SQRD4T20 COOLING SYSTEM

GENERAL INFORMATION

Overview

Description

Operation

- Engine cooling system adjusts engine operating temperature by the flow of coolant and makes engine operate normally under various operating conditions.
- Engine cooling system is a forced circulation system, which supplies circulation pressure for cooling system by water pump and forces coolant to circulate in the engine cylinder block, and distributes excessive heat to radiator by the flow of coolant, and radiates it to the air by cooling fan. Also, engine cooling system provides heat to the heater core in cabin to improve driving comfort.

Specifications

Torque Specifications

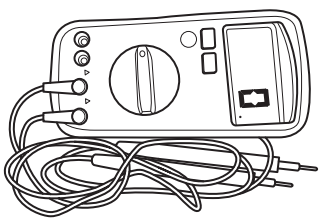
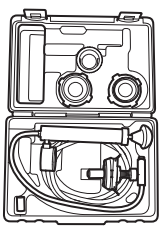
Description	Torque (N·m)
Expansion Tank Fixing Bolt	5 ± 1
Thermostat Housing Fixing Bolt	8 + 3
Thermostat Seat Fixing Bolt	8 + 3
Cooling Fan Fixing Bolt	5 ± 1
Radiator Upper Crossmember Fixing Bolt	9 ± 1
Water Pump Fixing Bolt	8 + 3
Coupling Bolt Between Radiator and Condenser	7 ± 1

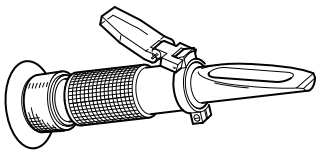
Coolant Capacity

Item	Capacity (L)
Cooling System	7 ± 0.5

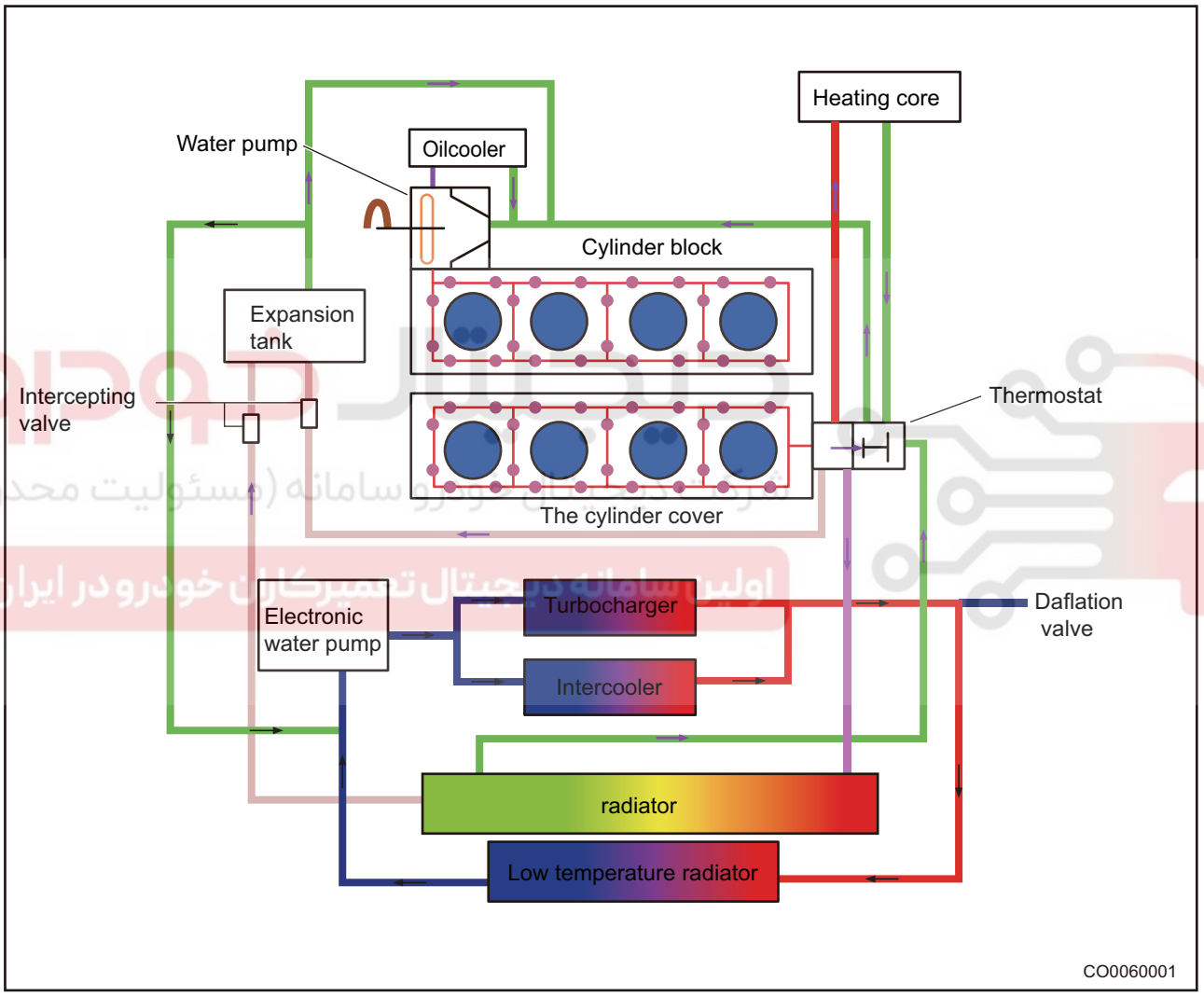
Tools

General Tools

Digital Multimeter	 002
Cooling System Pressure Tester	 055

Freezing Point Tester	 007

Cooling System Operation Flowchart



Small circulation: When coolant temperature is below 82 ± 2°C, thermostat assembly closes. Coolant only circulates inside the cylinder block and warms up other engine parts that need heat. Water pump assembly circulates engine coolant through cylinder block, oil cooler assembly, turbocharger and cylinder head. The coolant does not radiate heat through radiator.
Large circulation: When coolant temperature is higher than 95°C, thermostat assembly opens fully and all coolant flowing out of cylinder block enters radiator for radiating. It then returns to cylinder block for circulation by water pump. Due to radiating in radiator, engine coolant temperature decreases quickly to prevent engine from overheating.

DIAGNOSIS & TESTING

Diagnostic Content

Problem Symptoms Table

Hint:

Use symptoms table below to help determine cause of problem. Check each suspected area in sequence. Repair, replace or adjust faulty components as necessary.

Symptom	Suspected Area
Insufficient coolant	Coolant pipe (deteriorated and leaks)
	Expansion tank (leaks)
	Radiator (leaks)
	Heater core (leaks)
	Thermostat assembly (improperly sealed)
	Thermostat seat assembly (cracked and damaged)
	Water pump (leaks)
	Engine cylinder head gasket (damaged)
	Engine cylinder head (cracked and leaks)
	Engine cylinder block (water jacket leaks and cylinder block cracked)
Engine overheating	Low coolant level
	Air resistance exists in pipe
	Expansion tank cap (damaged)
	Engine Control Module (ECM) failure
	Cooling fan
	Radiator
	Thermostat assembly
Engine undercooling	Thermostat assembly
	Cooling fan
Unable to reach normal engine temperature	Cooling fan (constantly operating)
	Thermostat assembly
Cooling fan does not operate or abnormal air speed	Fan controller
	Cooling fan
	Wire harness
	Engine Control Module (ECM) failure

Cooling System Leakage Test

Warning:

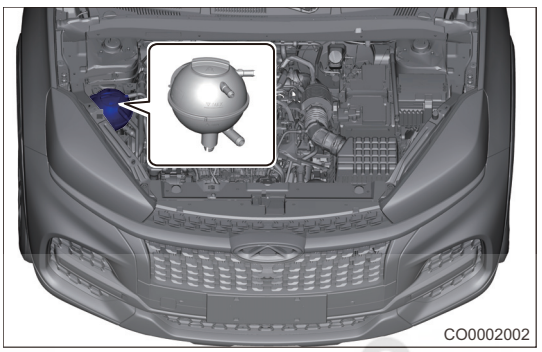
- Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.

Caution:

- When testing cooling system, please pressurize the system to specified pressure. Otherwise, system components may be damaged.
- Before testing cooling system, do not perform operation until coolant temperature drops to normal level. Otherwise, it may cause scald.

Test Procedures

1. Turn off all electrical equipment and the ignition switch.
2. Check if coolant level is between "MAX" and "MIN" lines. If coolant level is below "MIN" line, add coolant.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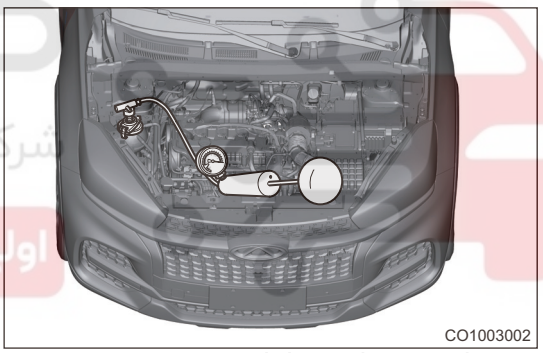
3. Connect cooling system pressure tester to coolant pressure release cap opening (expansion tank cap opening) and tighten it slowly.

   Caution:
   Make sure there is no leakage in connecting part of coolant system pressure tester, in order to avoid pressure leakage during test.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4. Pressurize cooling system to 1.2 bar with the cooling system pressure tester, and then observe the pressure changes. If system pressure does not drop within 2 minutes, it indicates there is no leakage in system. If pressure changes greatly, it indicates that there is a leakage in system; find the leaking area and perform troubleshooting.

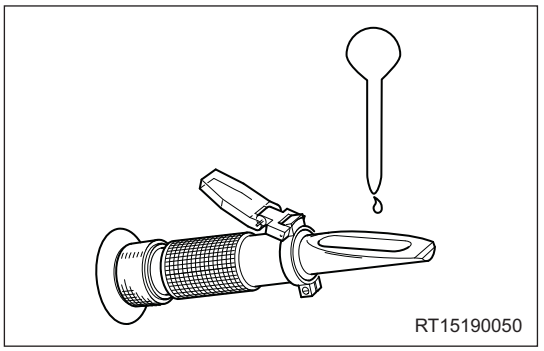
Coolant Freezing Point Test

Caution:

- DO NOT mix different colors or types of coolant.
- Please select coolant which is suitable for local climate in different areas.
- Please read measured value at the scale line. In order to distinguish the scale line more clearly, drip a drop of water on the glass of freezing point tester with a pipette, then the scale line can be clearly distinguished via a "waterline".

Test Procedures

- As shown in illustration, drip a drop of coolant on the glass of freezing point tester with a pipette, and then observe freezing point value of coolant.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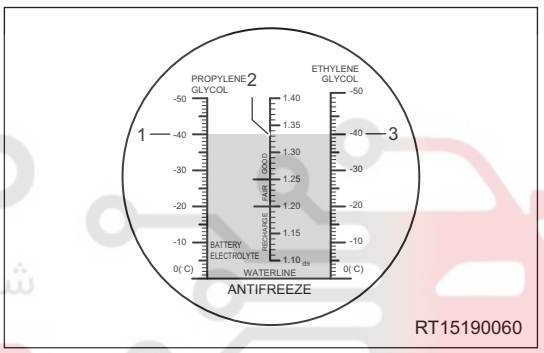
- As shown in illustration, observe scale 3 of freezing point tester to read ethylene glycol coolant freezing point value. The freezing point value must be kept at -40 °C (value varies with geography, climate or freezing point).

  If freezing point is beyond the specified value, replace the coolant.

  Hint:

  Scale 1 is used to measure the freezing point value of propylene glycol coolant, and scale 2 is used to measure the battery electrolyte concentration.



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ON-VEHICLE SERVICE

Coolant Replacement

Engine System Coolant Draining

Warning/Caution/Hint

Warning:

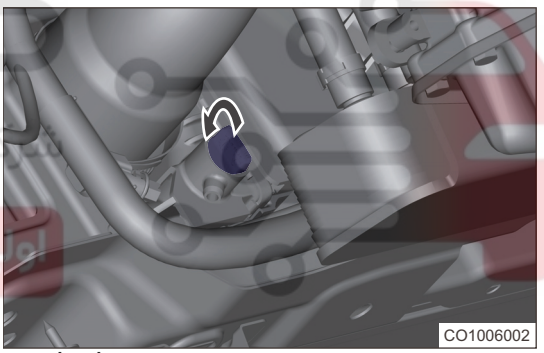
- Never remove pressure release cap when engine is operating or temperature is higher. Otherwise, it may cause scald.
- Be careful when opening pressure release cap, the high-pressurized hot engine coolant and steam may flow out and cause serious burns.
- Wait until the engine has cooled down, and then cover the pressure release cap with a piece of damp cloth and turn it one turn slowly (counterclockwise). Step back when releasing cooling system pressure. After confirming that all pressure has been released, turn the pressure release cap with cloth covered and remove it.
- Violating above descriptions may cause serious personal injury.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the expansion tank cap when engine temperature and radiator temperature are low.
4. Remove the engine lower protector assembly.
5. Drain the coolant.

(a) Put a coolant collector under the vehicle, rotate the radiator drain cock plug (arrow) counterclockwise and drain the coolant in radiator and expansion tank.

Hint:

Put a drainage device or similar tool at the radiator outlet, so that coolant can flow into the collector smoothly.



(b) After coolant stops flowing, retighten the radiator drain cock plug.

Caution:

- Tighten drain cock plug to prevent leakage.
- Wasted coolant should be handled by the specialized department according to local laws and regulations. Never discard it at will.

Coolant Adding

Caution:

- Only use coolant that meets Chery specifications.

Coolant Capacity

Item	Capacity (L)
Cooling System	7 ± 0.5

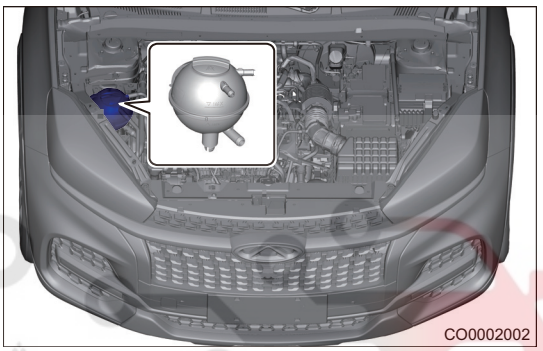
Warning:

- If it is necessary to add coolant when engine is hot, loosen expansion tank cap slightly first to release internal pressure and loosen the cap completely after waiting for a while, and then add coolant.
- If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.

Caution:

- DO NOT use inferior coolant.
- DO NOT mix different colors or types of coolant.
- Be careful when adding coolant; avoid spilling coolant on any area of engine.

1. Open expansion tank cap and add coolant until coolant level reaches the "MAX" line.



2. Tighten expansion tank cap, start and run engine. Maintain engine speed between 2000 and 2500 rpm to warm up the engine until cooling fan operates.

   Caution:

   If there is no coolant in expansion tank after engine just starts, perform the followings:

   - Stop the engine;
   - Wait until coolant cools down;
   - Add coolant to "MAX" line on expansion tank.

   Run the engine at 2500 rpm until coolant level becomes stable.
3. Stop engine and wait until coolant temperature drops to the ambient temperature. Check that coolant level is between "MAX" and "MIN" lines. If coolant level is below the "MIN" line, repeat all the above procedures. If coolant level is above the "MAX" line, drain coolant until the level is between "MAX" and "MIN" lines.

Tank Upper Crossmember Assembly

Removal

Warning/Caution/Hint

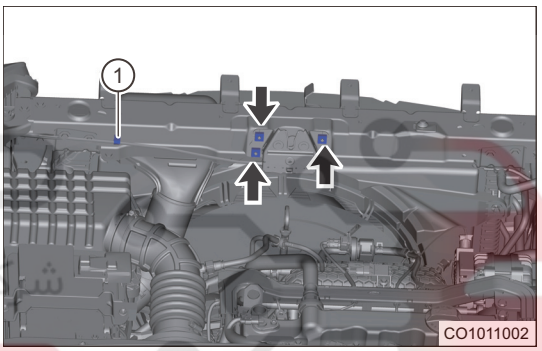
Warning:

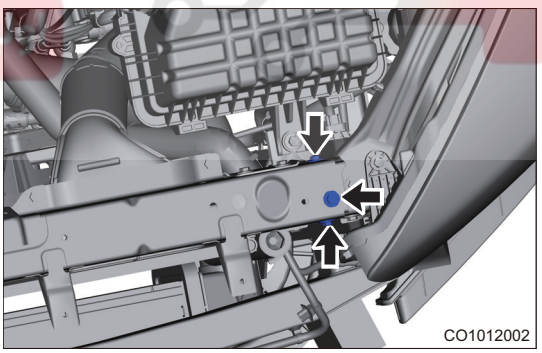
- Perform removal procedures with front compartment at low temperature after cooling fan stops completely, otherwise, rotating cooling fan or hot components of front compartment may cause serious injury.

Caution:

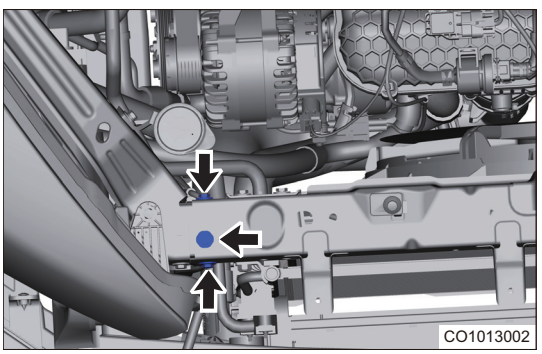
- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the front bumper assembly (See page 45-6).
4. Remove the air filter assembly (See page 08-9).
5. Remove the tank upper crossmember assembly.
   (a) Remove engine compartment cover lock cable fixing clip (1) from tank upper crossmember.
   (b) Remove 3 fixing nuts (arrow) from engine compartment cover lock.
   Tightening torque
   9 ± 1 N·m

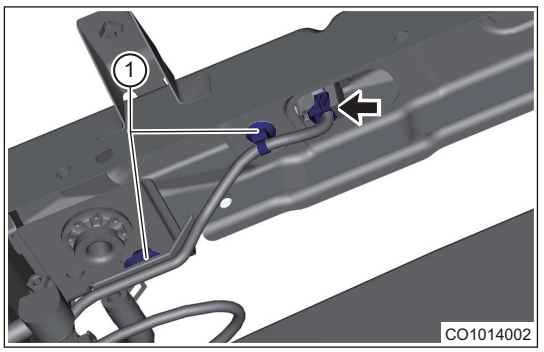




   (c) Remove 6 fixing bolts (arrow) from tank upper crossmember.
   Tightening torque
   9 ± 1 N·m



(d) Disconnect engine compartment cover contact switch connector (arrow) and disengage fixing clips (1).



(e) Remove the tank upper crossmember assembly.

Installation

1. Installation is in the reverse order of removal.

Expansion Tank

Removal

Warning/Caution/Hint

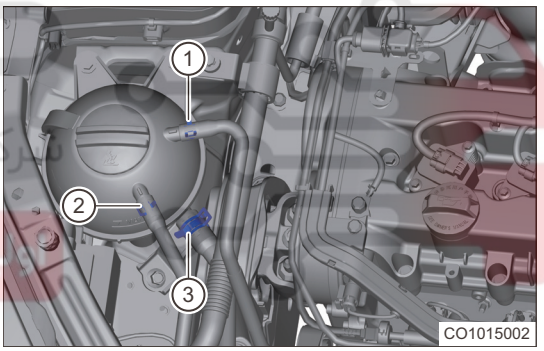
Warning:

- Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.
- If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.

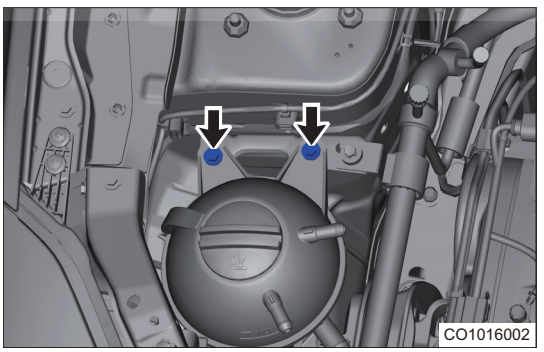
Caution:

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Drain the coolant.
4. Remove the expansion tank.
   (a) Loosen elastic clamp (1) and disconnect connection between expansion tank and engine discharge pipe.
   (b) Loosen elastic clamp (2) and disconnect connection between expansion tank and radiator discharge pipe.
   (c) Loosen elastic clamp (3) and disconnect connection between expansion tank and water supply pipe.



   (d) Remove 2 fixing bolts (arrow) from expansion tank.
   Tightening torque
   5 ± 1 N·m



   (e) Remove the expansion tank assembly.

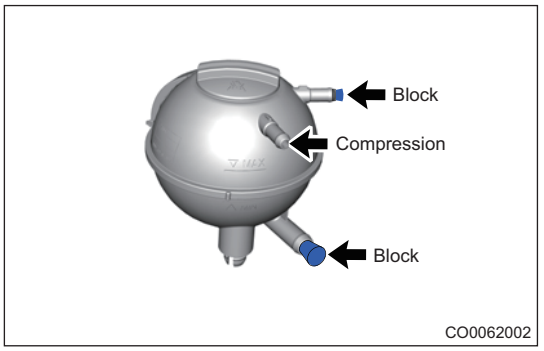
Inspection

Expansion Tank

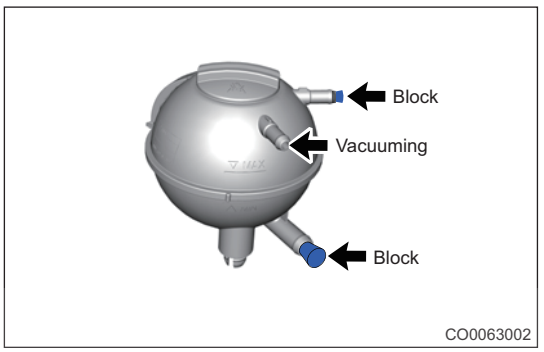
1. Check that the expansion tank is welded firmly, and there are no defects such as fractures and cracks at the weld.
2. The expansion tank should be colorless and transparent. During use of vehicle, expansion tank assembly is not allowed to have discoloration that affects the appearance and function, and scale line should be clearly visible.

Expansion Tank Cap

3. Block two holes of expansion tank and pressurize one of them. When pressure reaches the opening pressure of relief valve (120 - 150 kpa), the pressure in expansion tank should be maintained at the relief valve opening pressure value.



4. Block two holes of expansion tank and vacuumize one of them. When vacuum pressure reaches the opening pressure of vacuum valve (-2 - 10kpa), vacuum pressure in expansion tank should be maintained at the vacuum valve opening pressure value.



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Installation

1. Installation is in the reverse order of removal.

Caution:

- When connecting water supply pipe and expansion tank, align the " 土 " mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of " 土 " mark, align the edge of elastic clamp with lower edge of " 二 " position of " 土 " mark.
- When connecting engine discharge pipe and expansion tank, align the "工" mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of " 工 " mark, align the edge of elastic clamp with lower edge of " 二 " position of " 工 " mark.
- When connecting radiator discharge pipe and expansion tank, align the " 工 " mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of " 工 " mark, align the edge of elastic clamp with lower edge of " 二 " position of " 工 " mark.
- Check that coolant has been added to the specified level after installation.

Thermostat Assembly

Removal

Warning/Caution/Hint

Warning:

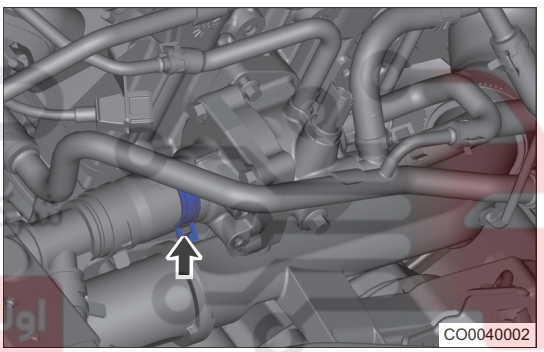
- Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.
- If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.

Caution:

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the intake hose assembly (See page 08-10).
5. Drain the coolant.
6. Remove the thermostat assembly.

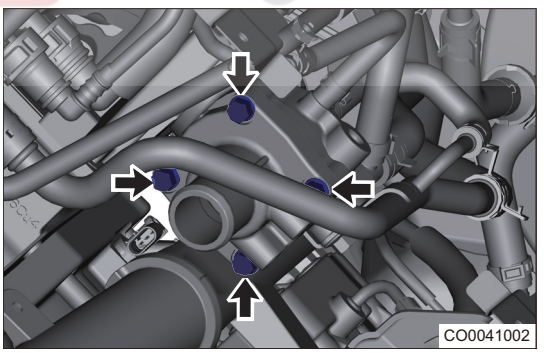
(a) Loosen the elastic clamp (arrow) and disconnect the connection between engine inlet hose and thermostat housing.



(b) Remove 4 fixing bolts (arrow) from thermostat housing.

Tightening torque

8 + 3 N·m

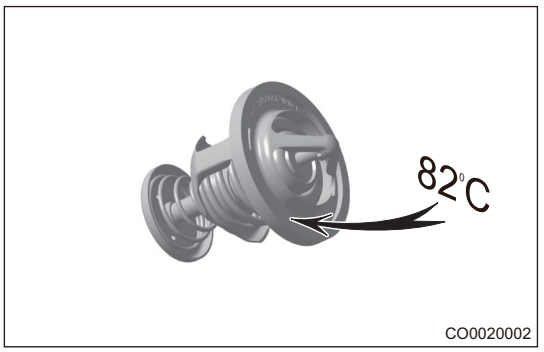


(c) Remove thermostat housing and remove thermostat assembly from thermostat seat.

Inspection

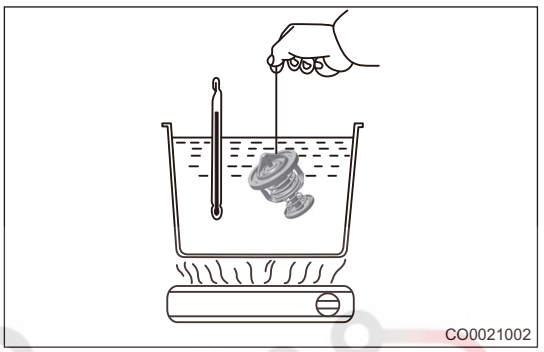
1. Check opening temperature and maximum lift of thermostat assembly.

Hint:
Opening temperature of thermostat is engraved in the thermostat assembly.



(a) Soak thermostat assembly into water, heat water gradually and perform inspection.

- Opening temperature of thermostat assembly is 82 ± 2°C.
- Maximum lift of thermostat assembly is no less than 8.5 mm.
- Temperature is 95°C when thermostat assembly opens fully.



(b) If above inspection conditions are not met, replace thermostat assembly.

Installation

1. Installation is in the reverse order of removal.

Caution:

- When connecting engine outlet pipe and thermostat housing, position the " 土 " mark on pipe port right above, and rotate elastic clamp and center line of mark 90°.
- Check that coolant has been added to the specified level after installation.

Thermostat Seat Assembly

Removal

Warning/Caution/Hint

Warning:

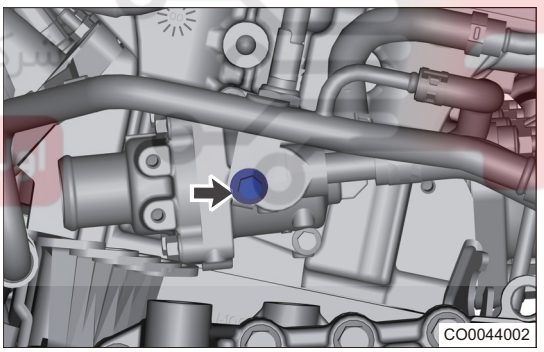
- Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.
- If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.

Caution:

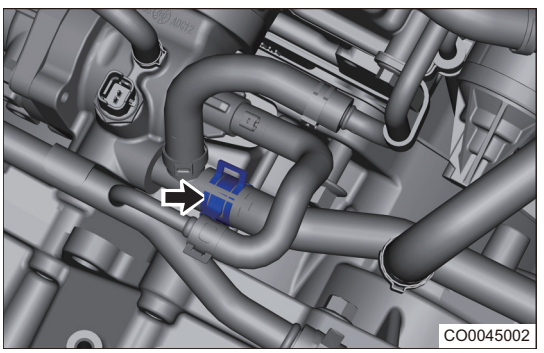
- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the battery (See page 14-8).
5. Remove the battery tray (See page 14-10).
6. Drain the coolant (See page 10-8).
7. Remove the air filter assembly (See page 08-9).
8. Remove the intake hose.
9. Remove the thermostat assembly (See page 10-14).
10. Remove the thermostat seat assembly.

(a) Remove 1 fixing bolt (arrow) from coolant pipe.

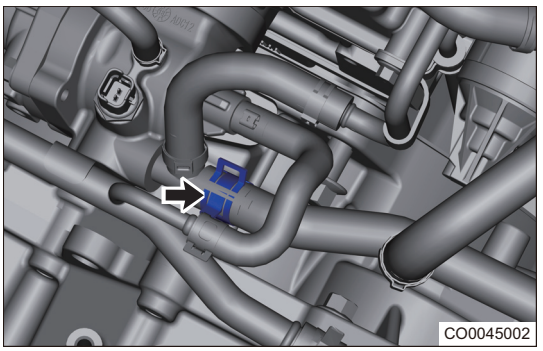


(b) Loosen the elastic clamp (arrow), and disconnect heater water pipe.

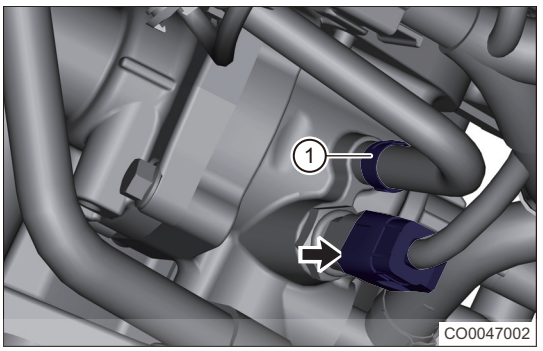


(c) Loosen elastic clamp (1) and disconnect coolant pipe.

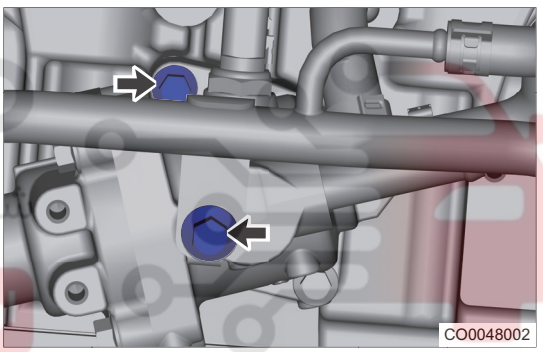
(d) Loosen elastic clamp (2) and disconnect turbocharger water pipe.



(e) Disconnect coolant temperature sensor (arrow), loosen elastic clamp (1) and disconnect hose and thermostat seat assembly.



(f) Remove fixing bolt (arrow) from thermostat seat assembly.



(g) Remove the thermostat seat assembly and O-ring.
(h) Remove coolant temperature sensor from thermostat seat assembly.

Installation

1. Installation is in the reverse order of removal.

   Caution:

   - Replace thermostat seat O-ring with a new one during installation, and removed thermostat seat O-ring cannot be reused.
   - When connecting engine discharge hose and thermostat seat, align the "T" mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of "T" mark, align the edge of elastic clamp with lower edge of " 一 " position of "T" mark.
   - When connecting small circulation water pipe and thermostat seat, align the "T" mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of "T" mark, align the edge of elastic clamp with lower edge of " 一 " position of "T" mark.
   - When connecting engine inlet pipe and thermostat seat, align the "工" mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of " 工 " mark, align the edge of elastic clamp with lower edge of " 二 " position of " 工 " mark.
   - When connecting heater inlet pipe and thermostat seat, position the " 土 " mark on pipe port right above, and align center position of elastic clamp tabs with "I" position of " 土 " mark, align the edge of elastic clamp with lower edge of " 二 " position of " 土 " mark.
   - When connecting heater outlet pipe and thermostat seat, align the " 工 " mark on pipe port with limited post, and align center position of elastic clamp tabs with "I" position of " 工 " mark, align the edge of elastic clamp with lower edge of " 二 " position of " 工 " mark.
   - Check that coolant has been added to specified level after installation, and check for leakage at the removal and installation position.

Discharge Steel Pipe Assembly

Removal

Warning/Caution/Hint

Warning:

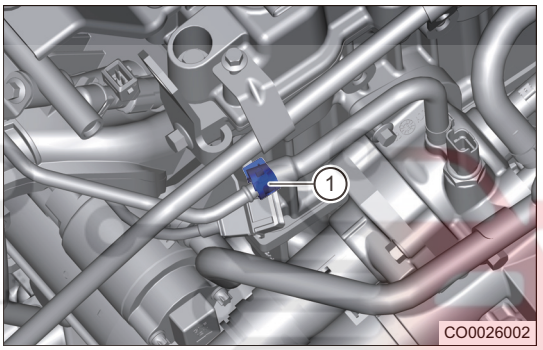
- Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.
- If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.

Caution:

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the engine trim cover.
4. Remove the discharge steel pipe assembly.

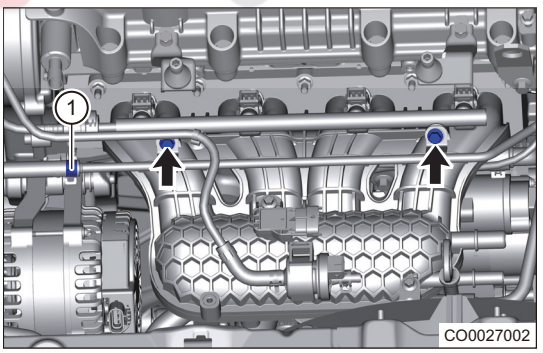
(a) Loosen elastic clamp (1) and disconnect connection between discharge hose and discharge steel pipe assembly.



(b) Loosen elastic clamp (1) and disconnect connection between discharge hose and discharge steel pipe assembly.

(c) Remove 2 fixing bolts (arrow) from discharge steel pipe assembly.

Tightening torque
8 + 3 N·m



(d) Remove the discharge steel pipe assembly.

Installation

1. Installation is in the reverse order of removal.

   Caution:

   - When connecting discharge hose 1 and discharge steel pipe, align the "T" mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of "T" mark, align the edge of elastic clamp with lower edge of " 一 " position of "T" mark.
   - When connecting discharge hose 2 and discharge steel pipe, align the "土" mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of " 土 " mark, align the edge of elastic clamp with lower edge of " 二 " position of " 土 " mark.
   - When connecting discharge hose 3 and discharge steel pipe, align the "T" mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of "T" mark, align the edge of elastic clamp with lower edge of " 一 " position of "T" mark.
   - Check that coolant has been added to specified level after installation, and check for leakage at the removal and installation position.

Cooling Fan Assembly

Removal

Warning/Caution/Hint

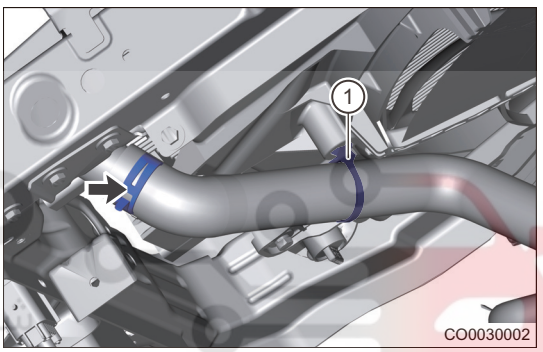
Warning:

- Perform removal procedures with engine compartment at low temperature, after cooling fan stops completely, to prevent accidents.

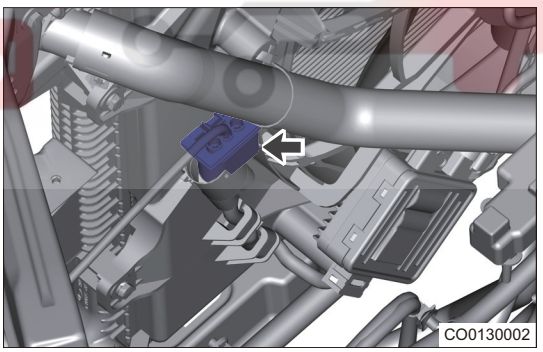
Caution:

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the air filter assembly (See page 08-9).
4. Drain the coolant (See page 10-8).
5. Remove the cooling fan assembly.
   (a) Loosen elastic clamp (arrow) and disconnect engine outlet hose and radiator.
   (b) Disengage fixing clip (1) between water pipe and cooling fan assembly.



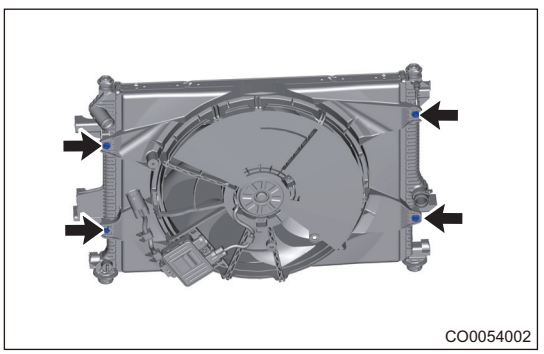
   (c) Disconnect the cooling fan connector (arrow).



   (d) Remove 4 fixing bolts (arrow) connecting cooling fan and radiator.

   Tightening torque

   5 ± 1 N·m



   (e) Remove the cooling fan assembly.

Inspection

1. Check cooling fan blade for dirt. If so, clean the cooling fan.
2. Check cooling fan blade for missing, cracks, etc. If so, replace cooling fan.

Installation

Warning/Caution/Hint

Caution:

- Check that coolant has been added to the specified level after installation.

1. Installation is in the reverse order of removal.

Radiator Assembly

Removal

Warning/Caution/Hint

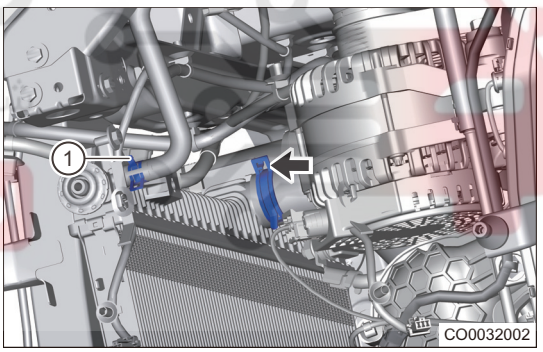
Warning:

- Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.
- If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.

Caution:

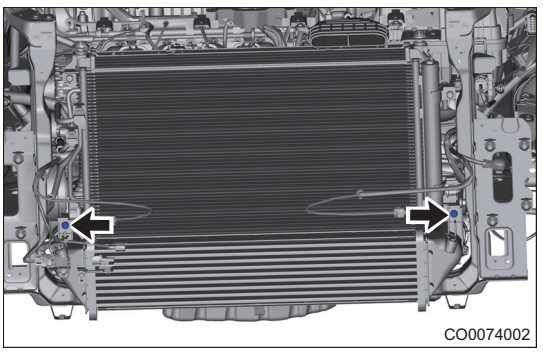
- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the front bumper assembly (See page 45-6).
4. Remove the tank upper crossmember assembly
5. Drain the coolant (See page 10-8).
6. Remove the cooling fan assembly (See page 10-21).
7. Remove the radiator assembly.
   (a) Loosen elastic clamp (1) and disconnect connection between radiator discharge hose and radiator assembly.
   (b) Loosen elastic clamp (arrow) and disconnect connection between engine inlet hose and radiator assembly.



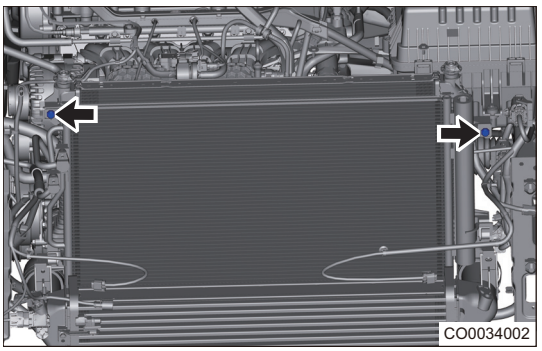
   (c) Remove 2 fixing bolts (arrow) connecting radiator assembly and intercooler.

Tightening torque
5 ± 1 N·m



(d) Remove 2 fixing bolts (arrow) connecting radiator assembly and condenser.

Tightening torque
5 ± 1 N·m



(e) Remove the radiator assembly carefully.

Inspection

1. Check radiator surface for dirt. If so, clean radiator surface.

Installation

1. Installation is in the reverse order of removal.
   Caution:
   - When connecting engine outlet pipe and radiator, align the " 工 " mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of " 工 " mark, align the edge of elastic clamp with lower edge of " 二 " position of " 工 " mark.
   - When connecting engine inlet pipe and radiator, align the " 土 " mark on pipe port with boss, and align center position of elastic clamp tabs with "I" position of " 土 " mark, align the edge of elastic clamp with lower edge of " 二 " position of " 土 " mark.
   - Check that coolant has been added to specified level after installation, and check for leakage at the removal and installation position.

Water Pump Assembly

Removal

Warning/Caution/Hint

Warning:

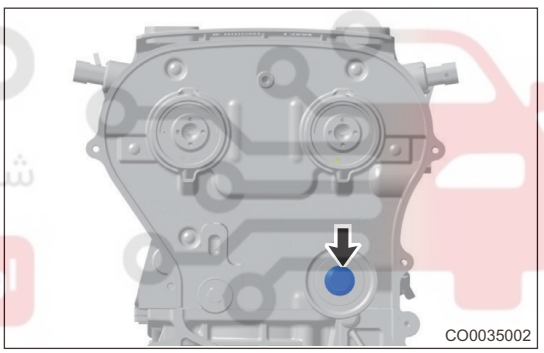
- Always make sure engine is cold before operating cooling system. Never open expansion tank cap or remove drain cock plug, when engine is operating or cooling system temperature is high. High-pressurized hot engine coolant and steam may flow out and cause serious burns.
- If your body contacts coolant accidentally, clean it with water immediately. If it is serious, please go to hospital.

Caution:

- Be sure to wear necessary safety equipment to prevent accidents when repairing.
- Try to prevent body paint surface from being scratched during removal and installation.

1. Turn off all electrical equipment and the ignition switch.
2. Disconnect the negative battery cable.
3. Remove the engin compartment lower protector assembly.
4. Drain the coolant.
5. Move away the accessory drive belt.
6. Remove the engine timing chain.
7. Remove the water pump assembly.

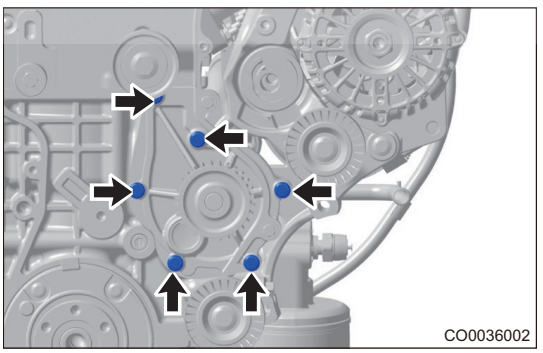
(a) Remove 1 fixing bolt (arrow) and timing idler pulley.



(b) Remove 6 fixing bolts (arrow) from water pump assembly.

Tightening torque

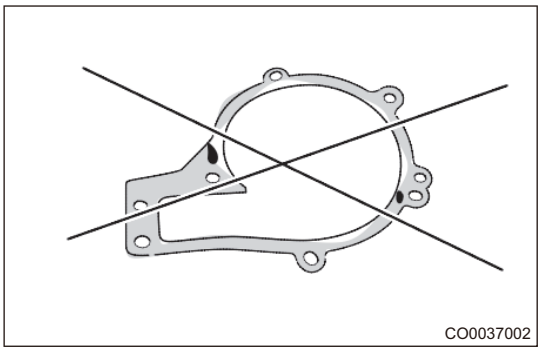
8 + 3 N·m



(c) Remove the water pump assembly and seal ring.

Inspection

1. Check the water pump seal ring.
   (a) Check water pump seal ring for wear or deterioration. If there is wear or deterioration, replace seal ring.



2. Check water pump assembly. If any of following conditions occur, replace water pump assembly immediately.
   (a) Water pump assembly impeller is damaged
   (b) Water pump assembly bearing is loosened
   (c) Water pump assembly rotates with abnormal noise

Installation

Warning/Caution/Hint

Caution:

- Clean installation surface of water pump assembly.
- If water pump is damaged, replace rather than attempt to repair it.
- Check that coolant has been added to the specified level after installation.
- Perform cooling system pressure test after adding coolant, to check cooling system for leakage.