7. Cooling system

Notice before service

1. For the corresponding precautions regarding coolant (antifreeze), please refer to the radiator section in the " Maintenance " chapter of this manual .
2. Check the cooling water pipes ; check the coolant level. Adding and draining coolant are described in detail in the radiator section of the " Maintenance " chapter and will not be repeated in this section.

Tool :

			
Clamp pliers	multimeter	Adjustable air pressure source	Homemade head*

* It can be sealed with a soft rubber plug, or a hose can be folded in half and tied with a rope or wire as a plug for the small tube to test the sealing of the water tank inlet. You can find a water pipe with an inner diameter of 16 mm and cut a section . One end can be firmly assembled with a suitable air pipe joint and a clamp to test the sealing of the water tank inlet , the main water tank , and the small water tank .

9. If there is a “  ” symbol on the right side of the step , you can click it to quickly jump to the corresponding step.

● If you open the radiator cap when the engine is not completely cooled, the coolant may spray out and cause burns. Be sure to open the radiator cap only after the radiator and engine have cooled down.

Troubleshooting

1. Engine temperature is too high :

The coolant temperature display of the instrument is abnormal or the water temperature sensor is abnormal ;
b. Thermostat abnormality;
c. Insufficient coolant ;
d. Radiator , water pipe, water tank are blocked ;
e. Air enters the cooling system;
f. Cooling fan failure;
g. Cooling fan relay failure (see the section on electronic fuel injection relay in the chapter on electronic fuel injection system) .

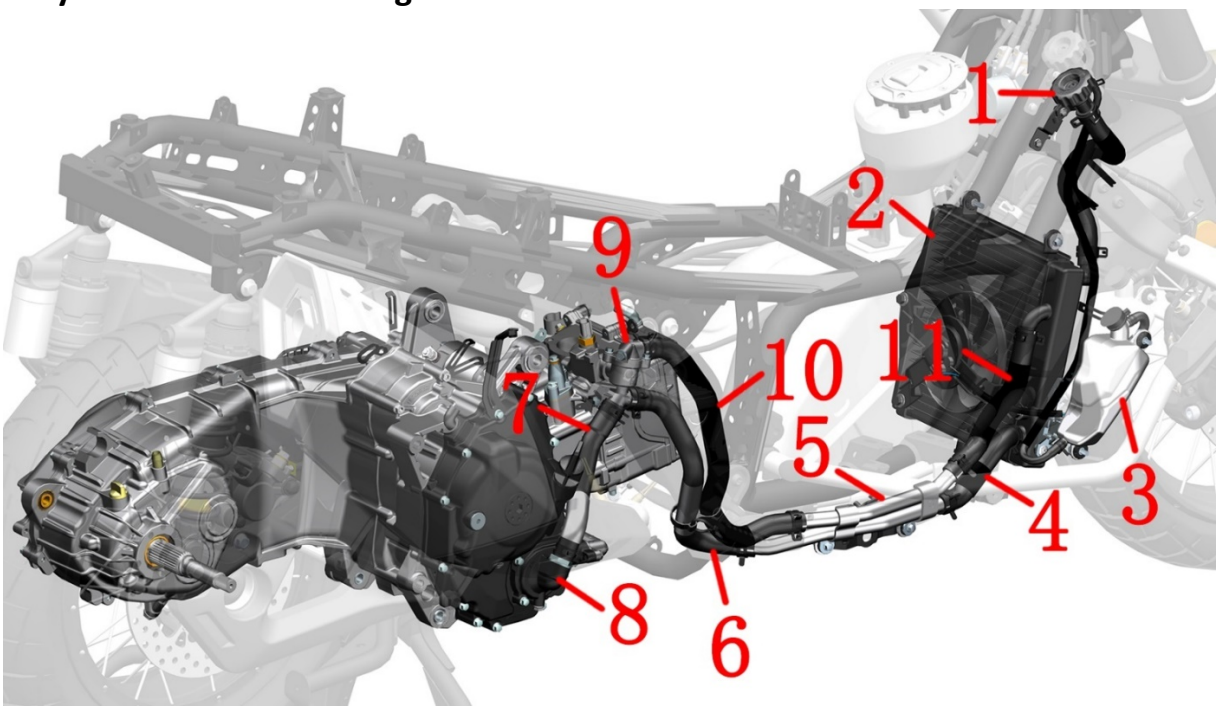
2. Engine temperature is too low:

The coolant temperature display of the instrument is abnormal or the water temperature sensor is abnormal ;
b. Thermostat abnormality;
c. Cooling fan relay failure (see the section on electronic fuel injection relay in the chapter on electronic fuel injection system) .

3. Coolant leakage

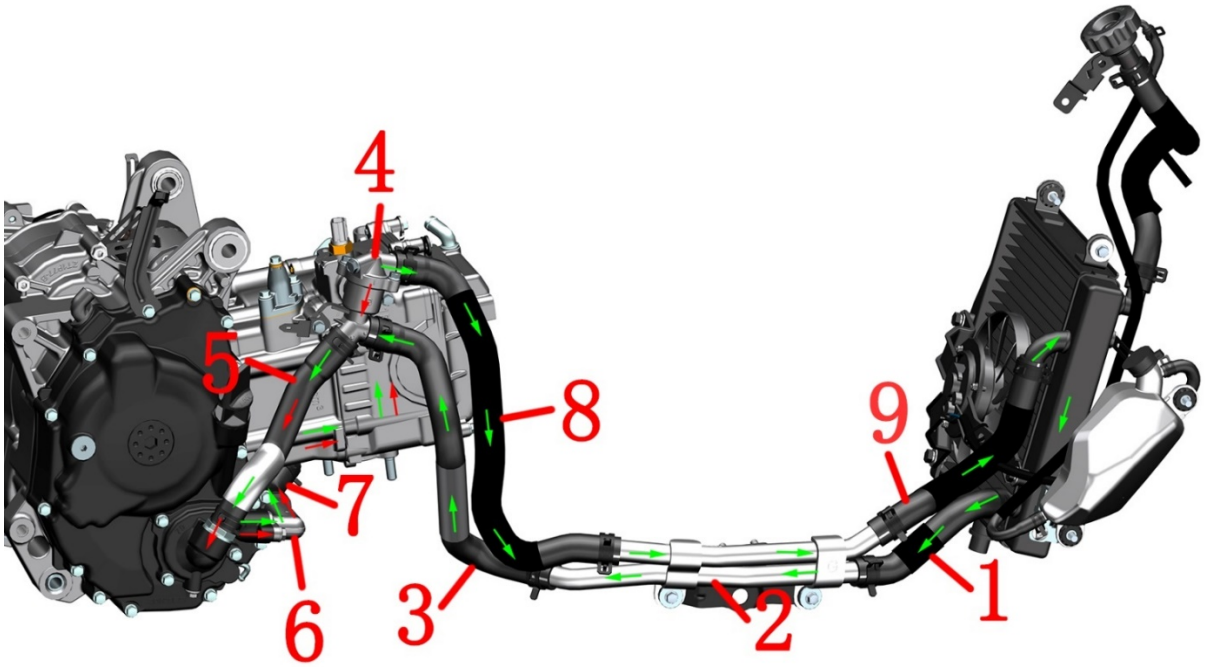
a. Water pump seal failure;
b. The O - ring is damaged or aged;
c. The radiator cap is damaged;
d. The sealing gasket is damaged or aged;
e. Water pipe rupture;
f. The radiator is damaged .

Coolant system distribution diagram



1 - Main water tank filling port 2 - Main water tank 3 - Auxiliary water tank 4 - Main water tank outlet pipe 5 - Aluminum water pipe 6 - Engine water pipe 7 - Water pump cover water inlet pipe 8 - Water pump cover assembly 9- Thermostat assembly 10- Thermostat water outlet pipe 11- Main water tank water inlet pipe

Coolant flow diagram



1- Main water tank outlet pipe 2- Aluminum water pipe 3- Engine water pipe 4 - Thermostat 5 - Water pump cover water inlet pipe 6 - Water pump cover water outlet pipe joint 7 - Water pump cover water outlet pipe 8 - Thermostat water outlet pipe 9 - Main water tank water inlet pipe

Cooling System :

Small loop (indicated by green arrows) :

Water pump → water pump cover outlet pipe joint → water pump cover outlet pipe → cylinder → thermostat → water pump cover inlet pipe

Large cycle (indicated by green arrows) :

Water pump → water pump cover outlet pipe joint → water pump cover outlet pipe → cylinder → thermostat → thermostat outlet pipe → aluminum water pipe → main water tank inlet pipe → main water tank → main water tank outlet pipe → aluminum water pipe → engine water pipe → thermostat → water pump cover inlet pipe

Cooling system disassembly

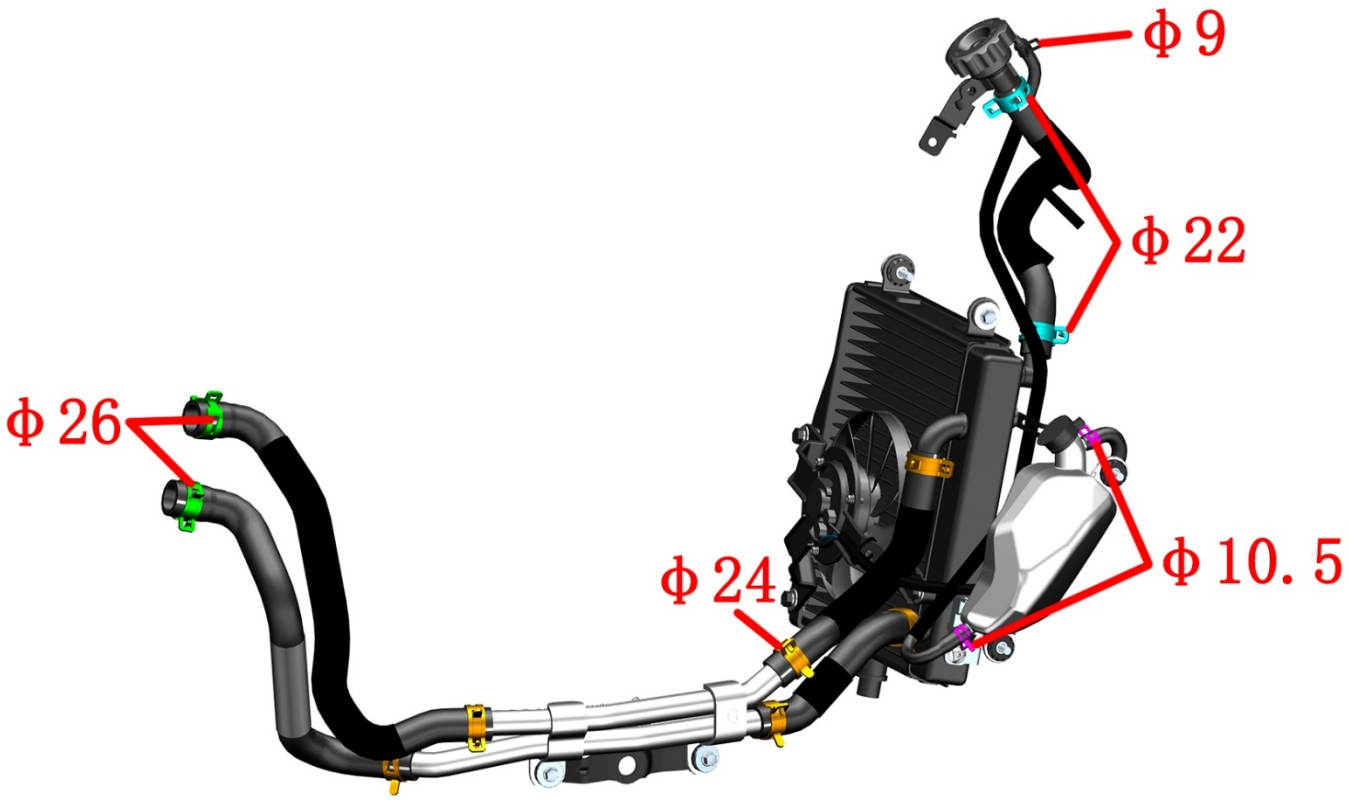
Notice:

● Before disassembly, refer to the coolant draining steps in the radiator section of the Maintenance chapter to drain all the coolant .

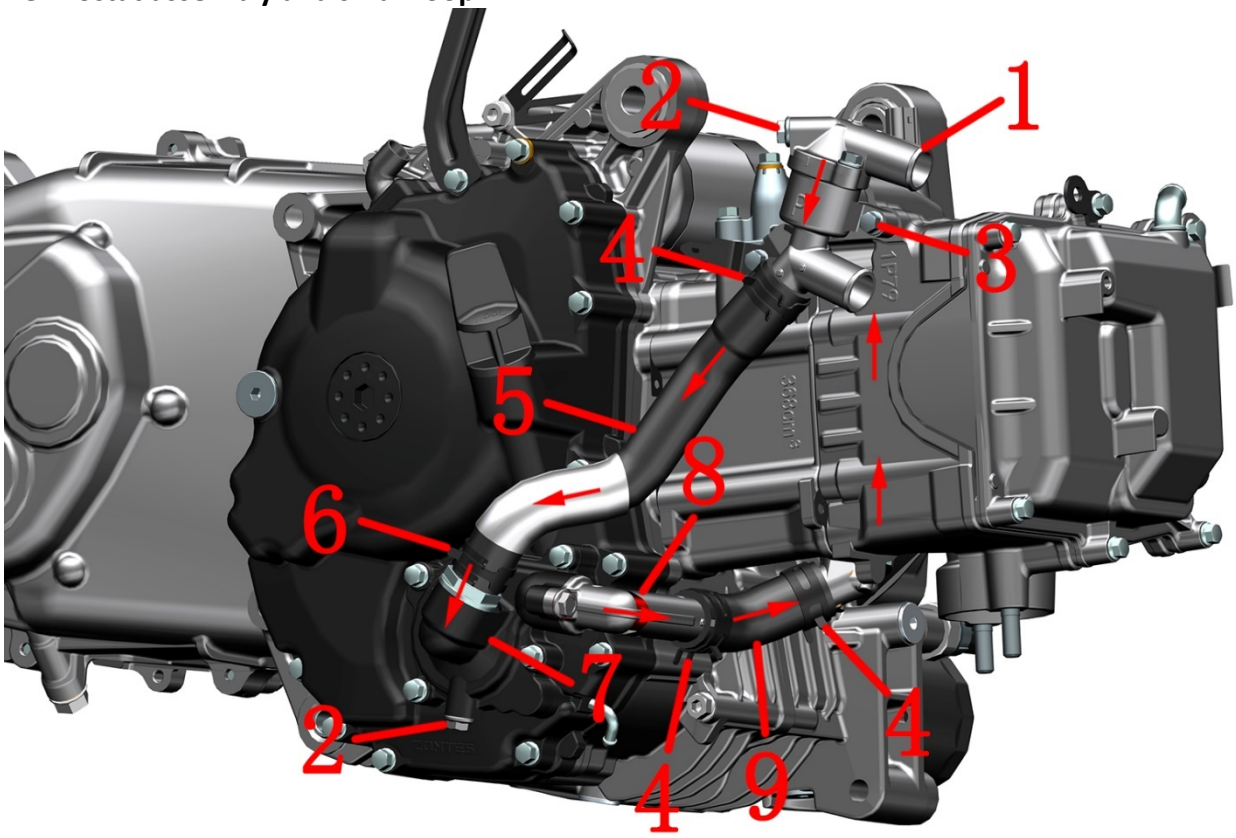
●During the disassembly process, you should wear protective measures such as waterproof gloves and protective glasses , and avoid coolant contact with the skin .

● Make sure to wait until the engine, radiator and muffler are completely cooled before disassembling them.

Coolant system clamp /clamp distribution diagram



Thermostat assembly and small loop

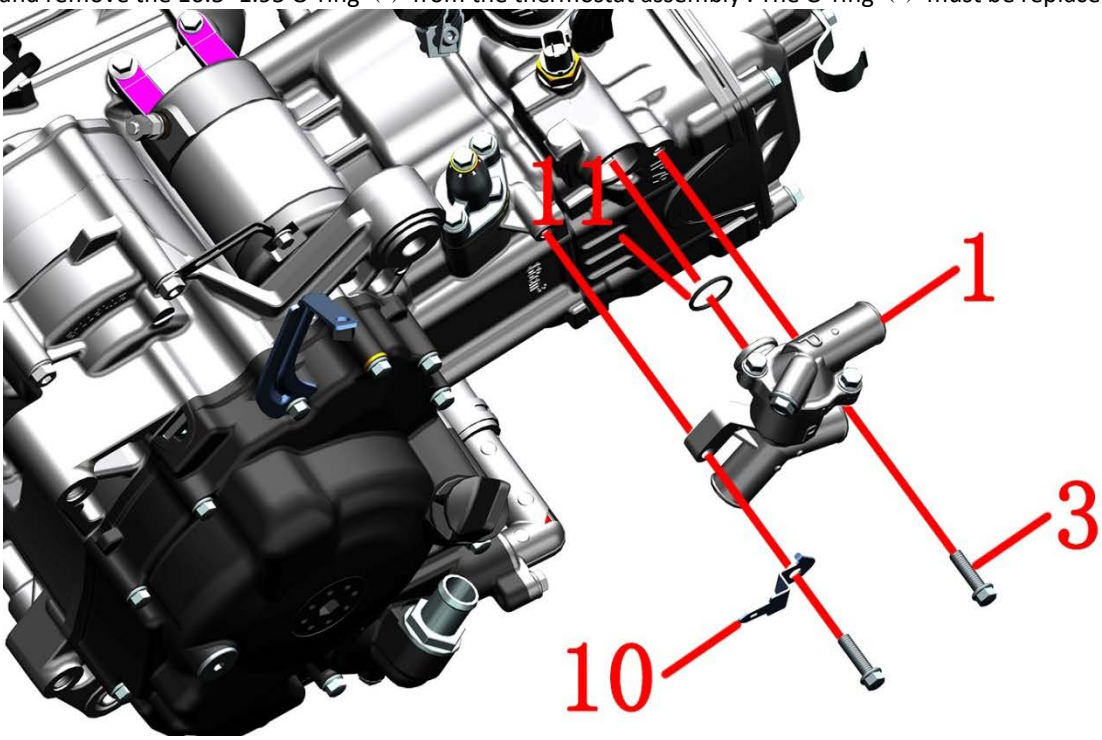


1-Thermostat assembly 2-M6× 12 bolt* 2 3 - M6×22 bolt * 2 4 - Water pipe clamp (ϕ 26) * 3 5 - Water pump cover water inlet pipe 6 - Water pipe clamp (ϕ 24) 7 - Water pump cover assembly 8 - Water pump cover outlet pipe joint 9 - Water pump cover outlet pipe

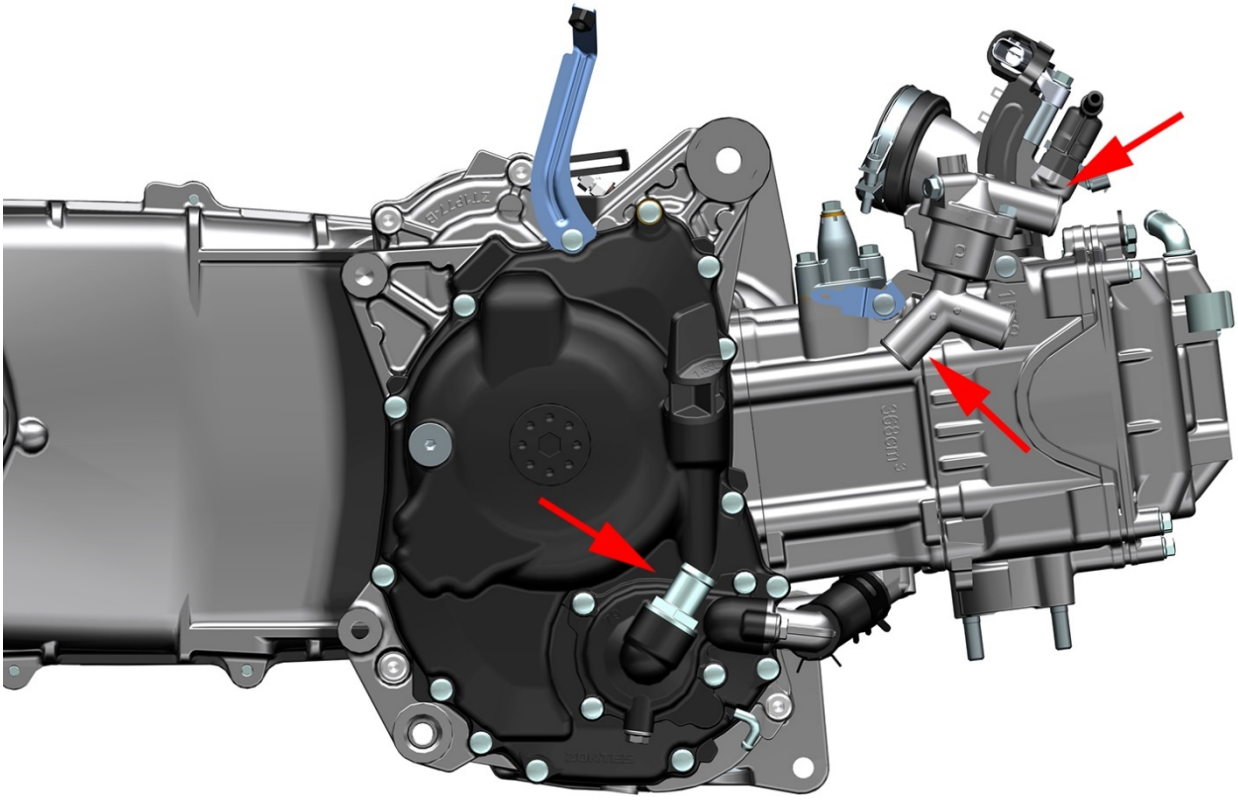
Note: Bolt (2) at the thermostat is the exhaust bolt, and bolt (2) at the water pump cover is the coolant discharge bolt . Both have ϕ 5.6×ϕ1 O-rings , which need to be replaced once removed.

a. Use clamp pliers to remove clamps (4) and (6) respectively , and separate water pipes (5) and (9) . Remove the clamp from the water pipe .

b. Use an 8 # sleeve to remove the two bolts (3) , remove the thermostat assembly (1) and the oxygen sensor bracket (10) , and remove the 16.5×1.95 O-ring (11) from the thermostat assembly . The O-ring (11) must be replaced once removed .



reassembly , clean the joint surface and make sure that the O-ring is not missing and is properly assembled . The clamp should be stuck inside the boss to prevent it from loosening. Bolt (3) Torque: 12±1.5 Nm (1.2±0.2 kgf.m, 9±1 lbf.ft) .



Cooling system accessories

Notice:

Specialized ventilation tooling (gas pressure reducing valve , air gun, sealing tube) is required for testing.

● After the soaking inspection is completed, the water stains should be wiped clean in time , or blown dry with a dust gun. If you use a dust gun to blow dry the main water tank and the small water tank, be careful not to use too much wind pressure and keep away from the cooling fins to avoid damage or deformation of the cooling fins .

●When doing air tightness testing, unless the gas pressure is specifically stated , 160kPa (1.63 Kgf/cm ^{2} , 23.2 psi) compressed air , immerse the parts in water and let them stand for 10 s. No bubbles should be seen . If there are bubbles , it means it is leaking and needs to be replaced.

● The heat sink fins are allowed to have a small amount of lodging and deformation. If the lodging area is too large, it will affect the heat dissipation effect and it is recommended to replace it. A small amount of deformation can be straightened with a small flat-blade screwdriver.

● It is prohibited to use high-pressure water guns or high-pressure air to directly flush or blow the heat sinks of the main water tank and small water tank .

● Before further testing, you should first check whether there are signs of leakage . If there is a slight leakage, you can try to repair it, otherwise you should replace it.

1. Main water tank

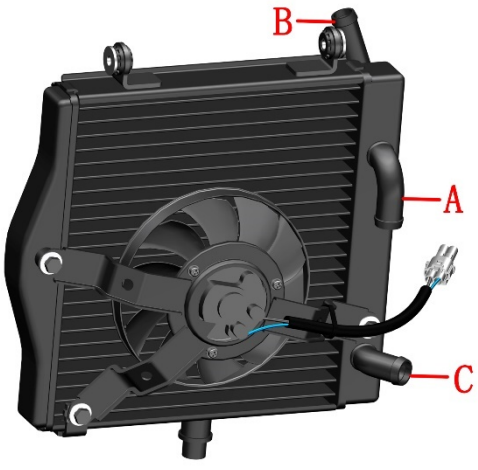
Check whether the buffer glue is aged and cracked.

Use a self-made plug to plug ports A and C , and check the tightness from port C. The pressure is 160 kPa (1.63 Kgf/cm ^{2} , 23.2 psi) gas, ensure that there is no air leakage at the nozzle, immerse the water tank in water and wait for 10 seconds to observe whether there are bubbles

Check whether the fan and the grille are firmly assembled and the fan blades are not stuck when rotating . Check whether the buffer rubber is aged or cracked. Check whether the fan cable is damaged.

the fan plug is positive, and the black pole is negative. Find a battery with sufficient power and connect the wires according to the positive and negative poles , and check whether the fan draws air backwards .

You can use compressed air with low pressure to blow from the back to the water tank from a long distance to clean the foreign matter on the surface. Or you can use a water gun with low pressure to spray the heat sink from a long distance to clean the foreign matter on the surface.



2. Water tank filling port

Notice:

Specialized ventilation tooling (gas pressure reducing valve , air gun, sealing tube) is required for testing.

● After the water soaking inspection is completed, the water stains should be wiped clean in time.

2.1 Overall sealing inspection

Seal the small tube and ventilate the large tube to check the air tightness. The pressure is 160 kPa (1.63 Kgf/cm ^{2} , 23.2 psi) gas, ensure that the pipe opening is leak-proof, place the water inlet into the water and let it stand for 10 seconds to observe whether there are bubbles.

2.2 Pressure relief valve inspection

100 kPa (1.02 Kgf/cm ^{2} , 14.5 psi) of compressed air , put the water inlet into the water and let it stand for 10 s. There should be no bubbles in the small tube . Increase the compressed air to 1 1 0kPa (1.12 Kgf/cm ^{2} ,16 psi) bubbles should appear.

3. Auxiliary water tank

First check whether the rubber cover is old or cracked , if so , replace it. If it looks good, then check the airtightness.

Seal the two small water outlets and open the black rubber cover of the water tank to check for air tightness.

Continue to seal the small water outlet, fill the auxiliary water tank with water , turn the auxiliary water tank upside down, and observe whether the water tank rubber cover is leaking. If there is leakage, it is unqualified. After completing the sealing inspection, pour out the water, remove the plug and let the auxiliary water tank dry naturally or blow it dry with a dust gun .

4. Water and oil shared sensor

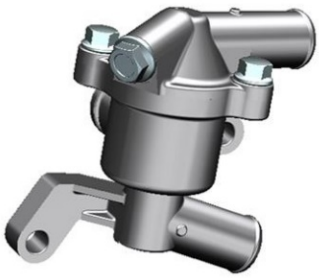
sensor detection and disassembly and assembly methods, please refer to the section on EFI parts fault diagnosis and troubleshooting in the chapter " EFI System" .

5. Thermostat

5.1 Inspection

Check the appearance for damage or leakage.

Simple test method (testing on the whole vehicle) :



the cold engine , open the water inlet cap immediately. If the liquid level does not fluctuate, the thermostat is normal, otherwise it is abnormal . When the water temperature is lower than 70 ℃ (158F) , the thermostat should be in the valve closed state. When it is higher than the initial opening temperature, the expansion valve of the expansion cylinder gradually opens, and the circulating coolant in the radiator begins to flow.

After the temperature rises, check the water inlet pipe of the small water tank again. You should be able to feel obvious signs of water flow or the temperature of the pipe wall, otherwise the water pump or water channel is blocked.

the temperature rises slowly after reaching 80 °C (176 °F) , the thermostat is working properly. If the water temperature continues to rise rapidly and boiling water suddenly overflows when the internal pressure reaches a certain level , it indicates that the valve is stuck .

If it is stuck or not closed tightly, you can remove it for cleaning or repair first , otherwise it should be replaced.

5.2 Fault phenomenon

When the water temperature gauge indicates high, the engine temperature is overheated , but the coolant temperature in the water tank is not high, the radiator is not hot when touched by hand, and the small water tank fan rotates normally, it indicates that the large circulation is blocked or obstructed, and it can be preliminarily judged that the thermostat is abnormal.

There are generally two situations when the thermostat is abnormal:

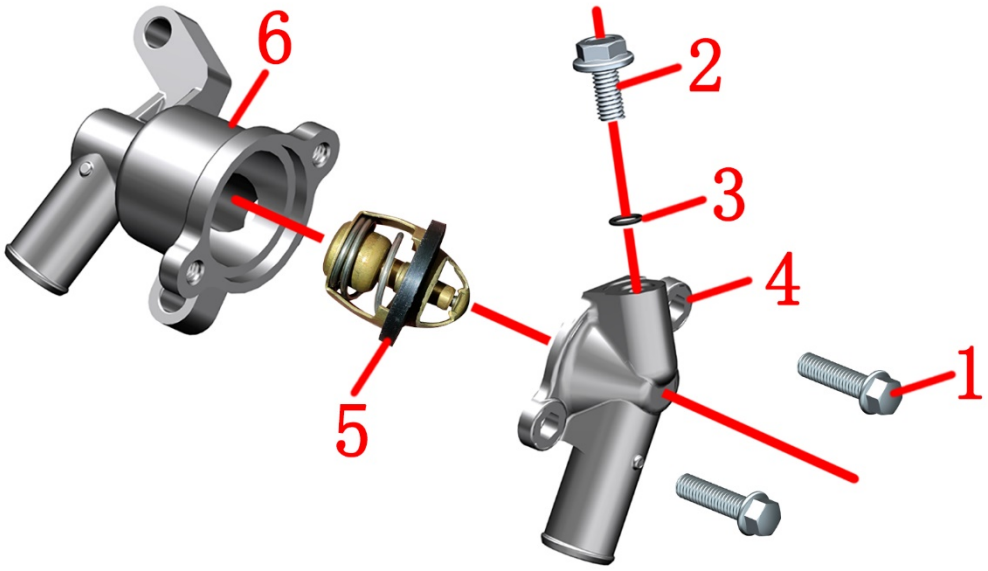
a . The main valve is in a closed state for a long time. Regardless of the water temperature, the coolant circulates according to the small circulation route, causing the engine to overheat.

b. The main valve is in the open state for a long time, which will cause the water temperature to rise slowly during startup. Especially in winter, the slow rise in coolant temperature causes the engine to not operate at normal temperature, resulting in the engine temperature being too low.

5.3 Disassembly

How to check the thermostat assembly :

Block the two ports and introduce 181 kPa (1.85 Kgf/cm ^{2} , 26.3 psi) of compressed air , put it into water and let it stand to observe whether there are bubbles. If there are bubbles, it means it is leaking.



1-M6 ×22 bolts*2 2-M6 ×12 bolts 3-ϕ 5.6×ϕ1 O-ring 4-Thermostat upper housing 5-Thermostat core 6- Thermostat lower housing

Thermostat core inspection:

lift of the main valve in a temperature-adjustable constant temperature heating device . If any of them does not meet the specified value, it should be replaced. Alternatively, use a thermometer , water, heater and container to test.

Thermostat initial opening temperature 80～84℃（176～183 F), the core moves 0.1mm (0.004 in) can be considered as the initial opening. Full opening temperature is 95℃ (20 3 F), the core movement is greater than 3.5 mm (0.14 in).

simple test method is to put the core into a high temperature resistant container, pour boiling water into it and soak it for a while, use pliers to take out the core, and observe whether the valve can be fully opened . If it can , it indicates that it is normal. After the temperature gradually decreases, the valve should be able to reset until it is fully closed again.

Before re- assembly , the mating surfaces should be cleaned and the O-rings should not be missed .

6. Water pipes

Check the surface of each water pipe for cracks, bulges and other defects. Block one end of the water pipe , ventilate the other end and put the water pipe into the water outlet to check whether there are bubbles. If there are bubbles, replace them.

7. Check the water pump cover assembly

Check the two places indicated by the arrows for leakage. The bolts are for draining coolant. If there is leakage, remove the bolts and replace the O-rings . If there is leakage at the right crankcase cover water pipe , try to pull out the water pipe (it is difficult to pull out because it is coated with sealant before press-fitting) , clean it, re-apply sealant and reinstall it; or directly replace the right crankcase cover assembly.

a small amount of coolant to leak from the leaking pipe. However, it is abnormal if there is continuous leakage when the engine is running. You need to remove the water pump cover to check whether the seal has failed.