

# BRIXTON

MOTORCYCLES



**/// CROSSFIRE 125**

**WORKSHOP MANUAL**  
ENG

# Preface

With the increasing variety of motorcycles, more and more new designs and technologies are being introduced. To help service personnel better master the maintenance, adjustment and servicing techniques of the CROSSFIRE 125, we have compiled this maintenance manual.

This manual refers to the CROSSFIRE 125 LC.

The contents of Chapter 1 to Chapter 2 refer to the adjustment of various components of the motorcycle. Chapter 3 describes the individual components of the motorcycle. Chapter 4 lists the maintenance procedures for the electrical system and the schematic diagram.

Relevant standard maintenance procedures, maintenance precautions and general repair knowledge are not included in this manual. If you need to refer to the above content, please refer to other relevant documents.

All information, diagrams, data and performance indices published in this manual are the latest product information at the time of printing. The company reserves the right to change this manual at any time without prior notice. Every part of this manual is protected by copyright. Reprinting is only permitted with the express permission of the company.

Thank you for purchasing the CROSSFIRE 125 LC!  
We wish you much pleasure and comfort in your future travels!

Editor September 2022

# Contents

Preface.....	2
Contents.....	3
Chapter 1 Overview.....	4
Printing position of machine number.....	4
Maintenance precautions .....	5
Main performance technical data .....	7
Torque value of main standard parts.....	8
Wiring diagram .....	10
Symbol description .....	11
Chapter 2 Lubrication System.....	13
Maintenance instructions.....	13
Lubrication position of the whole vehicle.....	14
Lubrication of the engine.....	14
Chapter 3 Inspection and Adjustment .....	21
Maintenance instructions.....	21
Fuel system .....	31
Cooling system.....	36
Cooling electrical system .....	42
Disassembly and Installation of Engine.....	43
Frame, exhaust system.....	46
Front wheel, front suspension, steering column, front brake .....	50
Rear wheel, rear brake, rear suspension devices .....	58
Chapter 4 General Introduction of Electrical System .....	63
Battery and power supply system .....	64
Starting system.....	69
Lighting signal system.....	73
Information display system .....	81
Engine management system .....	87
EMS fault diagnosis process .....	99
Electrical schematic diagram.....	103

# Chapter 1 Overview

Printing position of machine number	Maintenance interval table
Maintenance precautions	Wiring diagram
Main performance technical data	Symbol description
Standard torque value	

## Printing position of machine number

Vehicle picture:



Printing position of frame number:



The frame number is engraved on the right side of the frame riser

Location of nameplate:



The frame name plate is riveted on the left side of the frame seat tube

Printing position of engine number:



The engine number is engraved under the left crankcase body



## Maintenance precautions

1. Parts, accessories, lubricating oil and other auxiliary materials produced by the company or approved and recommended by the company shall be used. If the used parts do not meet the specifications or requirements, the motorcycle may be damaged.  
2. When reassembling after disassembly, new washers, seal components and cotter pins shall be replaced.



3. When fastening bolts or nuts, they shall be carried out in diagonal cross sequence and tightened step by step in 2-3 times to reach the specified standard torque value.

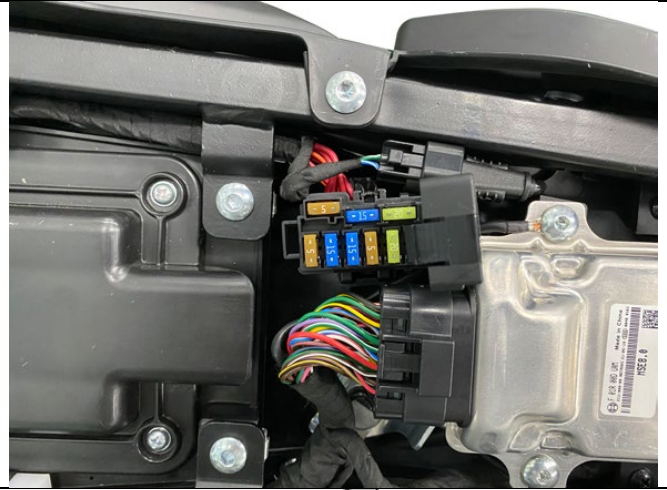


4. After the parts are disassembled, they shall be cleaned before inspection and measurement.  
When cleaning parts, non combustible or high ignition point cleaning fluid shall be used.  
Before assembly, the sliding surface of parts shall be applied with the specified lubricating oil.  
After assembly, check whether all parts are installed correctly. Rotation, movement and operation checks are required.

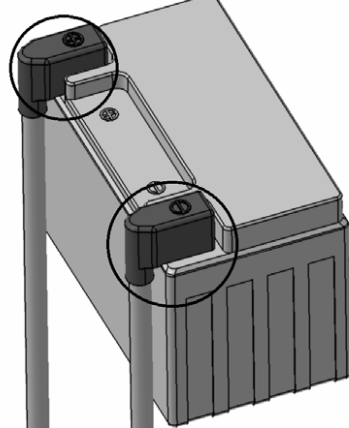
5. Special and general tools must be used in assembling and disassembling motorcycles.  
6. The specified or equivalent grease (oil) must be applied or injected at the specified place.  
7. When there are more than two people operate the motorcycle, they should care each other's safety and work together.  
8. Before operation, the negative terminal (-) of the battery must be removed, and the spanner should not touch the frame.  
After the operation, the connection, fixation and connection of each part shall be confirmed again. If the battery has been removed, the positive terminal (+) should be connected first.



9. When the fuse is blown, the reason shall be checked and the corresponding fuse must be replaced according to the specified capacity after repair.

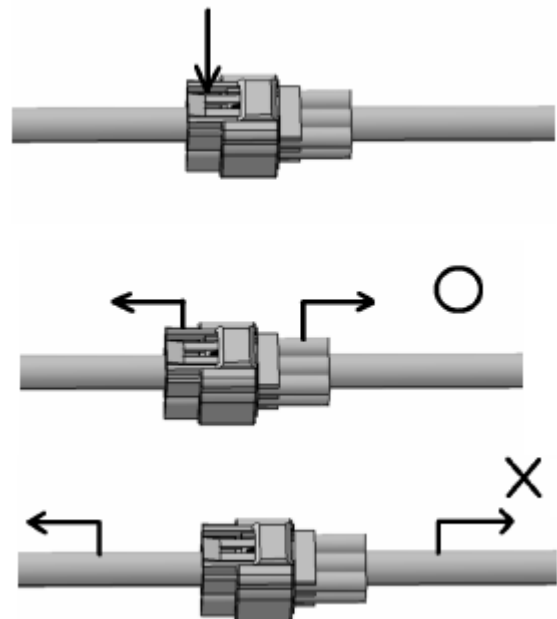


10. The covers shall cover the terminal after the operation.



11. When disassembling the connector with lock, the lock must be released before operation.

When disassembling the connector, hold the connector body and do not pull the wire harness. Before connecting the connector, the terminal shall not be broken or bent, confirm that the terminal is not too long or falling off, and the connector should be fully inserted.



12. The harness fixing belt shall be tightly fastened to the specified position of the frame. The clamps shall clamp the wire bundles correctly. The wire harness shall be clamped at the place that is not in contact with the part with high temperature, The wire harness shall be clamped at the place that is not in contact with the edge and acute corner of the vehicle body. And the wire harness shall not pass through the place where it contacts with the head and front part of bolts and screws. The wire harness should not be loosened or pulled by force. If the wire harness needs to contact with the edge and acute corner in any case, it should be protected with hose or tape at the contact part. Do not break the covering of the wire harness. If the wire harness is damaged, it should be repaired by

13. When wiring, it should be noted that when the handle is turned left and right to the limit position, the wire bundle shall not be too tight and too loose, and it should be confirmed that there is no prominent bending, pressed phenomenon, edge interference and other phenomena.

14. When using the test table, you should understand the instructions in the operation manual and operate according to the maintenance manual.

15. Do not drop or throw any parts.

16. If the terminal is rusted, it shall be treated with sandpaper before connecting.

17. Cables should not be twisted or bent by force. Because the deformed or damaged cable is the cause of poor operation and damage.

winding with plastic tape. Do not press on the wire harness when installing parts. Do not twist the wire harness.	
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## Main performance technical data

	Items	Data	
Dimensions and weight	Length×width×height	2077mmX765mmX1045mm	
	Wheelbase	1385mm	
	Minimum ground clearance	170mm	
	Vehicle quality	Mass in running order: 175 kg, full load: 324kg	
Vehicle body	Frame form	Steel tube type	
	Front suspension rear camber	25°	
	Front suspension	Hydrostatic spring composite damping (inverted)	
	Rear suspension	Hydraulic spring composite center damping	
	Front tire size	120/70-18 59S or 100/90-18 56P	
	Rear tire size	140/70-17 66S or 130/80-17 65P	
	Front wheel pressure	Single person: 250 kPa, double: 250 kPa	
	Rear wheel pressure	Single person: 250 kPa, double: 250 kPa	
	Front brake	Disc diameter Φ 300mm	
	Rear brake	Disc diameter Φ 218mm	
	Fuel tank capacity	11L	
	Fuel grade	92#	
	Engine	Type	Single cylinder, four strokes, water cooled
Cylinder diameter × piston stroke		58mm×47mm	
Cylinder displacement		124cc	
Compression ratio		12:1	
Maximum power		10kw/9500rpm	
Maximum torque		11.4N.m/7500rpm	
Valve clearance (cold state)		IN: 0.10~0.15, EX: 0.15~0.20	
Valve drive mechanism		Chain drive	
Air filter element		Paper filter type	
Cooling mode		Water-cooling	
Filling amount of cooling water		860ml	
Crankshaft balancing mode		Unbalanced shaft	
Lubricating system		Splash, pressure lubrication, oil filter is replaceable	
Type of oil pump		Rotor type	
Engine oil grade		SAESJ-10W/40 model or equivalent model	
Filling quantity of oil		1.2L for broken tank and 1.0L for daily maintenance	
Oil filter		Filter is replaceable	
Starting mode		Motor starting	
Idle speed		1500(1±10%)r/min	
Net weight of engine		28kg	
Transmission system	Clutch	Manual wet multi chip	
	Clutch operating system	Manual mechanical type	
	Gearshift	6-speed constant engagement	
	Primary reduction ratio	3.350	
	Gear ratio	I	2.833
		II	1.875
		III	1.421
		IV	1.190
		V	1.043
		VI	0.880
Final reduction ratio	3.923		
Gear shift	Left foot operated shuttle		
	Sequence I –N– II – III – IV – V – VI		
Electric and EFI	Generator	172W / 5000r / min. 12V18 pole Three-phase full-wave	
	Battery capacity	12V 9A.h	
	Power supply system	DC power supply, the generator is only charging the battery	

Fuse	20A*1, 15A*3, 5A*2
Spark plug model	NGK CR9E
Spark plug gap	0.6~0.7mm
Anti theft device type	Type 2. Lock the steering column with the ignition switch
Fuel supply mode	EFI, ECU control
Ignition mode	EFI
Headlamp	LED12V12W/24W
Turn signals	Front: 12V0.8W rear:12V0.8W
Brake lamp/rear position lamp	12V3.5W/1.6W

## Torque value of main standard parts

### Engine

Items	Quantity	Thread diameter (mm)	Torque value (N.m)
Five-star paddle bolt	1	8	21~25
Shift arm set bolt	1	/	25~29
Magneto rotor bolt	1	/	138~142
Spark plug	2	/	14~18
AB bolt	6	9	46~50
Rocker shaft bolt	2	12	13~17
Drain plug	1	12	28~32
Closing bolt M8 × 105	1	8	15N*m and then tighten 120°
Closing bolt M10	1	10	10
Closing bolt M8	10	8	22~26
Driving sprocket mounting bolt	1	10	52~56
Clutch nut	5	/	126~130
Connecting rod cap nut	4	8	33~35
Isolator bolt	6	8	27~31
Primary driving gear bolt	1	16	103~105
Mounting bolt of oil pressure sensor	1	/	23~27
Oil pressure sensor	1	/	10~14
Mounting bolt of shift display	2	4	2~4
Fine filter pipe joint	1	/	2~4
Fine filter	1	/	8~12
Water temperature sensor	1	12	14~16
Clutch lifting plate bolt	5	6	11~13
Starter motor positive line nut	1	6	8~12
Camshaft bracket bolts	12	6	10~14

### Vehicle body

Items	Quantity	Thread diameter (mm)	Torque value (N.m)
Assembly of engine front suspension	4	8	28~35
Assembly of engine rear suspension	2	10	55~65
Assembly of front shock absorber	2	8	28~32
Cap nut of connecting plate on steering column	1	16	60~70
Steering column and front shock absorber	4	8	45~55
Handlebar and clip	4	8	21~25
Front axle	1	14	75~85
Flat fork shaft	1	12	60~70
Rear axle	1	14	75~85
Cradle rear component and rear stabilizer connecting shaft	1	12	45~55
Cradle rear component and cradle front component shaft	1	12	60~70

Cradle rear component and flat fork connecting shaft	1	12	60~70
Cradle front component and frame connecting shaft	1	12	60~70
The frame is connected with the rear flat fork	1	12	60~70
Brake disc and hub connection	9	8	28~32
Front brake calipers and front shock absorber connections	2	10	55~65
Brake oil pipe connection	8	10	24~28

Except for the torque values of important parts listed in the above table, the torque ranges of other standard fasteners are shown in the table below

Items	Torque value (N.m)
5mm bolts and nuts	4~6
6mm bolts and nuts	8~12
8mm bolts and nuts	28~32
10mm bolts and nuts	35~45
5mm screw	4~6
6mm screw	7~11

Regular maintenance table

Inspection cycle Inspection items	Mileage	Initial 1000km	Every 5000km	Every 10000km	Every 15000km
	Time	First 3 months	Every 15 months	Every 30 months	Every 45 months
Air filter (filter cartridge)		–	Check	Check	Replace
*Muffler bolts and nuts		Fastening	–	Fastening	–
* Valve clearance (Cold-state check) Inlet $15 \pm 0.03$ mm / outlet $0.25 \pm 0.03$ mm		Check	Check	Check	Check
Spark plug		–	Check	Check	Check
Engine oil		Replace	Replace	Replace	Replace
Oil filter		Replace	–	Replace	–
Free stroke of clutch handle		Check	Check	Check	Check
*Throttle body		Check	–	Check	–
Throttle cable clearance		Check	Check	Check	Check
Idle speed		Check	Check	Check	Check
Fuel evaporative pollutant control system		–	–	Check	–
* Coolant		Replace every 8000 km or every 24 months			
Radiator hose		–	Check	Check	Check
Fuel pipe		–	Check	Check	Check
Drive chain		Check	Check	Check	Check
		Check, clean and lubricate every 1000 km			
*Brake		Check	Check	Check	Check
* Brake fluid hose		–	Check	Check	Check
		Replace every 4 years			
Brake fluid		–	Check	Check	Check
		Replace every 2 years			
Tire		–	Check	Check	Check
* Steering mechanism		Check	–	Check	–
*Front fork		–	–	Check	–
*Rear shock absorber		–	–	Check	–
* Bolts and nuts mounted on the car body and engine		Fastening	Fastening	Fastening	

Note:

When checking according to the items in the table, further cleaning, lubrication, adjustment or replacement shall be carried out if necessary.

Note:



When driving for a long time under bad road conditions and high-power conditions, the inspection frequency shall be increased.

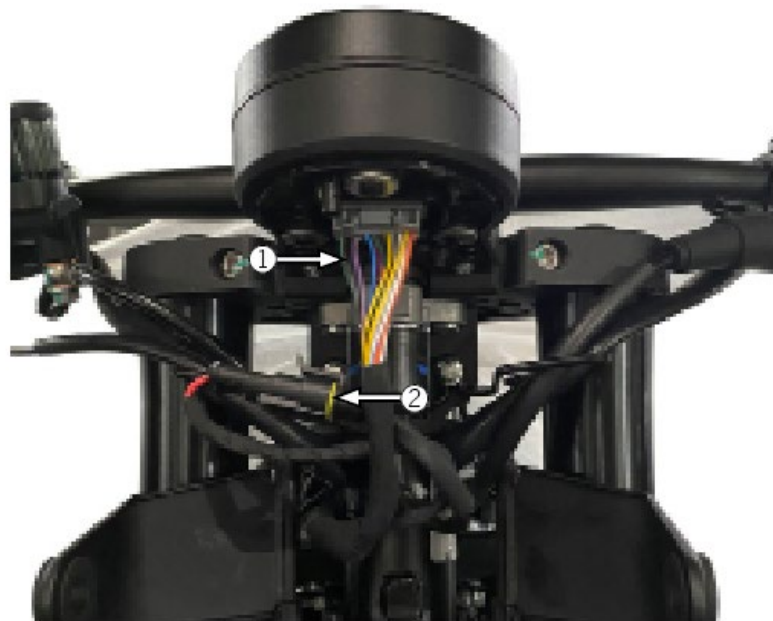
Note:

The items marked with "\*" in the table should be handled by the qualified franchise Repair Shop.

## Wiring diagram



Ⓐ



1 instrument wiring, 2 Ignition switch wiring



## Ⓑ-left



1 Wiring of left combination switch, radiator fan wiring, 2 Battery, 3 ECU, 4 Ignition coil wiring  
5 Main relay, oil pump relay, 6 Horn, 7 Voltage regulating rectifier, 8 Magneto wiring, 9 Start relay

## Ⓑ-right



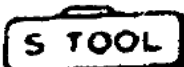



1 ECU, 2 Fuse box, 3 Fault diagnosis interface, 4 ABS, 5 Fuel sensor wiring, 6 Right combination switch wiring

## Symbol description

Meaning of symbols in this manual:

Graphic symbols	The meaning of graphic symbols	Graphic symbols	The meaning of graphic symbols
	Measures to be prompted during operation, inspection and maintenance.		Use general tools.
	Special instructions or disposal measures proposed to prevent certain damage to vehicles.		Tightening torque specification: 50 N.m
	Special instructions or measures proposed to avoid a great injury or		Use the recommended oil.

	personal injury.		
	When reassembling after disassembly, new parts must be replaced.		Use thread locking agent.
	Use special tools.		Use lithium grease.

# Chapter 2 Lubrication System

Maintenance instructions	Inspection of engine oil
Troubleshooting	Replacement of oil
Lubrication position of the whole vehicle	Cleaning of oil coarse filter
Lubrication of each operating line	Cleaning and replacement of oil filter
Engine lubrication system diagram	Oil pump

## Maintenance instructions

This section introduces the checking and replacement methods of engine oil, as well as the cleaning methods of oil coarse filter and oil filter. Besides, it also introduces the parts of the motorcycle.


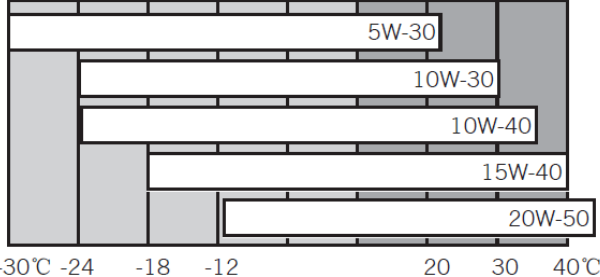
Engine oil is an important factor affecting engine performance and service life. It must be used according to regulations. It is not allowed to use ordinary engine oil, gear oil, vegetable oil, etc. The engine is filled with SJ-10W/40 grade oil when it is sold out of the factory. When changing the engine oil, please drain the original engine oil in the crankcase, clean it with washing kerosene, and then add new engine oil according to the regulations.

When checking or cleaning the machine system, the engine may not be removed, but the oil in the engine shall be drained before checking or cleaning.

Technical specification: oil filling amount: 1.2L for opening the middle box and 1.0L for daily maintenance

Oil pump flow: 12L / min (when engine speed is 6000 rpm).

Tightening torque of oil drain screw plug: 25 ~ 30 N.m.

 <p><b>Warning</b> If repeatedly exposed to engine oil for a long time, it may cause skin cancer. While this is unlikely unless you handle used oil every day, it is still important to be careful to wash your hands thoroughly with soap and water immediately after handling used oil. Keep children away.</p>	Choose the viscosity according to the temperature			
	Low temperature performance	Fuel economy	High temperature performance	Lubricity performance at high temperature
		Low temperature start-up		Noise reduction performance at high temperature
 <p>The chart shows the operating temperature ranges for different oil grades. The x-axis represents temperature in degrees Celsius, ranging from -30 to 40. The y-axis represents oil grades. The ranges are: 5W-30 (-30 to 30), 10W-30 (-24 to 30), 10W-40 (-18 to 30), 15W-40 (-12 to 30), and 20W-50 (-12 to 20).</p>				

## Troubleshooting

<p><b>Oil contamination</b></p> <ol style="list-style-type: none"> <li>1. Failure to change the oil according to the maintenance interval table;</li> <li>2. Damage to the threads of the oil injection port, poor sealing;</li> <li>3. The piston ring is worn.</li> </ol> <p><b>Low oil pressure</b></p> <ol style="list-style-type: none"> <li>1. The oil level is too low;</li> <li>2. The oil passage, orifice or oil filter net are blocked;</li> <li>3. Oil pump failure.</li> </ol>	<p><b>Excessive oil consumption</b></p> <ol style="list-style-type: none"> <li>1. The engine is leaking oil;</li> <li>2. The piston ring is worn;</li> <li>3. The guide rods of intake and exhaust valves are worn;</li> <li>4. The oil shield is worn or damaged.</li> </ol>
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## Lubrication position of the whole vehicle



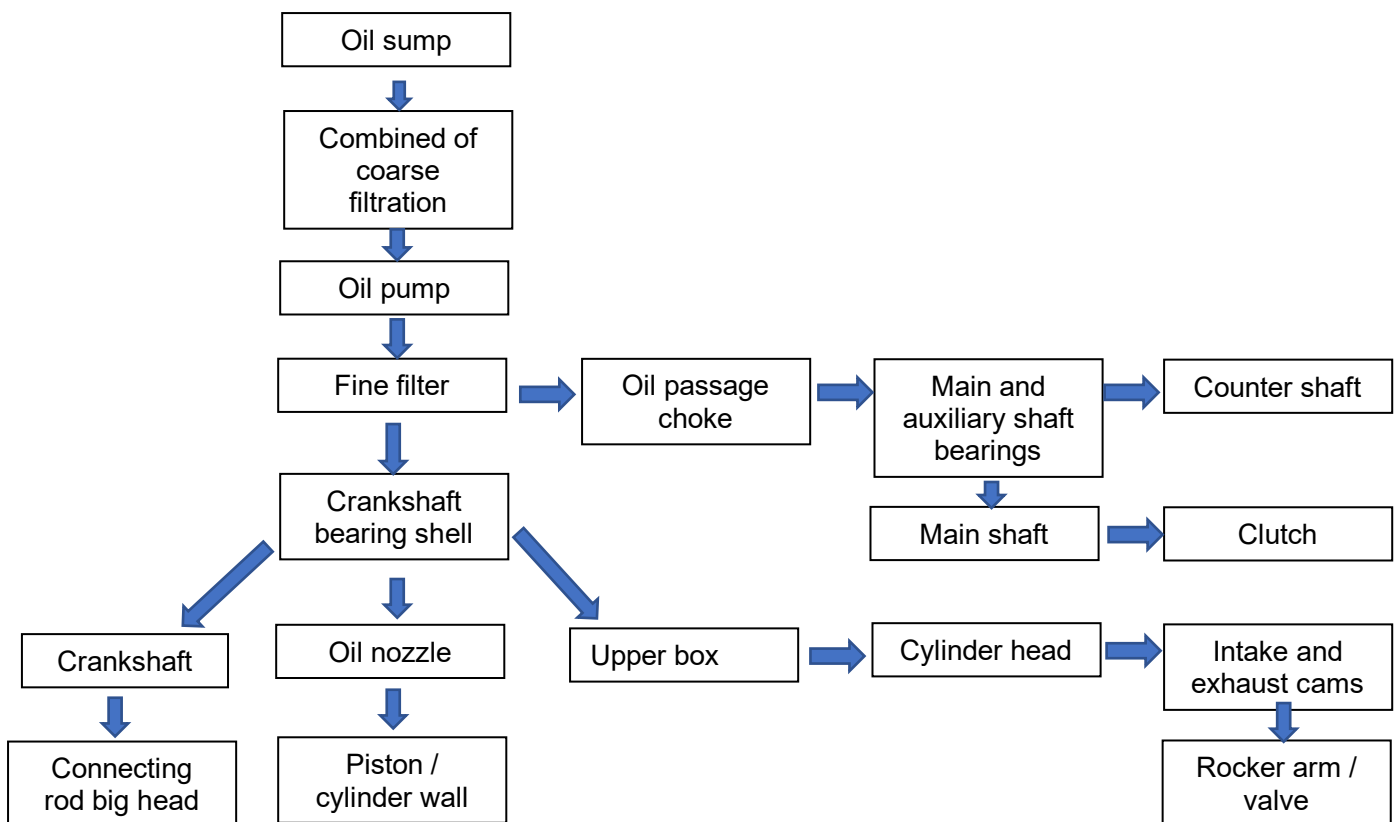
Except the drive chain shown in the figure above use special chain oil, the rest positions adopt lithium grease. All oils not specified in this manual shall adopts common oils. All sliding surfaces and cables not shown in this figure shall be coated with oil or grease.

### Lubrication of each operating line

The clutch control line and throttle control line shall be regularly checked. The method is to remove the upper end connection of each operating line, and fully maintain the wire rope and each fulcrum with lithium base grease.

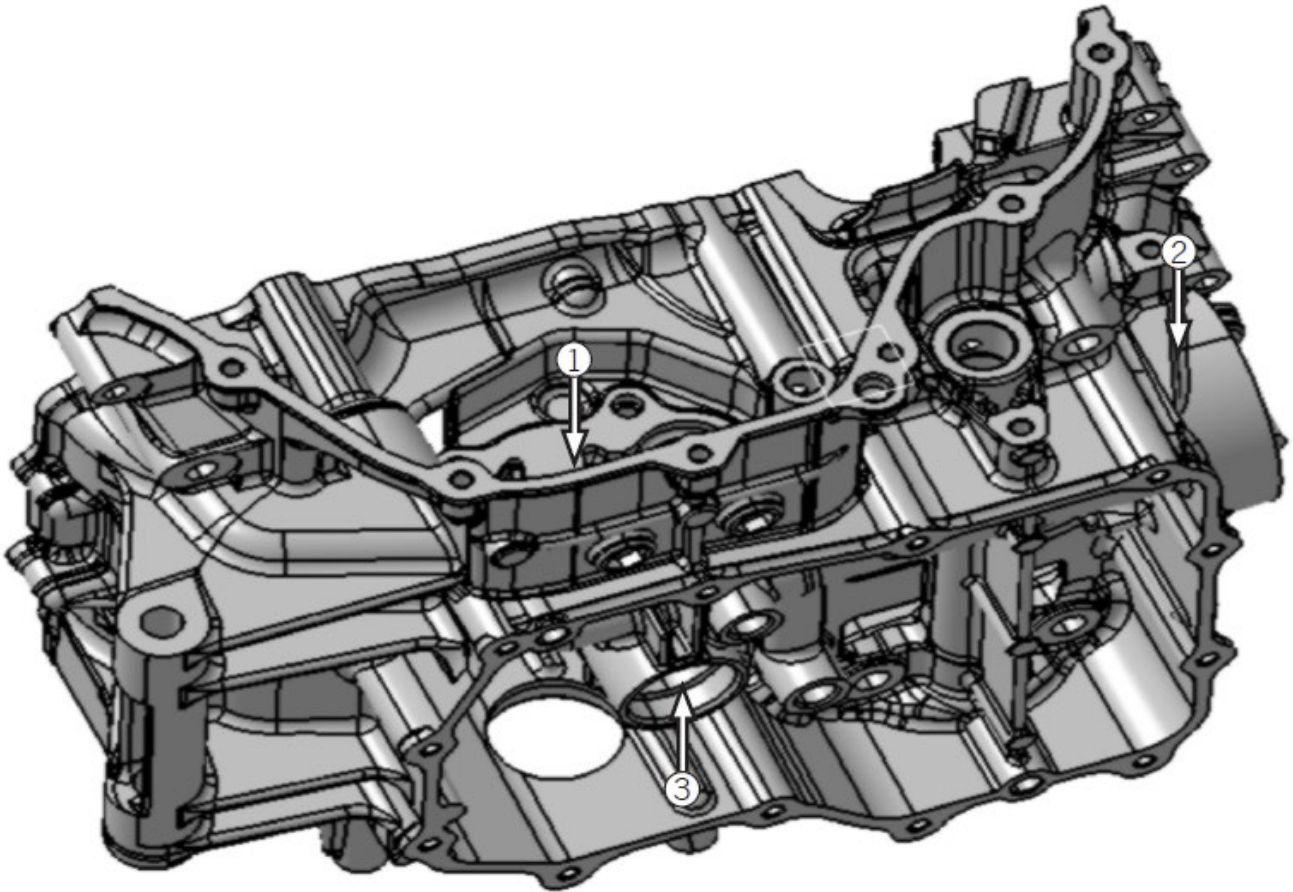
## Lubrication of the engine

### Engine lubrication system diagram



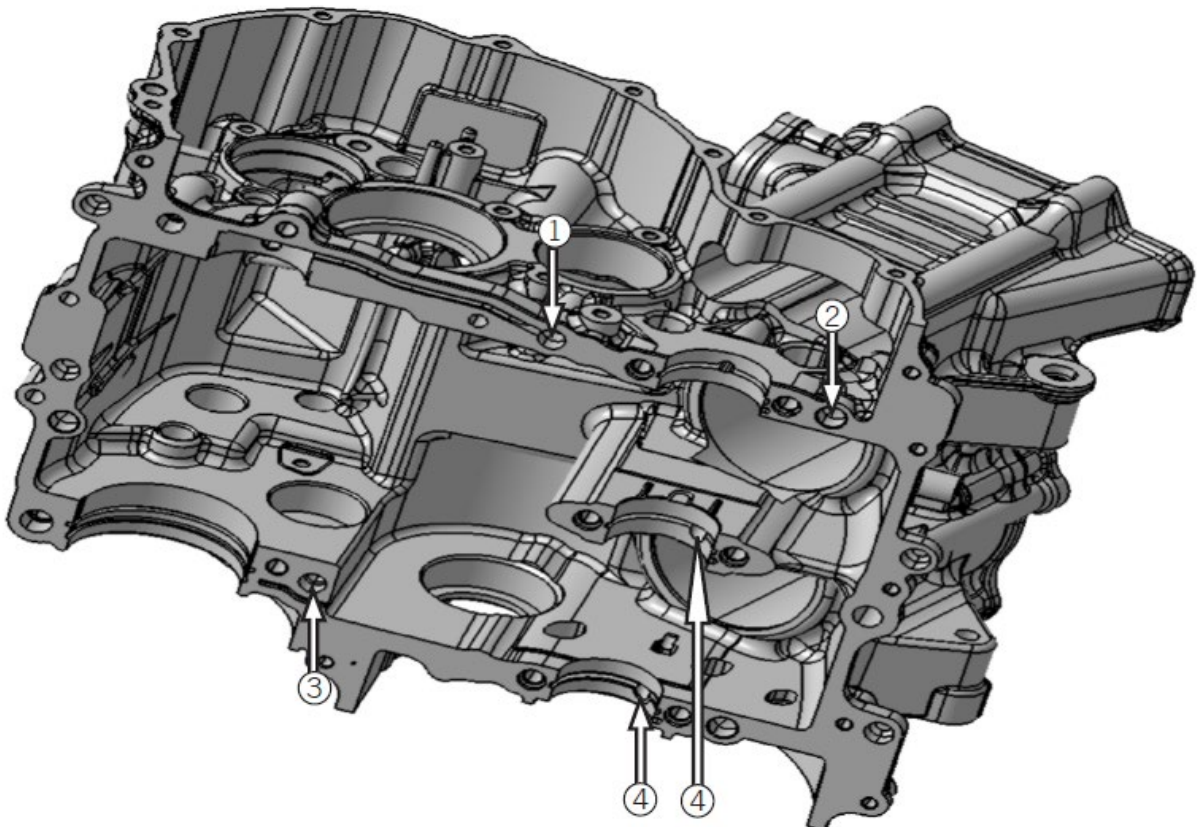


## Lower crankcase oil passage



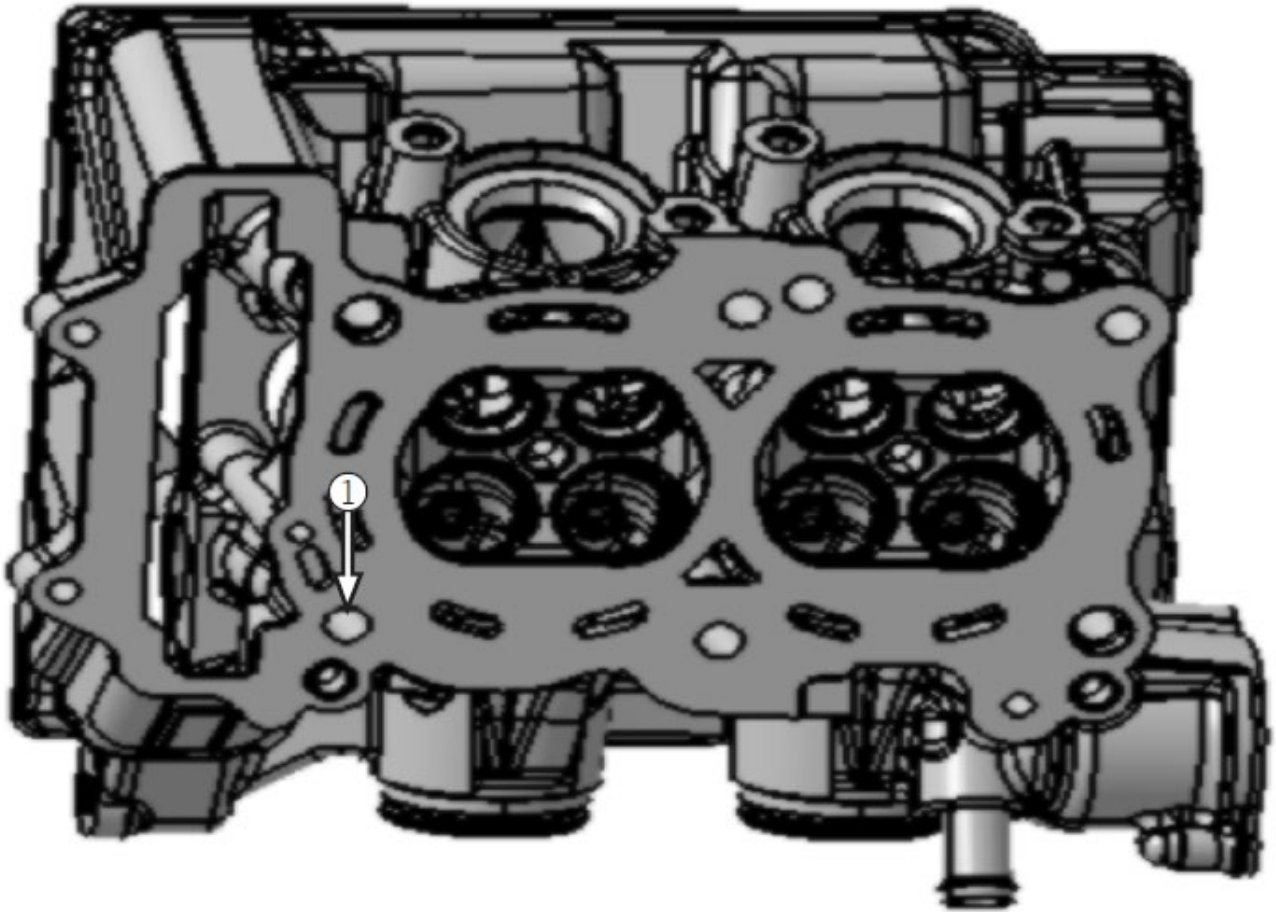
1 The oil flows from the primary filter assembly to the oil pump, 2 The oil flows from the oil filter to the oil passage orifice, 3 The oil flows from the oil pan to the primary filter assembly

## Upper crankcase body oil passage



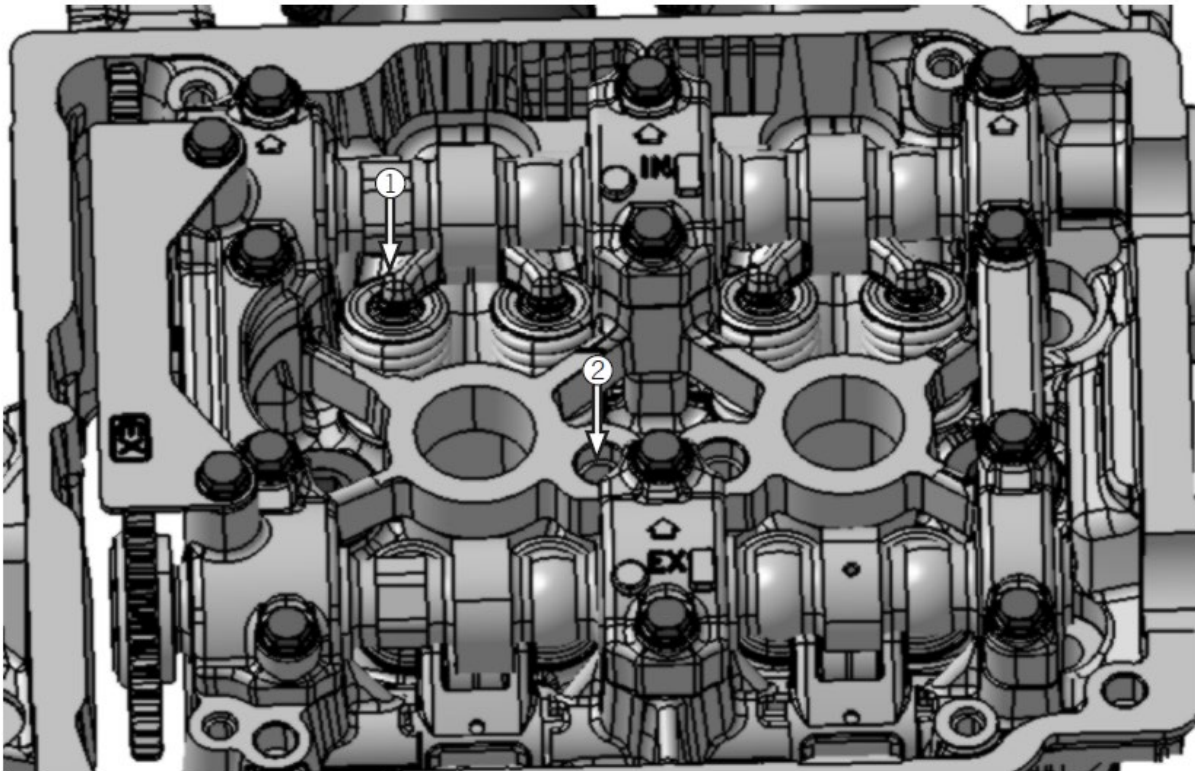
1 The oil flows from the oil passage orifice to the main shaft, 2 The oil flows from the orifice to the cylinder head, 3 The oil flows from the oil pan to the primary filter set, 4 The oil flows from the oil pump to the oil filter

## Cylinder head oil passage



1 The oil flows from upper case to cylinder head

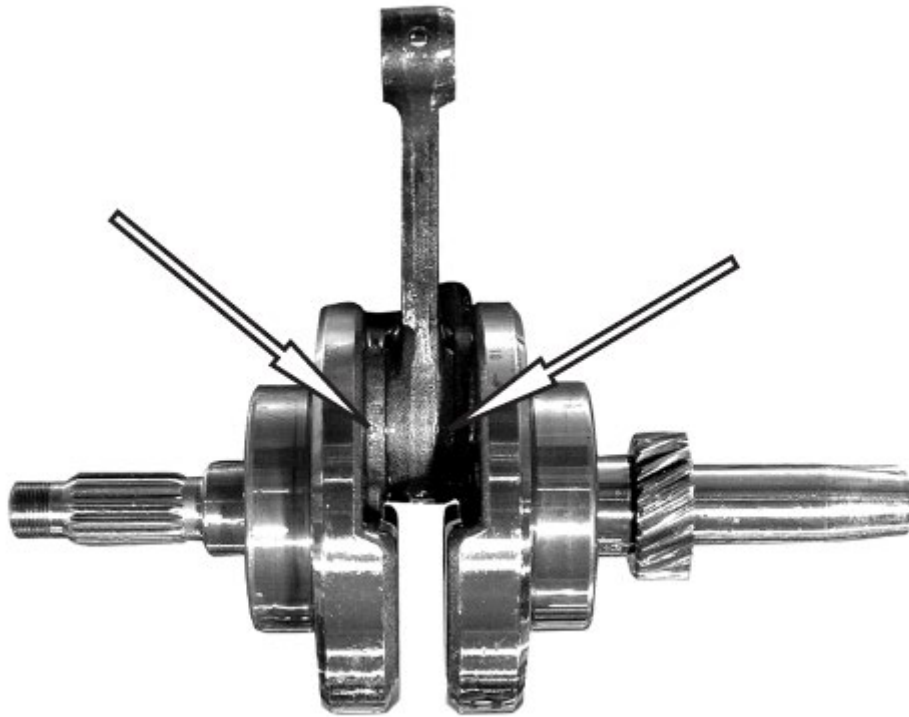
## Lubrication of camshaft journal



1 The oil flows from cylinder head to intake cam, 2 The oil flows from intake cam to exhaust cam



## Lubrication of crankshaft



## Inspection of engine oil

Support the motorcycle on a flat surface with a special clamp and check the oil sight window on the right crankcase cover. If the oil level is below the lower engraved line, the recommended oil should be replenished so that it is filled to the upper limit of the middle deviation.

Replenishment method: Remove the oil filler plug and slowly fill the oil with a funnel until the oil level in the oil viewing window reaches the upper limit of the middle deviation. Then install the oil filling plug and tighten it.

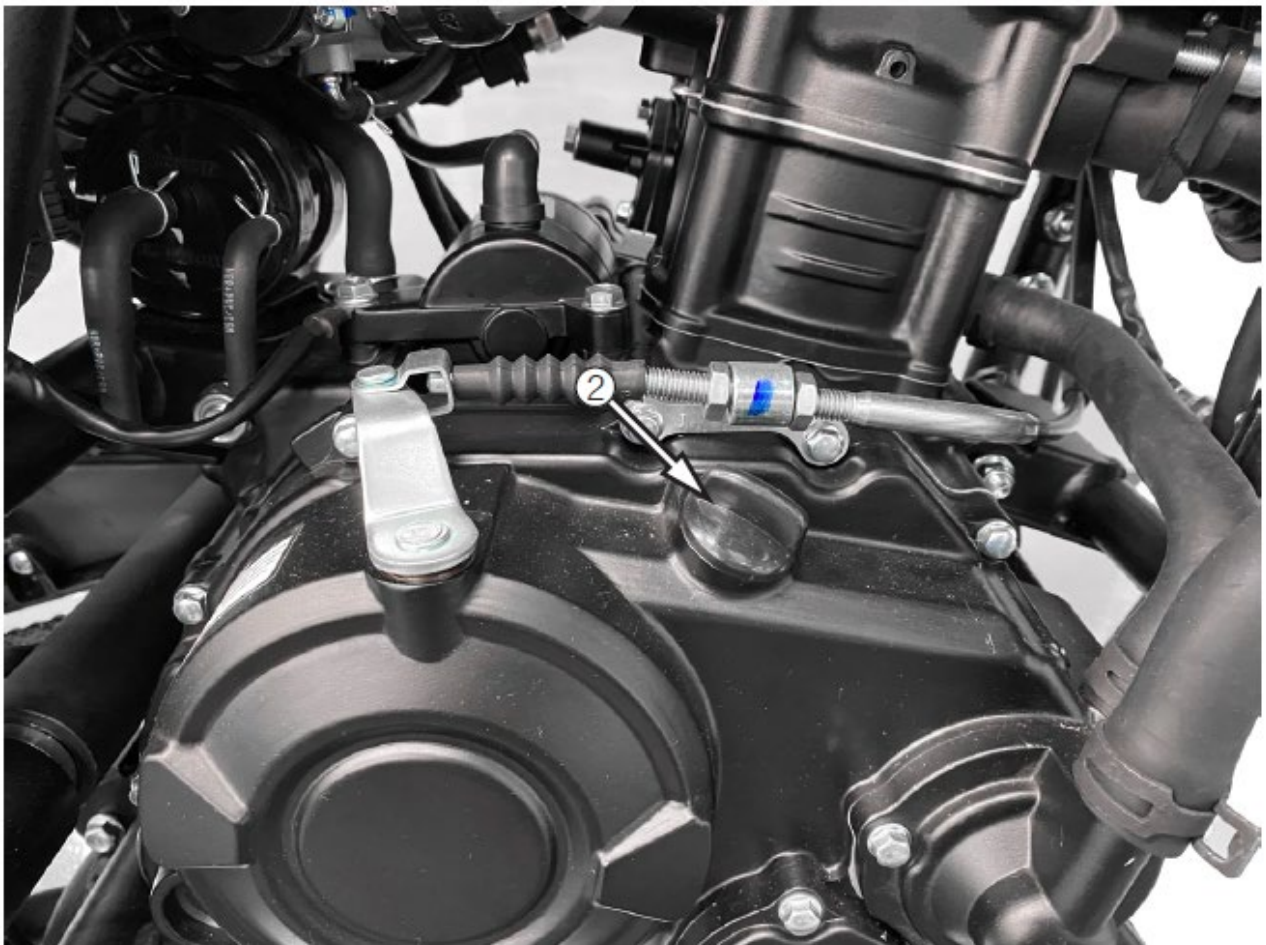


1 Engine oil sight window, 2 Engine oil upper limit line, 3 Engine oil lower limit line

## Replacement of oil

Oil changes should be done before the engine has cooled down. Only in this way can the oil in the crankcase be removed quickly and completely.

During replacement, open oil bolt, drain waste oil, clean oil drain bolt, replace new gasket, and then install oil drain bolt. Loosen the oil filling plug, slowly fill 1.0L new code-designated engine oil into the crankcase with funnel, and then install the oil filling plug.



1 Loosen the oil drain bolt, 2 Fill the oil

## Oil pump

When the oil pump fails, it needs to be removed for maintenance or replacement. It is not necessary to remove the engine from the frame to perform this work.

This part includes the following main contents:

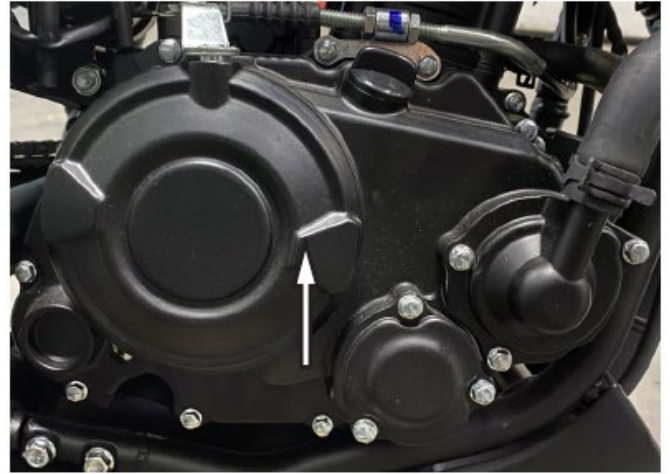
- Disassembly steps and diagrams of oil pump;
- Installation steps of oil pump;
- Disassembly and assembly of oil pump.

### Disassembly steps and diagram of oil pump:

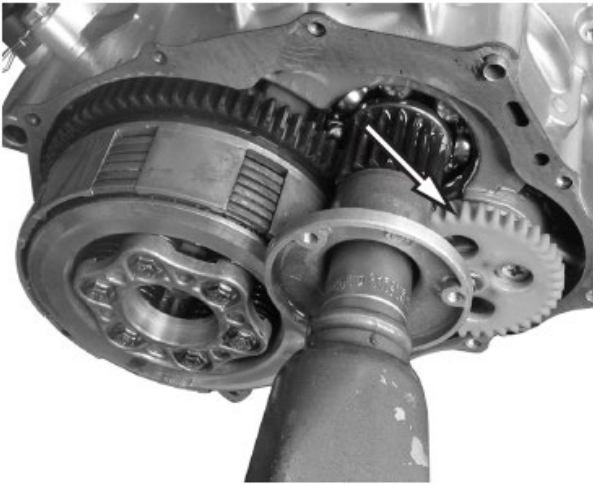
- 1、 1. Separate the clutch control line from the clutch control arm;



- 2、 2. Remove the right crankcase cover;



- 3、 3. Remove the oil pump bolts, the driven gear of the oil pump, and the oil pump.



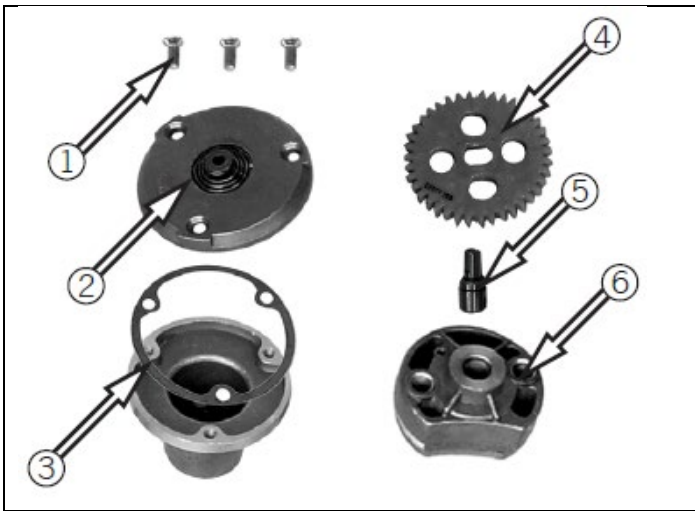
### Installation steps of oil pump:

The installation procedure is reverse to the disassembly procedures. During installation, pay attention to the following points:

1. The parts are clean and intact;
2. After installing the right crankcase cover, the angle position of the clutch control arm may change, so it shall be readjusted to adapt to the adjustment of the clutch operation line;
3. After everything is done, don't forget to fill up the coolant and oil

## Disassembly and assembly of oil pump





Sequence	Procedure	Quantity	Remark
1	Oil filter cap screw	3	
2	Oil filter cover	1	Use thread sealant
3	Seal washer	1	
4	Oil pump	1	
5	Oil pump	1	
6	Oil pump	1	

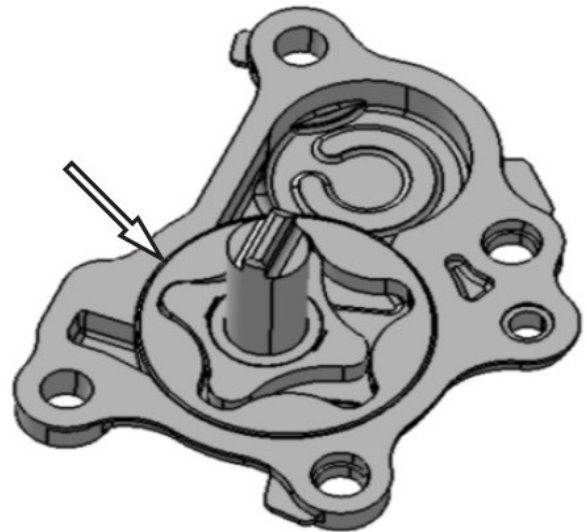
**Inspection of oil pump**

Check whether the clearance of the oil pump is within the maintenance limit with a standard feeler gauge.

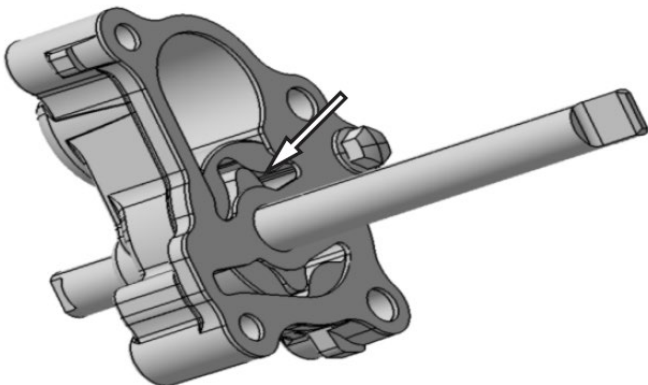
Inspection of radial clearance  
Maintenance limit: 0.20 mm



inspection of end clearance  
Maintenance limit: 0.12 mm

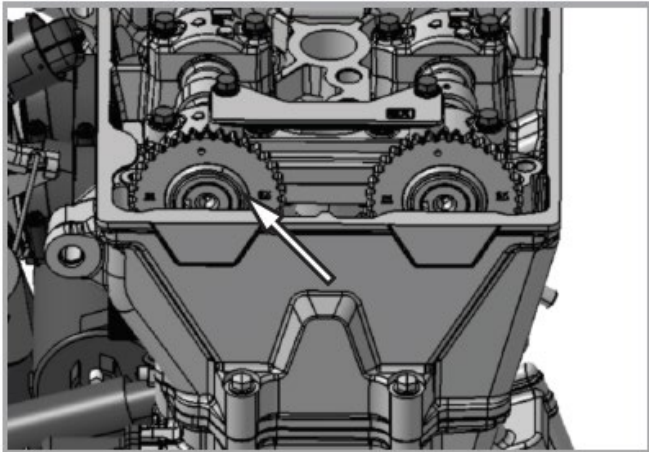


inspection of end clearance  
Maintenance limit: 0.12 mm

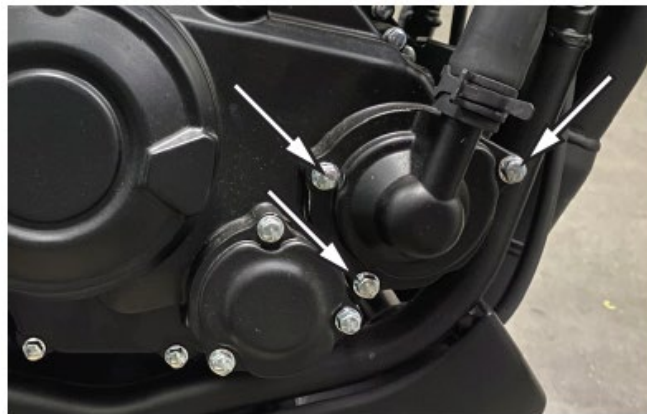




bolt clockwise to make the "I" mark on the rotor align with the closing box when it is on the right side, and remove the cylinder head cover to see if it is in the timing position (as shown in the figure).



the bolts after inspection.



### Lubricating oil

Use a special fixture to support the motorcycle on the flat ground, so that the engine is in a horizontal position and does not tilt. Visually check whether the oil level in the oil window on the right crankcase cover is between the upper and lower marking lines.

When the engine oil is too little, it shall be replenished in time.



Check whether the coolant in the accumulator is between the upper and lower marking lines. If it is too little, replenish it in time.



Replenish method: Unscrew the radiator water filler cap in a counterclockwise direction and guide the coolant slowly with a funnel until the coolant level is at the upper limit of the middle deviation. Then cover the radiator cap.



### Cylinder pressure

When the engine can't be started or it is difficult to start, other faults have been eliminated. When it is suspected that the cylinder pressure is abnormal, check the cylinder pressure.

Cylinder pressure:  $\geq 0.6\text{MPa}/300\text{rpm}$ .

During the test, remove the spark plug, install the pressure gauge at the installation place of the spark plug, fully open the throttle handle, start the engine by electricity, and check whether there is air leakage at each connection part of the pressure gauge. Set the pressure gauge to zero and start the engine again until the pressure gauge stops rising. The maximum indication of the pressure gauge is usually reached after 1-2 starts. The maximum indication is the cylinder pressure. After the test, install the spark plug back to its original position.



1 Accumulator, 2 Radiator water inlet

In the added coolant, the proportion of antifreeze and pure water should always be kept at half. Do not only add antifreeze or pure water.

A funnel should be used when refilling to prevent the coolant from flowing out. Also check the water pipe of the accumulator for leakage or damage, if it is leaked or damaged, replace it.

If the accumulator is empty, check the coolant level of the radiator. Turn the radiator cap counterclockwise to see if the coolant level reaches the bottom of the neck of the radiator injection port. If not, add coolant.

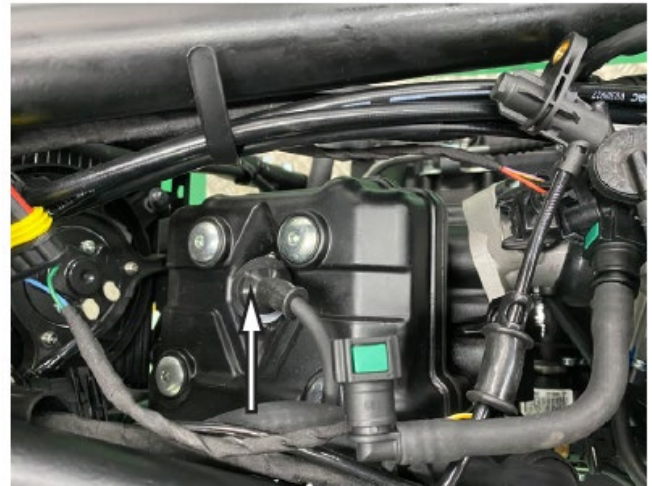


1 Turn the key clockwise, 2 Fully open the throttle handle, 3 Press the electric start button



**Warning:**

**Before opening the radiator cap, make sure that the engine and radiator are completely cooled, otherwise it may cause the coolant to spray out and cause serious scald.**



Remove the spark plug and test the cylinder pressure

The main reasons for low cylinder pressure are as follows:

- Incorrect valve clearance adjustment
- Valve leakage
- Cylinder head seal washer ablation
- Worn piston rings or cylinders
- The piston is worn

The main reasons for high compression force are as follows

- There is carbon deposit on the top of combustor or piston

Start the engine at idle speed.

Carefully listen to the engine running sound, if the timing chain has a relatively crisp "click" sound, it means that the chain tension is insufficient, so the chain tension shall be replaced.

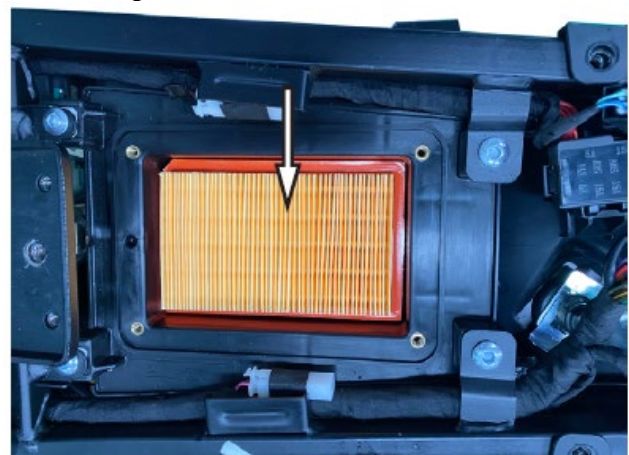
Replacement method:

Loosen 2-M6 × 25 inner hexagon screw, remove the sealing washer, remove the old chain tensioner. Be careful not to drop the sealing gasket, etc. into the crankcase. Insert the locking key of the tensioner into the tail of the new chain tensioner, rotate to make the front end of the tensioner retract and lock, replace with a new seal washer, install a new chain tensioner and fasten it.

Pull out the lock key of the tensioner to tighten the timing chain.

Replace with a new sealing washer and install the screw at the end of the chain tensioner.

3、 Remove the air filter cover and air cleaner cartridge



**Note:**

When the timing chain is in a relaxing state, do



**Notes:**

1. Remove the filter element and check whether the

not rotate the crankshaft, so as to avoid wrong timing gear.



Chain tensioner

filter element is normal. The filter element is a paper filter element, and the dirt on the surface can be cleaned by compressed air; If the filter element is too dirty, broken or damaged, it shall be replaced;

2. When driving in dusty areas, the cycle of cleaning and replacing the air filter element shall be shortened;
3. Keeping the air filter clean can improve the working efficiency of the engine and prolong the service life of the engine.

After cleaning or replacing the filter element, assemble the whole vehicle in reverse order.

## Air filter element

### Cleaning and replacement of air filter element

1. Open and remove the seat cushion with the key
2. Loosen the fastening screws of the air filter housing



Loosen air cleaner cover

## Throttle control

First, check whether the throttle operating line is deformed, kinked or damaged.

Then measure the free stroke of the throttle handle. Turn the handle to one side of the free stroke, draw a straight line between the handle and the counterweight with a marker pen, then turn the handle to the other side of the free stroke, and measure the distance of the straight line staggering, which is the free stroke of the throttle handle.

The free stroke is 2-6 mm.

If the free stroke is not enough or too large, it shall be adjusted.

## Idle speed



Note:

**After other items of the engine have been adjusted to the specified range, check and adjust the idle speed.**

The idle speed of the car is controlled by ECU. The idle air flow of throttle body has been adjusted at the factory. Therefore, do not adjust the idle speed adjusting screw. When the idle speed is unstable, there is no idle speed or the idle speed is too high, please find out the cause of the fault according to the troubleshooting method of EMS system and remove the fault.

Idle speed 1500r/min±100r/min.



Adjustment method:  
 Fine adjustment:  
 Pull to open the protective rubber sleeve, loosen the lock nut A, and turn the adjusting screw to adjust to a suitable free stroke. Then tighten the lock nut A and install the protective rubber sleeve.



Lock nut A

Rough adjustment: If the fine adjustment can not be in place, separate the throttle control line from the throttle body, loosen the lock nut B, and adjust the larger stroke range. After adjustment, tighten the lock nut B. Check whether the throttle can rotate smoothly from full open to full close in any position. If there is hysteresis, adjust or replace it.



Lock nut B

**Braking System**

Check the free stroke of the front brake handle.  
 The free stroke of the brake handle is 5-10 mm.

Inspection of brake fluid level:  
 Check the brake fluid level in the front brake cylinder. If the level is too low but not completely empty, replenish the brake fluid directly. The specification of

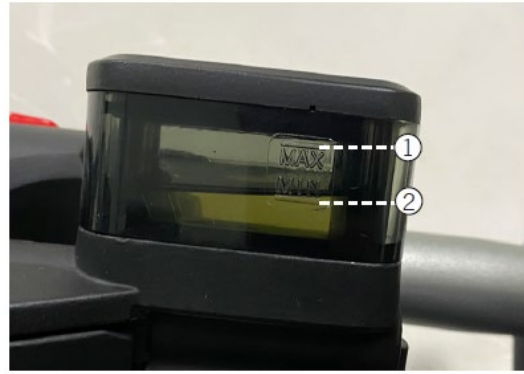




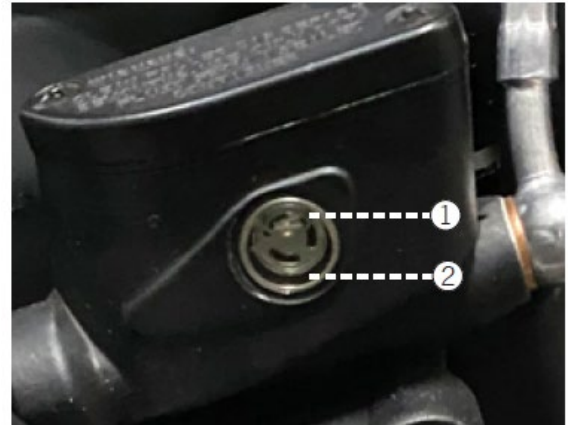
Check the free stroke of the rear brake pedal. The free stroke of the rear brake pedal is 10-15 mm. If adjustment is needed, turn the adjusting nut to reach the specified free stroke position.



replenishing brake fluid is DOT 4.



1 Lower limit line, 2 Lower limit line



1 Lower limit line, 2 Lower limit line

If it is found that the brake fluid in the cylinder is turbid, with impurities or peculiar smell, the brake fluid should be drained and refilled. Refer to the vacuum filling method of brake fluid in the next section. If the brake fluid in the front and rear brake cylinders is exhausted, use a vacuum pump to pump air at the brake caliper body bleeder nozzle, and then fill the cylinder.

Refer to the vacuum filling method of brake fluid in the next section.

Vacuum filling method of brake fluid:

This method is applicable to the filling of brake fluid in a new car or when the brake fluid in the brake cylinder is exhausted.

1. Use a vacuum pump to pump air at the brake caliper body bleeder nozzle.



Front brake caliper body

3. Operate the brake handle or pedal to remove the residual air of the brake caliper.

4. When the vacuum pump has completely eliminated the air in the brake caliper and the brake fluid, squeeze the handle or step on the pedal tightly, and quickly tighten the vent nozzle bolt. The tightening torque range is between 7 ~ 9 Nm.

5. Install the brake cylinder cover. The gasket should be flat during installation. If necessary, replace it with a new one.

6. After filling, check the oil cup, hydraulic brake hose and all connecting parts for oil leakage.



**Note:**

1. The brand of brake fluid is DOT4 non petroleum base brake fluid.
2. The brake fluid shall not be mixed with other impurities; otherwise, chemical changes will occur and the braking performance will be reduced.



Rear brake caliper body



**Warning:**

The brake fluid is highly corrosive and shall not be splashed on the surface of painting parts or plastic parts; In case of contact with eyes or skin, rinse immediately with plenty of water and consult a doctor

2、 Open the brake cylinder cover and fill brake fluid.



Front brake cylinder cover



Rear brake cylinder cover

**Running System**

Size and pressure of tire

Check the tire pressure with a tire pressure gauge to see if it meets the recommended tire pressure requirements.



**Clutch operating line**

Check the free stroke of the clutch handle.  
Free stroke of clutch control handle: 10-20 mm.

Adjustment method:

Fine adjustment: Pull to open the protective rubber sleeve, loosen the lock nut, and turn the adjusting nut to adjust to a suitable free stroke. Then tighten the lock nut and install the protective rubber sleeve.

If the fine adjustment can not achieve suitable free stroke, the clutch operating line at the handle end must be removed to adjust the engine end.

Rough adjustment: First remove the clutch operation line at the handle end, then remove the clutch control arm at the engine end, rotate the clutch control arm to a suitable angle, then install it, install the clutch



**Note:**

Check the tire pressure when the tire is at the normal temperature.

operation line, and finally adjust it to a suitable free stroke according to the fine adjustment method.



**Note:**

It is necessary to ensure that the clutch handle has suitable free stroke! If it is too loose, it may cause the clutch not to be disengaged; If it is too tight, it may cause poor engagement of clutch and damage clutch easily.

Tire size and recommended tire pressure

Tyre size	Front tire		Rear tire	
	120/70-18 59S or 100/90-18 56P		140/70-17 66S or 130/80-17 65P	
Cold tire pressure	Single		Double	
	Front tire	Rear tire	Front tire	Rear tire
	250kPa	250kPa	250kPa	250kPa

If the tire pressure does not meet the specified requirements, check the tire for cuts, embedded nails or other sharp objects.



1 Adjust nut, 2 Lock nut



Remove the clutch operating line



Chain adjuster adjusting nut





Adjust clutch operating line



**Note:**

The marking on the chain adjusters on both sides must be consistent.



**Warning:**

The rear axle nut must be tightened with a tightening torque of 75~85 N.m.

**Cleaning and inspection of chain**

Clean the drive chain with cleaning fluid to remove dust and soil, and then air dry to check whether the chain is worn or broken. If it is damaged, replace the chain. Then install the chain and apply the special lubricant for the chain;

Check the worn condition of large and small chain wheels. If the gears are seriously worn, missing or broken, they should be replaced

**Drive chain**

**Inspection of drive chain tension**

Support the motorcycle on the flat ground with the side bracket and set the transmission in the neutral position. Check the tension of the drive chain. The method is to press the chain up and down with your fingers to check the up and down movement of the chain below.

Sag of transmission chain: 15 ~ 25 mm.

If the chain is too loose or too tight, it needs to be adjusted.

**Adjustment method:**

Loosen the rear shaft nut, turn the adjusting nut on the chain adjuster, tighten the rear shaft nut after reaching the specified chain tension, and check the free rotation flexibility of the rear wheel and the consistency of the front and rear wheels.



**Note:**

Apply proper amount of chain special lubricating oil on the connecting shaft of lock plate.

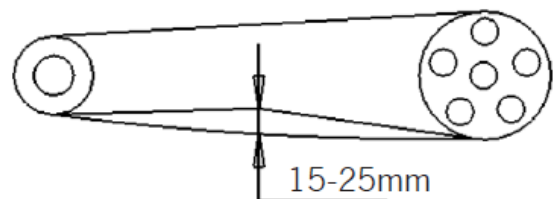


**Note:**

The chain of the car is connected by locking plate. During installation, the open end of the spring clip of the chain joint should be opposite to the movement direction of the chain.



Rear axle nut



Sagging degree

**Battery**

**Disassembly of battery**

Refer to the removal and installation of the fuel tank, remove the fuel tank, remove the negative pole of the battery first, and then the positive pole, loosen and remove the fastening bolt of the battery bracket, and then take out the battery. Clean the positive and negative pole of the battery and the external surface of

**Riser steering bearing**

Support the motorcycle with a jack or other bracket to make the front wheel off the ground, and check whether the steering handle can rotate freely. If the steering handle can not rotate freely, and there is axial movement or stagnation, adjust the adjusting nut of the front fork riser.

the battery.

### Installation of battery

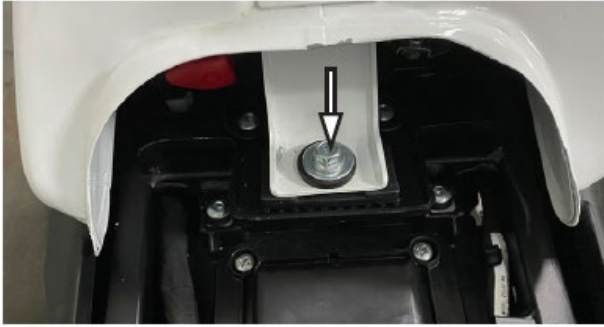
Install in reverse order. When connecting the electrode wire, the positive pole must be connected first.



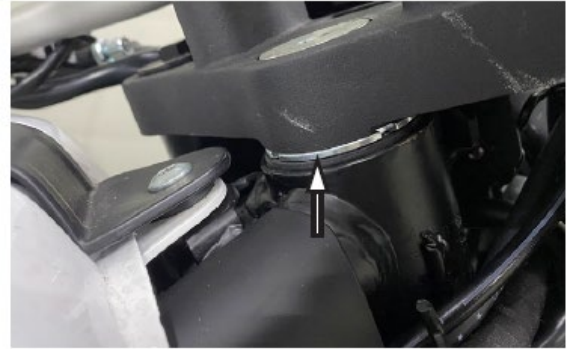
**Note:**

The starting and EMS system of the car completely rely on the battery power supply, so it is very important to keep the battery fully charged, otherwise it cannot be started.

Support the front wheel



Remove the seat cushion, side tank cover



Front fork riser adjusting nut



Remove the electrode wire and band

### Headlight Dimming

Check the direction of headlight before driving.

The headlamp can be adjusted vertically.

Adjustment method:

Loosen the fixing bolts of the headlamps, rotate the headlamps upward to adjust the lights height, otherwise adjust lights height downward to the desired height.



Headlamp height adjustment bolt

### Suspension system

#### Front suspension

Put the front brake in the braking state and press the front fork several times to check whether the front suspension works normally.

In case of abnormal noise or "click" sound, all fasteners shall be checked and tightened according to the specified torque value.

#### Rear suspension

Press the rear of the seat cushion firmly to check whether the rear fork sleeve is worn or damaged. If it is damaged, replace it. Check whether the whole suspension assembly is firmly installed and whether it is damaged or deformed.

#### Bolts, nuts and fasteners

All bolts, nuts and fasteners should be tightened according to the interval table. Check all split pins, safety clamps and locks.

# Fuel system

This section describes the knowledge of the fuel system.



1 Fuel tank, 2 Fuel injector, 3 High pressure pipe, 4 Air cleaner, 5 Valve body, 6 Fuel pump, 7 Fuel sensor

Maintenance instructions	Replacement of fuel filter
Troubleshooting	Disassembly and installation of air filter
Disassembly and installation of fuel tank	Removal and installation of throttle body
Disassembly and assembly of fuel tank	



## Warning:

**Pay great attention to fire prevention when handling gasoline!**

When disassembling the components of the fuel system, pay attention to the installation position of the seal Components. When reassembling, be sure to use a new seal Components. Do not disassemble the throttle body (the fuel injector can be removed).

## Technical Specifications

Throat diameter is equal to  $\Phi 30\text{mm}$ .

Idle speed  $1500\text{r}/\text{min} \pm 100\text{r}/\text{min}$

The free stroke of throttle handle is  $2 \sim 6\text{mm}$

## Troubleshooting

The engine can be ignited but cannot be started

<ol style="list-style-type: none"> <li>1. There is no fuel in the fuel tank or there is too little fuel in the fuel tank;</li> <li>2. Too much fuel entering the cylinder;</li> <li>3. The air filter is blocked;</li> <li>4. The spark plug is off;</li> <li>5. The flow of fuel pipe is not smooth;</li> </ol>	<ol style="list-style-type: none"> <li>6. Fuel quality (containing moisture);</li> <li>7. The fuel oil is stored too long;</li> <li>8. Fuel pump failure;</li> <li>9. Injector failure (blockage).</li> </ol>
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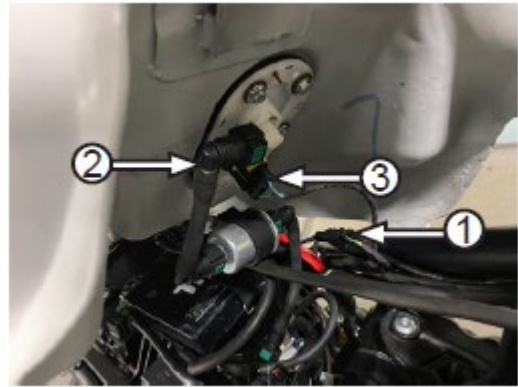
<b>Disassembly and installation of fuel tank</b> <b>Disassembly steps:</b>	4. Remove the connector of the fuel sensor ① . Disassemble the fuel pipe ②. Remove the fuel pump
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1. Remove the seat cushion (open the seat cushion with the key and take it off).



③.



2. Remove 2 M6×16 connection screws from the left and right cover, 2 M6 × 12 connection screws, 4 M6 × 25 cap screws from fuel tank trim cover assembly, remove the left and right cover and the fuel tank trim cover.



5. Remove the fuel tank.



3. Remove 1 stepped screw, M6 × 22 front fixing bolt, and 1 M8 × 30 rear fixing bolt from the fuel tank assembly.



In order to avoid the contamination of the fuel delivery pipeline, the joint shall be sealed with adhesive tape after the fuel pipe is pulled out.

When disassembling the fuel tank, the fuel tank is not stable. It is recommended that two people help to disassemble the fuel tank.

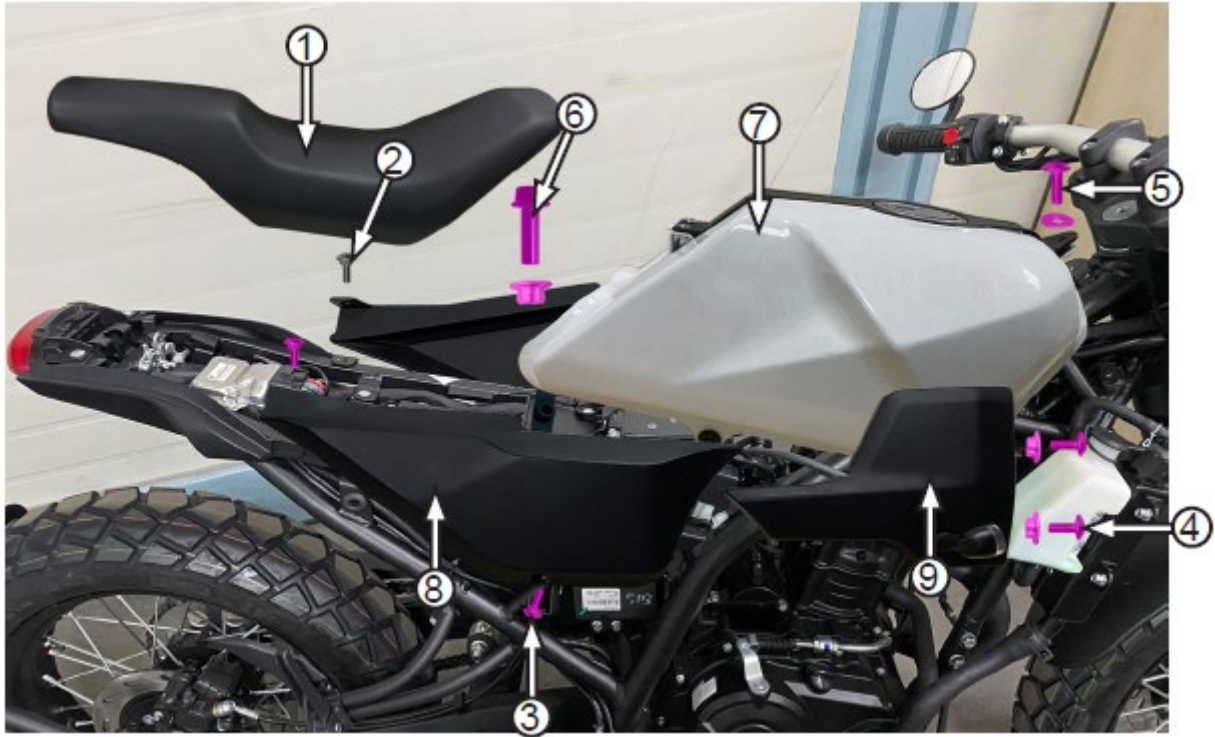
Installation procedures:

The installation procedures of the fuel tank are reverse to the disassembly procedures.

During installation, pay attention to the routing of fuel pump control line, and strictly follow the wiring diagram. Pay attention to avoid fuel pipeline pollution.



## Disassembly / installation of fuel tank



Sequence	Procedure	Quantity	Remark
	Disassembly sequence		The installation sequence is reverse to the disassembly sequence
1	Seating washer	1	
2	Bolt M6 × 16	2	
3	Cap screw M6 × 16	2	
4	Bolt M6×25	4	
5	Bolt M6×22	1	
6	Bolt M8 × 30	1	
7	Fuel tank assembly	1	
8	Left and right cover	1	
9	Left and right trim covers of fuel tank	1	

### Disassembly and assembly of fuel tank

Refer to the figure below for the disassembly and assembly of the fuel tank.

The assembly procedures are in reverse order to the disassembly procedures.

Notice the oil outlet of the oil pump towards the right side of the fuel tank during assembly.



Sequence	Procedure	Quantity	Remark
	Disassembly sequence		The installation sequence is reverse to the disassembly sequence
1	Bolt M6 × 16	2	
2	Fuel sensor	1	
3	Bolt M5 × 16	6	
4	Fuel pump assembly	1	
5	Fuel overflow pipe	1	
6	Leakage pipe at fuel tank opening	1	
7	Fuel tank	1	

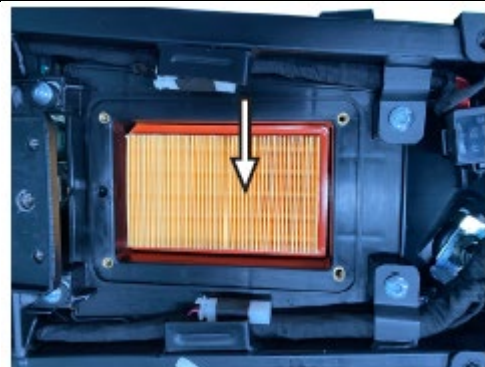
### Replacement of fuel filter

Replacement cycle: 15000km.

Tools: flat type screw driver.

**⚠ Note:**

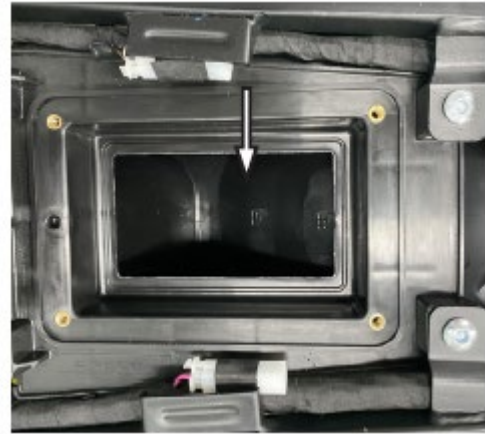
**Do not pull the liquid level sensor and float rod assembly hard during installation and disassembly.**



Take out the filter element

**Disassembly procedures of filter:**

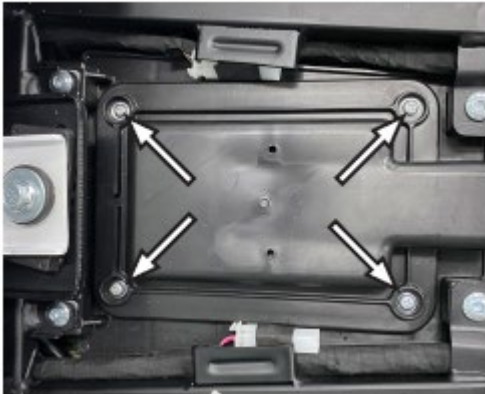
Press the inverted buckle of the filter and pull out the filter.



Filter cavity

**Cleaning and replacement of air filter element**

Open the cushion, loosen the upper body screw of the air filter, remove the upper body, take out the filter element, and clean or replace the filter element. Clean the sand and dust in the filter cavity with a clean cotton cloth.

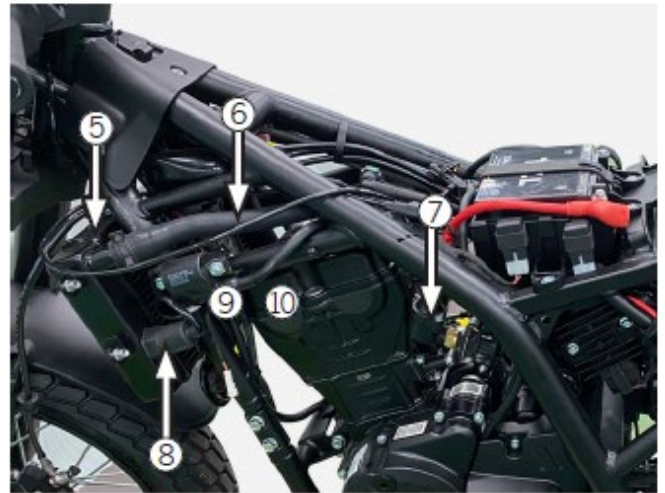


Set screw

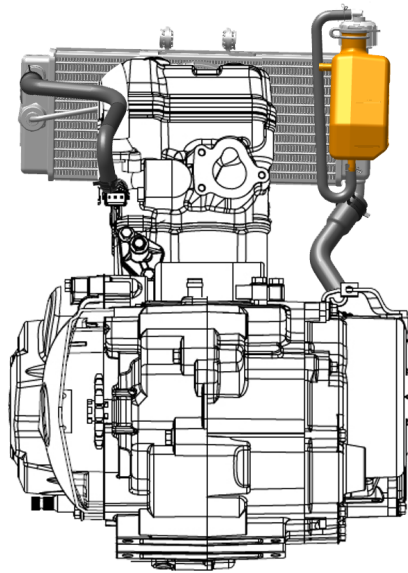


Take out the air filter cover

## Cooling system



1 Engine, 2 Short circle hose/ water pipe, 3 Water tank cover, 4 Water outlet hose/ water pipe, 5 Radiator, 6 Water inlet pipe, 7 Thermostat, 8 Temperature sensor



Maintenance instructions	Water pump
Troubleshooting	Thermostat
Inspection of performance	Cooling electrical system
Radiator	

### Maintenance instructions

The maintenance of this part must be carried out under cold or low temperature.

The maintenance of this part can be carried out on the vehicle.

The replenishment of coolant is carried out by the hydraulic accumulator. The radiator cap shall not be removed except for the re replenishment of coolant after the disassembly of the cooling system or the extraction of the radiator.

After the inspection and maintenance, the radiator detector is used to check whether there is water leakage in each connecting part and sealing part.

#### Warning:

If the radiator cap is opened when the coolant temperature is above 100 °C, there is a risk of severe boiling due to the pressure drop. Therefore, never open the cap at this time.

#### Note:

When the coolant adheres to the painting surface, sometimes it will damage the painting surface. Therefore, in case of adhesion, it should be washed with water quickly.



## Maintenance benchmark

Items	Standard value	Operation limit
Radiator cap relieving pressure		
Opening temperature of thermostat valve	Boiling point	/
	Fully boiling	/
	Full boiling (88 °C)	/
Coolant boiling temperature (50% mixture ratio)	Atmospheric pressure	/
	88.2 kPa pressure	/
Coolant capacity	860ml	/

## Coolant mixture ratio table

The lowest temperature in the use area	Mixture ratio	Antifreeze (ml)	Pure water (ml)
-9°C	20%	240	960
-16°C	30%	360	840
-25°C	40%	480	720
-37°C	50%	600	600
-44.5°C	55%	660	540

Bold type refers to the mixture ratio of coolant filling when the vehicle leaves the factory.

Use the specified coolant to replenish.

Avoid mixing with other brands of coolant.

This coolant is toxic and must not be drunk.

For the lowest temperature in the use area, the mixture ratio with about - 5 °C shall be selected.

## Troubleshooting

<p>Water temperature rise too high</p> <ol style="list-style-type: none"> <li>Poor fan switch;</li> <li>Poor radiator cap;</li> <li>Poor thermostat;</li> <li>Too little coolant;</li> <li>The water pipe or water pipe sleeve is blocked;</li> <li>The radiator blade is blocked;</li> <li>The radiator is blocked;</li> <li>The water pump is abnormal;</li> <li>The cable is short circuited.</li> </ol>	<p>The water temperature does not rise or does not rise well</p> <ol style="list-style-type: none"> <li>Poor fan switch;</li> <li>Poor thermostat;</li> <li>The cable is short circuited. Water leakage</li> </ol> <ol style="list-style-type: none"> <li>Poor mechanical seal;</li> <li>Deterioration and poor adhesion of O-rings;</li> <li>Damage and deterioration of water pipe.</li> </ol>
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## Inspection of performance

### Inspection of radiator cap



#### Warning:

**Make sure the coolant is completely cool before opening the cover.**

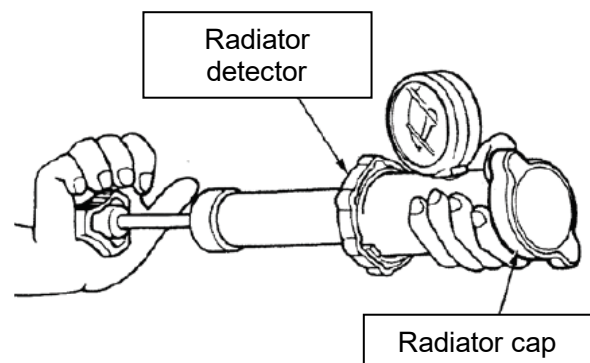
Install the radiator cap on the radiator detector to increase the pressure of the pump. If it can be maintained within the specified pressure range for 6 seconds, it can be used



#### Note:

**When installing the cap on the detector, first coat the sealing surface with water.**

Valve opening pressure of radiator cap: 73.5 ~ 103 kPa



### Inspection of radiator pressurization

Install the radiator detector on the radiator to increase the pressure of the pump,

Confirm that it can be held within the specified pressure range for 6 seconds.

Specified pressure: 73.5-103 kPa.

Confirm whether the pipe and the connecting parts are leaking.

Do not increase the pressure above the specified pressure, which may cause damage to the radiator and

## Radiator

### Disassembly of radiator

1. Park the motorcycle on flat ground and remove the radiator cover.



2. Loosen the hoop and pull out the water pipe.



3. Pull out the radiator outlet pipe and drain the coolant



4. Unplug the temperature control switch connector and fan power cord.



5. Remove the fixing bolts of the radiator and remove the radiator.



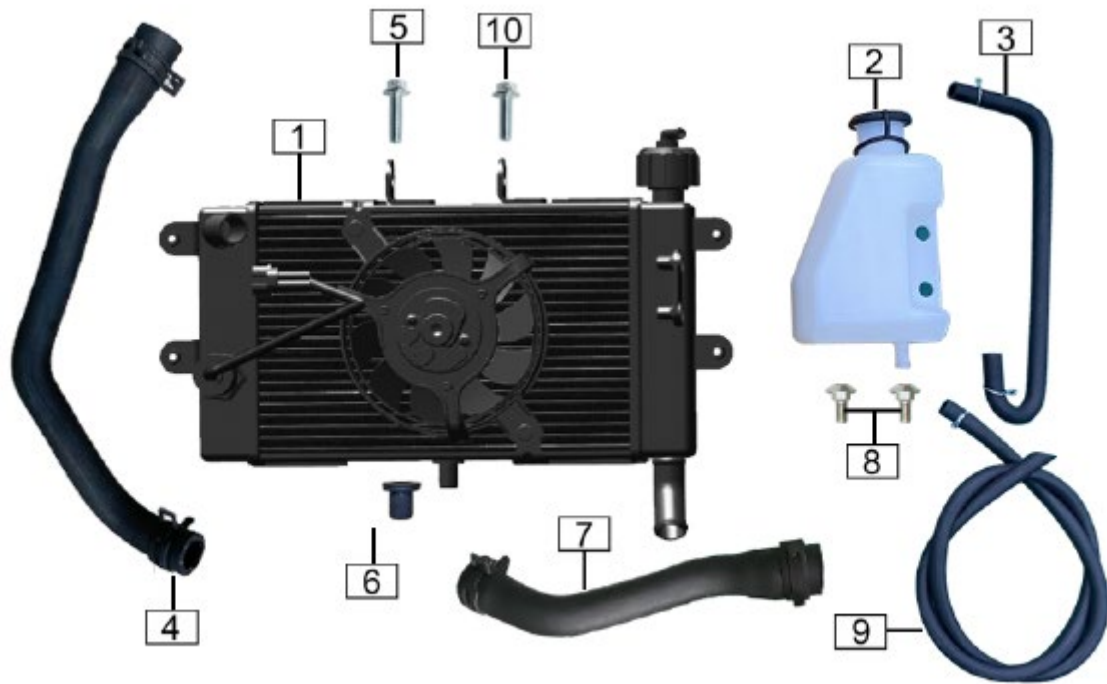
### Installation of radiator

Reverse the order of disassembly.

Avoid damaging the radiator during disassembly.

After installation, don't forget to fill in the coolant and check whether the connection parts are leaking.

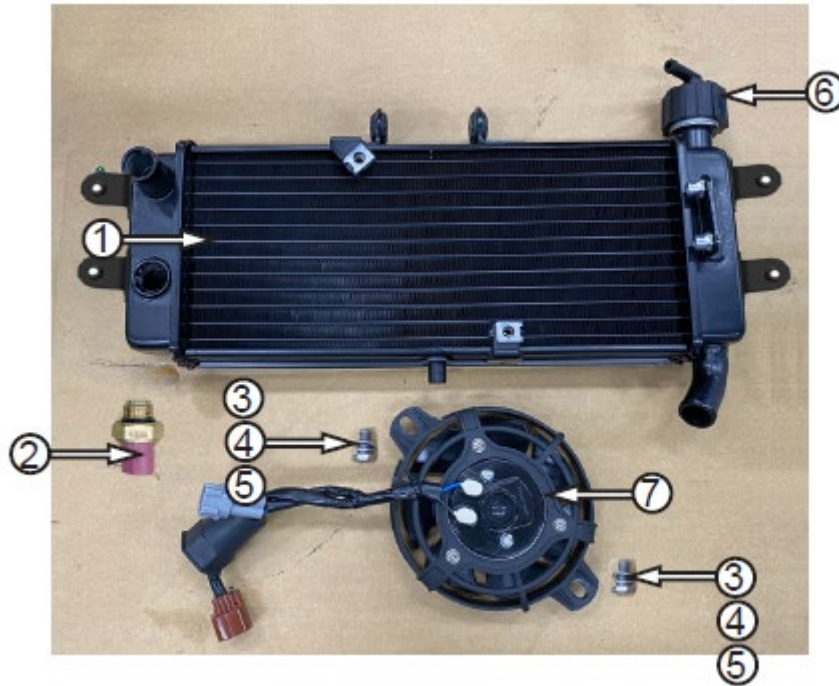
### Disassembly / installation of radiator



Sequence	Procedure	Quantity	Remark
	Disassembly sequence		The installation sequence is reverse to the disassembly sequence
1	Water cooler (with cover, fan, sub black)	1	
2	Auxiliary water tank(with cover)	1	
3	Water pipe assembly( $\varphi 7 \times \varphi 11 \times (35+30+190+65)$ )	1	
4	Water pipe assembly ( $\varphi 14 \times \varphi 22 + \varphi 19 \times \varphi 27$ ) $\times (50+90+60)$	1	
5	Bolt M6 $\times$ 30	1	
6	Headlamps cushion	1	
7	Water pipe assembly( $\varphi 13 \times \varphi 21 + \varphi 19 \times \varphi 27$ ) $\times (50+100+135+70)$	1	
8	Hexagon socket step screws M6 $\times$ 16 ( $\varphi 14$ , $\varphi 8.5 \times 3.5$ )	2	
9	Leaking water pipe ( $\varphi 5 \times \varphi 9 \times 510 + \varphi 7 \times \varphi 11 \times 20$ )	1	
10	Bolt M6 $\times$ 25	1	

### Disassembly/ assembly of radiator

Refer to the figure below for disassembly/ assembly of radiator.  
Be careful not to damage the heat sink.



Sequence	Procedure	Quantity	Remark
	Decomposition sequence		The assembly sequence is reverse to the disassembly sequence
1	Radiator body	1	
2	Temperature control switch	1	
3	Bolt M6 × 16	2	
4	Spring washer φ6	2	
5	Washer φ6	2	
6	Water tank cover	1	
7	Fan components	1	

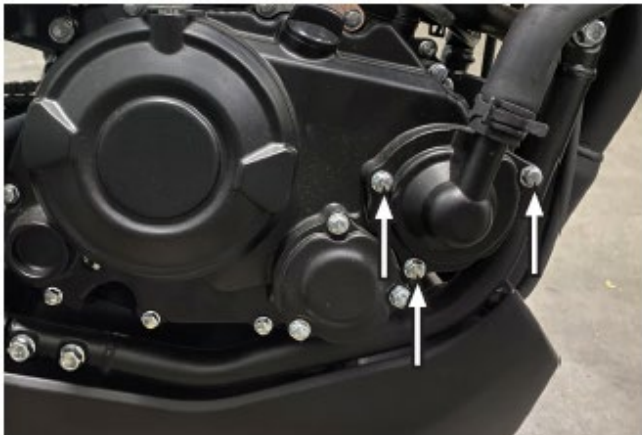
## Water pump

### Disassembly and assembly of water pump

Be sure to drain the coolant before disassembling the water pump.

Loosen the small circulating water pipe clamp and the water pump inlet and outlet pipe clamp.

Remove 3 connecting bolts.



Take out the water pump.

Install the water pump in reverse order.

The O-shaped seal washer shall be replaced during installation, and the oil shall be smeared on the water

### Inspection of water pump

Remove the connecting bolts, open the water pump, and check whether the seal washer and the water pump turbine are damaged.



Inspection of water pump

If the turbine of the water pump is damaged, or the water pump leaks beyond repair, please replace it with a new one.



pump mounting hole to facilitate assembly.  
Replace the seal washer (6) at the drain hole during installation.

### Disassembly/ installation of water pump

Sequence	Procedure	Quantity	Remark
	Disassembly sequence		The installation sequence is reverse to the disassembly sequence
1	Pump assembly	1	
2	Water pump	1	
3	Special shaped seal washer	1	
4	Connecting water pipe	1	
5	Small circulating water pipe	1	
6	Clamp 27	2	
7	Clamp 22	2	
8	Bolt 6 x 20	2	
9	Bolt M6 x 60	1	
10	Seal washer	1	
11	O-shaped seal washer	1	

### Thermostat

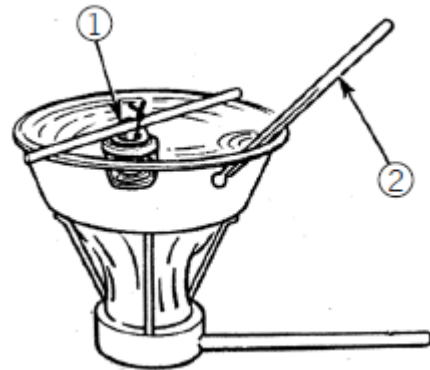
#### Disassembly and assembly of thermostat



Thermostat

#### Inspection of thermostat

Put the thermostat into the detection container, then gradually increase the water temperature and detect the valve opening temperature.



1 Thermostat, 2 Water temperature gauge

Boiling point	71°C
Full boiling temperature	88°C
Degree of full boiling	3.5mm

#### ⚠ Note:

Do not let the thermostat touch the container.  
If the thermostat has a little valve open at room temperature, it should be replaced.

The valve opening should be maintained at 88 °C

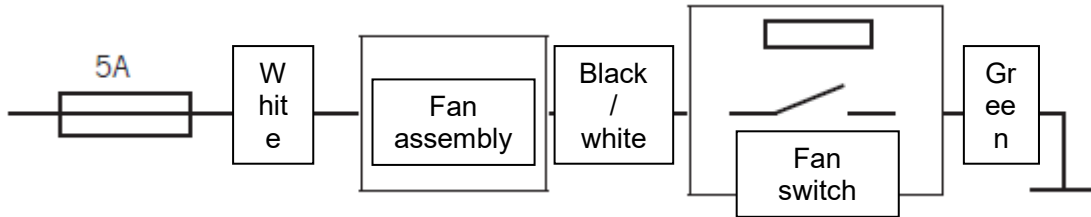
## Cooling electrical system

### Overview

When the working temperature of the engine reaches a limit, the cooling water will circulate through the radiator, and the temperature will continue to rise. Turn on the fan switch on the radiator, turn on the power supply of the fan, and the fan will rotate to take away the engine heat of the cooling water circulation, and the water temperature will drop until the fan switch is turned off and the fan stops running. The system consists of the following components:

Fan switch  
Fan

### Circuit diagram



### Introduction of main components

Fan switch (temperature control switch)

#### 1. Working principle

The fan switch is actually a kind of heat sensitive switch. When the temperature rises, the paraffin expands and pushes the moving contact to move. The paraffin expansion coefficient is proportional to the temperature. When the temperature reaches a certain value, the moving contact will be connected with the static contact; When the temperature drops, the moving contact is disconnected from the static contact under the action of spring force. The on and off of the fan switch controls the operation of the fan.

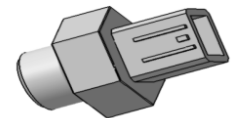
#### 2. Basic parameters

Operating temperature of switch: opening temperature  $88^{\circ}\text{C} \pm 3^{\circ}\text{C}$ , close  $80^{\circ}\text{C} \pm 3^{\circ}\text{C}$

Rated working current: DC12V5A.

#### 3. Possible failures

The switch is normally on;  
The switch cannot be connected;  
The temperature deviation of the switch operation is too large;  
The insert is rusted and has poor contact.



### Fan assembly

#### 1. Working principle

The fan assembly is composed of fan motor, fan leaf and bracket. The cooling fan of radiator is generally axial-flow fan, the air inlet is fan leaf end, the air outlet is motor end, and the wind direction of inlet and outlet is in the same direction. The motor uses a 12V DC motor, which drives the fan leaf to rotate to form the flow of wind and take away the heat from the radiator.

#### 2. Basic parameters

Fan output air volume  $\geq 400\text{m}^3/\text{h}$ ;

Motor speed  $(4500 \pm 400)$  r/min;

Rated working current  $\leq 4\text{A}$ ;

Fan rotation direction: clockwise when viewed from the motor output shaft.

#### 3. Possible failures

Fan motor open circuit failure;

Fan motor short circuit failure;

The fan leaf interferes with the support, and the fan is noisy during operation;

The joint between fan leaf and motor shaft slips;

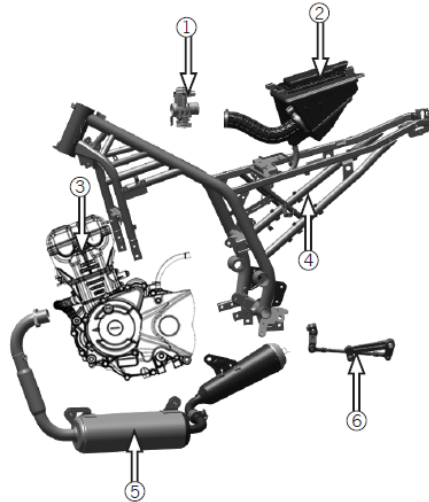
The bracket is broken.



Failure phenomenon	Possible causes	Solutions:
The water temperature	Line break;	Connection repair;

has given an alarm and the fan still doesn't work	Open circuit failure of fan switch;	Replace the fan switch;
	Fan motor failure;	Replace the fan motor;
	The fan page is stuck or slipping.	Inspection and maintenance.
The fan keeps working	Line short circuit;	Maintenance exclusion;
	Open circuit failure of fan switch	Replace the fan switch
Excessive fan noise	The fan leaf interferes with the bracket;	Inspection and maintenance;
	The fan leaf is loose or broken;	Fastening or replacement;
	The bracket is broken.	Replace the bracket.

## Disassembly and Installation of Engine



1 Throttle valve body, 2 Air filter, 3 Engine, 4 Frame, 5 Muffler, 6 Transmission pedal

### Disassembly and Installation of Engine

Maintenance instructions	Installation of engine
Disassembly of engine	

#### Maintenance instructions

<p>Only when the crankshaft, balance shaft and transmission part of the engine are maintained (sectioned), it is necessary to disassembly the engine from the frame. When maintaining other parts of the engine, it is not necessary to disassembly the engine from the frame.</p> <p>Before removing the engine, the motorcycle shall be supported on the flat ground with side bracket, and the cooling water and engine lubricating oil shall be drained.</p> <p>In order to maintain the cylinder head, cylinder block, piston and other heat engine parts, it is necessary to remove the cover, oil tank, radiator, throttle body, air filter assembly, etc.</p> <p>If you need to remove the left front cover of the engine for maintenance, you need to remove the transmission pedal and left rear cover, etc.</p> <p>The installation sequence is reverse to the disassembly sequence.</p> <p>When resuming installation, all wiring pipes shall be arranged according to the wiring diagram, and the removed hoops shall be replaced with new ones.</p>	<p><b>Specifications</b></p> <p>Engine net weight 28 kg  Add 1.2L to the broken engine oil tank and 1.0L to the daily maintenance  Cooling water capacity 860ml</p> <p><b>Important torque figures</b></p> <p>Engine suspension bolt M10: 55 ~ 65 N.m</p>
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## Disassembly of engine

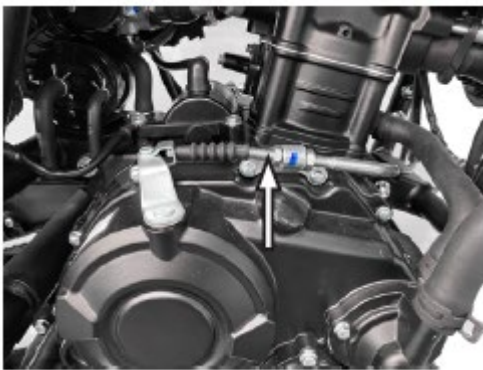
Park the motorcycle on the flat ground and drain the cooling water and engine lubricating oil.  
Remove the cover, oil tank, muffler and radiator (refer to relevant chapters).



### Disassembly of left rear cover



### Disassembly of clutch cable.



Remove the drive chain  
Remove the starting motor wire and engine grounding wire



### Disassembly of spark plug cap.



### Remove the magneto output line.



### Disassembly of transmission control sub-assembly



### Remove the engine Front suspension and Frame Bolt.

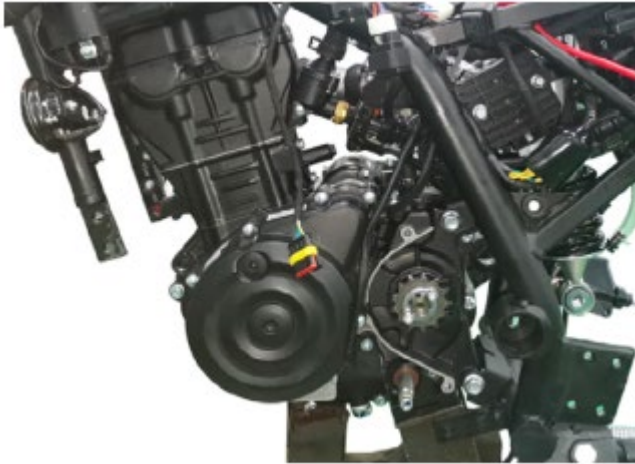




Disassembly of engine rear suspension mounting bolts



Disassembly the engine

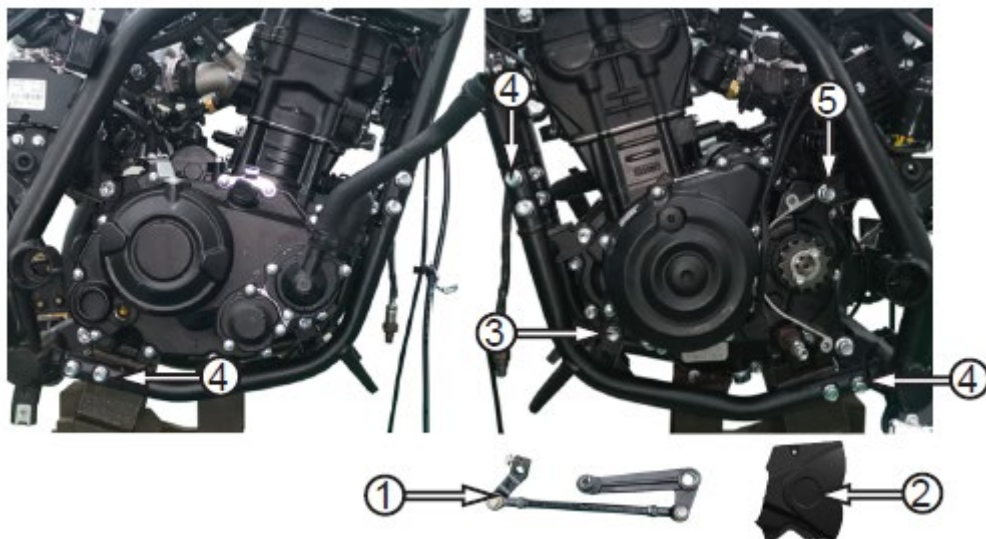


Sequence	Procedure	Quantity	Remark
	Disassembly sequence		The installation sequence is reverse to the disassembly sequence
1	Cover, oil tank, radiator, muffler, air filter, etc		Refer to relevant chapters
2	Variable speed control components	1	
3	Left rear cover	1	
4	Bolt M8 × 28	8	
5	Nut M8	10	
6	Bolt M8 × 87	2	
7	Engine front suspension	1	
8	Bolt M10X1.25X113	2	

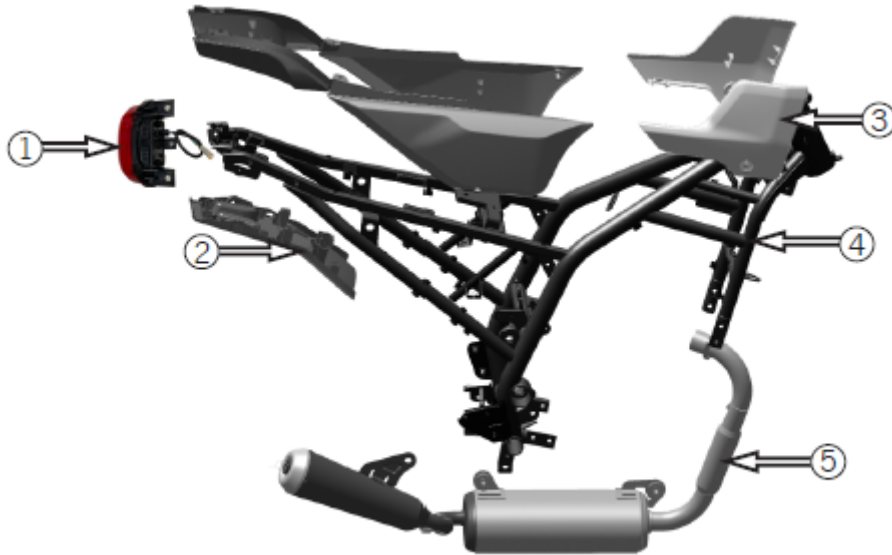
### Installation of engine

The engine is installed in the reverse order of disassembly.

During installation, pay attention to the cables during installation, and the wiring shall be arranged according to the wiring diagram.



## Frame, exhaust system



1 Tail light component, 2 Rear fender, 3 Closure panel, 4 Frame, 5 Muffler

Maintenance instructions	Disassembly / installation of rear fender
Troubleshooting	Disassembly/ installation of exhaust muffler
Closure panel, headlamp and instrument	Rear lamp assembly

### Maintenance instructions

During the maintenance of this part, special attention shall be paid to the covers, instruments and lamps not to be scratched or damaged.

Disassembling or maintaining parts before the exhaust system cools may cause severe burns.



This part mainly includes the disassembly and installation of cover, rear fender, exhaust muffler, radiator and lamp.

### Troubleshooting

<p>Excessive emission noise</p> <ol style="list-style-type: none"> <li>1. The emission system is damaged;</li> <li>2. Exhaust leakage;</li> </ol>	<p>Work abnormalities</p> <ol style="list-style-type: none"> <li>1. The exhaust system is deformed;</li> <li>2. Exhaust leakage;</li> <li>3. The muffler is blocked.</li> </ol>
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### Closure panel, headlamp and instrument

#### Disassembly procedures of cover, headlamp and instrument

<p>1. Support the motorcycle with side bracket on the flat ground and remove the cushion.</p> 	<p>2. Remove two mounting bolts from each side cover. Remove the left and right side cover assembly. Pay attention to handle with care, do not scratch the decorative surface.</p> 
<p>3. Remove 2 mounting screws headlamps , unplug the connector of headlamps and remove headlamps.</p>	<p>6. Remove 3 ST4.2×13 tapping screws, 2 M5 × 10 cap screws from the meter and braket mounting screws to</p>



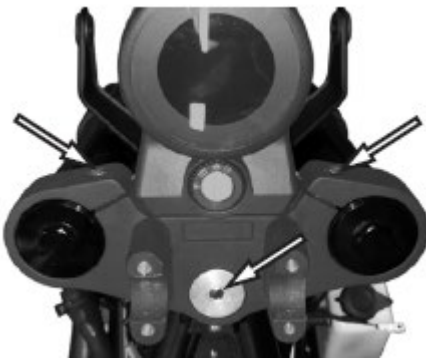
4. Remove 4 handlebar clip mounting bolts, and the inner hexagon screw M8×30. Remove three mounting screws of the rear cover of meter, self-tapping cap screws ST2.8×12, and unplug the connector of meter.



get Meter.



5. Remove 2 mounting bolts and socket head cap screws of the upper connecting plate of the steering column and inner hexagon screw M8×30. And the locking bolts of the upper connecting plate of the steering column, and remove the upper connecting plate.



Installation procedures of cover, headlamp and instrument:

The installation steps of the cover, headlamp and instrument are in the reverse order of the disassembly. Pay attention not to scratch the cover and damage the bulb during installation.

**⚠ Note:**

**In the process of disassembly, do not scratch the appearance surface of the cover and do not break the tenon.**

**Disassembly/ installation of exhaust muffler**

Disassembly procedures of exhaust muffler  
Make sure the muffler is completely cooled before operation, otherwise it will cause scald.

1. Support the motorcycle on the ground with the main



bracket, and pull out the oxygen sensor plug.



2. Remove 4 M6 × 16 inner hexagon socket step screws from the fixing screws of the lower shroud assembly.



3. Remove 2 M8×25 inner hexagon screws from the connecting screws of muffler and engine exhaust port, Remove 2 M8 × 45 hexagon socket bolts from the connecting bolt of the rear part of silencer and the frame, and 1 M10× 20 connecting bolt from the rear pedal . Loosen connecting hoop bolt of the front and rear sections and remove silencer.



### Installation procedure of exhaust muffler

Proceed in the reverse order of disassembly. The muffler seal washer at the engine exhaust port should be replaced with a new one. During installation, apply sealant to the joint of exhaust pipe and muffler, and then tighten the bolts of exhaust port and muffler support after the hoop bolts of joint are tightened, otherwise air leakage will be caused.

#### ⚠ Note:

**Make sure the muffler is completely cooled before operation, otherwise it will cause scald.**



### Disassembly / installation of rear tail lamp

1. Unscrew 2 M6 × 16 hexagon socket step cap screws, 1 M5 × 12 hexagon socket step cap screw from the fixing cap screws of cover plate and remove the tail lamp assembly.



1、 2. Remove 2 M5× 16 fixing bolts from the ECU controller.



**Note:**  
Only when the main power is off can the ECU be pulled out.

## Front wheel, front suspension, steering column, front brake



1 Control subassembly, 2 Upper connecting plate, 3 Front fork assembly, 4 Front wheel components, 5 Front axle

Maintenance instructions	Front wheel
Important torque figures	Front suspension
Troubleshooting	Direction column
Control sub-assembly	Front brake

### Maintenance instructions

When maintaining the front wheel, the motorcycle should be reliably supported by a jack or other bracket under the engine to keep the front wheel off the ground. Only tires marked "TUBELESS" should be used.

Inhalation of friction plate dust will cause respiratory discomfort. Do not use air duct or dry brush to clean the brake components. Please go to the professional repair network for repair and maintenance.

### Important torque figures

Front axle	75~85N.m	Fastening bolts of front shock absorber plate	20~25N.m
Handlebar fixing bolt	21~25N.m	Front fork riser nut	60~70N.m
Fixing bolts of upper and lower connecting plates	60~70N.m	Fastening screw of brake disc	28~32N.m

### Troubleshooting

<p>Unstable direction</p> <ol style="list-style-type: none"> <li>1. The bearing of riser is damaged;</li> <li>2. Insufficient tire pressure;</li> <li>3. Tire is damaged;</li> <li>4. The wheel bearing is damaged.</li> <li>5. The adjusting nut of riser is too tight.</li> </ol> <p>Steer to one side or not in a straight line</p> <ol style="list-style-type: none"> <li>1. The adjustment of left and right shock absorbers is uneven;</li> </ol>	<p>Difficulty in turning the wheel.</p> <ol style="list-style-type: none"> <li>1. The wheel bearing and axle sleeve are damaged</li> <li>2. The tire pressure is not enough.</li> <li>3. The brake disc does not reset.</li> </ol> <p>Suspension is too soft</p> <ol style="list-style-type: none"> <li>1. The elasticity of the front fork spring is not enough;</li> <li>2. The hydraulic oil level is too low or the fluid type is wrong.</li> </ol>
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2. The front fork is bent;
3. The front axle is bent and the wheel is not installed correctly;
4. The wheel bearing is damaged;

Front wheel runout

1. Deformation of wheel rim
2. Wear of wheel bearing
3. Deformation or looseness of wheel spokes
4. Front axle is loose
5. Tire is damaged

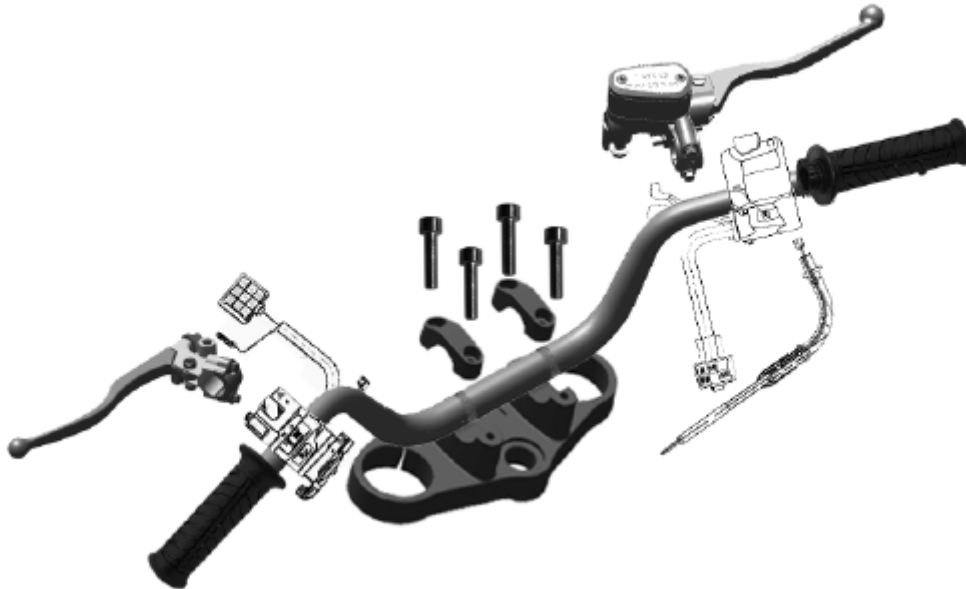
The suspension is too hard

1. The hydraulic oil level is too high or the fluid type is wrong.
2. Bending of front shock absorber fork tube
3. The front shock absorber is blocked.

Poor brake performance

1. There is air in the brake pipe;
2. The brake shoe is worn;
3. There is water or oil on the brake shoes.

**Disassembly / assembly of control sub-assembly**



**Caution**

The front brake master cylinder shall be hoisted with steel wire rope, and its height shall be at least the same as that of the original installation position, so as to prevent air from invading the master cylinder and affecting the braking performance. It is forbidden to twist the brake hose.

When assembling clutch handle and front brake cylinder block, the opening shall be aligned with the marking point of handlebar.

The opening at the back end of the clip is aligned with the marking point of the handlebar. First tighten the front bolt of the clip, and then the back bolt.

After installation, adjust the throttle control line.

The cable and wiring are consistent with the wiring diagram.

1. Pull out the brake switch plug



2. Remove the front brake master cylinder clip bolt.

5. Pull off the clutch switch plug.



6. Remove the clutch handle bolt.



3. Remove the right combined switch screw.



4. Remove the fixing screw of throttle cable wire seat, and remove the fixing screw fasten throttle cap screws.



7. Remove the left combined switch screw.



6. Remove the handlebar clip fixing bolt.



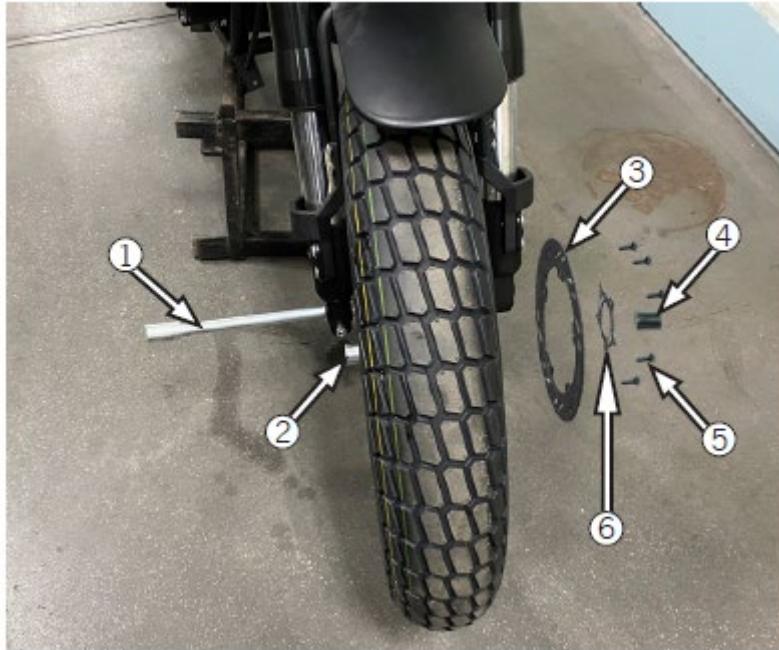
### Maintenance requirements

Sequence	Procedure	Quantity	Remark
Disassembly sequence		The installation sequence is reverse to the disassembly sequence	
1	Brake switch plug	2	
2	Clamp bolt of front brake master cylinder	2	Note: 1. Tighten the upper bolt first, and then the lower one 2. There are two raised triangular marks on the clip facing up
3	Front brake cylinder block components	1	
4	Clutch switch plug	2	
5	Clutch line	1	
6	Counterweight bolt	2	
7	Counterweight	2	
8	Left handlebar	1	The handle mark is aligned with the marking point of the handlebar
9	Clutch handle bolt	1	Align the handle opening with the marking point of the handlebar
10	Clutch handle	1	
11	Left combined switch screw	2	Note: Tighten the upper bolt first, then the lower bolt
12	Left combined switch	1	
13	Fuel feeder seat screw	2	Note: Tighten the front bolts first, and then the rear



			bolts
14	Fuel feeder seat	1	
15	Throttle cable	2	Note: do not bend or twist the throttle cable
16	Fuel feeder	1	
17	Right combined switch screw	2	Note: Tighten the front bolts first, and then the rear bolts
18	Right combined switch	1	
19	Clip bolt M8×35	4	Note: Tighten the front bolts first, and then the rear bolts
20	Clip	1	
21	Handlebar	2	Pay attention to the position of marks during installation

### Front wheel disassembly / assembly



- 1 Front axle, 2 Front wheel right bushing, 3 Front brake disc, 4 Front wheel left bushing, 5 Front brake disc bolts  
6 Front speed signal disc

#### Caution

Soiled brake discs and friction discs may reduce braking performance. Please pay attention to replacing friction discs and cleaning soiled brake discs.

When the brake caliper is removed, do not pull the brake handle to avoid difficulties when assembling the front wheel.

The vehicle bearing shall be replaced in a complete set.

### Maintenance requirements

Sequence	Procedure	Quantity	Remark
Disassembly sequence		The installation sequence is reverse to the disassembly sequence	
1	Bolt	1	Tightening torque: 55-65 N.m
2	Front axle	1	Tightening torque: 75-85 N.m. Apply lithium grease
3	Front wheel left bushing	1	Apply lithium grease during assembly
4	Front wheel right bushing	1	Apply lithium grease during assembly
5	Front brake disc bolts	5	Tightening torque: 28-32 N.m
6	Front brake disc assembly	1	
7	Front speed instrument	1	

### Front suspension disassembly / assembly



1 Upper shock absorber bolt, 2 Lower shock absorber bolt, 3 Front shock absorber, 4 Front fender

#### Caution

Lift the front brake master cylinder with steel wire rope, and the height shall be at least the same as that of the original installation position. It is forbidden to twist the brake hose. When the brake caliper is removed, do not pull the brake handle to avoid difficulties when assembling the front wheel. Before removing the shock absorber, loosen the lock nut of the steering column, but do not remove it.

#### Maintenance requirements

Sequence	Procedure	Quantity	Remark
Disassembly sequence		The installation sequence is reverse to the disassembly sequence	
1	Brake caliper bolt	2	Tightening torque: 45-50 N.m
2	Front brake oil pipe fixing clip nut	1	
3	Front brake caliper components	1	Note: Lift the front brake master cylinder with wire rope, and do not twist brake hose. Flex brake hose
4	Front fender bolts	4	Hexagon socket bolt M6x12
5	Front fender	1	
6	Mudguard bracket screw	4	Hexagon socket bolt M6x16
7	Mudguard bracket	2	
8	Lower connecting plate mounting bolt	4	Hexagon socket bolt M8x35, just loosen it
9	Mounting bolt of upper connecting plate	2	Hexagon socket bolt M8x30, just loosen it. Don't drop it.
10	Front shock absorber	2	
11	Front Mudguard bracket screw	8	Hexagon socket bolt M5x14

#### Disassembly/ assembly of steering column



1 Upper damping bolt, 2 Steering column locking bolt, 3 Lower damping bolt, 4 Steering column combination

#### Caution

Soiled brake discs and friction discs may reduce braking performance. Please pay attention to replacing friction discs and cleaning soiled brake discs.

When the brake caliper is removed, do not pull the brake handle to avoid difficulties when assembling the front wheel.

The vehicle bearing shall be replaced in a complete set.

#### Maintenance requirements

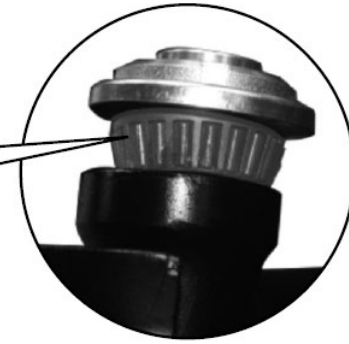
Sequence	Procedure	Quantity	Remark
Disassembly sequence		The installation sequence is reverse to the disassembly sequence	
1	Steering column lock nut	1	Assembly torque: 60-90 N.m
2	Steering column gasket	1	
3	Upper connecting plate damping bolt M8 × 30	2	
4	Upper connecting plate	1	
5	Ignition switch lock screw	2	Hexagon socket screw M8X20
6	Combined ignition switch components	1	
7	Lower connecting plate damping bolt M8×30	2	Torsion force of left and right front shock absorber: 45~55 N.m;
8	Adjusting nut	1	The assembly torque is 10 ~ 12 N.m, and the steering column is rotated repeatedly during assembly
9	Tapered roller bearing	2	
10	Steering column assembly	1	Turn the steering column repeatedly during assembly
11	Direction column bearing washer	1	

#### Assembly of directional column

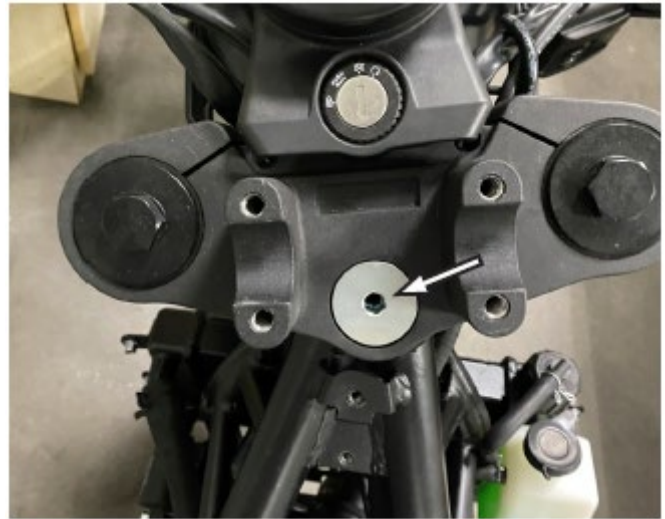
Apply enough lithium grease on the surface of bearing roller.

Place the steering column into the frame riser.

Put in the bearing and adjusting nut in turn. While tightening the adjusting nut, turn the steering column repeatedly to make the bearing roller fit with the washer. Adjust the adjusting nut of the steering column to 35 ~ 45 N•m, then loosen the adjusting nut of the steering column (the adjusting nut can be freely turned by hand), and then use the torque wrench to adjust to 10 ~ 12 N•m. After that, the steering column can rotate flexibly without jamming. There is no interference in the range of maximum rotation angle.



Put in the upper connecting plate, and then tighten the steering column bolt to the specified torque of 60-70N.m. Turn the steering column again to confirm that it can rotate reliably and stably without external force, and there is no frustration.



Tighten the bolts before connecting the connecting plate on the steering column. Torque requirement: 28~32 N.m



## Front brake

### Maintenance instructions

Soiled brake discs and friction discs may reduce braking performance. Please pay attention to replacing friction discs and cleaning soiled brake discs. Do not clean the brake components with air duct or dry brush in case of inhaling friction plate dust and causing respiratory discomfort. For repair and maintenance, please go to specialized maintenance centers. The spilled brake fluid will seriously damage the surface of instrument glass and oil and gas components, and it is also harmful to some rubber. When disassembling the master cylinder, pay attention to it. First, make sure that the master cylinder is horizontal.

Do not allow contaminants (dirt, water, etc.) to enter the master cylinder.

Once the hydraulic system is opened or the brake is loose, the air in the brake system must be drained.

When the system maintenance, DOT4 brake fluid must be used, and do not mix with different types of brake fluid.

Before driving a motorcycle, the running state of the brake must be checked.

### Troubleshooting

1. There is air in the pipeline;
2. Pipeline leakage;
3. The brake fluid level is low.

The brake handle is not flexible

1. The brake system is blocked
2. The piston of brake caliper is stuck and worn.



4. The brake friction plate is dirty; 5. The piston seal of brake auxiliary cylinder is worn and aged. 6. The piston seal of brake master cylinder is worn and aged. 7. The piston of brake auxiliary cylinder is stuck and worn. 8. The piston of brake master cylinder is stuck and worn. 9. The brake shoes are worn. 10. Poor sliding of brake shoe. 11. The pipeline is blocked. 12. The brake disc is warped and deformed. 13. Pipeline is polluted.	3. Poor sliding of brake shoe. 4. The pipeline is blocked. 5. The piston of main brake pump is stuck and worn. 6. The brake handle is bent.  The brake deviates to one side 1. Dirty brake discs / friction plates. 2. The wheels are not calibrated. 3. The brake disc is warped and deformed. 4. Poor sliding of brake shoe.
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### Front brake caliper components removal/ assembly



1 Front brake disc, 2 Brake caliper bolts, 3 Front brake caliper

#### Caution

Soiled brake discs and friction discs may reduce braking performance. Please pay attention to replacing friction discs and cleaning soiled brake discs.

Lift the front brake master cylinder with steel wire rope, and the height shall be at least the same as that of the original installation position. It is forbidden to twist the brake hose.

When the brake caliper is removed, do not pull the brake handle to avoid difficulties when assembling the front wheel.

Do not clean the brake components with air duct or dry brush in case of inhaling friction plate dust and causing respiratory discomfort. For repair and maintenance, please go to specialized maintenance centers.

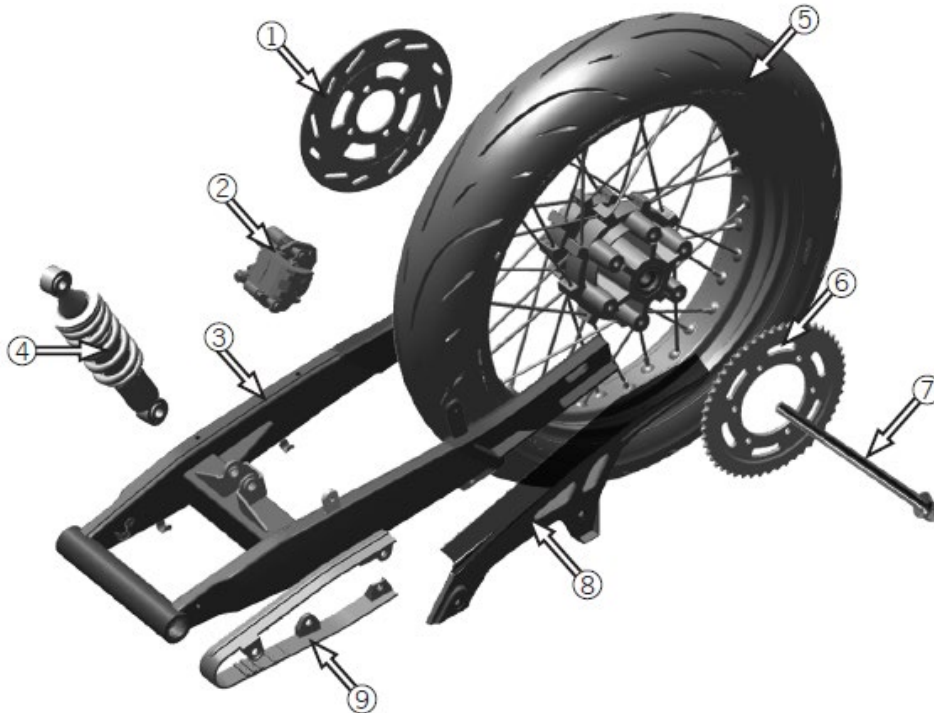
After replacing the friction plate, operate the brake handle repeatedly to make the caliper cylinder piston close to the friction plate and reset.

#### Maintenance requirements

Sequence	Procedure	Quantity	Remark
Disassembly sequence		The installation sequence is reverse to the disassembly sequence	
1	Brake caliper bolt M10×60	2	Tightening torque: 55-65 N.m
2	Front brake caliper components	1	Lift the front brake main cylinder with steel wire rope, and do not twist the brake hose

3	Spring clip	1	
4	Friction plate locating pin	1	
5	Friction plate	2	

## Rear wheel, rear brake, rear suspension devices



1. Rear brake disc 2. Rear brake caliper body 3. Rear fork assembly 4. Rear shock absorber  
5. Rear tire assembly 6. Sprocket 7. Rear axle shaft 8. Chain box 9. Chain guard

Maintenance instructions	Rear fork assembly
Troubleshooting	Rear shock absorber
Rear wheel	Rear fork rocker arm assembly

### Maintenance instructions

This section describes the removal, installation and maintenance of the rear wheel, rear brake, rear fork, rear shock absorber and rocker link. When performing repair and maintenance for the rear wheel, rear shock absorber and rocker arm connecting rod, the motorcycle should be reliably supported by an air jack or other bracket under the engine.

#### Important torque figures

Fastening nut on rear axle: 75 ~ 85N.m

Rear fork nut 60 ~ 70N.m

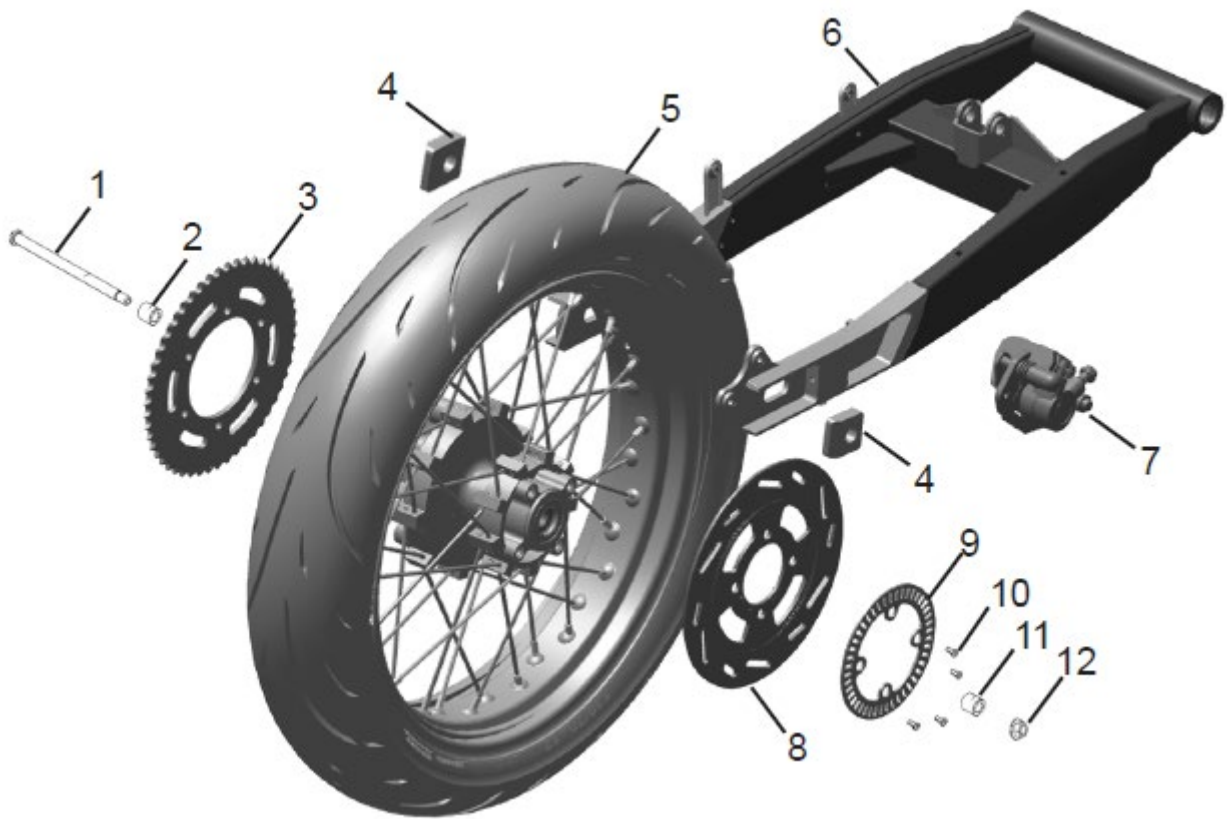
Damping rocker arm M12 bolt & nut: 60 ~ 70N.m

Brake disc fastening screw: 28 ~ 32N.m

### Troubleshooting

<p>Swings of the rear wheel</p> <ol style="list-style-type: none"> <li>1. Deformation of wheel rim;</li> <li>2. The rear wheel bearing is worn;</li> <li>3. Low tire pressure;</li> <li>4. Inconsistency in the left and right of the regulator;</li> <li>5. Damaged wheel sleeve.</li> </ol> <p>Noise</p> <p>Loose fasteners.</p>	<p>Difficulty in turning the wheel.</p> <ol style="list-style-type: none"> <li>1. Damaged wheel bearing and shaft sleeve;</li> <li>2. Incorrect wheel installation;</li> <li>3. Bent rear axle</li> <li>3. Rear brake friction plate can not reset</li> </ol> <p>Abnormal suspension</p> <ol style="list-style-type: none"> <li>1. The damping spring is too hard or too soft ;</li> <li>2. Damaged rear fork bearing;</li> <li>3. Bent shock absorber.</li> </ol>
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### Rear wheel



1. Rear axle shaft 2 Rear wheel left sleeve 3. Sprocket 4. Chain adjuster and bolt 5. Rear tire combination 6. Flat fork combination 7. Rear disc brake lower pump assembly 8. Rear brake tray 9. Rear speed signal tray 10. Rear brake disc fixing screw 11. Rear wheel right bushing 12. Rear axle fastening nuts

**Disassembly steps of rear wheel**

1. Loosen the chain adjusting bolt and lock nut to get them separated from the positioning baffle.



3. Take out the rear axle.



2. Screw out rear axle fastening nut M14×1.5.



4. Take out the rear wheel assembly.



5. Take out the right rear wheel bushing.





6. Take out the left rear wheel bushing.



7. Remove the sprocket fastener, take out the sprocket and get the rear wheel.



8. Take out the disc of rear disc brake.



### Rear fork

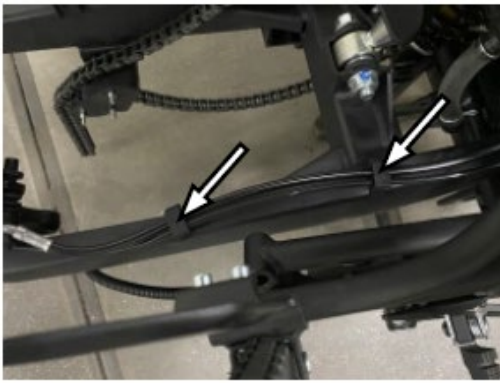
#### Disassembly steps of rear fork:

1. Remove the rear wheel assembly first (refer to disassembly steps of rear wheel).
2. Remove the brake oil pipe clamp.

Note: ⚠

When removing the brake caliper body, make sure that the rear brake caliper body is lower than the rear brake cylinder body to prevent air from





3. Pull the rear brake caliper body backward out of the suspension position.



4. Remove the nut M12 x 1.25 of connecting bolt between rear damper and flat fork




5. Loosen the flat fork shaft nut M14×1.5, pull out the flat fork shaft from the right side and pull out the flat fork backward.



#### Inspection of flat fork shaft

Place the flat fork shaft on the V-shaped seat, and test the deflection of the flat fork shaft with a dial indicator. If the figure goes beyond or equal to 0.2 mm, replace the flat fork shaft with a new one.

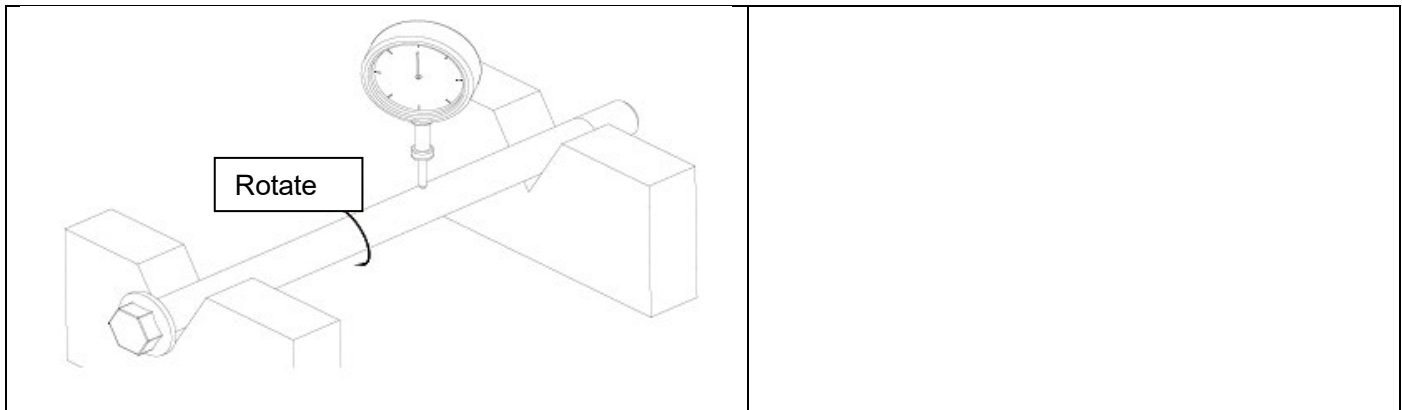
entering the cylinder body reducing the braking performance. And after removing the rear brake caliper body, if it does not need to be replaced, do not step on the rear brake pedal.

Warning: 

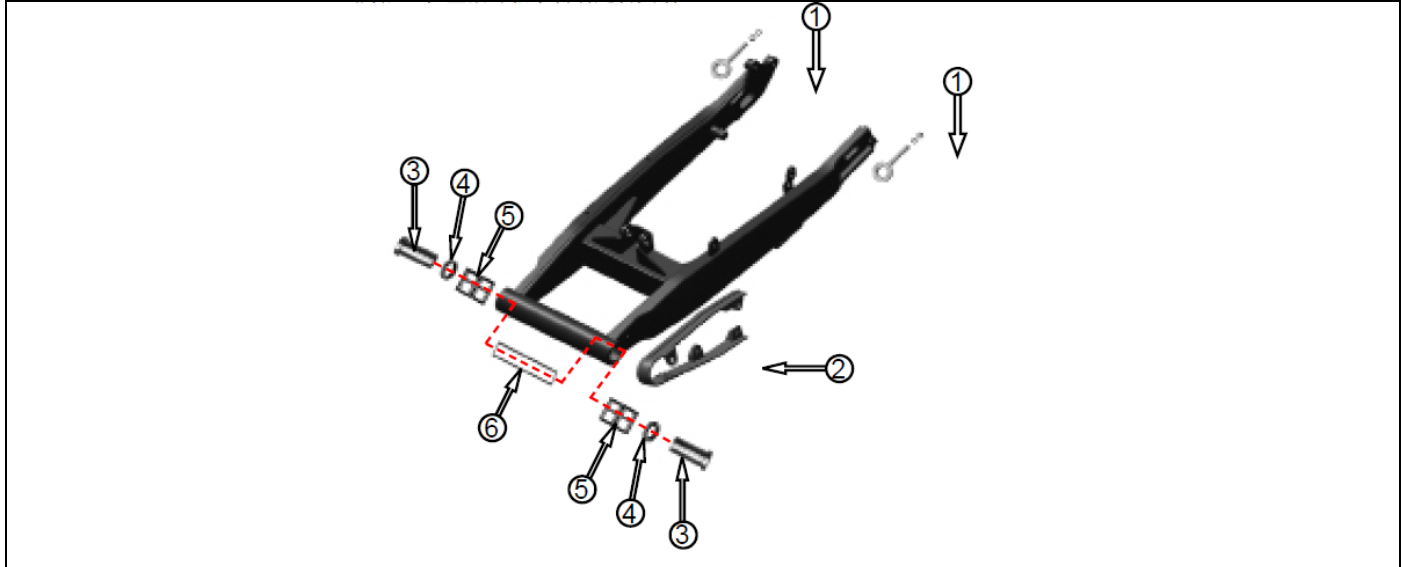
Tighten the flat fork shaft fastening nut to the specified torque of 75 ~ 85N.m.

Removal/installation of flat fork





Disassembly/assembly steps of rear fork  
 Refer to the figure below for the disassembly/assembly of the rear fork.  
 The sealing ring and needle roller bearing should be replaced after removal. After the needle bearing is installed, make sure that it is 3 mm away from the end, and the needle shall be coated with lithium grease. After installation, check whether the needle roller bearing rotates flexibly.



Sequence	Procedure	Quantity	Remark
	Decomposition sequence		The assembly sequence is reverse to the disassembly sequence
1	Chain adjuster	2	
2	Chain guard	1	
3	Flat fork shaft bushing	2	When assembling, make sure that the shaft sleeve rotates flexibly
4	Flat fork oil seal (24×16×5)	2	
5	Needle roller bearing HK2520	2	Apply lithium grease on the needle roller during installation
6	Rear flat fork liner	1	

# Chapter 4 General Introduction of Electrical System

Precautions for Circuit Inspection	System Principle and Structure
------------------------------------	--------------------------------

## Precautions for Circuit Inspection

1. When disconnecting and connecting the connector, turn the ignition switch to the off position to avoid damage to the electrical components.
2. When checking the circuit, please adopt the probe that can be inserted from the front and back of the connector and reliably contacted with the terminal.
3. The power supply and relevant electrical components shall be disconnected during the inspection of the circuit.
4. When using voltage check, check the battery voltage first.
5. When there is a fault in the electrical system, it is generally diagnosed according to the following steps:
  - A. Observe the fault performance to locate the faulty subsystem;
  - B. Using the elimination method and the circuit diagram to minimize the fault range;
  - C. Check the circuits of subsystems for open circuit, short circuit or wrong connection;
  - D. Check the relevant components for failure or damage.
6. When investigating the circuit fault, check the place that is easy to dismantle first. Parameter detection method and part replacement method can be adopted, but when using part replacement method, make sure that there is no overload in the circuit to avoid damaging new parts.
7. Please prepare multimeter and clamp meter for circuit inspection.
8. Most of the instantaneous electrical failure is caused by the wire connector or wire failure.

## System Principle and Structure

The electrical system is an essential guarantee that the motorcycle can operate normally, safely, reliably and efficiently. It covers a considerable number of disciplines, including motor, electrical, electronic technology, computer, electrochemistry, acoustics, optical materials, etc. And with the development of electronic technology in particular, the motorcycle electrical system will undergo significant changes. The electrical system is more advanced than traditional motorcycles in that it applies more advanced automotive electronics and is much more complex. It consists of the following subsystems.

- Power supply system
- Starting system
- Engine management system
- Cooling system (electrical part)
- Lighting signal system
- Information display system

In the following chapters, we will describe them separately. Among them, the cooling system has been described in Chapter 5 and will not be described again.

# Battery and power supply system

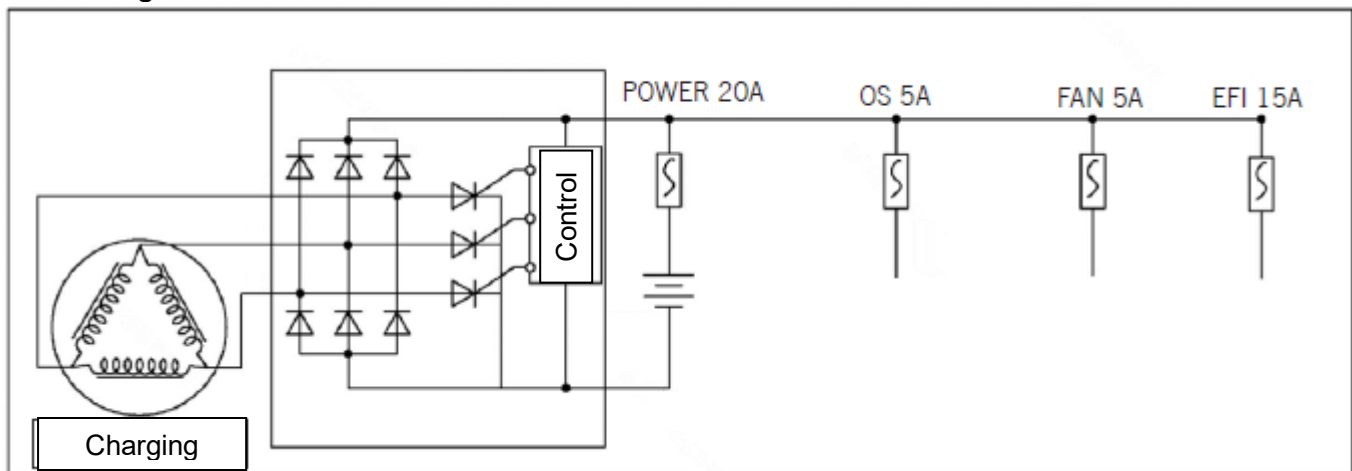
Overview	Introduction of main components
Circuit diagram	Main fault diagnosis
Parts layout	

## Overview

Power supply system is the premise of vehicle electrical system, which can provide sufficient power for other electrical subsystems. The functions include: charging, storing and discharging. Power supply system is characterized by large power supply capacity, up to 168W. It consists of the following parts:

- Magneto
- Voltage regulating rectifier
- Battery
- Combined ignition switch
- Fuses

## Circuit diagram



## Parts layout



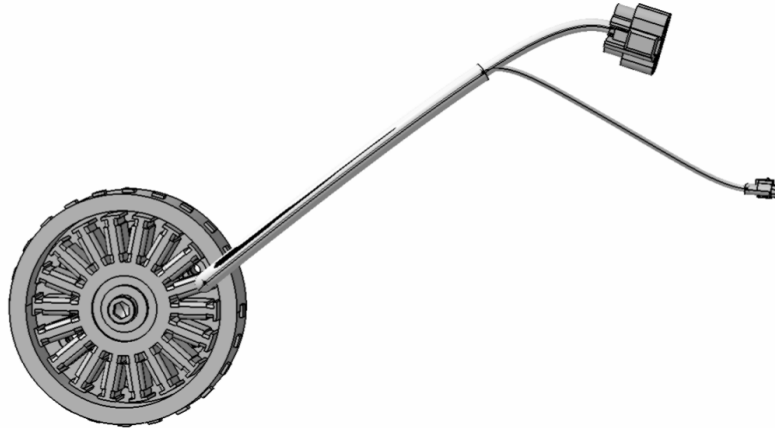
1 Ignition switch, 2 Main electrical harness, 3 Battery, 4 Voltage regulating rectifier, 5 Magneto

## Introduction of main components

### Magneto



## 1. Outline drawing



## 2. Working principle

The crankshaft drives the rotor to rotate, and the stator winding coil cuts the magnetic line of force to generate the induced electromotive force to output alternating current,  $E=Blv$ . Motorcycle magneto is a permanent magnet alternator. The permanent magnet steel is the rotor and the coil winding is the stator. Magneto is the main power supply of electrical system.

## 3. Basic parameters

The rotor consists of six magnets with 12 poles;

The stator winding has 18 poles in total, connected by three-phase  $\Delta$ , and the winding resistance of each phase is 0.3-0.5  $\Omega$ ;

Calibration power: 172W / 5000r / min (cold engine state) (maximum attenuation of hot engine is 8%).

## 4. Possible failures

Broken magnetic steel

Faded magnetic properties of the magnetic steel;

Short circuited stator winding to the ground;

Short circuit of stator winding inter turn;

Fall off and open circuit of welding points of stator winding;

Friction damage between rotor and stator (foreign matter entering).

## Voltage regulating rectifier

### 1. Outline drawing



### 2. Working principle

The three-phase sinusoidal alternating current which fluctuates with the speed of the magneto is converted into a stable direct current through a full wave rectification and controllable voltage stabilizing charging circuit. The voltage regulating rectifier provides power to the load and charge the battery.

### 3. Basic parameters

Structure type: three phase full wave rectifier, short circuit type;

Adjustment voltage:  $14.5V \pm 0.5V$ ; Working current: 15A.

### 4. Possible failures

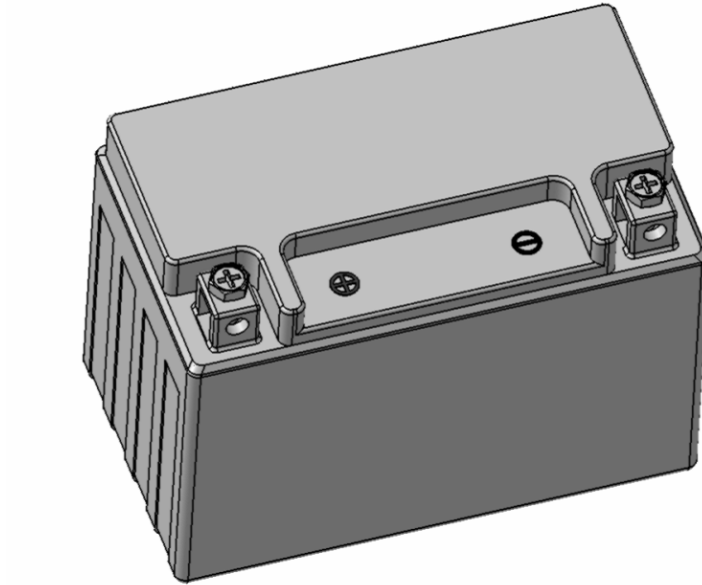
Out-of-control voltage regulator circuit, causing overcharge to the battery;

Open circuit or short circuit of the rectifier circuit, failing to charge the battery or causing insufficient charging;

Short circuit or open circuit of outgoing line.

## Battery

### 1. Outline drawing



### 2. Working principle

Immersed in electrolyte, the two kinds of lead (negative electrode) and lead dioxide (positive electrode) can produce 2V voltage. There are six cells connected in series, and the voltage can reach 12 ~ 13V. It is the auxiliary power supply of the electrical system and can absorb the overvoltage in the circuit.

### 3. Basic parameters

Battery type: valve regulated wet load maintenance free lead-acid battery, model: 12V/9A·h;

10HR rated capacity: 9A·h ( $25\text{ }^{\circ}\text{C} \pm 2^{\circ}\text{C}$ );

High rate discharge performance ( $-10^{\circ}\text{C}$ ) 90A: duration more than 90s; voltage greater than 8.5V after 5s.

### 4. Possible failures

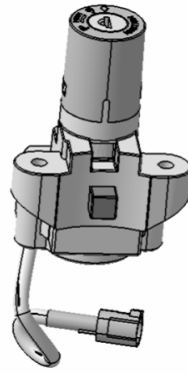
Polarized plates leading to reduced capacity, failure to provide the energy required for starting and reduced charging performance;

Leakage, causing corrosion electrode;

Too much internal resistance, serious self-discharge phenomenon, voltage below 5V.

## Combined ignition switch

### 1. Outline drawing



## 2. Working principle

The ignition lock cylinder with double slot and 8-tooth key is the main switch of the whole vehicle power supply. It is also the head direction lock.

## 3. Basic parameter switch menu

Switch key inter-opening rate should be no more than 0.1%;

Rated working current of switch: 20A.

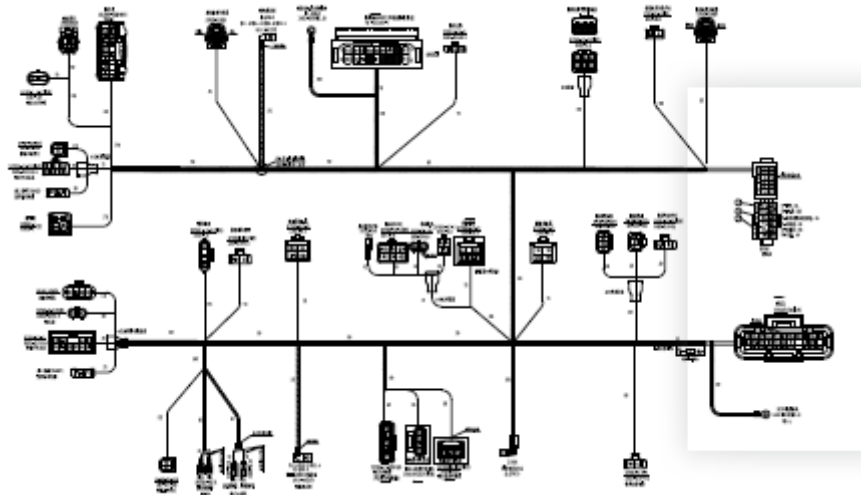
## 4. Possible failures

Invalid lock cylinder, causing inflexible switch or failure to open the switch with the key; Failure of the switch contact, causing the failure of the switch; The contact short circuit between the switch contact and the shell, causing the main fuse to burn out and the whole vehicle has no power; Open circuit or short circuit to ground of outgoing line; Failure in the locking tab, causing failure in the front direction lock.

Line color Gear	Red	Black	Key	Locking tab
			Cannot be withdrawn	Not protrude
			Can be withdrawn	Not protrude
			Can be withdrawn	Protrude

## Wire harness

### 1. Outline drawing



### 2. The working principle

Wire bundle consists of wires of various specifications, connector sheaths, terminals, conduit pipes, tapes, fuse and other parts of various specifications through bifurcation, riveting, wrapping and assembly. Through the connection of wire harness, the electrical and electronic equipment of the whole vehicle can work normally.

### 3. Basic parameters

The on-off status of all colored wires shall conform to the electrical wiring diagram; Riveting of each branch and terminal shall be firm and connected well; The conduit pipes and the tape should be tightly wrapped without looseness; All connectors and corresponding electrical and electronic equipment shall be reliably connected.

### 4. Possible failures

Terminal and connector are not assembled in place and loose; Short circuit to ground or adjacent wires caused by damaged wire sheath; Corrosion at the fork, causing unreliable connection or open circuit;

Instantaneous failure and poor contact of wire head or wire (most instantaneous electrical failures are caused by this); Poor contact or burnt out of the fuse; Unstable installation of wire harnesses on the body of the car to tie the turn, causing the wire vibration wear loss or poor contact.

### Main fault diagnosis

Failure phenomenon	Possible causes	Solutions:
No electricity in the whole car, i.e. when the key is turned on, there is no display on the instrument, and other electrical functions cannot be performed.	The main fuse is blown out;	Replace the main fuse
	Poor contact of main fuse circuit;	Plug in again
	Poor contact of the positive and negative lines of the battery;	Reconnect
	No electricity in the battery;	Charge or replace it
	Ignition switch failure;	Repair or replace
	Poor connection between ignition switch outgoing line and main cable;	Plug in again
	Open circuit or short circuit of main cable.	Repair or replace
Low battery voltage	Too long storage of the whole vehicle	Charge with DC stabilized voltage
	Vehicle charging circuit fault or too large vehicle quiescent current	Check the charging circuit and quiescent current of the whole vehicle
	Decaying battery capacity, battery does not store power, battery self discharge	To replace the battery
The battery is not fully charged.	Poor connection between outgoing line of voltage regulating rectifier and main cable or magneto	Plug in again
	Open circuit or short circuit of main cable	Repair or replace
	Magneto failure	Replace the magneto rotor
	Failed voltage regulating rectifier	Replace the voltage regulating rectifier.
	Batteries failing to store power	To replace the battery
Battery overcharge: The battery shows a large volume of gas or deformation	Failed voltage regulating rectifier	Replace



# Starting system

Overview	Introduction of main components
Circuit diagram	Main fault diagnosis
Parts layout	

## Overview

When the engine starts to work, it needs the help of external force to make it work first, then it can perform the ignition and fuel supply program, and the internal-combustion engine can cycle combustion and work stably. The motorcycle is only equipped with electric starting. Firstly, remove the gear switch, side bracket switch, clutch switch protection, and then press the start button, turn on the starter relay, so the starting motor begin to rotate, driving the intermediate gear and isolator, so that the engine can enter the working cycle, and the engine can be ignited, injected and burned normally. The system consists of the following components:

- Starting motor;
- Starter relay
- Battery
- Start switch and flameout switch;
- Neutral switch, side bracket switch and clutch switch.

## Circuit diagram



1 Starting motor, 2 Ignition switch, 3 Engine stop, 4 Electric starting switch, 5 Starting relay, 6 Isolation diode, 7 Neutral switch, 8 Clutch switch

## Parts layout

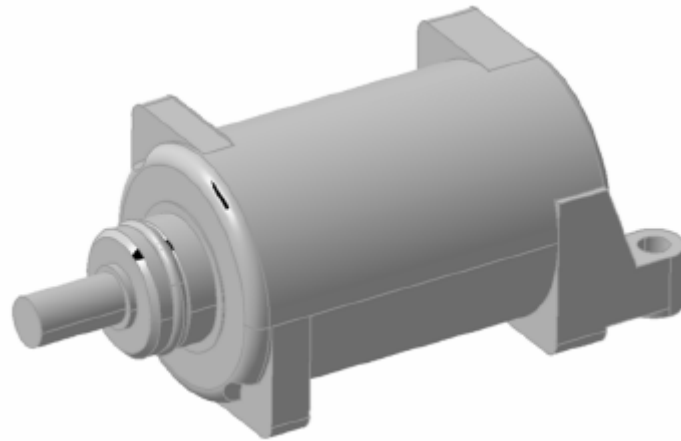


1 Engine stop, 2 Starting switch, 3 Clutch switch, 4 Battery, 5 ECU, 6 Starting relay, 7 Side bracket switch, 8 Gear switch, 9 Starting motor, 10 Cable harness

## Introduction of main components

### Starting motor

### 1. Outline drawing



### 2. Working principle

The current carrying conductor is subject to electromagnetic force in magnetic field,  $F=Bli$ . Apply power to the positive and negative terminals of the starter motor (negative override), and the motor shaft starts to rotate, thus driving the initial engine operation through the reduction gear, the isolator, and the crank

### 3. Basic parameters

The stator has four magnets, four poles and four carbon brushes;

	Condition	Voltage (V)	Current	Speed r/min	Torque N.m
Motor characteristics	No load	11.5	≤30	≥10000	
	With load	9.5	≤120	≥6000	1.0
	Brake	6	≤300		≥2.5

Specification: 12V650W;

Rotation direction of output shaft: viewed from the tooth end, clockwise;

Output characteristics

### 4. Possible failures

Motor open circuit failure;

Excessive wear of carbon brush;

Broken stator magnetic steel;

Faded magnetic properties of the magnetic steel;

Friction short circuit between rotor winding enameled wire and stator;

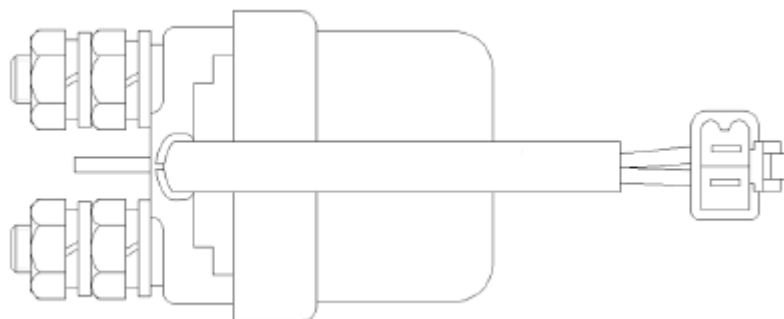
Bearing failure, causing abnormal noise of motor operation;

Poor oil seal causing short circuit failure due to oil in motor;

Poor waterproof causing decreased performance of the motor due to water in the motor.

## Start relay

### 1. Outline drawing



### 2. Working principle

Turn on the voltage at both ends of the relay coil so that it can generate electromagnetic force and pull on the movable contact and the fixed contact. The small current through the operating switch and relay coil can control the large current through the starting motor and relay contact. The starter relay also contains the power circuit (power pole B, coil terminal).

### 3. Basic parameters

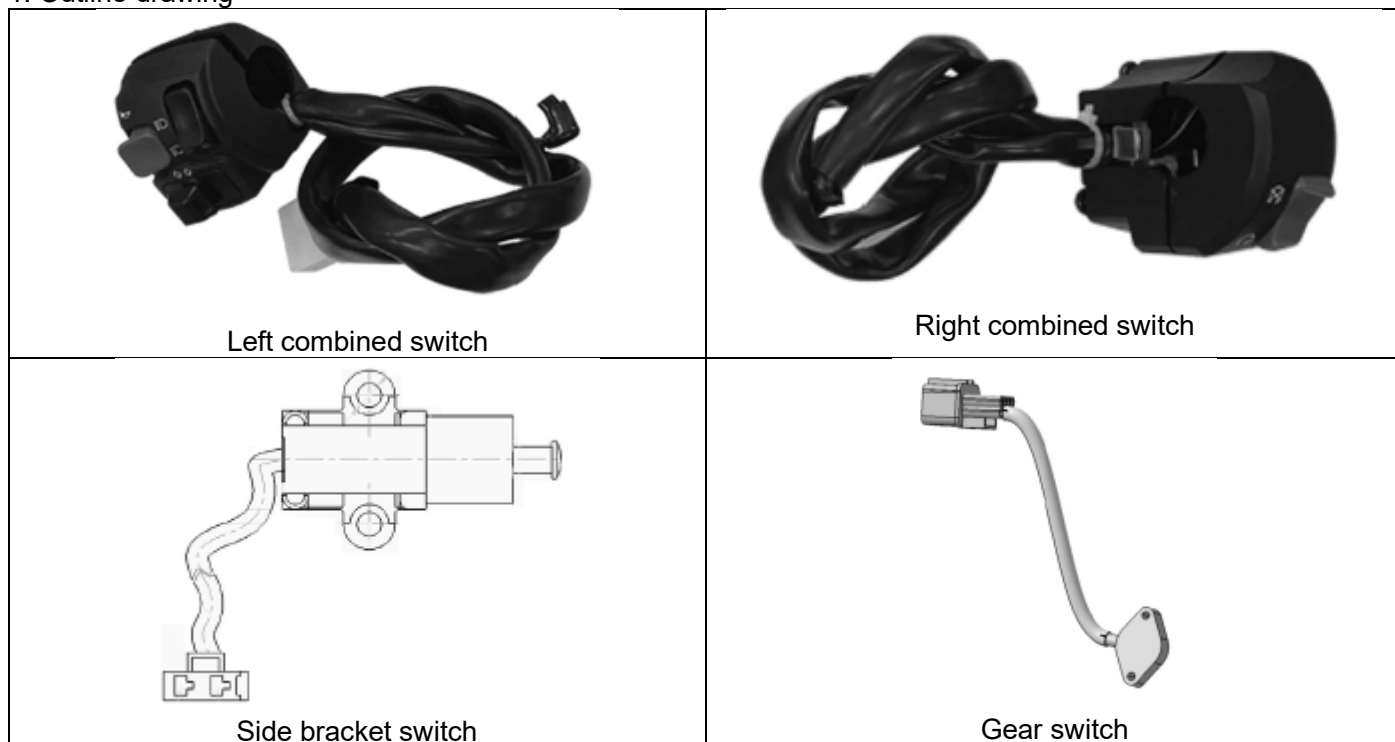
Nominal voltage: 12V;  
 Rated current: DC150A;  
 Closing voltage: ≤ 7.5V;  
 Release voltage: ≤ 3.5V;  
 Contact voltage drop: below 0.2V (at 150A);  
 Coil current: ≤ 3.5A.

4. Possible failures

Open circuit of the coil or lug causing failure in the contact point pulling in;  
 Short circuit of the coil, causing failure in the contact point pulling in;  
 Corroded or ablated contact point, causing failure in connection even if it is closed;  
 Contacts that cannot be disconnected caused by excessive current;  
 Open circuit of power circuit (power pole B, coil terminal) , causing the whole vehicle unable to start.

**Control switch (left and right combined switch, gear switch)**

1. Outline drawing






2. Switch function

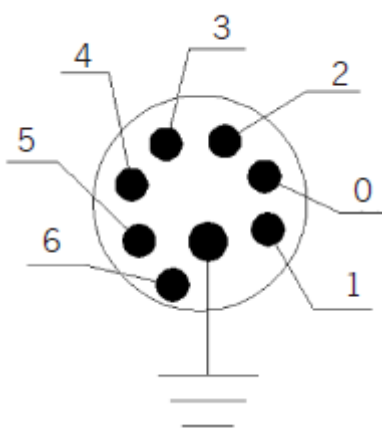
Left combined switch functions

	Orange	Gray	Light blue	Blue and yellow	White	Blue	Red	Light green
←	○ — ○							
→		○ — ○						
☹				○ — ○				
☹				○ — ○ — ○				
⚡							○ — ○	

Right combined switch functions

	Orange	Gray	Light blue	Blue and yellow	White	Blue	Red	Light green
⊗	○ — ○							
↻		○ — ○						

					<input type="radio"/> — <input type="radio"/>		
					<input type="radio"/> — <input type="radio"/> — <input type="radio"/>		
							<input type="radio"/> — <input type="radio"/>

<table border="1" style="width: 100%;"> <tr> <td style="width: 15%;">Pack up</td> <td style="width: 10%; text-align: center;"><input type="radio"/></td> <td style="width: 10%; text-align: center;"><input type="radio"/></td> <td style="width: 65%;">The engine can work</td> </tr> <tr> <td>Lay down</td> <td style="text-align: center;"><input type="radio"/> — <input type="radio"/></td> <td></td> <td>Engine cannot be started or turned off.</td> </tr> </table> <p style="text-align: center;">Side bracket switch functions</p> <p>3. Possible failures  Broken positioning pin of the switch, rotating on the handle tube when in use;  No sense of being in place or weak the sense of being in place;  The button cannot be reset;  Switch failure and open circuit of outgoing line, the switch unable to be connected;  Lead wire breakage, switch dysfunction;  Loose side bracket switch and poor contact;  Abrasion, open circuit or open circuit of side bracket switch lead-out wire;  Switch worn, vibrated, and corroded by water.</p>	Pack up	<input type="radio"/>	<input type="radio"/>	The engine can work	Lay down	<input type="radio"/> — <input type="radio"/>		Engine cannot be started or turned off.	<p style="text-align: center;">Gear switch functions</p>  <p style="text-align: center;"> Gear 1 (Pink)  Gear 0 (Green and red)  Gear 2 (Blue and red)  Gear 3 (Green and black)  Gear 4 (Yellow and red)  Gear 5 (Yellow and white)  Gear 6 (Purple) </p>
Pack up	<input type="radio"/>	<input type="radio"/>	The engine can work						
Lay down	<input type="radio"/> — <input type="radio"/>		Engine cannot be started or turned off.						

### Main fault diagnosis

Failure phenomenon	Possible causes	Solutions:
Starter relay does not pull in: press the start button, do not hear the sound of relay pull in, start motor does not turn.	The battery voltage is too low;	Charge the battery;
	The corresponding fuse is not connected or burnt out;	Connect the fuse or replace it;
	Open circuit of neutral line of gear switch;	Connect or replace the gear switch;
	Side bracket switch open circuit failure;	Connect or replace the side bracket switch.
	Clutch switch open circuit failure;	Connect or replace the clutch switch;
	Open circuit failure of start button;	Connect the circuit or replace the left switch;
	The flameout switch is broken;	Connect the circuit or replace the left switch;
	Starter relay failure;	Replace the starter relay.
Starting motor does not run: there is a sound of relay closing, but the motor does not run.	The relevant lines of the main cable are open circuit.	Repair or replace the main cable.
	The battery voltage is too low;	Charge the battery;
	Loose thick wire connector;	Fasten the connector;
	Motor open circuit failure;	Replace the motor;
	Open circuit between pole contacts of start relay;	Replace the starter relay.
	Motor short circuit failure;	Replace the motor;
Motor speed too low	Engine stuck and motor locked.	Check the engine.
	The battery voltage or capacity is too low;	Charge or replace the battery;
	Poor contact of connector head;	Fasten the connector;
	The output torque of starting motor is not enough;	Replace the motor;
	Excessive engine resistance.	Check the engine.



# Lighting signal system

Overview	Introduction of main components
Circuit diagram	Main fault diagnosis
Parts layout	

## Overview

Lighting signal system is an important guarantee for the safe driving of vehicles, which includes the headlamp lighting system, signal lamp control system, and horn system.

### Headlamp lighting system:

When the vehicle is driving at night, it needs the headlamp to illuminate the road and remind the surrounding vehicles and people of the existence of the vehicle. When driving at medium and high speed, it uses the high beam lamp, and when meeting, it uses the low beam lamp. The low beam lamp is required to be anti glare. In addition, for the dual lamp lighting system, when one high beam fails, the other high beam is not allowed to light up, which needs to be controlled by the headlamp controller.

### Signal lamp control system:

When the vehicle is turning, it is necessary to prompt the surrounding vehicles and people to avoid reasonably by flashing the turn signal; When driving at night, the tail light is needed to indicate the existence of the vehicle and illuminate the license plate number; When braking, you need to light up the brake light to indicate that the vehicle behind is braking and decelerating. The flashing of turning signal lamp is controlled by switch and flasher, and the other lamps are only controlled by switch.

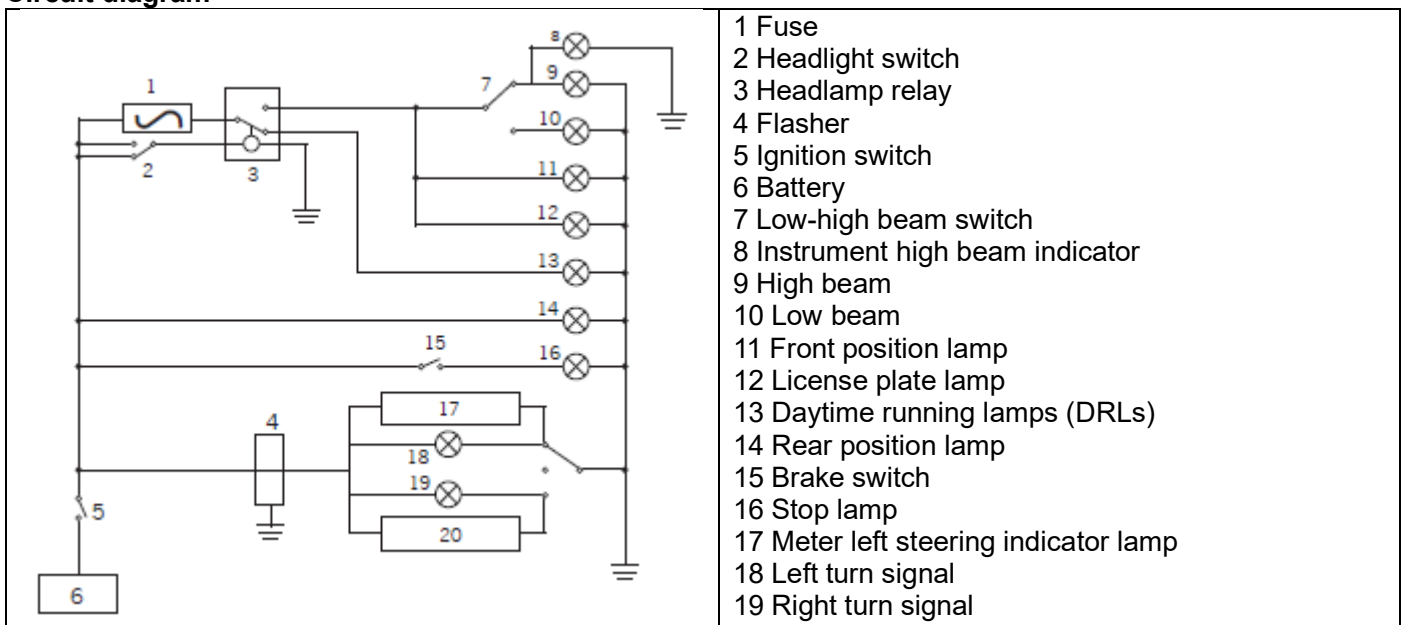
### Horn system:

If other vehicles or pedestrians are obstructing or may hinder the driving of the vehicle, the horn can be used to prompt to ensure driving safety. The operation of the horn is controlled by the horn button.

### Components:

- Headlamp (including daytime running lamp)
- Combined rear position lamp
- Turn signals
- Horn
- Headlamp relay
- Flasher
- Front brake light switch
- Rear brake switch
- Left and right switch combination

### Circuit diagram



## Parts layout



- 1 Combination tail lamp, 2 Main electric harness, 3 Flasher, 4 Right combination switch, 5 Left combination switch,  
6 Headlamps, 7 Front brake switch, 8 Rear right direction indicator lamp, 9 License plate lamp, 10 Rear left direction indicator lamp

## Introduction of main components

### Headlamp

#### 1. Outline drawing



#### 2. Working principle

The headlight beads have LED high beam and LED low beam, the high beam is located on the focal point of the parabolic surface of the headlight reflector, the light is reflected by the reflector and becomes a parallel beam, then scattered through the light glass, which can evenly illuminate the road within 100m ahead; the low beam is located in front of the focal point, the light is reflected and can illuminate the road within 30m ahead, as the light is equipped with a light shield underneath the beads, which can make the light not dazzling.

#### 3. Basic parameters

At DC13.5 voltage

High beam:  $25.7W \pm 10\%$ ; Low beam:  $12.8W \pm 10\%$ ;

Position lamp:  $0.67W \pm 10\%$ ; Daytime running lamps (DRLs)  $8.7W \pm 10\%$ .

#### 4. Possible failures

Lamp bead failure;  
Water or dust in the lamp;  
Loose PCB welding;  
Smearred glass slide of lamp shell;  
Lamp line open circuit or short circuit;  
The mirror deformed at high temperature;  
Light shield broken or loose; lights deflect.

#### 5. Lighting adjustment

Up-and-down adjustment: Loosen the fastening screws on both sides of the headlight, turn headlamps, and adjust headlamps light.

Left and right adjustment: the car can not be adjusted left and right.



### Combined rear position lamp

#### 1. Outline drawing



#### 2. Working principle

The combined rear position lamp integrates the functions of tail lamp and brake lamp. The light of the tail lamp and brake lamp is red, the tail lamp/brake lamp bead is a double filament bead, the low power bead is used for the tail lamp, and the high-power bead is used for the brake lamp.

#### 3. Basic parameters

Rear position lamp bead specification: LED 2.2W;

Brake light bead specification: LED5.8W.

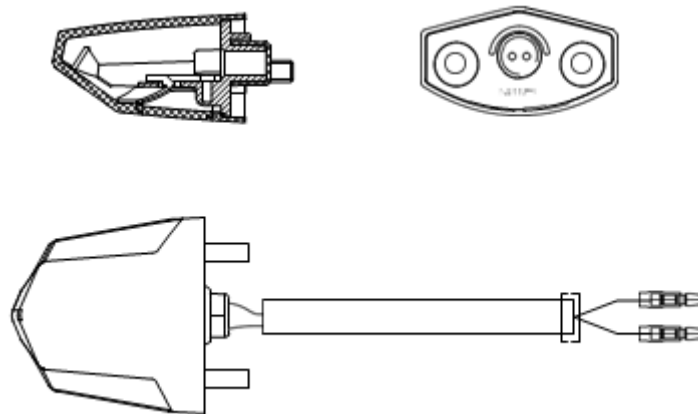
#### 4. Possible failures

Lamp bead failure;  
Loose lamp holder;  
Lamp line open circuit or short circuit;  
Water or dust in the lamp;

Scratched or damaged lamp glass;  
The reflection block falls off.

## License plate signal lamp

### 1. Outline drawing



### 2. Working principle

The light of the license plate lamp is white, and the light of the license plate lamp is formed by the reflection of the reflecting block through the transparent plexiglass below.

### 3. Basic parameters

Specification of license lamp bead: 0.257W;

### 4. Possible failures

Lamp bead failure;  
Loose circuit board;  
Lamp line open circuit or short circuit;  
Water or dust in the lamp;  
Scratched or damaged lamp glass;  
The reflection block falls off.

## Front turn signal lamp

### 1. Outline drawing



### 2. Working principle

The front turn signal lamp is composed of lamp glass, lamp shell, reflector, lamp holder, handle and lamp bead. The light emitted by the lamp beads is reflected into concentrated light by the reflector, and then scattered into uniform and soft orange light by the lamp glass.

### 3. Basic parameters

Specification of front turn signal lamp bead: LED0.81W.

### 4. Possible failures

Lamp bead failure;  
Loose lamp holder;  
Lamp line open circuit or short circuit;



Water or dust in the lamp;  
Scratched or damaged lamp glass;  
Loose or broken handle.

## Rear turn signal lamp

### 1. Outline drawing



### 2. Working principle

The rear turn signal lamp is composed of lamp glass, lamp shell, reflector, lamp holder, handle and lamp bead. The light emitted by the lamp beads is reflected into concentrated light by the reflector, and then scattered into uniform and soft orange light by the lamp glass.

### 3. Basic parameters

Specification of front turn signal lamp bead: LED0.81W.

### 4. Possible failures

Lamp bead failure;  
Loose lamp holder;  
Lamp line open circuit or short circuit;  
Water or dust in the lamp;  
Scratched or damaged lamp glass;  
Loose or broken handle.

## Flasher

### 1. Outline drawing



### 2. Working principle

The electronic flasher controls the on-off of the high-power FET through an IC chip, and outputs a certain frequency voltage to make the turn signal light up. If a turn signal is disconnected, the flash frequency will be significantly increased. The flasher also has the function of short-circuit self-protection, and beeps when it is protected.

### 3. Basic parameters

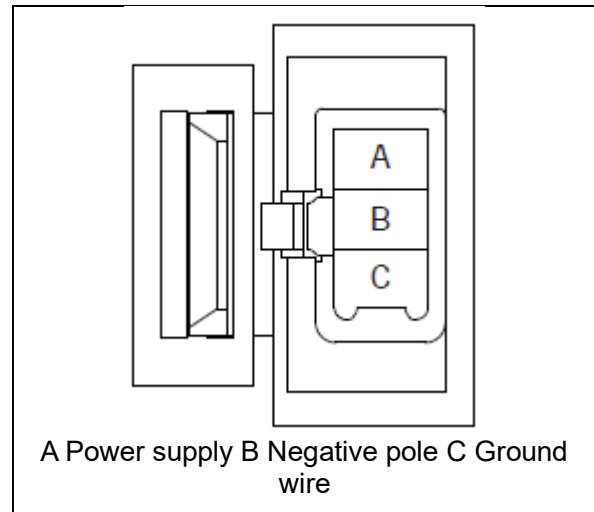
Working voltage: 9-15V, working load:  $0.53W \times 2 \pm 0.05W$   
Flash frequency of missing light:  $(90 \pm 30)$  times/min.

#### 4. Pin function

The turn signal cannot be turned on;  
The interference triggers the relay by mistake ;  
The turn signal lamp cannot flash;  
Short circuit protection is triggered by interference;  
The relay fails ;

#### 5. Possible failures

The turn signal cannot be turned on;  
The interference triggers the relay by mistake ;  
The turn signal lamp cannot flash;  
Short circuit protection is triggered by interference;  
The relay fails ;  
When one turn signal is disconnected, the flash frequency has no obvious change;  
The pin is corroded and cannot be connected.



### Front brake light switch

#### 1. Outline drawing



#### 2. Working principle

When braking, hold the brake handle tightly, and the contact contacts with the conductive elastic sheet under the action of spring force, so as to connect the circuit, and the brake light is on. Release the brake handle, press the brake handle against the switch guide rod, compress the spring, make the contact leave the conductive spring, the circuit is disconnected, and the brake light goes out.

#### 3. Basic parameters

The opening stroke of the switch is 2mm and the full stroke is 4mm.

#### 4. Possible failures

The contact and shrapnel are rusted and in poor contact;  
The switch is stuck and the guide rod can not act;  
The leading out insert is broken or rusted.

### Rear brake switch

#### 1. Outline drawing



## 2. Working principle

The pull rod of the rear brake light switch is connected with the brake pedal through the spring. When the brake pedal is pressed, the brake pull rod moves downward, and the contact also moves down. It contacts with the two-contact shrapnel at the same time. When the circuit is connected, the brake light is on; When the brake pedal is released, the brake pull rod moves upward under the elastic force of the return spring, so that the contact is separated from the two-contact shrapnel, the circuit is disconnected, and the brake light goes out.

## 3. Basic parameters

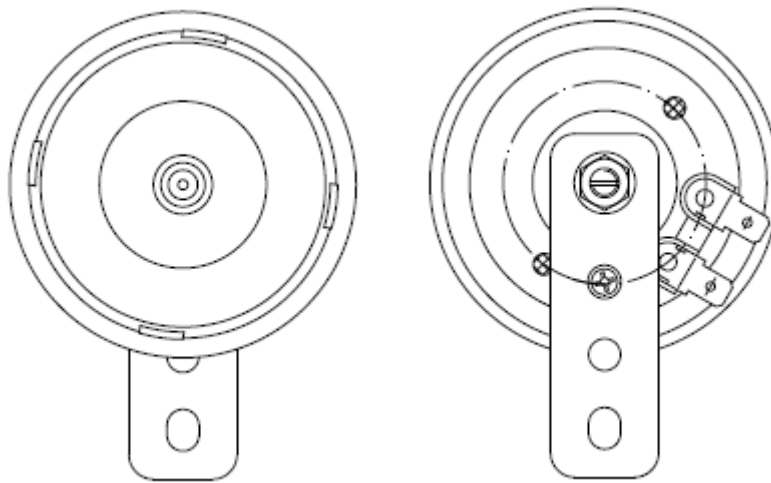
The on stroke of the switch is 2.5mm and the full stroke is 6mm.

## 4. Possible failures

The contact and shrapnel are rusted and in poor contact;  
The switch is stuck, and the pull rod cannot move;  
Open circuit or short circuit of outgoing line.

# Horn

## 1. Outline drawing



## 2. Working principle

Working current circuit of horn: positive lug → horn coil → contact → negative lug. After the current passes through the horn coil, the magnetic field generates suction on the armature, which makes the bass diaphragm and the treble diaphragm move at the same time. When the contact is opened, the current is interrupted, and the electromagnetic force disappears. The diaphragm returns by its own elastic force, the contact is closed again, and the circuit is connected again. The contact clearance can be adjusted by screw to change the vibration frequency of diaphragm, so as to change the sound level.

## 3. Basic parameters

Voltage: DC12V, current: 1.5A; Sound pressure level: 105dB

## 4. Possible failures

Contact ablation;  
The contact clearance is too large or too small (can be adjusted and repaired);  
Coil short circuit or short circuit;  
The leading out insert is broken or rusted

## 5. Horn adjustment

After the horn works for a long time, the contact arm may deform, causing the contact gap to be too large or too small, making the volume of the horn too small or unable to make sound. At this time, it can be repaired by adjusting the screw. Now loosen the lock nut, turn the screw clockwise or anticlockwise, turn on the power supply of the horn at the same time, adjust until the sound is loudest, and finally lock the nut.

## Main fault diagnosis

Failure phenomenon	Possible causes	Solutions:
--------------------	-----------------	------------

Headlamp does not light up: The high beam lamp cannot be turned on; The low beam lamp cannot be turned on; None of them can work.	Engine not started;	Start the engine;
	The corresponding fuse is not connected or burnt out:	Connect the fuse or replace it;
	The corresponding switch fails;	Repair or replace the switch;
	Headlamp relay failure;	Replace the headlamp relay;
	Lamp bead failure;	Replace lamp beads;
	Poor connection on the line;	Re plug;
	The relevant lines of the main cable are open circuit.	Repair or replace the main cable.
The headlamp does not turn on reliably	Poor contact of fuse, lamp bead or circuit;	Re connect the poor contact area;
Position light not on: Front position light not on: Tail light does not work: None of them can be lit.	The corresponding fuse is not connected or burnt out:	Connect the fuse or replace it;
	Lamp bead failure;	Replace lamp beads;
	Poor connection on the line;	Re plug;
	The relevant lines of the main cable are open circuit.	Repair or replace the main cable.
Turn signal lamp cannot be turned on: front turn signal lamp cannot be turned on; The rear turn signal lamp cannot be turned on; Can't light up.	The battery voltage is too low;	Charge the battery;
	The corresponding fuse is not connected or burnt out:	Connect the fuse or replace it;
	The left turn signal switch fails;	Repair or replace the left switch;
	Failure of right turn signal switch;	Repair or replace the right switch;
	Flasher failure;	Replace flasher
	Lamp bead failure;	Replace lamp beads;
	Poor connection on the line;	Re plug;
	The relevant lines of the main cable are open circuit.	Repair or replace the main cable.
Brake light does not light up	The corresponding fuse is not connected or burnt out:	Connect the fuse or replace it;
	Failure of front brake light switch;	Replace the front brake light switch on;
	Failure of rear brake light switch;	Adjust and replace the rear brake light on;
	Lamp bead failure;	Replace lamp beads;
	Line fault.	Inspection and maintenance.
The horn does not sound.	The corresponding fuse is not connected or burnt out:	Connect the fuse or replace it;
	Failure of horn button;	Repair or replace the left switch;
	Horn failure;	Adjust or replace the horn;
	Poor connection on the line;	Re plug;
	The relevant lines of the main cable are open circuit.	Repair or replace the main cable.



# Information display system

Overview	Introduction of main components
Circuit diagram	Main fault diagnosis
Parts layout	

## Overview

The information display system displays the static and dynamic information of the whole vehicle through the instrument panel, and provides it to the driver to guide the driver to operate safely.

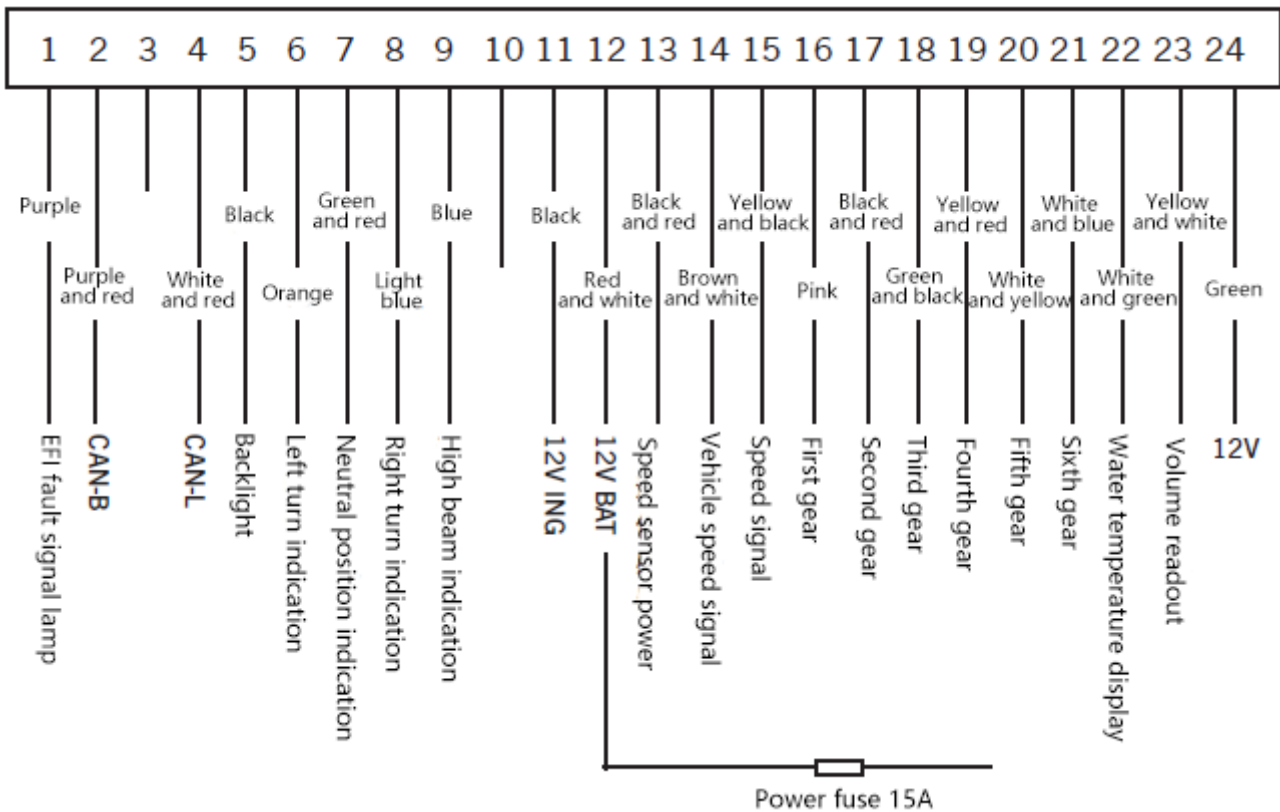
The displayed vehicle information includes the following contents: vehicle speed, engine speed, oil level, gear, voltage alarm, water temperature alarm, steering indication, high beam indication, accumulated/subtotal mileage/time, clock, EMS fault code.

The signal transmission of the display system is all electronic signal, and the instrument is also all electronic instrument.

The components of the system include:

- Instrument assembly
- Speed sensor
- Oil level sensor
- Gear switch
- Signal switch
- ECU

## System schematic diagram



## Parts layout



1 Rear right direction indicator lamp, 2 Rear license plate lamp, 3 Rear left direction indicator lamp, 4 Combination tail lamp, 5 ECU, 6 Right combination switch, 7 Left combination switch, 8 Meter, 9 Headlamps

### Introduction of main components

#### Instrument assembly

##### 1. Outline drawing



##### 2. Working principle

All electronic instruments (also known as digital instruments), the first input is all electronic signals (including digital signals and analog signals), through circuit processing, all converted into digital signals, through the CPU control output, drive stepper motor pointer, LCD and LED, display the information.

##### 3. Pin menu

Pin number	Function	Pin number	Function
1	L-TURN	13	
2	FULE(Fuel signal)	14	6th gear

3	Engine coolant temperature	15	5th gear
4	Speed (vehicle speed signal)	16	4th gear
5	TACHO (speed signal)	17	3rd gear
6	Speed sensor power +5V	18	2nd gear
7	N<->(neutral)	19	1st gear
8	YG+(high beam)	20	EFI fault signal
9		21	ABS (suspended light)
10		22	R-TURN
11		23	IGN<+>(positive pole of power supply)
12	BATT<-> (battery negative)	24	BATT<+>(battery positive)

#### 4. Basic functions

The display contents of the instrument include: vehicle speed, steering indication, high beam indication, neutral indication, oil level alarm indication, engine temperature alarm indication, gear display, oil level display, cumulative mileage display and subtotal mileage display.

#### 5. Possible failures

Some functions cannot be displayed correctly;

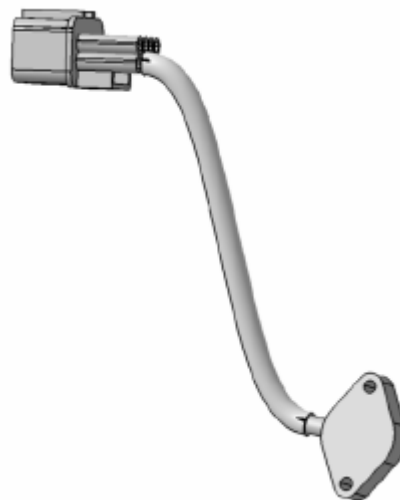
The operation button can't adjust the clock and switch the mode; Water inflow to the instrument.

Mechanical vibration fracture of shell;

The surface is discolored or scratched.

### Gear switch

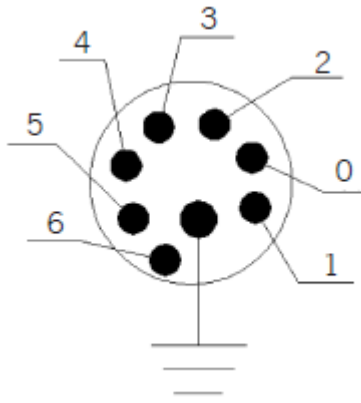
#### 1. Outline drawing



#### 2. Working principle

The rotation of the speed change drum drives the moving contact to rotate, and the moving contact is pressed and contacted with the end contact of the gear switch under the action of the spring force. There are 7 contacts on the end face of the gear switch corresponding to the gears of the shift drum: 1st - Neutral - 2nd - 3rd - 4th - 5th - 6th, leading to 7 color wires. When the speed change drum rotates, the corresponding color line is grounded.

#### 3. Position map of gear color line



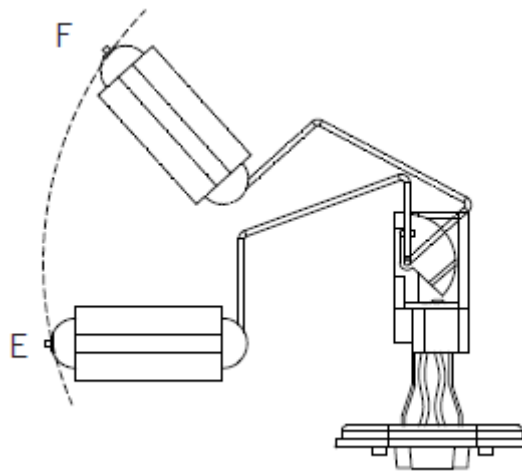
1st gear (pink), 0 gear (green and red), 2nd gear (blue and red), 3rd gear (green and black), 4th gear (yellow and red), 5th gear (yellow and white), 6th gear (purple)

#### 4. Possible failures

- Contact wear to poor contact;
- The gear switch vibrates or the press fit is broken;
- The gear switch is loose;
- Poor contact of connector;
- Open circuit or short circuit of outgoing line.

### Oil level sensor

#### 1. Outline drawing



F High oil level  
E Low oil level

#### 2. Working principle

The oil level sensor consists of float, floating rod, magnetic core, lead wire, etc. The float, floating rod and magnetic core form a variable resistor. The height of oil level changes, which drives the float up and down. The position of variable resistor changes, and the corresponding resistance value is output.

#### 3. Corresponding relationship between instrument display scale and oil level sensor resistance

Fuel display segment code	Input cathode ( $\Omega$ )	Error value
1 grid	$88 \leq R < 95$	Note: 1 grid: $73 \leq R \leq 94$ , two fuel alarm icons are always on; Flashing of 1 grid: $R \geq 94$ , two fuel alarm icons and 1 grid of fuel all flash, frequency 1HZ
2 grids	$72 \leq R < 88$	
3 grids	$57 \leq R < 72$	
4 grids	$34 \leq R < 57$	
5 grids	$14 \leq R < 34$	
6 grids	$R < 14$	

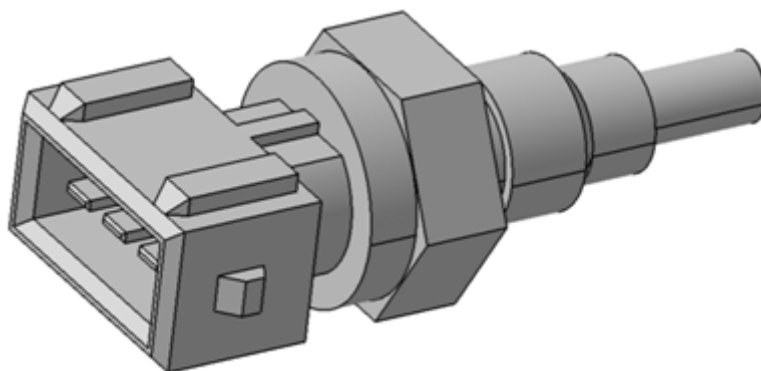
#### 4. Possible failures



Float falling off;  
 Poor contact between contact piece and thick film circuit board;  
 The stent was broken;  
 The circuit board is damaged;  
 The outgoing line falls off.

## Water temperature sensor

### 1. Outline drawing



### 2. Working principle

Water temperature sensor: after the engine starts, the temperature in the water tank rises, and the resistance value of the water temperature sensor reaches the set value. At this time, LCE receives the signal, processes it and sends it to the instrument, which displays the water temperature scale to remind the driver.

### 3. Corresponding relationship between instrument display scale and resistance value of water temperature sensor

Temperature (°C)	Standard resistance ( Ω )
-20	6149
-10	3198
0	1718
10	976
20	583
30	363.3
40	233.3
50	154
60	107.4
70	72.2
80	52
90	3.67
100	27
110	21
120	16

## Main fault diagnosis

Failure phenomenon	Possible causes	Solutions:
Speed indication fault: the speed number is not displayed; Indicates that the vehicle speed deviation is large.	The distance between speed sensor and signal panel is too large;	Reduce the distance to 2mm;
	Vehicle speed sensor failure;	Replace the speed sensor;
	Signal panel failure;	Replace the signal panel;
	Instrument failure;	Replace the instrument;
With speed and without mileage increase indication	Poor wiring, open circuit or short circuit.	Replug or repair.
	Instrument failure.	Replace the instrument.
Engine speed indication fault	Poor wiring or open circuit;	Re-plug or repair;
	Instrument failure;	Replace the instrument;

	ECU failure.	Replace ECU.
Oil level indication fault: no indication with oil; indication without oil.	Fuel sensor failure or float stuck;	Replace the fuel sensor;
	Instrument failure;	Replace the instrument;
	Poor wiring, open circuit or short circuit.	Replug or repair.
Gear indication fault: no gear indication; Gear indication error.	The moving contact spring fails;	Replace the spring;
	The moving contact or gear switch contact is worn;	Change the moving contact or gear switch;
	Gear switch failure;	Change the gear switch;
	Instrument failure;	Replace the instrument;
	Poor wiring, open circuit or short circuit.	Replug or repair.
The water temperature alarm light is always on	Poor wiring or open circuit;	Re-plug or repair;
	Instrument failure;	Replace the instrument;
	ECU failure.	Replace ECU.
The voltage alarm lamp gives false alarm, and the voltage alarm lamp cannot give alarm	Poor wiring or open circuit;	Re-plug or repair;
	Instrument failure.	Instrument failure.
Instrument backlight does not light up	Poor wiring or open circuit;	Re-plug or repair;
	Instrument failure;	Replace the instrument;
The instrument cannot display the information that ECU should display information	Poor wiring or open circuit;	Re-plug or repair;
	Instrument failure;	Replace the instrument;
	ECU failure.	Replace ECU.
The direction indicator cannot be turned on and the high beam indicator cannot be turned on	Poor wiring or open circuit;	Re-plug or repair;
	Instrument failure.	Replace the instrument.
Clock display fault: No display, no adjustment or large error.	Instrument failure.	Replace the instrument.
LCD cannot switch mode	Instrument failure.	Replace the instrument.
The function of the instrument cannot be adjusted	Instrument failure.	Replace the instrument.

# Engine management system

## Overview

The engine management system adopts the closed-loop EFI system. By controlling the injection quantity, it can effectively control the air-fuel ratio of the mixture, and make the air-fuel ratio of the engine reach the optimal value under various working conditions, so as to improve the power, reduce the fuel consumption, reduce the exhaust pollution, improve the driving performance, low temperature starting performance and idle performance.

The control of closed-loop EFI system includes: fuel quantitative control, ignition timing control, ignition closing angle control, etc. Fuel quantity control is the most important function of the system, which includes  $\lambda$  Closed loop control, start control, post start control, warm-up control, idle speed control, part load control, full load control, acceleration and deceleration control, overspeed oil cut-off control and deceleration oil cut-off control.

The basic components of the system are as follows

### 1. Sensor

- Three in one sensor (air density information, load information, load range information, acceleration and deceleration information)
- Engine temperature sensor (engine temperature information)
- Muffler oxygen sensor (information of excess air coefficient greater than 1 or less than 1)
- Engine speed sensor (speed information, crankshaft position)

### 2. Actuator:

- Fuel pump
- Fuel injector (fuel supply)
- Ignition coil
- High voltage connecting line
- Spark plug (ignition)
- Throttle, idle stepper motor (intake)

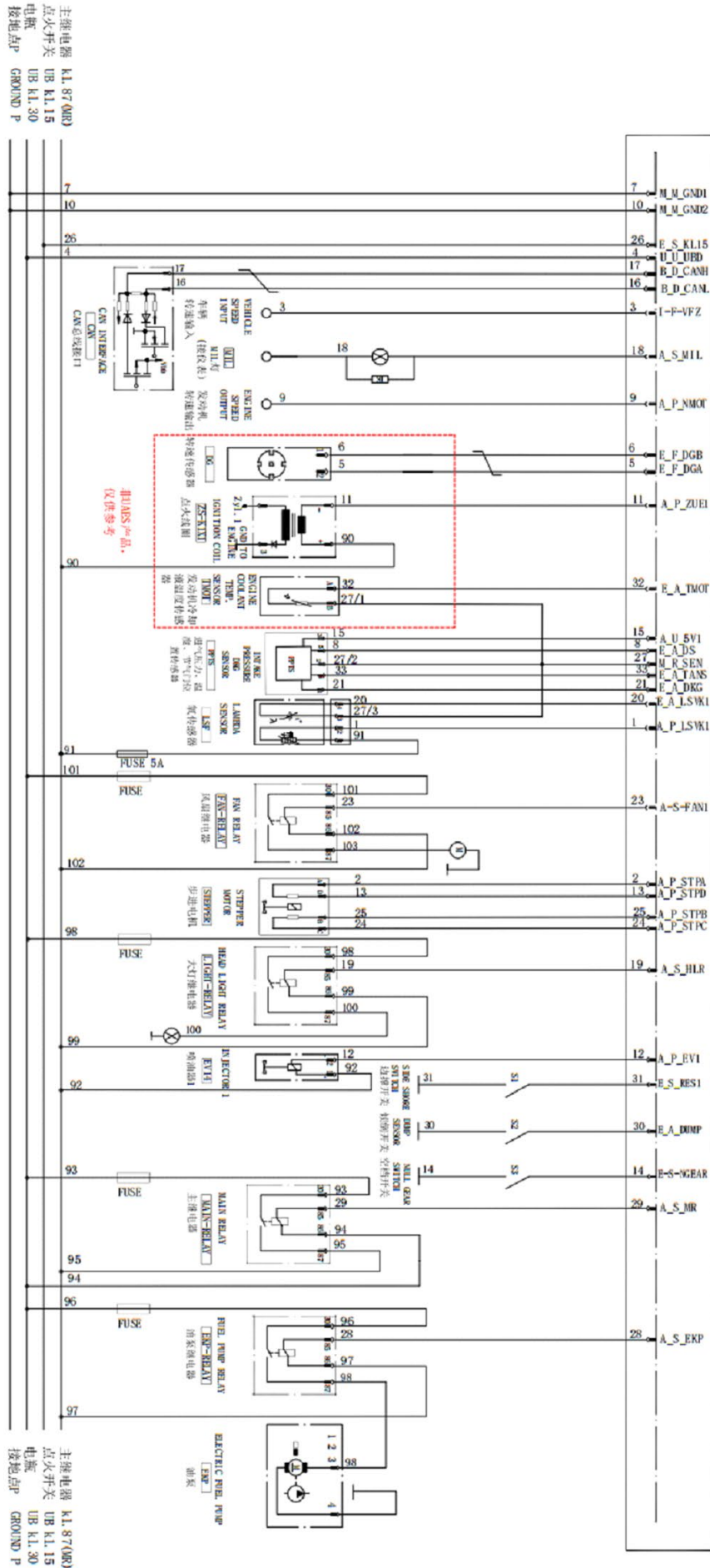
### 3. Electronic control unit:

- ECU

## Maintenance precautions

1. The EFI system fault diagnosis can be carried out through the fault indicator light on the vehicle instrument, and the special diagnostic instrument can also be used to communicate with the vehicle ECU to carry out EFI system fault diagnosis and read the fault code.
2. Turn on the key switch for fault diagnosis.
3. If the throttle position is adjusted, it is necessary to turn off the key switch and restart the engine for idle position self-learning.
4. In case of sensor failure, ECU will limp and continue to drive by default, and the user is requested to drive the vehicle to the special repair shop in time for maintenance; If the actuator fails, the ECU will not be able to control the vehicle normally. Please contact the special repair shop immediately for maintenance.

# System schematic diagram



主继电器 K1.87(OR)  
 点火开关 UB K1.15  
 电瓶 UB K1.30  
 接地点 P GROUND P

主继电器 K1.87(OR)  
 点火开关 UB K1.15  
 电瓶 UB K1.30  
 接地点 P GROUND P



## Parts layout



1 Instrument, 2 Right combination switch, 3 Left combination switch, 4 Battery, 5 ECU, 6 Combination tail lamp, 7 Rear registration plate lamp, 8 Rear left direction indicator lamp, 9 Sensor, 10 Three in one sensor, 11 Water temperature sensor

## Introduction of main components

### Three in one sensor

#### 1. Outline drawing



1 Inlet pressure signal, 2 5V reference voltage, 3 5V reference voltage grounding, 4 Throttle plate position signal, 5 Inlet temperature signal

#### 2. Working principle

The three in one sensor is the function of the intake manifold absolute pressure sensor, the function of the intake manifold absolute temperature sensor and the throttle opening function are integrated into one whole.

The absolute pressure sensor of intake manifold is composed of pressure conversion element (elastic diaphragm + strain resistance) and signal conditioning circuit which amplifies the output signal of conversion element. One side of the pressure conversion element is the vacuum chamber, and the other side leads in the intake manifold pressure, so the higher the absolute pressure in the intake manifold, the greater the deformation of the diaphragm, and the deformation is proportional to the pressure. The resistance of the strain resistor attached to the elastic diaphragm changes in direct proportion to its deformation. Using this principle, the pressure change in the intake manifold can be converted into an electrical signal.

The core temperature sensor of engine intake air temperature sensor is composed of semiconductor thermistor with negative temperature coefficient characteristic (NTC). The temperature sensor usually needs a special measuring circuit to test its resistance characteristics. The output characteristic of the semiconductor

thermistor with negative temperature coefficient is that the resistance of the thermistor is inversely proportional to the temperature, that is, when the temperature increases, the output resistance of the thermistor decreases; When the temperature decreases, the output resistance of the thermistor increases. The throttle sensor is an angle sensor with linear output. Its essence is an angular displacement sliding rheostat, which is composed of two arc-shaped sliding contact resistors and two sliding contact arms. The rotating shaft of the sliding arm is connected with the throttle shaft on the same axis. Add 5V supply voltage  $U_S$  to both ends of sliding contact resistance. When the throttle valve rotates, the sliding arm rotates with it and moves on the sliding resistance at the same time, and the potential up of the contact is led out as the output voltage, so that the opening angle signal of the throttle valve can be converted into the voltage signal.

### 3. Basic parameters

Pressure test scope: 10 ~ 115kPa;  
 pressure will cause permanent damage)

temperature scope: - 40°C ~ 125°C

Working voltage: 5V ± 0.25VDC;

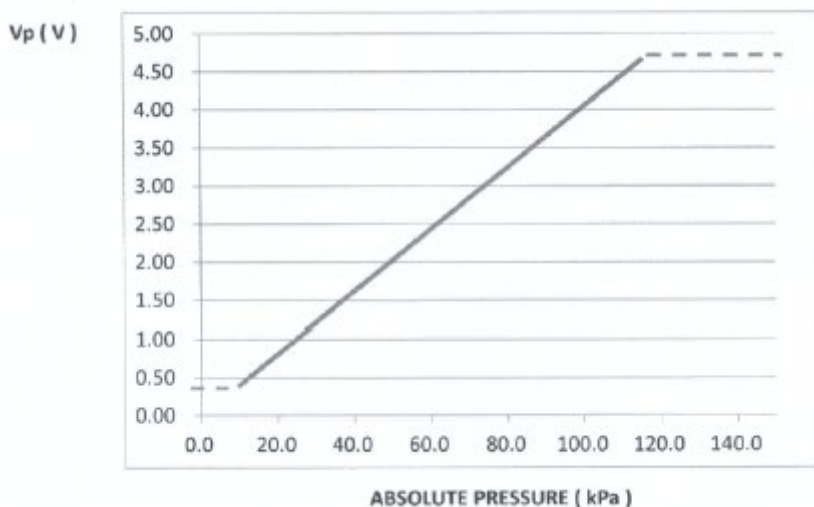
Limit pressure: 655KPa (exceeding this

Working

Storage temperature scope: - 40°C ~ 150°C

Maximum working current: <10mADC

Relationship between intake pressure and output voltage:



The characteristic parameters of thermistor when the intake air temperature sensor is unloaded are shown in the table below:

Temp.(°C)	Resistance(Ω)			Temp. Coef.(%/°C)	Temp. Tolerance(°C)		Audit tolerance @T± 1K Resistance(Ω)	
	MIN.	CENTER	MAX.		MIN.	MAX.	MIN.	MAX.
-40	37610	41690	45770	-5.61	-1.74	1.74	34220	46540
-35	28730	31620	34500	-5.45	-1.67	1.67	26160	34900
-30	22120	24170	26220	-5.30	-1.61	1.61	20240	26440
-25	17150	18620	20090	-5.14	-1.54	1.54	15800	20280
-20	13390	14450	15510	-5.00	-1.47	1.47	12380	15620
-15	10530	11300	12060	-4.85	-1.40	1.40	9760	12120
-10	8341	8896	9451	-4.71	-1.32	1.32	7832	9552
-5	6649	7053	7456	-4.58	-1.25	1.25	6298	7562
0	5335	5629	5923	-4.44	-1.18	1.18	5090	6026
5	4307	4522	4736	-4.32	-1.10	1.10	4124	4802
10	3498	3655	3812	-4.19	-1.02	1.02	3356	3864
15	2858	2972	3087	-4.08	-0.94	0.94	2766	3134
20	2348	2431	2514	-3.96	-0.86	0.86	2286	2558
25	1940	2000	2060	-3.85	-0.78	0.78	1900	2100
30	1598	1654	1711	-3.74	-0.91	0.91	1566	1752
35	1323	1375	1428	-3.64	-1.05	1.05	1296	1456
40	1100	1149	1198	-3.55	-1.19	1.19	1070	1226
45	920	965	1009	-3.45	-1.34	1.34	889	1028
50	773	813	854	-3.36	-1.49	1.49	742	867
55	652	689	726	-3.28	-1.64	1.64	621	735
60	552	586	620	-3.19	-1.79	1.79	527	631
65	470	500	531	-3.11	-1.95	1.95	451	543
70	401	429	457	-3.04	-2.12	2.12	386	470
75	344	369	394	-2.96	-2.28	2.28	329	404
80	297	319	342	-2.89	-2.45	2.45	283	350
85	257	277	297	-2.82	-2.62	2.62	245	303
90	222	241	259	-2.75	-2.80	2.80	212	267
95	193	210	227	-2.68	-2.98	2.98	187	237
100	169	184	199	-2.62	-3.17	3.17	166	210

Throttle position opening

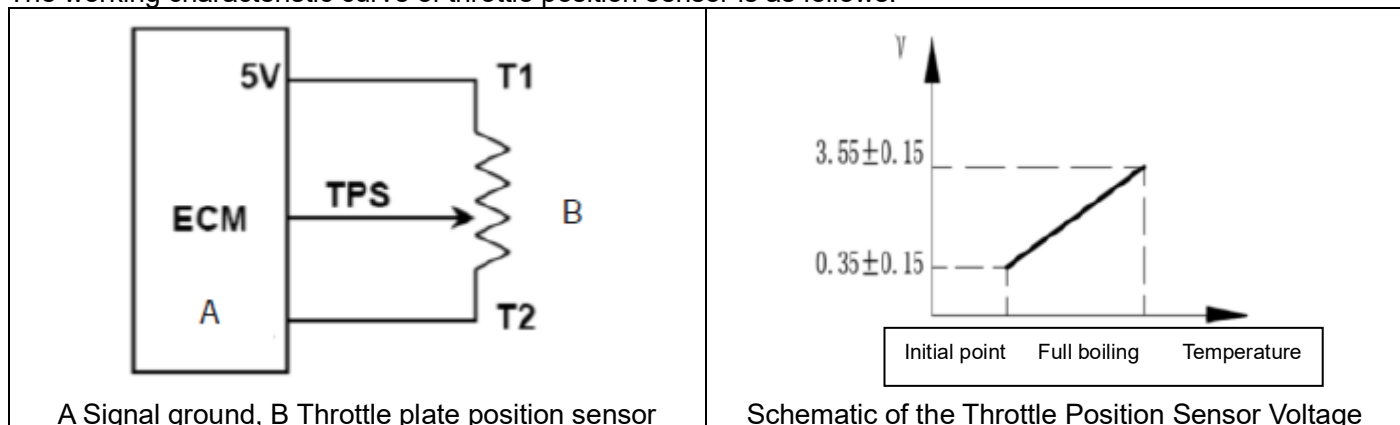
Measurement range: 7% ~ 93% (from idle to full open)

Throttle position sensor reference voltage: 5V ± 0.1V

When the throttle is fully closed, the normal output of the reference voltage is 12% ± 5%

When the throttle is fully open, the normal output of the reference voltage is between 83% and 93%

The working characteristic curve of throttle position sensor is as follows:



#### 4. Possible failures

The sensor probe is blocked by foreign matters;

Air leakage failure of sensor connection;

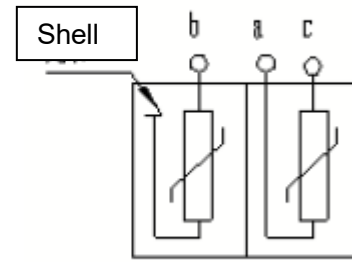
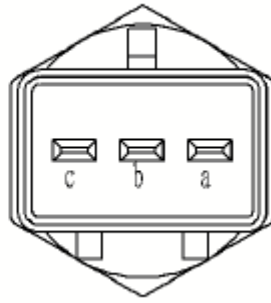
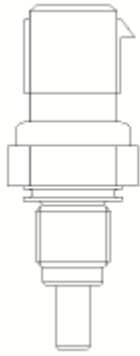
Sensor short circuit or open circuit failure;

The sensor fails to feed water;

Mechanical failure of sensor.

### Engine temperature sensor

#### 1. Outline drawing



## 2. Working principle

The engine temperature sensor is a negative temperature coefficient (NTC) thermistor. By using the temperature sensitive characteristics of the thermistor, the change of the ambient temperature is converted into the change of the resistance value of the thermistor, which is then converted into a voltage signal through a voltage divider circuit and output to the ECU. The thermistor value decreases with the increase of coolant temperature, but it is not linear.

## 3. Basic parameters

The temperature curve R-T table of engine temperature sensor is as follows:

## 4. Possible failures

The resistance is not accurate;  
Sensor open circuit or short circuit.

## 3. Corresponding relationship between instrument display scale and resistance value of water temperature sensor

Display grid number of water	Input resistance	
Display 1 grid	$363.3 \leq R < 1718$	Temperature alarm mode: 5 grids, the temperature alarm is always on; 6 grids flashing, the temperature icon and 6 grids flash at the same time, with the frequency of 1HZ
Display 2 grids	$154 \leq R < 363.3$	
Display 3 grids	$72.2 \leq R < 154$	
Display 4 grids	$36.7 \leq R < 72.2$	
Display 5 grids	$21 \leq R < 36.7$	
Display 6 grids	$R < 21$	
Do not display	$R \geq 1718 \Omega$	



Engine temperature sensor temperature curve R-T table

ECU通道电阻 (a-c) ECU passageway resistance				仪表通道电阻 (b-壳体) Instrument passageway resistance (b housing)	
温度 Temperature (°C)	标准电阻 Standard resistance (Ω)	电阻精度 Resistance precision (±%)	温度精度 Temperature precision (±?)	温度 Temperature (°C)	标准电阻 Standard resistance (Ω)
-40	100, 865	4.87	0.7	45	265.0-323.0
-35	72, 437	4.64	0.7	50	216.0-264.0
-30	52, 594	4.43	0.7	54	185.0-226.0
-25	38, 583	4.21	0.7	60	148.5-180.5
-20	28, 582	4.00	0.7	80 (*)	74.6-90.6
-15	21, 371	3.8	0.7	90	53.5-66.5
-10	16, 120	3.60	0.6	100	40.6-48.6
-5	12, 261	3.40	0.6	108	34.0-38.0
0	9, 399	3.21	0.6	110	32.0-36.0
5	7, 263	3.06	0.6	113	30.0-34.0
10	5, 658	2.92	0.6	115(*)	25.7-31.7
15	4, 441	2.78	0.6	120	23.0-27.0
20	3, 511	2.64	0.6	125	20.5-24.5
25(*)	2, 795	2.50	0.6		
30	2, 240	2.45	0.6		
35	1, 806	2.40	0.6		
40	1, 465	2.36	0.6		
45	1, 195	2.31	0.6		
50	980	2.27	0.6		
55	809	2.23	0.6		
60	671	2.19	0.6		
65	559	2.15	0.6		
70	469	2.11	0.6		
75	395	2.07	0.6		
80	334	2.04	0.6		
85 (*)	283	2.00	0.6		
90	241.8	2.10	0.7		
95	207.1	2.21	0.7		
100	178.0	2.31	0.8		
105	153.6	2.42	0.8		
110	133.1	2.52	0.9		
115	115.7	2.61	0.9		
120	100.9	2.68	1.0		
125	88.3	2.75	1.1		
130	77.5	2.80	1.1		
135	68.3	2.84	1.2		
140	60.3	2.87	1.2		
145	53.4	2.89	1.2		
150	47.5	2.90	1.2		

# Oxygen Sensor

## 1. Outline drawing and pin definition



	<table border="1"> <thead> <tr> <th colspan="3">Oxygen sensor pin definition</th> </tr> <tr> <th>No.</th> <th>Corresponding cable color</th> <th>use</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Red</td> <td>Heating positive</td> </tr> <tr> <td>2</td> <td>White</td> <td>Heating negative</td> </tr> <tr> <td>3</td> <td>Gray</td> <td>Signal ground</td> </tr> <tr> <td>4</td> <td>Black</td> <td>Oxygen sensor signal</td> </tr> </tbody> </table>	Oxygen sensor pin definition			No.	Corresponding cable color	use	1	Red	Heating positive	2	White	Heating negative	3	Gray	Signal ground	4	Black	Oxygen sensor signal
Oxygen sensor pin definition																			
No.	Corresponding cable color	use																	
1	Red	Heating positive																	
2	White	Heating negative																	
3	Gray	Signal ground																	
4	Black	Oxygen sensor signal																	

## 2. Working principle

OSMa oxygen sensor is based on multilayer ceramic elements with flat plate structure, in which zirconia layer is the core element. The working principle of zirconia element is equivalent to a simple solid primary cell. According to the electrochemical principle, there will be potential difference between the two electrodes due to the difference of oxygen ion concentration. When the air-fuel ratio of the engine is lean, the oxygen ion concentration in the exhaust gas is relatively high, the oxygen ion concentration difference between the inner and outer electrodes is small, that is, the potential difference is small, and the output voltage signal of the oxygen sensor is close to 0V; On the contrary, when the air-fuel ratio is rich, the oxygen ion concentration in the exhaust gas is relatively low, the oxygen ion concentration difference between the inner and outer electrodes is large, that is, the potential difference is large, and the output voltage of the sensor is close to 1V.

## 3. Basic parameters

Exhaust temperature 450 °C, characteristic parameters of oxygen sensor:

Concentrated gas mixture (  $\lambda < 1$  ) The output voltage of the oxygen sensor is greater than or equal to 750mV when the temperature is high;

Lean mixture (  $\lambda > 1$  ) The output voltage of the oxygen sensor is less than or equal to 120mV;

The concentration and dilution response time is less than 80 mS;

The response time of dilute concentration is less than 65mS.

13.5V, heater power at 450 °C exhaust: 7.0

13.5 V, 450 °C exhaust heater current: 0.52A±0.10A

Nominal voltage of oxygen sensor: 13.5V

Maximum operating voltage of oxygen sensor: 18V

Minimum operating voltage of oxygen sensor: 10V

Limit voltage of oxygen sensor (at 21 °C, <60s): 21V

## 4. Possible failures

Heating element failure;

Sensor element failure;

The ceramic tube was broken;

Heating circuit short circuit or open circuit;

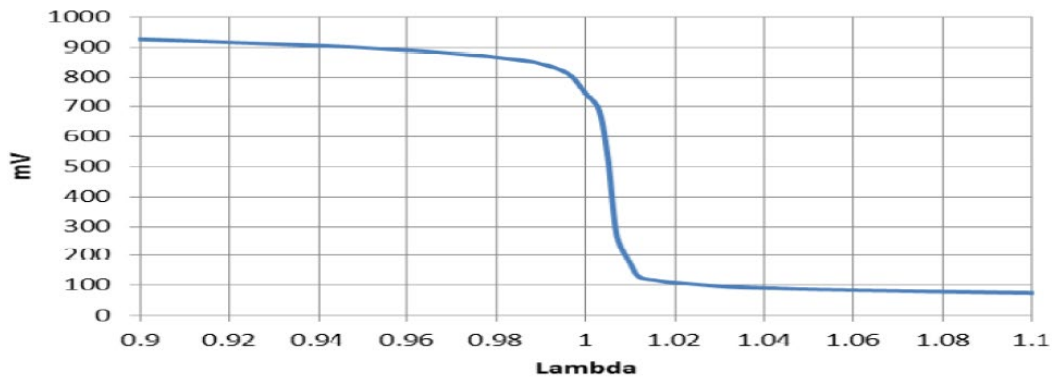
Sensor circuit short circuit or open circuit.

Exhaust temperature 850 °C, characteristic parameters of oxygen sensor:

		250 hours of durability	650 hours of durability
Exhaust temperature	850°C	850°C	850°C

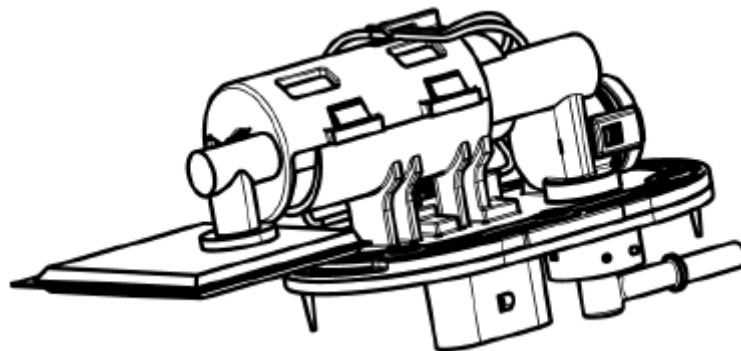
When $\lambda=0.97$ (CO=1%) Sensing element voltage (mV)	$\geq 720$	$\geq 700$	$\geq 700$
When $\lambda=1.10$ Sensing element voltage (mV)	$\leq 90$	$\leq 100$	$\leq 100$
Response time (ms) (600mV to 300mV)	$\leq 200$	$\leq 250$	$\leq 250$
Response time (ms) (300mV to 600mV)	$\leq 60$	$\leq 60$	$\leq 60$

When the exhaust temperature is 450 °C, the conversion characteristics of the oxygen sensor are as follows:



## Fuel pump

### 1. Outline drawing



### 2. Working principle

The fuel pump is integrated with fuel pump core, fuel pump bracket, filter, oil pressure regulator, etc., which is installed in the fuel tank; The fuel pump core works, and the fuel is filtered through the pump core to the filter, and then adjusted to a certain pressure by the oil pressure regulator and output to the external oil pipe, and finally to the injector; The constant fuel pressure is set to 350 kPa.

### 3. Basic parameters

Storage temperature: - 40°C~80°C;

Operating temperature: - 40°C~70°C;

Fuel temperature: -30°C~70°C;

The insulation resistance of conductive part and insulating part is 500m Ω above;

### 4. Possible failures

The oil pump cannot rotate;

Failure of oil pressure regulator;

Support vibration failure;

Fuel pump short circuit or open circuit;

Poor sealing of sealing ring.

## Fuel injector

## 1. Outline drawing and pin definition



Power supply + main relay



Injector signal

## 2. Working principle

The fuel injector is actually an electromagnetic switch control element device. Its fuel supply mode adopts top fuel supply structure. The inner part of the injector is designed with an electromagnetic coil around the iron core. The two electrodes from the electromagnetic coil are the input control interface of the injector. The fuel injector is directly connected with the control circuit of the engine electronic control module (ECM) and the system power supply through the engine harness. The solenoid coil of the injector directly receives the output control voltage signal from the engine electronic control module (ECM), that is, the ECM directly drives the solenoid coil to control the opening and closing time of the ball valve at the lower end of the injector. When the electromagnetic coil is energized, the electromagnetic force is generated to overcome the spring force and fuel pressure of the ball valve, so that the ball valve rises. The high-pressure fuel (250 ~ 400kPa) in the fuel line can pass through the valve seat hole of the fuel injector through the orifice plate and form a conical spray to spray into the valve body of the intake valve. When the power of the injector is cut off, the magnetic force of the solenoid coil disappears automatically, and the ball valve of the injector closes automatically under the action of the return spring, which stops the injection action of the injector. The orifice plate of the fuel injector is a thin plate at the head of the fuel injector, which is used to accurately control the fuel injection quantity and evenly atomize.

## 3. Basic parameters

Working temperature range: - 40 °C ~ 130 °C

System fuel pressure: 350kPa

Static coil resistance: 12.5Ω±0.8Ω

Normal working voltage: 9 ~ 15V

Storage temperature: - 40 ~ 70 °C

The deviation of fuel flow from 20°C shall not exceed 5% temperature.	-40		+45	°C
O-ring leakage permit in the range of -35 — -40°C	The fuel in the O-ring area is allowed to be wet, but no dripping is allowed			
Allowable vibration acceleration			400	m/s <sup>2</sup>
Supply voltage	6		16	V
Insulation resistance	1			MΩ
Permissible leakage current			0.75	mA
Tolerable internal fuel pressure			1100	kPa
Tolerable torque			6	Nm
Tensile force that can be withstood			600	N

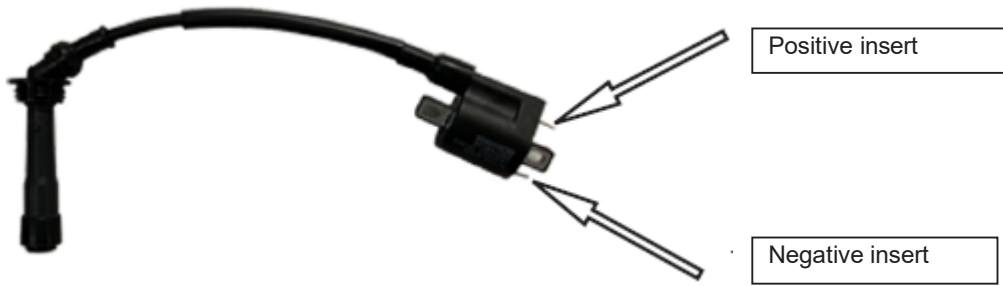
## 4. Possible failures

The fuel injector is blocked;  
 Open circuit or short circuit of electromagnetic coil;  
 Fuel injector vibration failure;  
 Poor sealing of sealing ring.

## Ignition coil



## 1. Outline drawing and pin definition



## 2. Working principle

The ignition coil consists of primary winding, secondary winding, iron core and shell. When the battery voltage is applied to the primary winding, the primary winding charges. Once the ECU cuts off the primary winding circuit, the charging will be stopped. At the same time, high voltage electricity will be induced in the secondary winding, and the spark will be generated through the high voltage connecting line and spark plug discharge, which will ignite the fuel air mixture in the cylinder.

## 3. Basic parameters

Working voltage: 6 ~ 16V;

Primary coil resistance:  $0.53\Omega \pm 0.08\Omega$ ;

Secondary coil resistance:  $8k\Omega \pm 1.2k\Omega$ ;

Primary coil inductance:  $1mH \pm 0.2mH$ ;

Secondary coil inductance:  $9.5H \pm 1.9H$ ;

Insulation resistance: under normal temperature, the insulation resistance between ignition coil shell and spark plug cap copper sleeve is greater than  $1000M\Omega$ ;

## 4. Possible failures

Open circuit of primary winding;

Breakdown and short circuit of secondary winding;

Surface discharge.

## High voltage connecting line

### 1. Outline drawing



### 2. Working principle

High voltage connecting wire is a device connecting ignition coil and spark plug. It consists of spark plug cap, high voltage wire and ignition coil connector cap.

### 3. Possible failures

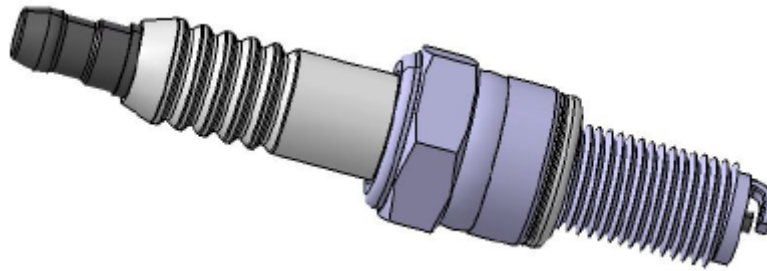
The connection of high voltage wire with spark plug cap and ignition coil connector cap is loose;

The insulation rubber sleeve of spark plug cap and ignition coil joint cap is aging and leakage;

The clip spring of spark plug cap and ignition coil connector cap is invalid and the contact is poor.

## Spark plug

### 1. Outline drawing



## 2. Working principle

The function of the spark plug is to introduce the high pressure produced by the ignition coil into the combustion chamber and ignite the mixture by spark between its two electrodes. The spark plug is mainly composed of center electrode, side electrode, connecting screw, insulator, sealing washer and shell. In order to better restrain the interference of ignition to the outside world, damping resistance powder is added between the connecting screw and the center electrode. According to the length of the insulator skirt, the spark plug can be divided into different thermal mass. The longer the insulator skirt is, the lower the heat dissipation degree and the lower the calorific value, otherwise, the higher the calorific value.

## 3. Basic parameters

Spark plug model: CR9E(NGK);

There is a resistance of 3-6kΩ inside the spark plug

## 4. Possible failures

Serious carbon deposition on spark plug;

The spark plug electrode is ablated;

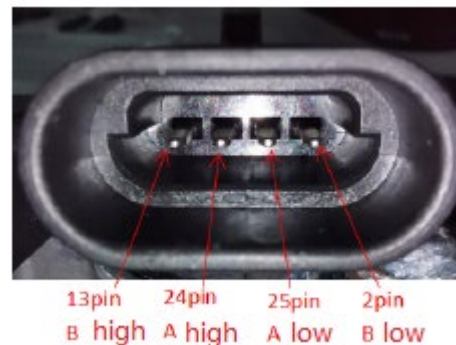
The spark plug insulator is broken;

The spark plug is overheated;

The spark plug leaks

## Idle stepper motor

### 1. Outline drawing and pin definition



## 2. Working principle

The basic working principle of idle bypass air volume control valve comes from the principle of stepping motor. It is composed of rotor made of two special-shaped permanent magnet modules, stator component composed of two groups of two-phase electromagnetic coils, screw rotor transmission mechanism which converts rotary motion into straight line, conical regulating control valve, input circuit signal connector, spring, metal forming assembly fixed shell, rubber sealing ring and other main components. When a specific electric pulse input signal acts on the two groups of electromagnetic coils respectively, the polarity of the electromagnetic field formed by the two groups of coils will be changed in a certain order. According to the principle that the same magnetic field attracts and the different magnetic field repels each other, the rotor mechanism will be driven to rotate in a certain direction. Therefore, the stepper motor can transform the electric pulse input signal into discontinuous mechanical rotary motion, and then transform the rotary motion of the rotor into the forward and backward linear motion of the adjusting head through the screw rotor transmission mechanism.

## 3. Basic parameters

Rated total operating voltage: 12V;

Allowable working voltage: 7.5V ~ 14.2V;

Allowable working temperature:  $-40^{\circ}\text{C} \sim 150^{\circ}\text{C}$ ;

DC resistance specification of each coil:  $53 \pm 5.3\Omega$  ( test at  $27^{\circ}\text{C}$ );

Inductance characteristics of each coil:  $33 \pm 5\text{mH}$  (test at  $25^{\circ}\text{C}$  with 1000Hz sine wave input signal);

#### 4. Possible failures

Pipeline blockage or air leakage;

Idle speed actuator blocked;

Open circuit or short circuit of electromagnetic coil;

Idle actuator vibration failure.

## ECU

### 1. Outline drawing



### 2. Working principle

ECU obtains various information about the actual working state of the engine or the whole vehicle through several sensors configured by the engine management system. ECU drives the actuator configured by the system to perform the optimization and control of engine operating conditions according to the data calibrated and stored in advance by the system.

The main input signal sensors of EFI system include: engine intake pressure sensor (MAP), engine intake temperature sensor (MAT), cylinder head temperature / coolant temperature sensor (CLT), oxygen sensor (O2) and crankshaft position sensor (CPS). ECU controls the engine through the actuator equipped with the system. The actuators of the system mainly include fuel injector (INJ), ignition coil (IGN), electric fuel pump and idle air control valve (IACV).

### 3. Basic parameters

Normal working voltage range:  $9\text{V} \sim 16\text{V}$ ;

ECU system includes short time anti 26V voltage protection and short time anti 13V reverse polarity voltage protection. If ECU bears overvoltage or reverse polarity voltage for a long time, ECU Hardware will be permanently damaged.

Storage temperature:  $-40^{\circ}\text{C} \sim 105^{\circ}\text{C}$

Working temperature:  $-20^{\circ}\text{C} \sim 85^{\circ}\text{C}$

### 4. Possible failures

Connector failure;

Component damage;

Water inlet short circuit;

The components are loose and fail after vibration.

## EMS fault diagnosis process

### 1. Analyze the situation reflected by users

Make detailed records of problems (faults, other situations reflected by the user) and the occurrence process stated by the user.

### 2. Check, record and sort out diagnostic trouble code

It can read out the fault content through the instrument fault indicator and fault diagnosis instrument, and look up the fault code table

Diagnostic trouble code confirmation procedure:

Turn on the power supply, connect the fault diagnosis instrument, read and clear the historical fault, turn off the

power supply, start the engine, run at idle speed for 2min (if it cannot be started, press the start button for 5s) and perform 2-3 times of acceleration and deceleration operation. The fault diagnosis instrument reads the current fault.

3. Appearance inspection

Check whether the wire connector, fuse, high voltage connecting wire, throttle and its parts are abnormal.

4. Basic function check

Check the battery voltage Check whether the engine can start, idle and accelerate

Check the fuel pump for operation

Check the ignition spark and spark plug

Check the engine speed sensor for iron filings

Check whether the pressure sensor bond is damaged Check whether fuel injector is blocked

Other examinations.

5. According to the confirmed fault code, appearance inspection and basic function inspection results, carry out fault treatment.

6. Use the fault diagnosis instrument to check whether the idle speed data of the hot engine in the system is within the specified range.

7. The method in the fault diagnosis table is used for fault analysis and treatment.

8. Clear the fault record.

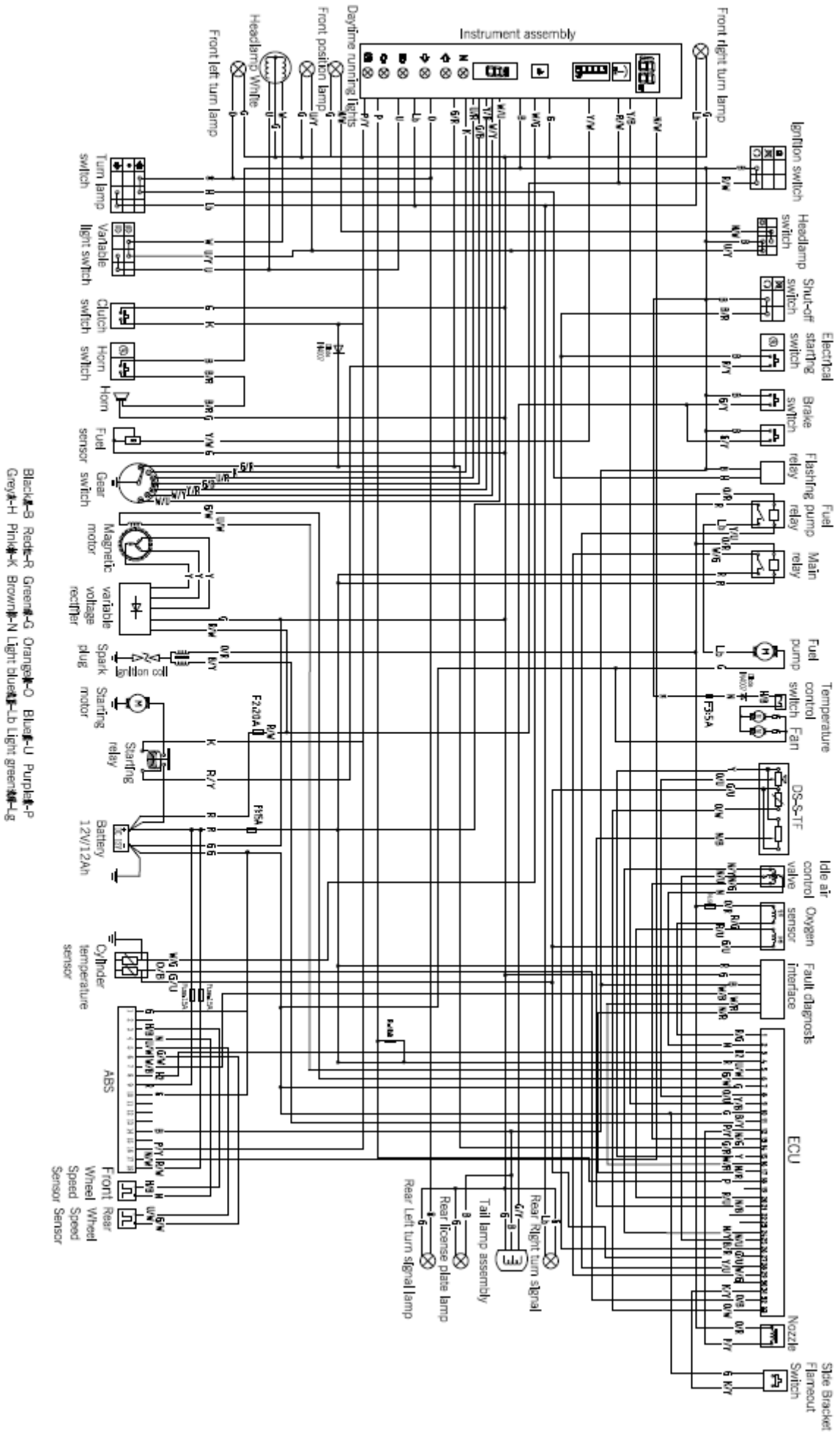
**EMS Fault Diagnosis Table**

Failure phenomenon	Possible causes	Solutions:
Difficult to start	Starting system fault:	Maintain the starting system as described in the previous chapter:
	Excessive engine starting resistance or insufficient cylinder pressure;	Check the mechanical part of the engine;
	Blockage of air filter or air leakage of throttle body and intake pipe;	Repair the air filter, throttle body or intake pipe;
	<b>No spark or abnormal spark;</b>	
	The fuse is blown;	Replace fuse;
	The starting speed is lower than 300r / min;	Check the starting system;
	Poor contact of high voltage connecting wire;	Reconnection;
	Aging of spark plug cap and poor water insulation;	Replace the spark plug cap;
	Main cable line fault or poor grounding;	Line maintenance;
	Spark plug failure;	Remove carbon deposit or replace spark plug;
	Ignition coil fault;	Replace the ignition coil;
	Emergency stop switch failure;	Replace the emergency stop switch;
	ECU failure;	Re plug or replace ECU;
	The engine speed sensor or signal wheel is faulty.	Remove scrap iron and adjust clearance.
	<b>No fuel pressure or insufficient fuel pressure:</b>	
	Oil pump relay failure;	Re plug or replace the oil pump relay;
	The fine filter is blocked or the oil pump fails;	Replace the fine filter or oil pump;
	The fuel pipe is blocked or leaking;	Replace the oil pipe;
	Injector failure.	Replace the fuel injector.
	Intake pressure sensor failure or hose rupture;	Replace intake pressure sensor or hose:
Incorrect ignition timing:	Readjust ignition timing;	
The fuel is deteriorated or contains water.	Replace the qualified fuel.	
The engine idles unsteadily or does not idle, the return oil stalls	Insufficient engine cylinder pressure;	Check the mechanical part of the engine;
	The air filter is blocked or the throttle body and intake pipe leak;	Repair the air filter, throttle body or intake pipe;
	The exhaust system is blocked;	Replacement or cleaning;
	<b>Ignition system check:</b>	
	Poor contact of high voltage connecting wire;	Reconnection;
	Aging of spark plug cap and poor water insulation;	Replace the spark plug cap;
	Carbon deposition or failure of spark plug;	Remove carbon deposit or replace spark plug;
	The engine speed sensor or signal wheel is faulty;	Remove scrap iron and adjust clearance;
	Incorrect ignition timing:	Adjust the ignition timing again;
	<b>Oil supply system inspection:</b>	
	Fine filter blocked or oil pump failure;	Replacement of fine filter or oil pump;
	The fuel pipe is blocked;	Oil pipe replacement;
	Injector failure;	Replace the fuel injector;
	<b>Idle speed control system check:</b>	
	The idle screw is loose;	Adjust the idle screw and tighten it;
Throttle position sensor fault;	Replacing throttle position sensor;	



Failure phenomenon	Possible causes	Solutions:
Unstable engine speed or no idle speed, fuel return and flameout	Intake pressure sensor and hose failure;	Replace the intake pressure sensor or connecting pipe;
	Water temperature sensor failure;	Replace the water temperature sensor;
	Idle stepper motor fault;	Replace the idle stepper motor and its pipeline;
	Poor line connection or poor grounding;	Check and connect the circuit;
	ECU failure;	Re plug or replace ECU;
	Incorrect fuel grade, deterioration or water content.	Replace the qualified fuel.
Engine idling too high	The throttle line does not reset;	Adjust the throttle line and idle screw;
	Oil pump pressure regulator failure;	Replace the pressure regulator;
	Intake air temperature sensor failure;	Replace the intake air temperature sensor;
	Idle stepper motor and connecting pipe fault.	Replace the idle stepper motor.
Insufficient engine power The speed does not go up during acceleration or the reaction is slow during flameout acceleration Poor performance and powerlessness during acceleration Engine vomiting, unstable speed	Engine mechanical failure;	Maintain the mechanical part of engine;
	Air filter blocked or throttle body, intake pipe leakage;	Repair air filter, throttle body or intake pipe;
	exhaust system and three-way catalytic converter blocked;	Replacement or cleaning;
	Ignition coil, high voltage wire or spark plug fault;	Maintenance or replacement;
	Oil pump or oil supply pipeline fault;	Maintenance or replacement;
	Fuel injector blockage or failure;	Clean or replace;
	The signal of each sensor is abnormal;	Replace the failed sensor;
	Poor line connection or poor grounding;	Check and connect the circuit;
	ECU failure.	Re plug or replace ECU.
Excessive fuel consumption	The engine cylinder pressure is insufficient;	Maintain the mechanical part of engine;
	Ignition coil, high voltage wire or spark plug fault;	Maintenance or replacement;
	Phase sensor and circuit fault	Maintenance or replacement;
	Oil pump or oil supply pipeline fault:	Maintenance or replacement;
	Fuel injector blockage or failure;	Clean or replace;
	ECU failure.	Re plug or replace ECU.
When using other electrical loads, the idle speed is poor or the engine stalls	Other electrical load is too large or intermittent short circuit makes the battery voltage unstable;	Replace other electrical loads;
	The short circuit between the system line and other load lines makes the system signal voltage unstable.	Check and re connect the wiring.

# Electrical schematic diagram







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