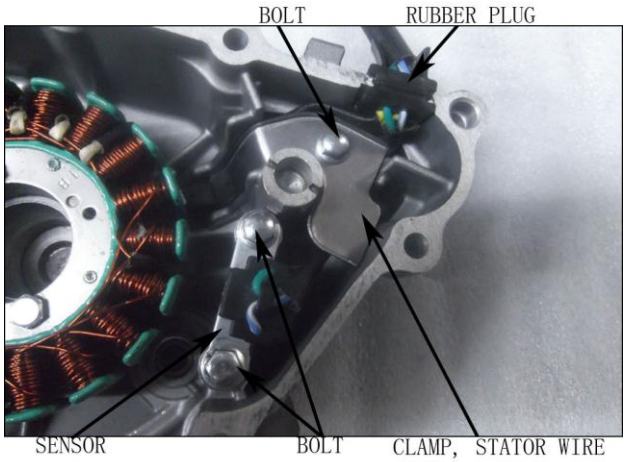


4. 装好传感器并紧固螺栓
Install sensor and tighten bolts.

将磁电机线夹卡入左盖相应位置，紧固螺栓
Press cable clip of magnetor into corresponding position on left cover, and tighten bolts.

注意
Note

在装配磁电机线夹时，要将线束卡好，避免损伤线束，造成短路。
When assemble magnetor cable clip, collect the



harness into groove to avoid damage of the harness; otherwise, short circuit may be engendered.

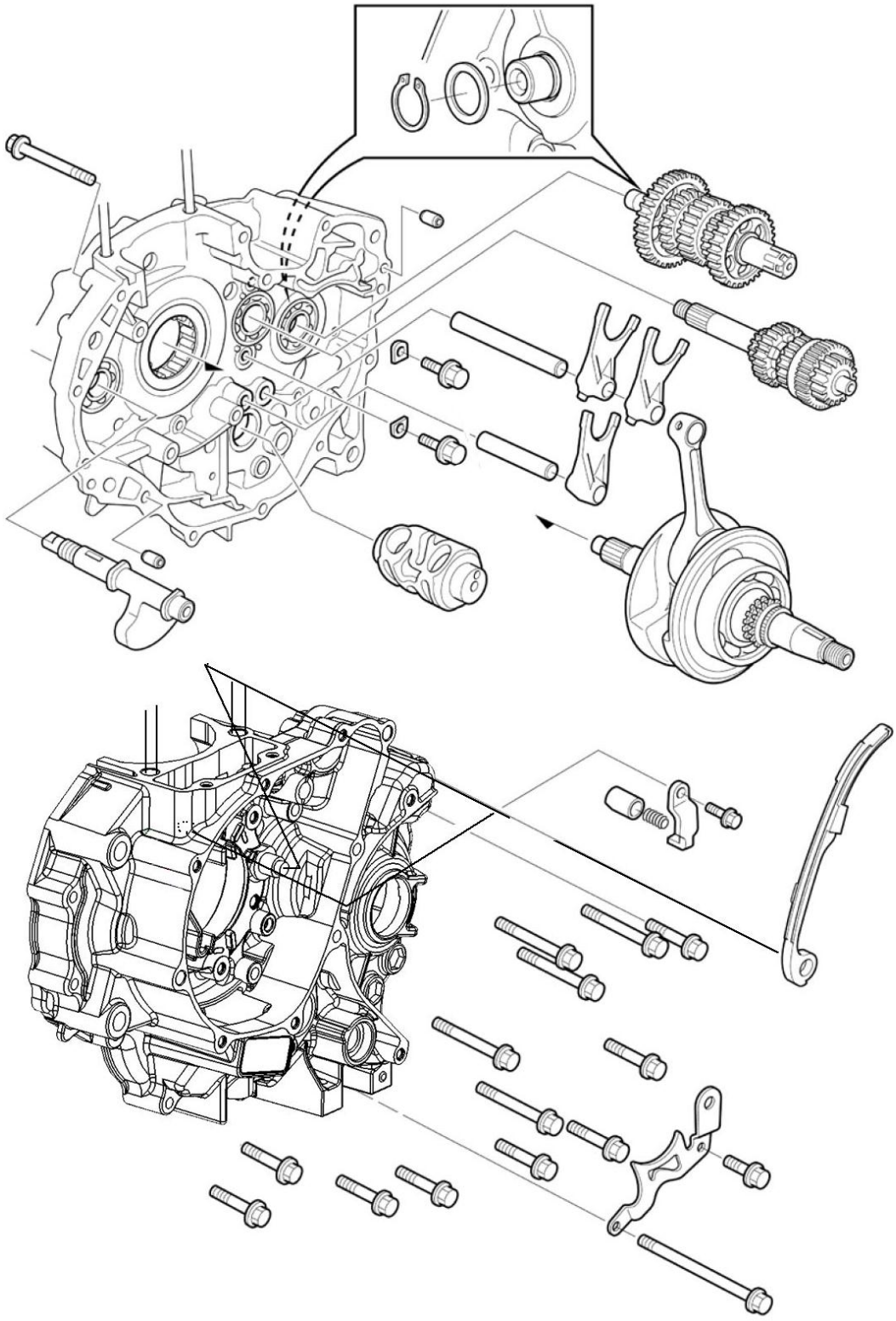
螺栓紧固扭力:10N.m
Tightening torque of bolt: 10N.m

5. 将左盖装配到发动机上（7-4 页）
Install left cover onto engine (refer to Page7-4)

曲轴箱的拆卸与装配
Removal and Installation of Crankcase

一、曲轴箱分解图

I. Exploded view of crankcase



二、使用标准
II. Adopted specifications

单位：mm
unit: mm

项目 Item			标准值 Standard	维修极限值 Service Limit
曲柄连杆 Crankshaft, Connecting Rods	连杆大头 Connecting Rod Big End:	径向间隙 Radial Clearance	0~0.008	0.03
		侧隙 Side Clearance	0.1~0.35	0.5
	曲轴跳动 Crankshaft Runout		0.03	0.08
拨叉 fork	拨叉轴外径 Outer diameter of fork shaft		Φ9.966~φ9.984	Φ9.93
	拨叉内径 Inner diameter of fork		Φ10.000~φ10.018	φ10.05
	拨叉爪部厚度 Shift Fork Ear Thickness		4.93~5.00	4.5
主副轴 Transmission	档齿内孔直径 Gear tooth inner hole diameter	M4	Φ20.000~φ20.021	Φ20.04
		M5	Φ20.000~φ20.021	Φ20.04
		C1	Φ20.500~φ20.521	Φ20.55
		C2	Φ23.000~φ23.021	Φ23.04
		C3	Φ23.025~φ23.046	Φ23.06
	衬套外径 Bushing diameter	M4	Φ19.959~φ19.980	Φ19.93
		M5	Φ19.959~φ19.980	Φ19.93
		C1	Φ20.459~φ20.480	Φ20.41
		C2	Φ22.984~φ23.005	Φ22.95
	衬套内径 Bushing inside diameter	M4	Φ17.000~φ17.018	φ17.04
		C1	Φ17.000~φ17.018	φ17.04
		C2	Φ20.000~φ20.021	Φ20.04
	主副轴外径 The shaft diameter	M4	φ16.966~φ16.984	φ16.93
		C1	φ16.966~φ16.984	φ16.93
		C2	φ19.974~φ19.987	φ19.94
		C3	φ19.979~φ20.000	φ19.95

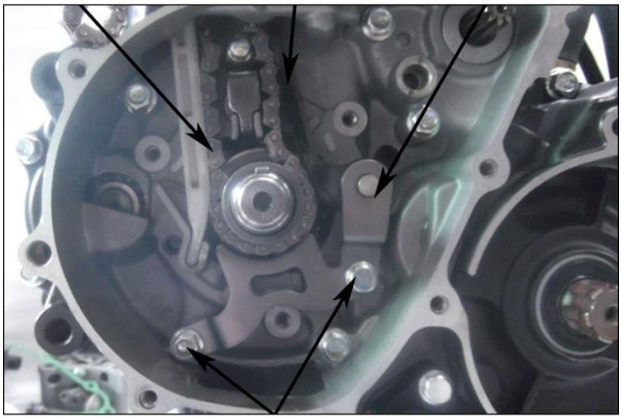
紧固扭力标准
Requirement of tightening torque

GB5789 螺栓的紧固标准：10N.m
Tightening torque of GB5789 bolt: 10N.m

GB16674 螺栓的紧固标准：10N.m
Tightening torque of GB16674 bolt: 10N.m

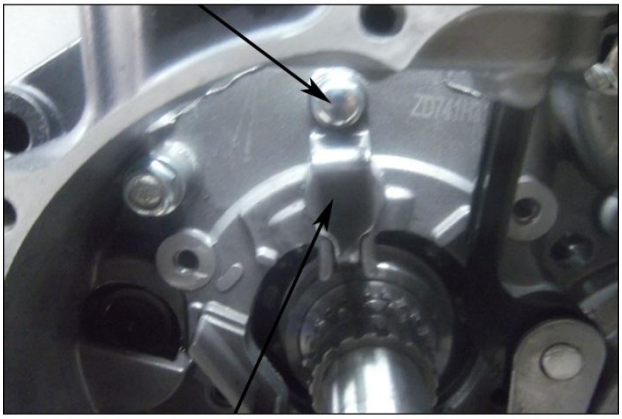
三、曲轴箱的拆卸
III. Removal of crankshaft

1. 按之前的步骤拆除相应的零部件（缸头、缸体、右盖、左盖等）；
Dismantle corresponding components and parts (cylinder head, cylinder block, right cover, left cover) in accordance with steps described in foregoing text.

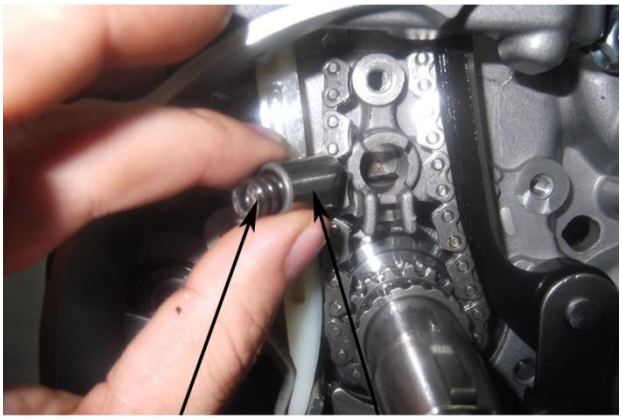


2. 拆除链条护板上的紧固螺栓，取出链条护板、张紧板、导向板、链条；
Loosen and dismantle fastening bolt on chain guard, then take out chain guard, tension plate, guide plate and chain.

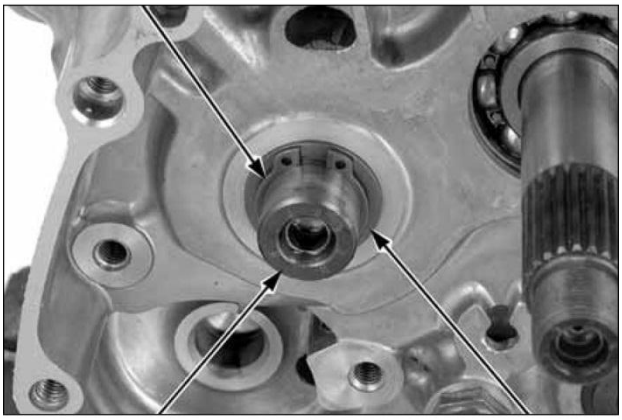
3. 拆除压销体上的紧固螺栓，取出压销体挡板；
Dismantle fastening bolt on pressing pin body, then take out guard plate of pressing pin body.



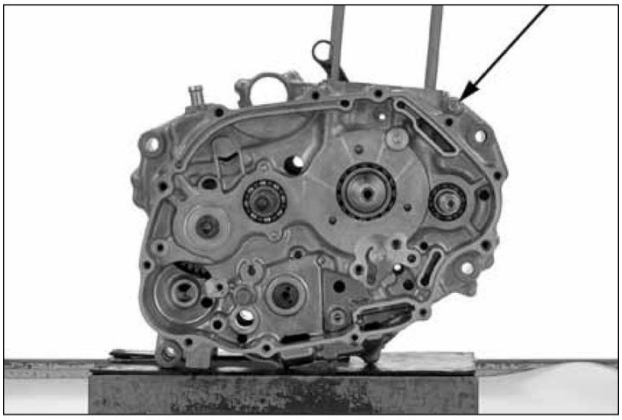
4. 取出压销体、弹簧；
Take out pressing pin body and spring.



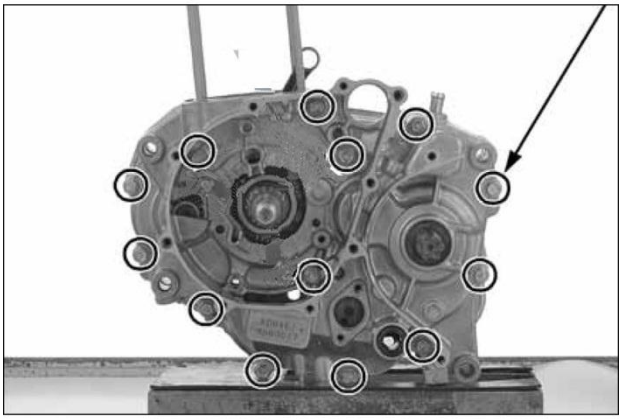
5. 拆除副轴上的卡圈、垫圈；
Remove circlip and washer on counter shaft.



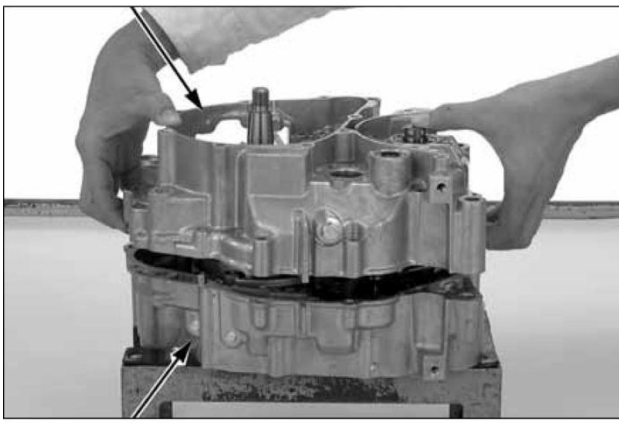
6. 拆除右曲轴箱上的紧固螺栓
Dismantle fastening bolt on right crankshaft.



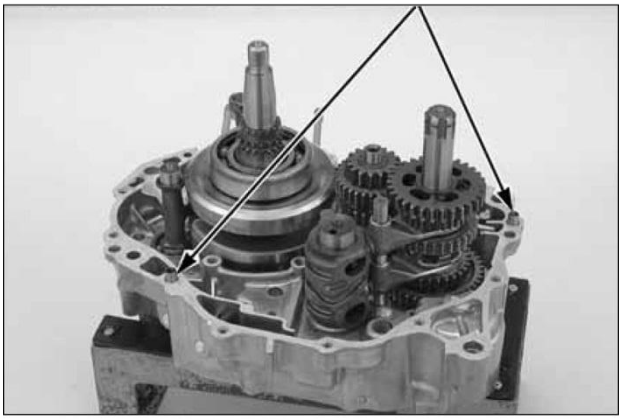
7. 拆除曲轴上的紧固螺栓；
Dismantle fastening bolts on crankshaft.



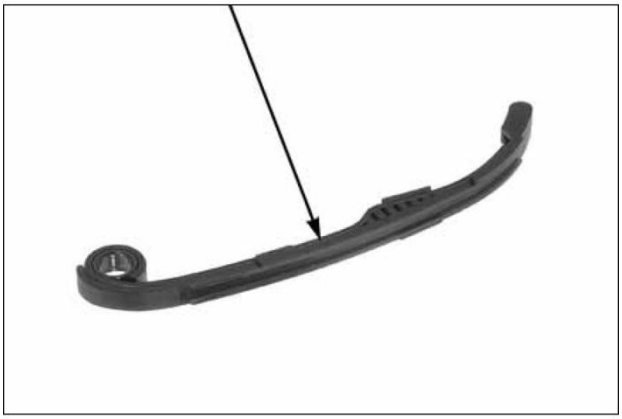
8. 右体向下放置好曲轴箱，用胶榔头敲击副轴和曲轴，使左右曲轴箱密封胶分离，放平曲轴箱，向上将左曲轴箱取出；
Place crankcase properly with right half downwards. Knock counter shaft and crankshaft with rubber hammer to loosen adhesive on left and right halves. Place horizontally the crankcase and remove left half upwards.



9. 取下定位销；
Dismantle locating pin.



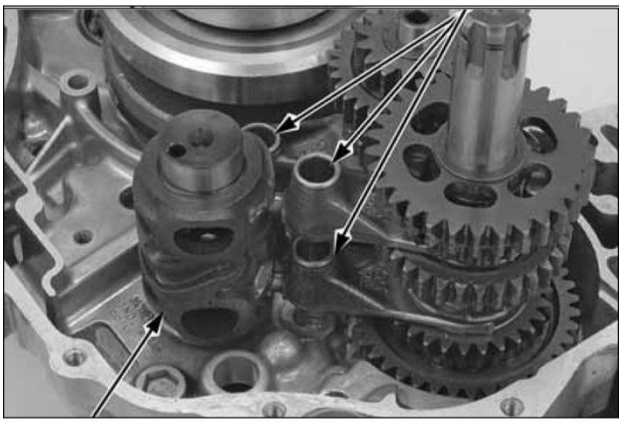
10. 检查链条张紧板是否严重磨损或损坏，如果有更换一个新的张紧板
Check chain tension plate for severe wear or damage. If there is, replace the tension plate with a new one.



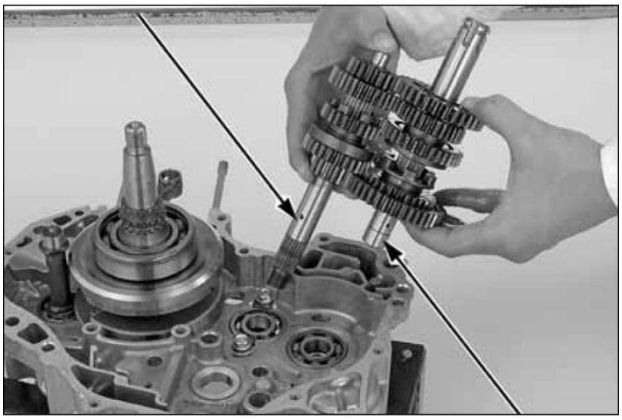
四、传动系统的拆卸与检查
IV. Removal and check of drive train

1. 取出主轴和副轴的拨叉轴
Take out fork shaft of main and counter shafts.

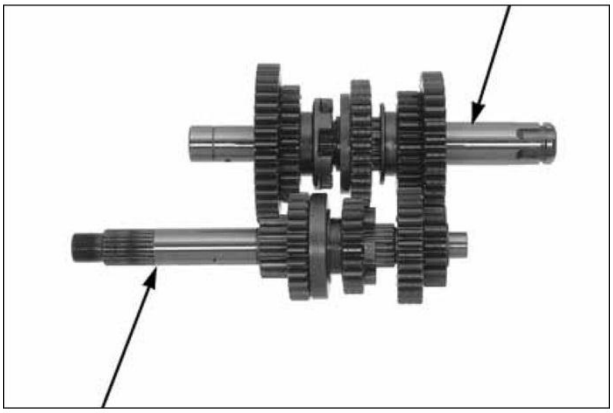
2. 向两边取出拨叉、变速鼓
Take out fork and gearshift drum from both sides.



3. 取出主副轴
Take out main and counter shafts.

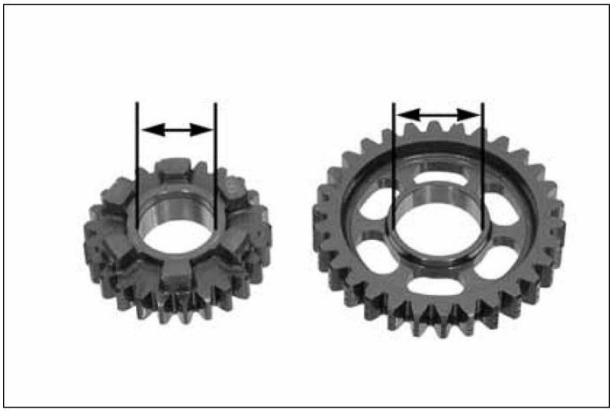


3. 主副轴的检测
Check of main and counter shafts



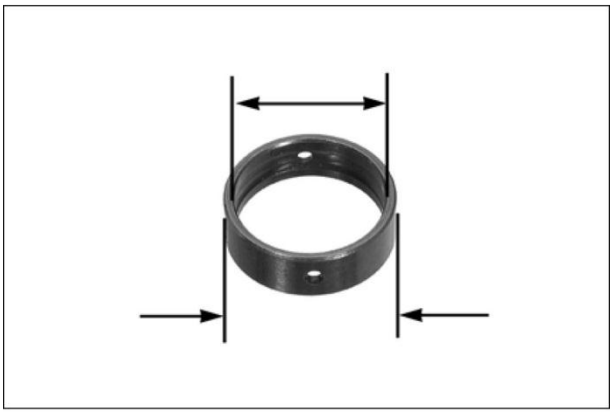
1) 分解主副轴上的档齿；
Disassemble gears on main and counter shafts.

2) 检查各档位齿轮是否有严重磨损或损坏；测量各档齿的内孔直径
Check gears for severe wear or damage. Check inner diameter of the gears.



使用极限值 Service limit	M4	Φ20.04mm
	M5	Φ20.04mm
	C1	Φ20.55mm
	C2	Φ23.07mm
	C3	Φ23.07mm

3) 检查轴套是否有严重磨损、损坏
Check shaft sleeve for severe wear and damage.



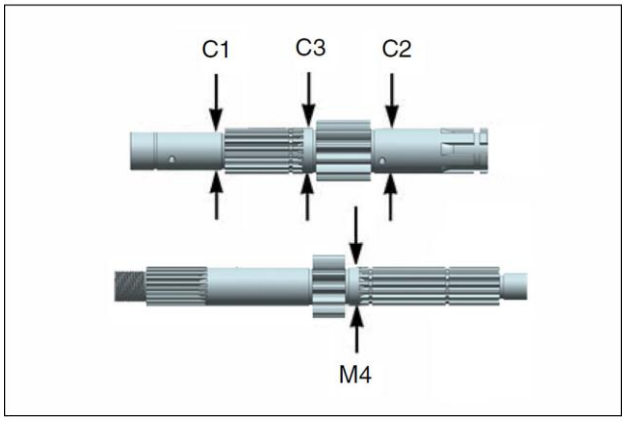
测量轴套的内径和外径
Measure inner and outer diameters of shaft sleeve.

衬套外径使用极限值 Service limit of outer diameter of bushing	M4	Φ19.93mm
	M5	Φ19.93mm
	C1	Φ20.41mm
	C2	Φ22.95mm
衬套内径使用极限值 Service limit of inner diameter of bushing	M4	φ17.04mm
	C1	φ17.04mm
	C2	Φ20.04mm

计算轴套与齿轮配合的间隙
Calculate fit clearance between shaft sleeve and gear

使用极限值 Service limit	0.10mm

4) 检查主副芯轴的花键、轴部有无异常磨损、损坏
Check spline key and shaft of main and counter shaft for abnormal wear and damage.



测量轴上与齿轮配合的直径
Measure diameter of shaft at gear-mating position.

主副轴外径使用极限值 Service limit of outer diameter of main and counter shafts	M4	φ16.93mm
	C1	φ16.93mm
	C2	φ19.94mm
	C3	φ19.95mm

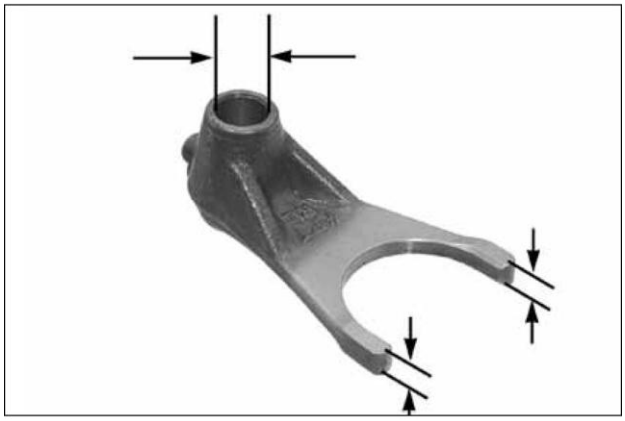
计算各档齿与轴套的配合间隙
Calculate fit clearance between gears and shaft sleeve

使用极限值 Service limit	0.10mm

4. 变速鼓检查
Check of gearshift drum

1) 检查变速鼓两端、型线槽有无异常的磨损、损坏；
Check both ends of gearshift drum and profiled groove for abnormal wear or damage.

2) 检查拨叉有无异常磨损、变形
Check fork for abnormal wear and deformation.



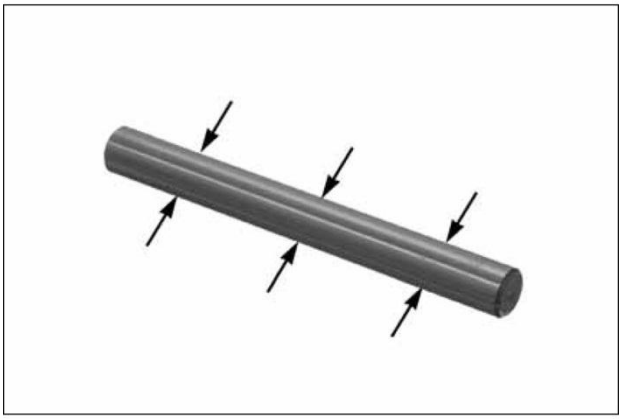
测量拨叉的内孔直径和爪部厚度
Measure inner hole diameter and ear thickness of fork.

使用极限值 Service limit	内孔直径 Inner hole diameter	10.07mm
	爪部厚度 Ear thickness	4.50mm

3) 检查拨叉轴的有无异常磨损、损坏
Check fork shaft for abnormal wear and damage.

测量轴的直径
Measure diameter of shaft

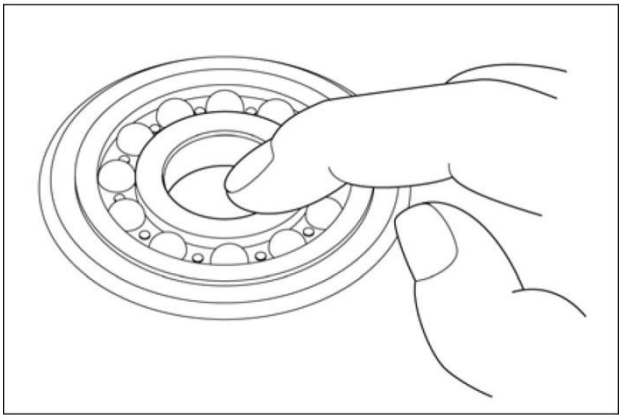
使用极限值 Service limit	Φ9.93 mm



5. 轴承的更换
Replacement of bearing

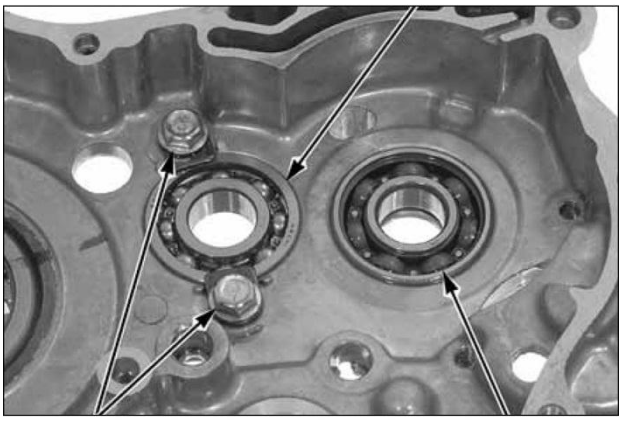
1) 转动轴承的内圈，检查轴承的转动是否灵活顺畅；
Turn inner race of bearing to check if it can rotate freely.

2) 检查轴承的保持架、滚珠是否有严重磨损和损坏
Check cage and ball of the bearing for severe wear and damage.

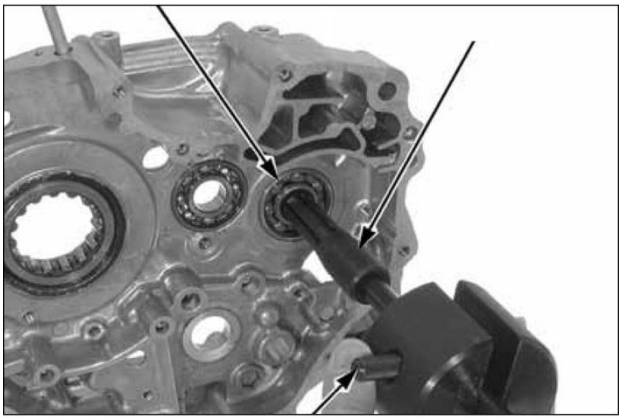


五、轴承的拆卸
V. Removal of bearing

1. 拆除轴承挡板及螺栓；
Dismantle bearing guard and bolt.

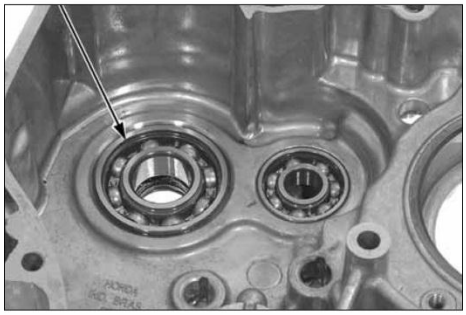


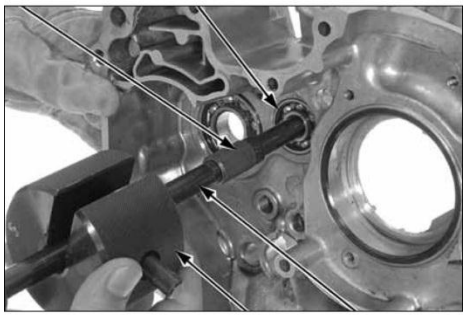
2. 采用轴承拉拔器取出右体上的轴承；
Take out bearing from right half with the aid of bearing puller.



3. 拆除左体上的副轴油封、换挡臂油封；
Dismantle oil seal of counter shaft and that of gearshift arm on left half.

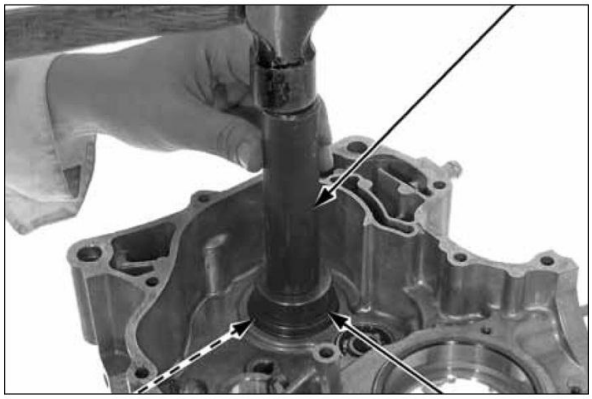
4. 采用轴承拉拔器拆除左箱体上的轴承
Dismantle bearing from left half with the aid of bearing puller.





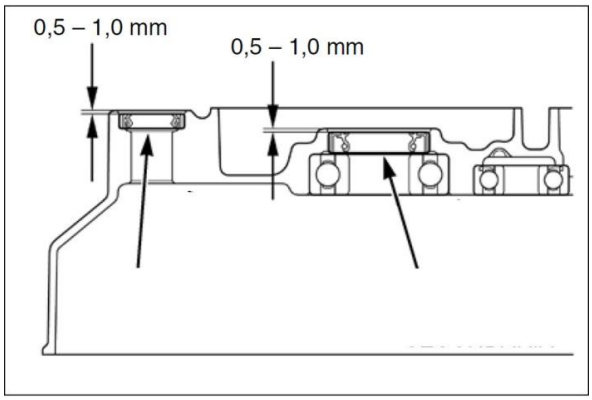
六、轴承的安装
VI. Installation of bearing

1. 轴承外圈涂抹适量的机油　采用专用工装将不同型号的轴承压入对应的孔内
Apply appropriate amount of engine oil on outer race of bearing, then press the bearings of various models into corresponding holes with special tools.



注意
Note
1. 轴承的安装需要使用专用的轴承安装工装
Bearing shall be installed with the aid of special tools.
2. 压装轴承时，只能压装轴承的外圈，否则会损伤轴承
When pressing bearing, force shall be applied on outer race of bearing only; otherwise, the bearing may be damaged.

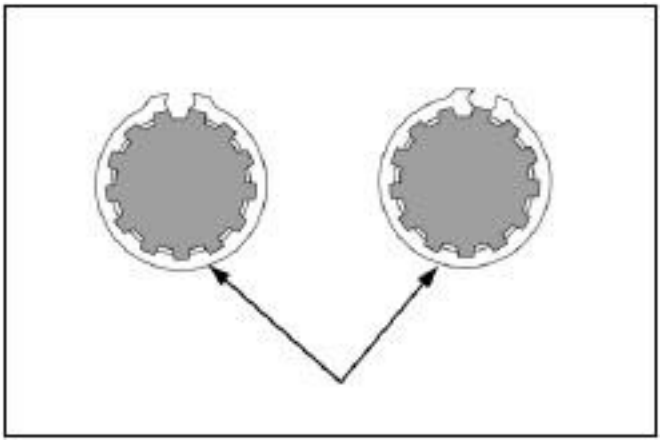
2. 油封内外圈涂抹适量的机油，采用专用工装将油封压装到位；
Apply appropriate amount of lube oil onto inner and outer races, then use special tools to press oil seal to its position.



3. 安装轴承定位板，紧固螺栓到要求的扭力值
Install locating plate of bearing and tighten the bolts to specified torque.

紧固扭力值：10N.m
Tightening torque: 10N.m

七、传动系统的安装
VII. Assembly of drive train



1. 将零部件用清洗剂清洗干净；
   Clean the components and parts with cleaning agent.
2. 清洗干净的零部件吹干后，涂抹机油；
   Dry the cleaned components and parts in air and apply engine oil on it.
3. 衬套的内外圈要涂抹适量润滑脂，以保证最初的润滑；
   Apply appropriate amount of grease onto inner and outer races of bushing to guarantee initial lubrication.
4. 将零部件装配到原来的位置上；
   Install the components and parts onto their original positions.

注意
Note

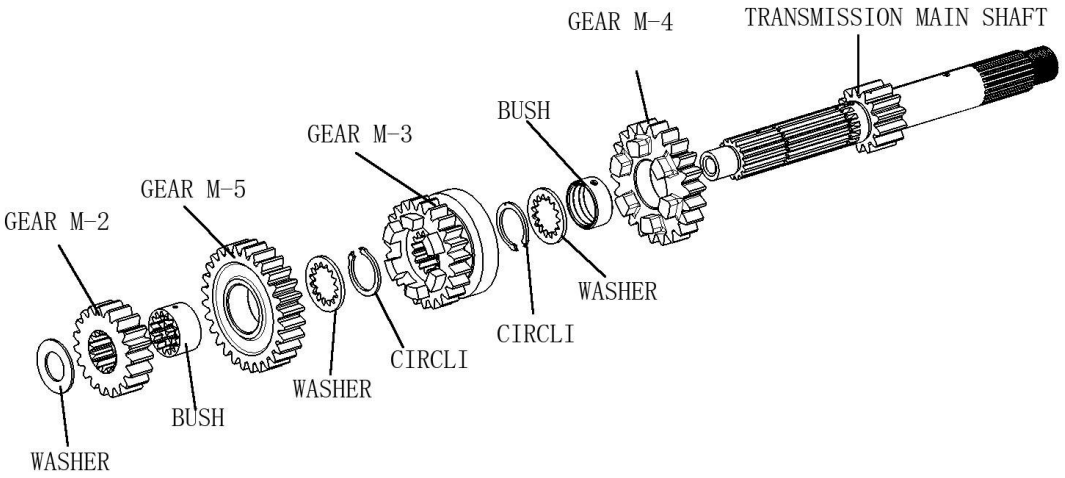
装配后的各档齿要可以灵活的转动和移动
All gears assembled shall be able to rotate and move freely.

垫圈的装配方向要按要求进行装配；
Washer shall be installed in accordance with specified direction.

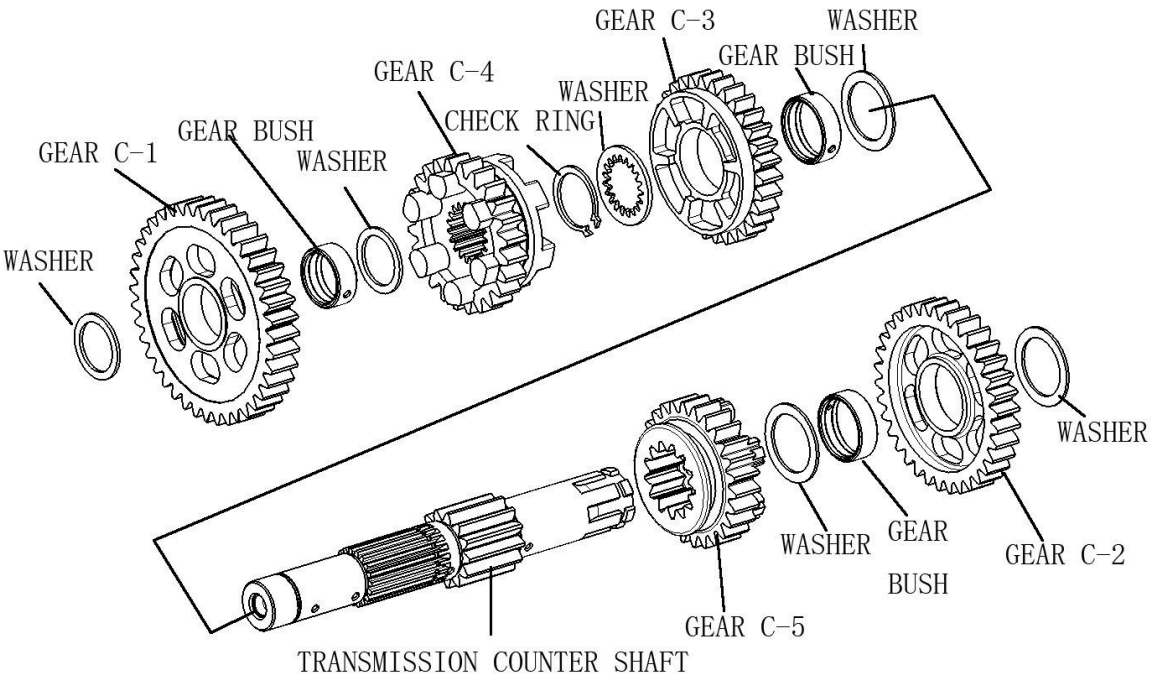
卡圈必须要更换新的，使用过的卡圈弹力不够，容易松动；
Circlip must be replaced with a new one. Used circlip is less in resilient force, causing looseness.

卡圈装配好后，开口位置要与轴上的花键槽对齐
After the circlip is installed, split of circlip shall be aligned with spline keyway on the shaft.

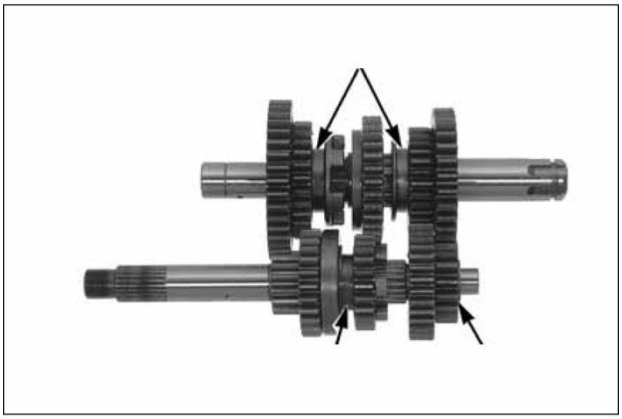
5. 主轴分解示意图
Exploded view of main shaft



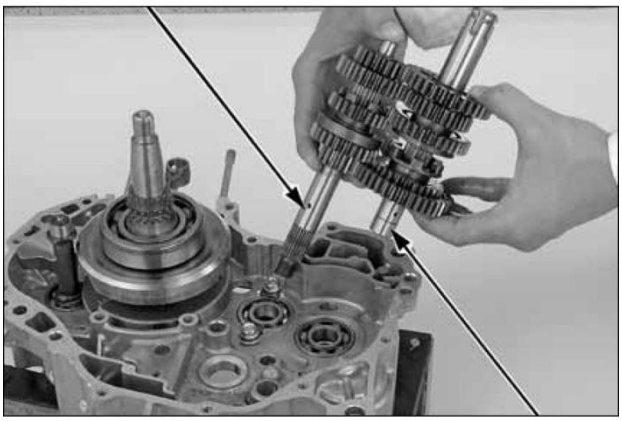
6. 副轴的分解示意图
Exploded view of counter shaft



7. 在齿的拨叉槽、齿轮部位涂抹适量的机油
Apply appropriate amount of lube oil onto fork groove and gears.



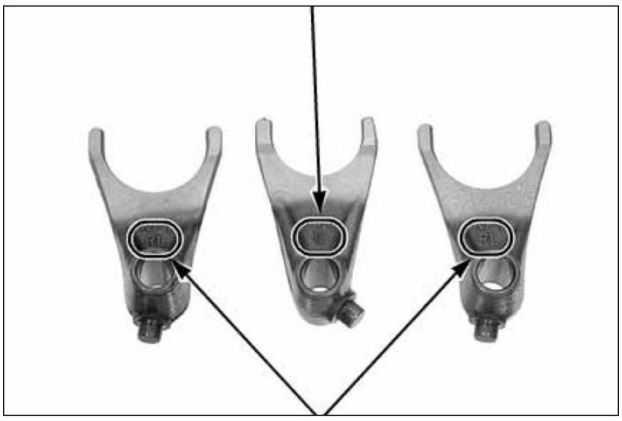
8. 将主副轴装入右轴箱内，注意主副轴上的两端的垫圈不要遗漏；
Install main and counter shafts into right half of crankcase. Care shall be take not to miss washers at both ends of the shafts.



9. 拨叉的标示
Marks on fork

C:主轴上的拨叉
Fork on main shaft

R/L：副轴上的拨叉
R/L: Fork on counter shaft

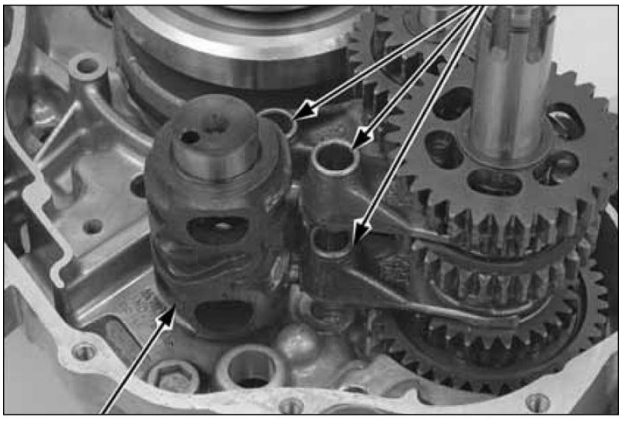


10. 将副轴拨叉、主轴拨叉装入相应的位置
Install forks of counter and main shafts into corresponding positions.

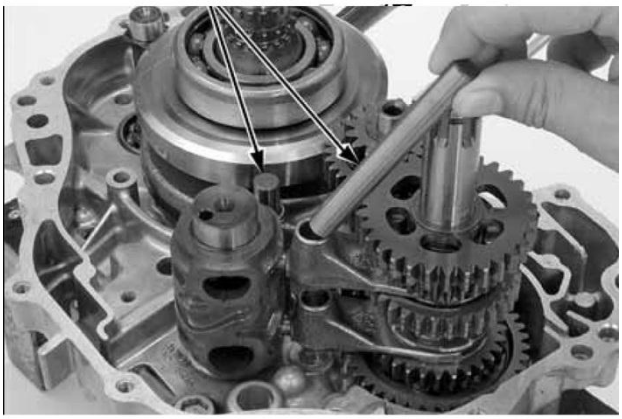
拨叉上的标示朝上；
Face of fork with mark shall be directed upwards.

变速鼓的型线槽内涂抹适量机油；
Apply appropriate amount of lube oil onto profiled groove of gearshift drum.

将变速鼓装入右箱体内，按照变速鼓的导向将拨叉装入变速鼓；
Install gearshift drum into right half of crankcase, and install fork into gearshift drum along guidance of the drum.

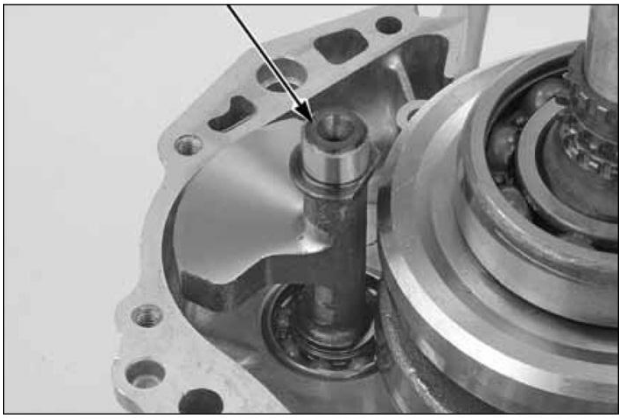


11. 拨叉轴上涂抹适量机油，插入拨叉孔内；转动副轴检查，各部件是否装配到位，主副轴是否转动灵活
Apply appropriate amount of engine oil onto fork shaft and insert the shaft into fork hole. Rotate counter shaft to check if all components and parts are installed into positions, and main and counter shafts can rotate freely.

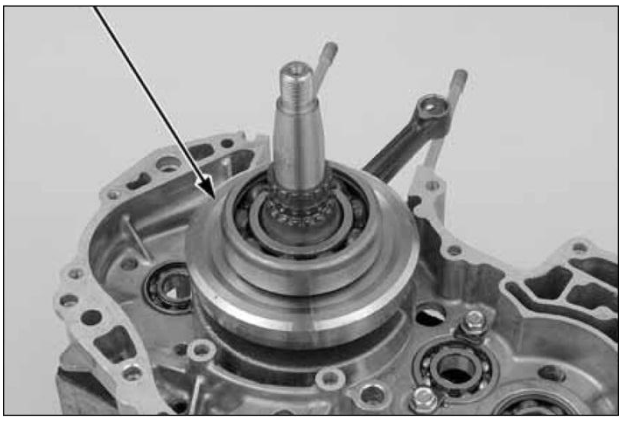


八、曲轴的拆卸与装配
VIII. Removal and installation of crankshaft

1. 取出平衡轴
Dismantle balanced shaft.



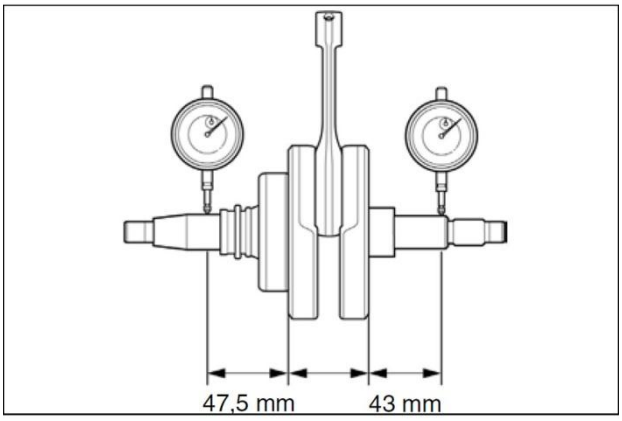
2. 取出曲轴
Dismantle crankshaft.



3. 曲轴的检测
Check of crankshaft.

将曲轴放置在 V 型铁块上，调整好检测用的百分表转动曲轴，读取表上变化的最大值
Rest crankshaft on V-shaped steel stand. Calibrate dial gauge to be used for check. Rotate crankshaft to take the maximum reading change on the gauge.

使用极限值 Service limit	0.08mm

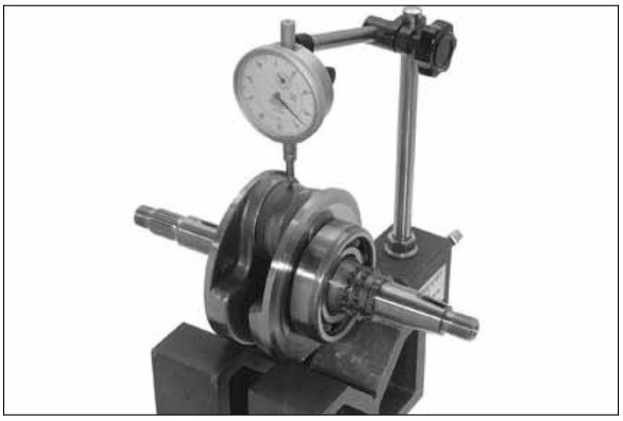


4. 用塞尺检测连杆大头与曲柄的侧隙
Measure side clearance between big-end of connecting rod and crankpin with feeler gauge.

使用极限值 Service limit	0.5mm

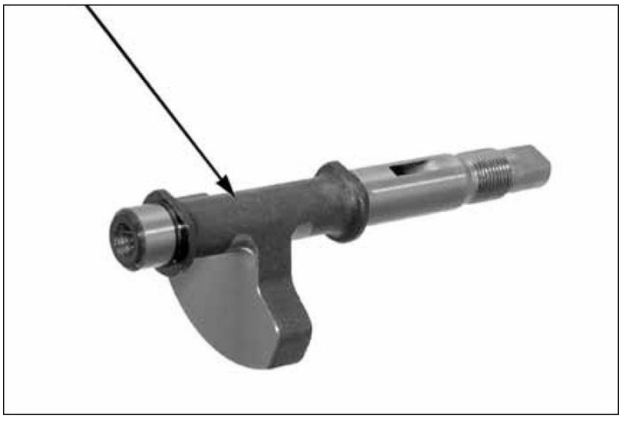
5. 测量连杆大头的径向间隙
Measure radial clearance of big-end of connecting rod

使用极限值 Service limit	0.05mm



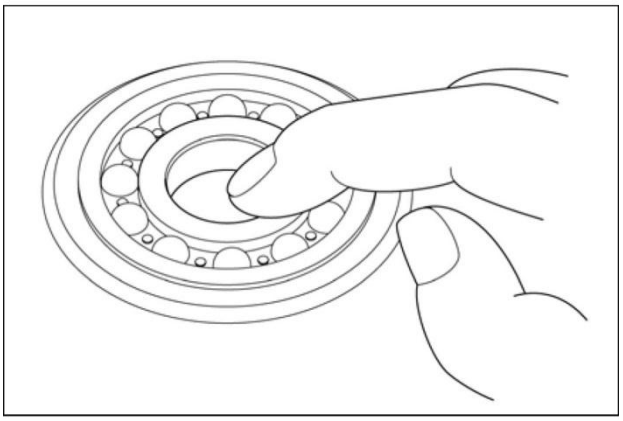
检查曲轴上的正时主动链轮有无异常的磨损、损坏，如果有就要相应的检查正时从动链轮、链条、张紧器等有无异常。
Check timing drive sprocket on crankshaft for abnormal wear and damage. If there is, check correspondingly timing driven sprocket, chain, tensioner, etc. for abnormal condition.

如果必要时需要更换正时主动链轮，主动链轮齿顶要与曲柄销的中心对齐；
When it is necessary to replace timing drive sprocket, tooth crown of drive sprocket shall be aligned with center of crankpin.



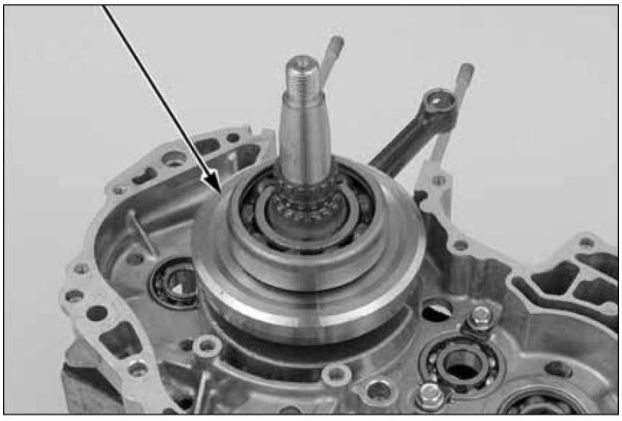
6. 检测平衡轴是否异常磨损，如果必要时更换一根新的
Check balanced shaft for abnormal wear. Replace it with a new one if necessary.

7. 检查轴承是否转动灵活
Check if bearing can rotate freely.

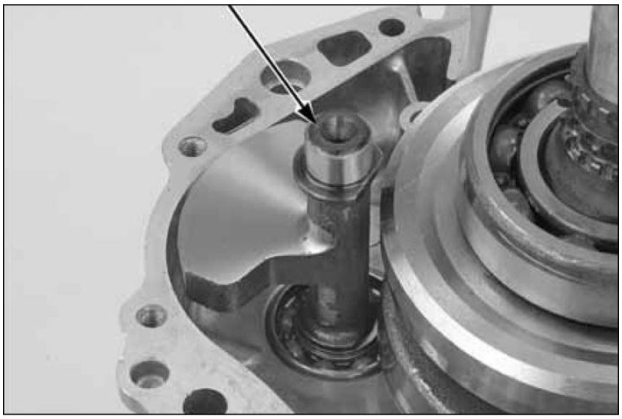


九、曲轴箱的装配
IX. Installation of crankcase

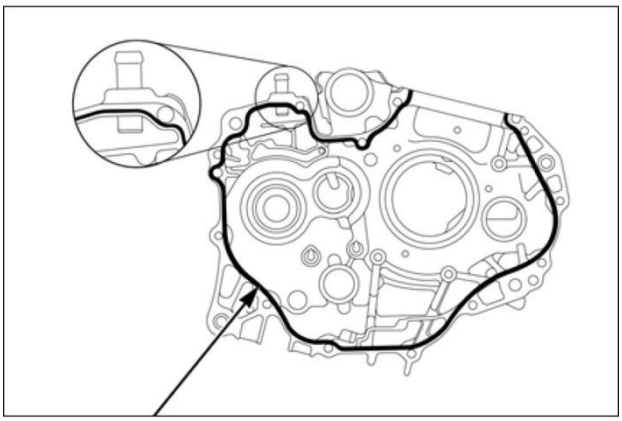
1. 将符合要求的曲轴装入右曲轴箱中
Install crankshaft that meets requirements into right half of crankcase.



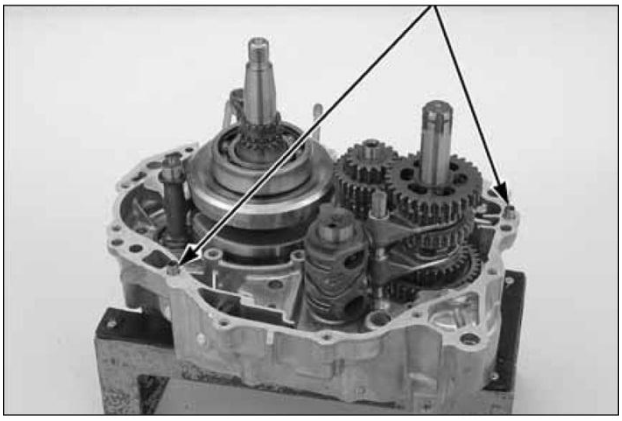
2. 装入平衡轴
Install balanced shaft.



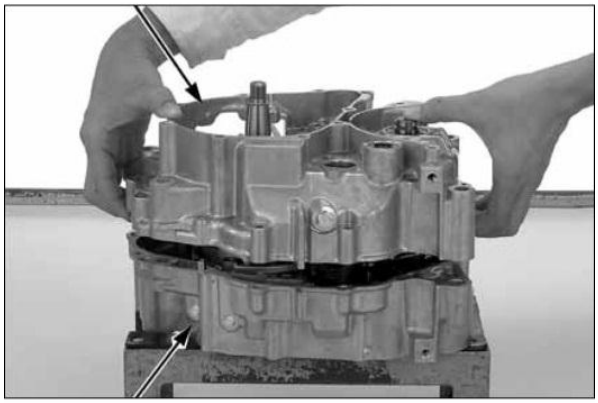
3. 将左右曲轴箱体结合面清理干净，在左曲轴箱的结合面上打平面密封胶，打胶的位置如图所示
Clean mating face of left and right halves of crankcase. Apply sealing adhesive on mating face of left half as shown in the figure.



4. 装配定位销
Install locating pin.



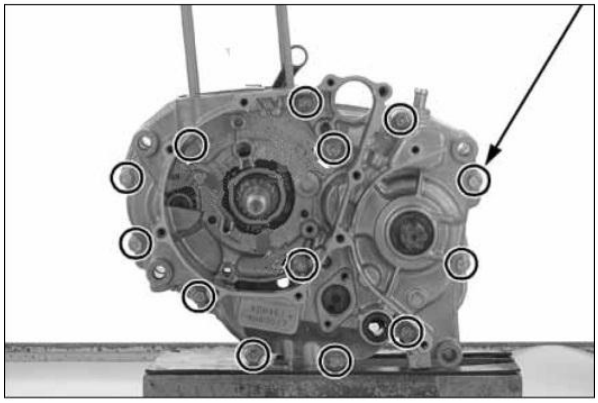
5. 将左曲轴箱装配到右曲轴箱上；
Assemble left half of crankcase onto right half.



注意
Note

当左曲轴箱装配后，与右曲轴箱不能紧密结合的时候要检查里面的零部件是否装配到位，是否有多余的零部件在曲轴箱内
When installing left half of crankcase, if it is found that the two halves cannot bind closely together, check if the components inside the halves are installed onto their positions, and if there are foreign matters in the crankcase.

6. 装配螺栓并预紧，再使用扭力扳手将螺栓紧固到规定的扭力值
Install and pretighten bolts, then tighten them with torque spanner to specified torque.

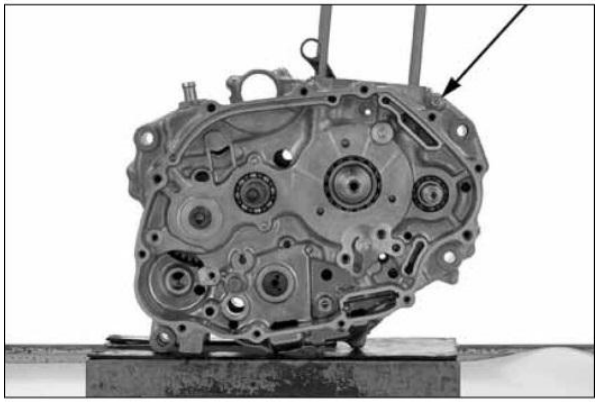


紧固扭力值：10N.m
Tightening torque: 10N.m

注意
Note

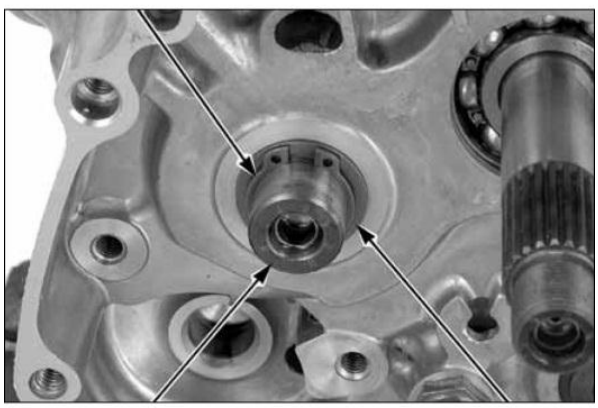
螺栓紧固后要检查主副轴、曲轴、平衡轴是否转动灵活
After the bolts are tightened, check main and counter shafts, crankshaft, balanced shaft for free rotation.

先紧固左盖内的 4 颗螺栓，再以对角线紧固其余的螺栓
Tighten 4 bolts inside left cover first, then tighten other bolts crosswise.



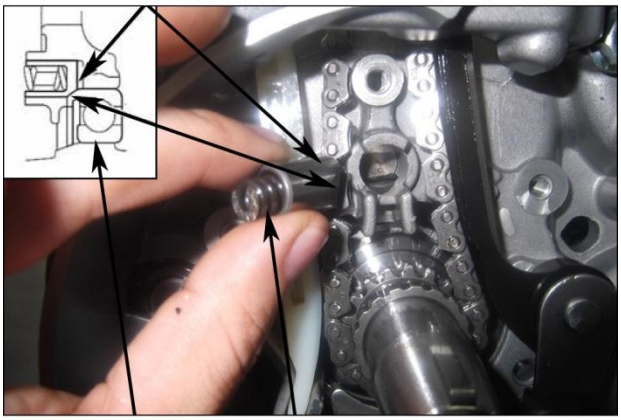
7. 紧固右曲轴箱上的螺栓
Tighten bolts on right half of crankcase.

8. 装配副轴上的垫圈、卡圈
Assemble washer and circlip on counter shaft.



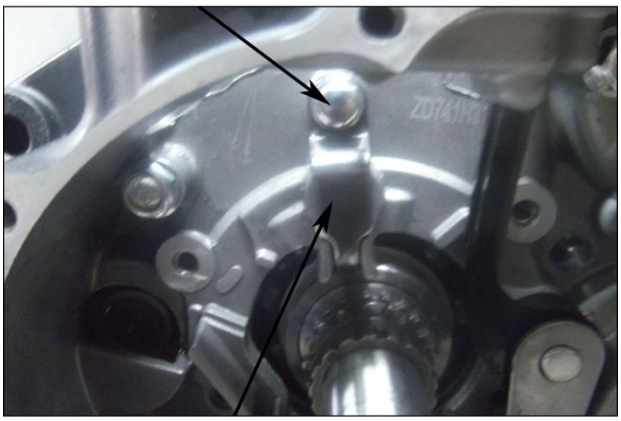
9. 装配压销体、压销体弹簧
Install pressing pin body and pressing pin body spring.

注意
Note
压销体的锥面要与轴承接触
Tapered face of pressing pin body shall contact bearing.



10. 螺栓涂抹 2-3 牙的螺纹紧固胶，将压销体挡板，螺栓装配到箱体上，并紧固螺栓到规定的扭力值
Apply threads fastening adhesive on 2~3 turns on bolt, then install pressing pin body guard and bolts onto crankshaft case. Tighten the bolts to specified value.

紧固扭力值：10N.m
Tightening torque: 10N.m



11. 依次装配链条、张紧板、链条护板，并紧固螺栓。
Install chain, tension plate, chain guard plate in turn, and tighten bolts.

紧固扭力值：10N.m
Tightening torque: 10N.m