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4.1 Intake system

4.1.1 Precautions

- Regularly check and clean the air inlet and pay attention to the tightness of the nozzle at the connection part of the intake duct to check for air leakage, so as to avoid rainwater or car wash water flowing into the intake system pipeline, causing damage to system assembly.
- Regularly clean or replace the air filter element as required.
- When it is found that the air filter element is damaged, the upper and lower end faces of the element are warped and uneven, or the rubber seal ring is aging, deformed, hardened or damaged, etc., the air filter element should be replaced with a new one immediately.
- Before removing each component of the intake system, remove any debris near the parts. Cover the orifice to prevent debris from entering the intake system pipeline or the range extender.
- During the refitting of some parts, it is necessary to replace the gasket in accordance with the requirements of the servicing process to avoid causing air leakage in the intake system and affecting the normal operation of the range extender.

Warning for fuel pressure removal:

- When removing the intake manifold assembly or before servicing the fuel system, the fuel system pressure must be removed first to reduce the risk of personal injury.
- After the fuel system pressure is removed, a small amount of fuel will overflow when the fuel pipeline joint and fuel injection rail are removed.

Warning for disconnection of battery:

- Before servicing any electrical components, turn off all electrical appliances, turn off the start switch, and disconnect the battery negative terminal.
- Failure to follow these safety instructions may result in personal injury or damage to the vehicle.

4.1.2 Introduction to structure and principle

Overview of intake system

- The intake system consists of air filter assembly, intake pressure/temperature sensor, throttle body assembly, intake manifold assembly, supercharging system pipeline and other parts of complex structures.

Turbocharger

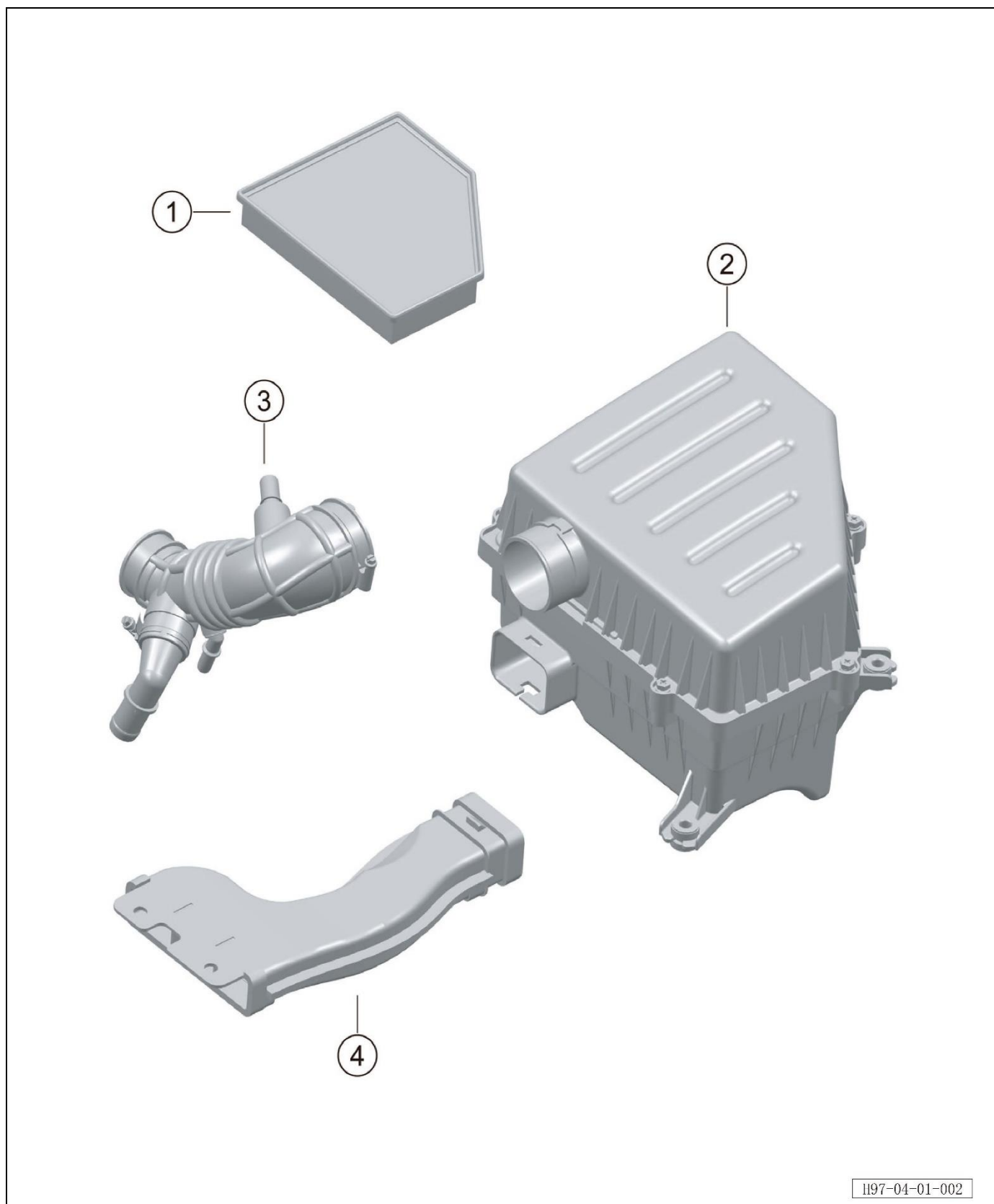
- A turbocharger is a type of compressor that increases the power output of a range extender by increasing the air intake.
- The turbocharger is mounted on the exhaust manifold, and the turbine is driven by the energy generated by the exhaust flow.
- The turbine is connected by a shaft to the compressor, which is installed in the intake system of the range extender. The high-speed rotating impeller raises the intake pressure above atmospheric pressure, thereby increasing the intake air input.
- The turbocharger is connected to the range extender through the fuel supply pipe and the fuel drain pipe. Oil is used to lubricate the bearings and also to remove heat from the turbocharger.
- The turbocharger is connected to the cooling system of the range extender through the water supply pipe and drain pipe, which can further reduce the high temperature of operation.

4.1.3 Location diagram of range extender assembly



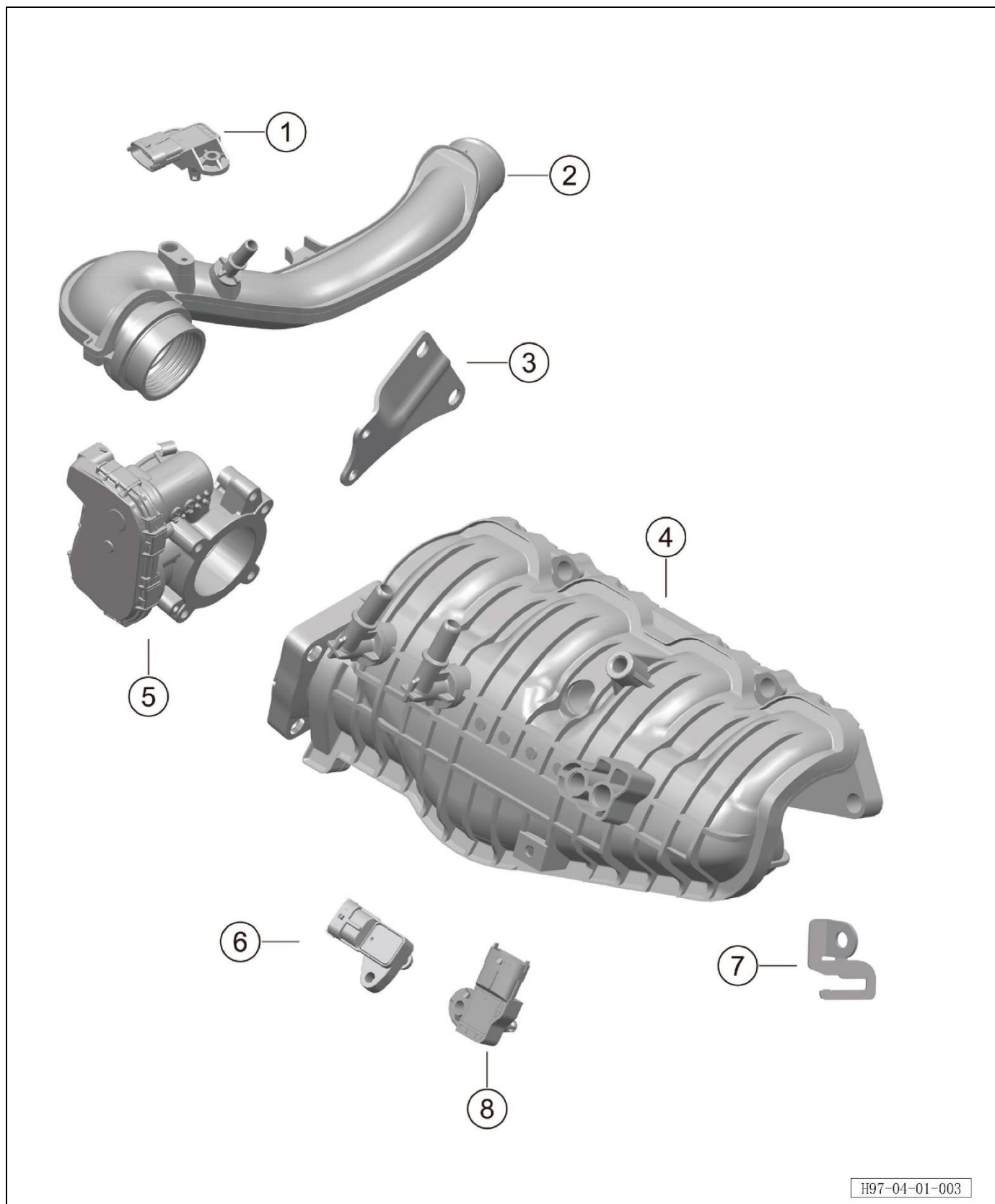
4.1.4 Exploded view

4.1.4.1 Air filter assembly



| S/N | Part name | Loading quantity | Remarks |
|-----|---------------------------------|------------------|---------|
| 1 | Air filter element | 1 | |
| 2 | Air filter assembly | 1 | |
| 3 | Air filter outlet pipe assembly | 1 | |
| 4 | Air filter inlet pipe assembly | 1 | |

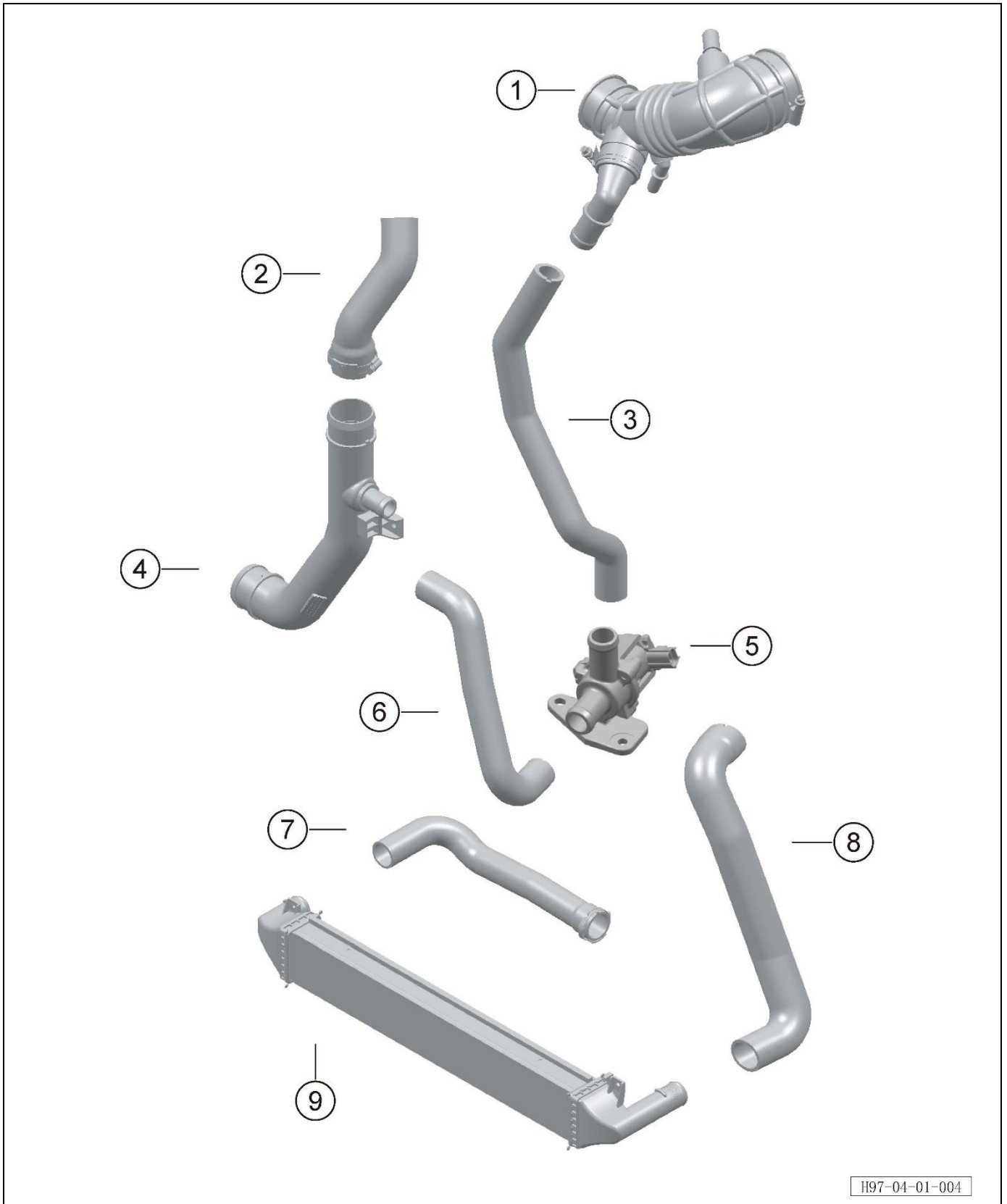
4.1.4.2 Intake manifold assembly



H97-04-01-003

| S/N | Part name | Loading quantity | Remarks |
|-----|---|------------------|---------|
| 1 | Ambient pressure sensor assembly | 1 | |
| 2 | Throttle front end plastic air inlet pipe | 1 | |
| 3 | Intake manifold bracket | 1 | |
| 4 | Intake manifold assembly | 1 | |
| 5 | Electronic throttle assembly | 1 | |
| 6 | Intake pressure/temperature sensor | 1 | |
| 7 | Bracket | 1 | |
| 8 | Fuel evaporation pipeline pressure sensor | 1 | |

4.1.4.3 Intercooler assembly



| S/N | Part name | Loading quantity | Remarks |
|-----|--|------------------|---------|
| 1 | Air filter outlet pipe assembly | 1 | |
| 2 | Intercooler air inlet hose 2# | 1 | |
| 3 | Pressure relief valve air outlet hose assembly | 1 | |
| 4 | Intercooler air inlet pipe | 1 | |
| 5 | RCV assembly | 1 | |
| 6 | Pressure relief valve air inlet hose assembly | 1 | |
| 7 | Intercooler air inlet hose 1# | 1 | |
| 8 | Intercooler air outlet hose | 1 | |
| 9 | Intercooler assembly | 1 | |

4.1.5 Technical parameters

Tightening Torque

| S/N | Part name | Torque (N.m) | Remarks |
|-----|------------------------------------|--------------|---------|
| 1 | Air filter outlet pipe clamp | 6 ± 1 | |
| 2 | Air filter upper housing bolt | 3 | |
| 3 | Intake pressure/temperature sensor | 5 ± 1 | |
| 4 | Ambient pressure sensor assembly | 5 ± 1 | |
| 5 | Electronic throttle assembly | 10 | |
| 6 | RCV assembly | 12 | |
| 7 | Intake manifold assembly | 22 ± 1 | |

4.1.6 Special tools

| S/N | Tool Name | Tool No. | Remarks |
|-----|--|-----------|-------------------------------|
| 1 | Special tool for water (flexible) pipe clamp | H52205000 | Clamp the cooling system hose |

4.1.7 Common faults

4.1.7.1 Weak power of ranger extender

| Fault causes | Countermeasures |
|--|--|
| 1. Fault of intake system Electronic throttle failure Air leakage of intake system pipeline | Check the harness and connector, and replace the electronic throttle assembly Check and repair the intake system and supercharging system |
| 2. Improper mixture composition Poor gasoline supply Air leakage of intake system pipeline | Check the fuel supply system Check and repair the intake system and supercharging system |

4.1.7.2 Turbocharger failure

| Fault causes | Countermeasures |
|--|--|
| Turbocharger failure Volute side damage caused by metal foreign matter Impeller rotation interference caused by inflow of foreign matter on the exhaust side Blade damage caused by foreign matter process Bearing burn due to insufficient fuel supply on the turbine side | Replace the turbocharger Replace the turbocharger Replace the turbocharger Replace the turbocharger |

4.1.8 Air filtering apparatus

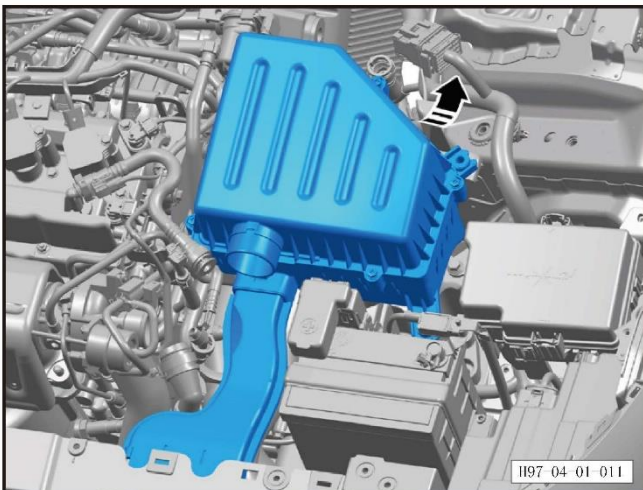
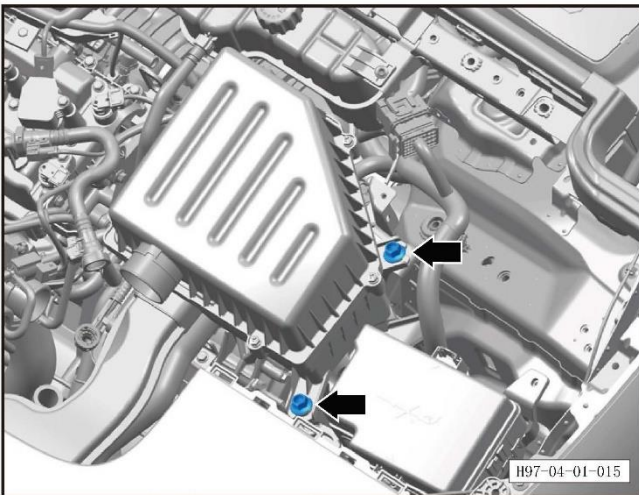
4.1.8.1 Removal and refitting of air filter assembly

Removal procedure

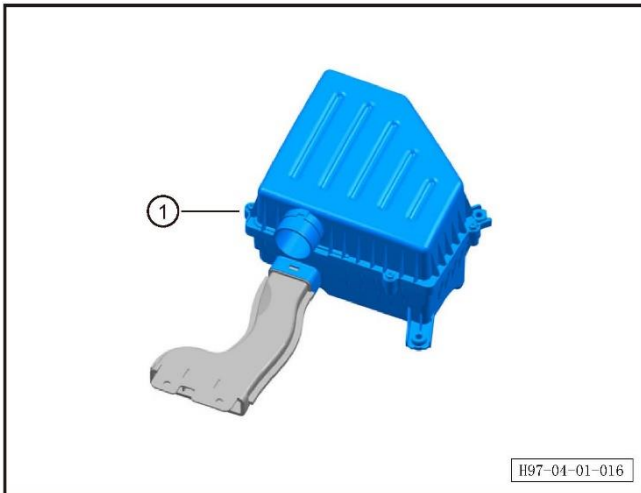
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Remove the air filter outlet pipe assembly (refer to [4.1.8.6 Removal and refitting of air filter outlet pipe assembly](#))
5. Remove the 2 clips on the air filter inlet pipe assembly (refer to [4.1.8.5 Removal and refitting of air filter inlet pipe assembly](#))
6. Remove the air filter assembly.

- a. Unscrew the 2 bolts that secure the air filter assembly to the bracket.

Tightening torque of bolt: $12\pm 1\text{Nm}$.



- b. Take out the air filter assembly and air filter inlet pipe assembly.



c. Remove the air filter assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.1.8.2 Removal and refitting of air filter body

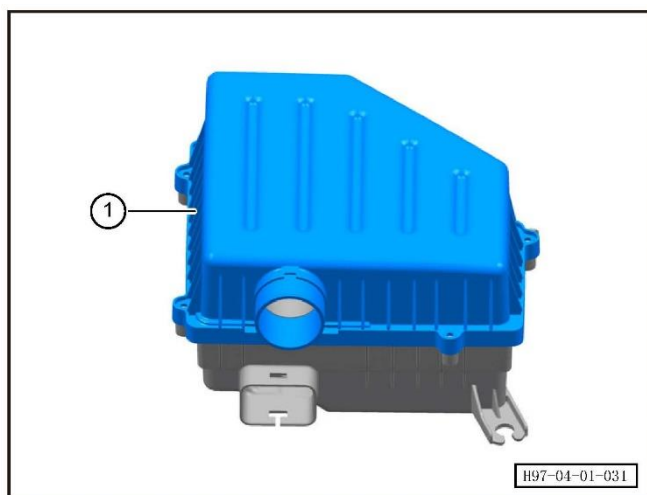
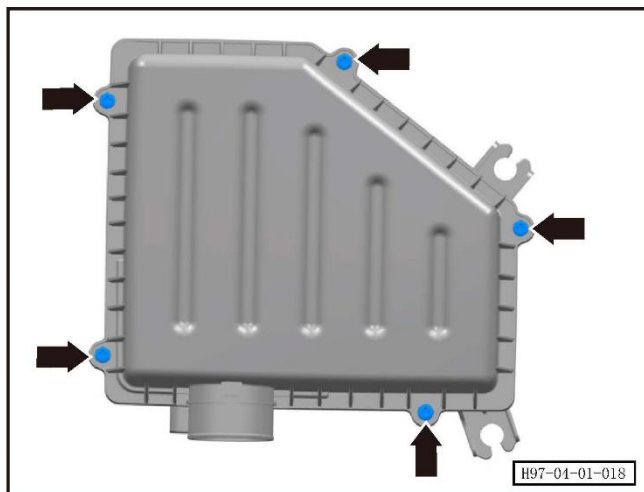
Removal procedure

1. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))

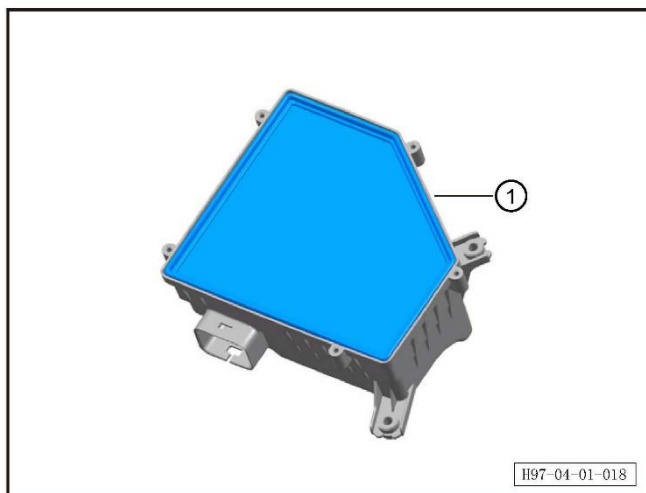
2. Remove the air filter body.

a. Unscrew the 5 bolts on the air filter assembly housing.

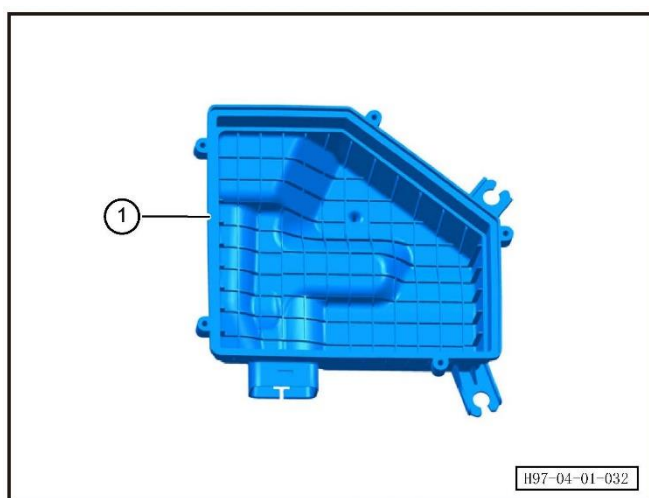
Tightening torque of bolt: 3Nm.



b. Take down the air filter body upper cover ①.



c. Take out the air filter element ①.



d. Clean the air filter lower housing assembly ①.

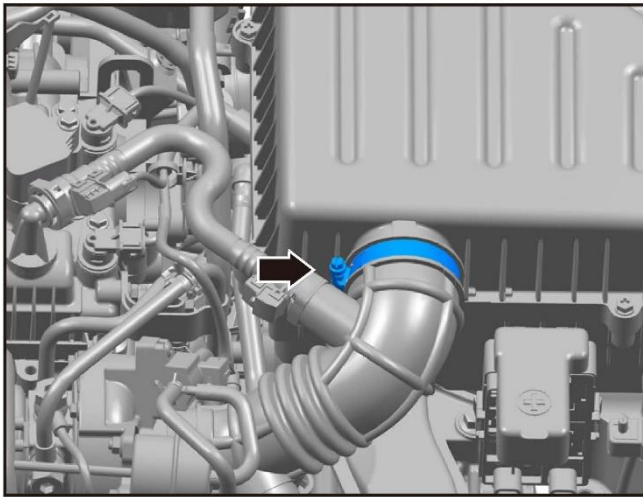
Refitting procedure

The refitting procedure is performed in reverse order.

4.1.8.3 Removal and refitting of air filter element

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Remove the air filter element.

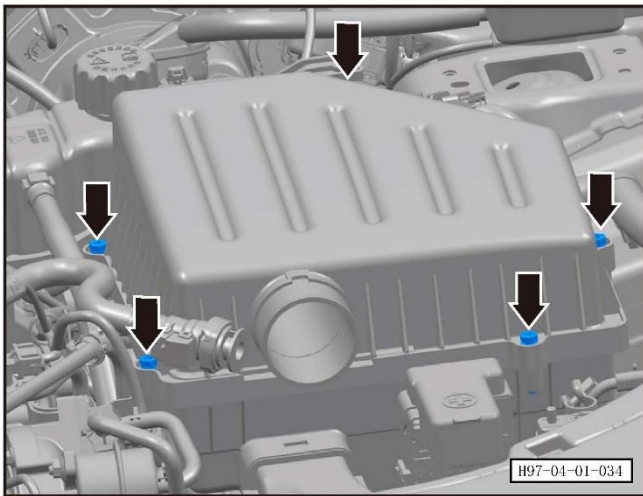


- a. Loosen the clamp bolts and disconnect the air filter outlet pipe from the air filter assembly.

Tightening torque of bolt: 4 ± 1 Nm.

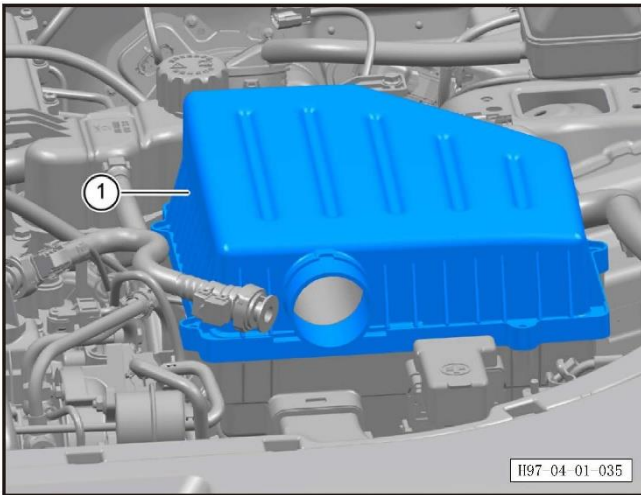
CAUTION:

- During refitting, adjust the position of the clamp, rotate it counterclockwise to the vertical state, and then tighten the clamp bolts to the standard torque.

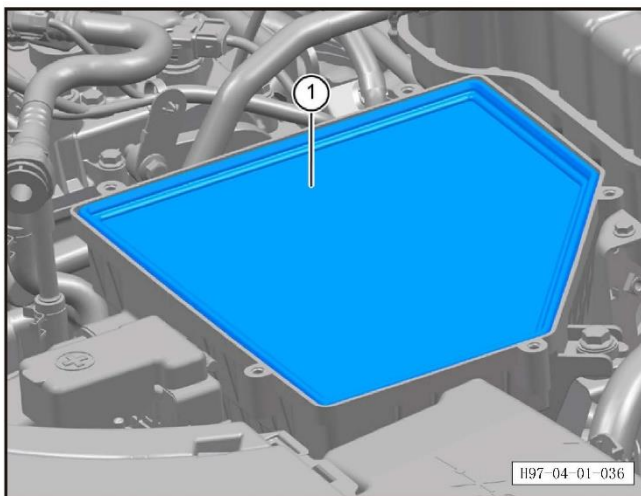


- b. Remove the 5 bolts on the air filter housing.

Tightening torque of bolt: 3Nm.



c. Remove the air filter upper housing ①.



d. Take out the air filter element ①.

Refitting procedure

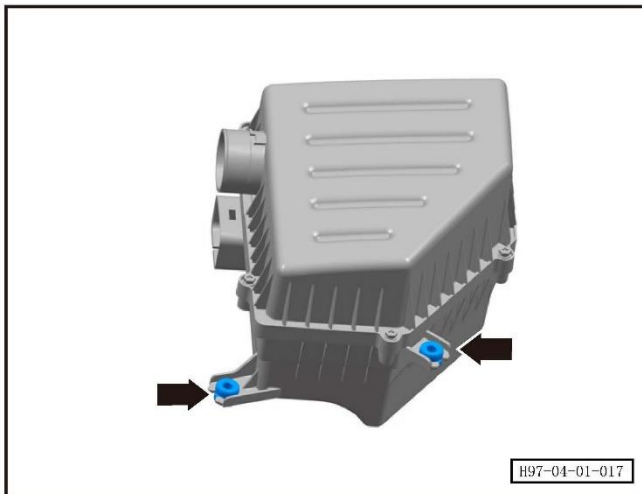
The refitting procedure is performed in reverse order.

4.1.8.4 Removal and refitting of air filter rubber block

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
5. Remove the air filter rubber block.

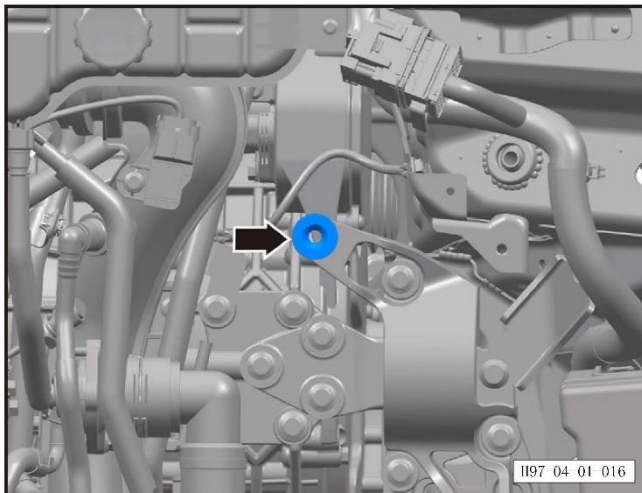
a. Take down the 2 rubber blocks from the air filter assembly housing.



b. Take down 1 retaining rubber block from the air filter assembly base.

Note:

The rubber block of the air filter assembly base is mounted on the generator bracket.



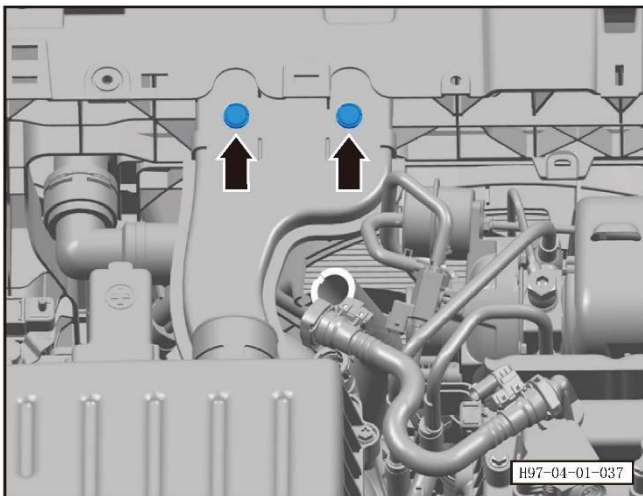
Refitting procedure

The refitting procedure is performed in reverse order.

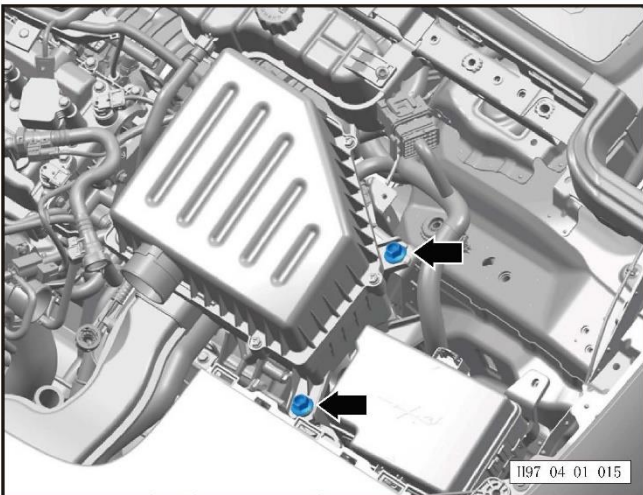
4.1.8.5 Removal and refitting of air filter inlet pipe assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Remove the air filter outlet pipe assembly (refer to [4.1.8.6 Removal and refitting of air filter outlet pipe assembly](#))
5. Remove the air filter inlet pipe assembly.

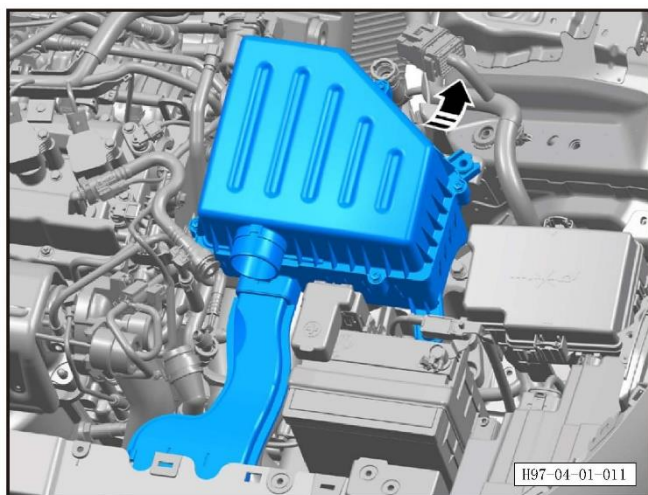


- a. Remove the 2 clips on the air filter inlet pipe assembly.

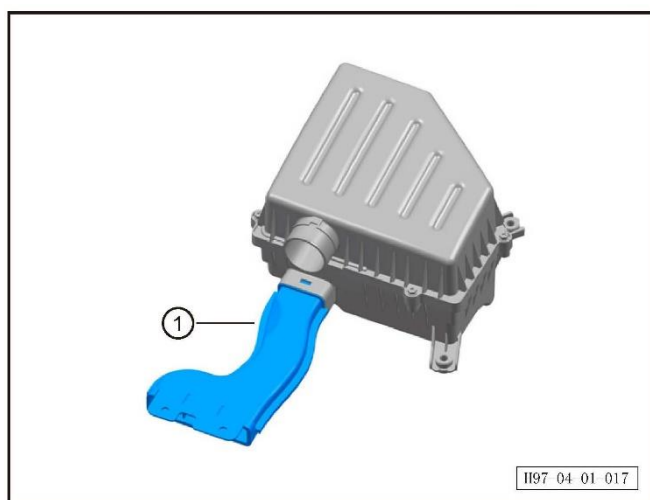


- b. Remove the 2 bolts securing the air filter assembly to the bracket.

Tightening torque of bolt: $12\pm 1\text{Nm}$.



c. Take down the air filter assembly and air filter inlet pipe assembly.



d. Remove the air filter inlet pipe assembly ①.

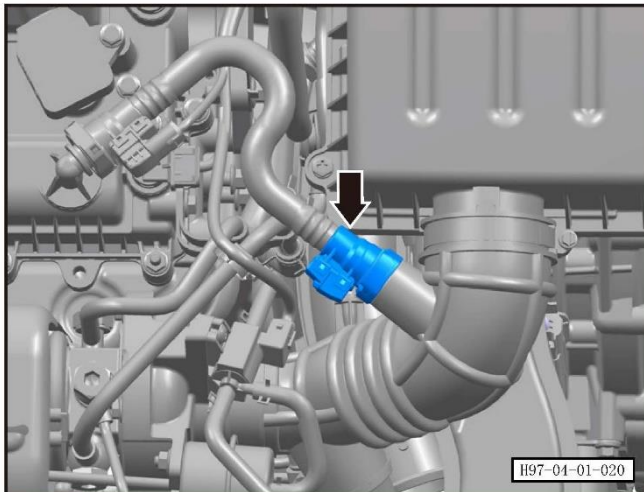
Refitting procedure

The refitting procedure is performed in reverse order.

4.1.8.6 Removal and refitting of air filter outlet pipe assembly

Removal procedure

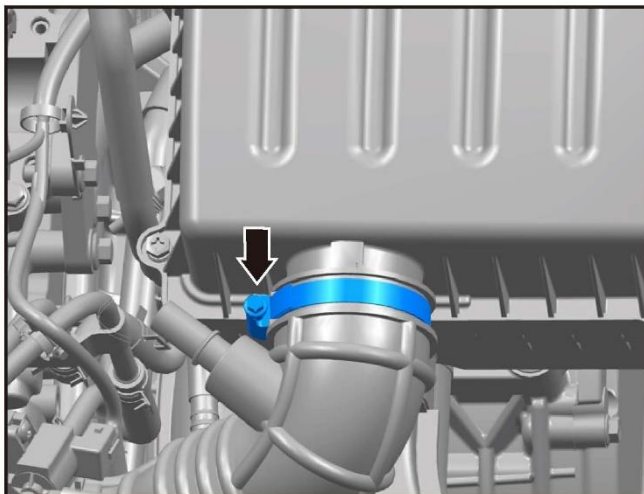
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the air filter outlet pipe assembly.



- a. Disconnect the quick-connect hose from the air filter outlet pipe.

CAUTION:

- Replace the seal ring when refitting.

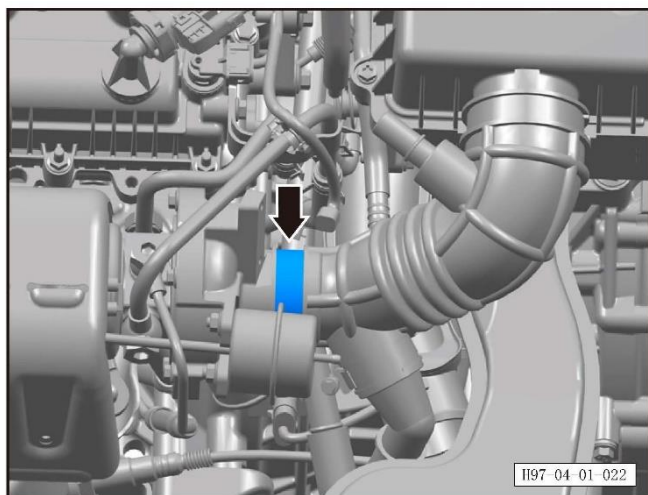


- b. Loosen the clamp bolt and disconnect the air filter outlet pipe from the air filter assembly.

Tightening torque of bolt: $4\pm 1\text{Nm}$.

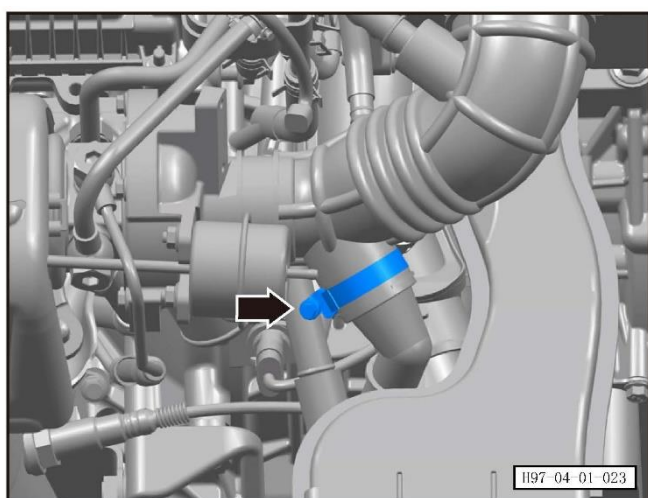
CAUTION:

- During refitting, adjust the position of the clamp, rotate it counterclockwise to the vertical state, and then tighten the clamp bolts to the standard torque.



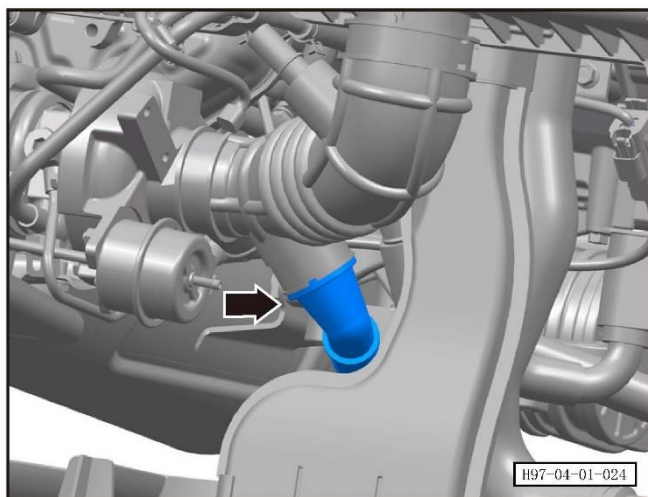
c. Loosen the clamp bolt and disconnect the air filter outlet pipe from the turbocharger air inlet.

Tightening torque of bolt: $6\pm 1\text{Nm}$.

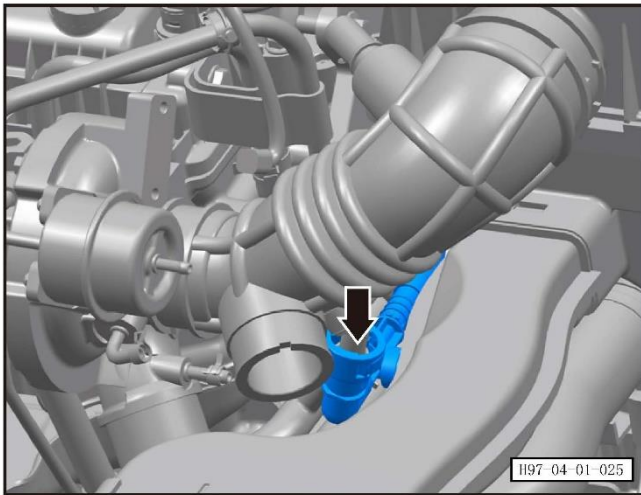


d. Loosen the clamp bolt connecting the air filter outlet pipe and the pressure relief valve air outlet pipe.

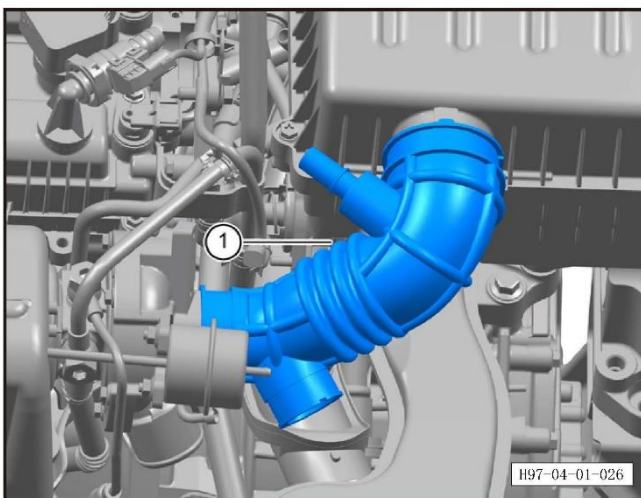
Tightening torque of bolt: $6\pm 1\text{Nm}$.



e. Disconnect the air filter outlet pipe from the pressure relief outlet pipe.



f. Disconnect the connection clip between the air filter outlet pipe and the high-pressure desorption tube.



g. Take down the air filter outlet pipe assembly ①.

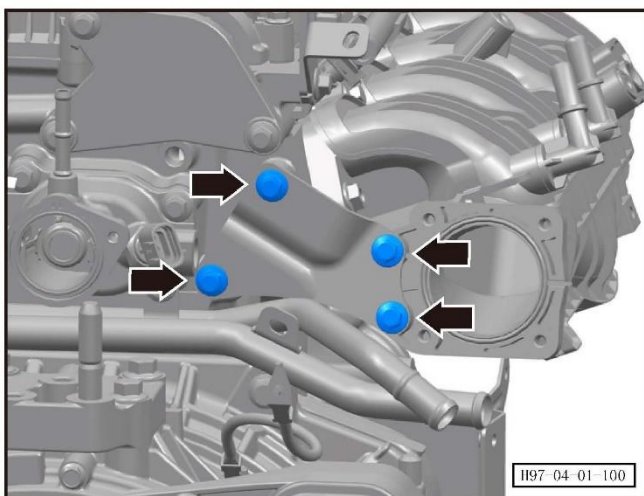
Refitting procedure

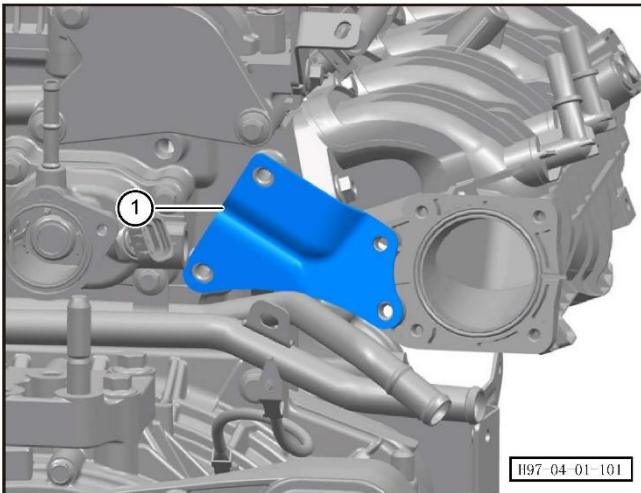
The refitting procedure is performed in reverse order.

4.1.8.7 Removal and refitting of intake manifold assembly

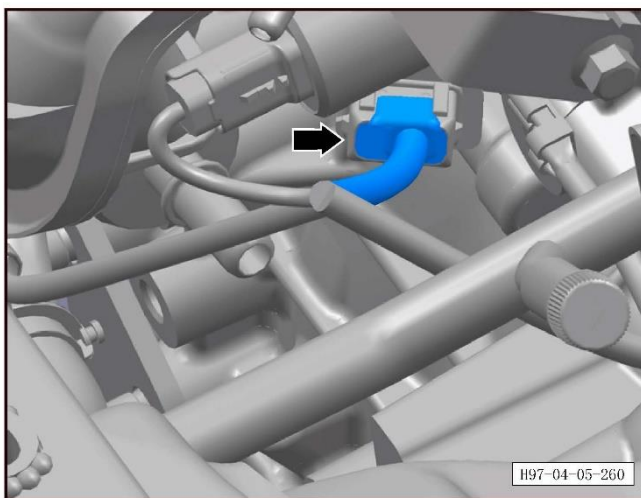
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
6. Disconnect the fuel inlet pipe 3# assembly (refer to [4.3.8.3 Removal and refitting of fuel inlet pipe 3#](#))
7. Remove the ambient pressure sensor (refer to [4.5.16.7 Removal and refitting of ambient pressure sensor](#))
8. Remove the intake pressure/temperature sensor (refer to [4.5.16.6 Removal and refitting of intake pressure/temperature sensor](#))
9. Remove the PCV valve vent pipe 2# (refer to [4.5.18.2 Removal and refitting of PCV valve vent pipe 2#](#))
10. Remove the high voltage desorption tube assembly (refer to [4.3.8.6 Removal and refitting of high voltage desorption tube assembly](#))
11. Remove the electronic throttle body (refer to [4.5.16.8 Removal and refitting of electronic throttle body](#))
12. Disconnect the canister desorption tube 3# (refer to [4.3.10.10 Removal and refitting of canister desorption tube 3#](#))
13. Remove the intake manifold assembly.
 - a. Unscrew the 4 bolts on the mounting bracket.
Tightening torque of bolt: $12\pm 1\text{Nm}$.

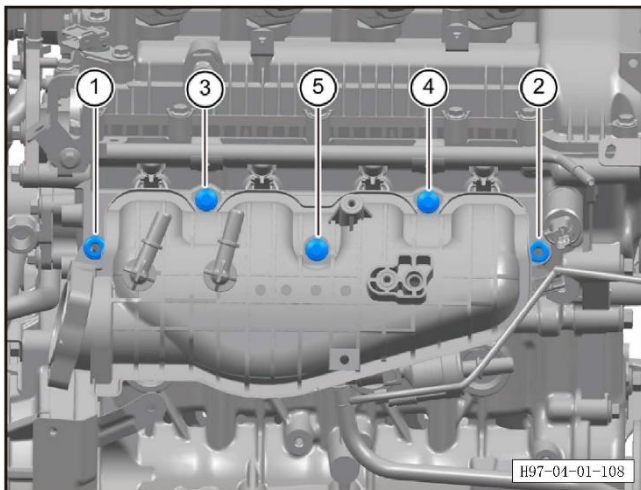




b. Take down the intake manifold bracket ①.



c. Disconnect the knock sensor connector.



d. Unscrew the 3 bolts and 2 nuts on the intake manifold assembly in the order marked.

Tightening torque of bolt: $22\pm 1\text{Nm}$.

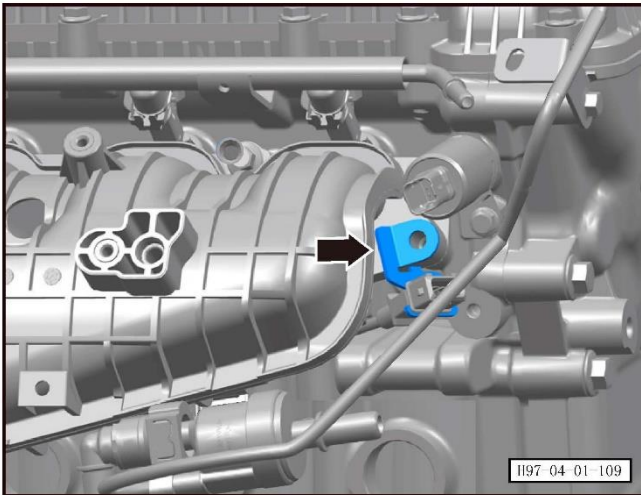
CAUTION:

- There are clips under the intake manifold assembly to fix the dual check valve vent pipe. Do not forcefully pull the intake manifold assembly to avoid damage to the vent pipe.

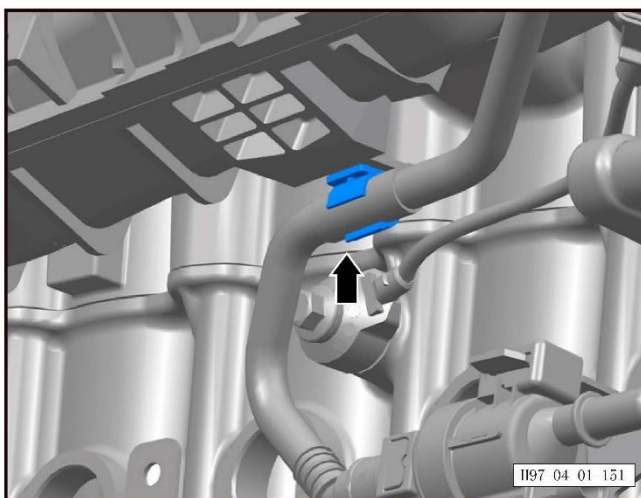
- Nut ① is the same as nut ②,

- ③, ④ and ⑤ are bolts.

- Nut ② not only fixes the intake manifold assembly, but also presses the bracket of the knock sensor connector harness.



e. Take down the knock sensor connector bracket.

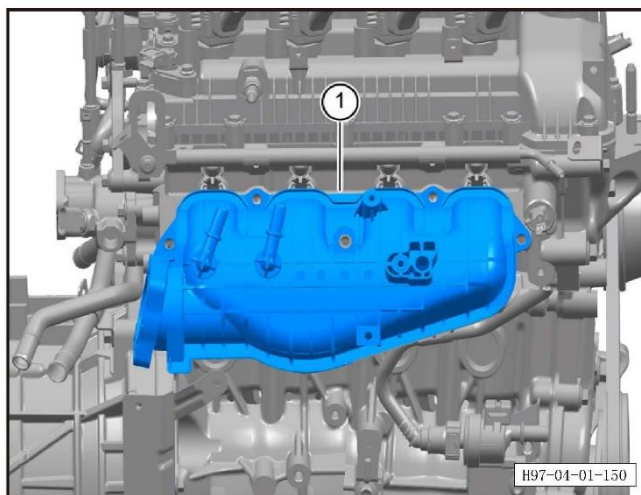


f. Take out the dual check valve vent pipe.

CAUTION:

- The bolts (nuts) securing the intake manifold assembly have been removed, and the intake manifold assembly can move upward for a certain distance at this time. It helps to observe and disconnect the lower connector.

- Do not pull the intake manifold assembly upwards with brute force to avoid damage to the lower pipeline when the situation below is not fully observed and it is not completely sure to disconnect the lower pipeline and the connector.



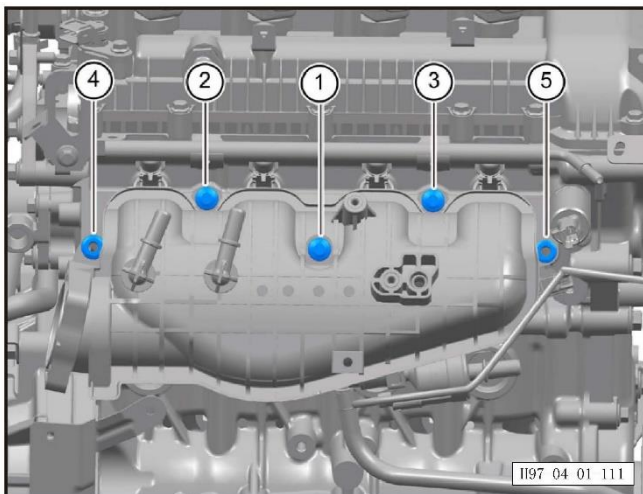
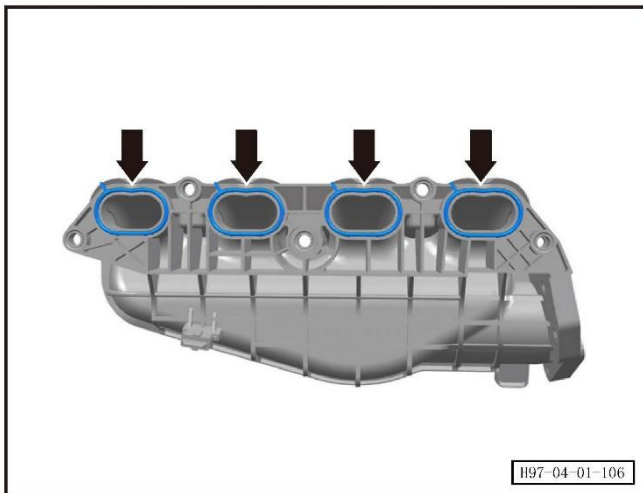
g. Take out the intake manifold assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- After disassembly and assembly, it is necessary to ensure that the joints of each pipeline on the intake manifold components are in good condition to avoid breakage of pipeline interface or missed installation of parts.
- If the pipe interface is broken, it is necessary to replace the intake manifold assembly.
- Avoid foreign matter entering the intake manifold assembly and cylinder block.
- Avoid missed installation of the vent pipe under the intake manifold assembly.
- When refitting the intake manifold assembly, it is necessary to replace the seal rings of each cylinder air inlet of the intake manifold to ensure that the sealing is intact after refitting.



- Refit the intake manifold bolts (nuts) in the order marked.

Tightening torque of bolt (nut): $22 \pm 1 \text{ Nm}$.

4.1.9 Intercooler assembly

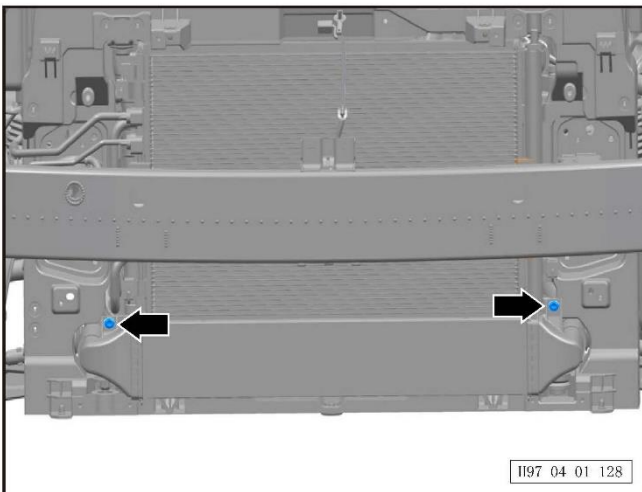
4.1.9.1 Removal and refitting of intercooler assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front bumper assembly (refer to [8.6.3.3 Removal and refitting of front bumper assembly](#))
6. Remove the front bumper energy absorption block (refer to [8.6.3.4 Removal and refitting of front bumper energy absorption block](#))
7. Remove the radiator guide frame (refer to [8.6.3.14 Removal and refitting of radiator guide frame \(REV\)](#))
8. Remove the intercooler assembly.

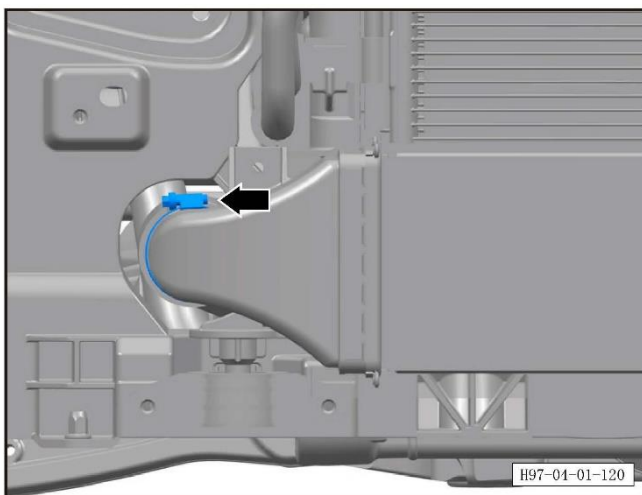
- a. Unscrew the 2 bolts on the intercooler.

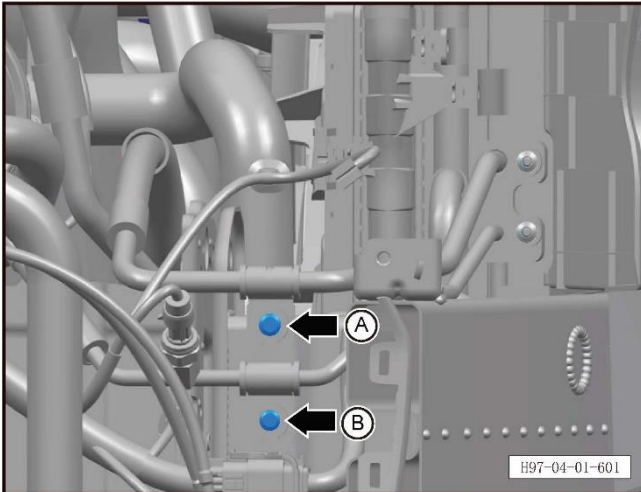
Tightening torque of bolt: $9\pm 1\text{Nm}$.



- b. Loosen the pipe clamp bolts and disconnect the left hose of intercooler from the intercooler assembly.

Tightening torque of bolt: $6\pm 1\text{Nm}$.



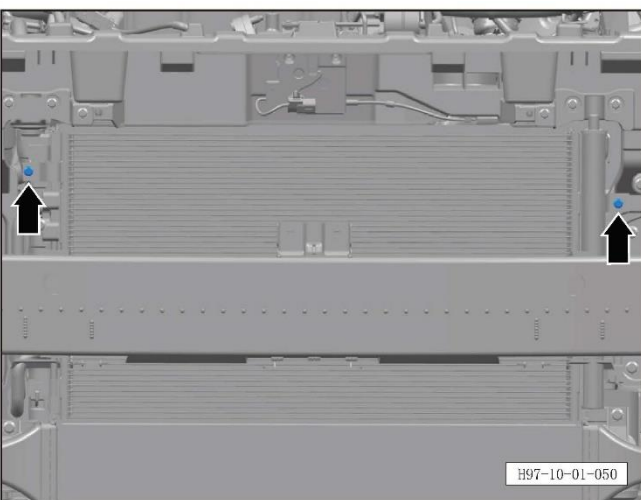


c. Unscrew the bolts A and B that fix the compressor inlet and outlet pipes.

Tightening torque of bolt: $10\pm 1\text{Nm}$.

CAUTION:

- There are two lifting lugs on the left and right sides of the intercooler assembly. Be careful not to damage the intercooler assembly and the lifting lugs.
- If the intercooler assembly is damaged, it must be replaced with a new one to avoid air leakage in the intake system.

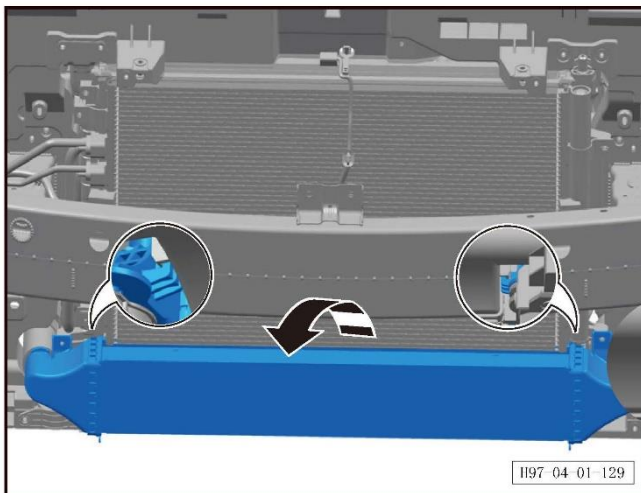


d. Unscrew the 2 bolts on the A/C condenser and lift the condenser up to the highest position.

Tightening torque of bolt: $8\pm 1\text{Nm}$.

CAUTION:

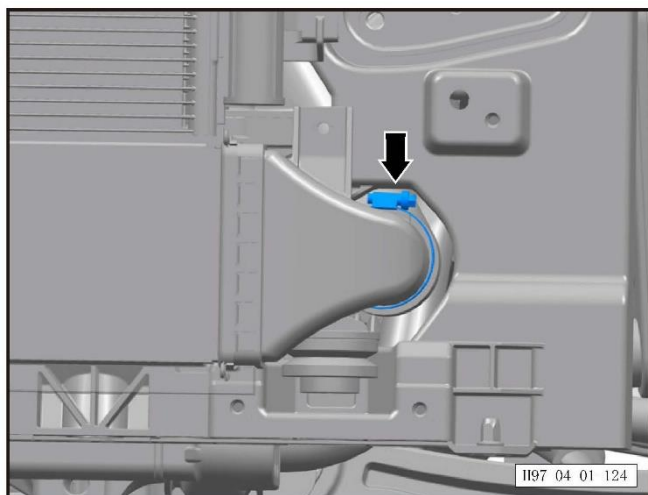
- The top end of the condenser is held up by the front-end module, and the condenser cannot be pulled out.



e. Pry out the intercooler assembly with slight force and disconnect the 2 lifting lugs.

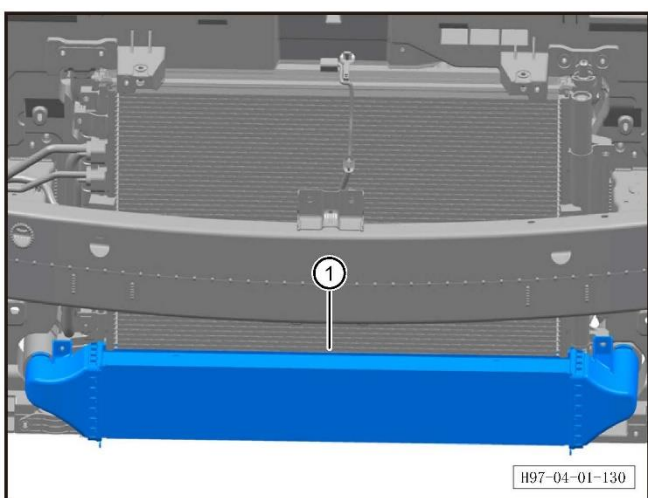
CAUTION:

- There are two lifting lugs on the left and right sides of the intercooler assembly. Be careful not to damage the intercooler assembly and the lifting lugs.
- If the intercooler assembly is damaged, it must be replaced with a new one to avoid air leakage in the intake system.



f. Pull out the intercooler and the connecting hose, loosen the pipe clamp bolts, and disconnect the right hose of intercooler from the intercooler assembly.

Tightening torque of bolt: $6\pm 1\text{Nm}$.



g. Take down the intercooler assembly ①.

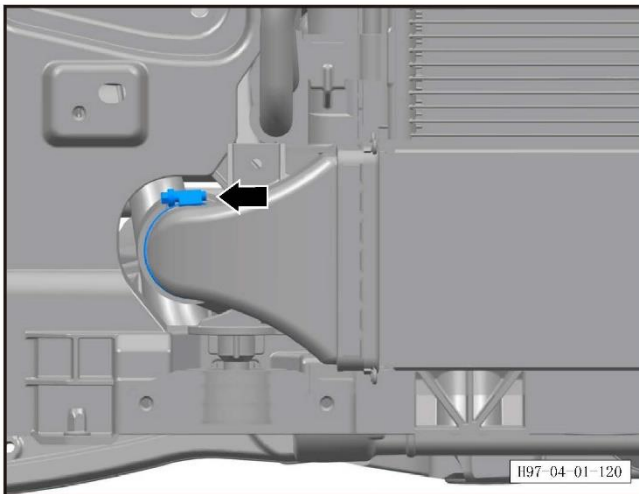
Refitting procedure

The refitting procedure is performed in reverse order.

4.1.9.2 Removal and refitting of intercooler air inlet hose 1#

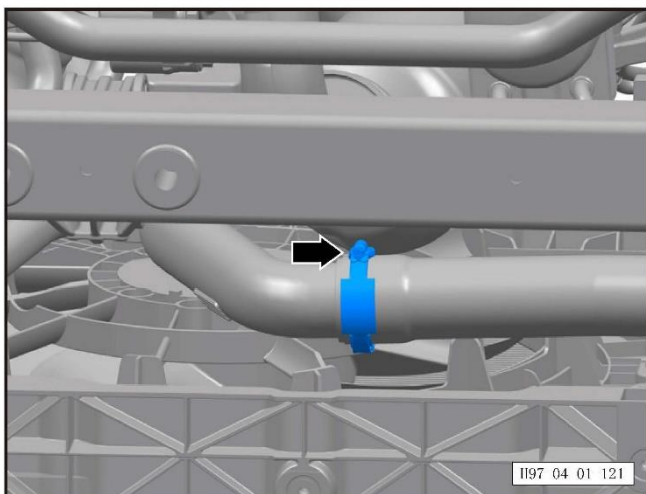
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front bumper assembly (refer to [8.6.3.3 Removal and refitting of front bumper assembly](#))
6. Remove the front bumper energy absorption block (refer to [8.6.3.4 Removal and refitting of front bumper energy absorption block](#))
7. Remove the radiator guide frame (refer to [8.6.3.14 Removal and refitting of radiator guide frame \(REV\)](#))
8. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
9. Remove the intercooler air inlet hose 1#.



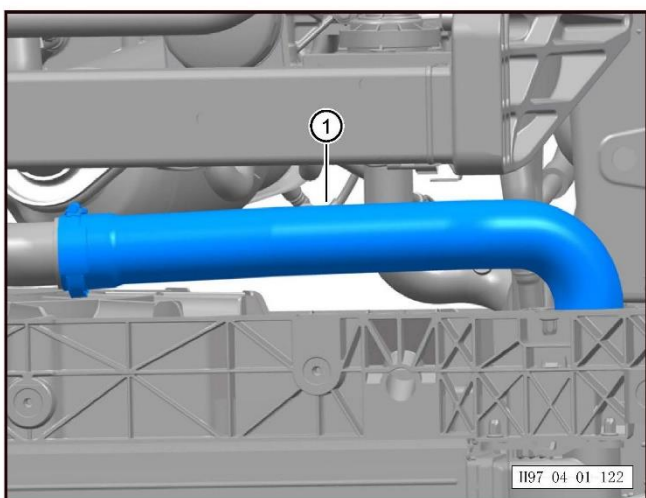
- a. Loosen the pipe clamp bolts and disconnect the intercooler air inlet hose 1# from the intercooler assembly.

Tightening torque of bolt: 6 ± 1 Nm.



b. Loosen the pipe clamp bolts and disconnect the intercooler air inlet hose from the air inlet pipe.

Tightening torque of bolt: $6\pm 1\text{Nm}$.



c. Take down the intercooler air inlet hose assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

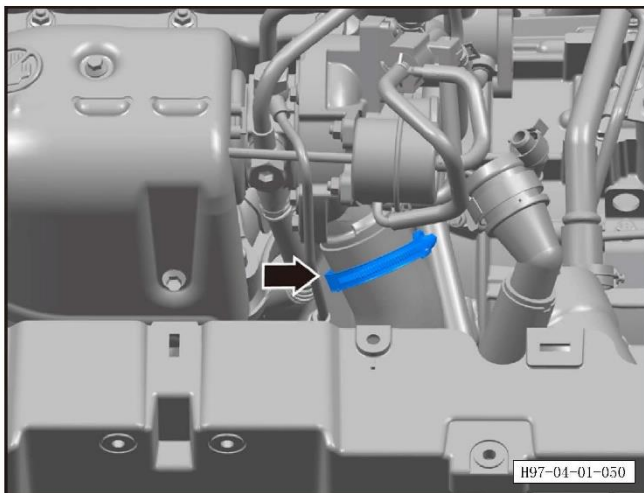
4.1.9.3 Removal and refitting of intercooler air inlet hose 2#

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the intercooler air inlet hose 2#.

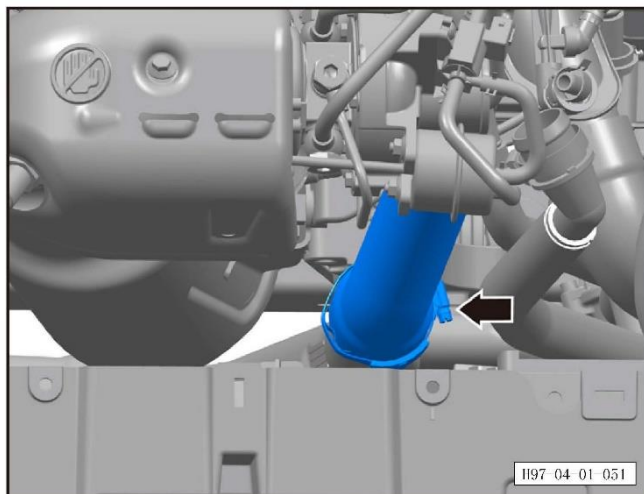
a. Loosen the pipe clamp bolts and disconnect the intercooler air inlet hose 2# from the turbocharger assembly.

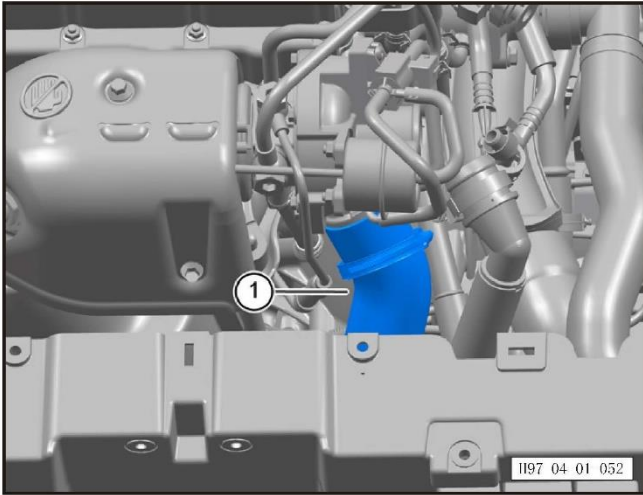
Tightening torque of bolt: $6\pm 1\text{Nm}$.



b. Loosen the pipe clamp bolts and disconnect the intercooler air inlet hose 2#.

Tightening torque of bolt: $6\pm 1\text{Nm}$.





c. Take out the intercooler air inlet hose 2# ①.

Refitting procedure

The refitting procedure is performed in reverse order.

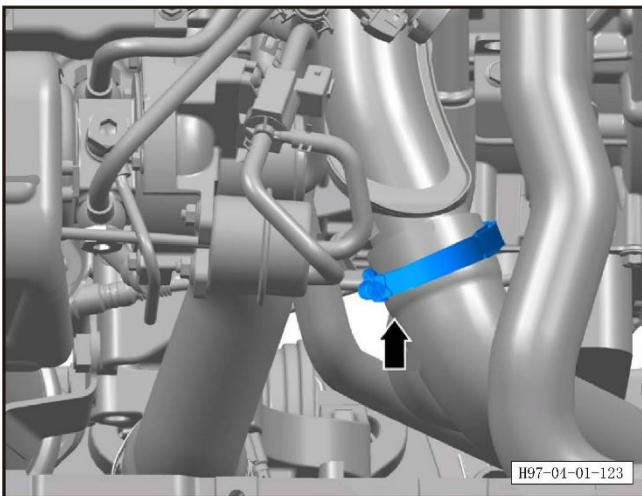
4.1.9.4 Removal and refitting of intercooler air outlet hose

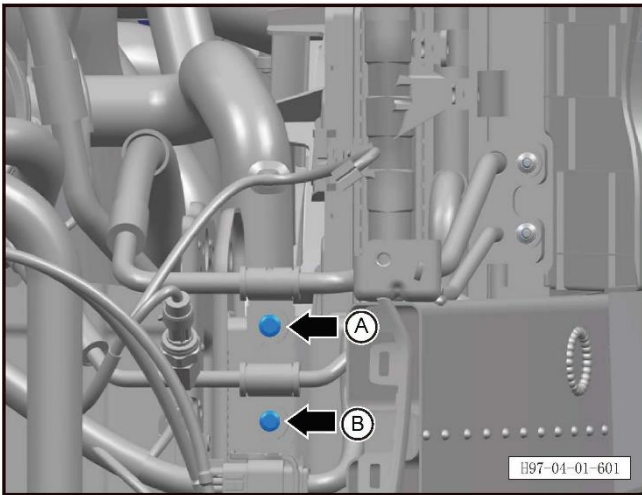
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front bumper assembly (refer to [8.6.3.3 Removal and refitting of front bumper assembly](#))
6. Remove the front bumper energy absorption block (refer to [8.6.3.4 Removal and refitting of front bumper energy absorption block](#))
7. Remove the radiator guide frame (refer to [8.6.3.14 Removal and refitting of radiator guide frame \(REV\)](#))
8. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
9. Remove the intercooler air outlet hose.

- a. Loosen the pipe clamp bolts and disconnect the intercooler air outlet hose.

Tightening torque of bolt: $6\pm 1\text{Nm}$.



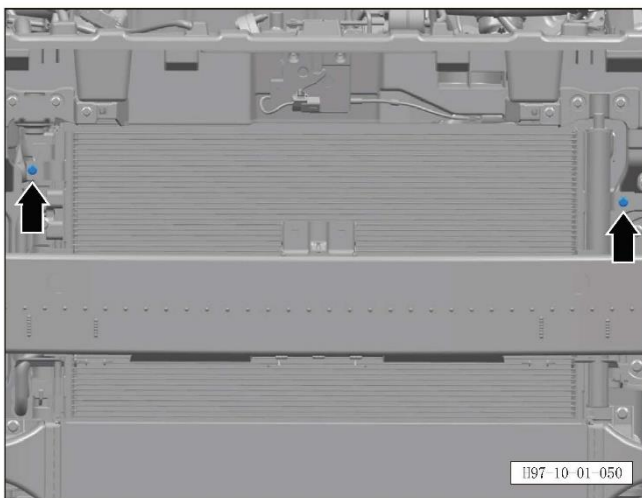


c. Unscrew the bolts A and B that fix the compressor inlet and outlet pipes.

Tightening torque of bolt: $10\pm 1\text{Nm}$.

CAUTION:

- There are two lifting lugs on the left and right sides of the intercooler assembly. Be careful not to damage the intercooler assembly and the lifting lugs.
- If the intercooler assembly is damaged, it must be replaced with a new one to avoid air leakage in the intake system.

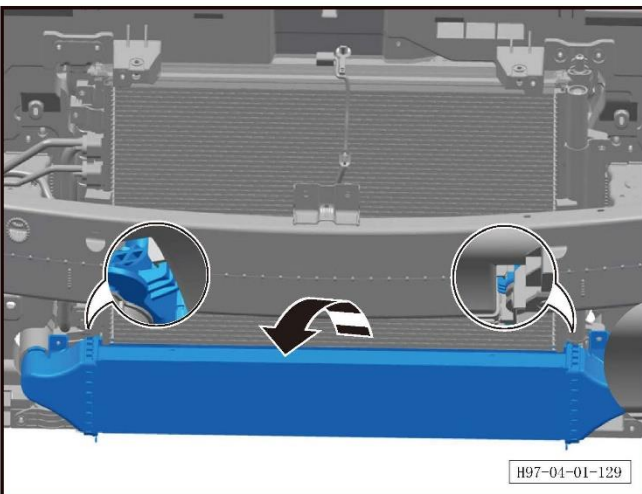


d. Unscrew the 2 bolts on the A/C condenser and lift the condenser up to the highest position.

Tightening torque of bolt: $8\pm 1\text{Nm}$.

CAUTION:

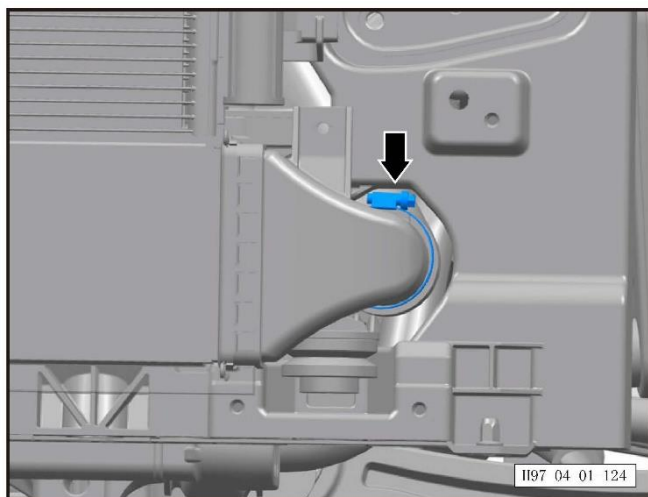
- The top end of the condenser is held up by the front-end module, and the condenser cannot be pulled out.



e. Pry out the intercooler assembly with slight force and disconnect the 2 lifting lugs.

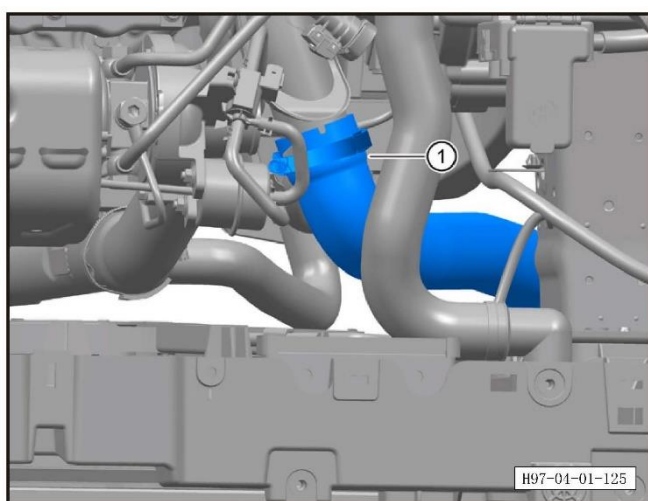
CAUTION:

- There are two lifting lugs on the left and right sides of the intercooler assembly. Be careful not to damage the intercooler assembly and the lifting lugs.
- If the intercooler assembly is damaged, it must be replaced with a new one to avoid air leakage in the intake system.



f. Pull out the intercooler and the connecting hose, loosen the pipe clamp bolts, and disconnect the right hose of intercooler from the intercooler assembly.

Tightening torque of bolt: $6\pm 1\text{Nm}$.



g. Take down the intercooler air outlet hose assembly ①.

Refitting procedure

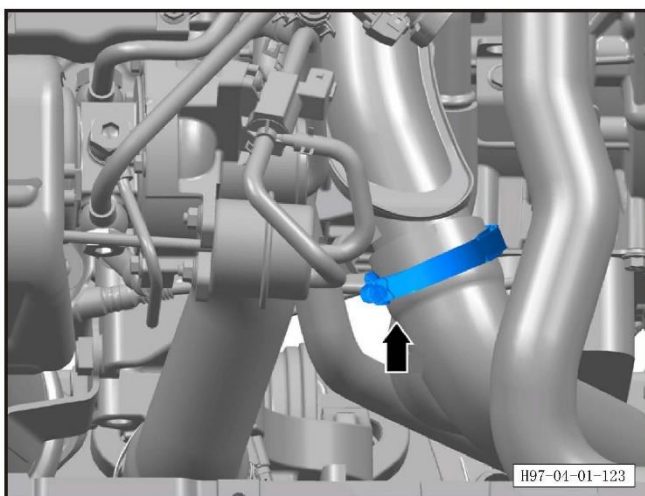
The refitting procedure is performed in reverse order.

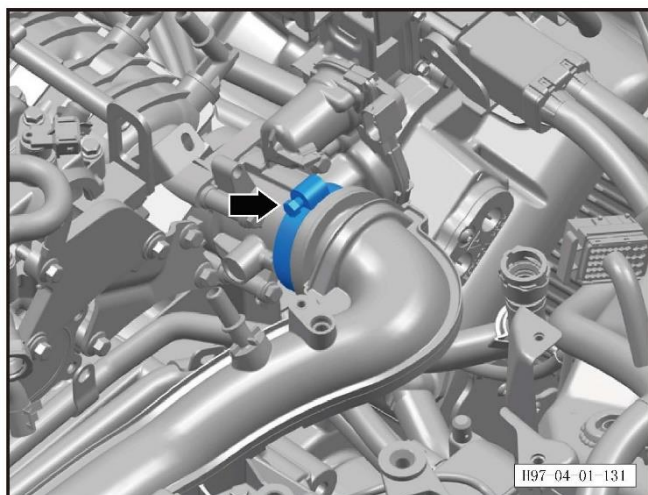
4.1.9.5 Removal and refitting of intercooler air outlet pipe assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
6. Remove the high voltage desorption tube assembly (refer to [4.3.8.6 Removal and refitting of high voltage desorption tube assembly](#))
7. Disconnect the intercooler air outlet pipe (refer to [4.1.9.4 Removal and refitting of intercooler air outlet hose](#))
8. Remove the water outlet chamber end cover (refer to [4.4.8.1 Removal and refitting of water outlet chamber end cover](#))
9. Remove the thermostat (refer to [4.4.8.2 Removal and refitting of thermostat](#))
10. Remove the water outlet chamber (refer to [4.4.8.3 Removal and refitting of water outlet chamber assembly](#))
11. Remove the ranger extender water outlet pipe (refer to [4.4.8.77 Removal and refitting of ranger extender water outlet pipe](#))
12. Remove the throttle front end intake pressure/temperature sensor (refer to [4.5.16.9 Removal and refitting of throttle front end intake pressure/temperature sensor](#))
13. Remove the intercooler air outlet pipe assembly.
 - a. Loosen the pipe clamp bolts and disconnect the intercooler air outlet hose from the air outlet pipe.

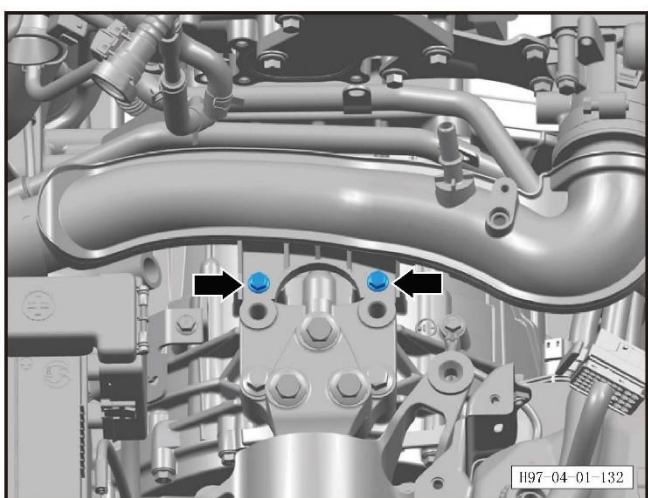
Tightening torque of bolt: $6\pm 1\text{Nm}$.





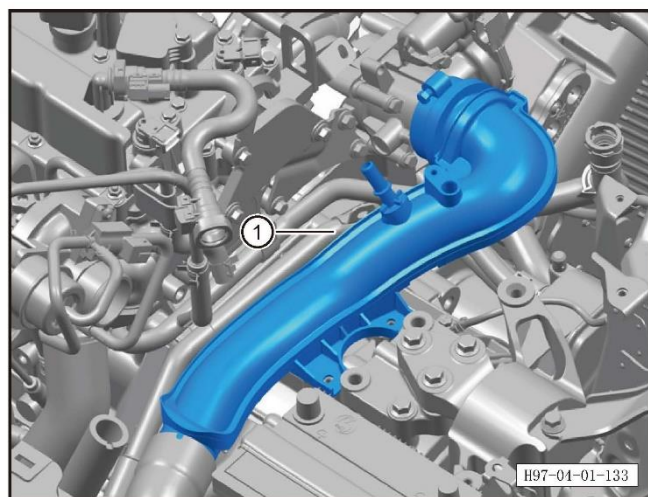
b. Loosen the pipe clamp bolts and disconnect the intercooler air outlet pipe from the electronic throttle valve assembly.

Tightening torque of bolt: $6\pm 1\text{Nm}$.



c. Unscrew the 2 bolts on the intercooler air outlet pipe.

Tightening torque of bolt: $20\pm 2\text{Nm}$.



d. Take out the intercooler air outlet pipe ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.2 Exhaust system

4.2.1 Precautions

- Do not operate the exhaust system until the range extender is cooled down naturally, for the exhaust pipeline temperature is high when the range extender is running or shortly after the range extender is stopped, so as to avoid burns caused by high temperature components to service personnel.
- When refitting the exhaust manifold and three-way catalytic converter assembly, all fasteners should be replaced with new parts.
- Distinguish the difference between front and rear oxygen sensors: the front oxygen sensor is installed at the front end of the three-way catalytic converter; the rear oxygen sensor is installed at the rear end of the three-way catalytic converter.
- Please handle the oxygen sensor carefully to avoid dropping the heated oxygen sensor.
- Electrical connectors and vent ends must not come into contact with grease, dust, or other contaminants. Do not use any kind of cleaning agent.
- Anti-seize agent must be applied to the threads of all fasteners in the exhaust manifold assembly.
- The heating parts of exhaust pipeline should be kept sufficiently far away from the body and other parts on body during the refitting of exhaust pipeline, otherwise it is easy to cause friction and damage other parts.
- The connection bending degree of exhaust system parts should not exceed 10 degrees, otherwise it will cause deformation of related parts and damage the sealing performance of the exhaust system.
- While refitting all the exhaust system assembly to the body, make sure to loosen the bolts/nuts of the connection parts of the exhaust system again and calibrate them such that the exhaust pipeline can be under uniform force, and then retighten them in place to the specified torque.

4.2.2 Introduction to structure and principle

- The exhaust system consists of exhaust manifold, three-way catalytic converter assembly, exhaust pipe, muffler, gasket and others.
- The three-way catalytic converter is an emission control device installed on the range extender exhaust system to reduce hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxides (NOx) in the exhaust gas.
- The combustion process of gasoline fuel produces toxic elements such as carbon monoxide, nitrogen oxides and non-combustible hydrocarbons. These toxic gases are converted into carbon dioxide, water and nitrogen by chemical reactions in catalytic converters.
- The catalyst in the converter is not serviceable.

Three-way catalytic converter assembly

- The three-way catalytic converter is the most important external purification device installed in the automobile exhaust system, which can convert harmful gases such as CO, HC and NOx from automobile exhaust into harmless carbon dioxide, water and nitrogen through oxidation and reduction. When the high-temperature automobile exhaust gas passes through the purification device, the purifying agent in the three-way catalyst converter will enhance the activity of the three gases CO, HC and NOx, prompting them to carry out a certain oxidation-reduction chemical reaction, in which CO is oxidized to a colorless, non-toxic carbon dioxide gas at high temperature; HC compounds are oxidized to water and carbon dioxide at high temperature; and NOx is reduced to nitrogen and oxygen. The three harmful gases are turned into harmless gases, so that the automobile exhaust gas can be purified.

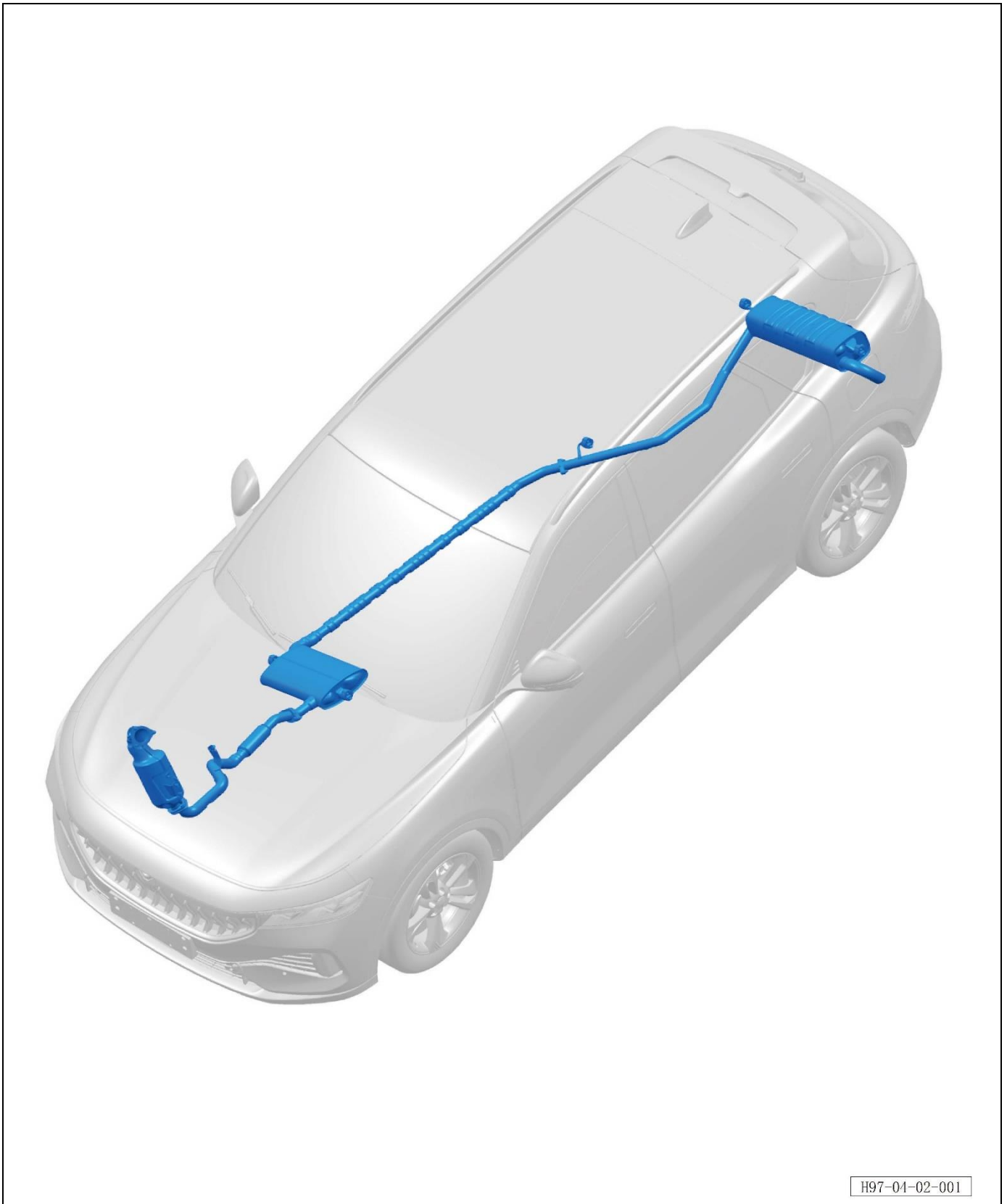
Muffler assembly

- The mobile muffler is a part used to reduce the noise generated when the exhaust gas of the motor vehicle is discharged, and make the high-temperature exhaust gas to be discharged safely and effectively. As part of the exhaust pipe, the muffler should ensure smooth exhaust, low resistance and sufficient strength of the exhaust pipe. The muffler must withstand the high temperature exhaust of 500°C -700°C to ensure that it will not be damaged or lose the muffling effect within the specified driving mileage of the car.

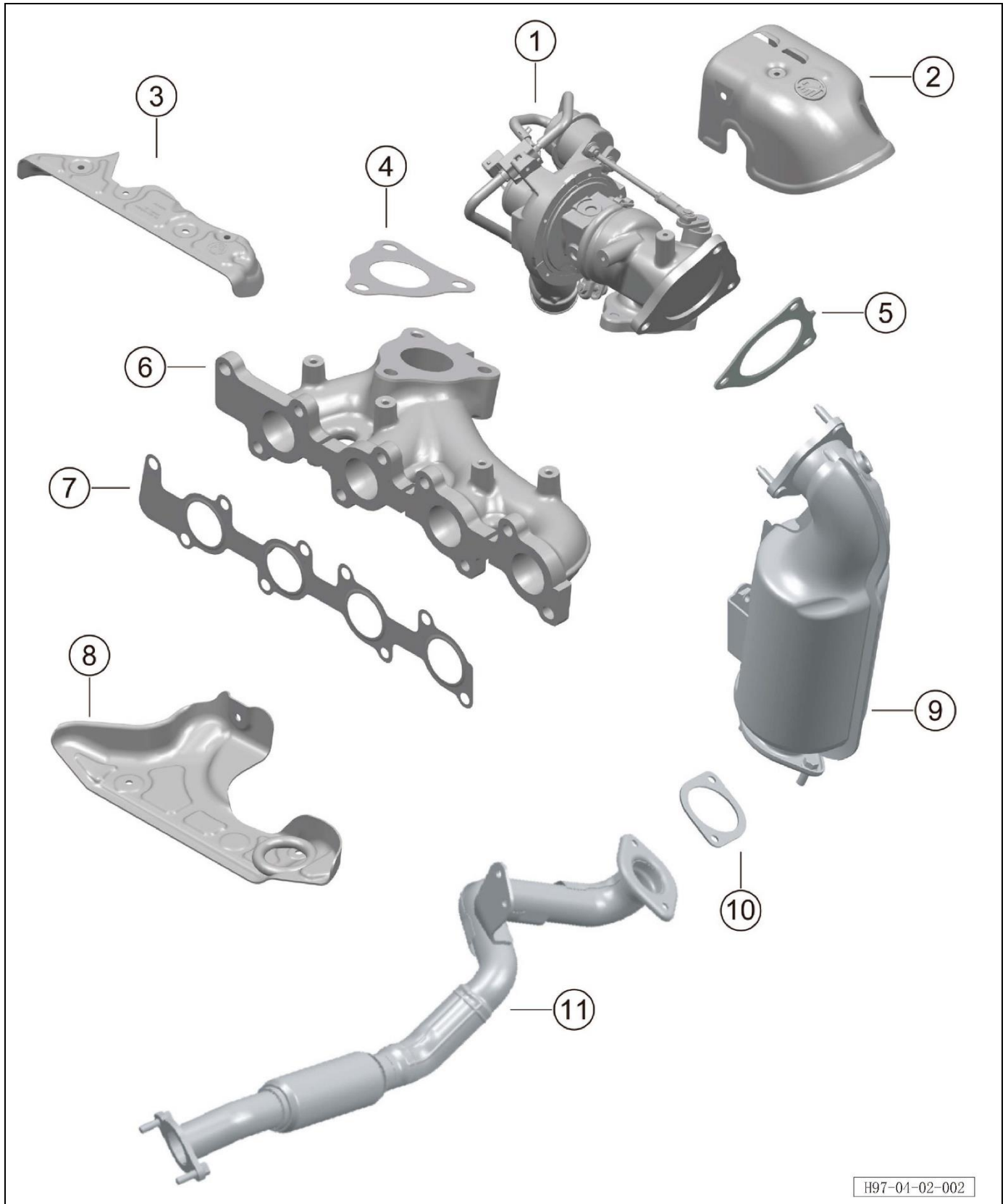
Oxygen sensor

- Oxygen sensor is an essential element on range extenders that employ three-way catalytic converters to reduce exhaust pollution. Once the air-fuel ratio of the mixture deviates from the theoretical air-fuel ratio, the purifying capacity of the three-way catalyst converter for CO, HC and NOx will drop sharply, so an oxygen sensor is installed in the exhaust pipe to detect the concentration of oxygen in the exhaust and send feedback signals to the controller for the controller to control the increase or decrease of the fuel injection amount of the injector, so as to control the air-fuel ratio of the mixture within the theoretical value range.
- Vehicles are now equipped with two oxygen sensors, respectively in the front and rear of the three-way catalytic converter. The front one is used to detect the air-fuel ratio of the range extender under different working conditions, and the computer adjusts the fuel injection amount and calculates the ignition time according to the signal. The rear one is mainly used to detect the working quality of the three-way catalytic converter, that is, the conversion rate of the catalytic converter. By comparing with the data of the front oxygen sensor, it is an important basis to detect whether the three-way catalytic converter works normally (good or bad).

4.2.3 Position diagram of parts

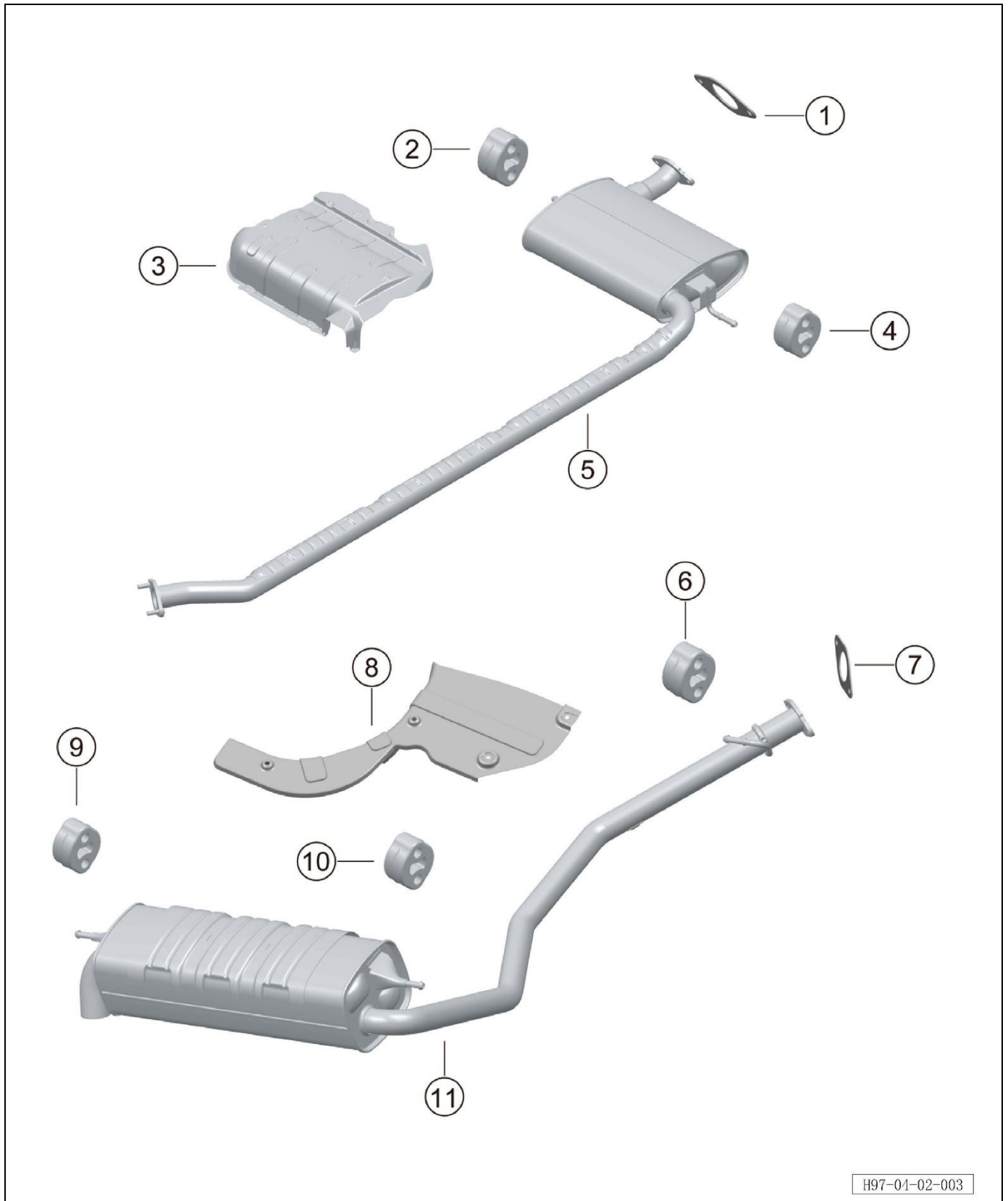


4.2.4 Structural exploded view of exhaust system and turbocharger



| S/N | Part name | Loading quantity | Remarks |
|-----|------------------------------|------------------|---------|
| 1 | Turbocharger | 1 | |
| 2 | Turbocharger heat shield | 1 | |
| 3 | Upper heat shield | 1 | |
| 4 | Gasket | 1 | |
| 5 | Catalytic converter gasket | 1 | |
| 6 | Exhaust Manifold | 1 | |
| 7 | Gasket | 1 | |
| 8 | Lower heat shield | 1 | |
| 9 | Catalytic converter assembly | 1 | |
| 10 | Catalytic converter gasket | 1 | |
| 11 | Bellows assembly | 1 | |

4.2.5 Structural exploded view of exhaust system and muffler



| S/N | Part name | Loading quantity | Remarks |
|-----|---------------------------|------------------|---------|
| 1 | Muffler gasket | 1 | |
| 2 | Lifting ring | 1 | |
| 3 | Front muffler heat shield | 1 | |
| 4 | Lifting ring | 1 | |
| 5 | Front muffler assembly | 1 | |
| 6 | Lifting ring | 1 | |
| 7 | Muffler gasket | 1 | |
| 8 | Fuel tank heat shield | 1 | |
| 9 | Lifting ring | 1 | |
| 10 | Lifting ring | 1 | |
| 11 | Rear muffler assembly | 1 | |

4.2.6 Technical parameters

Tightening Torque

| Fastening position | Specification | Tightening torque: N•m |
|--|---|------------------------|
| Catalytic converter assembly and mid-end exhaust pipeline assembly Middle exhaust pipe assembly | Hexagon flange nut M10×1.25 | 45 ± 5 |
| Exhaust Manifold | Hexagon flange nut M6×1.25 | 34 ± 2 |
| Front muffler heat shield | Hexagon flange nut M6 | 8 ± 2 |
| Fuel tank heat shield | Hexagon flange nut M6 | 8 ± 2 |
| Catalytic converter assembly | Hexagon flange nut M10×1.25 | 50 ± 5 |
| | Attached M10 bolt of catalyst converter | 50 ± 5 |
| | Clamp assembly | 15 ± 1 |

4.2.7 Special tools

| S/N | Tool Name | Tool No. | Description |
|-----|--|-----------|--|
| 1 | Special tool for removal and refitting of oxygen sensor sleeve | H52202000 | For removing and refitting oxygen sensor |

4.2.8 Common faults**4.2.8.1 Exhaust system failure**

| Fault causes | Countermeasures |
|---|---|
| 1. Obstruction of exhaust system 2. Air leakage of intake manifold | Clean or replace exhaust system parts Service the exhaust system related pipelines |

4.2.8.2 Exhaust system emissions unacceptable

| Fault causes | Countermeasures |
|--|--|
| 1. The use of leaded gasoline caused damage to the oxygen sensor and three-way catalytic converter 2. The misfire caused by failure of the ignition system and long-term use result in damage to the oxygen sensor and the three-way catalytic converter 3. The exhaust system is subjected to air leakage, and the ECU cannot get the correct oxygen sensor signal, causing the air-fuel ratio to become richer | Use unleaded gasoline, and replace oxygen sensor and three-way catalytic converter Service the ignition system, and replace the oxygen sensor and three-way catalytic converter Service the exhaust system |

4.2.8.3 Exhaust system noisy

| Fault causes | Countermeasures |
|---|---|
| 1. Air leakage of intake manifold 2. Obstruction of exhaust system | Service the exhaust system related pipelines Clean or replace exhaust system parts |

4.2.9 Exhaust hot end

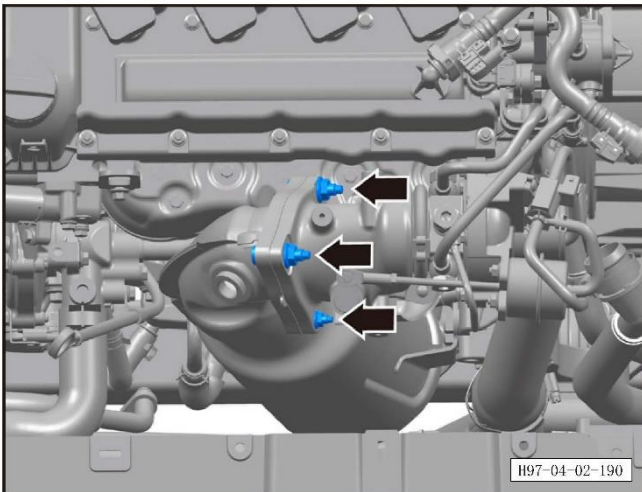
4.2.9.1 Removal and refitting of three-way catalytic converter

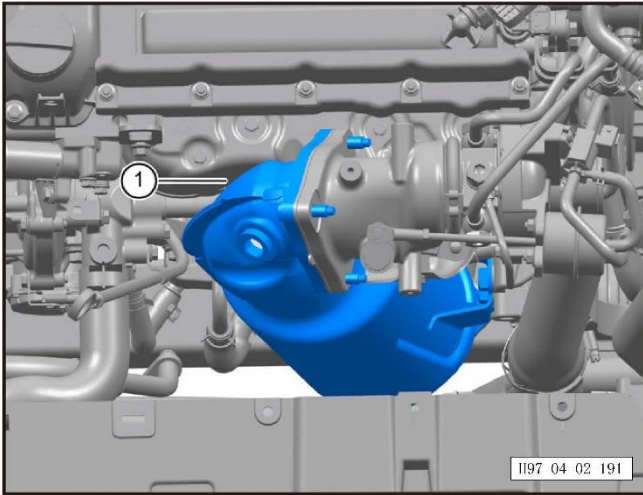
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Lift the vehicle.
6. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
7. Remove the turbocharger upper heat shield assembly (refer to [4.5.9.1 Removal and refitting of turbocharger upper heat shield assembly](#))
8. Remove the oxygen sensor I (refer to [4.2.9.3 Removal and refitting of oxygen sensor I](#))
9. Disconnect the exhaust bellows assembly (refer to [4.2.9.2 Removal and refitting of bellows assembly](#))
10. Remove the three-way catalytic converter assembly.

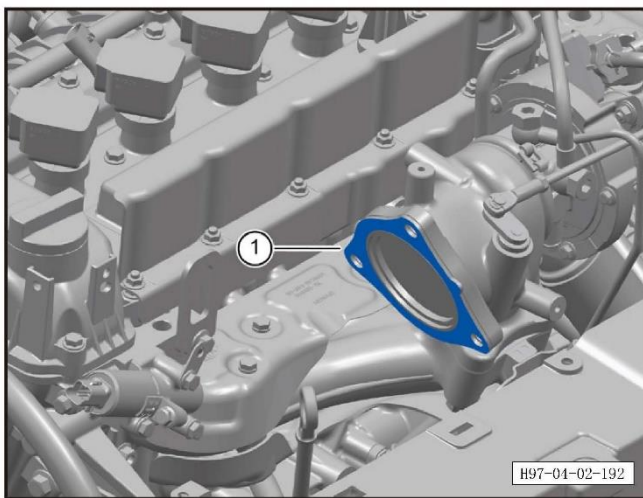
- a. Unscrew the three nuts connecting the three-way catalytic converter assembly and the turbocharger assembly.

Tightening torque of nut: $50\pm 5\text{Nm}$.





b. Take out the three-way catalytic converter assembly ①.



c. Take out the gasket ① between the three-way catalytic converter assembly and the turbocharger assembly.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION!

- Each time the exhaust system assembly is removed, the bolts and nuts need to be replaced.
- When removing the exhaust system assembly, the old gaskets need to be scrapped and replaced with new ones.
- Wear goggles and gloves when removing exhaust system parts. Otherwise, rust and sharp edges falling from worn exhaust system parts can cause serious personal injury.
- To avoid burns, do not service the exhaust system when it is hot. Please allow the exhaust system to cool before servicing.

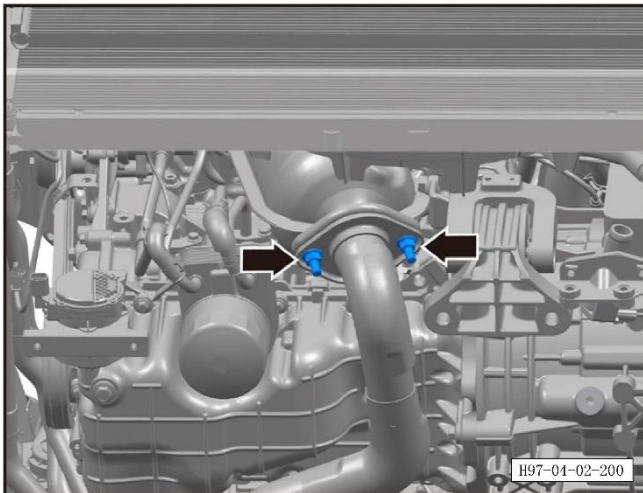
4.2.9.2 Removal and refitting of bellows assembly

Removal procedure

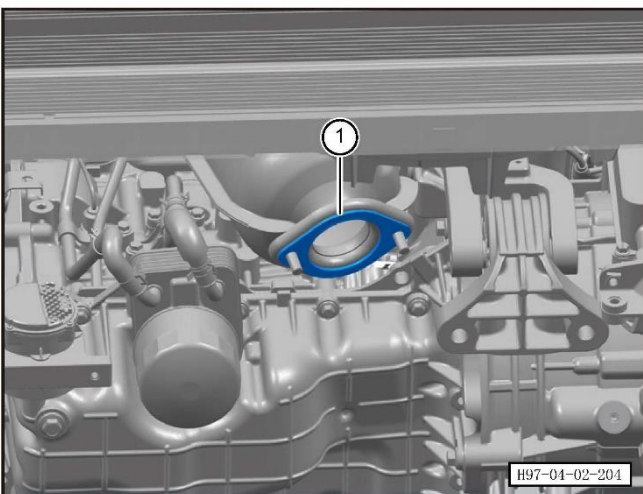
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Lift the vehicle.
6. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
7. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
8. Remove the bellows assembly.

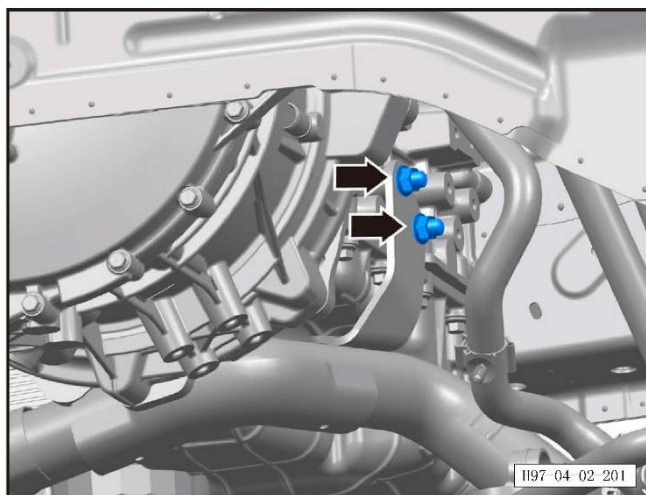
- a. Unscrew the 2 nuts connecting the three-way catalytic converter assembly and the exhaust bellows assembly.

Tightening torque of nut: $20\pm 2\text{Nm}$.



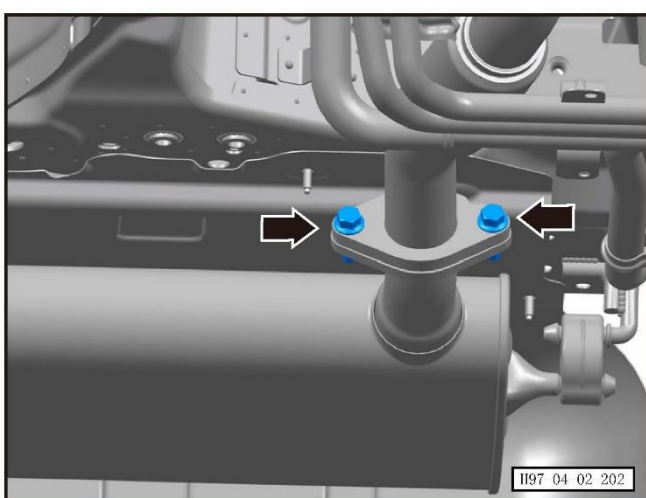
- b. Take out the bellows gasket ① and discard it.





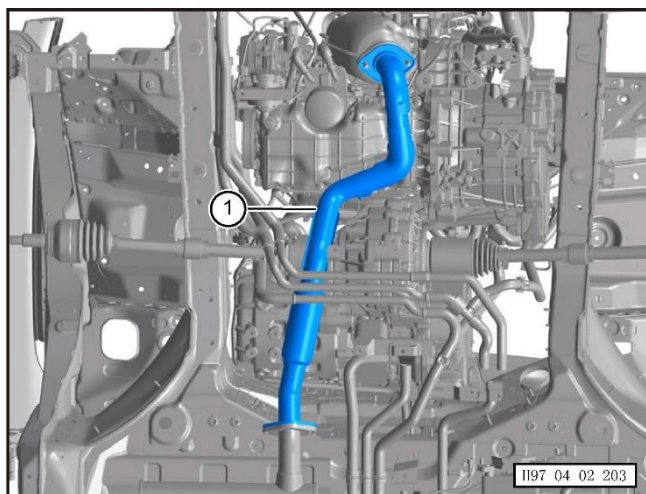
c. Unscrew the 2 nuts connecting the rear end of the range extender cylinder block with the exhaust bellows assembly.

Tightening torque of nut: $20\pm 2\text{Nm}$.

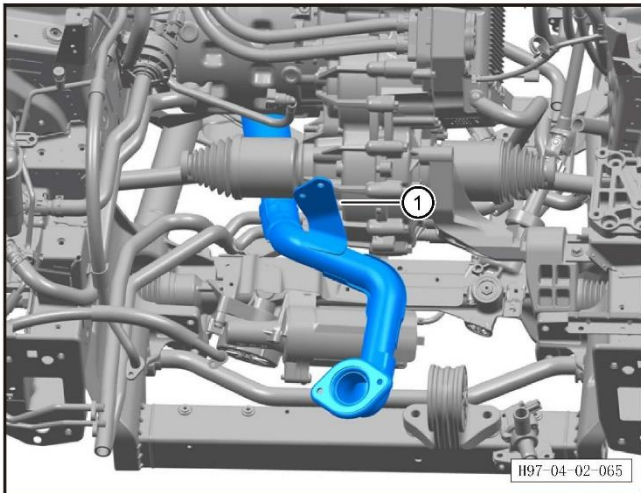


d. Unscrew the 2 bolts connecting the exhaust bellows assembly to the exhaust mid-section muffler assembly.

Tightening torque of bolt: $20\pm 2\text{Nm}$.



e. Disconnect the exhaust bellows assembly ① from the range extender assembly.



f. Take out the exhaust bellows assembly ①.

CAUTION!

- The exhaust bellows assembly can only be taken out after the range extender assembly is lifted out.

Refitting procedure

The refitting procedure is performed in reverse order.

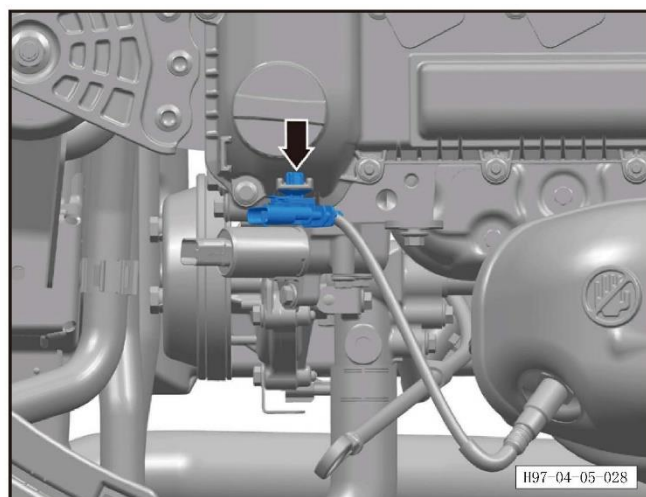
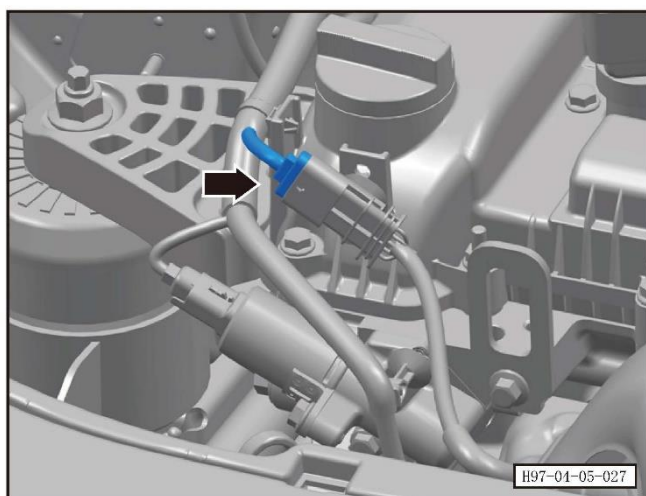
CAUTION!

- After the exhaust bellows assembly is removed, it may not be possible to take it out of the vehicle and the range extender assembly will need to be removed.
- Each time the exhaust system assembly is removed, the bolts and nuts need to be replaced.
- When removing the exhaust system assembly, it is necessary to discard the old gaskets; when refitting the exhaust system assembly, it is necessary to replace the gaskets with new ones.
- Wear goggles and gloves when removing exhaust system parts. Otherwise, rust and sharp edges falling from worn exhaust system parts can cause serious personal injury.
- To avoid burns, do not service the exhaust system when it is hot. Please allow the exhaust system to cool before servicing.

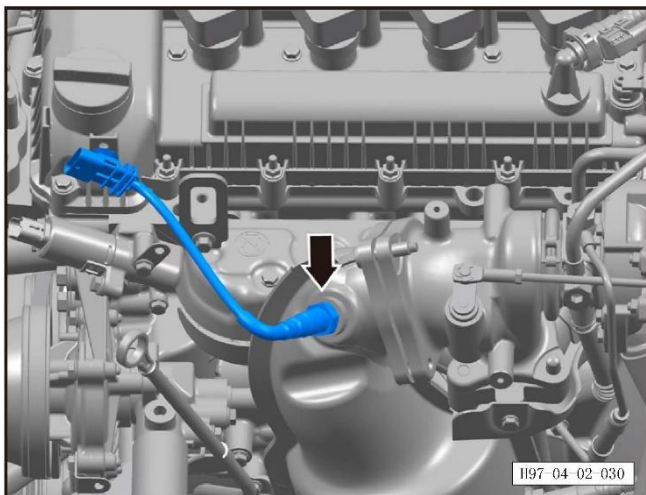
4.2.9.3 Removal and refitting of oxygen sensor I

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the turbocharger upper heat shield assembly (refer to [4.5.9.1 Removal and refitting of turbocharger upper heat shield assembly](#))
6. Remove the oxygen sensor I.
 - a. Disconnect the connector of oxygen sensor I.

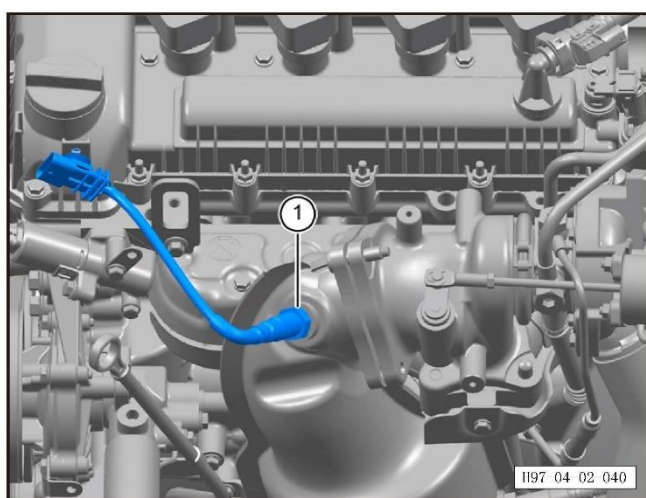


- b. Disconnect the clip of the oxygen sensor I connector.



c. Remove the connecting bolts between the oxygen sensor I assembly and the three-way catalytic converter assembly.

Tightening torque of oxygen sensor I assembly:
 $42\pm 2\text{Nm}$.



d. Take out the oxygen sensor I assembly.

Refitting procedure

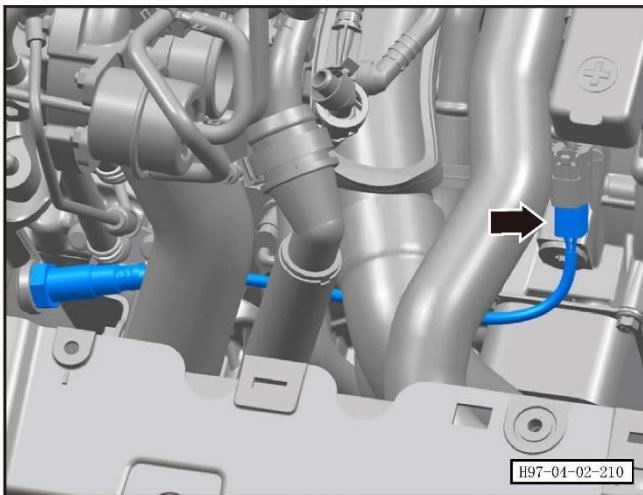
The refitting procedure is performed in reverse order.

4.2.9.4 Removal and refitting of oxygen sensor II

Removal procedure

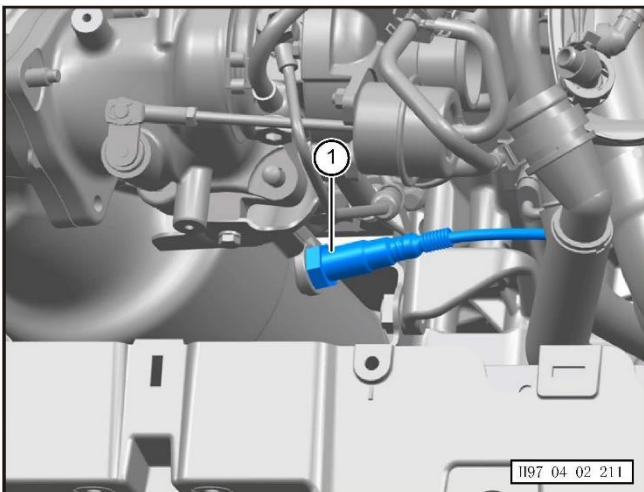
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the intercooler air inlet hose 2# (refer to [4.1.9.3 Removal and refitting of intercooler air inlet hose 2#](#))
6. Remove the air filter outlet pipe assembly (refer to [4.1.8.6 Removal and refitting of air filter outlet pipe assembly](#))
7. Remove the oxygen sensor II .

- a. Disconnect the connector of oxygen sensor II .



- b. Remove the oxygen sensor II assembly ①.

Tightening torque of bolt: $42\pm 2\text{Nm}$.



Refitting procedure

The refitting procedure is performed in reverse order.

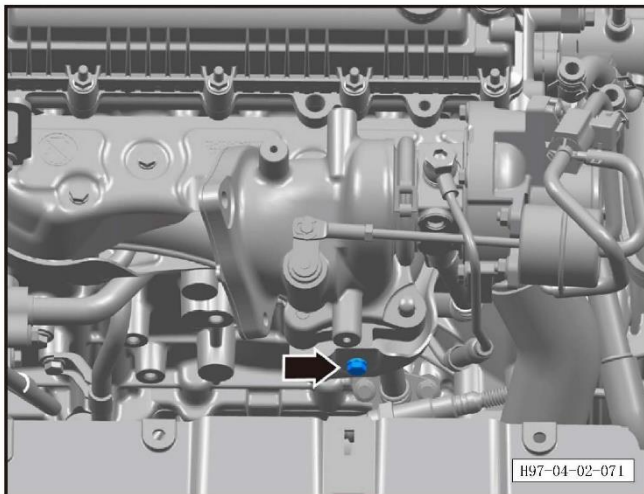
4.2.9.5 Removal and refitting of exhaust manifold lower heat shield

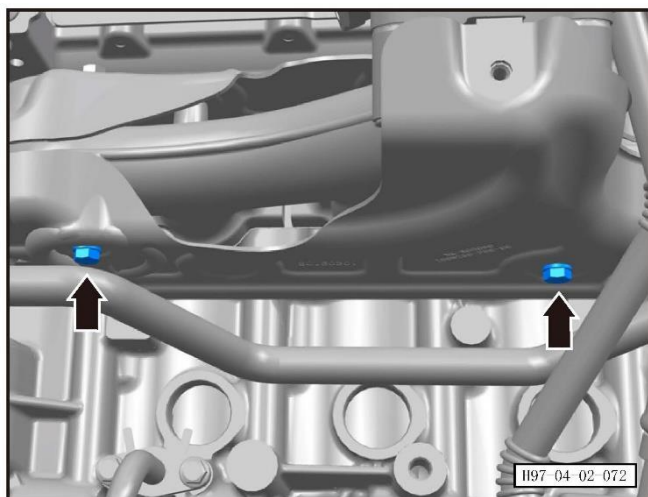
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the turbocharger upper heat shield assembly (refer to [4.5.9.1 Removal and refitting of turbocharger upper heat shield assembly](#))
6. Remove the turbocharger metal water return pipe assembly (refer to [4.5.9.6 Removal and refitting of turbocharger metal water return pipe assembly](#))
7. Remove the turbocharger metal water inlet pipe assembly (refer to [4.5.9.7 Removal and refitting of turbocharger metal water inlet pipe assembly](#))
8. Remove the three-way catalytic converter assembly (refer to [4.2.9.1 Removal and refitting of three-way catalytic converter assembly](#))
9. Remove the exhaust manifold lower heat shield.

- a. Unscrew the 1 bolt connecting the front end of the exhaust manifold lower heat shield to the exhaust manifold.

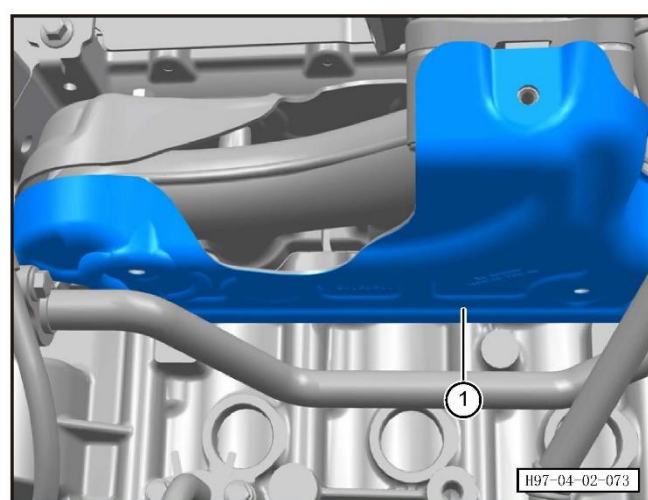
Tightening torque of bolt: $10\pm 1\text{Nm}$.





b. Unscrew the 2 bolts connecting the bottom of the exhaust manifold lower heat shield to the exhaust manifold.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



c. Take out the exhaust manifold lower heat shield ①.

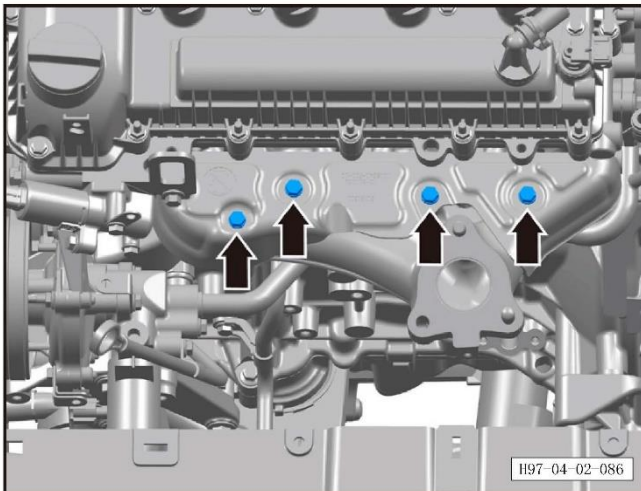
Refitting procedure

The refitting procedure is performed in reverse order.

4.2.9.6 Removal and refitting of exhaust manifold upper heat shield

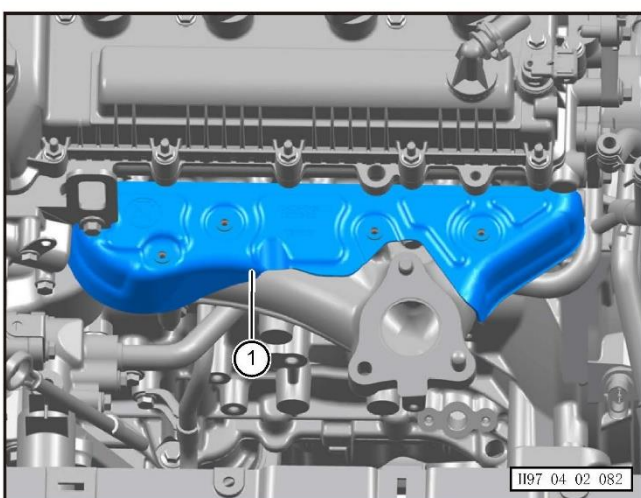
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the cylinder head heat shield (refer to [4.5.12.1 Removal and refitting of cylinder head heat shield](#))
6. Remove the turbocharger assembly (refer to [4.5.9.10 Removal and refitting of turbocharger assembly](#))
7. Remove the exhaust manifold upper heat shield.



- a. Unscrew the 4 bolts connecting the exhaust manifold upper heat shield to the exhaust manifold, and take down the gasket.

Tightening torque of bolt: $10 \pm 2 \text{ Nm}$.



- b. Take down the exhaust manifold upper heat shield ①.

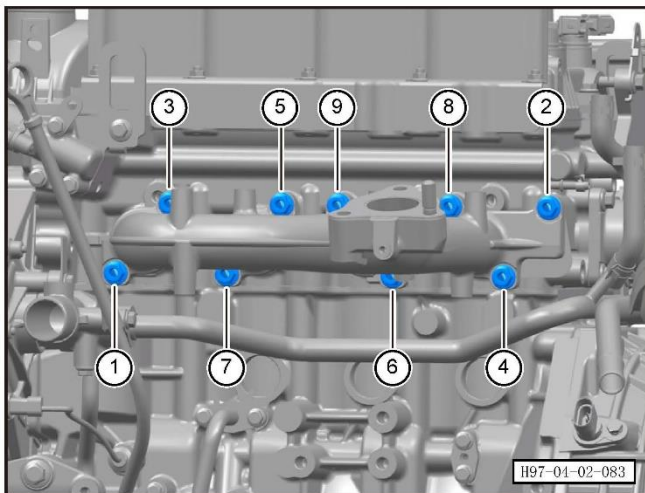
Refitting procedure

The refitting procedure is performed in reverse order.

4.2.9.7 Removal and refitting of exhaust manifold assembly

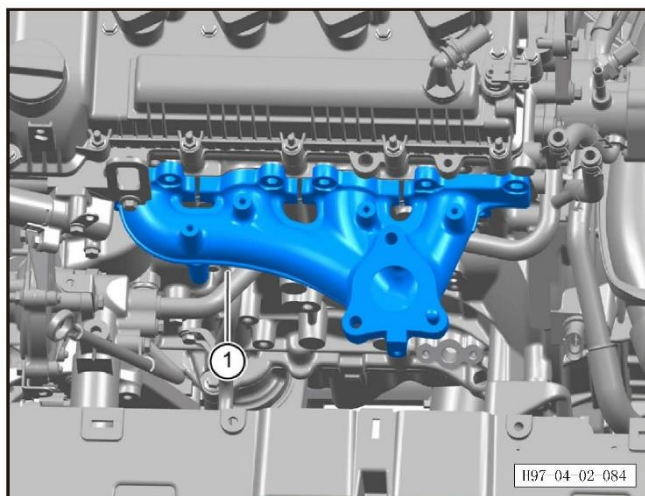
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the cylinder head heat shield (refer to [4.5.12.1 Removal and refitting of cylinder head heat shield](#))
6. Remove the turbocharger assembly (refer to [4.5.9.10 Removal and refitting of turbocharger assembly](#))
7. Remove the exhaust manifold upper heat shield (refer to [4.2.9.6 Removal and refitting of exhaust manifold upper heat shield](#))
8. Remove the exhaust manifold assembly.



- a. Unscrew the 9 nuts connecting the exhaust manifold assembly to the cylinder head body in the order marked.

Tightening torque of nut: $34\pm 2\text{Nm}$.



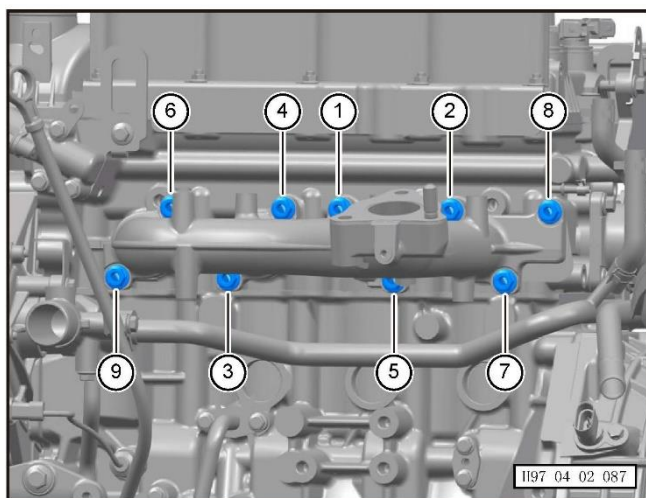
- b. Take out the exhaust manifold assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

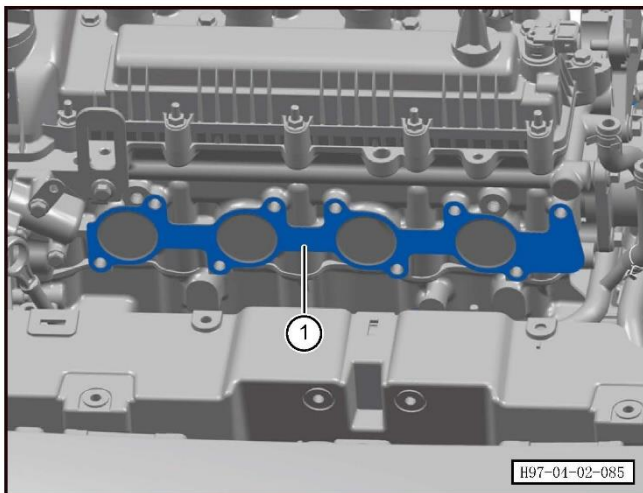
- Refit the 9 bolts connecting the exhaust manifold assembly to the cylinder head block in the order marked.
- When refitting the exhaust manifold, replace the nuts and washers with new ones.
- When refitting the exhaust manifold, replace the exhaust manifold gasket with a new one.



4.2.9.8 Removal and refitting of exhaust manifold gasket

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the cylinder head heat shield (refer to [4.5.12.1 Removal and refitting of cylinder head heat shield](#))
6. Remove the turbocharger assembly (refer to [4.5.9.10 Removal and refitting of turbocharger assembly](#))
7. Remove the exhaust manifold upper heat shield (refer to [4.2.9.6 Removal and refitting of exhaust manifold upper heat shield](#))
8. Remove the exhaust manifold assembly (refer to [4.2.9.7 Removal and refitting of exhaust manifold assembly](#))
9. Remove the exhaust manifold gasket
 - a. Take down the exhaust manifold gasket.



Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

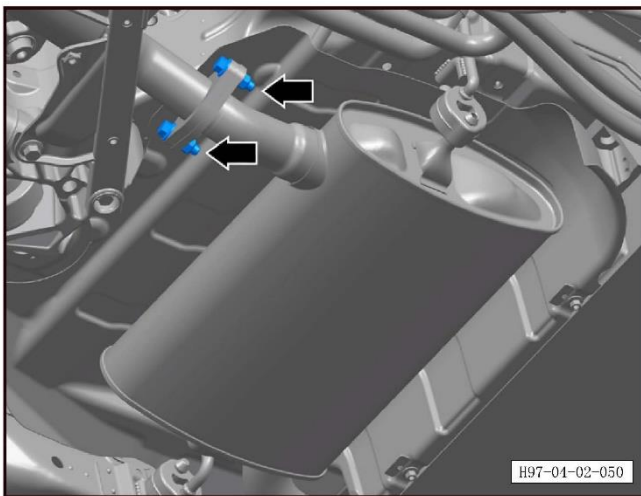
- When refitting the exhaust manifold, replace the nuts and washers with new ones.
- When refitting the exhaust manifold, replace the exhaust manifold gasket with a new one.

4.2.10 Muffler assembly

4.2.10.1 Removal and refitting of front muffler assembly

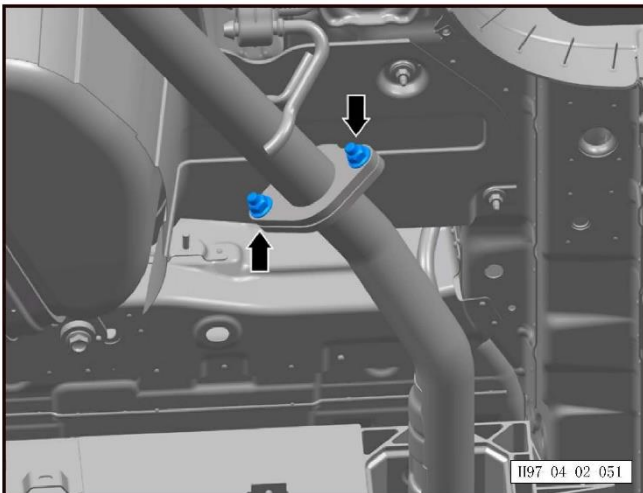
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Lift the vehicle.
6. Remove the front muffler assembly.



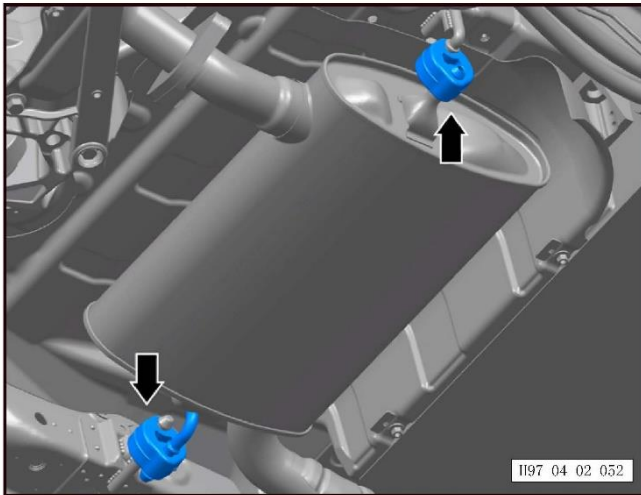
- a. Unscrew the 2 bolts and nuts at the connection between the front muffler assembly and the bellows assembly.

Tightening torque of bolt: $20\pm 2\text{Nm}$.

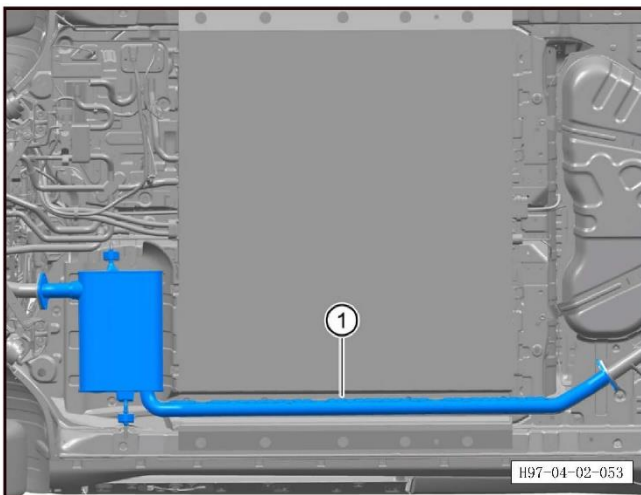


- b. Unscrew the 2 bolts and nuts at the connection of the front and rear mufflers.

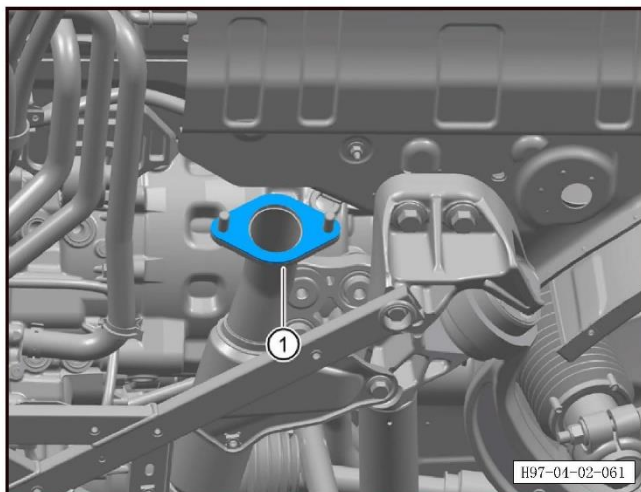
Tightening torque of bolt: $20\pm 2\text{Nm}$.



c. Disconnect the 2 lifting ears connecting the front muffler assembly to the body.



b. Take down the front muffler assembly ①.



Refitting procedure

The refitting procedure is performed in reverse order.

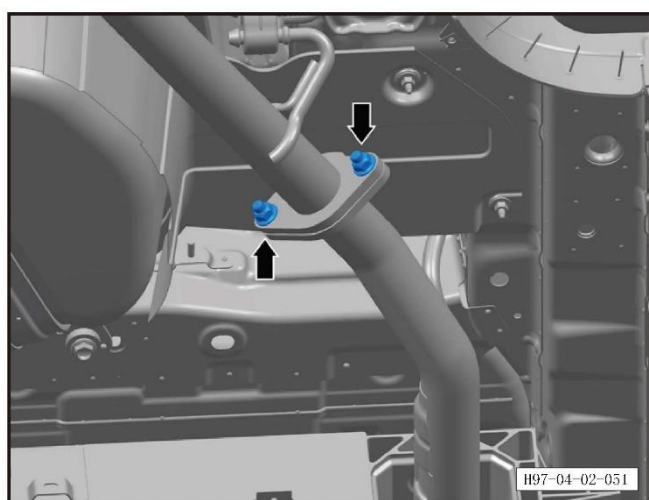
CAUTION:

- When refitting exhaust system assembly, bolts, nuts and corresponding gaskets must be replaced with new ones.
- When refitting the front and rear muffler assemblies, it is necessary to check whether the front insulation pads are in good condition. If they are damaged, they must be replaced with new ones.

4.2.10.2 Removal and refitting of rear muffler assembly

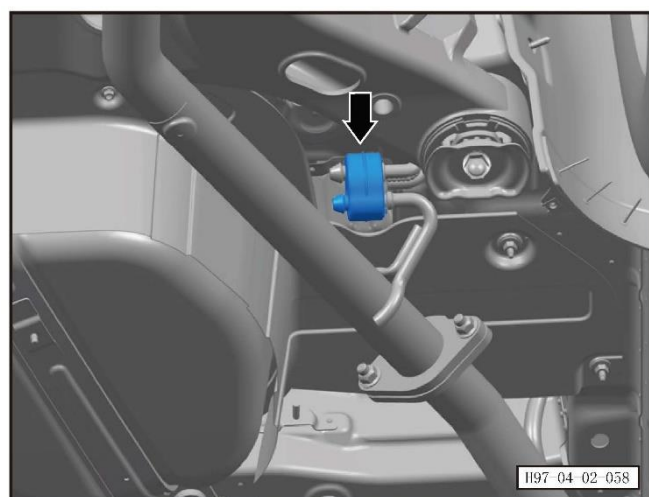
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Disconnect the battery negative terminal.
4. Lift the vehicle.
5. Remove the rear lower protective plate (refer to [8.6.4.6 Removal and refitting of rear lower protective plate \(REV\)](#))
6. Remove the rear muffler assembly.

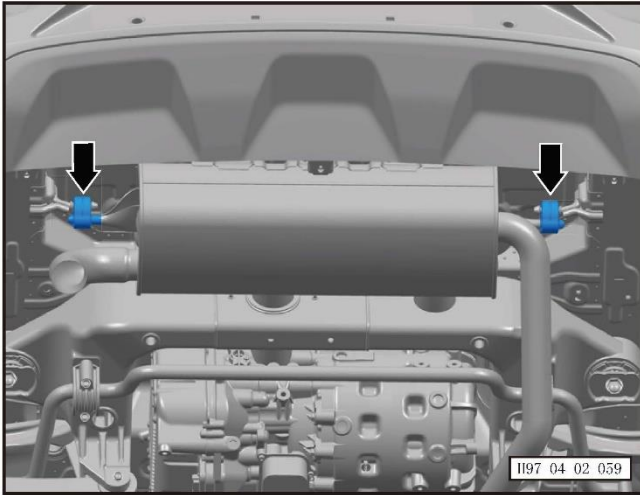


- a. Unscrew the 2 bolts and nuts at the connection between the front muffler assembly and the rear muffler assembly.

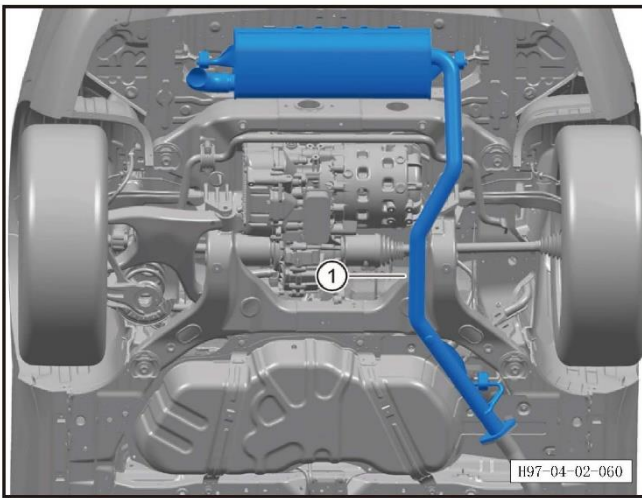
Tightening torque of bolt/nut: $20\pm 2\text{Nm}$.



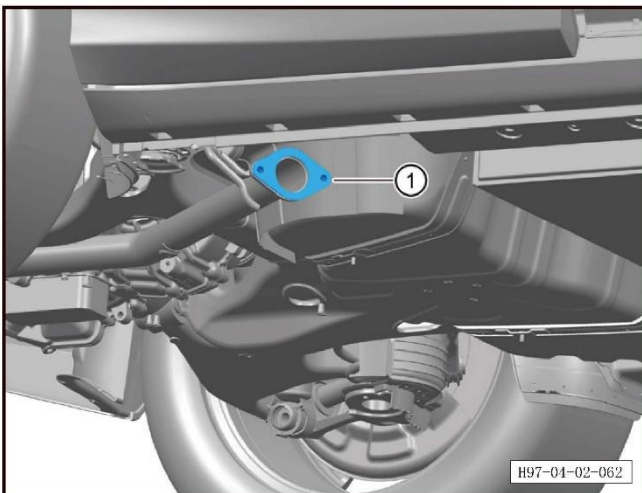
- b. Disconnect the rubber lifting lug.



c. Disconnect the 2 rubber lifting lugs of the rear muffler.



d. Remove the rear muffler assembly ①.



Refitting procedure

The refitting procedure is performed in reverse order.

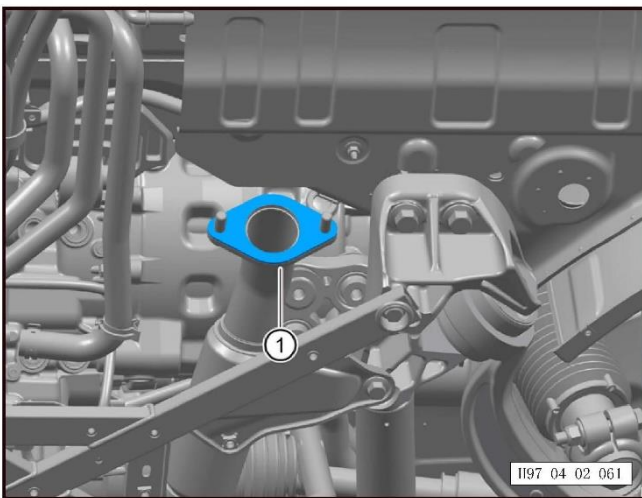
CAUTION:

- When refitting exhaust system assembly, bolts, nuts and corresponding gaskets must be replaced with new ones.
- When refitting the front and rear muffler assemblies, it is necessary to check whether the front insulation pads are in good condition. If they are damaged, they must be replaced with new ones.

4.2.10.3 Removal and refitting of front muffler gasket

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Disconnect the battery negative terminal.
4. Lift the vehicle.
5. Remove the front muffler assembly (refer to [4.2.10.1 Removal and refitting of front muffler assembly](#))
6. Remove the front muffler gasket.
 - a. Remove the front muffler gasket ①.



Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

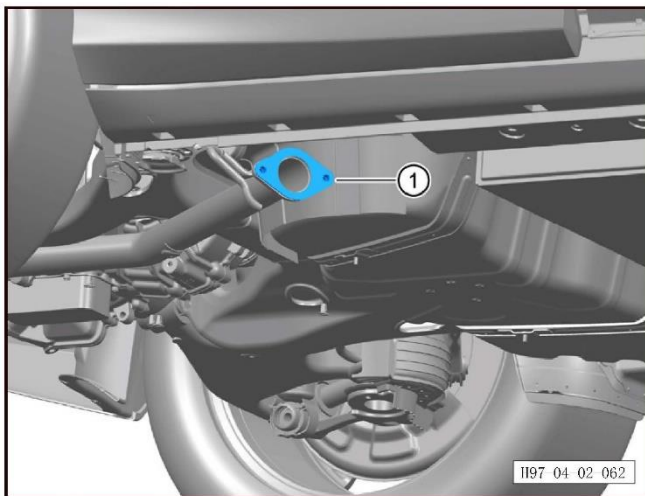
- When refitting the exhaust system assembly, bolts (nuts) and corresponding gaskets must be replaced with new ones.
- When refitting the front and rear muffler assemblies, it is necessary to check whether the front insulation pads are in good condition. If they are damaged, they must be replaced with new ones.

4.2.10.4 Removal and refitting of rear muffler gasket

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Disconnect the battery negative terminal.
4. Lift the vehicle.
5. Remove the front muffler assembly (refer to [4.2.10.1 Removal and refitting of front muffler assembly](#))
6. Remove the rear muffler gasket.

- a. Remove the rear muffler gasket ①.



Refitting procedure

The refitting procedure is performed in reverse order.

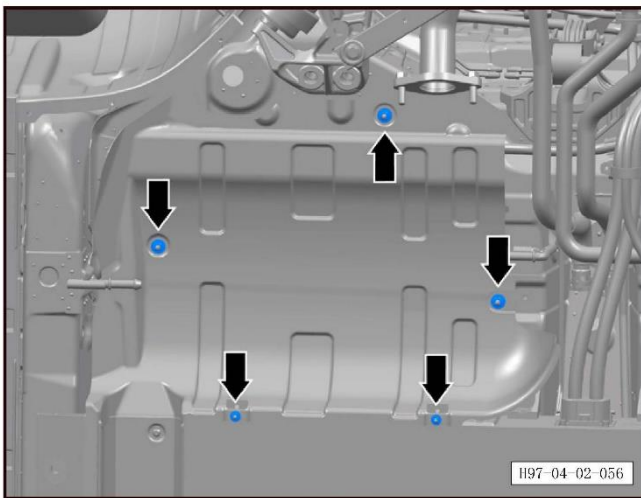
CAUTION:

- When refitting the exhaust system assembly, bolts (nuts) and corresponding gaskets must be replaced with new ones.
- When refitting the front and rear muffler assemblies, it is necessary to check whether the front insulation pads are in good condition. If they are damaged, they must be replaced with new ones.

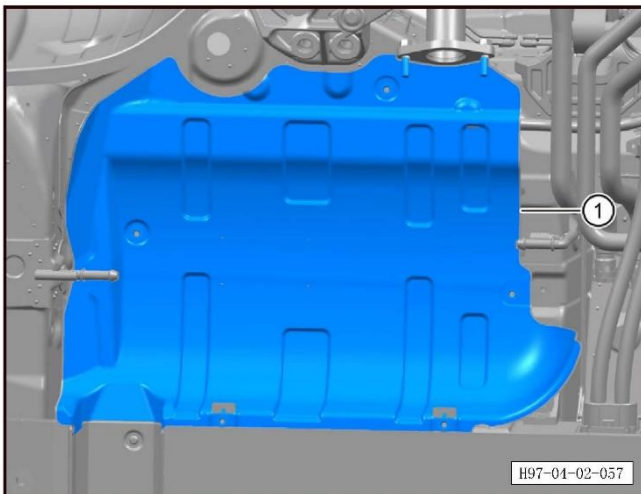
4.2.10.5 Removal and refitting of front muffler heat shield

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Disconnect the battery negative terminal.
4. Lift the vehicle.
5. Remove the front muffler assembly (refer to [4.2.10.1 Removal and refitting of front muffler assembly](#))
6. Remove the front muffler heat shield.



- a. Unscrew the 5 bolts on the front muffler heat shield. Tightening torque of bolt: $8\pm 2\text{Nm}$.



- b. Remove the front muffler heat shield ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.2.10.6 Removal and refitting of fuel tank heat shield

Removal procedure

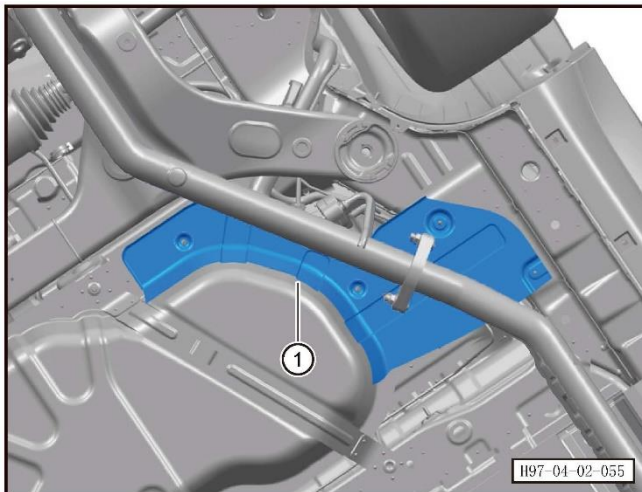
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Disconnect the battery negative terminal.
4. Lift the vehicle.
5. Remove the fuel tank heat shield.

- a. Unscrew the 4 bolts on the fuel tank heat shield.

Tightening torque of bolt: $8\pm 2\text{Nm}$.



- b. Take down the fuel tank heat shield ①.



Refitting procedure

The refitting procedure is performed in reverse order.

4.3 Fuel system

4.3.1 Precautions

Warning about actions to take when handling the fuel system:

Fuel vapors can build up when servicing fuel system parts in confined work areas such as the passenger compartment.

To avoid the risk of fire and vapor build-up, forced ventilation is required by opening the door and placing a fan unit.

Plug or cover all fuel system pipeline openings to reduce the evaporation of fuel vapors.

Clean up spilled fuel immediately and avoid sparks and any ignition sources.

Use signs to alert others in the work area that the fuel system is being serviced.

Warning about fuel and evaporative discharge pipes:

- All cracked, scratched or damaged fuel pipes should be replaced during refitting and no attempt should be made to repair the fuel pipelines.
- When removing or refitting the fuel pipe, do not directly hit the fuel pipe clamp with a hammer or hard tool.
- A few drops of clean range extender lubricating oil can be applied to the male fitting before connecting the fuel pipe joint. This ensures proper reconnection and prevents possible fuel leaks.
- Never inhale air from evaporative discharge pipes or hoses. Fuel vapors in evaporative exhaust components can cause personal injury.
- Gasoline or gasoline vapors are highly flammable and can cause a fire in the presence of an ignition source.
- To prevent fire or explosion hazards, do not use open containers to discharge or store gasoline.
- Please prepare corresponding fire extinguishers and fire hydrant facilities (which can provide a large amount of water) in the service site.

Warning about removing fuel pressure:

- Before servicing the fuel system, it is necessary to remove pressure from the fuel system to reduce the risk of personal injury.
- A small amount of fuel may spill when servicing fuel pipelines, fuel injection pumps or connections after removing pressure from the fuel system.

Matters concerning the fuel pressure relief of VOYAH FREE REV:

- Turn off the start switch, open the engine compartment fuse box, and follow the fuse instructions inside the box cover to unplug the fuel pump fuse or relay.
- Turn on the start switch, and READY will be displayed on the vehicle meter, then select outing mode, the vehicle will start the range extender to consume the remaining fuel in the fuel pipe, and the fuel pressure relief will be completed.
- Turn off the start switch, wait for 10 minutes, disconnect the negative pole of the battery, and then carry out subsequent servicing operations.
- The fuel pressure relief for VOYAH FREE REV applies to all the operations before the servicing of the fuel system in this chapter.

4.3.2 Introduction to structure and principle

Fuel System Overview

- The fuel system consists of fuel tank, fuel pump, fuel inlet pipe, fuel rail, injector nozzle, fuel tank clean air filter, etc.
- The fuel system undertakes fuel filling and transportation, which ensures that the fuel reaches the range extender smoothly so that the range extender works. At the same time, it is responsible for collecting gasoline vapor, and introducing gasoline vapor into the intake manifold to mix with air, and then press it into the combustion chamber of the range extender for combustion.
- The adsorption and desorption principle of the evaporation system is that the fuel in the fuel tank produces fuel vapor due to the change of ambient temperature.
- When the steam pressure is greater than the set pressure of the system, the two-way valve of the system is opened, and the fuel vapor enters the carbon canister and is adsorbed by the activated carbon.
- When the internal pressure of the system is lower than the set pressure, the two-way valve opens, and the external air enters the system through the carbon canister for supplementation; when the range extender is running, the controller detects the opening condition of the canister solenoid valve, the canister solenoid valve opens, and the fuel vapor enters the range extender under the action of supercharging in the intake manifold and participates in combustion.

Fuel pump assembly

- The gasoline pump is used to pump gasoline out of the tank and generate the working pressure required by the range extender. Gasoline passes through the fuel line and is sent to the fuel rail.
- The fuel pressure regulator is integrated into the fuel pump assembly to regulate the fuel pressure in the pipeline.
- The fuel level sensor is integrated in the fuel pump assembly to measure the fuel level in the fuel tank.

Injector nozzle

- The injector nozzle itself is a normally closed valve (normally closed valve means that the valve is always closed when no control signal is input; and the normally open valve means that the valve is always open when no control signal is input), of which the opening and closing are controlled by a valve needle moving up and down.
- When the controller issues a fuel injection command, the current flows through the coil in the injector nozzle, and a magnetic field is generated to suck up the valve needle, allowing the gasoline to be ejected from the hole of the injector nozzle. The biggest advantage of the electronically controlled injection system is that the controller accurately controls the fuel injection, so that the engine can have the correct air-fuel ratio in any state, save fuel, and make the fuel used efficiently. Not only does it keep the engine running smoothly, but its exhaust complies with environmental regulations.

Fuel rail

The fuel rail is the oil line pipe in front of the injector that supplies fuel to the cylinders of the internal combustion engine. It contains a fuel inlet and a seat cover that connects multiple injectors.

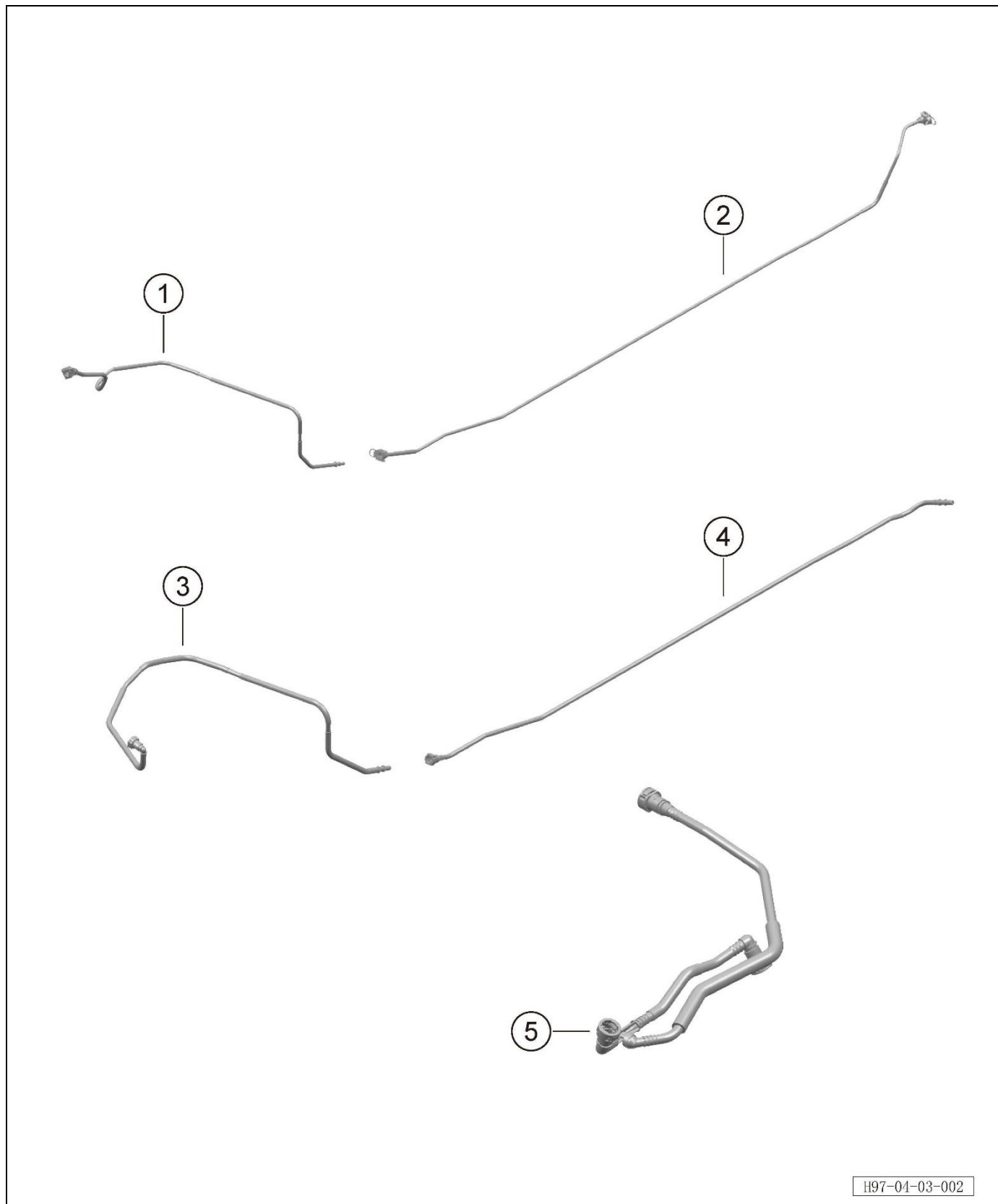
PCV valve

PCV is the abbreviation of Positive Crankcase Ventilation in English, which means crankcase (or oil sump) active ventilation control system in Chinese. It is mainly used to introduce the gas in the crankcase into the intake manifold through the PCV valve, which avoids insufficient combustion and deterioration of emissions. This prevents blow-by of crankcase exhaust gases from entering the atmosphere and prevents oil deterioration.

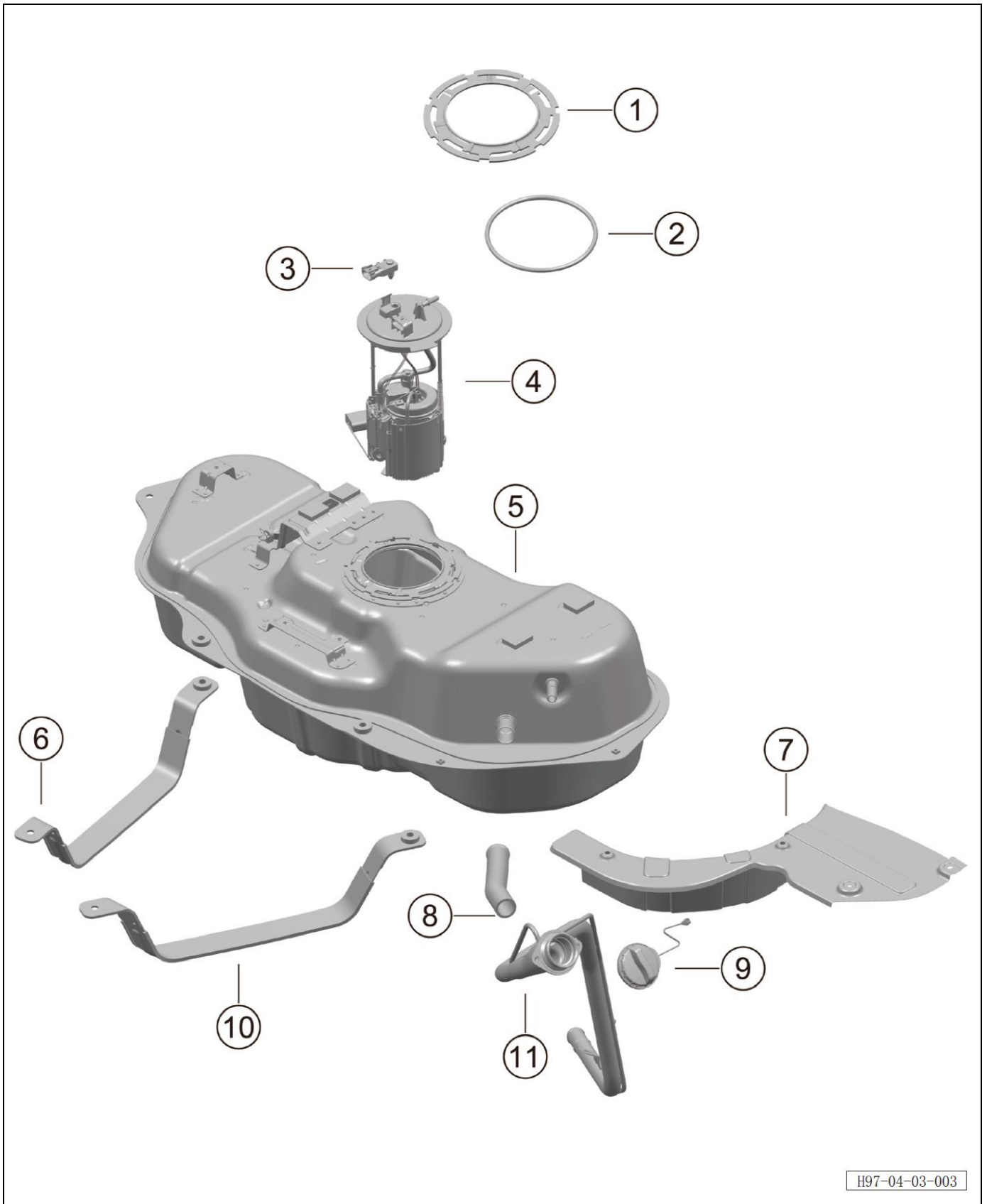
4.3.3 Position diagram of parts



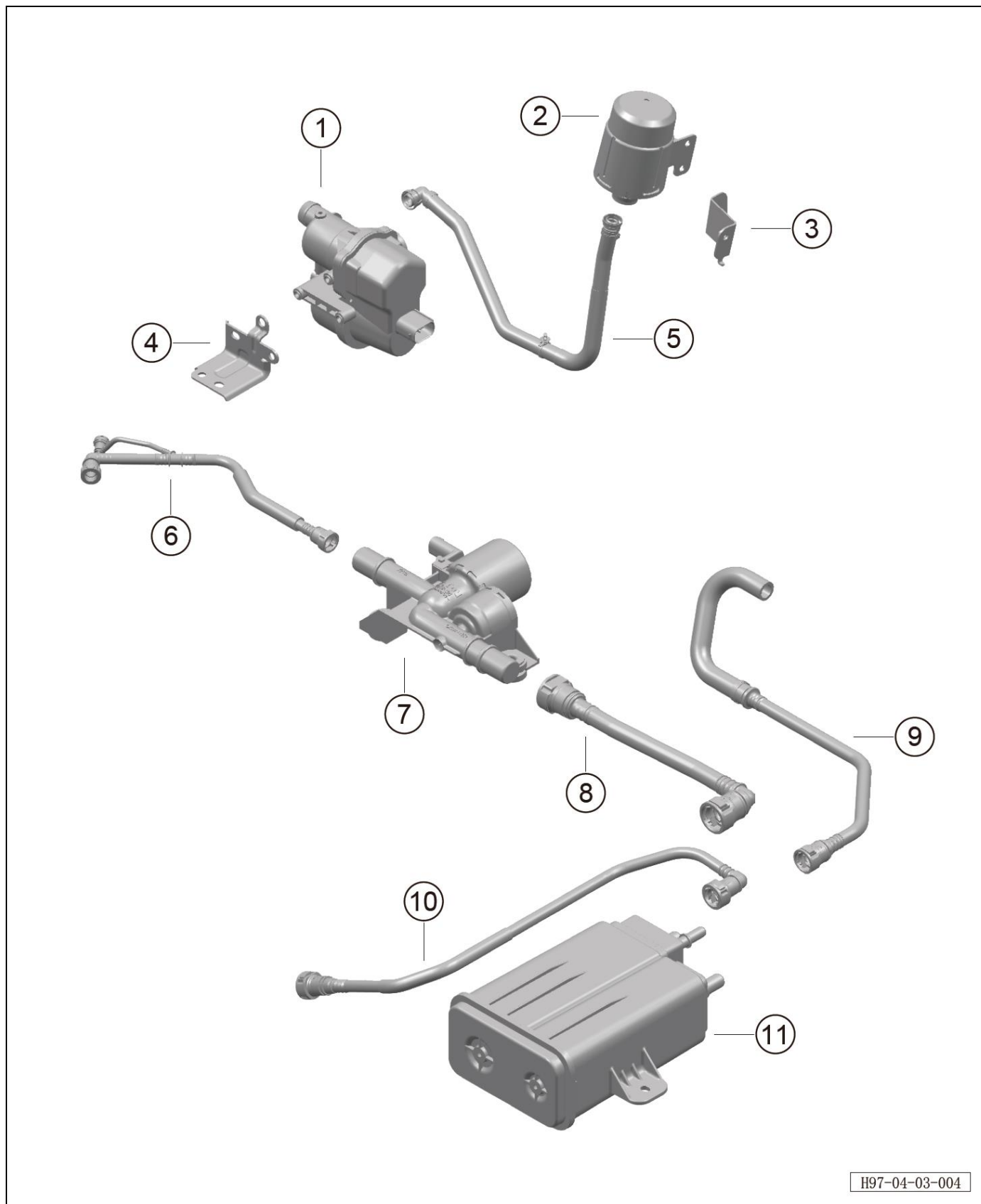
4.3.4 Exploded view



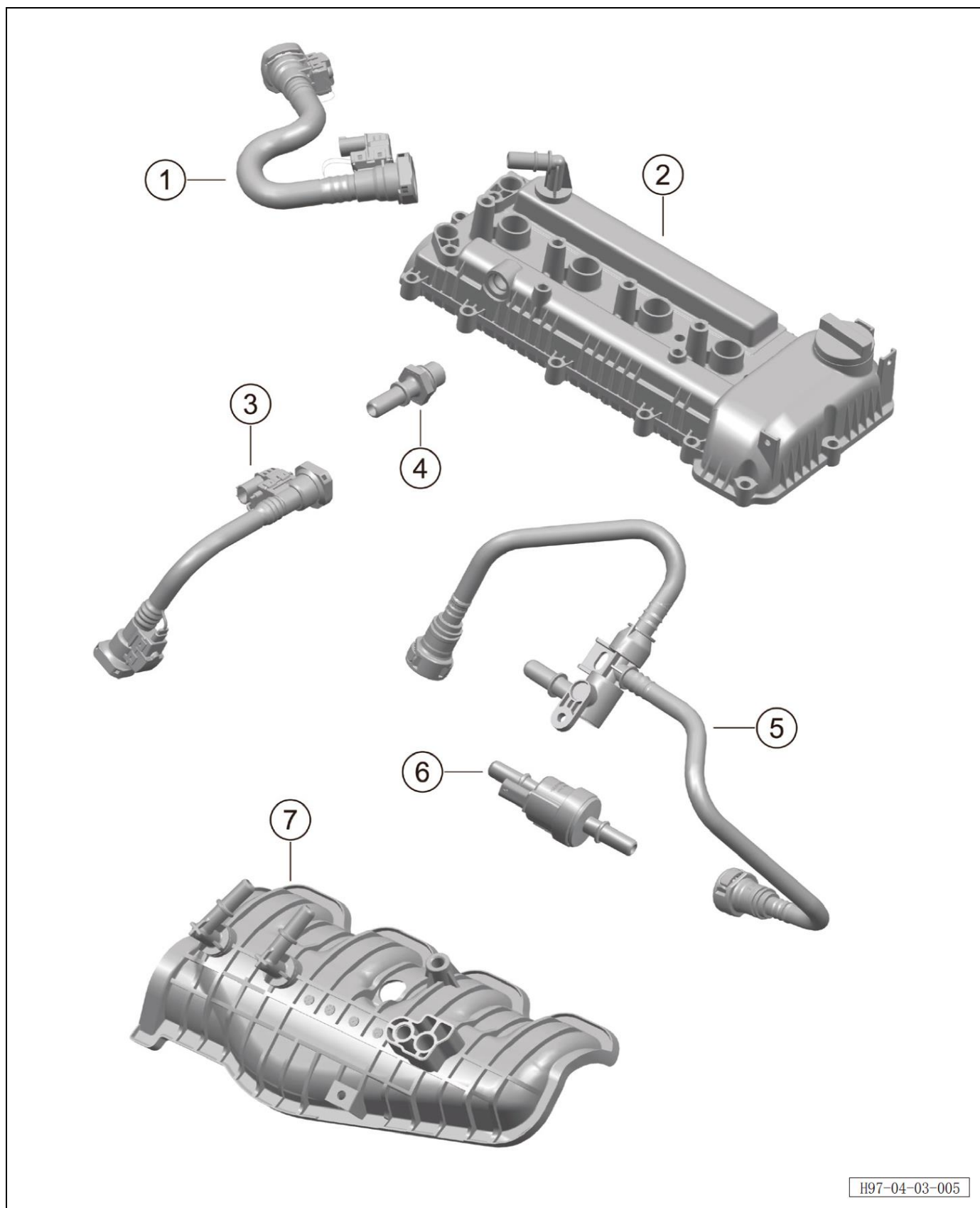
| S/N | Part name | Loading quantity | Remarks |
|-----|--|------------------|---------|
| 1 | Fuel inlet pipe 3# assembly | 1 | |
| 2 | Fuel inlet pipe 2# assembly | 1 | |
| 3 | Canister desorption tube 3# | 1 | |
| 4 | Canister desorption tube 2# | 1 | |
| 5 | High-pressure desorption tube assembly | 1 | |



| S/N | Part name | Loading quantity | Remarks |
|-----|-------------------------------|------------------|---------|
| 1 | Fuel pump pressure plate | 1 | |
| 2 | Fuel pump seal ring | 1 | |
| 3 | Fuel pressure sensor assembly | 1 | |
| 4 | Electronic fuel pump assembly | 1 | |
| 5 | Fuel tank assembly | 1 | |
| 6 | Fuel tank mounting strap II | 1 | |
| 7 | Fuel tank heat shield | 1 | |
| 8 | Fuel filler hose | 1 | |
| 9 | Fuel tank cap assembly | 1 | |
| 10 | Fuel tank mounting strap I | 1 | |
| 11 | Fuel filler pipe | 1 | |



| S/N | Part name | Loading quantity | Remarks |
|-----|------------------------------------|------------------|---------|
| 1 | DMTL | 1 | |
| 2 | Air filter | 1 | |
| 3 | Air filter bracket | 1 | |
| 4 | DMTL bracket | 1 | |
| 5 | Air filter conduit 1# | 1 | |
| 6 | Fuel vapor pipe assembly | 1 | |
| 7 | Fuel tank isolation valve assembly | 1 | |
| 8 | Fuel tank isolation valve guide | 1 | |
| 9 | Clean air conduit | 1 | |
| 10 | Canister desorption tube 1# | 1 | |
| 11 | Canister & accessories assembly | 1 | |



| S/N | Part name | Loading quantity | Remarks |
|-----|-------------------------------------|------------------|---------|
| 1 | Vent pipe 1 | 1 | |
| 2 | Cylinder head cover assembly | 1 | |
| 3 | Vent pipe 2 | 1 | |
| 4 | PCV valve assembly | 1 | |
| 5 | Dual check valve vent pipe assembly | 1 | |
| 6 | Canister control valve assembly | 1 | |
| 7 | Intake manifold assembly | 1 | |

4.3.5 Technical parameters

| S/N | Name | Fuel specifications | Capacity |
|-----|-----------|------------------------------|----------|
| 1 | Fuel tank | 92 # above unleaded gasoline | 56L |

4.3.5.1 Tightening torque

| Fastening position | Specification | Tightening torque (N•m) |
|---------------------------------------|--|-------------------------|
| Fuel tank strap fastener | Hexagon flange bolt | 22 ± 3 |
| Canister | Hexagon flange nut | 8 ± 2 |
| Fuel filler pipe | Worm drive hose clamp | 3.5 ± 0.5 |
| Fuel vapor pipe assembly | Hexagon flange bolt | 8 ± 2 |
| Fuel supply steel pipe fixing bracket | Hexagon flange bolt M5×8 | 5 ± 1 |
| Fuel pipe fixing bracket | Hexagon flange nut M6 | 8 ± 2 |
| Fuel pipe fixing bracket | Cross recessed pan head tapping screw and flat washer assembly | 2 ± 0.2 |
| Fuel rail injector assembly | Hexagon flange bolt M8×50 | 12 ± 1 |

4.3.6 Special tools

| S/N | Tool Name | Tool No. | Remarks |
|-----|------------------------------------|------------|---------|
| 1 | Fuel pump cover plate removal tool | H971101A00 | |
| 2 | Hydraulic lifter | H51202001 | |

4.3.7 Common faults

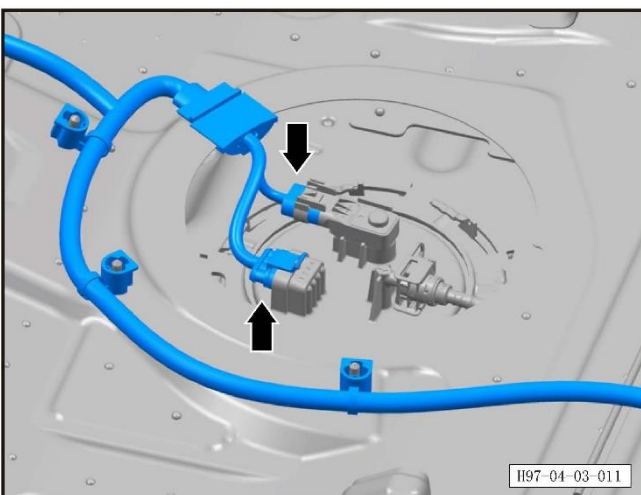
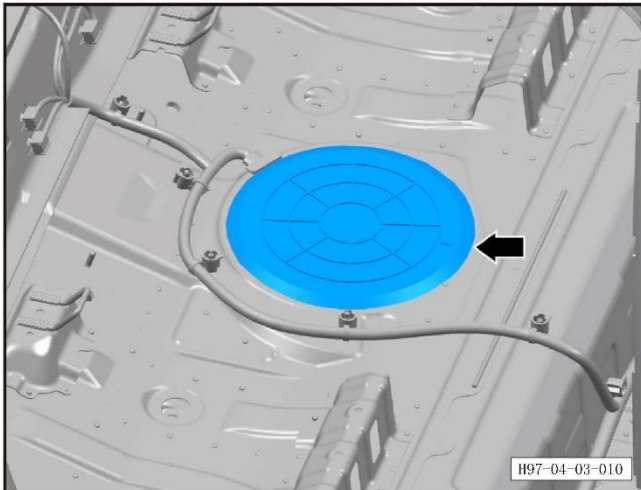
| S/N | Fault phenomenon: | Possible causes | Troubleshooting methods |
|-----|--|--|--|
| 1 | Unstable idle speed and difficult starting of range extender | The fuel injector is blocked, sealed improperly and damaged. | Check the injector, and replace it if necessary |
| 2 | | The fuel pressure is too high or low. | Overhaul or replace the electronic fuel pump |
| 3 | | Range extender control unit faulty | Check or replace the range extender control unit |
| 4 | High fuel pressure | The fuel pressure regulator is faulty. | Overhaul or replace the electronic fuel pump |
| 5 | | The fuel return pipe is blocked. | Overhaul or replace the electronic fuel pump |
| 6 | Low fuel pressure | The fuel pump fuse has poor contact or is damaged. | Overhaul the fuel pump fuse. |
| 7 | | The fuel pump relay has poor contact or is damaged. | Overhaul the fuel pump relay. |
| 8 | | The fuel pipeline is sealed improperly and leaky. | Overhaul the fuel pipelines. |
| 9 | | Fuel filter blocked (integrated) | Replace the fuel pump assembly. |
| 10 | | The fuel pressure regulator is damaged. | Replace the fuel pump assembly. |
| 11 | | The fuel pump is worn or damaged. | Replace the fuel pump assembly. |

4.3.8 Fuel sender

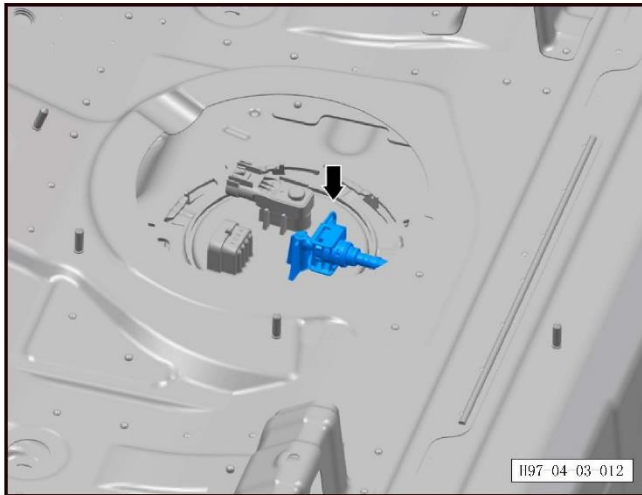
4.3.8.1 Removal and refitting of electronic fuel pump assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Disconnect the battery negative terminal.
3. Remove the engine compartment trim panel.
4. Pull out the fuel pump fuse.
5. Remove the rear seat cushion assembly (refer to [8.1.5.1 Removal and refitting of rear seat cushion assembly](#))
6. Remove the electronic fuel pump assembly.
 - a. Take out the fuel tank access cover.



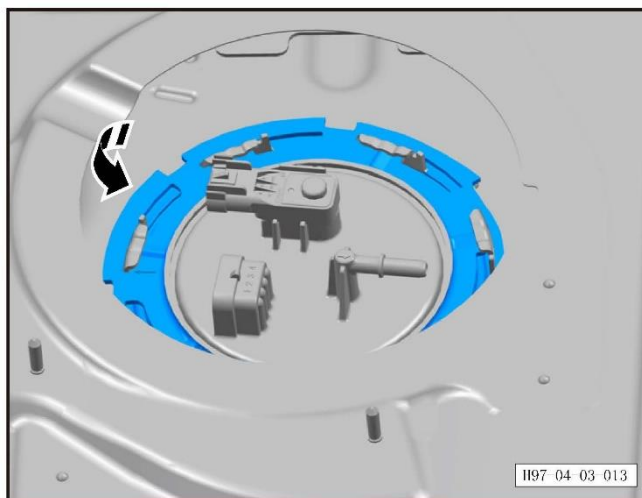
- b. Disconnect the 2 connectors on the fuel pump assembly.



c. Disconnect the connecting pipe clamp between the fuel pump assembly and the fuel inlet pipe 2#.

CAUTION:

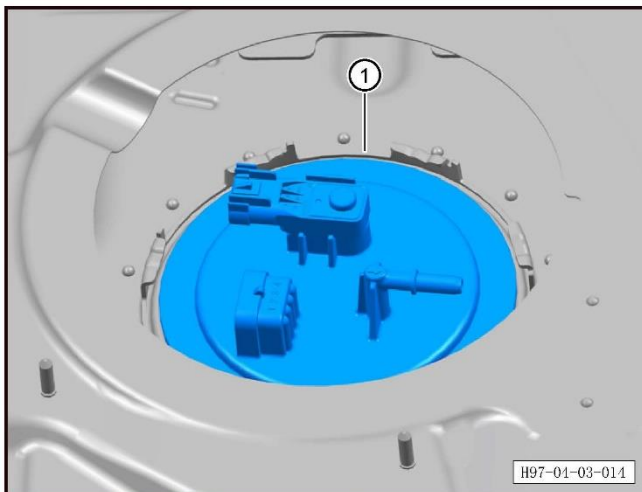
- Fuel sprayed under pressure can cause serious damage to skin and eyes.
- Before removing pressurized fuel system assembly, be sure to depressurize the fuel system prior to servicing.



d. Unscrew the oil pump pressure plate.

CAUTION:

- Use special tools for removal and refitting.



e. Take out the fuel pump assembly ①.

CAUTION:

- Use special tools for removal and refitting.
 - Lift the fuel tank fuel pump module slightly upwards.
- Note the fuel level sensor.
- There will be some residual fuel inside the fuel pump assembly, so be careful not to leak it into the car.

Refitting procedure

The refitting procedure is performed in reverse order.

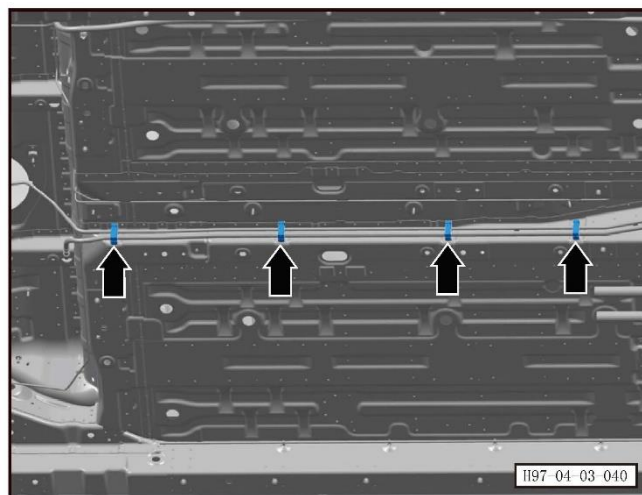
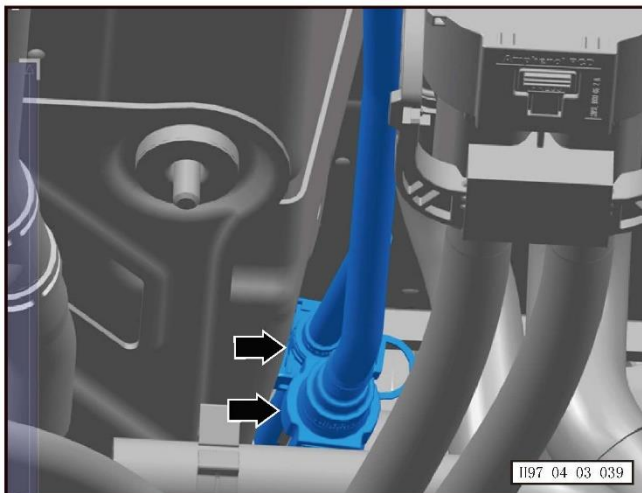
**CAUTION:**

- When refitting the fuel pump assembly, the fuel pump seal ring must be replaced with a new one.
- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

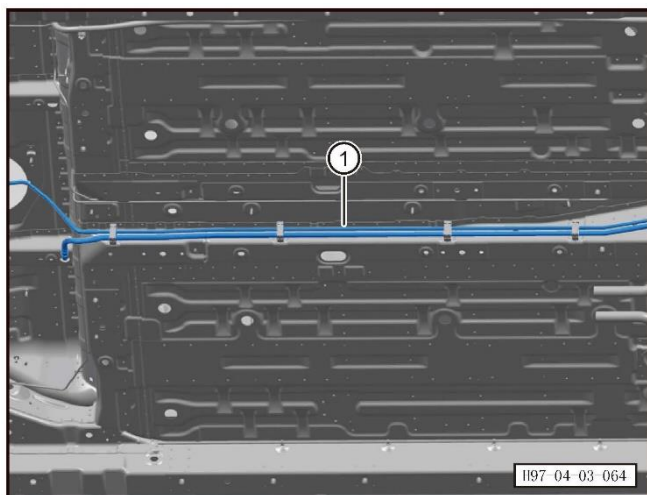
4.3.8.2 Removal and refitting of fuel inlet pipe 2# assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the high voltage (refer to [3.1.7.2 High voltage removal](#))
6. Remove the fuel pump assembly (refer to [4.3.8.1 Removal and refitting of electronic fuel pump assembly](#))
7. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
8. Remove the battery pack assembly (refer to [5.1.5.1 Removal and refitting of battery pack assembly \(REV\)](#))
9. Remove the fuel inlet pipe 2# assembly.
 - a. Disconnect the 2 clips of the canister desorption tube 2# and the fuel inlet pipe 2# assembly.



- b. Disconnect the 4 pipe clamps that fix the fuel inlet pipe 2# assembly on the body.



c. Take down the fuel inlet pipe 2# assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

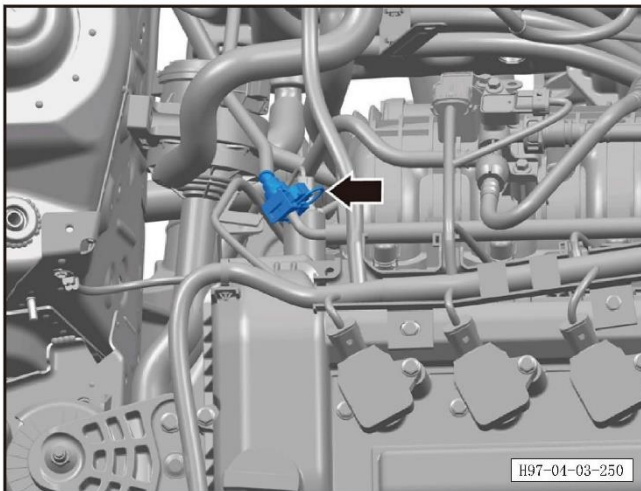
CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

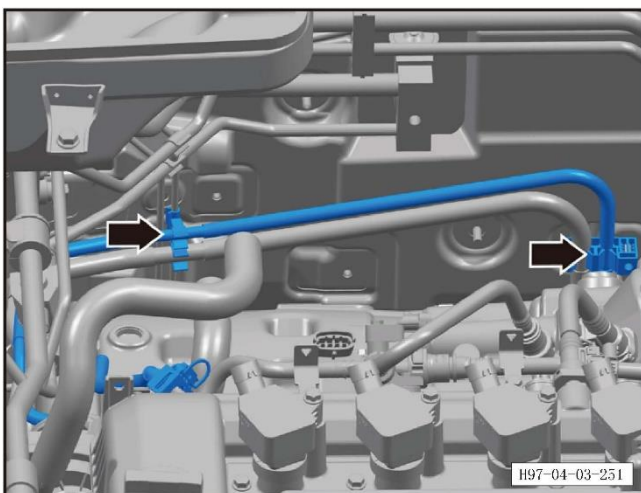
4.3.8.3 Removal and refitting of fuel inlet pipe 3# assembly

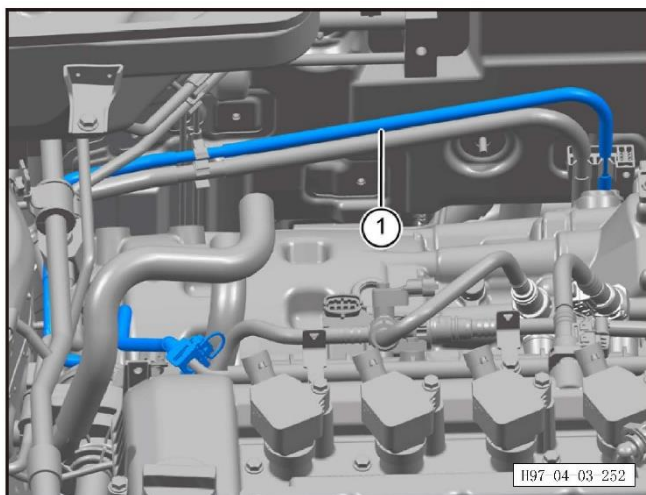
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Disconnect the fuel inlet pipe 2# assembly (refer to [4.3.8.2 Removal and refitting of fuel inlet pipe 2# assembly](#))
6. Remove the range extender controller (refer to [4.5.8.3 Removal and refitting of range extender controller](#))
7. Remove the engine compartment high voltage box assembly (refer to [4.5.8.2 Removal and refitting of engine compartment high voltage box assembly](#))
8. Remove the generator controller assembly (refer to [4.5.8.4 Removal and refitting of generator controller assembly](#))
9. Remove the fuel inlet pipe 3# assembly.
 - a. Disconnect the 1 clip connecting the fuel inlet pipe 3# assembly to the fuel rail.



- b. Disconnect the 2 pipe clamps connecting the fuel inlet pipe 3# assembly to the body.





c. Take out the fuel inlet pipe 3# assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

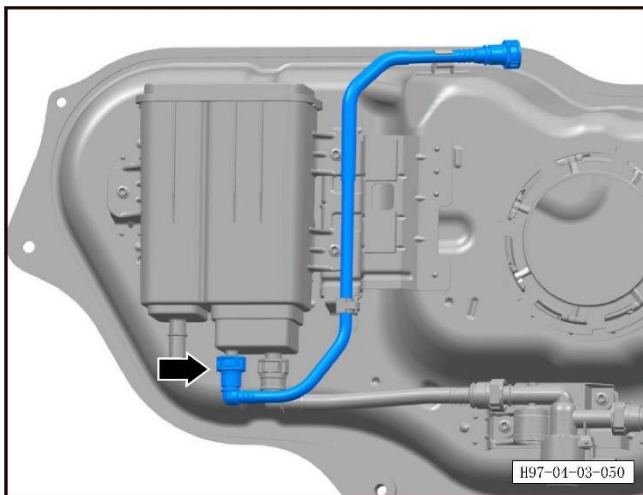
CAUTION:

- Remove high voltage (refer to [3.1.7.2 High voltage removal](#))
- After disconnecting the fuel pipeline, the exposed pipeline interface must be well protected to prevent debris from entering the fuel system.
- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

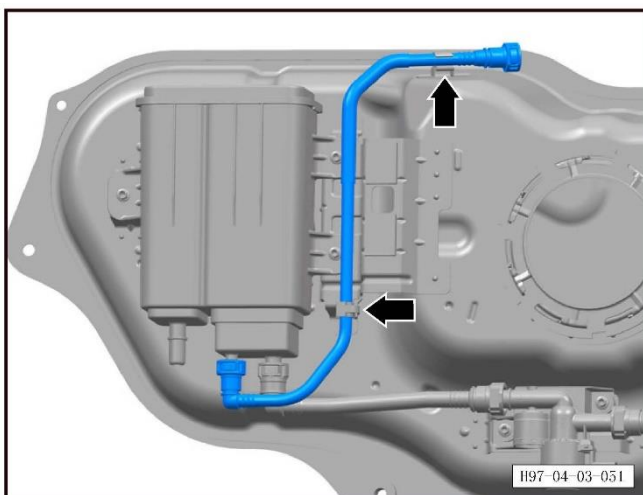
4.3.8.4 Removal and refitting of canister desorption tube 1#

Removal procedure

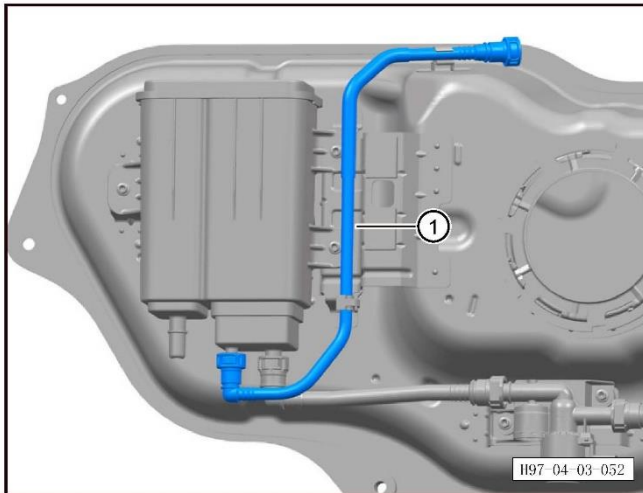
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the electronic fuel pump assembly (refer to [4.3.8.1 Removal and refitting of electronic fuel pump assembly](#))
6. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
7. Remove the canister desorption tube 1#.



- a. Disconnect the 1 pipe clamp that connects the canister desorption tube 1# to the canister & accessories assembly.



- b. Disconnect the 2 clips connecting the canister desorption tube 1# to the fuel tank assembly.



c. Take down the canister desorption tube 1# ①.

Refitting procedure

The refitting procedure is performed in reverse order.

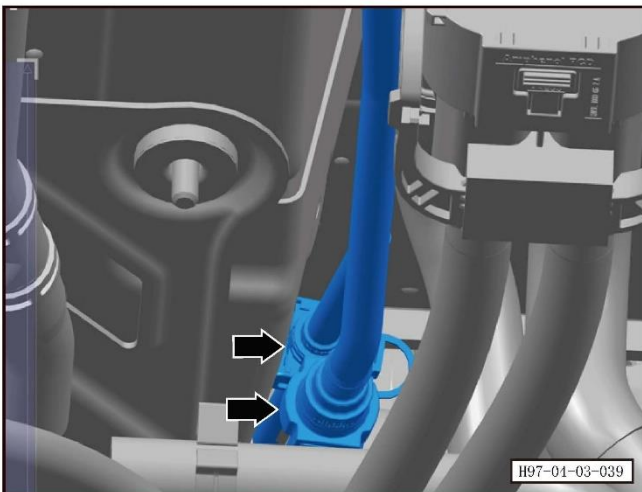
CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

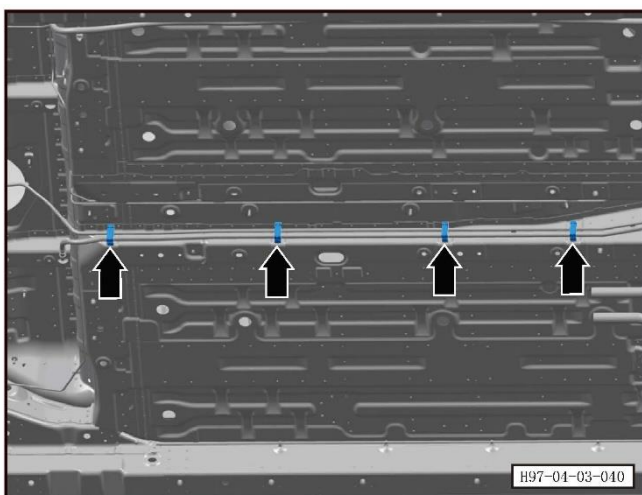
4.3.8.5 Removal and refitting of canister desorption tube 2#

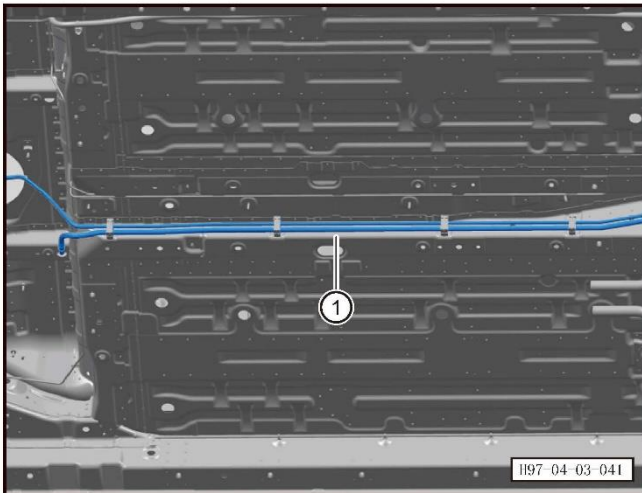
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
 2. Open the engine hood.
 3. Remove the engine compartment trim panel.
 4. Disconnect the battery negative terminal.
 5. Remove the high voltage (refer to [3.1.7.2 High voltage removal](#))
 6. Remove the fuel pump assembly (refer to [4.3.8.1 Removal and refitting of electronic fuel pump assembly](#))
 7. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
 8. Remove the battery pack assembly (refer to [5.1.5.1 Removal and refitting of battery pack assembly](#))
 9. Remove the canister desorption tube 2#.
- a. Disconnect the 2 clips connecting the canister desorption tube 2# and the fuel inlet pipe 2# assembly.



- b. Disconnect the 4 pipe clamps that secure the canister desorption tube 2# to the body.





c. Take down the canister desorption tube 2# ①.

Refitting procedure

The refitting procedure is performed in reverse order.

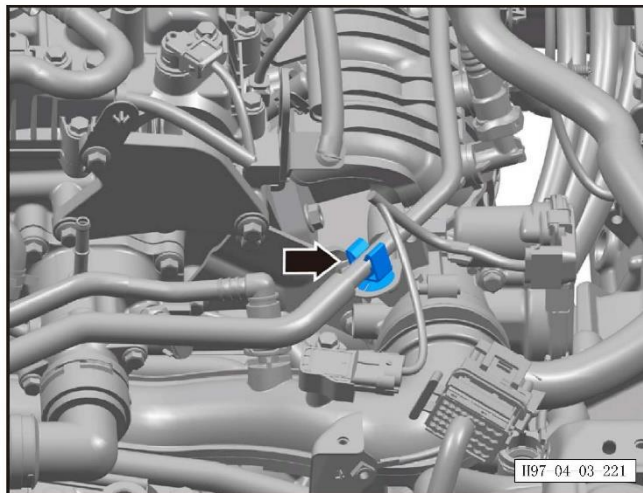
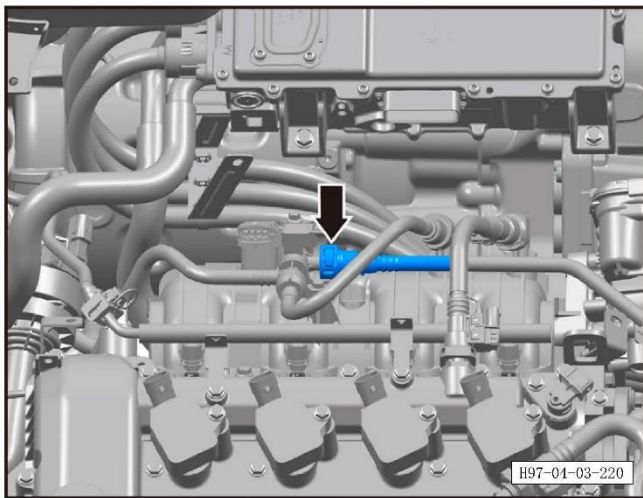
CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

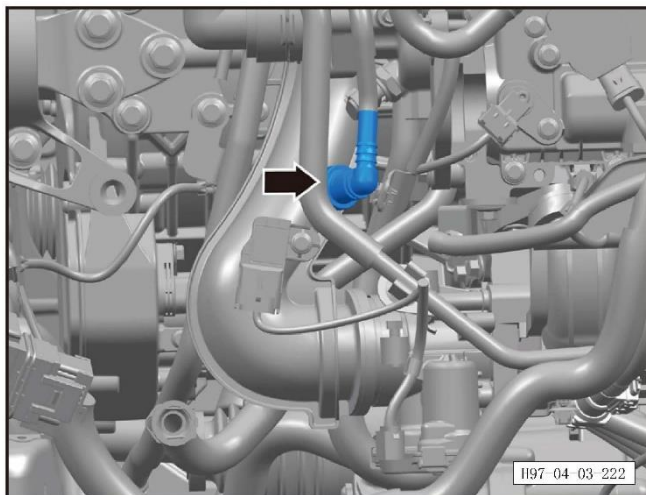
4.3.8.6 Removal and refitting of high-pressure desorption tube assembly

Removal procedure

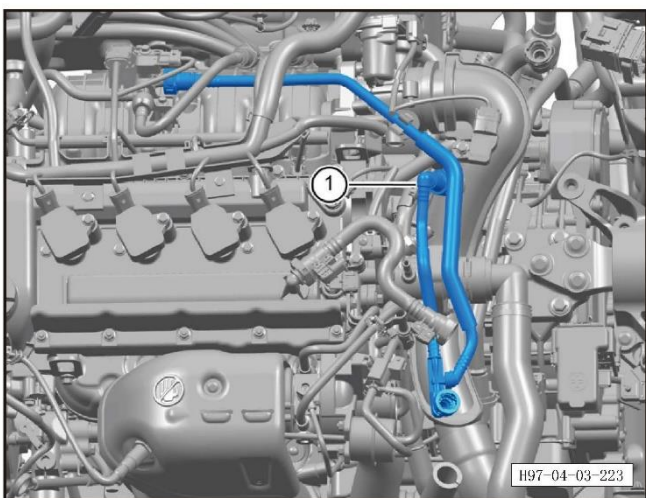
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
6. Remove the high-pressure desorption tube assembly.
 - a. Disconnect the 1 clip connecting the high pressure desorption tube assembly and the fuel evaporation pipe assembly.



- b. Disconnect 1 clip on the high pressure desorption tube assembly and the range extender bracket.



c. Disconnect 1 pipe clamp connecting the high pressure desorption tube assembly to the turbocharger air inlet pipe.



d. Take out the high pressure desorption tube assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.8.7 Removal and refitting of fuel rail assembly

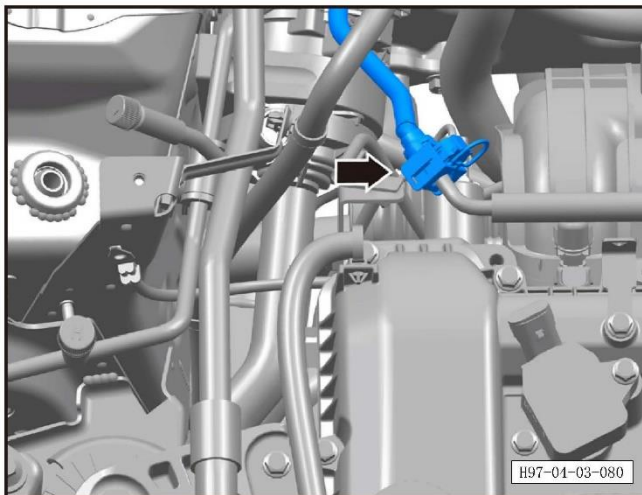
Removal procedure

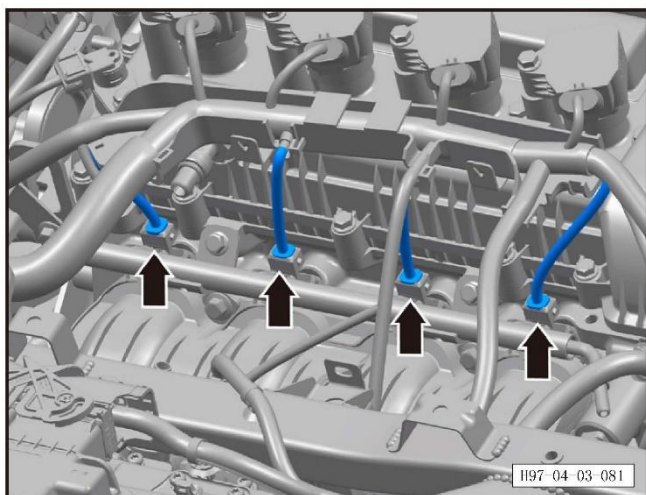
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Depressurize the fuel system.
6. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
7. Remove the ambient pressure sensor (refer to [4.5.16.7 Removal and refitting of ambient pressure sensor](#))
8. Remove the PCV valve vent pipe 2# (refer to [4.5.18.2 Removal and refitting of PCV valve vent pipe 2#](#))
9. Remove the high-pressure desorption tube assembly (refer to [4.3.8.7 Removal and refitting of high-pressure desorption tube assembly](#))
10. Remove the fuel rail assembly.

CAUTION:

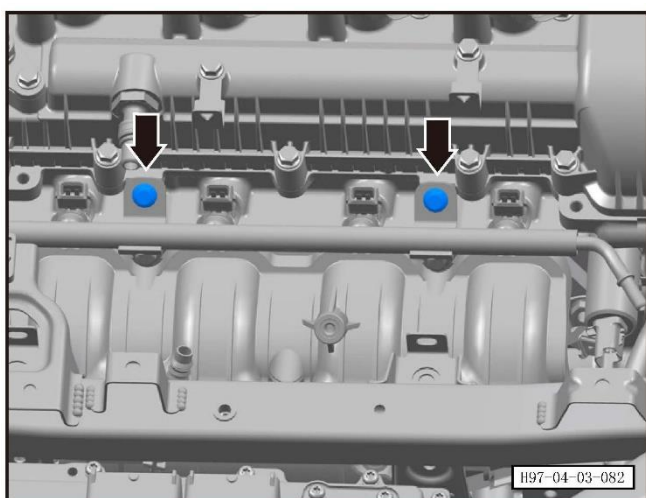
- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

- a. Disconnect 1 pipe clamp connecting the fuel inlet pipe 3# to the fuel rail assembly.

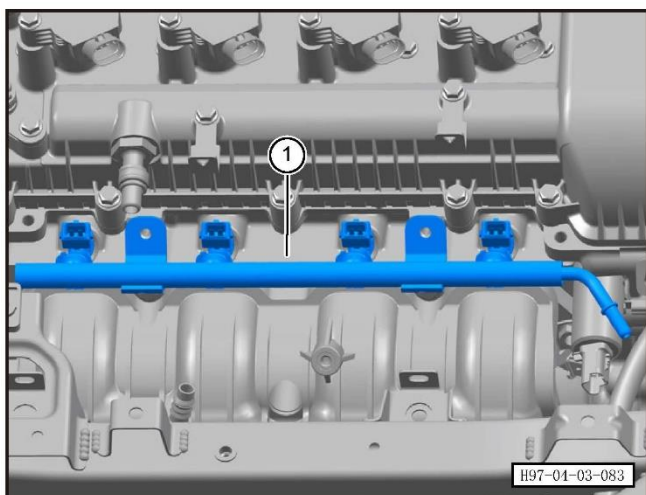




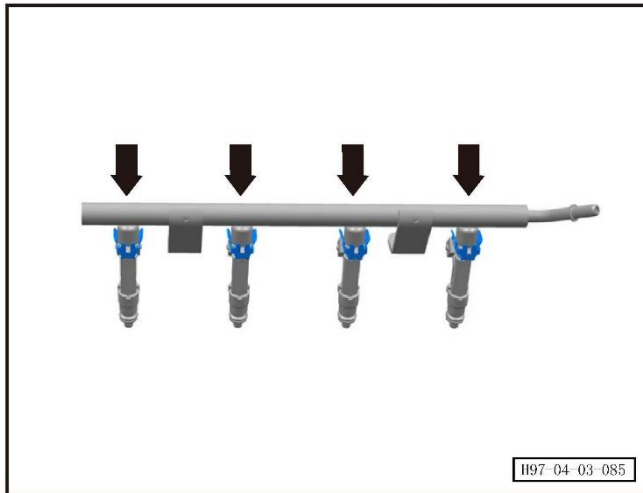
b. Disconnect the connectors for the 4 injectors.



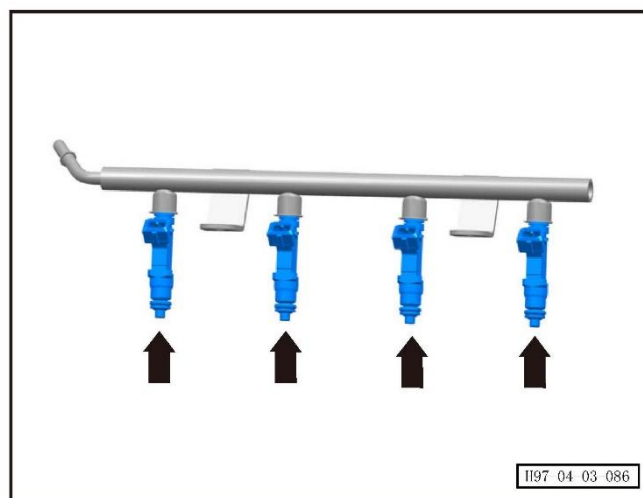
c. Unscrew the 2 bolts on the fuel rail assembly.
Tightening torque of bolt: $12\pm 2\text{Nm}$.



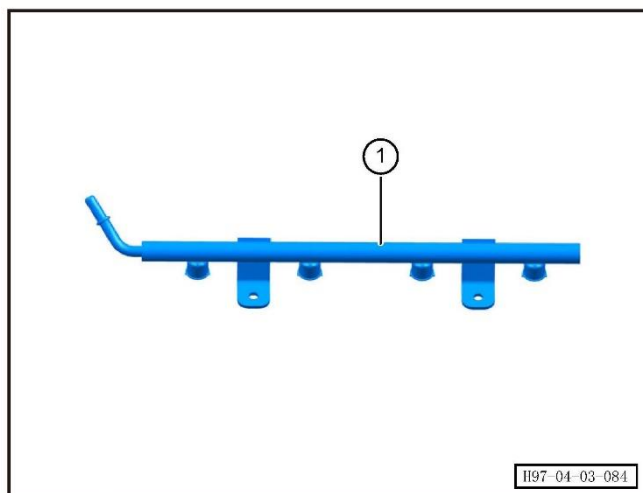
d. Remove the fuel rail assembly (including 4 injectors).



e. Disconnect the clips of the 4 injectors.



f. Take out 4 injector nozzles.



g. Fuel rail assembly ①.

Refitting procedure

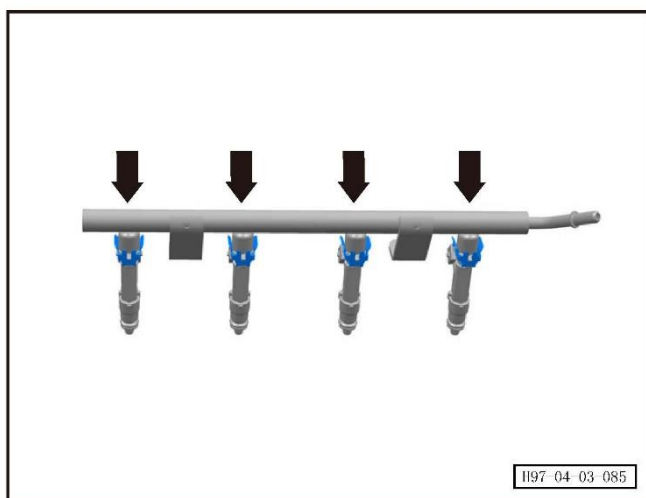
The refitting procedure is performed in reverse order.

4.3.8.8 Removal and refitting of injector nozzle

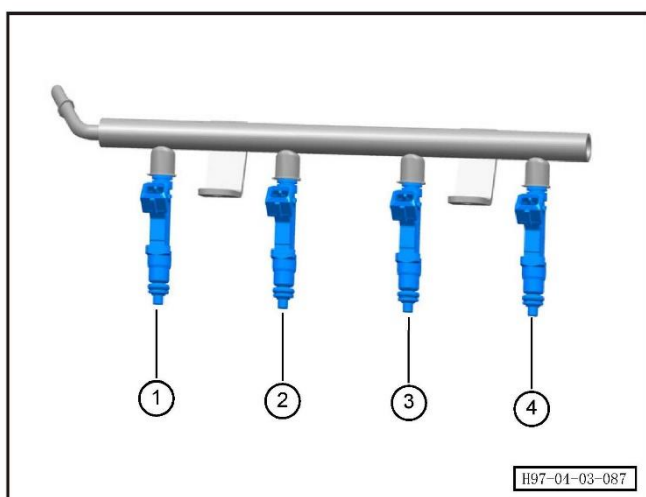
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel rail assembly (refer to [4.3.8.7 Removal and refitting of fuel rail assembly](#))
6. Remove the injector nozzle.

a. Disconnect the connection clip between the injector nozzle and the fuel rail assembly.



b. Take out 4 injector nozzles.



Refitting procedure

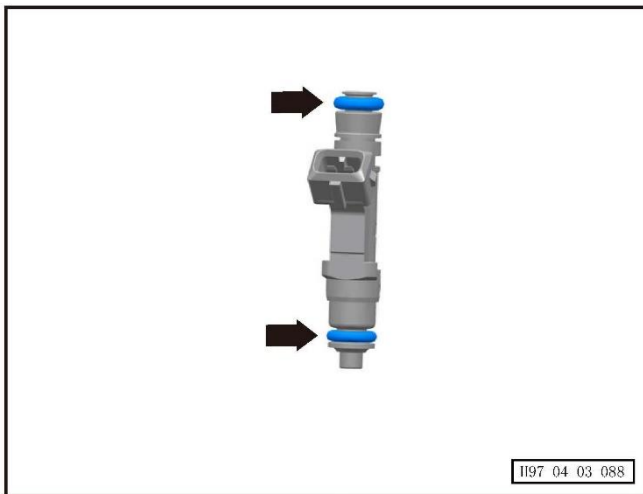
The refitting procedure is performed in reverse order.

CAUTION:

- When refitting the injector nozzle, the seal ring must be replaced with a new one.

CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

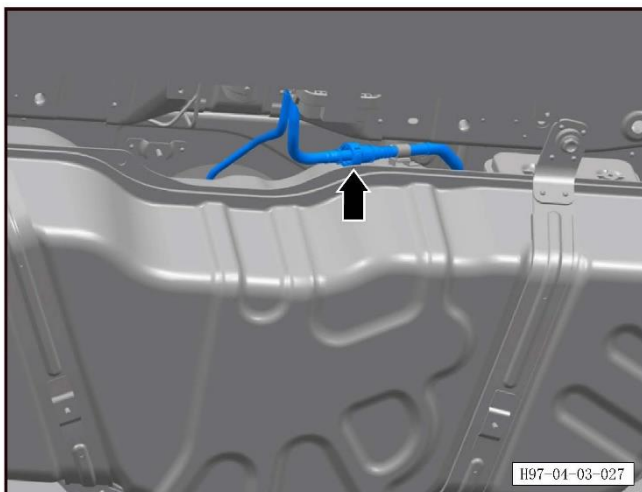
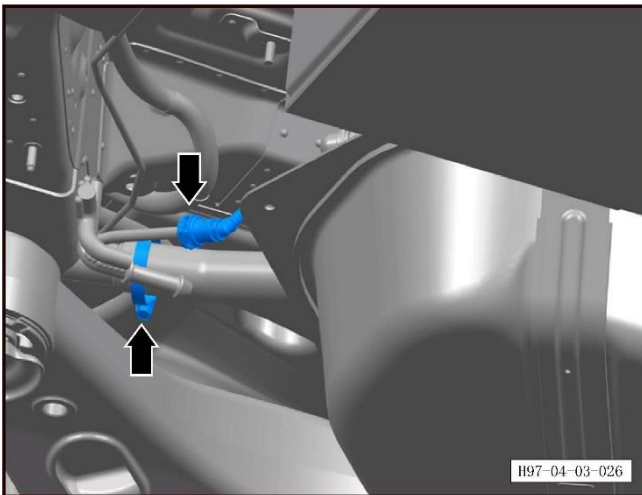


4.3.9 Fuel tank assembly

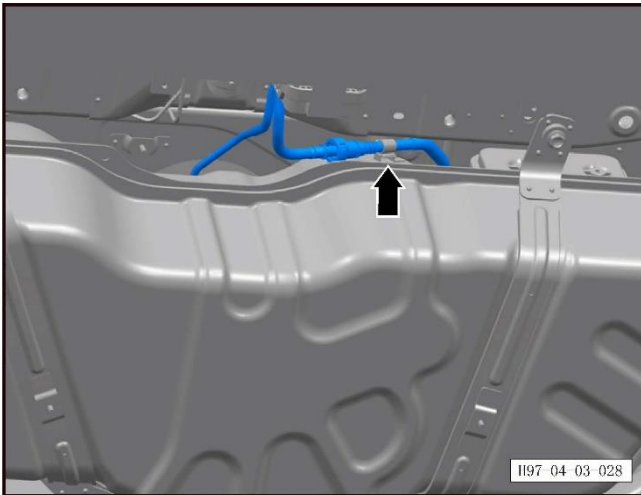
4.3.9.1 Removal and refitting of fuel tank assembly

Removal procedure

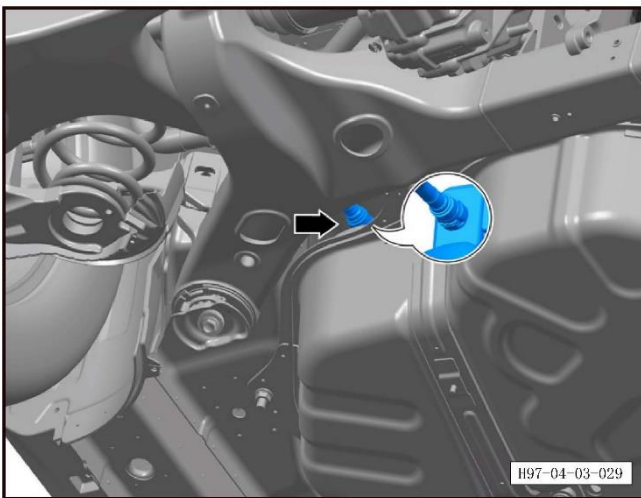
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Pull out the electric fuel pump fuse.
6. Remove the pipeline and harness on the fuel pump (refer to [4.3.8.1 Removal and refitting of electronic fuel pump assembly](#))
7. Lift the vehicle.
8. Remove the fuel tank assembly.
 - a. Loosen 1 pipe clamp bolt of the fuel filler pipe and disconnect 1 pipe clamp.



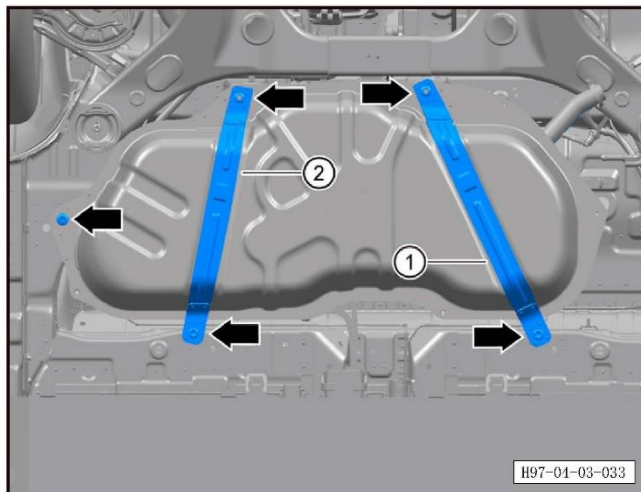
- b. Disconnect the 1 pipe clamp connecting the canister desorption tube 1# and the canister desorption tube 2#.



c. Disconnect the 1 clip connecting the canister desorption tube 1# to the fuel tank assembly.



d. Disconnect 1 pipe clamp connecting the clean air conduit to the canister & accessories assembly.



e. Unscrew the 5 bolts that fix the fuel tank assembly to the body, and take down the fuel tank mounting strap I ① and the fuel tank mounting strap II ②.

Tightening torque of bolt: $22\pm 2\text{Nm}$.

CAUTION:

- When removing the fuel tank, a lifting device must be used to support the bottom of the fuel tank.
- It is recommended that 2-3 people work together to complete the lifting operation of the fuel tank.



f. Take down the fuel tank assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.9.2 Removal and refitting of fuel pump seal ring

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Disconnect the battery negative terminal.
4. Pull out the electronic fuel pump fuse.
5. Remove the electronic fuel pump assembly (refer to [4.3.8.1 Removal and refitting of electronic fuel pump assembly](#))
6. Remove the fuel pump seal ring.
 - a. Take down the fuel pump seal ring ①.



Refitting procedure

The refitting procedure is performed in reverse order.

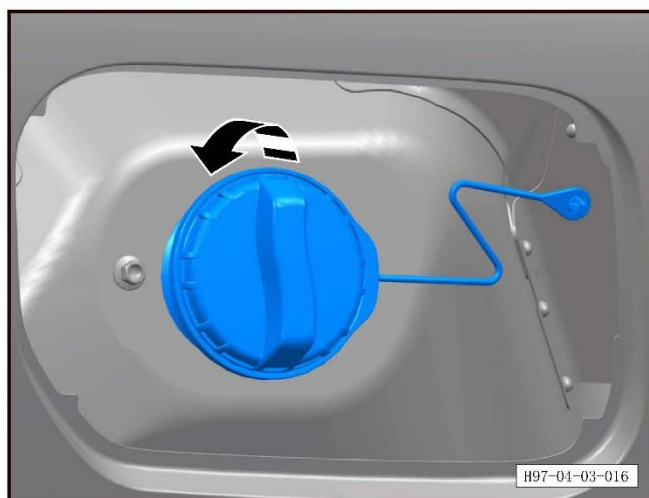
CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.9.3 Removal and refitting of fuel filler pipe

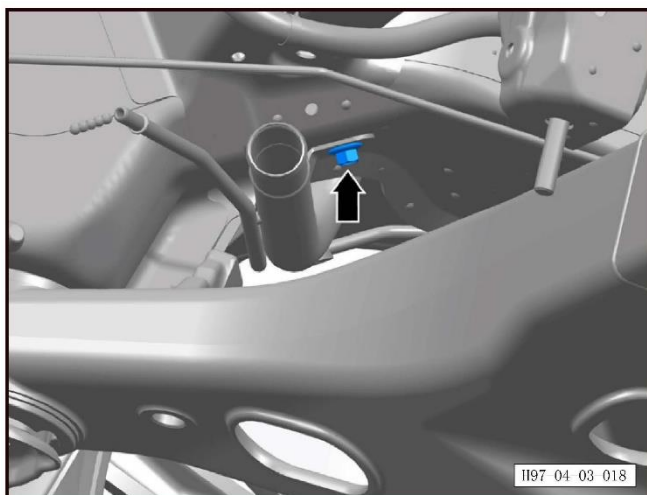
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
6. Remove the fuel filler pipe.
 - a. Unscrew the filler cap.



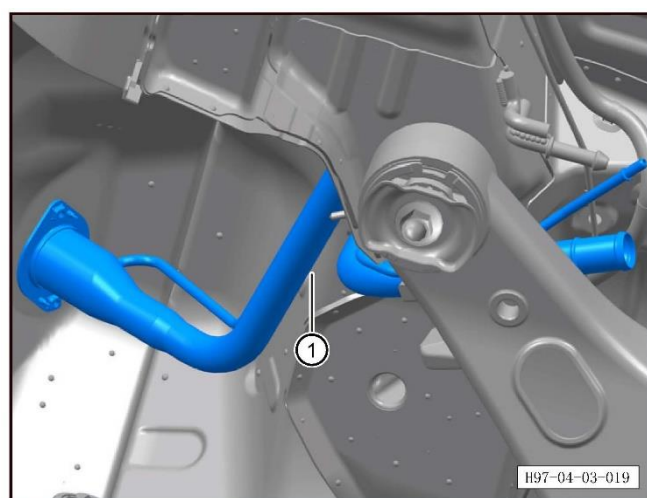
- b. Unscrew the 2 bolts connecting the filler pipe to the body.

Tightening torque of bolt: 6 ± 1 Nm.



c. Unscrew the 1 bolt that secures the filler pipe to the body.

Tightening torque of bolt: $10\pm 2\text{Nm}$.



d. Take out the fuel filler pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

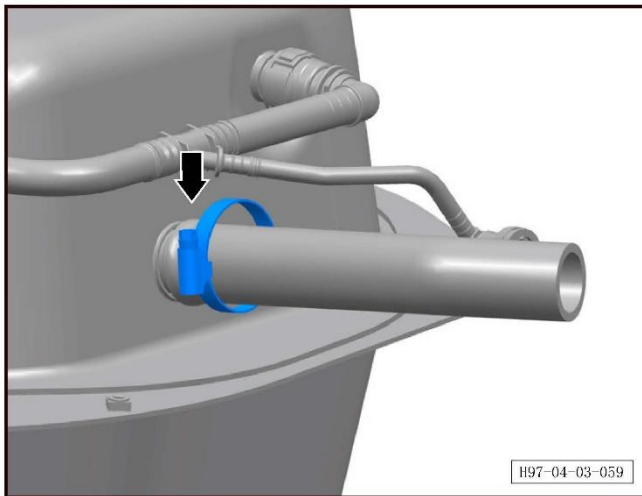
CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.9.4 Removal and refitting of fuel filler hose

Removal procedure

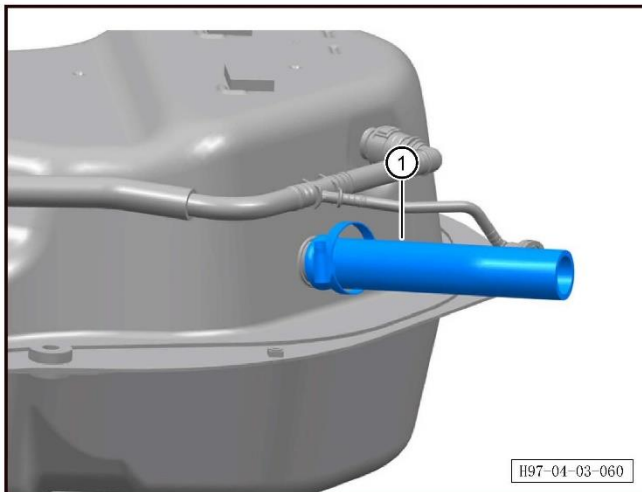
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
6. Remove the fuel filler hose.



- a. Disconnect 1 pipe clamp connecting the fuel tank assembly to the fuel filler hose.

CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.



- b. Take down the fuel filler hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

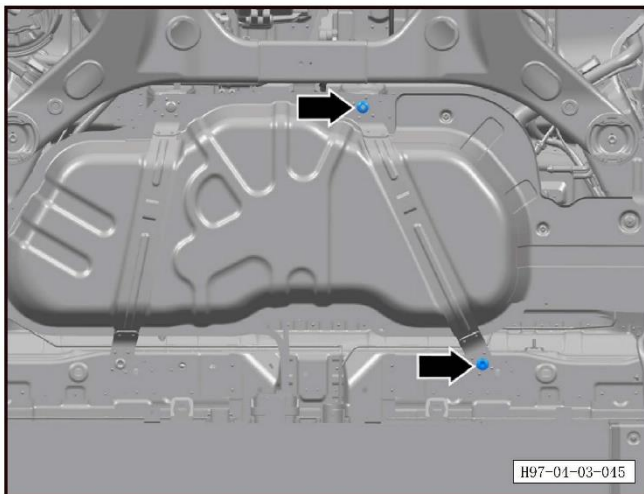
4.3.9.5 Removal and refitting of fuel tank mounting strap I

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel tank mounting strap I.

- a. Unscrew the 2 bolts on the fuel tank mounting strap I.

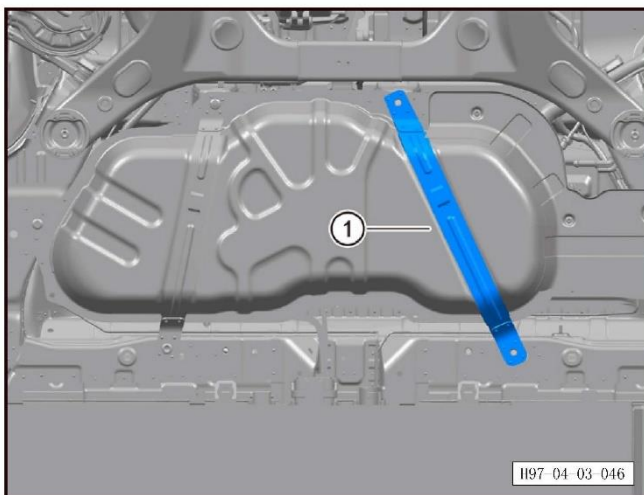
Tightening torque of bolt/nut: $22\pm 2\text{Nm}$.



- b. Take down the fuel tank mounting strap I ①.

CAUTION:

- When removing the fuel tank mounting strap, a lifting device is required to hold the bottom of the fuel tank.



Refitting procedure

Refit in reverse order of removal.

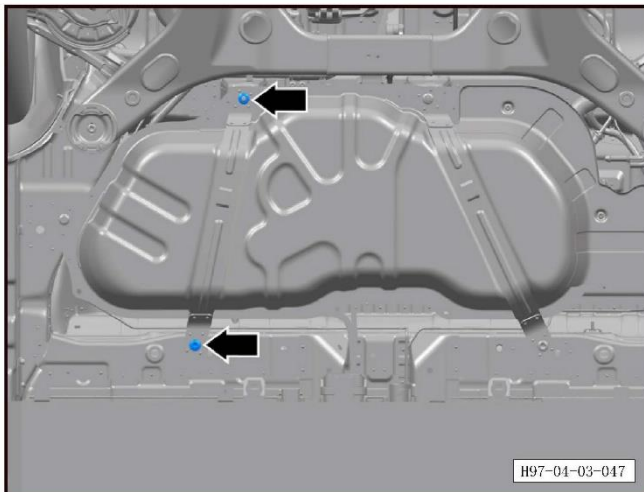
CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.9.6 Removal and refitting of fuel tank mounting strap II

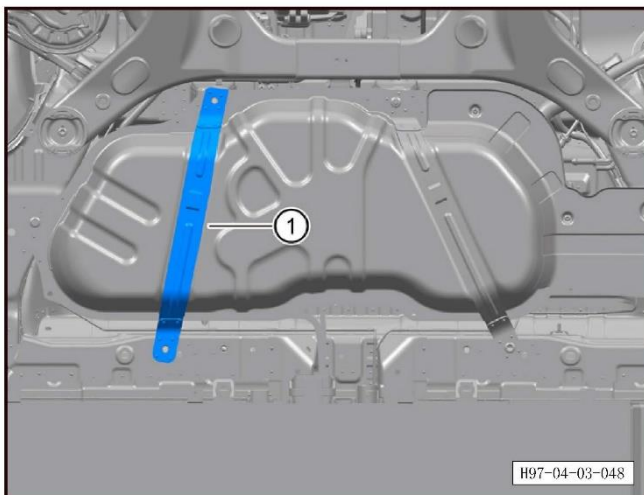
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel tank mounting strap II.



- a. Unscrew the 2 bolts on the fuel tank mounting strap II.

Tightening torque of bolt/nut: $22\pm 2\text{Nm}$.



- b. Take down the fuel tank mounting strap II ①.

CAUTION:

- When removing the fuel tank mounting strap, a lifting device must be used to support the bottom of the fuel tank.

Refitting procedure

Refit in reverse order of removal.

CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.10 Fuel evaporator

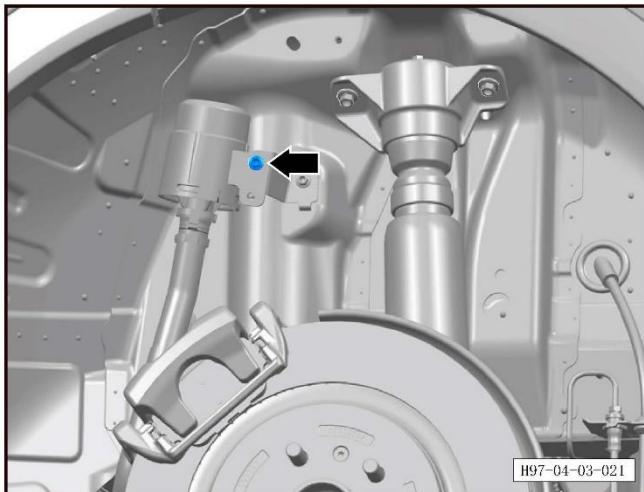
4.3.10.1 Removal and refitting of air filter

Removal procedure

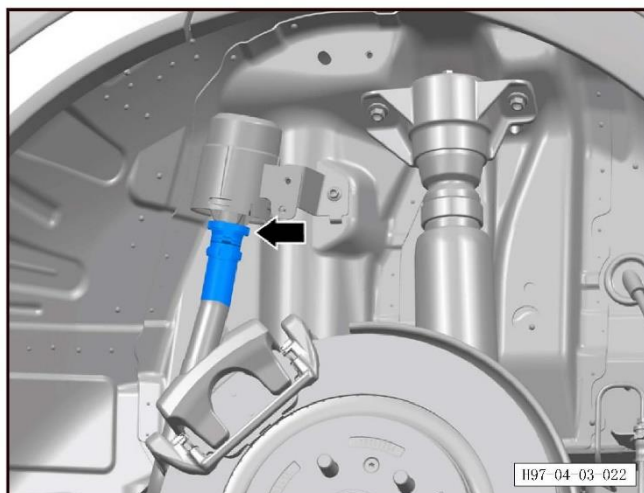
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the left rear wheel.
6. Remove the left rear wheel housing fender (refer to [8.6.4.2 Removal and refitting of rear wheel housing fender assembly](#))
7. Remove the air filter.

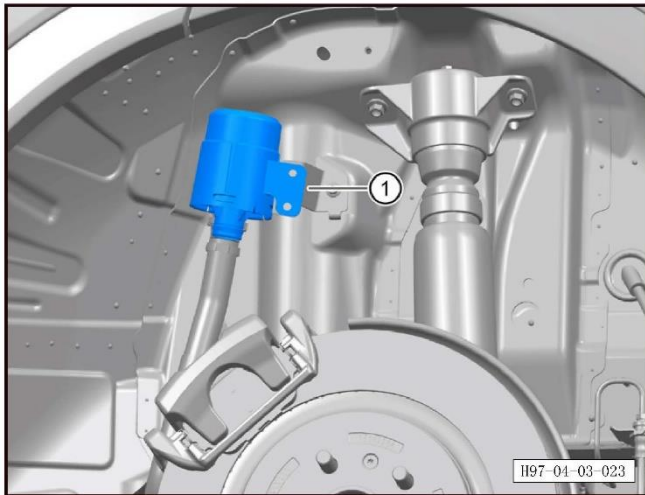
a. Unscrew 1 bolt of air filter and bracket.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



b. Disconnect 1 pipe clamp connecting the air filter to air filter conduit #1.





c. Take down the air filter ①.

Refitting procedure

Refit in reverse order of removal.

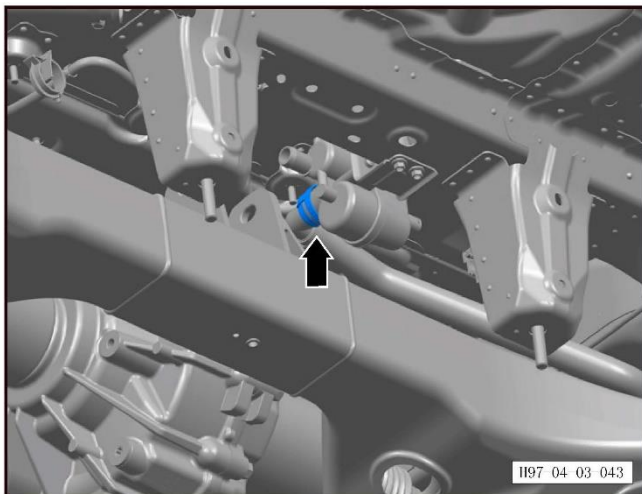
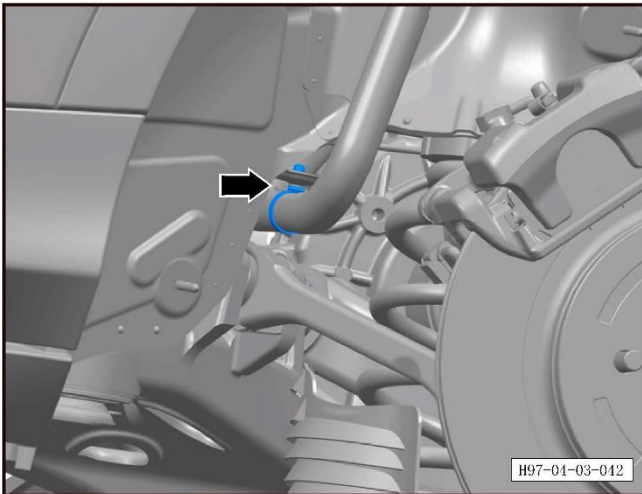
CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

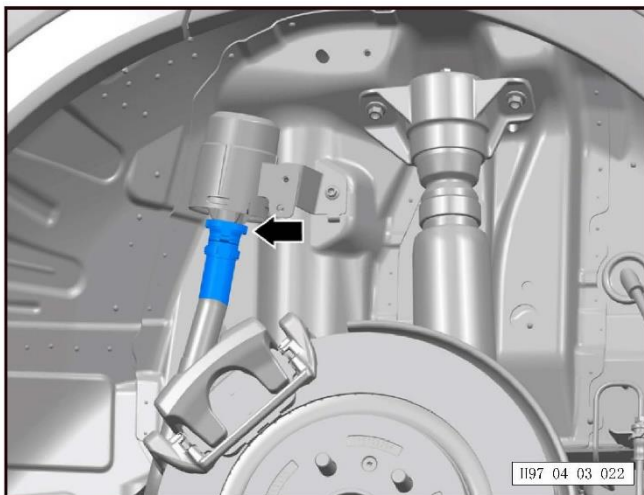
4.3.10.2 Removal and refitting of air filter conduit 1#

Removal procedure

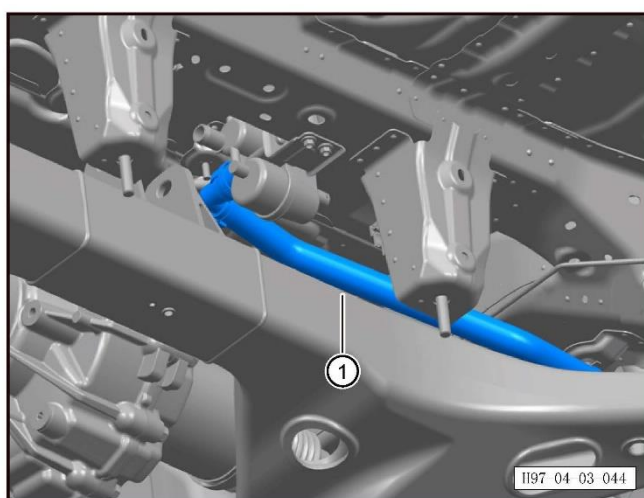
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
6. Remove the air filter conduit 1#.
 - a. Disconnect 1 securing strap on air filter conduit #1.



- b. Disconnect 1 pipe clamp connecting the air filter conduit #1 to the DMTL.



c. Disconnect the pipe clamp that connects the air filter to air filter conduit #1.



d. Take down the air filter conduit 1# ①.

Refitting procedure

Refit in reverse order of removal.

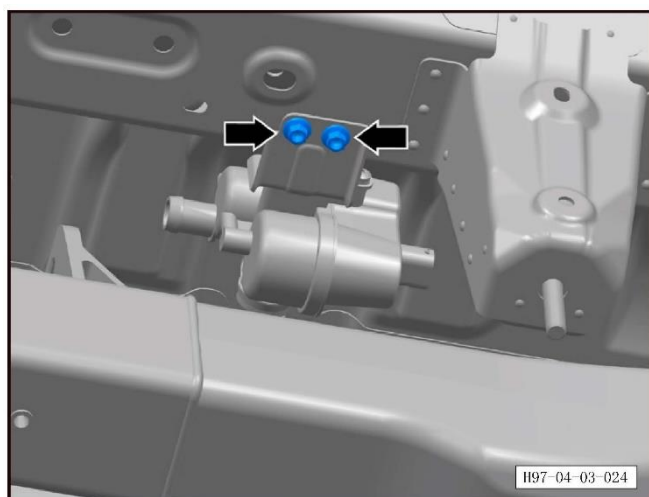
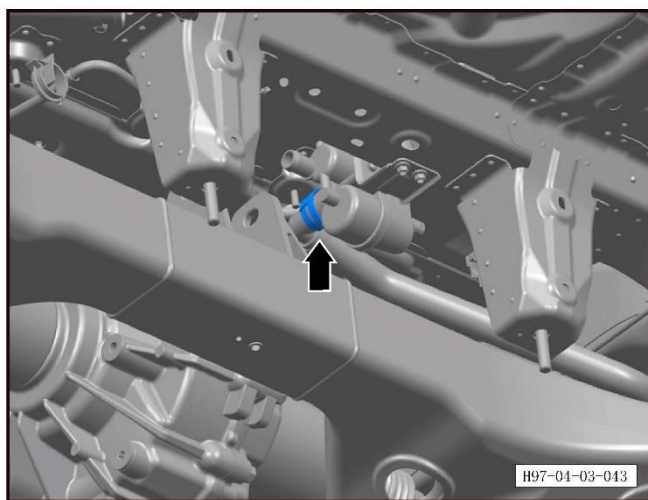
CAUTION:

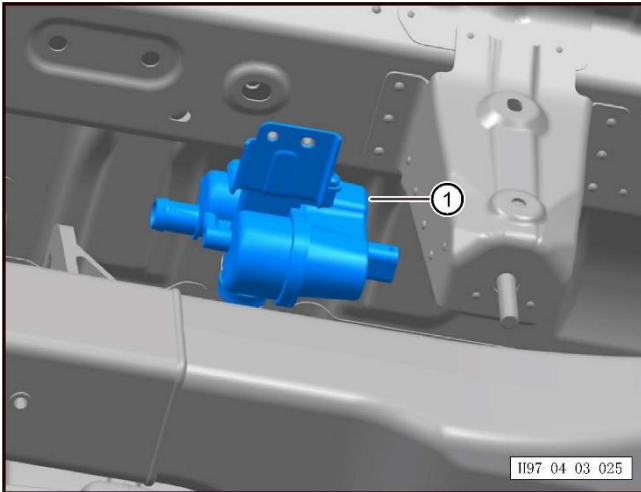
- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.10.3 Removal and refitting of DMTL

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
6. Remove the DMTL.
 - a. Disconnect 1 pipe clamp connecting the air filter conduit #1 to the DMTL.
 - b. Unscrew the 2 bolts that secure the DMTL to the body.





c. Take down the DMTL ①.

Refitting procedure

Refit in reverse order of removal.

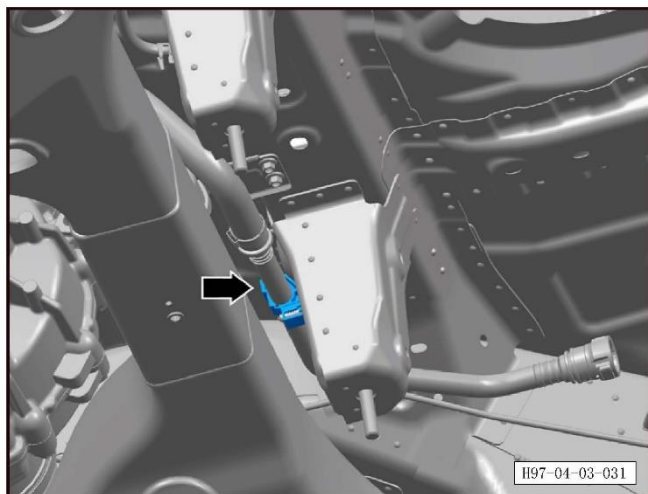
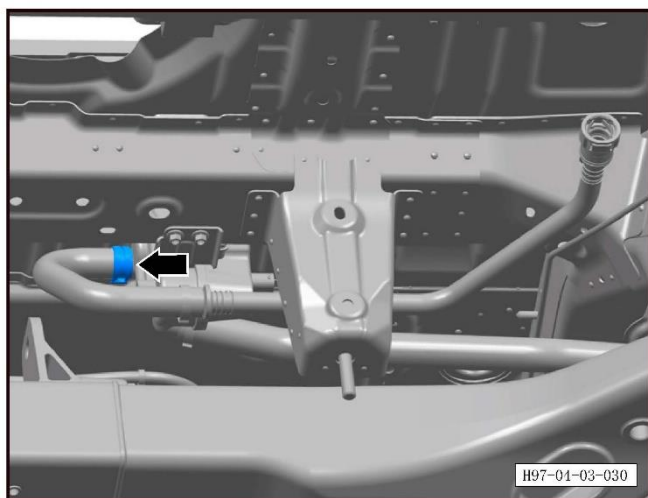
CAUTION:

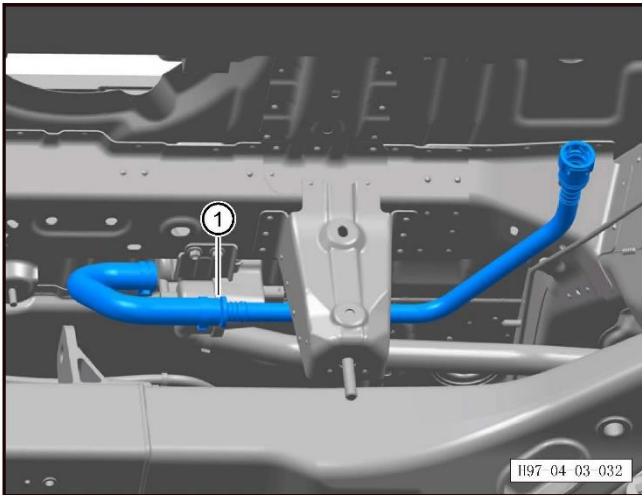
- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.10.4 Removal and refitting of clean air conduit

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
6. Remove the clean air conduit.
 - a. Disconnect 1 pipe clamp connecting the clean air conduit to the DMTL.
 - b. Disconnect 1 pipe clamp connecting the clean air conduit to the body.





c. Take down the clean air conduit ①.

Refitting procedure

Refit in reverse order of removal.

CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

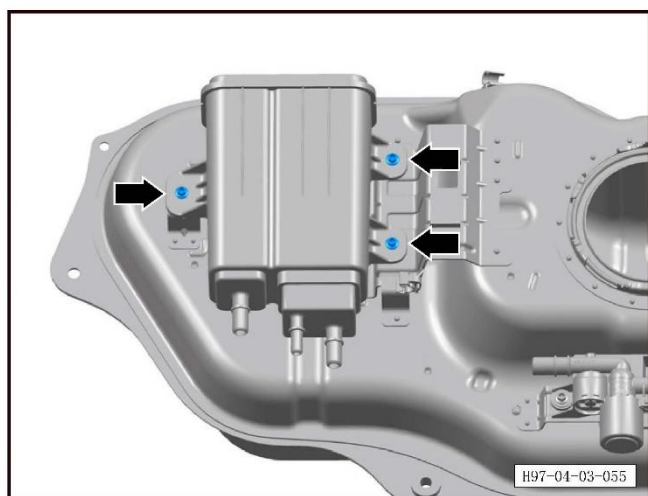
4.3.10.5 Removal and refitting of canister & accessories assembly

Removal procedure

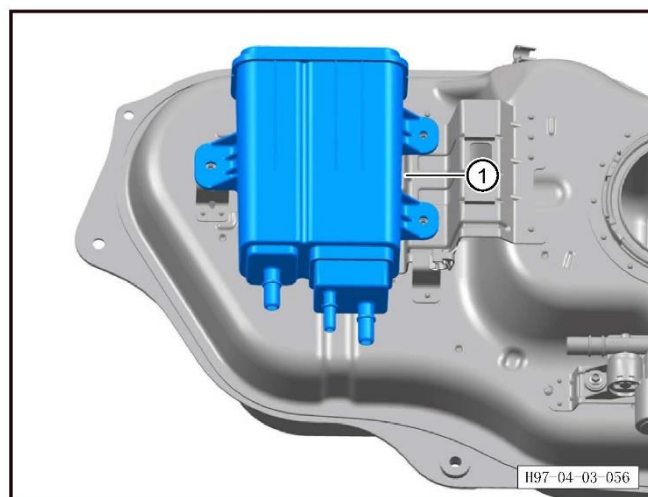
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
6. Remove the canister & accessories assembly.

- a. Unscrew the 3 bolts connecting the canister & accessories assembly to the fuel tank assembly.

Tightening torque of bolt: $10 \pm 1 \text{ Nm}$.



- b. Take down the canister & accessories assembly ①.



Refitting procedure

Refit in reverse order of removal.

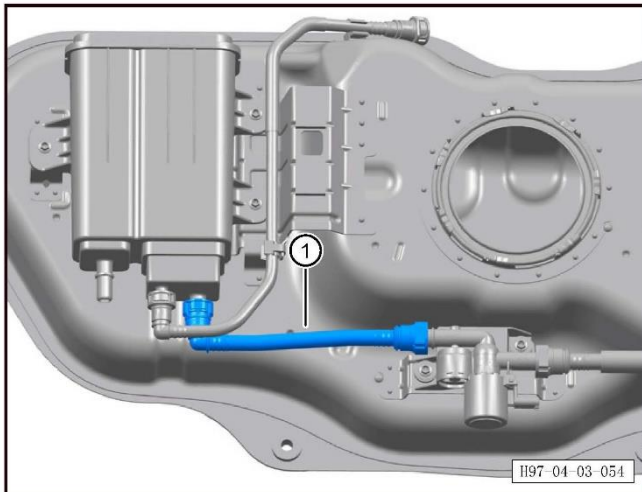
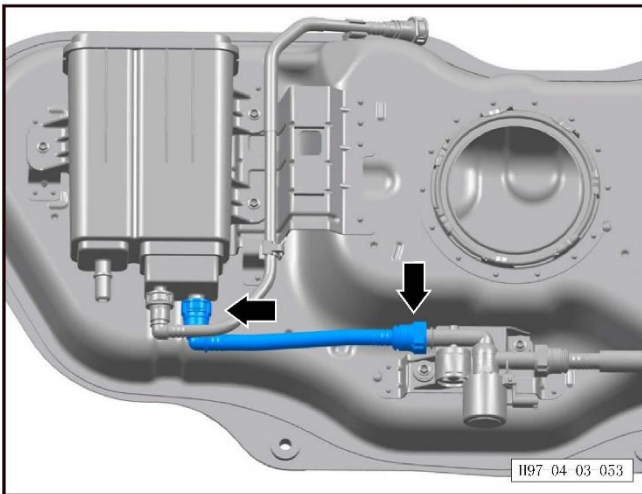
CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.10.6 Removal and refitting of fuel tank isolation valve guide

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
6. Remove the fuel tank isolation valve guide.
 - a. Disconnect the 2 pipe clamps attached to both ends of the fuel tank isolation valve conduit.



- b. Take down the fuel tank isolation valve guide ①.

Refitting procedure

Refit in reverse order of removal.

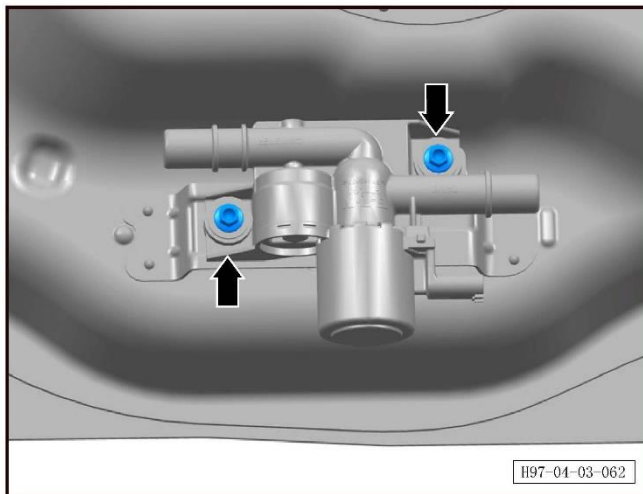
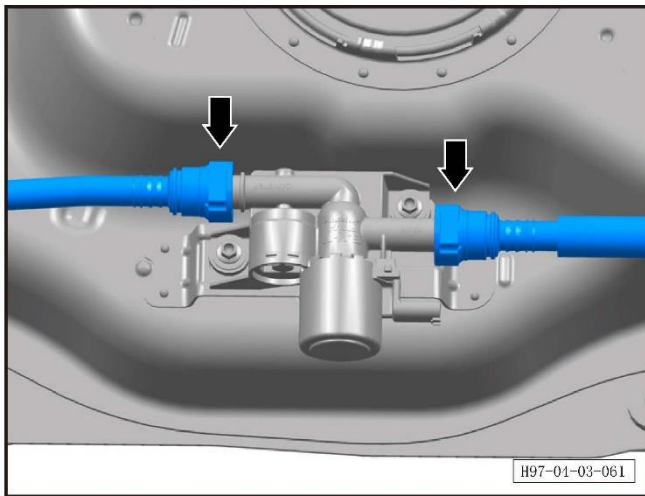
CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.10.7 Removal and refitting of fuel tank isolation valve assembly

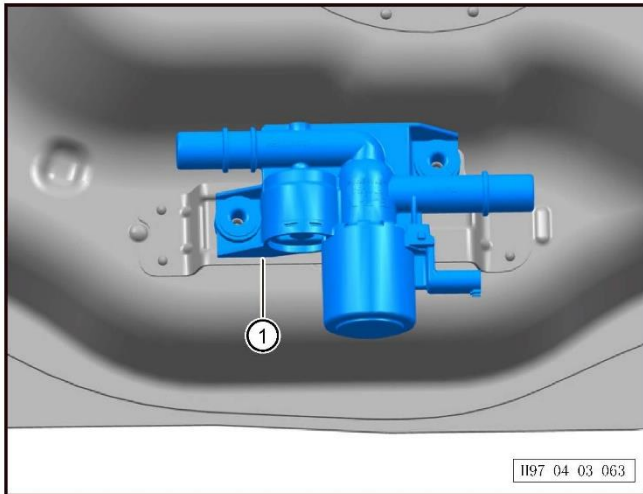
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
6. Remove the fuel tank isolation valve assembly.
 - a. Disconnect the 2 pipe clamps attached to both ends of the fuel tank isolation valve assembly.



- b. Unscrew the 2 bolts on the tank isolation valve assembly.

Tightening torque of bolt: $10 \pm 1 \text{ Nm}$.



- c. Take down the fuel tank isolation valve assembly ①.

Refitting procedure

Refit in reverse order of removal.

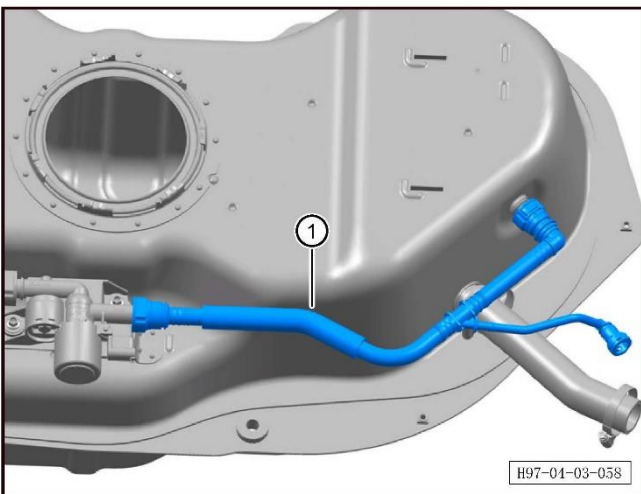
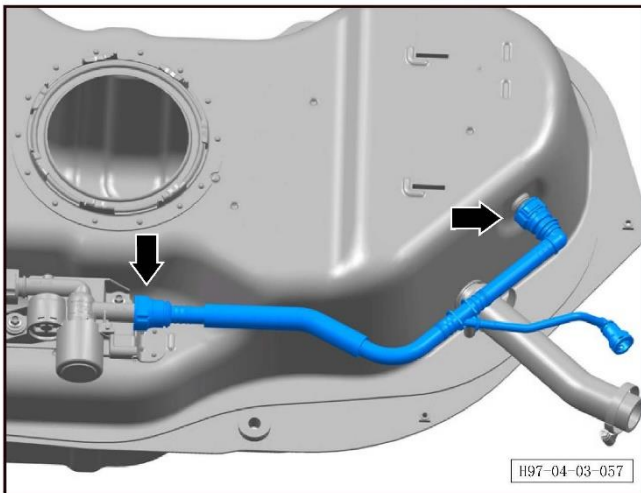
CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.10.8 Removal and refitting of fuel vapor pipe assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the fuel tank assembly (refer to [4.3.9.1 Removal and refitting of fuel tank assembly](#))
6. Remove the fuel vapor pipe assembly.
 - a. Disconnect the 2 pipe clamps attached to both ends of the fuel vapor pipe assembly.



- b. Take down the fuel vapor pipe assembly ①.

Refitting procedure

Refit in reverse order of removal.

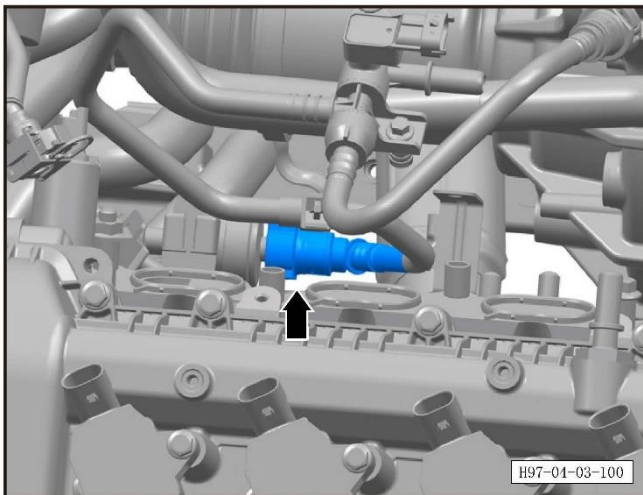
CAUTION:

- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.

4.3.10.9 Removal and refitting of canister control valve assembly

Removal procedure

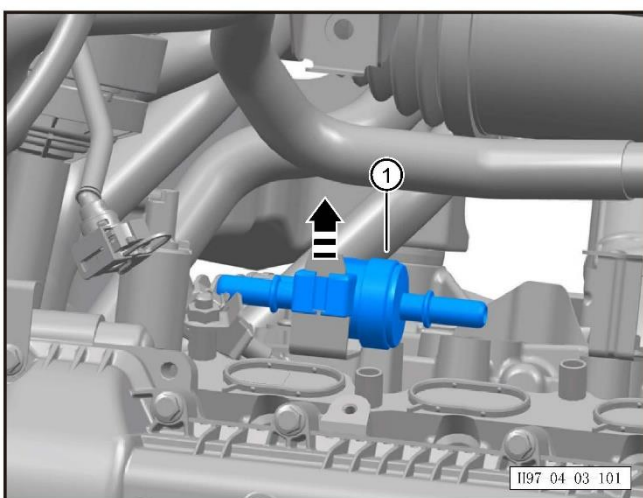
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the intake manifold assembly (refer to [4.1.8.7 Removal and refitting of intake manifold assembly](#))
6. Disconnect the canister desorption tube 3# (refer to [4.3.10.10 Removal and refitting of canister desorption tube 3#](#))
7. Remove the canister control valve assembly.



- a. Disconnect the dual check valve vent pipe from the canister control valve assembly.

CAUTION:

- After disconnecting the carbon canister desorption tube, there may be leakage of fuel vapor. Pay attention to sealing the relevant pipeline interfaces to avoid the volatilization of fuel.
- Keep away from sources of ignition.



- a. Take out the canister control valve assembly ①.

Refitting procedure

Refit in reverse order of removal.

4.3.10.10 Removal and refitting of canister desorption tube 3#

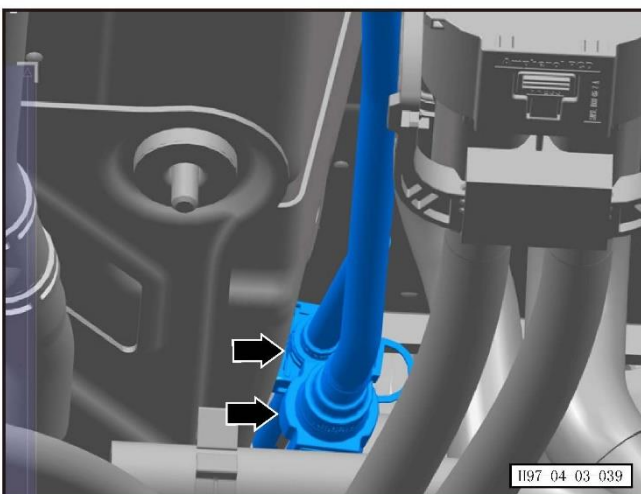
Removal procedure

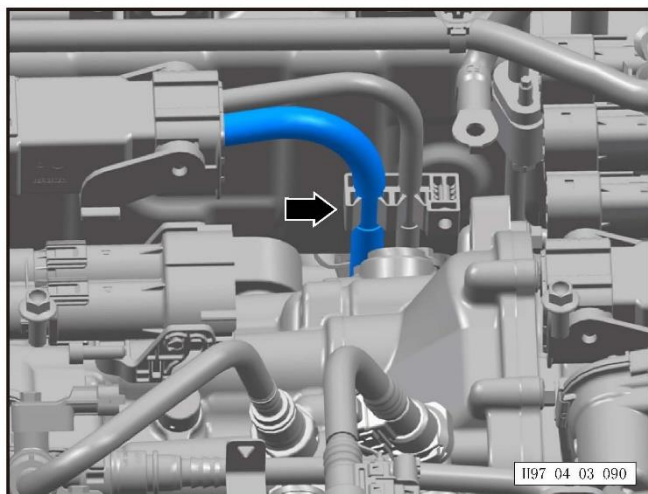
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the high voltage (refer to [3.1.7.2 High voltage removal](#))
6. Release any residual pressure in the fuel system pipelines.
7. Remove the windshield lower trim panel (refer to [8.6.6.22 Removal and refitting of windshield lower trim panel](#))
8. Remove the water bottle assembly and accessories (refer to [4.4.8.79 Removal and refitting of water bottle assembly and accessories](#))
9. Remove the engine compartment combination rod (refer to [4.5.15.6 Removal and refitting of engine compartment combination rod assembly](#))
10. Remove the range extender controller (refer to [4.5.8.3 Removal and refitting of range extender controller](#))
11. Remove the engine compartment high voltage box assembly (refer to [4.5.8.2 Removal and refitting of engine compartment high voltage box assembly](#))
12. Remove the generator controller assembly (refer to [4.5.8.4 Removal and refitting of generator controller assembly](#))
13. Remove the high voltage battery (refer to [5.1.5.1 Removal and refitting of battery pack assembly](#))
14. Remove the intake manifold assembly (refer to [4.1.8.7 Removal and refitting of intake manifold assembly](#))
15. Remove the canister desorption tube 3#.

- a. Disconnect the pipe clamps 2# and 3# of the canister desorption tube, and disconnect the pipe clamps 2# and 3# of the fuel inlet pipe.

CAUTION:

- It is recommended to disengage 2 pipe clamp interfaces at the same time;
- The plastic pipe clamps must be removed and refitted gently. If the pipe clamps are damaged, the corresponding pipe assembly must be replaced.

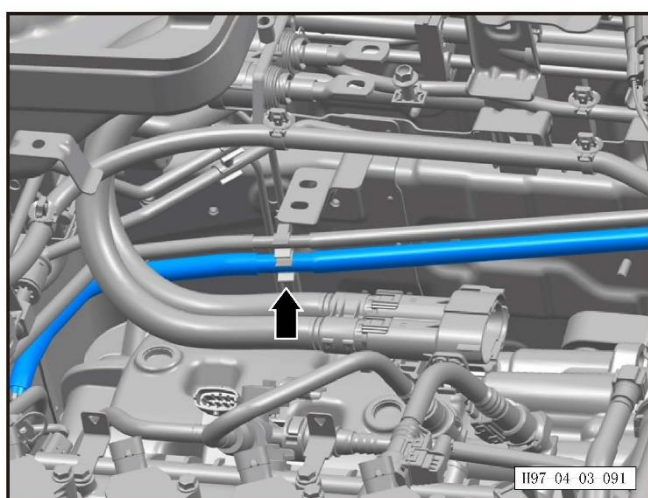




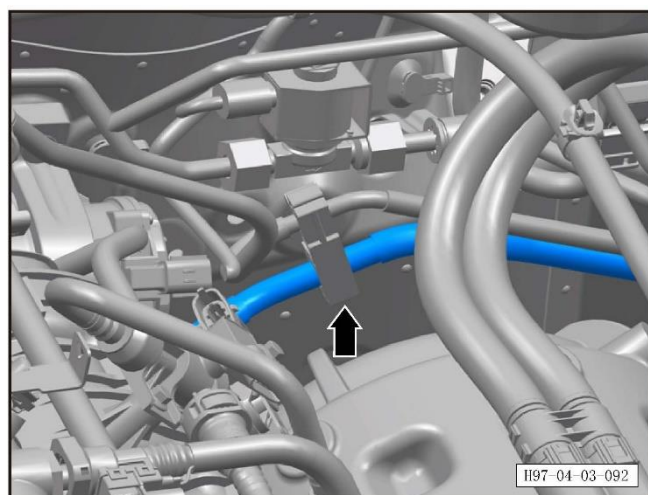
b. Disconnect 1 connection clip between the body and the canister desorption tube 3#.

CAUTION:

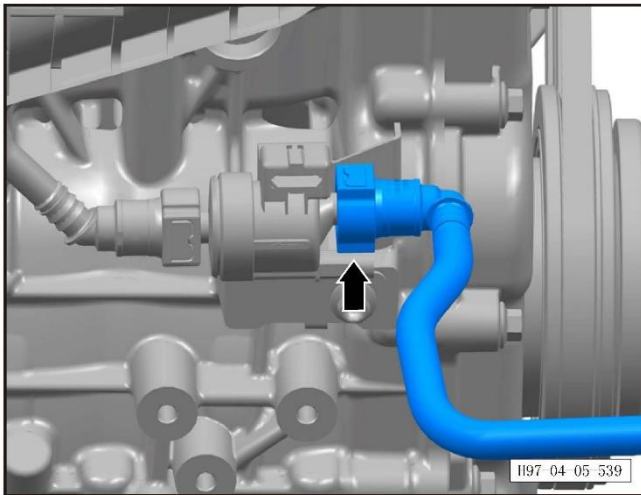
- For the fuel pressure relief of VOYAH FREE REV, please follow the steps in 4.3.1 Precautions at the beginning of this chapter.



c. Disconnect 1 connection clip between the body and the canister desorption tube 3#.



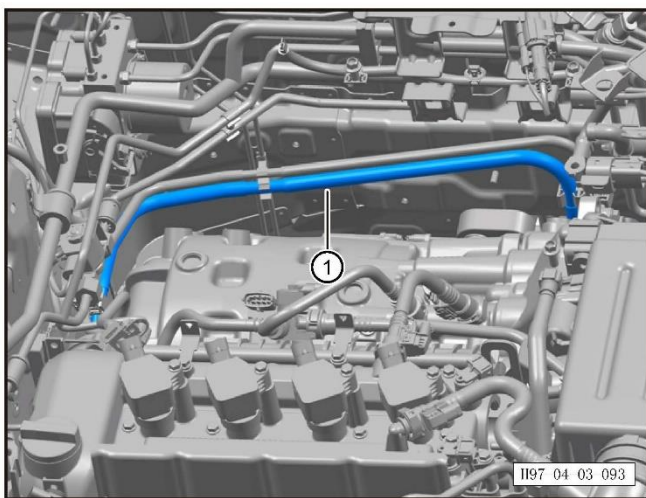
d. Disconnect 1 connection clip between the body and the canister desorption tube 3#.



e. Disconnect the canister control valve from the canister desorption tube 3#.

CAUTION:

- Disconnect the canister control valve connector.



f. Take out the canister desorption tube 3# ①.

Refitting procedure

Refit in reverse order of removal.

4.4 Cooling system

4.4.1 Precautions

- Before removing any part of the cooling system, verify that the range extender coolant is cool enough that it can be touched by hands.
- Be sure to use the type of coolant specified by the manufacturer. The use of the coolant not specified will cause corrosion of the cooling system components, resulting in cooling system malfunction or failure.
- The cooling fan will be started at any time when the range extender is in running.
- The coolant is toxic and inedible. In case of skin contact, clean the skin timely.
- After the vehicle runs for a period of time, the cooling system will be subjected to high temperature and certain pressure. When the coolant is not cooled and at high pressure, opening the water bottle cap will cause the solution to spray on the range extender, the body and the service personnel, which can lead to serious injury.

- Cooling system of REV: range extender cooling system; drive motor (including high voltage battery assembly) cooling system.
- Cooling system of EV: drive motor (including high voltage battery assembly) cooling system.
- During maintenance or repair, if the coolant needs to be added or replaced, pay attention to the difference of the cooling system to prevent misoperations.
- The coolant discharged during vehicle servicing should be collected in a centralized manner to avoid pollution to water and environment. Technicians should test whether the collected coolant meets the requirements for continued use:
- If the requirements for continued use are met, after servicing, add new coolant with the same specifications and drain the air;
- If the requirements for continued use are not met, after servicing, it is necessary to replace the coolant of the same specifications in the whole cooling system, and drain the air.

Coolant volume for VOYAH FREE.

- For VOYAH FREE (REV), the battery motor cooling system contains 12.5L coolant;
- For VOYAH FREE (REV), the cooling system of the range extender contains 6.5L coolant;
- For VOYAH FREE (EV), the battery motor cooling system contains 21L coolant;
- The coolant shall be replaced regularly according to the maintenance cycle specified by the manufacturer.

4.4.2 Introduction to structure and principle

Overview of cooling system

- When the range extender works, the gas mixture is burned in the cylinder combustion chamber to generate high temperature, and the heat is transmitted through the cylinder block. Without cooling, the range extender will not work, so a range extender coolant passage is provided in the cylinder block. The heat exchange with the outside world through the circulation of the range extender coolant can keep the operating temperature of the range extender within a certain range, so that the range extender can work effectively in all working conditions. When the range extender is in cold state, the cooling system controls the circulation amount of the range extender coolant through the thermostat, so that the range extender can be quickly warmed up.
- The cooling system consists of radiator, water bottle assembly, electronic fan assembly, thermostat and its housing, water pump and water pump drive belt. The mechanical water pump is driven by the accessory drive pulley. The cooling system can work normally only when all parts are functioning properly. When the range extender coolant reaches the working temperature of the thermostat, the thermostat is fully opened, and the coolant flows through the cooling system for a large circulation.
- The water bottle assembly is connecting the radiator, and is used to recover the range extender coolant discharged by expansion due to temperature rise. The water bottle assembly is used to maintain the correct liquid level of the range extender coolant.
- When the range extender is shut down, the range extender coolant cools and contracts automatically, and the range extender coolant that was previously drained is sucked back into the radiator and range extender. Thereby, the coolant in the radiator improves the cooling efficiency.
- When the cooling system is in cold state, the range extender coolant level should be maintained between the MIN and MAX marks on the water bottle assembly.
- The cooling fan control module changes the operating frequency of the cooling fan motor through the pulse width modulation (PWM) signal, so that the cooling fan can run at a variable speed. The cooling fan speed is affected by different operating conditions, and the range extender control module will adjust the duty cycle according to the requirements of the cooling system.

Radiator assembly

- The radiator is a heat exchanger. It consists of a radiator core and 2 water chambers. The aluminum radiator core employs a tube-and-fin cross-flow design, extending from the water inlet chamber to the water outlet chamber. The cooling fins are arranged around the outside of the pipes to facilitate the conduction of heat to the atmosphere. The flange edge of the water chamber and the aluminum radiator core are sealed with a high temperature resistant rubber gasket. The radiator also has a drain valve located at the bottom of the right water chamber. The drain valve unit consists of a drain valve and a drain valve seal ring. The radiator dissipates heat from the coolant flowing through it. The coolant flowing through the pipes is dissipated by the fins on the radiator core. As the air flows over the fins, it absorbs heat and reduces the coolant temperature.

Water bottle assembly

- The water bottle is a plastic jar with a threaded pressure cap. It is mounted higher than all other coolant passages. The water bottle provides a space in the cooling system that allows the coolant to expand and contract. There is a coolant filling point and a centralized bleed point on the water bottle cap. When the vehicle is operating, the coolant is heated and expands. The increased coolant flows into the water bottle. As the coolant circulates, the air is expelled as air bubbles. Coolant without bubbles is far more endothermic than coolant with bubbles.

Thermostat assembly

- The thermostat automatically adjusts the amount of water entering the radiator according to the temperature of the coolant, and changes the water circulation range to adjust the heat dissipation capacity of the cooling system and ensure that the range extender works within a suitable temperature range.
- The thermostat must be kept in good working condition, otherwise it will seriously affect the normal operation of the range extender. If the main valve of the thermostat is opened too late, the range extender will be overheated; if the main valve is opened too early, the warm-up time of the range extender will be prolonged and the temperature of the range extender will be too low.

Range extender water pump

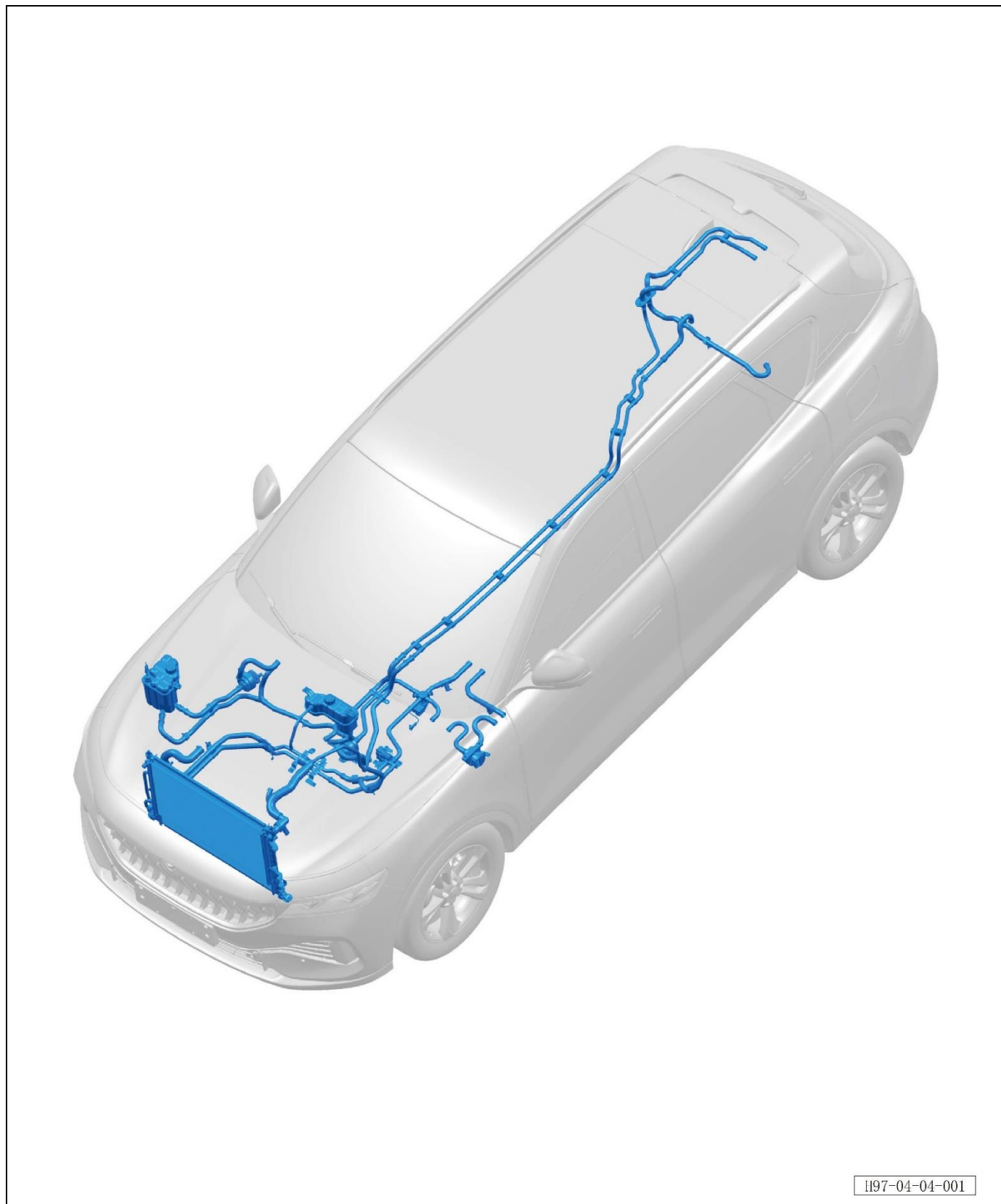
- The water pump is a component of the range extender cooling system used to circulate the coolant from each cooling circulation component.
- The water pump consists of seals, bearings, pulleys and housing, and is driven by a drive belt to reduce the noise of the water pump pulley. The water pump seals the drain hole groove to prevent coolant leakage.

Range extender coolant temperature sensor

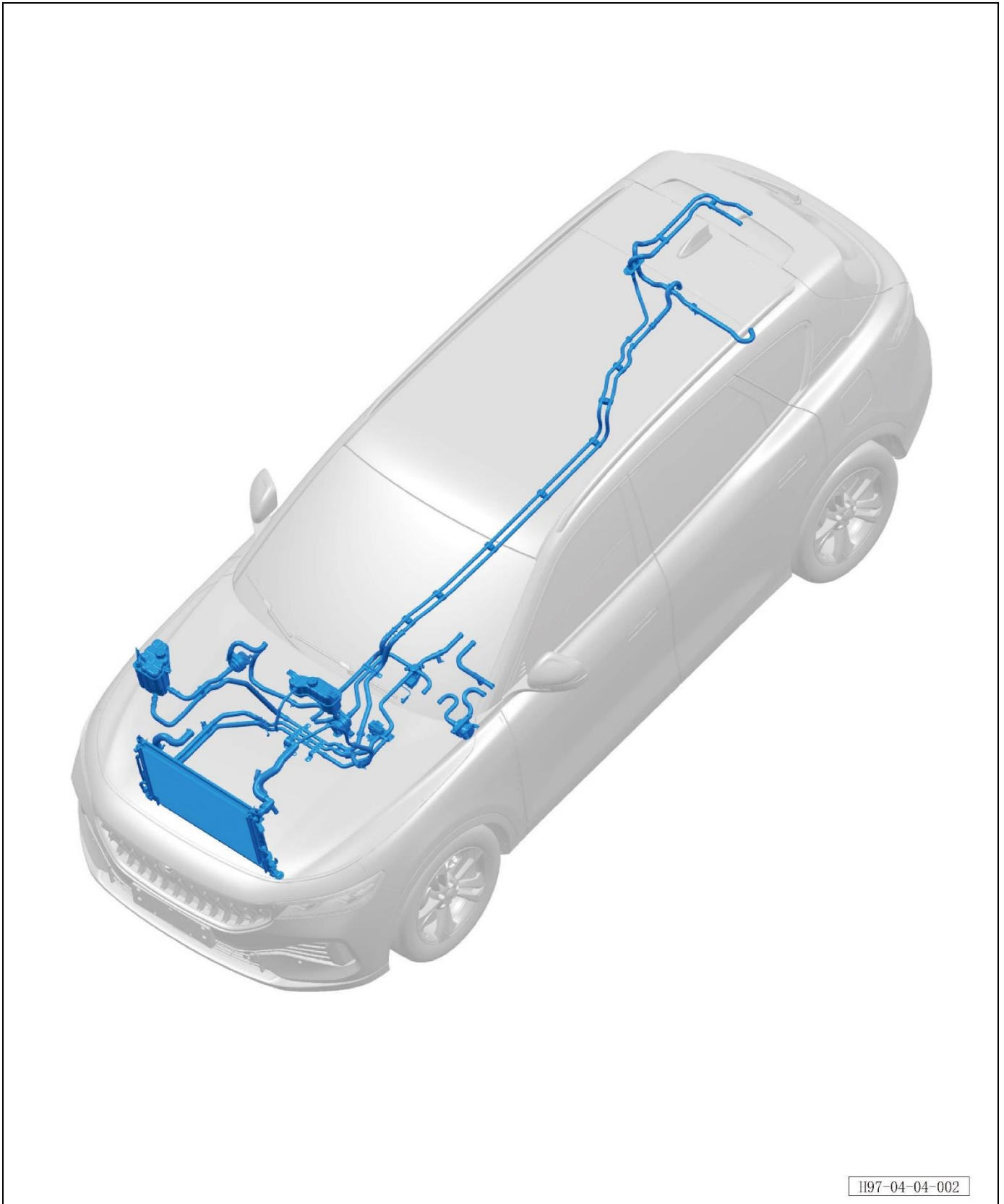
- The range extender coolant temperature sensor is used to determine the operating temperature of the range extender.

4.4.3 Position diagram of parts

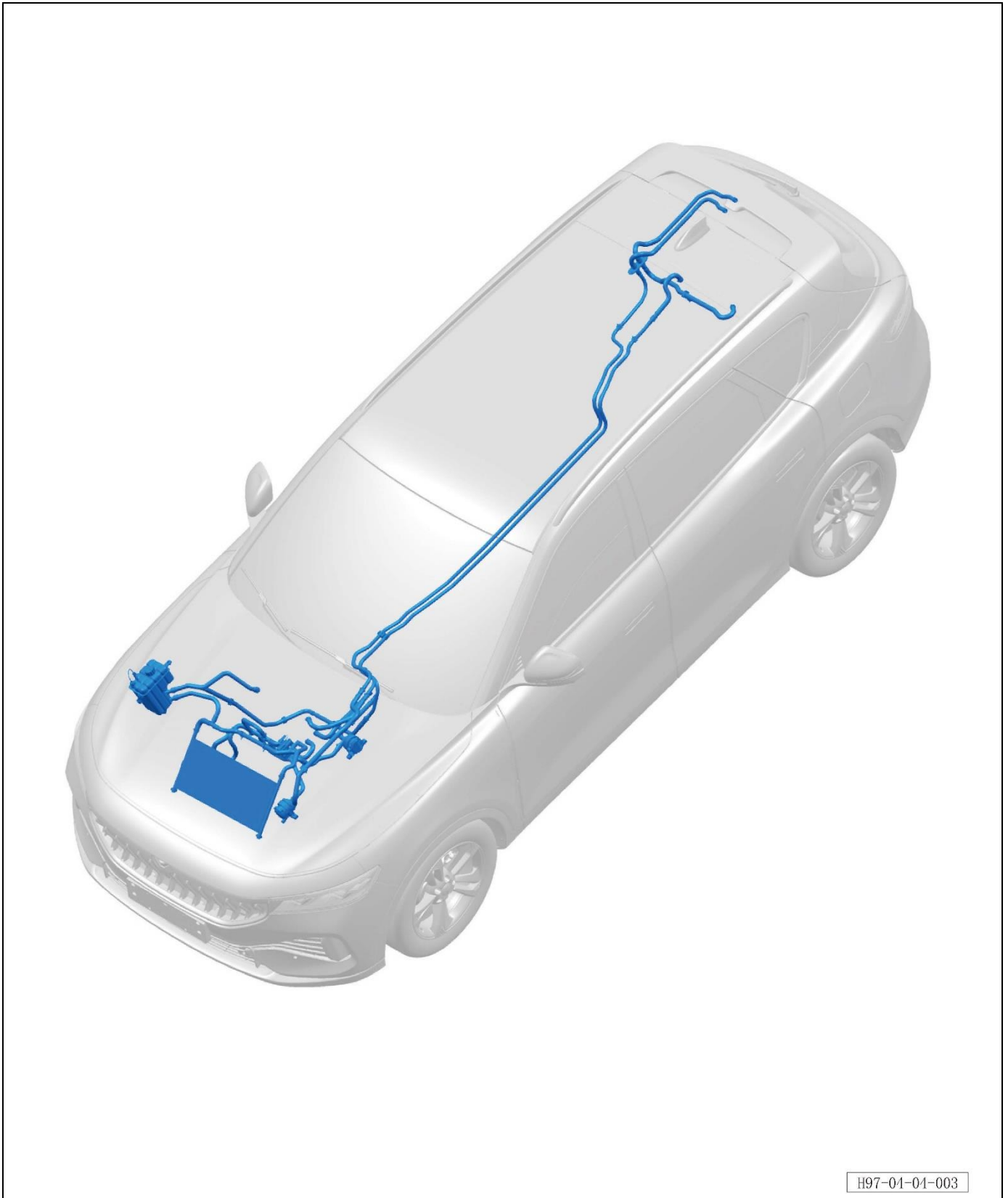
4WD pipeline for REV



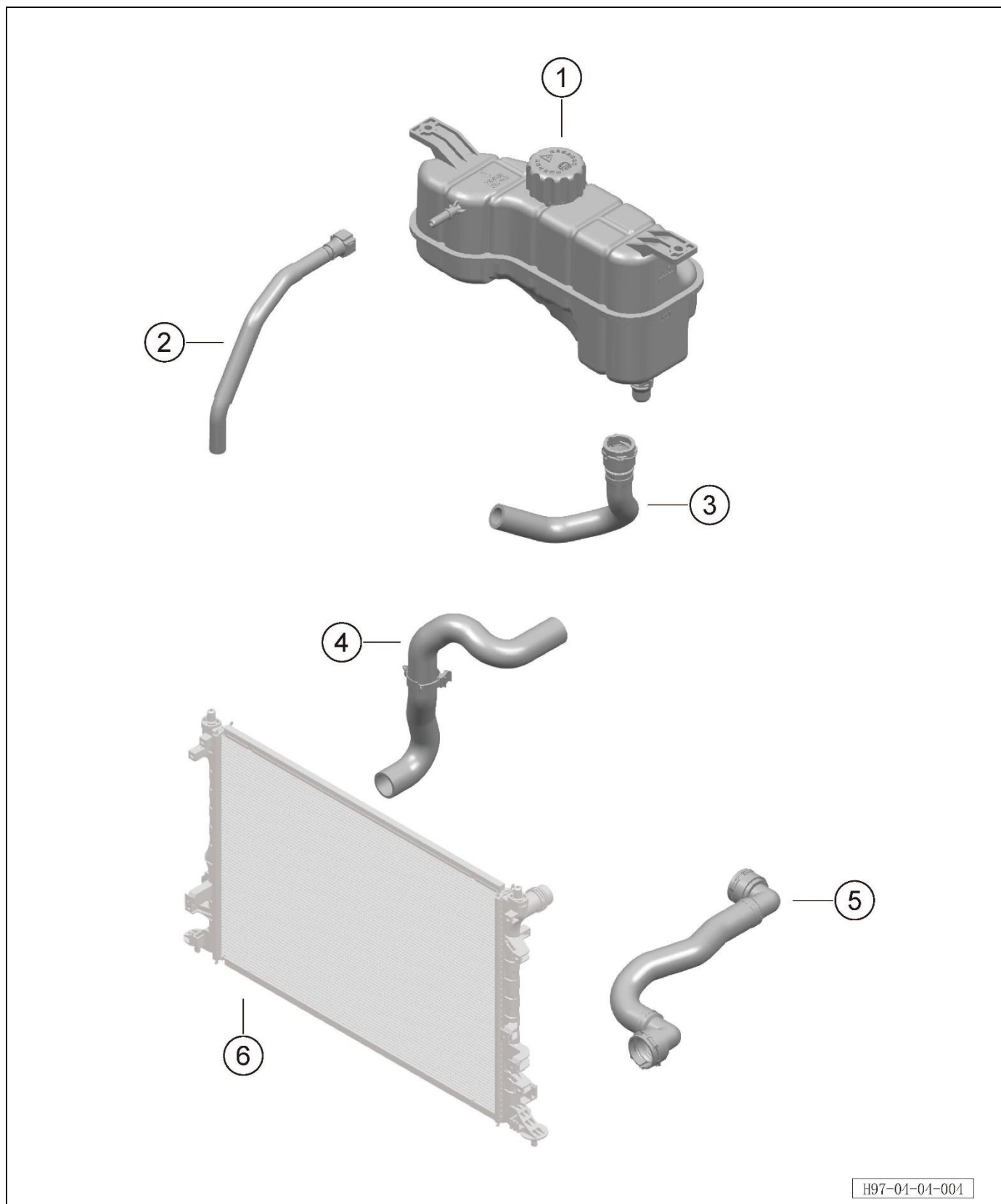
RWD pipeline for REV



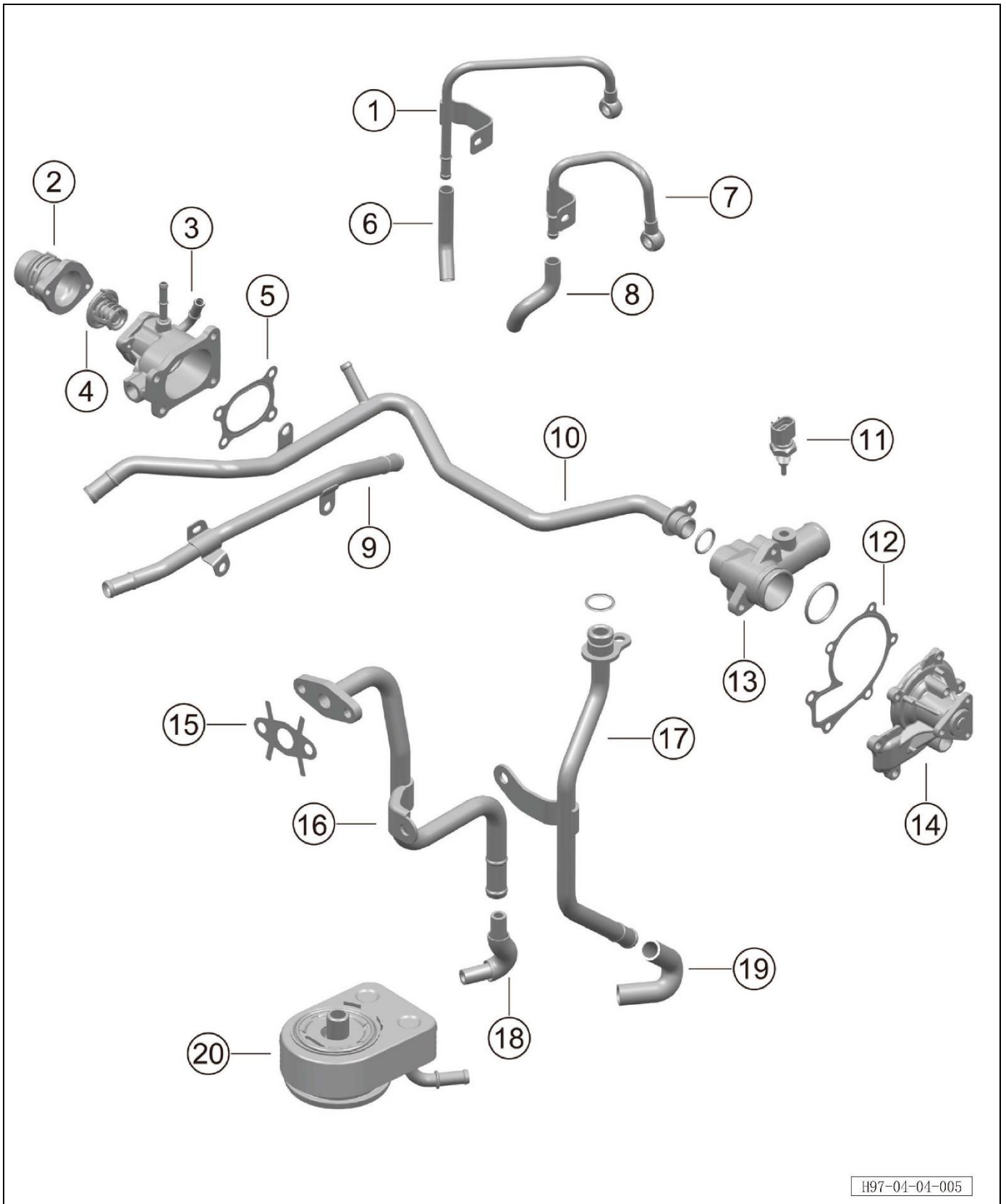
4WD pipeline for EV



4.4.4 Exploded view

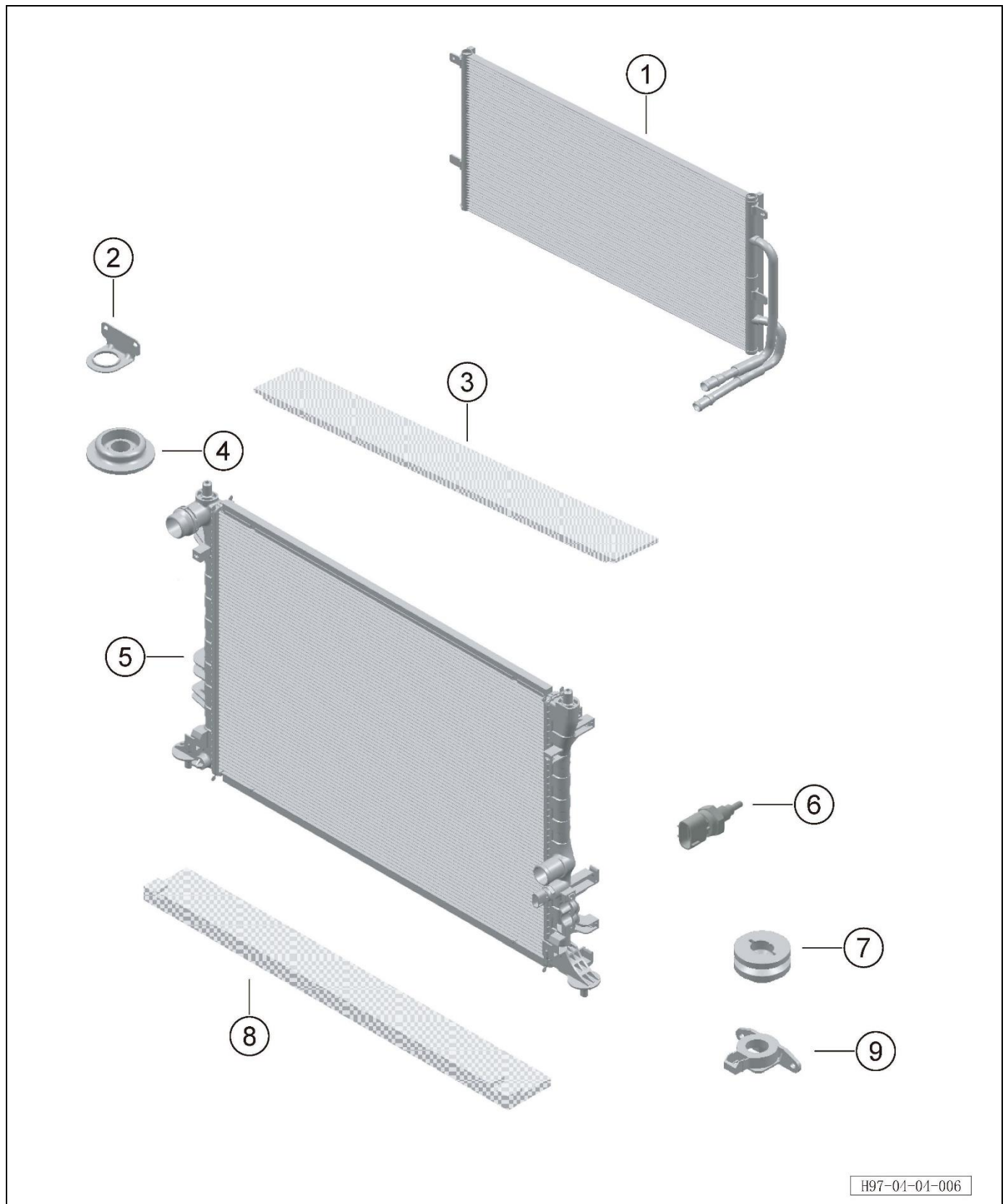


| S/N | Part name | Loading quantity | Remarks |
|-----|---------------------------------------|------------------|---------|
| 1 | Water bottle assembly and accessories | 1 | |
| 2 | Water bottle vent hose | 1 | |
| 3 | Water tank hose 2# | 1 | |
| 4 | Radiator outlet hose | 1 | |
| 5 | Radiator inlet hose | 1 | |
| 6 | Radiator assembly | 1 | |

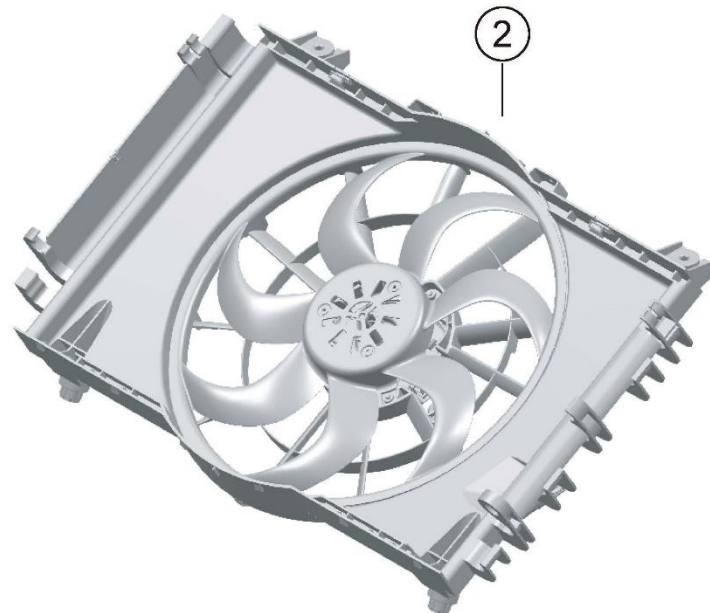
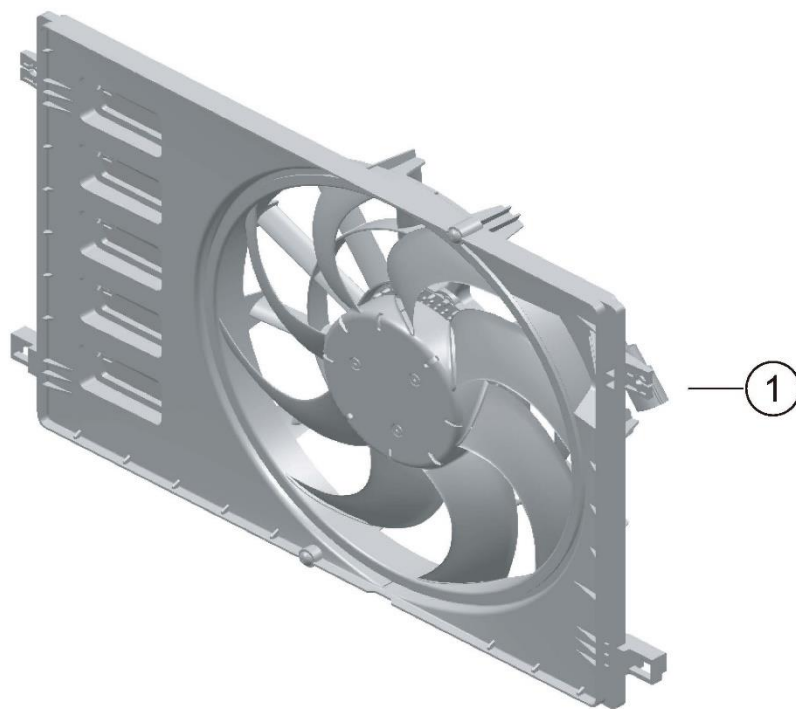


H97-04-04-005

| S/N | Part name | Loading quantity | Remarks |
|-----|---|------------------|---------|
| 1 | Turbocharger metal water return pipe assembly | 1 | |
| 2 | Water outlet chamber end cap | 1 | |
| 3 | Water outlet chamber assembly | 1 | |
| 4 | Thermostat assembly | 1 | |
| 5 | Water outlet chamber gasket | 1 | |
| 6 | Turbocharger water return hose | 1 | |
| 7 | Turbocharger metal water inlet pipe assembly | 1 | |
| 8 | Turbocharger water inlet hose | 1 | |
| 9 | Water outlet pipe assembly | 1 | |
| 10 | Heater water return pipe assembly | 1 | |
| 11 | Water temperature sensor | 1 | |
| 12 | Water pump gasket | 1 | |
| 13 | Water pump inlet end cover | 1 | |
| 14 | Water pump assembly | 1 | |
| 15 | Turbocharger oil return pipe gasket II | 1 | |
| 16 | Cooler metal water inlet pipe assembly | 1 | |
| 17 | Cooler metal water return pipe assembly | 1 | |
| 18 | Oil cooler water inlet hose | 1 | |
| 19 | Oil cooler water return hose | 1 | |
| 20 | Oil cooler assembly | 1 | |

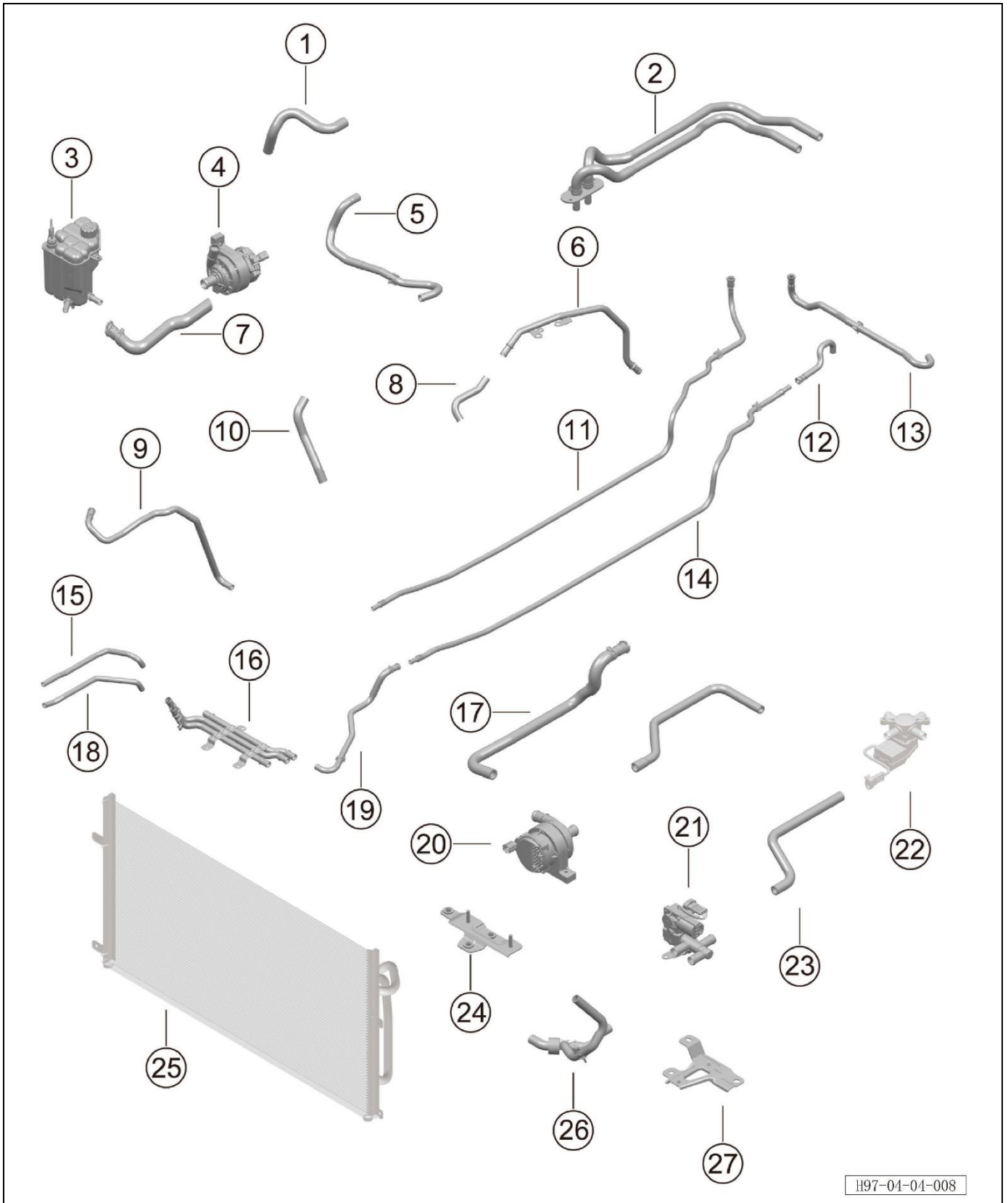


| S/N | Part name | Loading quantity | Remarks |
|-----|--------------------------------------|------------------|---------|
| 1 | Low temperature radiator | 1 | |
| 2 | Radiator upper bracket | 1 | |
| 3 | Cooling module sealing strip (upper) | 1 | |
| 4 | Radiator upper bracket bushing | 1 | |
| 5 | Radiator assembly | 1 | |
| 6 | Water temperature sensor | 1 | |
| 7 | Radiator lower bracket bushing | 1 | |
| 8 | Cooling module sealing strip (lower) | 1 | |
| 9 | Radiator lower bracket | 1 | |

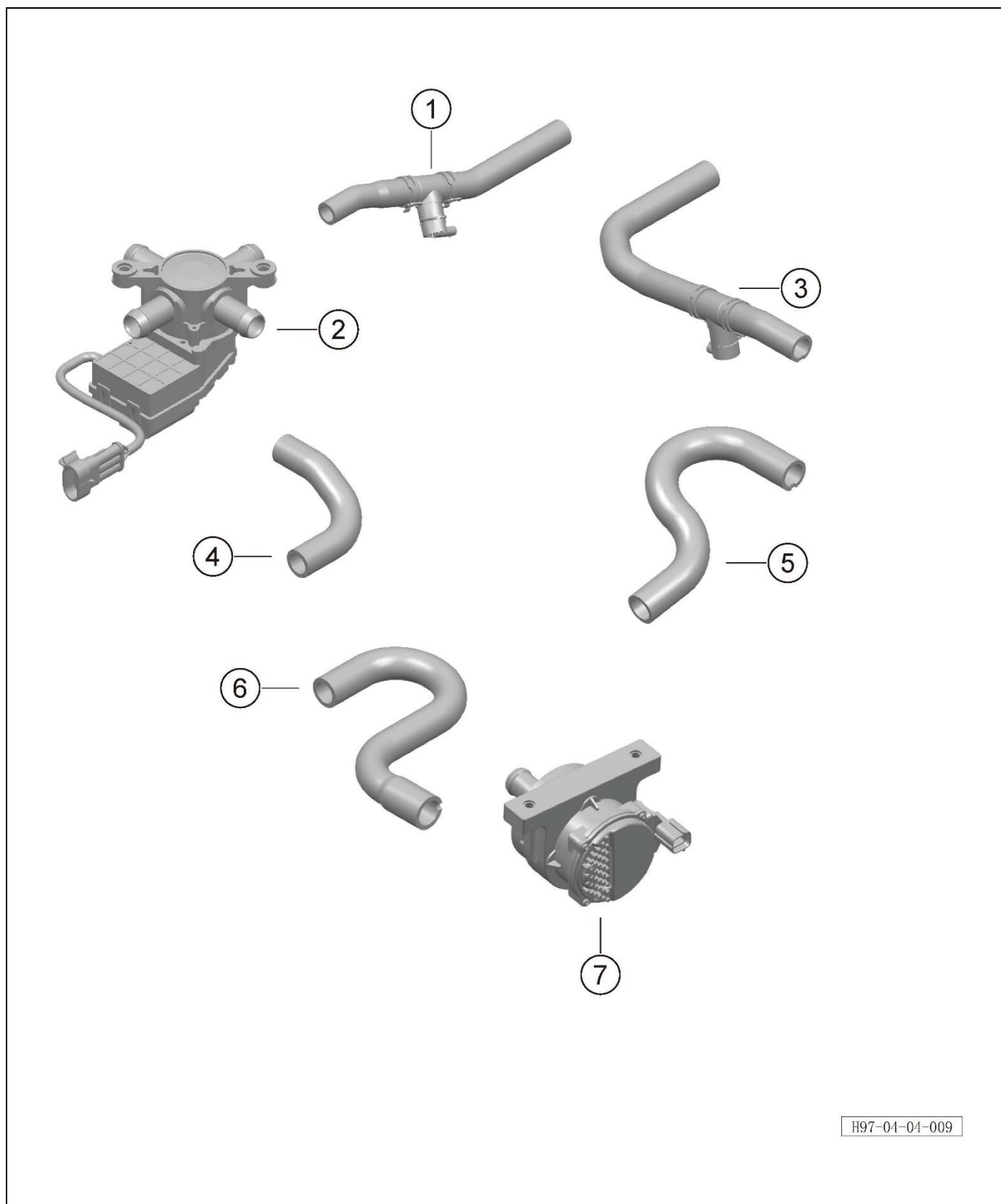


H97-04-04-007

| S/N | Part name | Loading quantity | Remarks |
|-----|-----------------------------|------------------|---------|
| 1 | Radiator fan motor assembly | 1 | (REV) |
| 2 | Radiator fan motor assembly | 1 | (EV) |

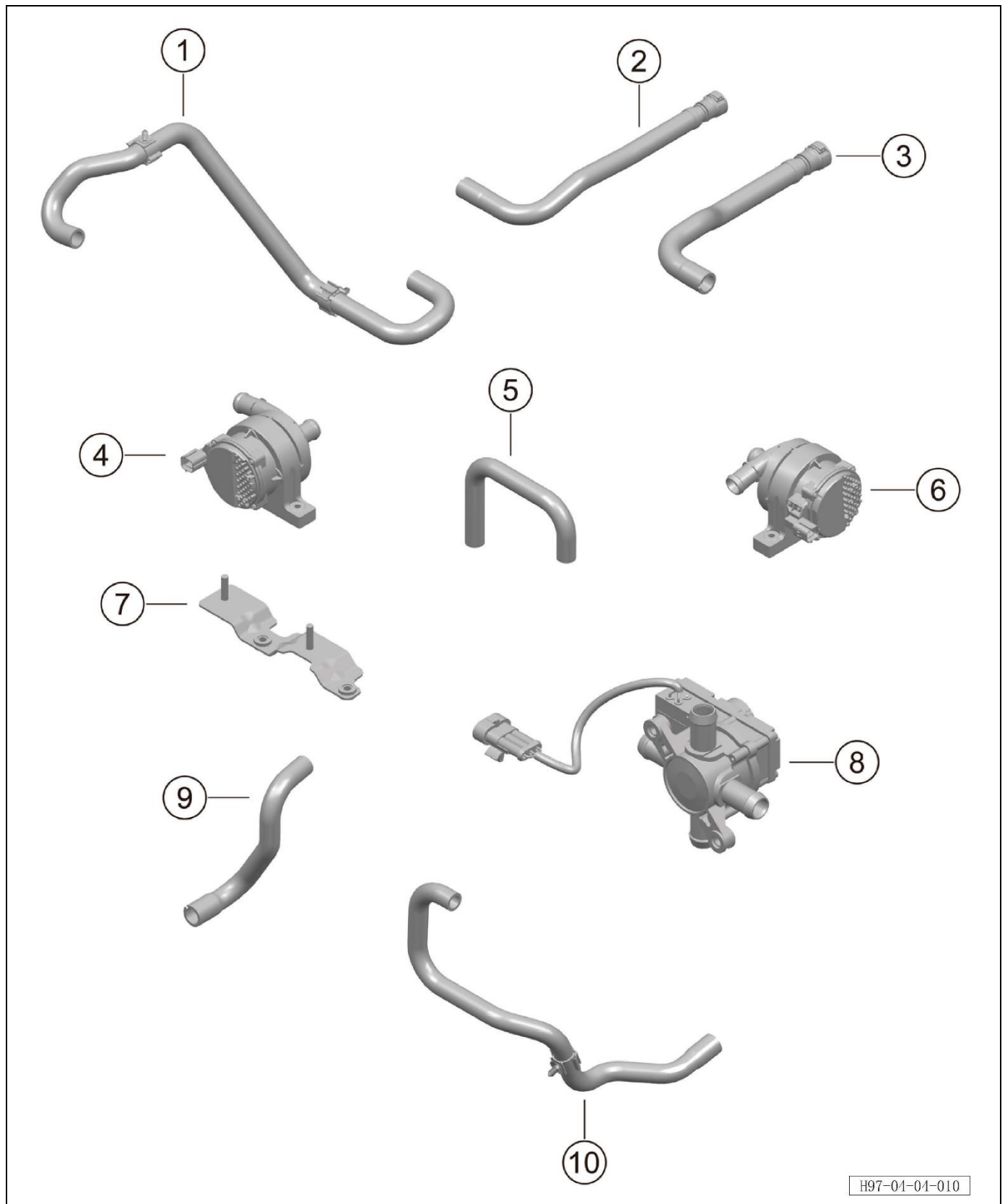


| S/N | Part name | Loading quantity | Remarks |
|-----|--|------------------|---------|
| 1 | Range extension controller water inlet hose | 1 | |
| 2 | Charger water pipe assembly | 1 | |
| 3 | Auxiliary water bottle assembly | 1 | |
| 4 | Water pump assembly | 1 | |
| 5 | Range extension controller water outlet hose | 1 | |
| 6 | Range extender water outlet pipe | 1 | |
| 7 | Water bottle outlet hose | 1 | |
| 8 | Generator water outlet pipe | 1 | |
| 9 | Water bottle inlet hose | 1 | |
| 10 | Generator water inlet pipe | 1 | |
| 11 | Middle channel water inlet pipe | 1 | |
| 12 | Rear motor water outlet hose | 1 | |
| 13 | Rear motor water inlet hose | 1 | |
| 14 | Middle channel water outlet pipe | 1 | |
| 15 | Low temperature radiator water inlet pipe assembly | 1 | |
| 16 | Water pipe assembly | 1 | |
| 17 | Water pump outlet hose | 1 | |
| 18 | Low temperature radiator water outlet pipe | 1 | |
| 19 | Middle channel water outlet hose | 1 | |
| 20 | Water pump assembly | 1 | |
| 21 | 3-way proportional valve assembly | 1 | |
| 22 | 4-way control valve assembly | 1 | |
| 23 | 4-way control valve water pipe I | 1 | |
| 24 | Electronic water pump right fixing bracket | 1 | |
| 25 | Low temperature radiator | 1 | |
| 26 | Generator water outlet pipe rear section | 1 | |
| 27 | 3-way proportional valve fixing bracket | 1 | |

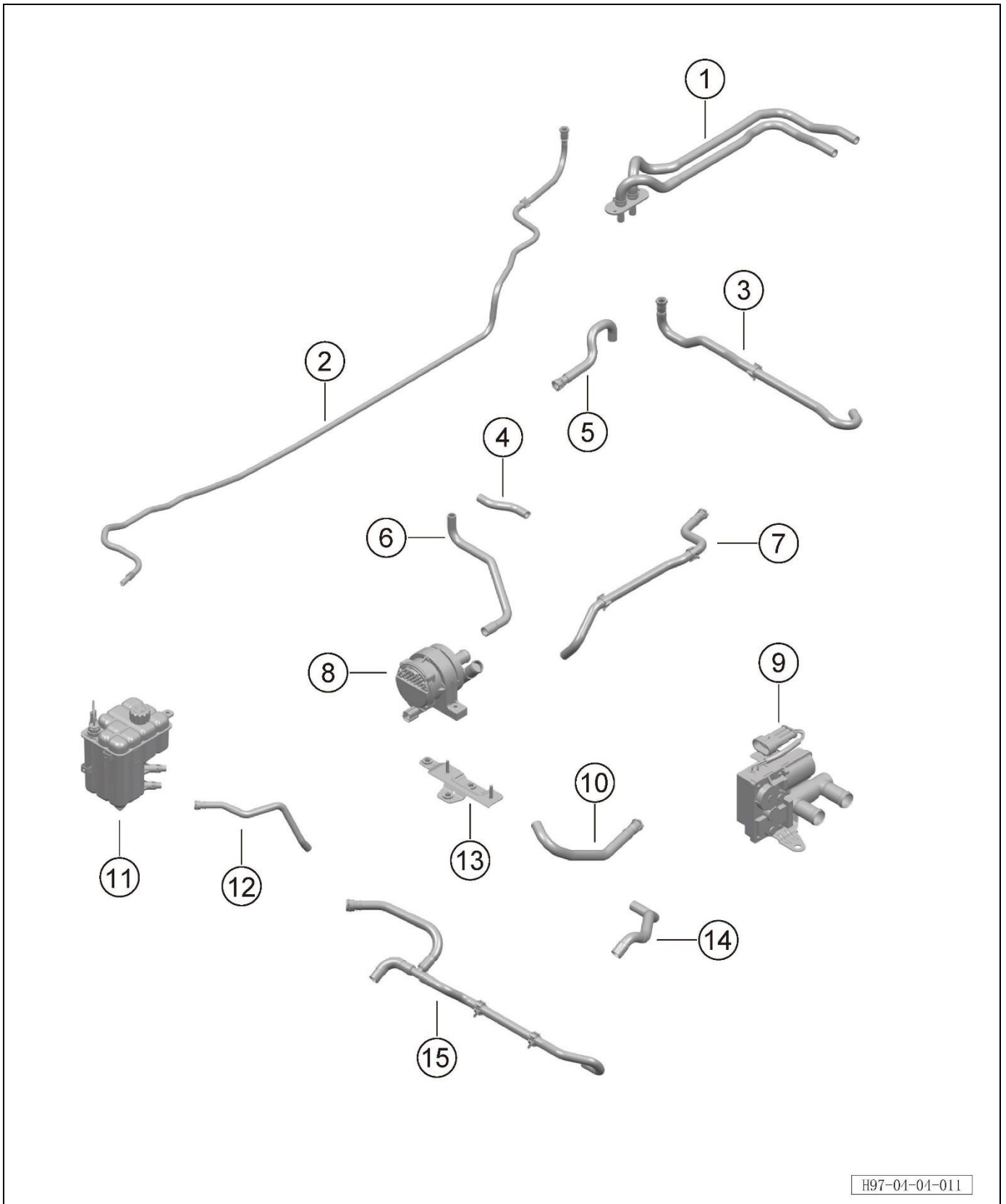


H97-04-04-009

| S/N | Part name | Loading quantity | Remarks |
|-----|---|------------------|---------|
| 1 | Battery pack outflow pipe assembly | 1 | |
| 2 | 4-way control valve assembly | 1 | |
| 3 | Battery pack inflow pipe assembly | 1 | |
| 4 | 4-way control valve water pipe III | 1 | |
| 5 | PTC heater inflow pipe assembly | 1 | |
| 6 | Battery cooler water outlet pipe assembly | 1 | |
| 7 | Water pump assembly | 1 | |



| S/N | Part name | Loading quantity | Remarks |
|-----|---|------------------|---------|
| 1 | PTC heater inflow pipe assembly | 1 | |
| 2 | Battery pack inflow pipe assembly | 1 | |
| 3 | Battery pack outflow pipe assembly | 1 | |
| 4 | Water pump assembly | 1 | |
| 5 | 4-way control valve water pipe III | 1 | |
| 6 | Water pump assembly | 1 | |
| 7 | Electronic water pump left fixing bracket | 1 | |
| 8 | 4-way control valve assembly | 1 | |
| 9 | Battery cooler water outlet pipe assembly | 1 | |
| 10 | 4-way control valve water pipe 4 | 1 | |



| S/N | Part name | Loading quantity | Remarks |
|-----|--|------------------|---------|
| 1 | Charger water pipe assembly | 1 | |
| 2 | Middle channel water inlet pipe | 1 | |
| 3 | Rear motor water inlet hose | 1 | |
| 4 | 4-way control valve water pipe I | 1 | |
| 5 | Rear motor water outlet hose | 1 | |
| 6 | 4-way control valve water pipe II | 1 | |
| 7 | Water pump to charger water pipe | 1 | |
| 8 | Water pump assembly | 1 | |
| 9 | 3-way proportional valve assembly | 1 | |
| 10 | Front engine water inlet pipe | 1 | |
| 11 | Auxiliary water bottle assembly | 1 | |
| 12 | Front engine water outlet pipe | 1 | |
| 13 | Electronic water pump right fixing bracket | 1 | |
| 14 | Low temperature radiator water outlet pipe | 1 | |
| 15 | Low temperature radiator water inlet pipe assembly | 1 | |

4.4.5 Technical parameters

Range extender coolant

| Vehicle model | Consumption per vehicle | Remarks |
|---------------|-------------------------|---------|
| REV | 21L | |
| EV | 19L | |

Tightening Torque

| S/N | Part name | Torque (N.m) | Remarks |
|-----|--|--------------|---------|
| 1 | Low temperature radiator hexagon flange bolt | 10 ± 1 | |
| 2 | Cross recessed pan head tapping screw | 8 ± 1 | |
| 3 | Radiator upper bracket bolt | 10 ± 1 | |
| 4 | Radiator lower bracket bolt | 10 ± 1 | |
| 5 | Water pump bracket | 10 ± 1 | |
| 6 | 3-way proportional valve fixing bracket | 10 ± 1 | |
| 7 | 4-way control valve assembly fixing bracket | 10 ± 1 | |
| 8 | Water bottle assembly fixing bracket bolt | 20 ± 2 | |

4.4.6 Special tools

| S/N | Tool Name | Tool No. | Remarks |
|-----|---|-----------|---------|
| 1 | Special tool for removal and refitting of water pump belt | H52201000 | |
| 2 | Special tool for water (flexible) pipe clamp | H52205000 | |
| 3 | Special tool for water (flexible) pipe clamp - small | H52205001 | |

4.4.7 Common faults

Range extender cooling system fault diagnosis

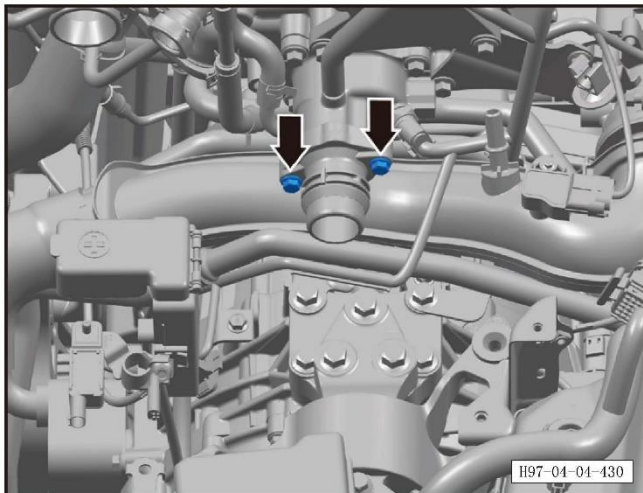
| Fault phenomenon: | Possible causes | Troubleshooting methods |
|---|---|--|
| Range extender overheating (cooling fan working properly) | Range extender accessory belt loose or broken | Adjust or replace |
| | Insufficient coolant | Check for coolant level, and add coolant as needed |
| | Faulty thermostat | Check and replace as needed |
| | Faulty water pump | Check and replace as needed |
| | Dirty or bent radiator or A/C condenser | Clean or repair |
| | Leakage of coolant | Check and replace corresponding components as needed |
| | Radiator or A/C condenser blocked | Check and replace radiator or condenser as needed |
| | Faulty coolant expansion tank cap | Check and replace as needed |
| | Incorrect ignition timing | Check timing system |
| | Faulty water temperature sensor | Check and replace as needed |
| | Faulty radiator cooling fan relay | Check and replace as needed |
| | Faulty radiator fan motor | Check and replace as needed |
| | Range extender ECU faulty | Check and replace as needed |
| | Harness or ground wire faulty | Check and replace as needed |
| Range extender overheating (radiator cooling fan not working) | Fuse blown | Check and replace as needed |
| | Faulty radiator cooling fan relay | Check and replace as needed |
| | Faulty water temperature sensor | Check and replace as needed |
| | Faulty radiator cooling fan motor | Check and replace as needed |
| | Faulty wire harness or grounding | Check and replace as needed |
| | ECU faulty | Check and replace as needed |

4.4.8 Front-end module assembly

4.4.8.1 Removal and refitting of water outlet chamber end cover

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
6. Remove the high-pressure desorption tube assembly (refer to [4.3.8.6 Removal and refitting of high-pressure desorption tube assembly](#))
7. Remove the water outlet chamber end cover.

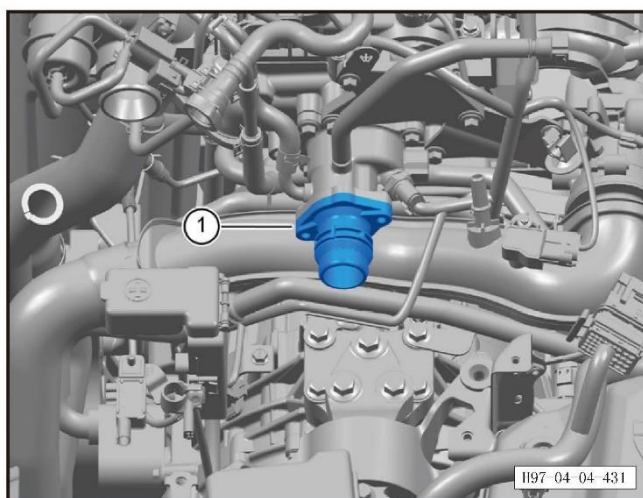


- a. Unscrew the 2 bolts on the water outlet chamber end cover.

Tightening torque of bolt: $15\pm 1\text{Nm}$.

WARNING:

- To avoid burns, do not remove the radiator cap until the range extender and radiator have cooled. If the cap is removed too soon, hot, high-pressure liquid and steam may be sprayed.



- b. Take out the water outlet chamber end cap ①.

CAUTION

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

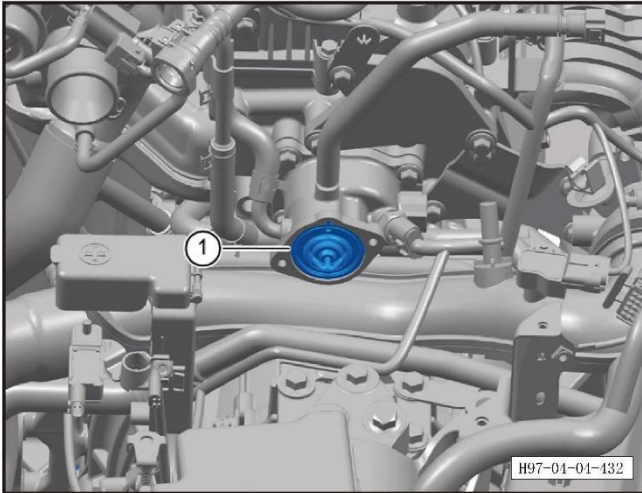
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.2 Removal and refitting of thermostat

Removal procedure

1. Remove the water outlet chamber end cover (refer to [4.4.8.1 Removal and refitting of water outlet chamber end cover](#))
2. Remove the thermostat
 - a. Take out the thermostat ①.



Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- Pay attention to the mounting direction of thermostat.
- Coolant must be added as required.

WARNING:

- To avoid burns, do not remove the radiator cap until the range extender and radiator have cooled. If the cap is removed too soon, hot, high-pressure liquid and steam may be sprayed.

4.4.8.3 Removal and refitting of water outlet chamber assembly

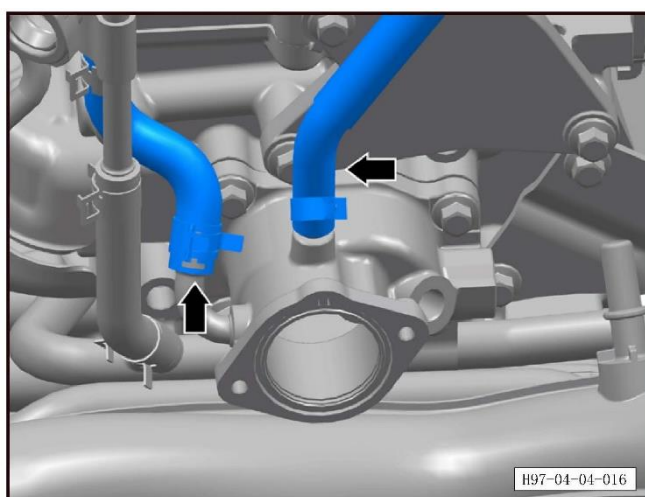
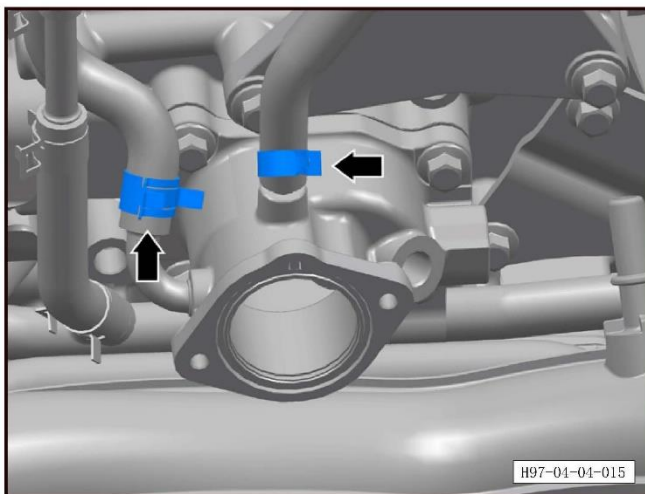
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
6. Remove the high voltage desorption tube assembly (refer to [4.3.8.6 Removal and refitting of high voltage desorption tube assembly](#))
7. Remove the water outlet chamber end cover (refer to [4.4.8.3 Removal and refitting of water outlet chamber assembly](#))
8. Remove the water temperature sensor (refer to [4.5.16.5 Removal and refitting of water temperature sensor](#))
9. Remove the water outlet chamber assembly.

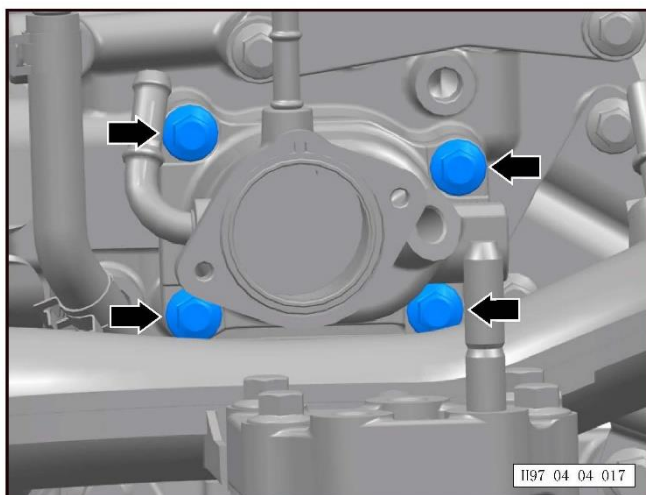
- a. Disconnect the 2 clamps on the water outlet chamber assembly.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.

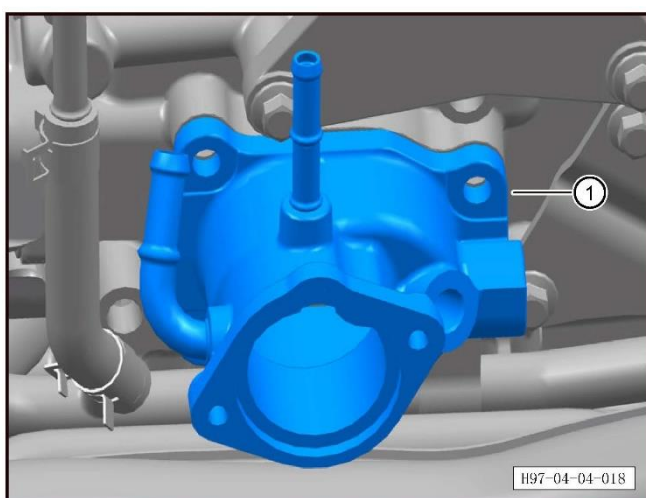


- b. Disconnect the 2 water pipes connected above the water outlet chamber assembly.



c. Unscrew the 4 bolts connecting the water outlet chamber assembly to the range extender cylinder head.

Tightening torque of bolt: $15\pm 1\text{Nm}$.



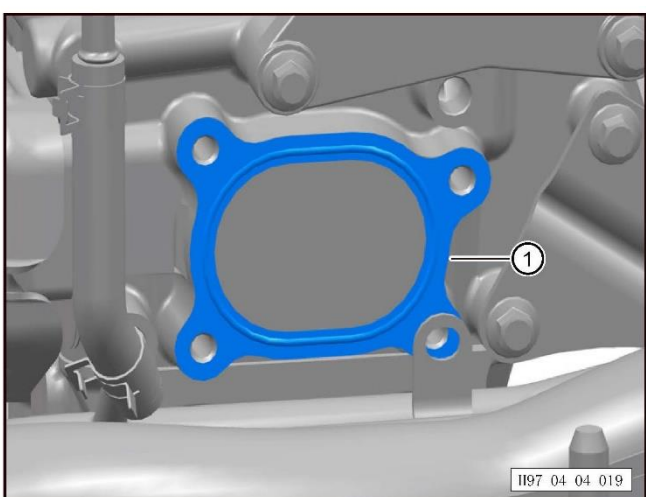
d. Take out the water outlet chamber assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- After removing the water outlet chamber assembly, the gasket ① need to be replaced with a new one.
- Coolant must be added as required.



4.4.8.4 Removal and refitting of radiator fan motor assembly (REV)

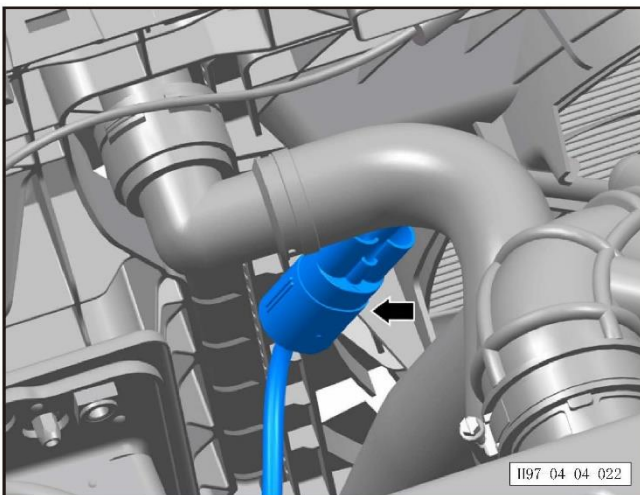
Removal procedure

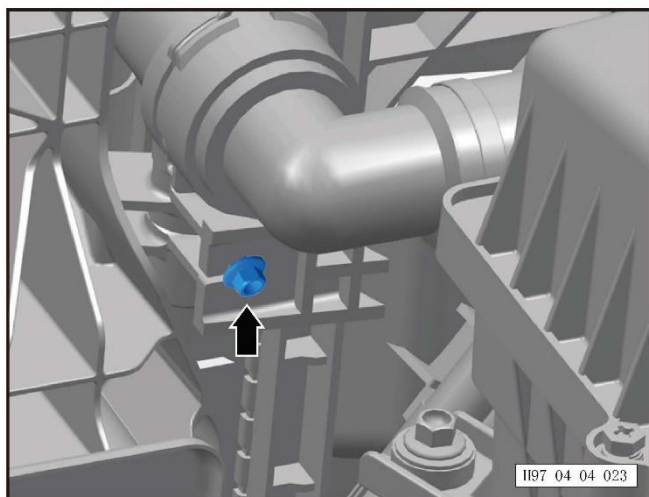
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front bumper assembly (refer to [8.6.3.3 Removal and refitting of front bumper assembly](#))
6. Remove the radiator guide frame (refer to [8.6.3.14 Removal and refitting of radiator guide frame \(REV\)](#))
7. Remove the radiator water inlet hose (refer to [4.4.8.69 Removal and refitting of radiator water inlet hose](#))
8. Remove the radiator water outlet hose (refer to [4.4.8.70 Removal and refitting of radiator water outlet hose](#))
9. Remove the front impact beam.
10. Remove the low temperature radiator assembly (refer to [4.5.8.5 Removal and refitting of low temperature radiator assembly \(REV\)](#))
11. Remove the radiator assembly (refer to [4.5.8.6 Removal and refitting of radiator assembly](#))
12. Remove the radiator fan motor assembly.

a. Disconnect the harness connector of fan motor.

CAUTION:

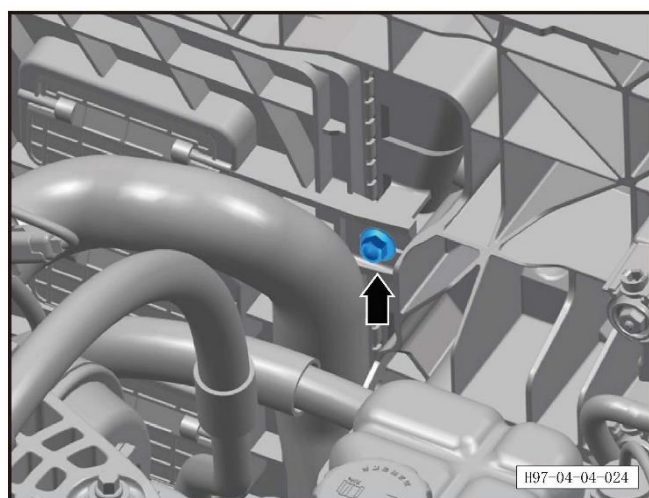
- Drain the coolant from the corresponding pipelines before removing them.





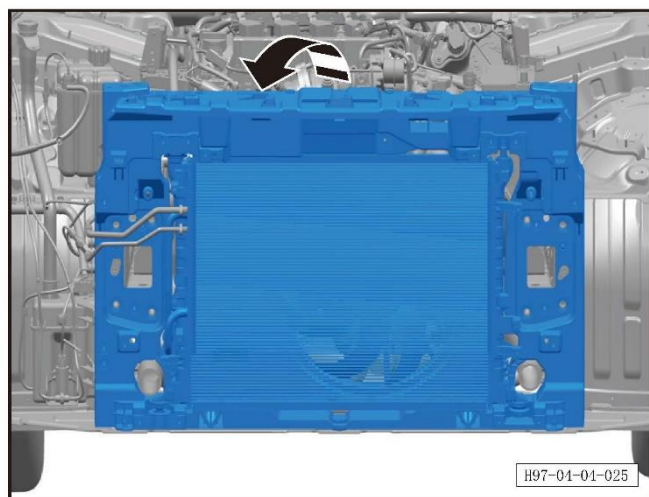
b. Unscrew the 1 bolt connecting the radiator fan motor assembly to the radiator assembly.

Tightening torque of bolt: $8\pm 1\text{Nm}$.

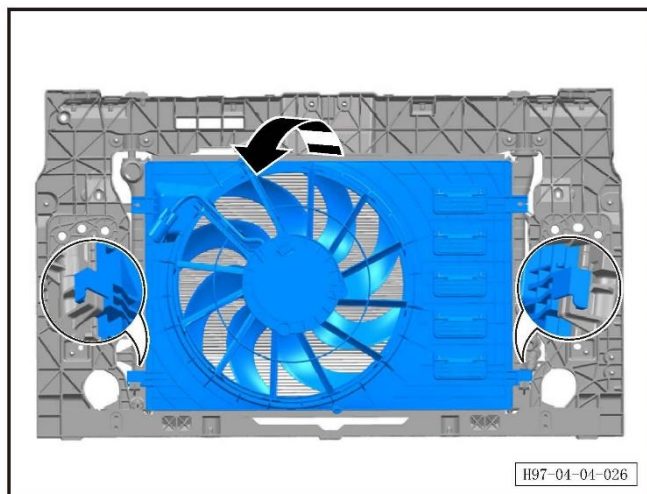


c. Unscrew the 1 bolt connecting the radiator fan motor assembly to the radiator assembly.

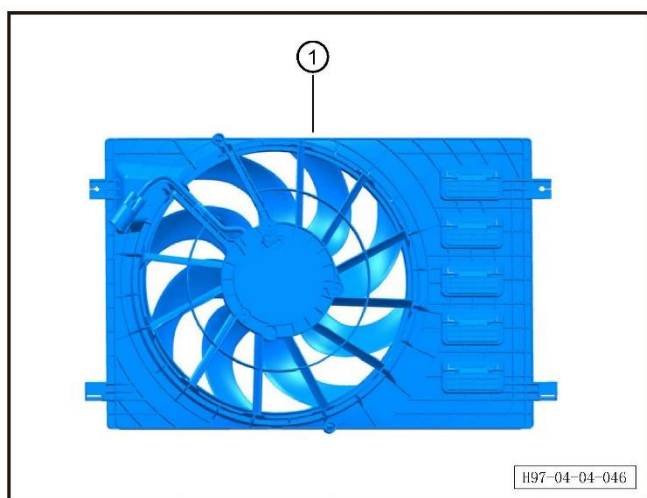
Tightening torque of bolt: $8\pm 1\text{Nm}$.



d. Take out the front-end module frame and the radiator and radiator fan motor assembly.



e. Detach and take out the front-end module frame and radiator fan motor assembly.



f. Take out the radiator fan motor assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

WARNING:

- To avoid burns, do not remove the radiator cap until the range extender and radiator have cooled. If the cap is removed too soon, hot, high-pressure liquid and steam may be sprayed.

CAUTION:

- Coolant must be added as required.

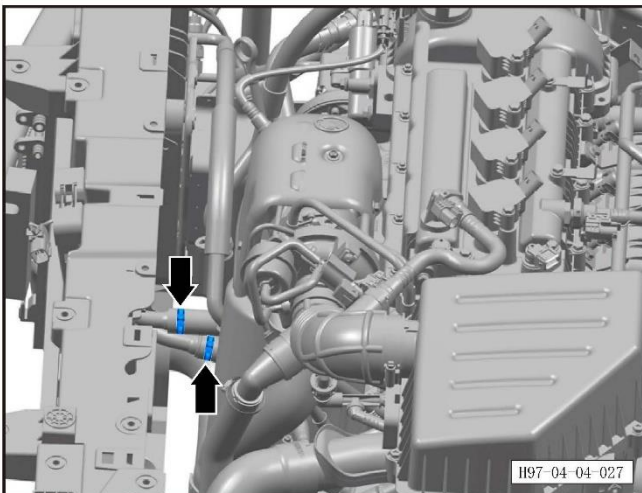
4.4.8.5 Removal and refitting of low temperature radiator assembly (REV)

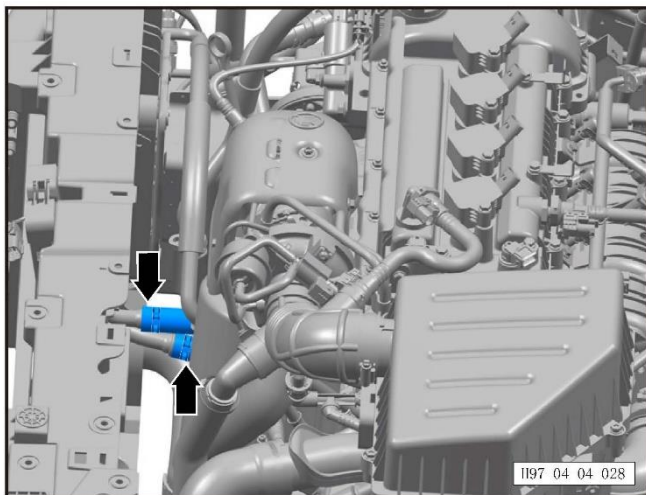
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the radiator fan motor assembly (refer to [4.4.8.4 Removal and refitting of radiator fan motor assembly](#))
6. Remove the front bumper assembly (refer to [8.6.3.3 Removal and refitting of front bumper assembly](#))
7. Remove the radiator guide frame (refer to [8.6.3.14 Removal and refitting of radiator guide frame \(REV\)](#))
8. Remove the radiator water inlet hose (refer to [4.4.8.69 Removal and refitting of radiator water inlet hose](#))
9. Remove the radiator water outlet hose (refer to [4.4.8.70 Removal and refitting of radiator water outlet hose](#))
10. Remove the low temperature radiator assembly.
 - a. Loosen the clamps of the low temperature radiator water inlet and outlet pipe assembly.

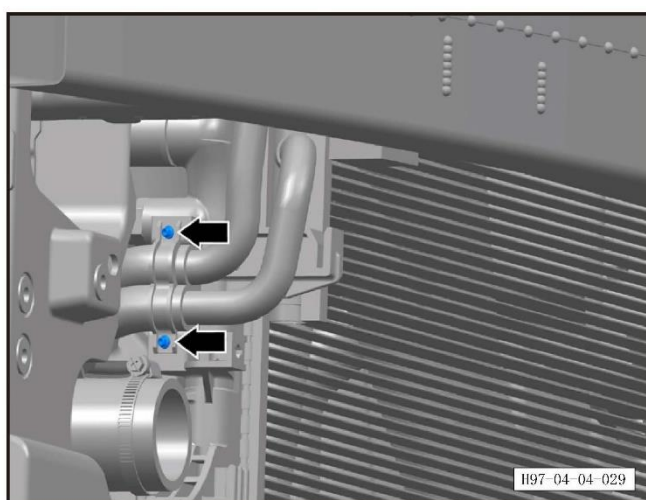
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



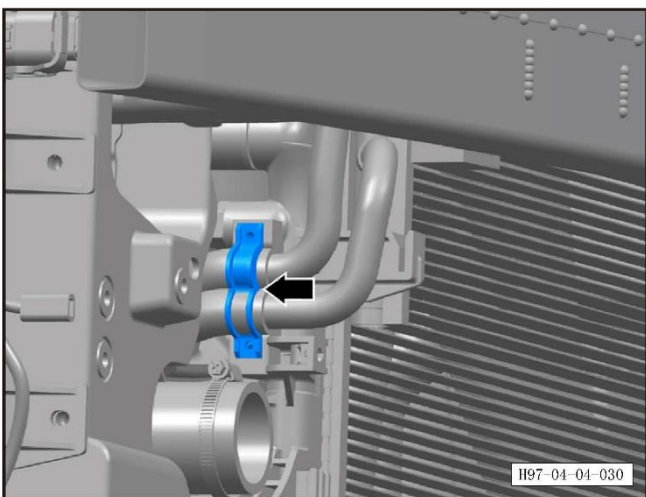


b. Disconnect the low temperature radiator water inlet and outlet pipe assembly from the low temperature radiator.

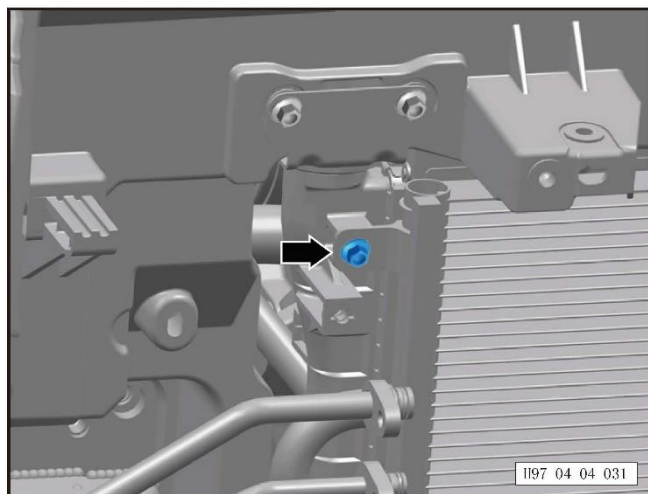


c. Unscrew the 2 bolts connecting the low temperature radiator water inlet and outlet pipe assembly to the radiator assembly.

Tightening torque of bolt: $8\pm 1\text{Nm}$.

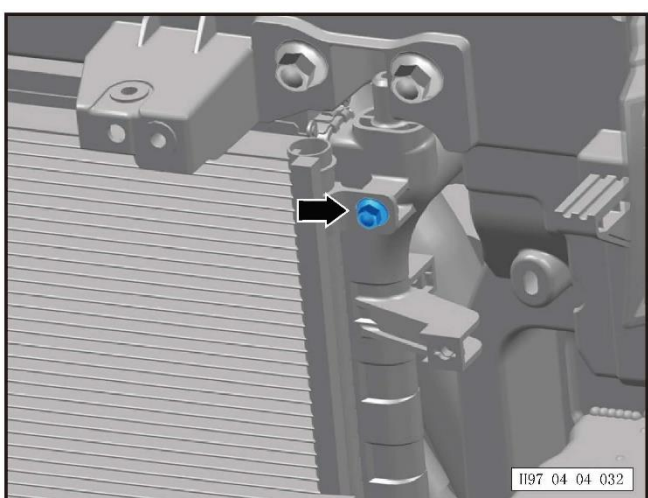


d. Disconnect the low temperature radiator water inlet and outlet pipe assembly from the radiator assembly.



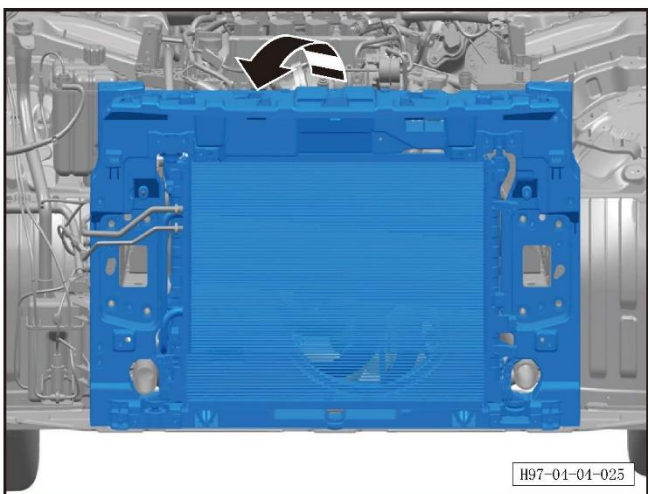
e. Unscrew the 1 bolt at the connection between the low temperature radiator to the radiator assembly.

Tightening torque of bolt: $8\pm 1\text{Nm}$.

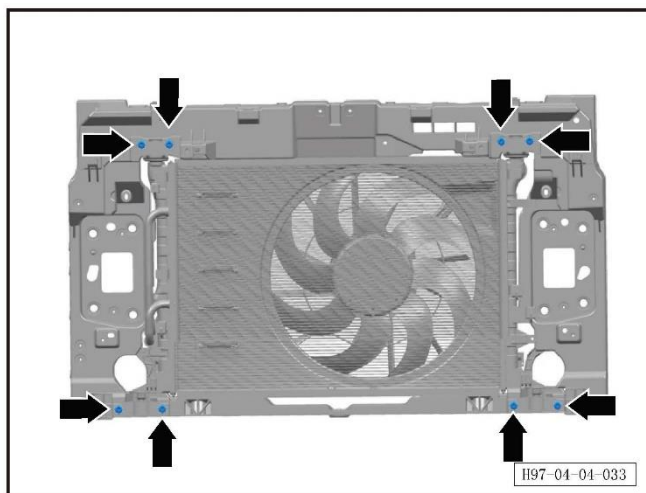


f. Unscrew the 1 bolt at the connection between the low temperature radiator to the radiator assembly.

Tightening torque of bolt: $8\pm 1\text{Nm}$.

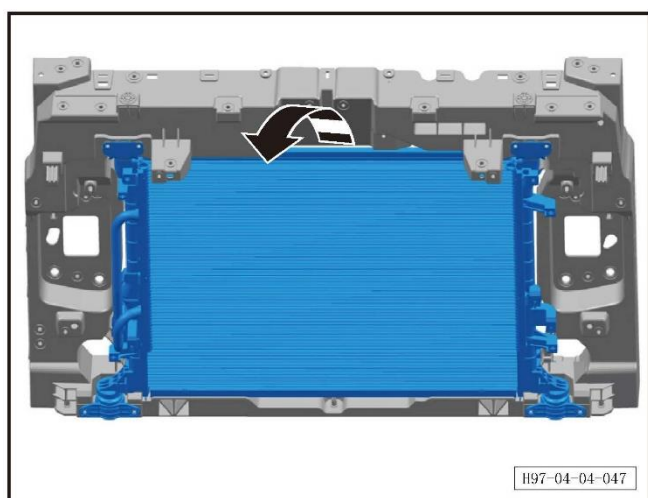


g. Take out the front-end module frame and the radiator and radiator fan motor assembly.

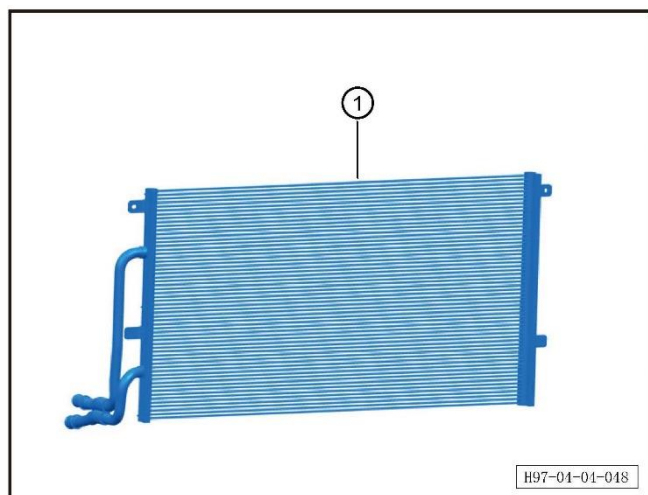


h. Unscrew the 8 screws of the radiator assembly fixing bracket.

Tightening torque of bolt: $8\pm 1\text{Nm}$.



i. Detach the front-end module frame from the 2 radiator assemblies.



j. Take out the low temperature radiator assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.6 Removal and refitting of radiator assembly

Removal procedure

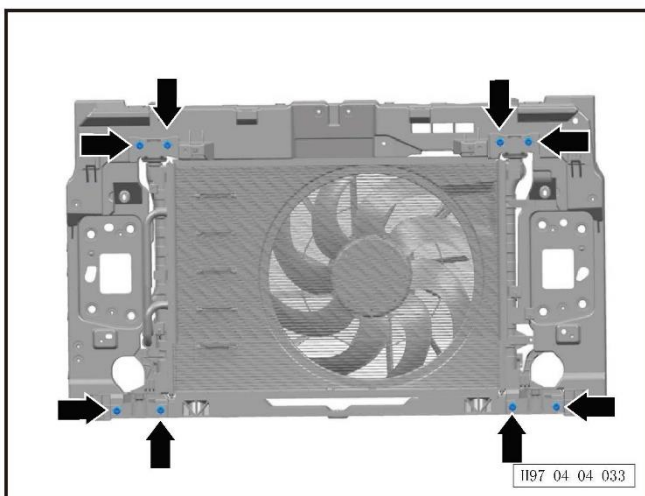
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front bumper assembly (refer to [8.6.3.3 Removal and refitting of front bumper assembly](#))
6. Remove the front bumper energy absorption block (refer to [8.6.3.4 Removal and refitting of front bumper energy absorption block](#))
7. Remove the radiator guide frame (refer to [8.6.3.14 Removal and refitting of radiator guide frame \(REV\)](#))
8. Remove the condenser assembly (refer to [10.1.10.16 Removal and refitting of condenser assembly \(REV\)](#))
9. Remove the intercooler assembly (refer to [4.1.9.1 Removal and refitting of intercooler assembly](#))
10. Remove the radiator water inlet hose (refer to [4.4.8.69 Removal and refitting of radiator water inlet hose](#))
11. Remove the radiator water outlet hose (refer to [4.4.8.70 Removal and refitting of radiator water outlet hose](#))
12. Remove the low temperature radiator assembly (refer to [4.5.8.5 Removal and refitting of low temperature radiator assembly \(REV\)](#))
13. Remove the radiator assembly.

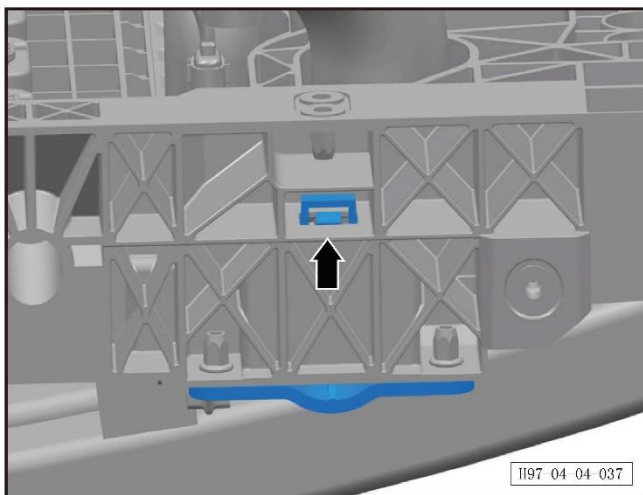
- a. Remove the 8 bolts from the radiator assembly fixing bracket.

Tightening torque of bolt: $8\pm 1\text{Nm}$.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

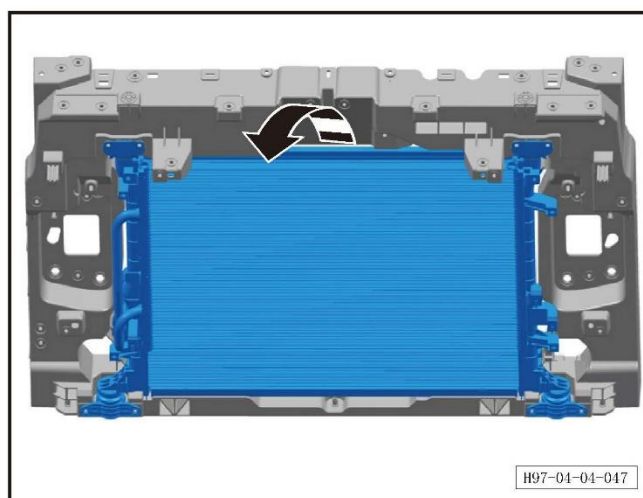




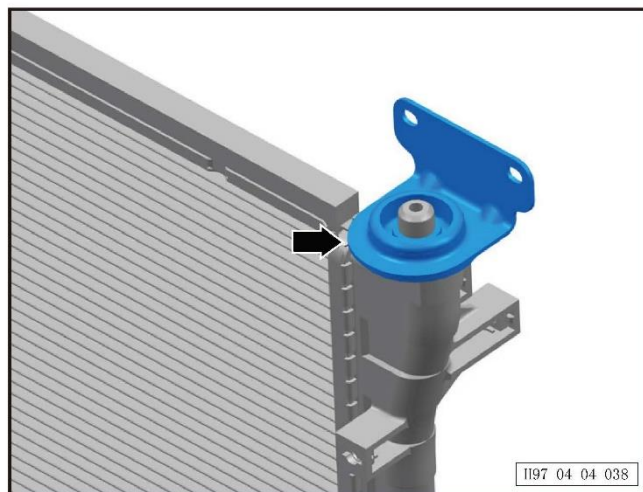
b. Disconnect the latch of the radiator lower bracket.

CAUTION:

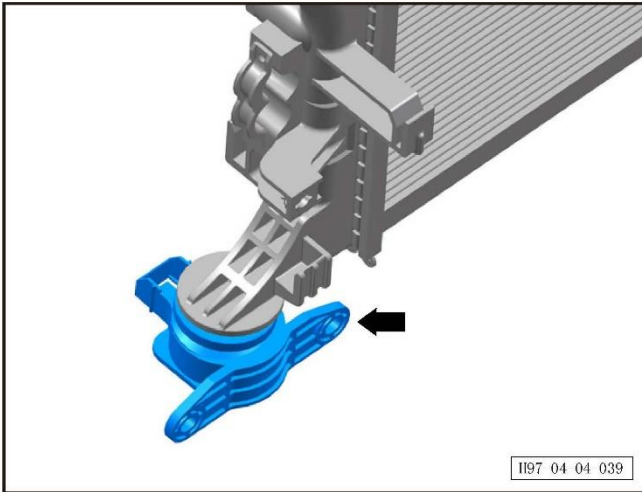
- 2 latches in total.



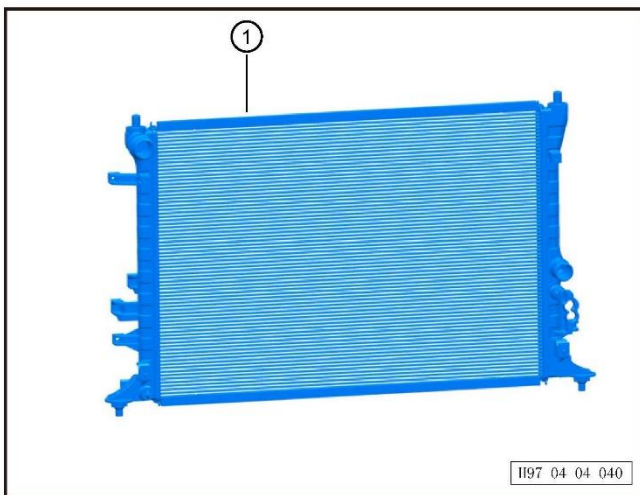
c. Detach the front module frame from the 2 radiator assemblies.



d. Take down the fixing bracket and bushing from the radiator assembly.



e. Take down the fixing bracket and bushing from the radiator assembly.



f. Remove the radiator assembly ①.

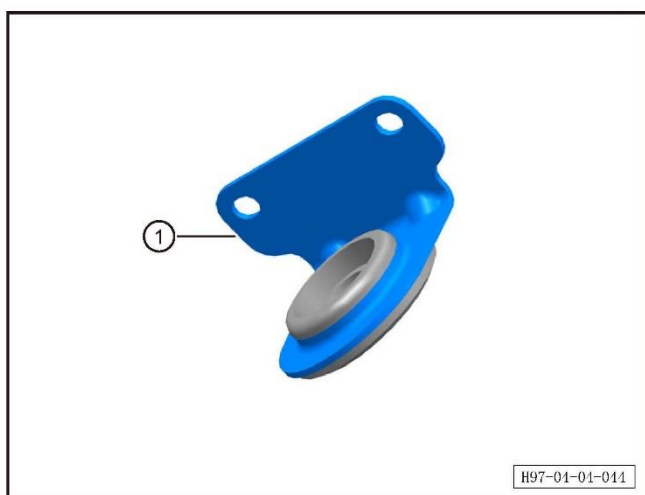
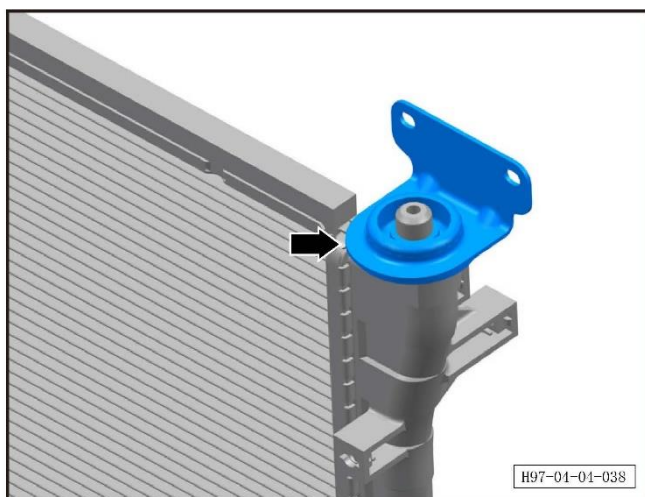
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.7 Removal and refitting of radiator upper bracket

Removal procedure

1. Remove the radiator assembly (refer to [4.4.8.6 Removal and refitting of radiator assembly](#))
2. Remove the radiator upper bracket.
 - a. Take down the fixing bracket and bushing from the radiator assembly.



- b. Detach and take out the radiator upper bracket.

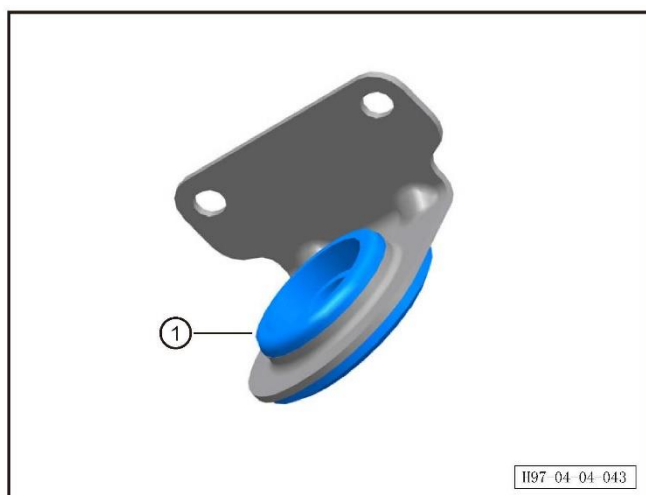
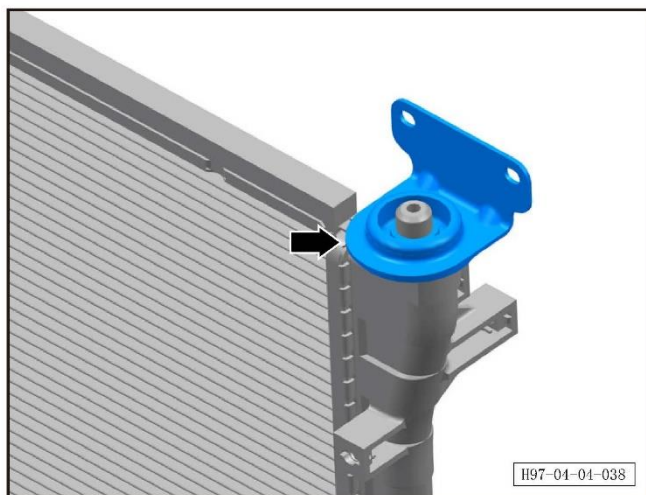
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.8 Removal and refitting of radiator upper bracket bushing

Removal procedure

1. Remove the radiator assembly (refer to [4.4.8.6 Removal and refitting of radiator assembly](#))
2. Remove the radiator upper bracket bushing.
 - a. Take down the fixing bracket and bushing from the radiator assembly.



- b. Detach and take out the radiator upper bracket bushing ①.

Refitting procedure

The refitting procedure is performed in reverse order.

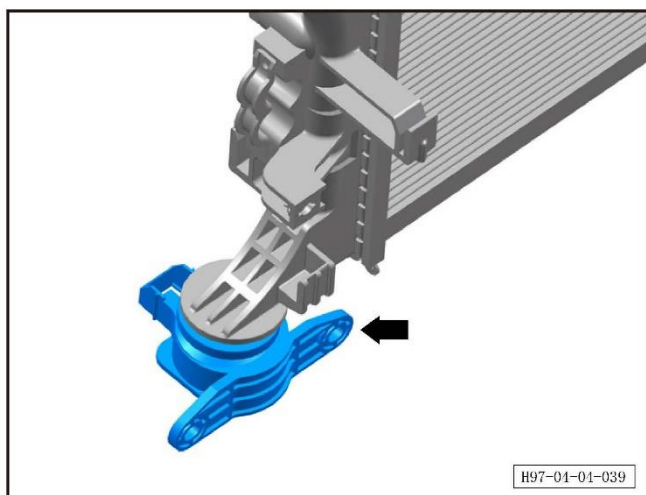
4.4.8.9 Removal and refitting of radiator lower bracket

Removal procedure

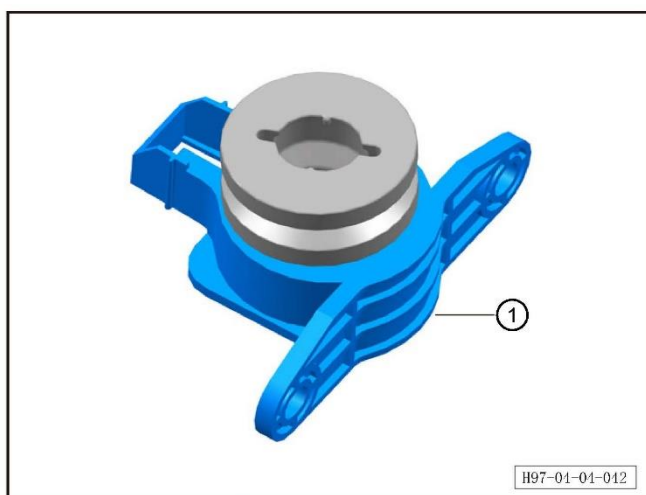
1. Remove the radiator assembly (refer to [4.4.8.6 Removal and refitting of radiator assembly](#))

2. Remove the radiator lower bracket.

a. Take down the fixing bracket and bushing from the radiator assembly.



b. Detach and take out the radiator lower bracket ①.



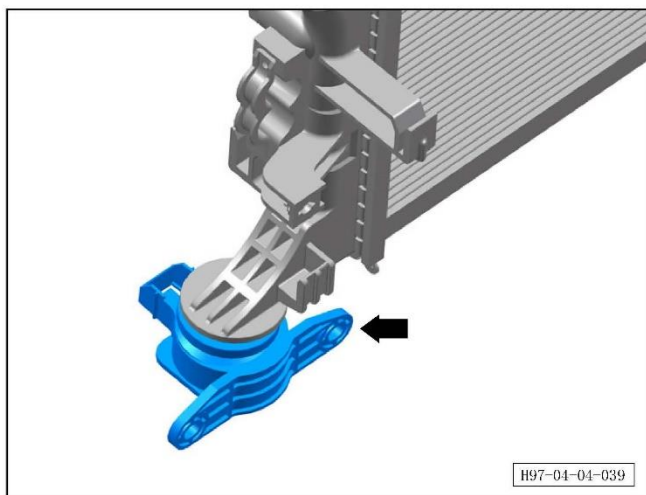
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.10 Removal and refitting of radiator lower bracket bushing

Removal procedure

1. Remove the radiator assembly (refer to [4.4.8.6 Removal and refitting of radiator assembly](#))
2. Remove the radiator lower bracket bushing.
 - a. Take down the fixing bracket and bushing from the radiator assembly.



- b. Detach and take out the radiator lower bracket bushing ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.11 Removal and refitting of water bottle vent hose

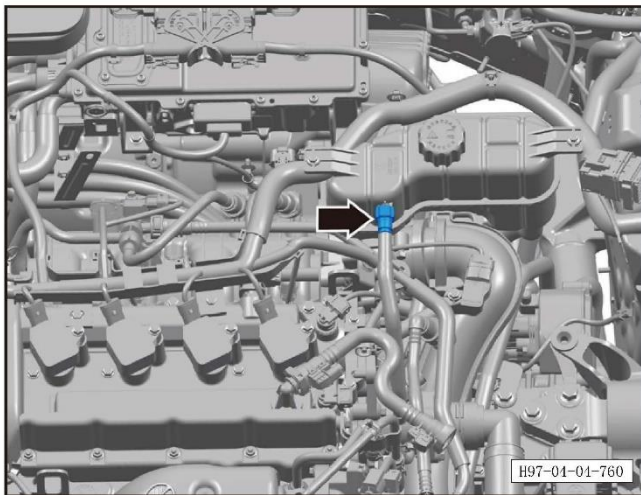
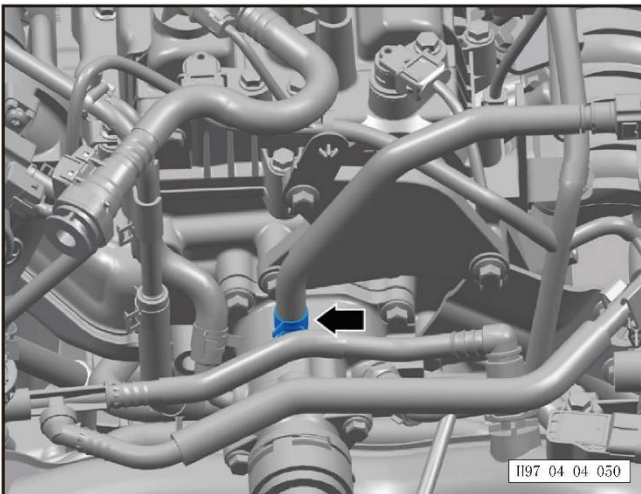
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water bottle vent hose.

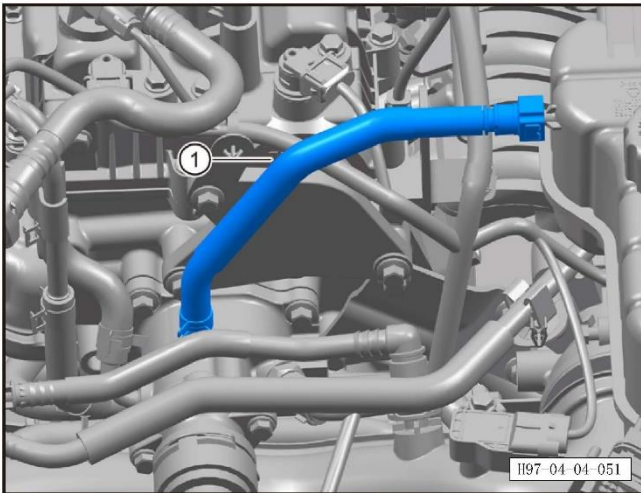
- a. Disconnect the connection pipe clamp between the water bottle vent hose and the thermostat assembly.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



- b. Disconnect 1 pipe clamp at the connection between the water bottle vent hose and the water bottle.



c. Take out the water bottle vent hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

WARNING:

- To avoid burns, do not remove the radiator cap until the range extender and radiator have cooled. If the cap is removed too soon, hot, high-pressure liquid and steam may be sprayed.

CAUTION:

- After refitting, coolant must be added as required.

4.4.8.12 Removal and refitting of generator water inlet pipe

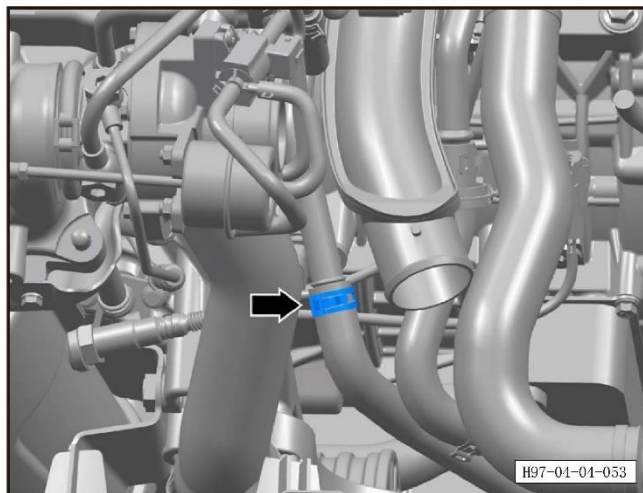
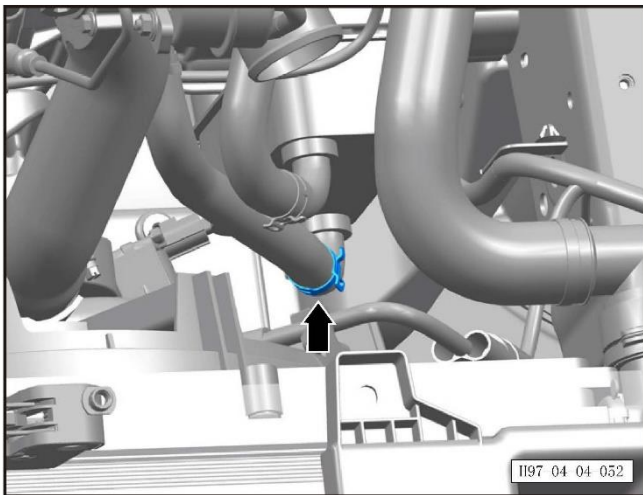
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the air filter inlet pipe assembly (refer to [4.1.8.5 Removal and refitting of air filter inlet pipe assembly](#))
6. Remove the generator water inlet pipe.

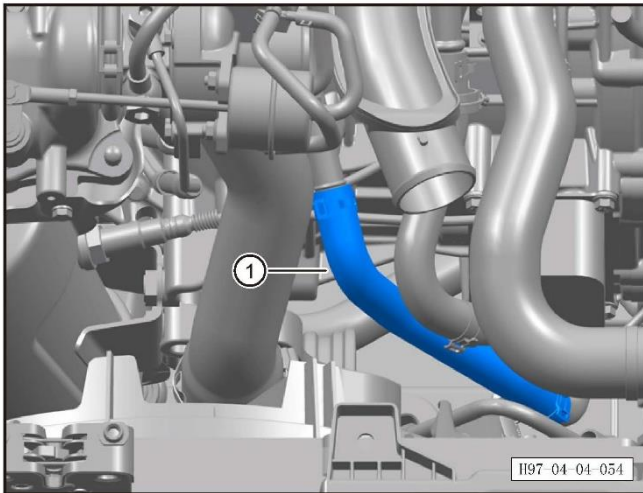
- a. Disconnect the generator water inlet pipe clamp.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.



- b. Disconnect 1 pipe clamp on the generator water inlet pipe.



c. Take out the generator water inlet pipe ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- After refitting, coolant must be added as required.

4.4.8.13 Removal and refitting of generator water outlet pipe

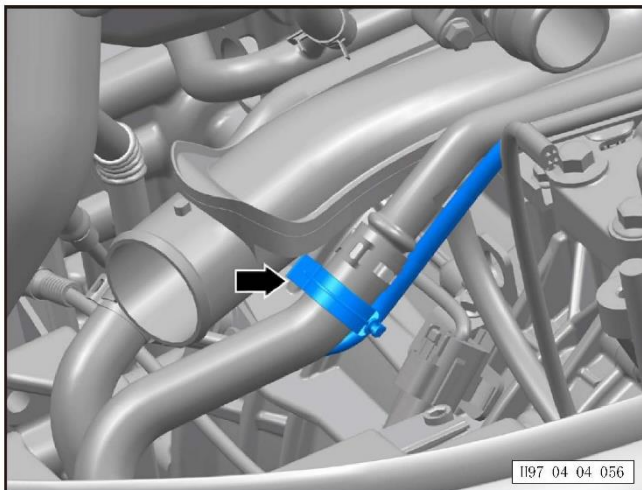
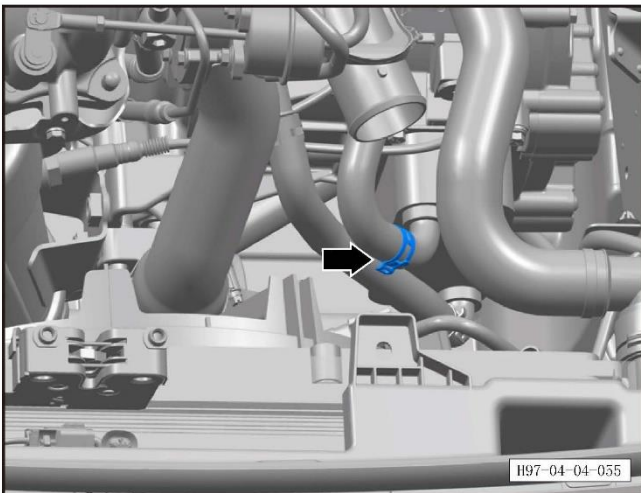
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the air filter inlet pipe assembly (refer to [4.1.8.5 Removal and refitting of air filter inlet pipe assembly](#))
6. Remove the generator water outlet pipe.

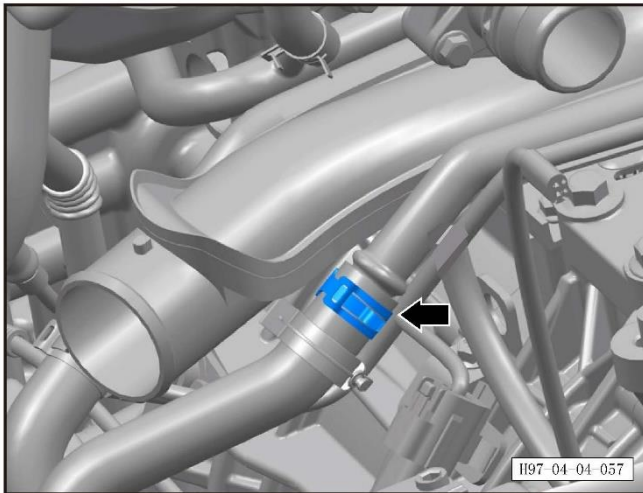
- a. Disconnect the generator water outlet pipe clamp.

CAUTION:

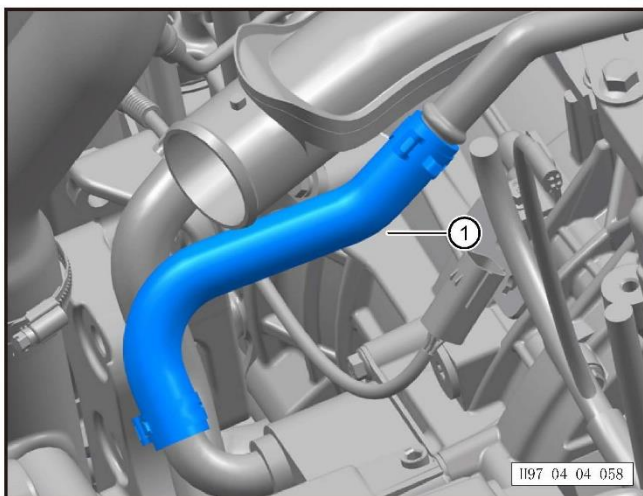
- Drain the coolant from the corresponding pipelines before removing them.



- b. Disconnect 1 pipe clamp on the generator water outlet pipe.



c. Disconnect the generator water outlet pipe clamp.



d. Take out the generator water outlet pipe ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- After refitting, coolant must be added as required.

4.4.8.14 Removal and refitting of low temperature radiator water inlet pipe

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the right front tire.
6. Remove the right front wheel housing fender body (refer to [8.6.5.1 Removal and refitting of front wheel housing fender assembly](#))
7. Remove the low temperature radiator water inlet pipe.

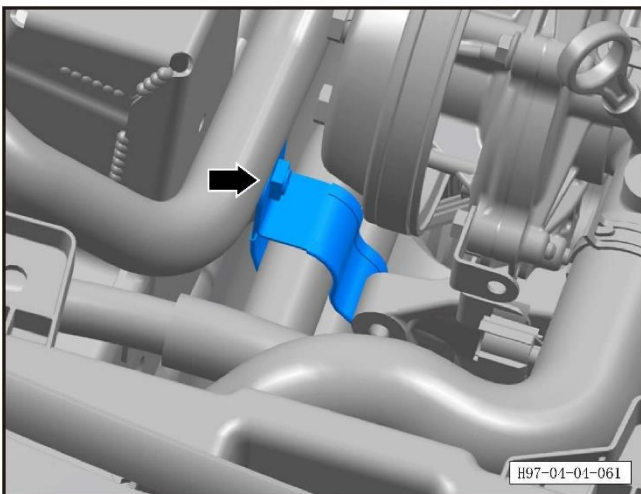


- a. Unscrew 1 bolt at the rear of the right front wheel housing fender body.

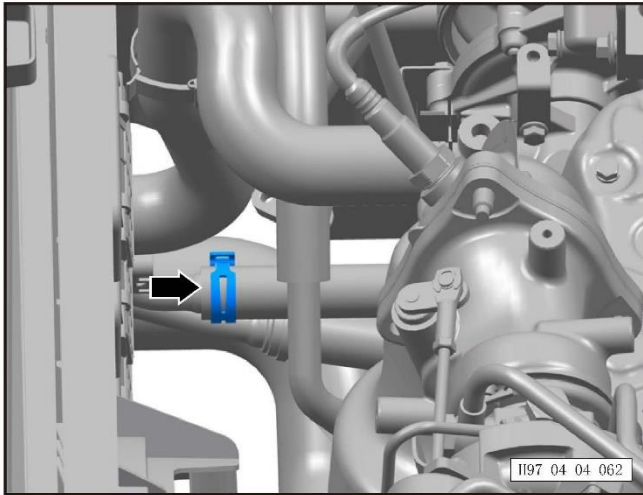
Tightening torque of bolt: $8\pm 1\text{Nm}$.

CAUTION:

- The bolt is used to fix the low temperature radiator water inlet pipe clamp.



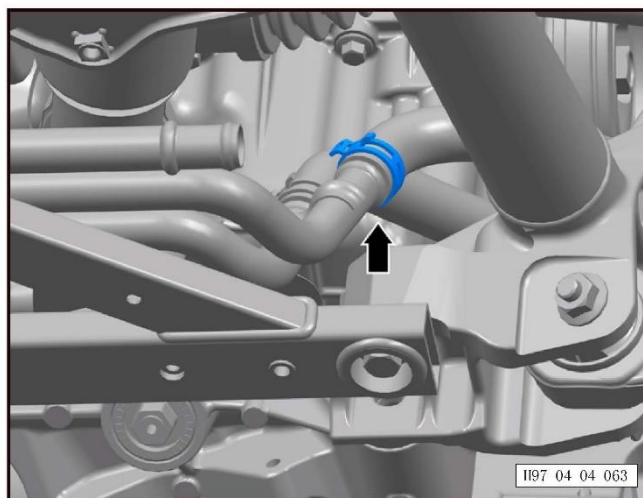
- b. Disconnect 1 pipe clamp connecting the low temperature radiator water inlet pipe to the body.



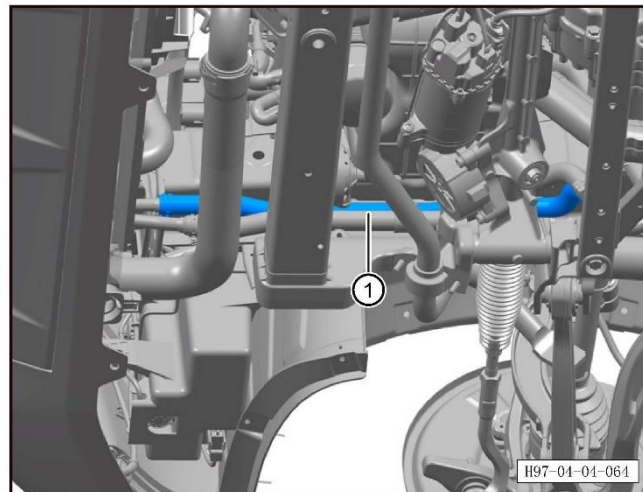
c. Disconnect 1 pipe clamp of the low temperature radiator water inlet pipe.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



d. Disconnect 1 pipe clamp connecting the low temperature radiator water inlet pipe to the middle channel pipe.



e. Take out the low temperature radiator water inlet pipe ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.15 Removal and refitting of low temperature radiator water outlet pipe

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the right front tire.
6. Remove the right front wheel housing fender body (refer to [8.6.5.1 Removal and refitting of front wheel housing fender assembly](#))
7. Remove the low temperature radiator water outlet pipe.

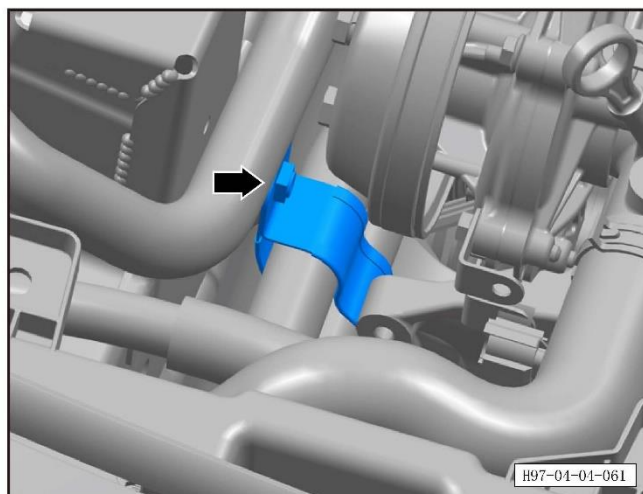


- a. Unscrew 1 bolt at the rear of the right front wheel housing fender body.

Tightening torque of bolt: $8\pm 1\text{Nm}$.

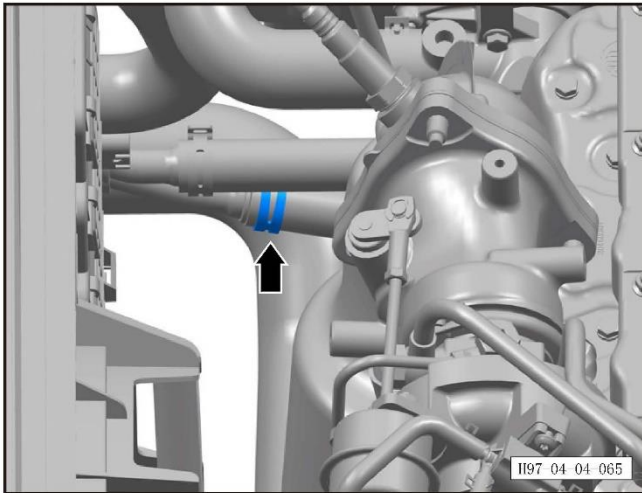
CAUTION:

- The bolt is used to fix the low temperature radiator water inlet pipe clamp.



- b. Disconnect 1 pipe clamp connecting the low temperature radiator water outlet pipe to the body.

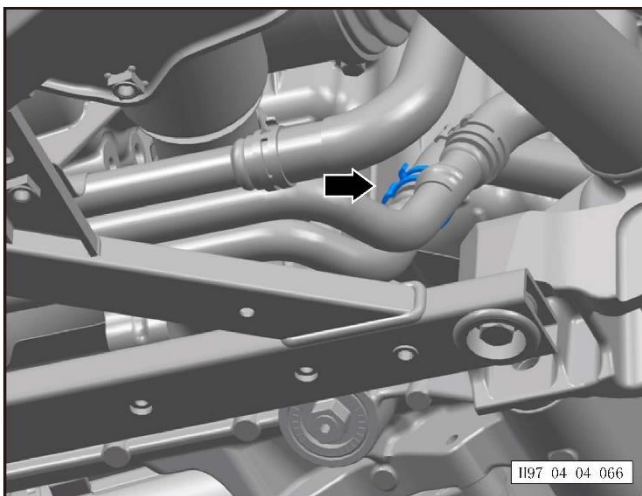
Tightening torque of bolt: $8\pm 1\text{Nm}$.



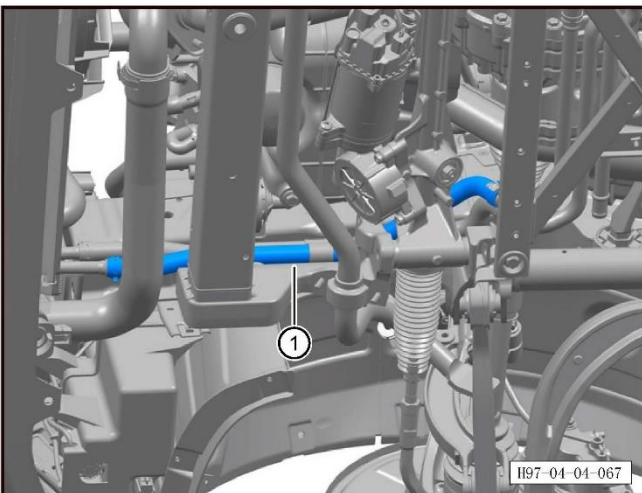
c. Disconnect 1 pipe clamp of the low temperature radiator water outlet pipe.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



d. Disconnect 1 pipe clamp connecting the low temperature radiator water outlet pipe to the middle channel pipe.



e. Take out the low temperature radiator water outlet pipe ①.

Refitting procedure

The refitting procedure is performed in reverse order.

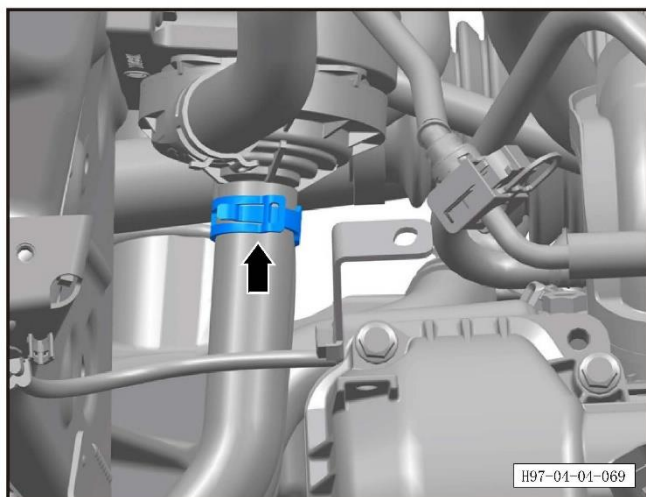
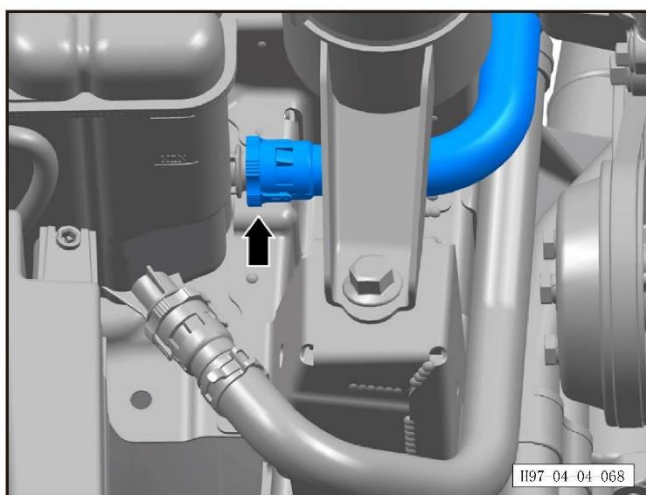
4.4.8.16 Removal and refitting of water bottle inlet hose

Removal procedure

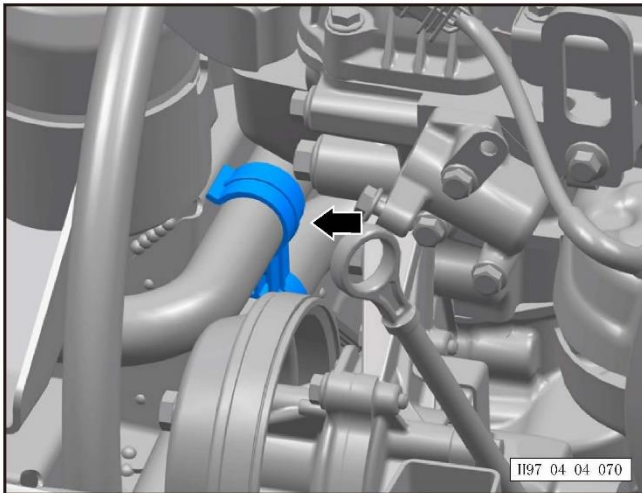
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water bottle inlet hose.
 - a. Disconnect the connection clip between the water bottle inlet hose and the water bottle.

CAUTION:

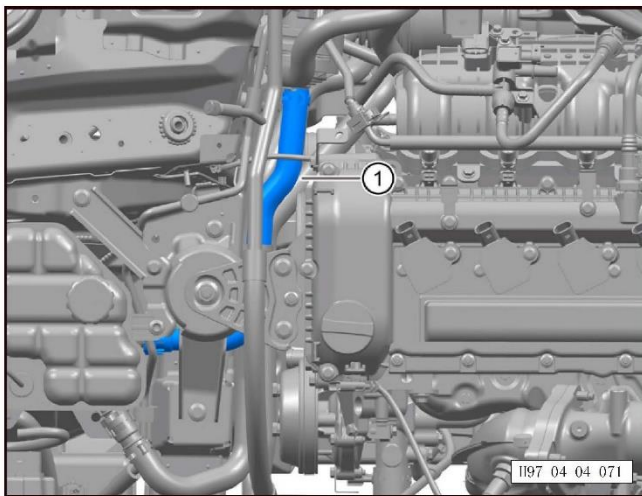
- Drain the coolant from the corresponding pipelines before removing them.



- b. Disconnect 1 pipe clamp connecting the water bottle inlet hose to the electronic water pump.



c. Disconnect 1 clip on the water bottle inlet hose.



d. Take out the water bottle inlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

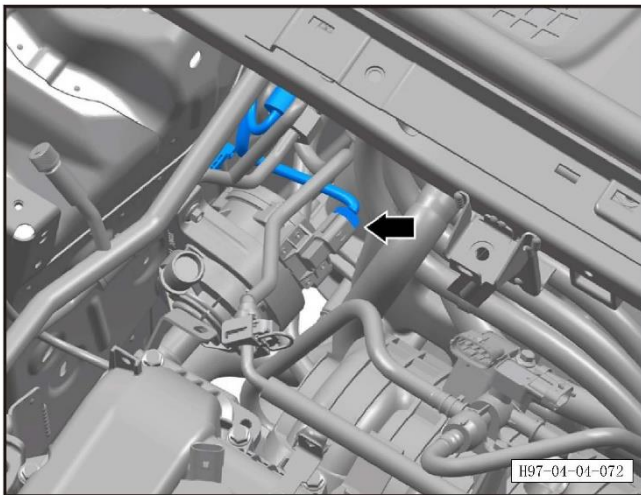
CAUTION:

- After refitting, coolant must be added as required.

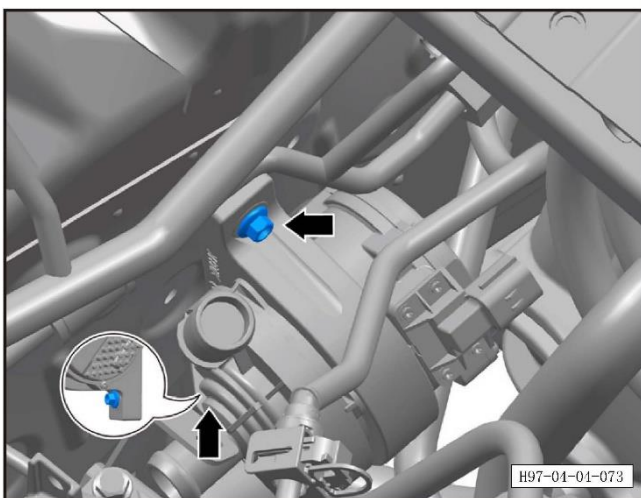
4.4.8.17 Removal and refitting of water pump assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water bottle inlet hose (refer to [4.4.8.16 Removal and refitting of water bottle inlet hose](#))
6. Remove the range extender controller water inlet hose (refer to [4.4.8.47 Removal and refitting of range extender controller water inlet hose](#))
7. Remove the water pump assembly.

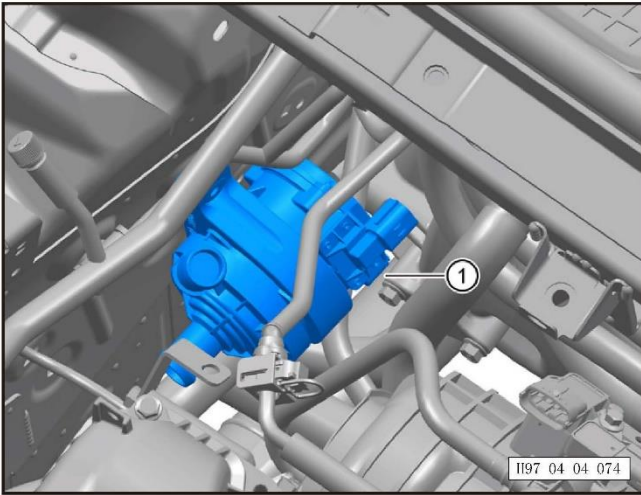


- a. Disconnect 1 connector of electric water pump assembly.



- b. Unscrew the 2 bolts connecting the water pump assembly to the body.

Tightening torque of bolt: $8\pm 1\text{Nm}$.



c. Take out the water pump assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

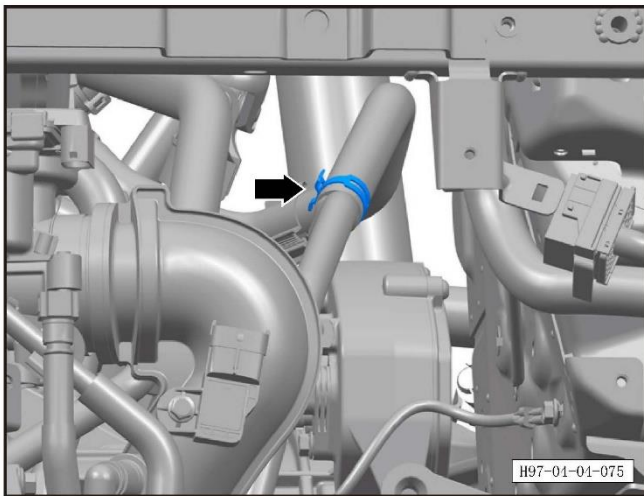
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.18 Removal and refitting of generator water outlet pipe rear section

Removal procedure

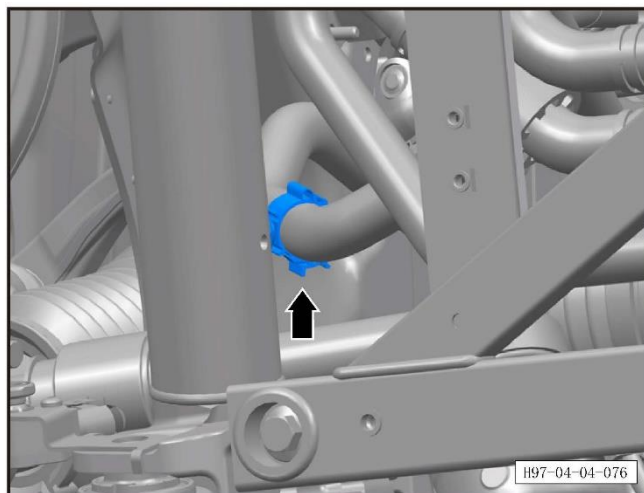
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the generator water outlet pipe rear section.



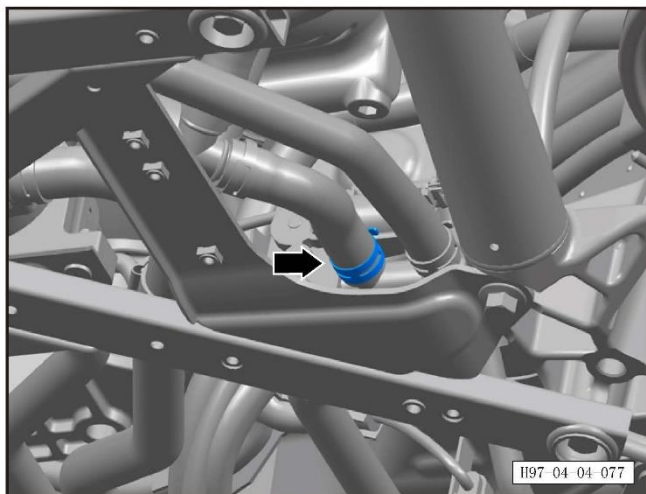
- a. Disconnect 1 pipe clamp on the generator water outlet pipe rear section.

CAUTION:

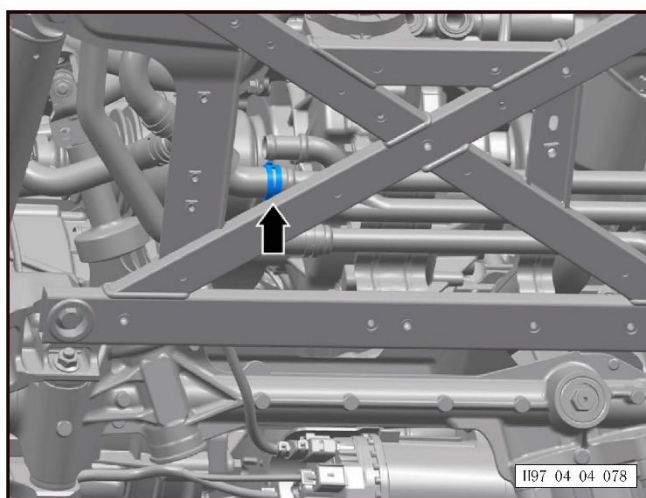
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



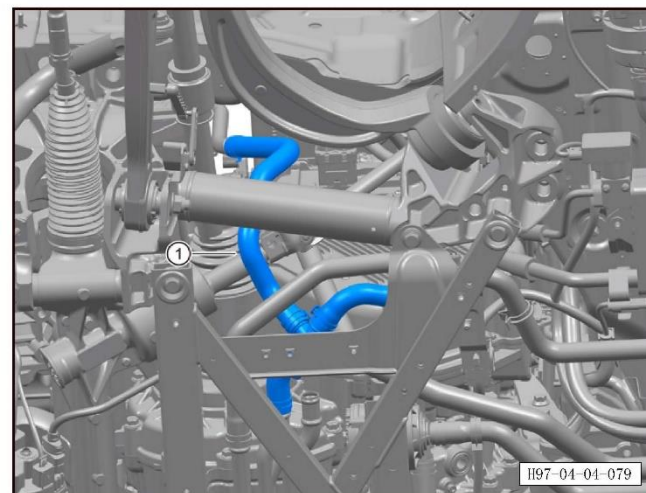
- b. Disconnect the 1 clip connecting the generator water outlet pipe rear section to the front subframe assembly.



c. Disconnect 1 pipe clamp on the generator water outlet pipe rear section.



d. Disconnect the 1 clip connecting the generator water outlet pipe rear section to the water pipe assembly.



e. Take out the generator water outlet pipe ①.

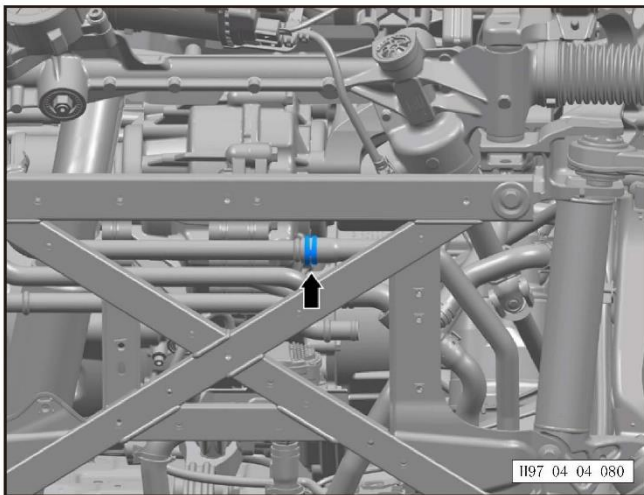
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.19 Removal and refitting of low temperature radiator water outlet pipe rear section

Removal procedure

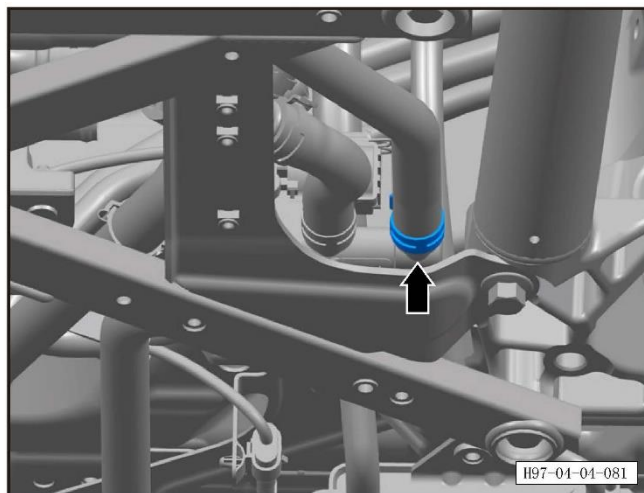
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the low temperature radiator water outlet pipe rear section.



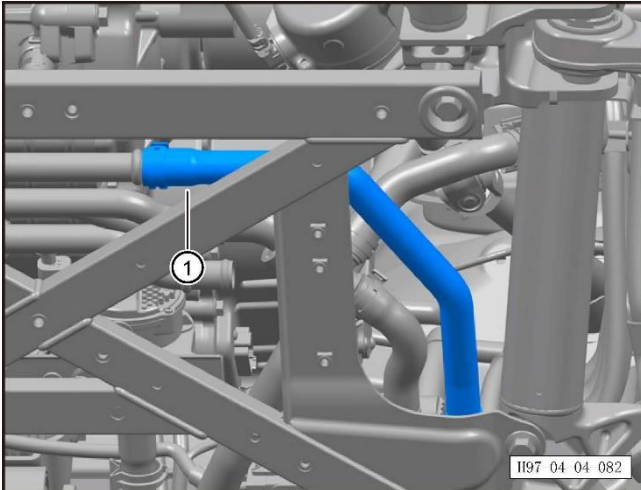
- a. Disconnect the pipe clamp connecting the low temperature radiator water outlet pipe rear section to the water pipe assembly.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



- b. Disconnect 1 pipe clamp of the low temperature radiator water outlet pipe rear section.



c. Take out the low temperature radiator water outlet pipe rear section ①.

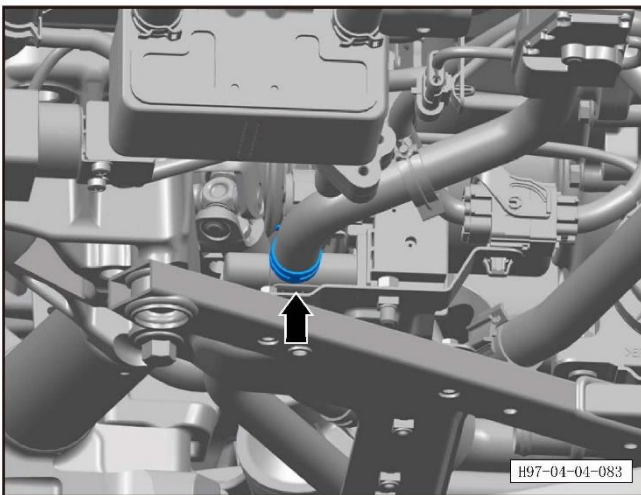
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.20 Removal and refitting of four-way control valve water pipe I

Removal procedure

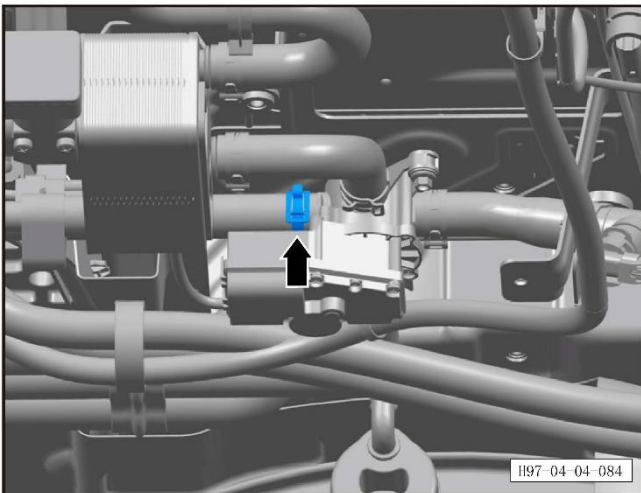
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the four-way control valve water pipe I.



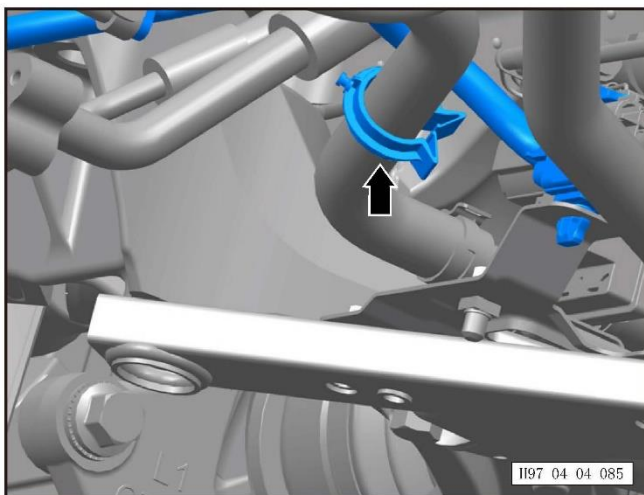
- a. Disconnect 1 pipe clamp connecting the four-way control valve water pipe I to the three-way proportional valve assembly.

CAUTION:

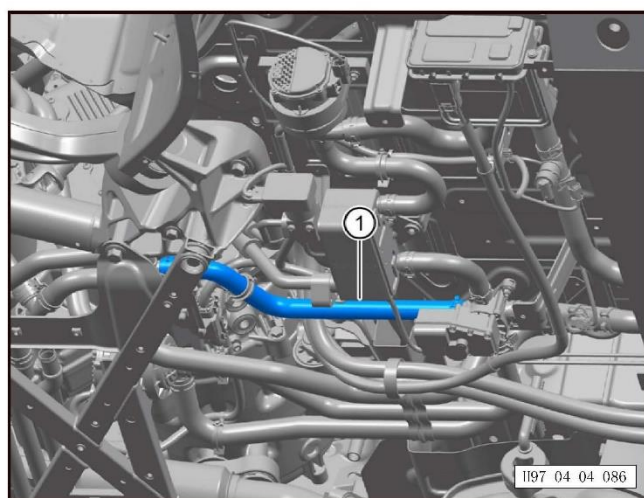
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



- b. Disconnect 1 pipe clamp connecting the four-way control valve water pipe I to the four-way control valve assembly.



c. Disconnect the clip in the middle of the four-way control valve water pipe I.



d. Take out the four-way control valve water pipe I ①.

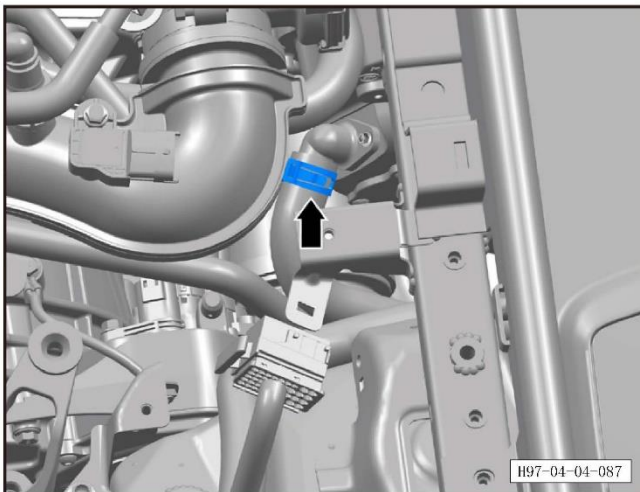
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.21 Removal and refitting of middle channel water outlet hose

Removal procedure

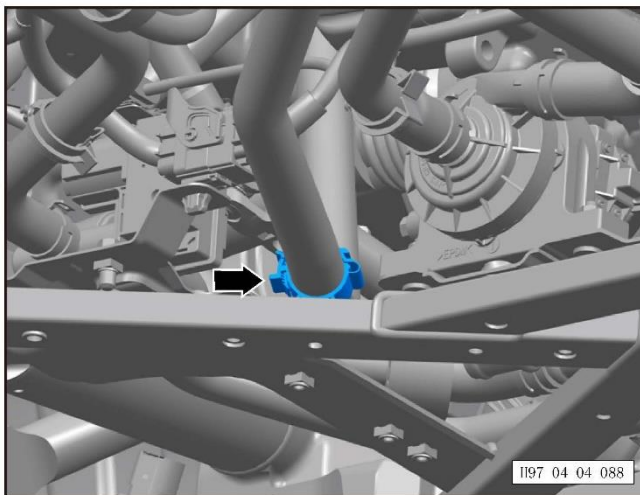
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the middle channel water outlet hose.



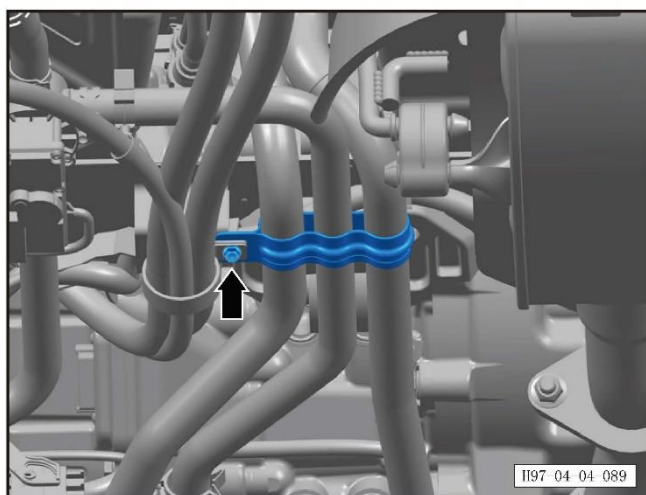
- a. Disconnect the pipe clamp connecting the middle channel water outlet hose to the front drive motor.

CAUTION:

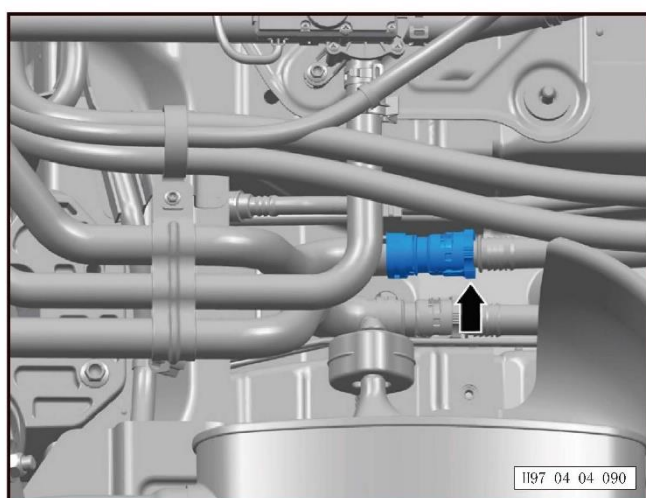
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



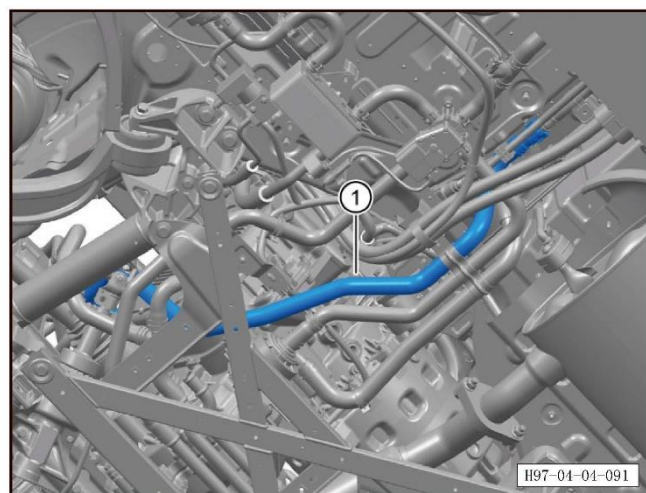
- b. Disconnect the 1 clip connecting the middle channel water outlet hose to the subframe.



c. Unscrew 1 bolt on the pipe clamp of water pipe III.
Tightening torque of bolt: $8\pm 1\text{Nm}$.



d. Disconnect 1 pipe clamp connecting the middle channel water outlet hose to the middle channel water outlet pipe.



e. Take out the middle channel water outlet hose ①.

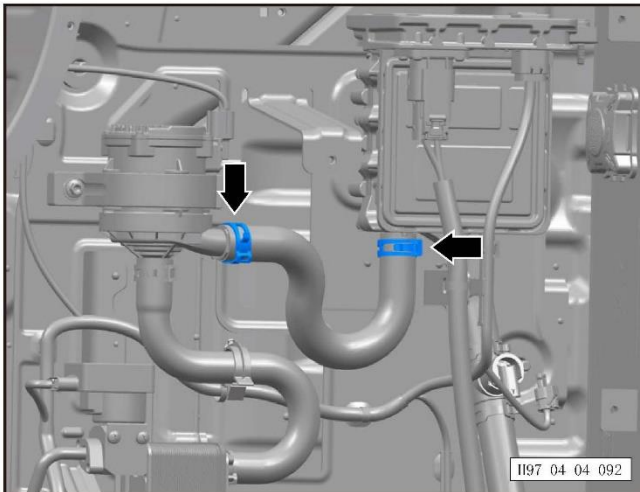
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.22 Removal and refitting of PTC heater inflow pipe assembly

Removal procedure

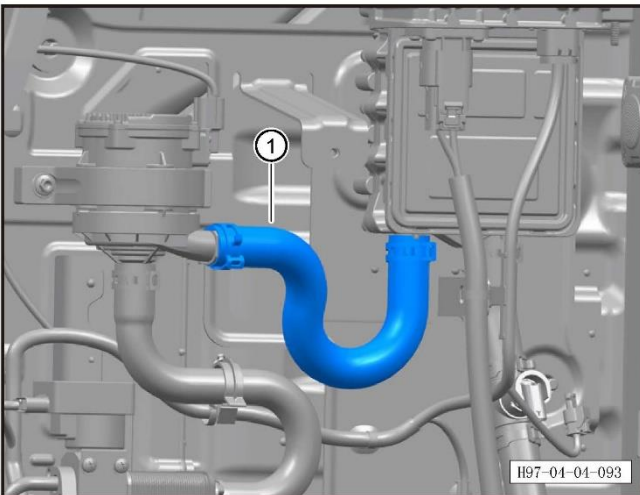
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the PTC heater inflow pipe assembly.



- a. Disconnect the 2 pipe clamps at both ends of the PTC heater inflow pipe assembly.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



- b. Take out the PTC heater inflow pipe assembly ①.

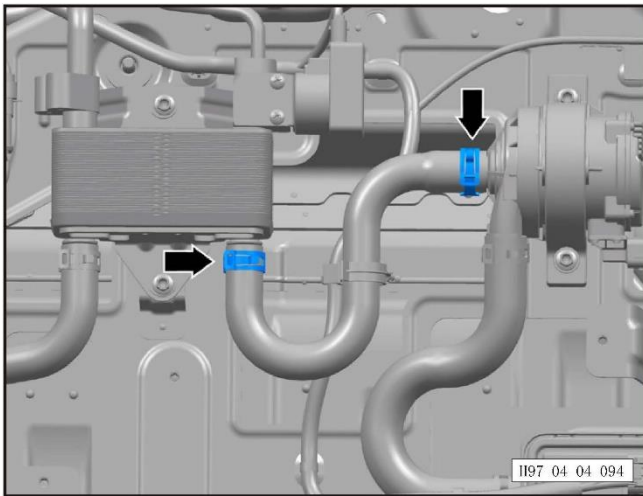
Refitting procedure

The refitting procedure is performed in reverse order.

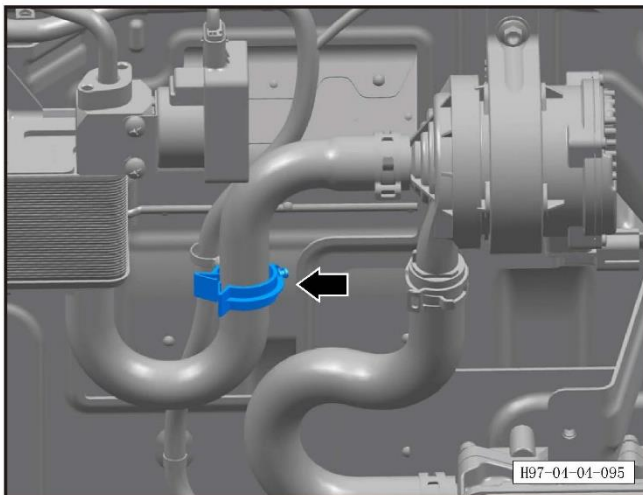
4.4.8.23 Removal and refitting of battery cooler water outlet pipe assembly

Removal procedure

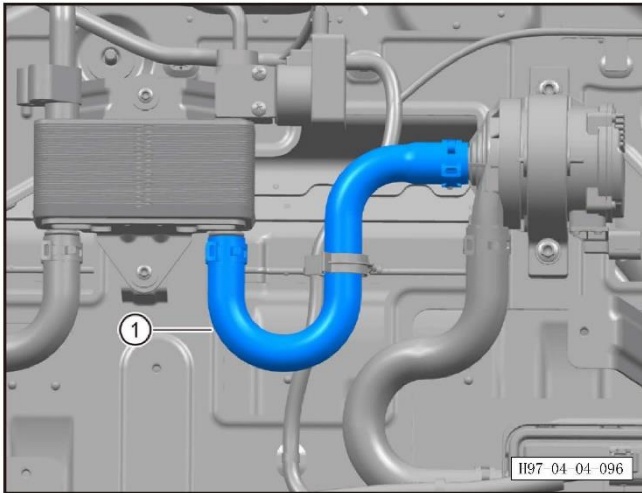
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the battery cooler water outlet pipe assembly.



- a. Disconnect the pipe clamps at both ends of the battery cooler water outlet pipe.



- b. Disconnect 1 clamp on the battery cooler water outlet pipe assembly.



c. Take out the battery cooler water outlet pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

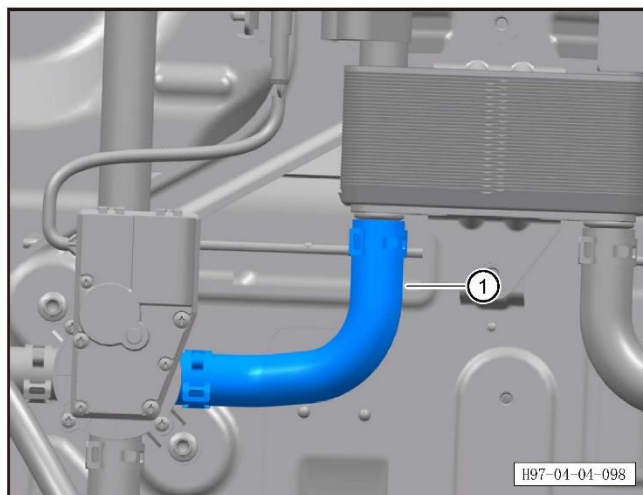
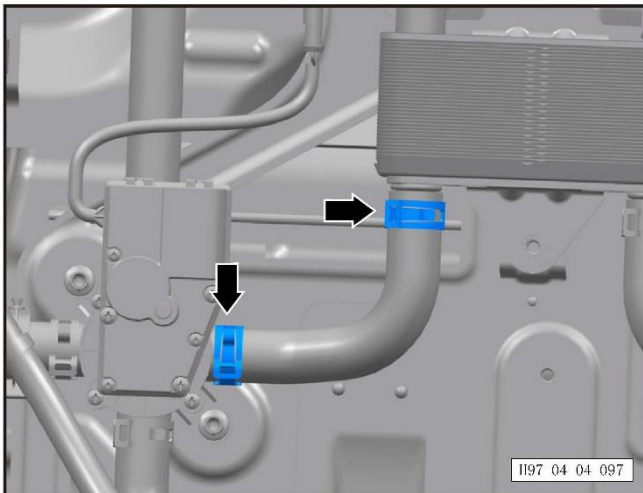
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.24 Removal and refitting of four-way control valve water pipe III

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the four-way control valve water pipe III.
 - a. Disconnect the pipe clamps at both ends of the four-way control valve water pipe III.



- b. Take out the four-way control valve water pipe III ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.25 Removal and refitting of water pump inlet hose

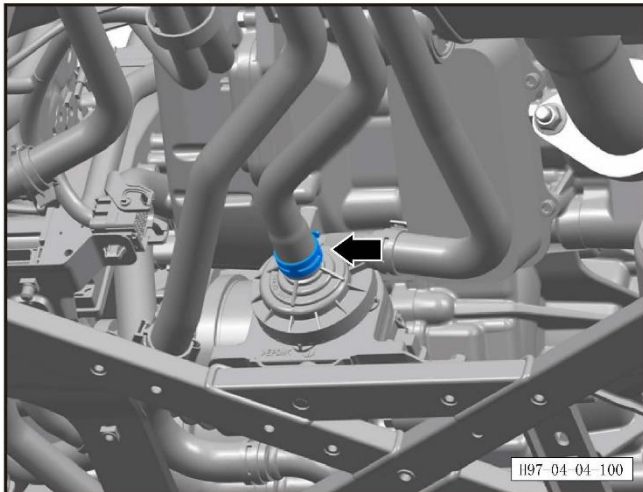
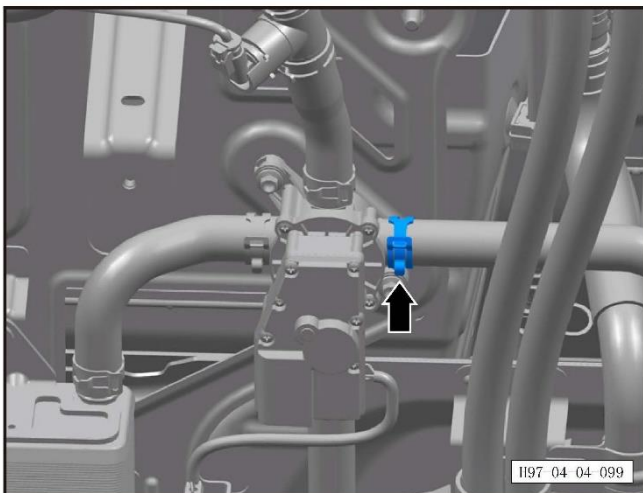
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump inlet hose.

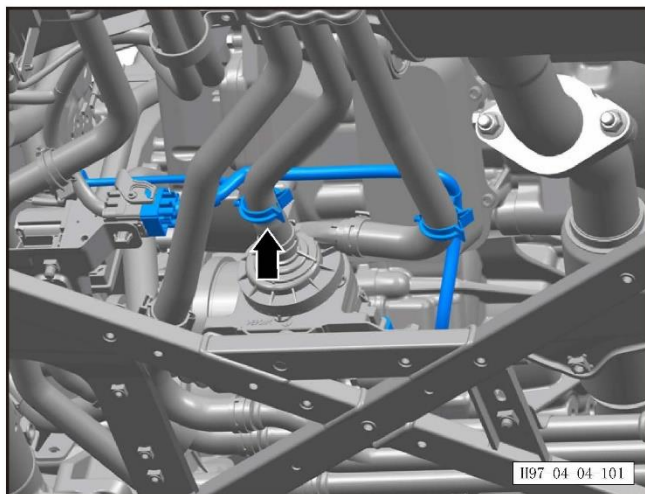
- a. Disconnect 1 clamp connecting the water pump inlet hose to the four-way control valve.

CAUTION:

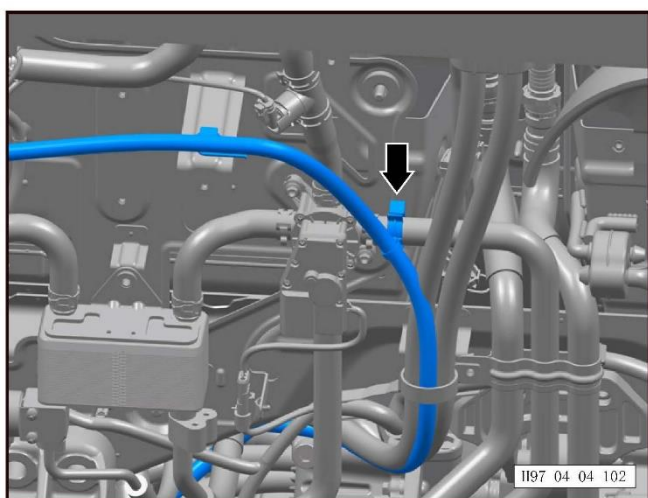
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



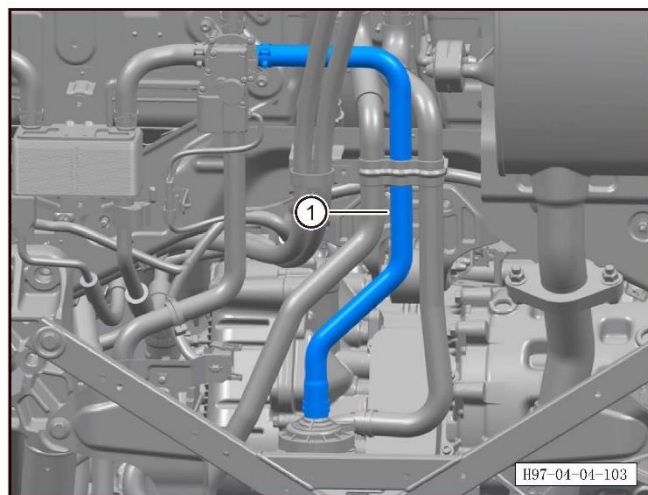
- b. Disconnect 1 clamp connecting the water pump inlet hose to the water pump.



c. Disconnect 1 clip on the water pump inlet hose.



d. Disconnect 1 clip connecting the water pump inlet hose to the harness.



e. Take out the water pump inlet hose ①.

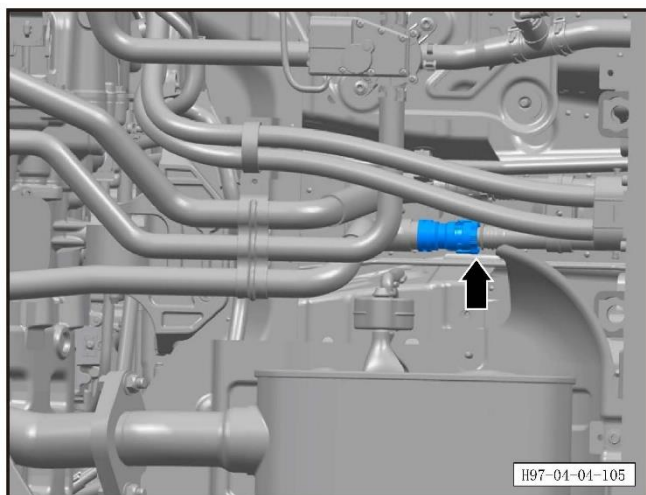
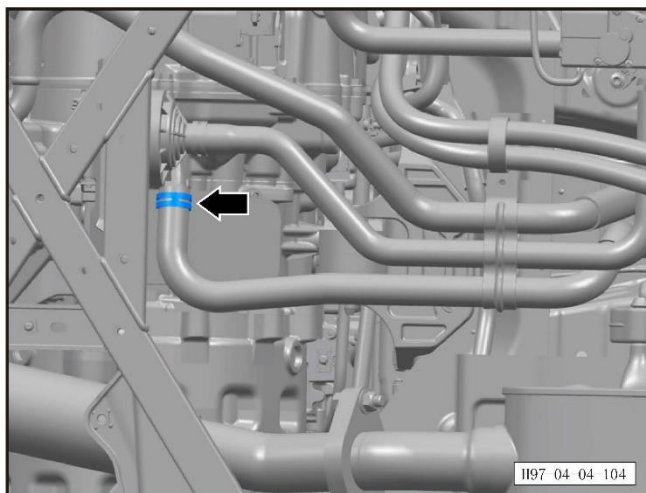
Refitting procedure

The refitting procedure is performed in reverse order.

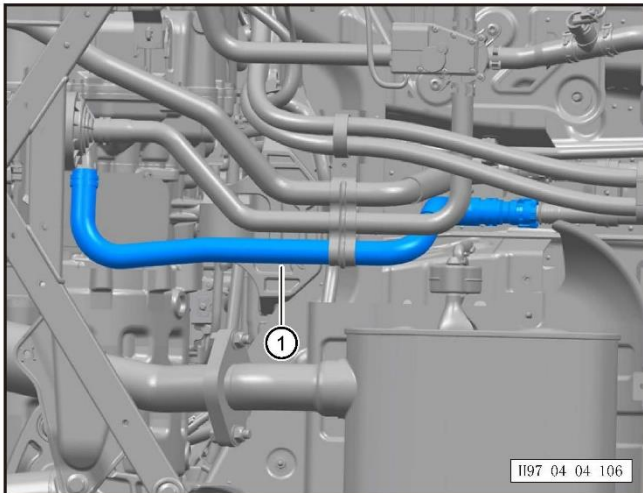
4.4.8.26 Removal and refitting of water pump outlet hose

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump outlet hose.
 - a. Disconnect 1 clamp connecting the water pump outlet hose to the water pump.



- b. Disconnect 1 pipe clamp at the connection between the water pump outlet hose and the middle channel water inlet pipe.



c. Take out water pump outlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

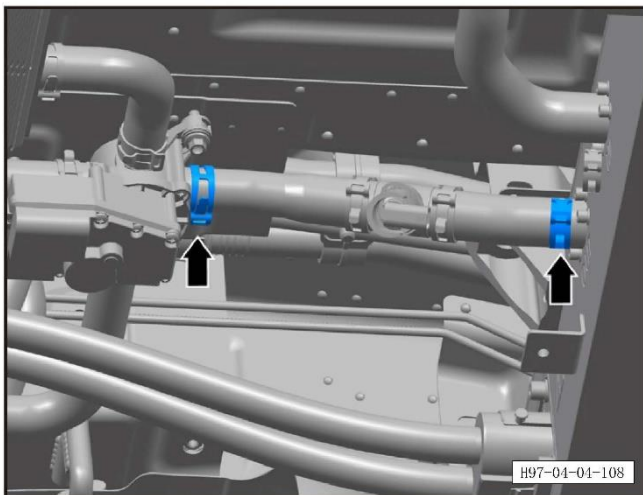
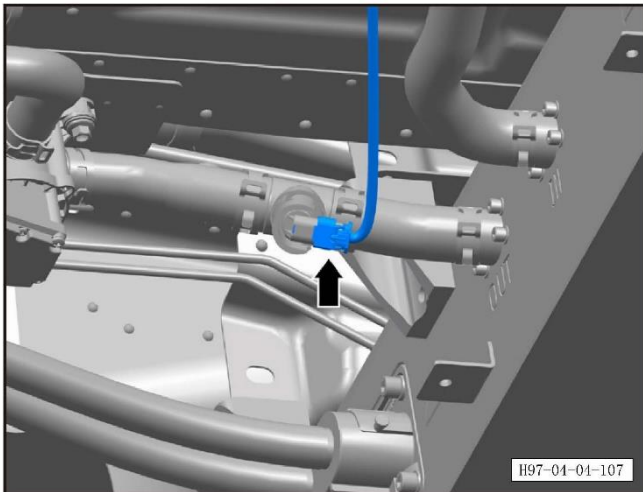
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

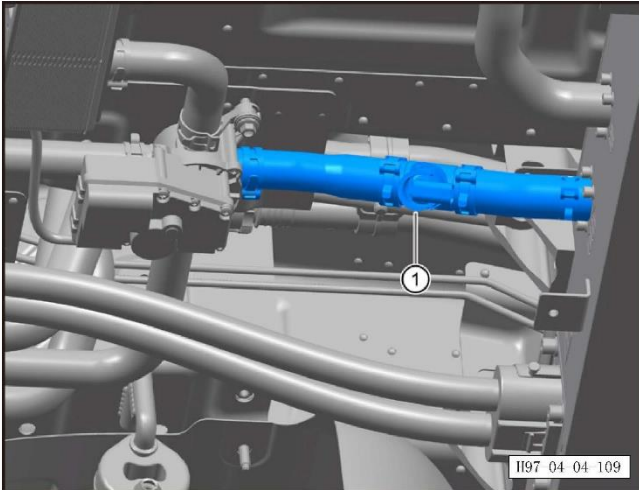
4.4.8.27 Removal and refitting of battery pack outflow pipe assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the battery pack outflow pipe assembly.
 - a. Disconnect 1 connector on the battery pack outflow pipe assembly.



- b. Disconnect the clamps at both ends of the battery pack outflow pipe assembly.



c. Take out the battery pack outflow pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

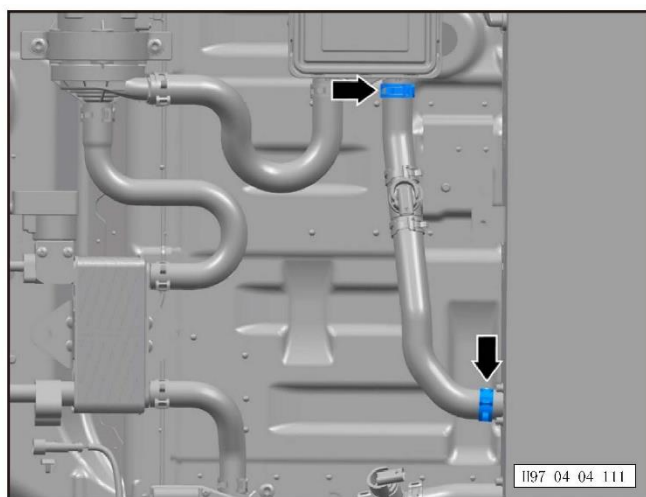
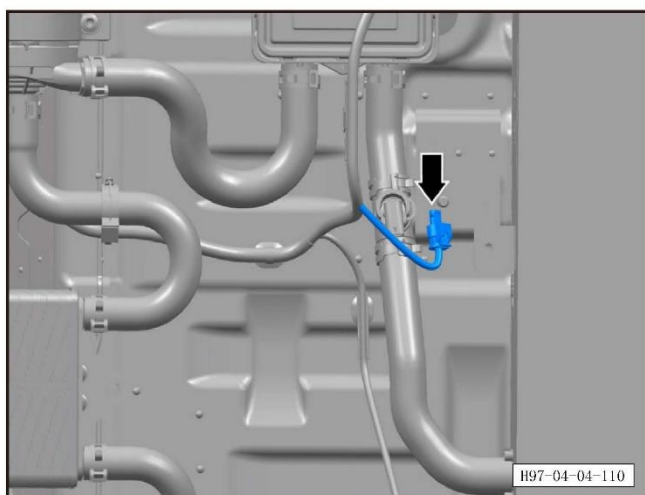
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

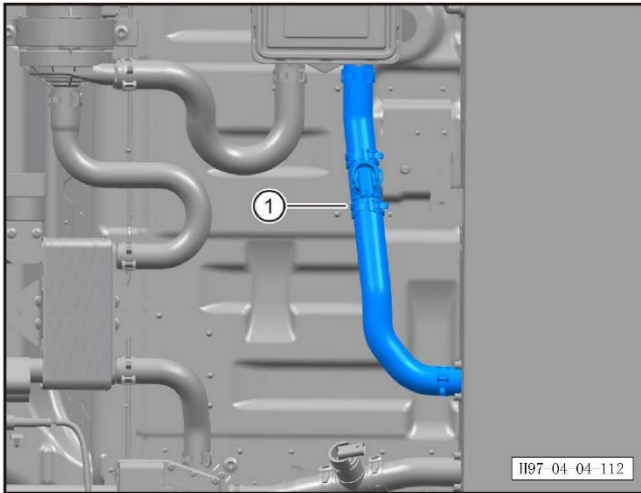
4.4.8.28 Removal and refitting of battery pack inflow pipe assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the battery pack inflow pipe assembly.
 - a. Disconnect the connector on the battery pack inflow pipe assembly.



- b. Disconnect the clamps at both ends of the battery pack inflow pipe assembly.



c. Take out the battery pack inflow pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

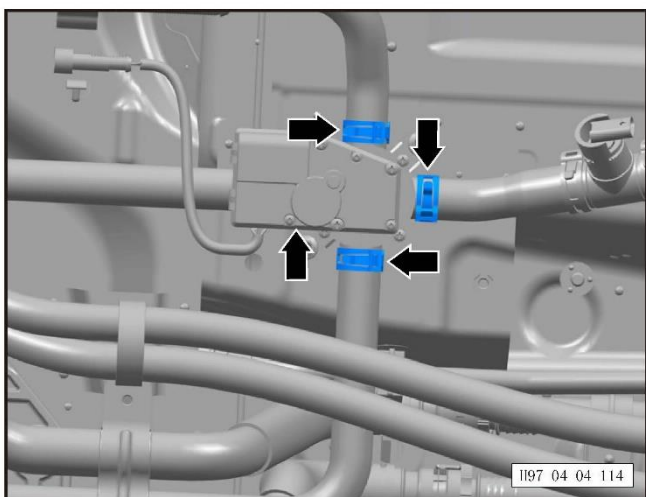
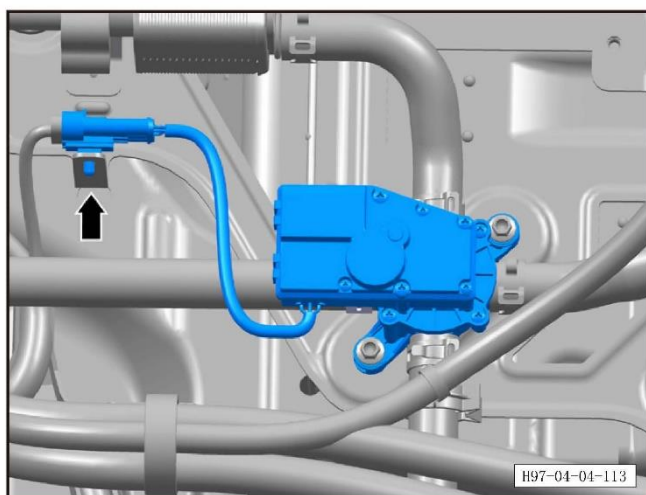
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

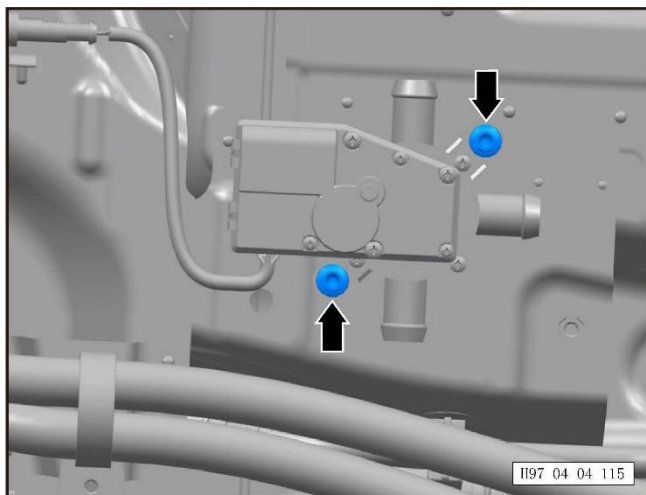
4.4.8.29 Removal and refitting of four-way control valve assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the four-way control valve assembly.
 - a. Disconnect the harness connector on the four-way control valve assembly.

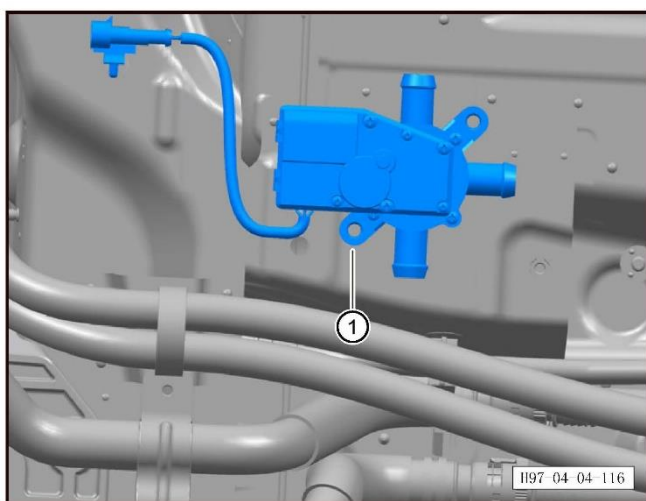


- b. Disconnect the 4 clamps and corresponding hoses connecting the 4-way control valve assembly.



c. Remove the 2 bolts fixing the 4-way control valve assembly.

Tightening torque of bolt: $8\pm 1\text{Nm}$.



d. Take out the four-way control valve assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

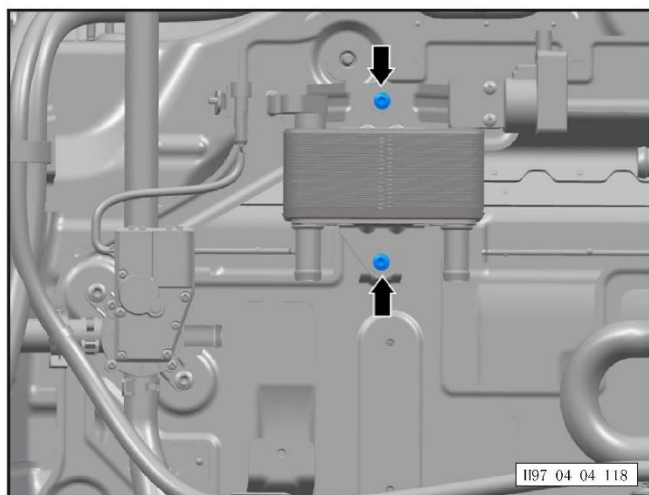
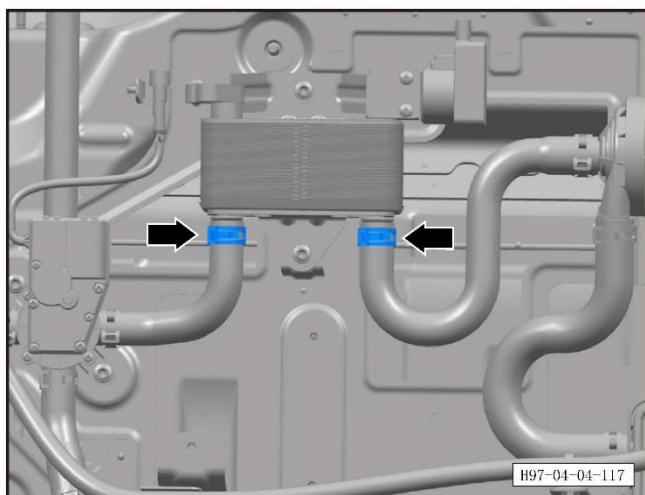
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.30 Removal and refitting of battery cooler assembly

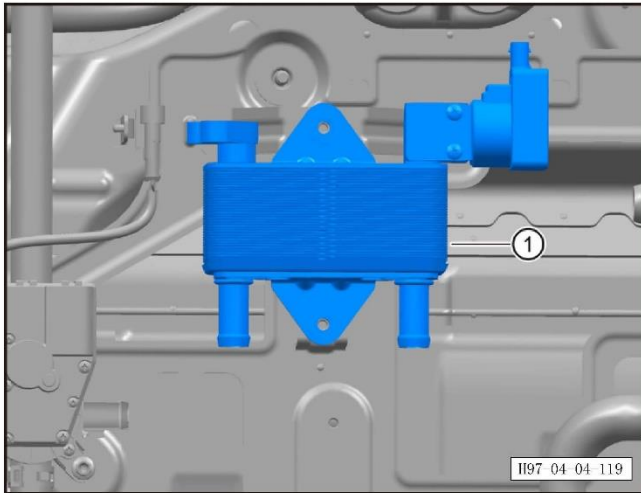
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the battery cooler assembly.
 - a. Disconnect the 2 clamps and the corresponding 2 hoses on the battery cooler assembly.



- b. Unscrew the 2 bolts on the battery cooler assembly.

Tightening torque of bolt: $8\pm 1\text{Nm}$.



c. Take out the battery cooler assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

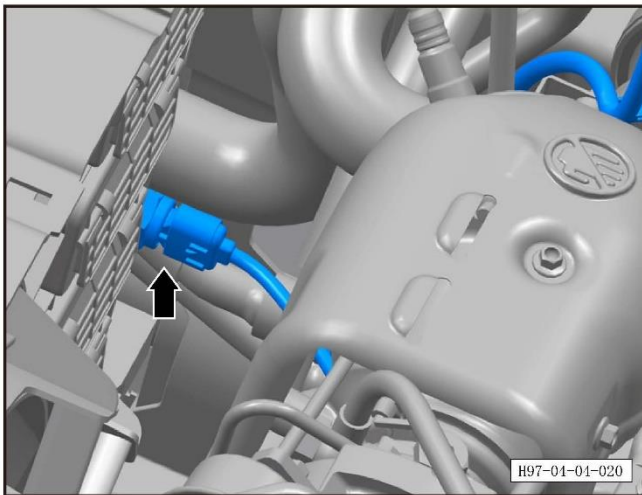
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

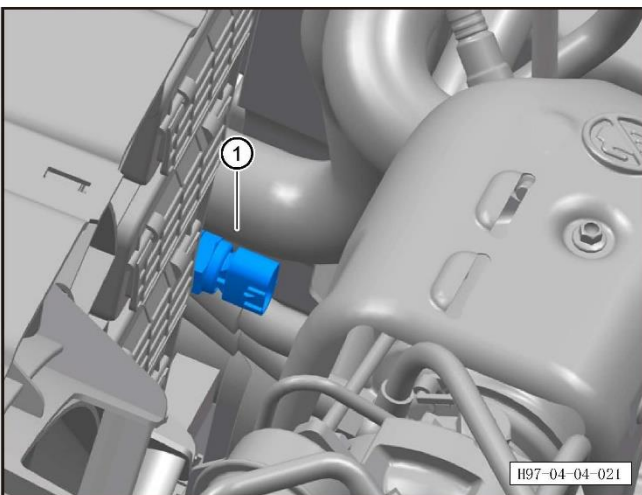
4.4.8.31 Removal and refitting of water temperature sensor on radiator assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water temperature sensor on radiator assembly.



- a. Disconnect the water temperature sensor connector from the radiator assembly.



- b. Take out the water temperature sensor on radiator assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.32 Removal and refitting of three-way proportional valve assembly

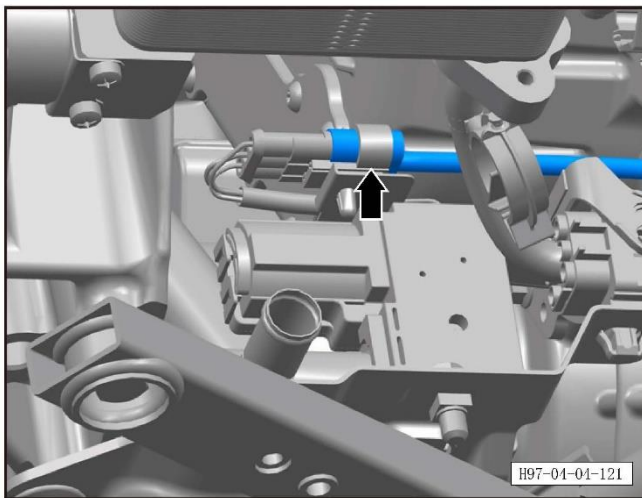
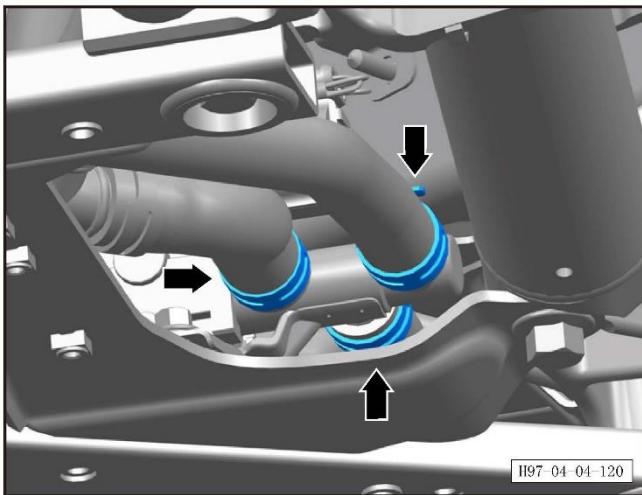
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the 3-way proportional valve assembly.

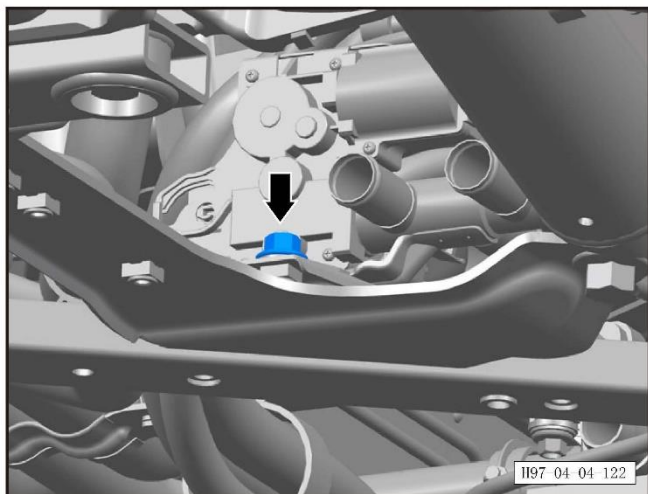
- a. Disconnect the 3 pipe clamps and corresponding hoses on the 3-way proportional valve assembly.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

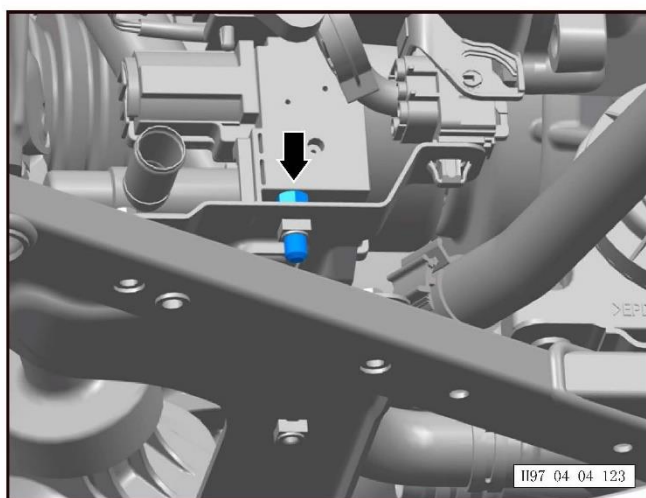


- b. Disconnect the connector on the 3-way proportional valve assembly.



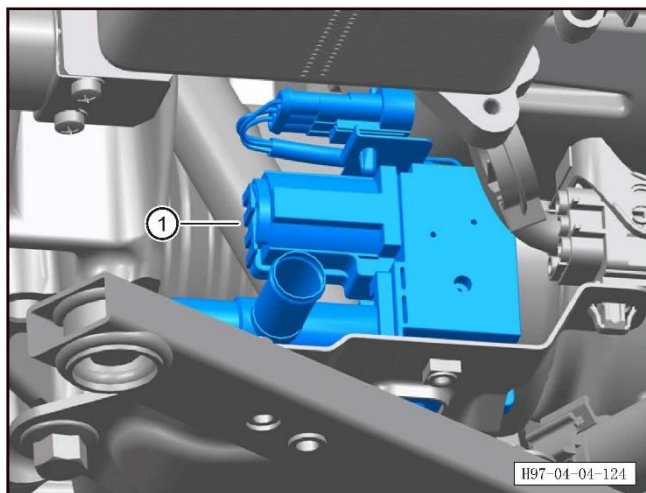
c. Unscrew 1 bolt on the 3-way proportional valve assembly.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



d. Unscrew 1 bolt on the 3-way proportional valve assembly.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



e. Take out the 3-way proportional valve assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.33 Removal and refitting of water bottle inlet hose

Removal procedure

CAUTION!

- Wait for the coolant temperature to drop below 60 °C before performing service operations.

- Before removing the water inlet hose, it is necessary to open the water bottle cap first for pressure relief.

- After the servicing operation is completed, it is necessary to add coolant to the specified level.

1. Turn off all electrical appliances and turn off the start switch.

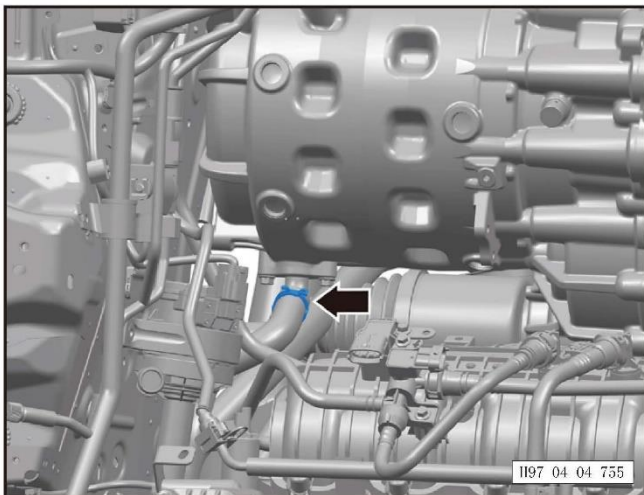
2. Open the engine hood.

3. Remove the engine compartment trim panel.

4. Disconnect the battery negative terminal.

5. Open the water bottle cap for pressure relief.

6. Remove the water bottle inlet hose.

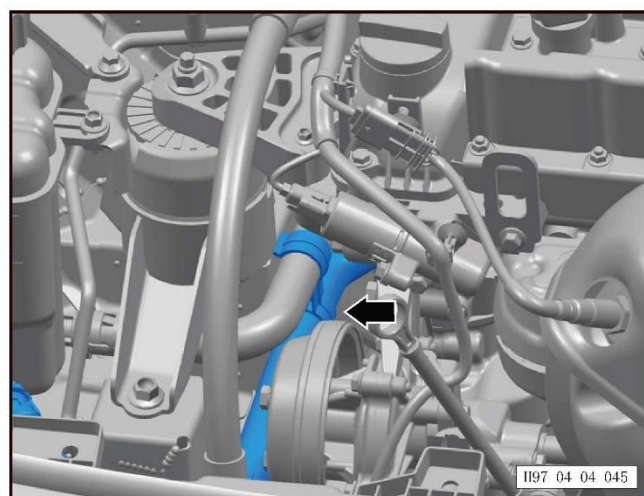


a. Disconnect the connection clip between the water bottle inlet hose and the front drive motor water outlet, and disconnect the hose.

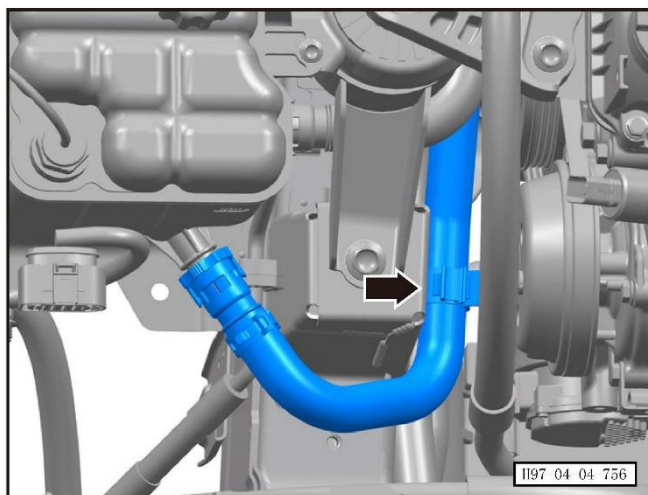
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.

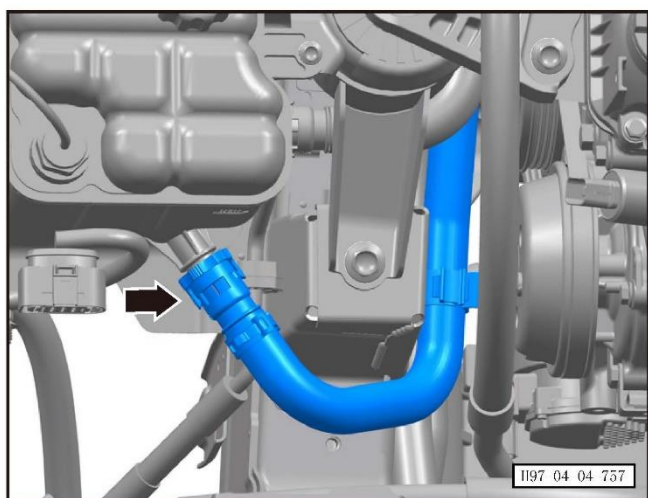
- After refitting, coolant must be added as required.



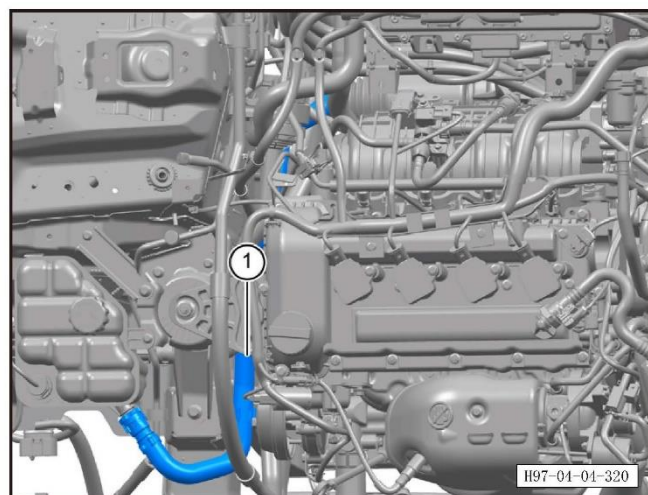
b. Disconnect the water bottle inlet hose from the engine compartment bracket pipe clamp.



c. Disconnect the water bottle inlet hose from the engine compartment bracket pipe clamp.



d. Disconnect the connection clip between the water bottle inlet hose and the water bottle.



e. Take out the water bottle inlet hose assembly ①.

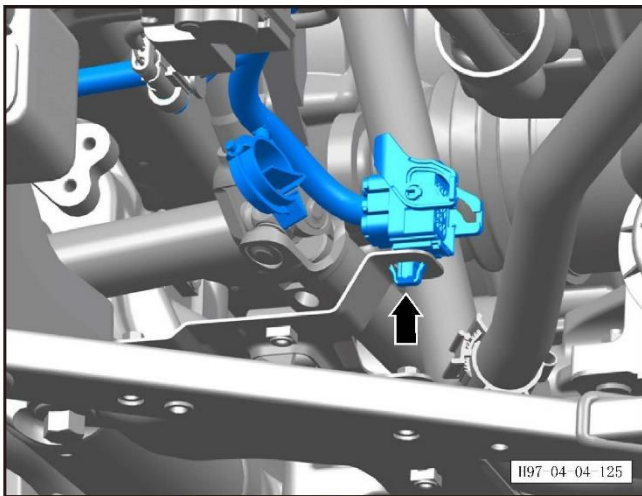
Refitting procedure

The refitting procedure is performed in reverse order.

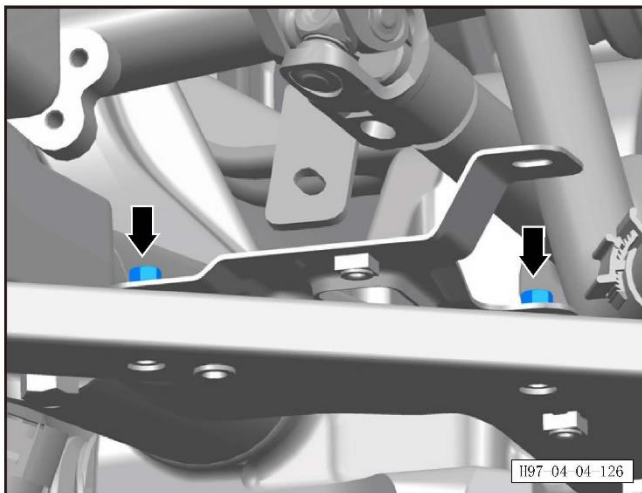
4.4.8.34 Removal and refitting of three-way proportional valve mounting bracket

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the 3-way proportional valve mounting bracket.

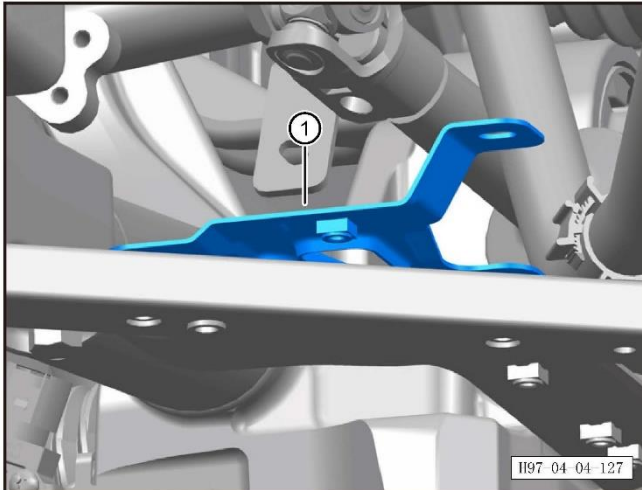


- a. Disconnect the harness connector clip on the three-way proportional valve mounting bracket.



- b. Remove the 2 bolts on the 3-way proportional valve mounting bracket.

Tightening torque of bolt: $10 \pm 1 \text{ Nm}$.



c. Take out the 3-way proportional valve mounting bracket ①.

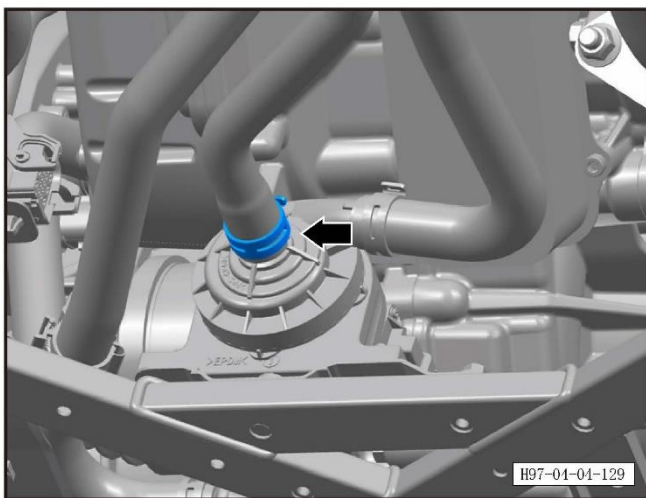
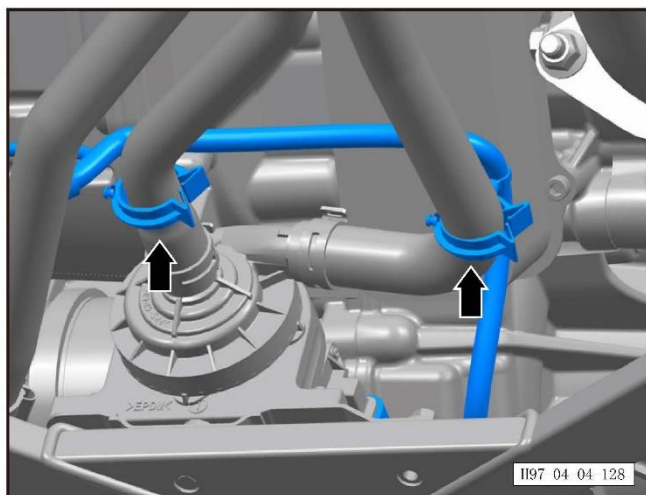
Refitting procedure

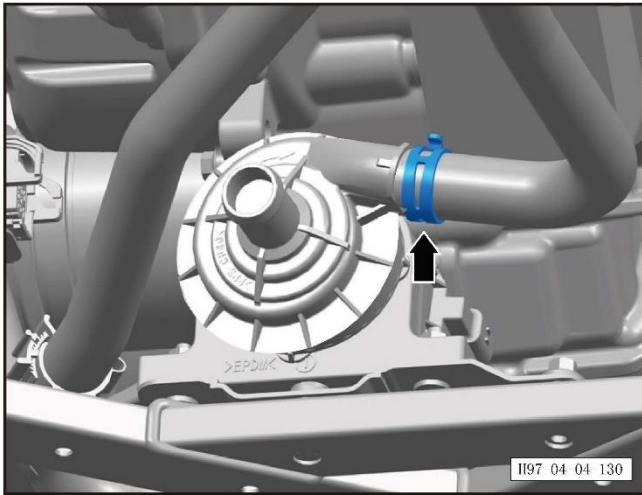
The refitting procedure is performed in reverse order.

4.4.8.35 Removal and refitting of water pump assembly

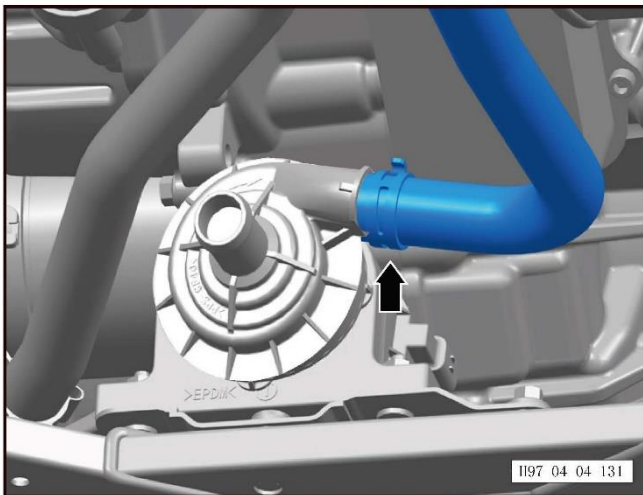
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump assembly.
 - a. Disconnect the 2 harness clips connecting the water pump hose.
 - b. Disconnect 1 clamp on the water pump hose.

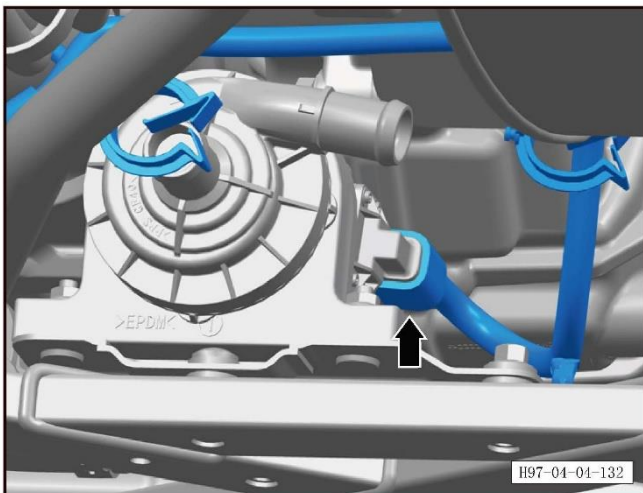




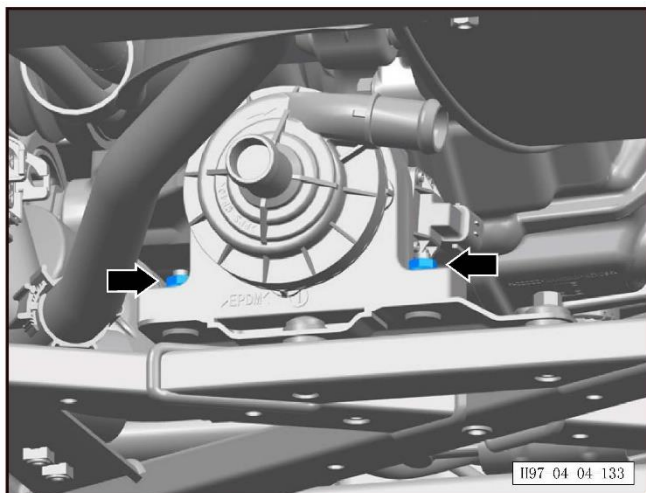
c. Disconnect 1 clamp on the water pump hose.



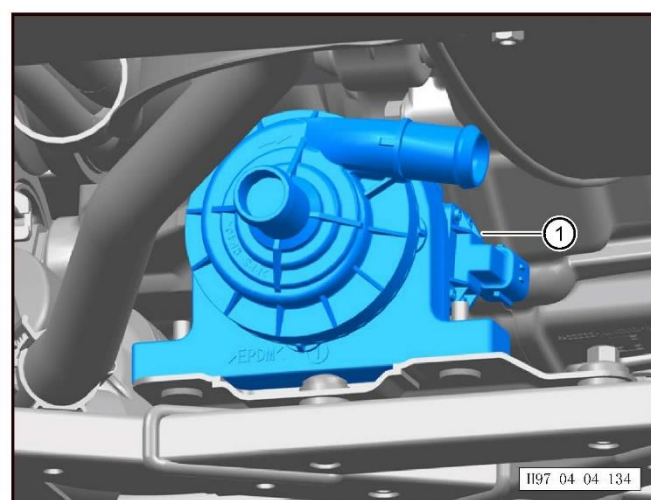
d. Disconnect the water pump connecting hose.



e. Disconnect 1 connector on the water pump.



f. Unscrew 2 bolts on the water pump.
Tightening torque of bolt: $10\pm 1\text{Nm}$.



g. Take out the water pump assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

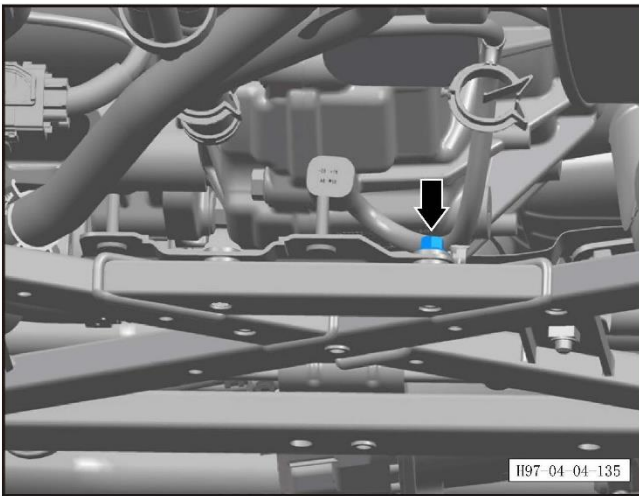
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.36 Removal and refitting of electronic water pump right mounting bracket

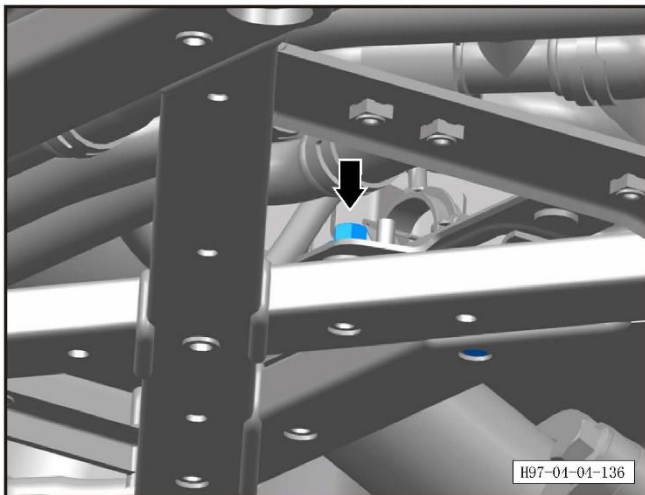
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the electronic water pump right mounting bracket.



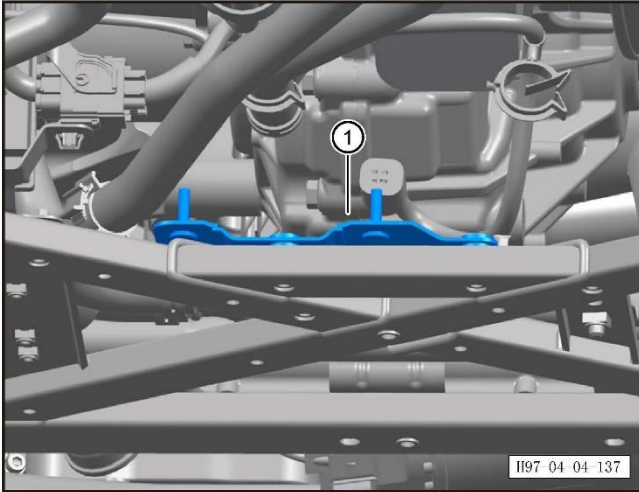
- a. Unscrew 1 bolt on the electronic water pump right mounting bracket.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



- b. Unscrew 1 bolt on the electronic water pump right mounting bracket.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



c. Take out the electronic water pump right mounting bracket ①.

Refitting procedure

The refitting procedure is performed in reverse order.

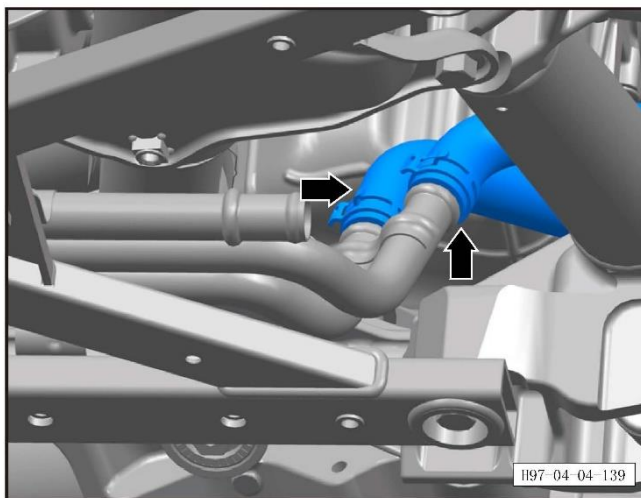
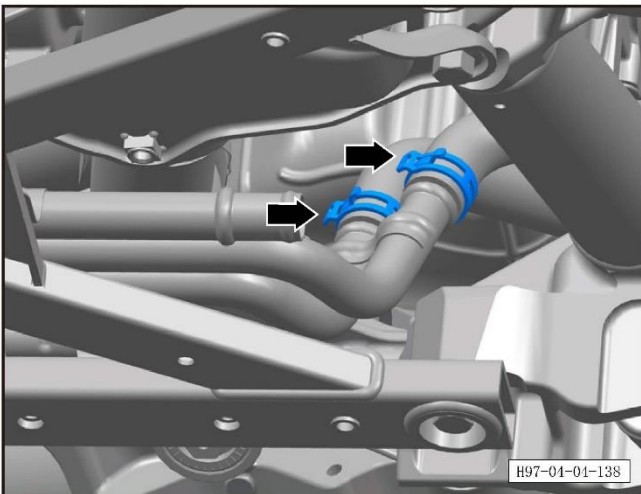
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

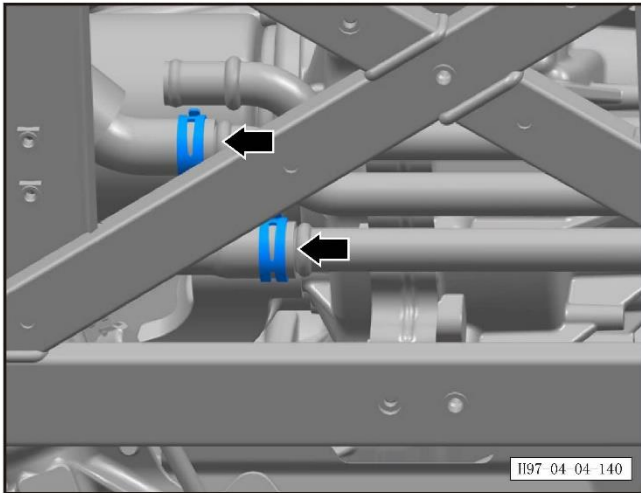
4.4.8.37 Removal and refitting of water pipe assembly

Removal procedure

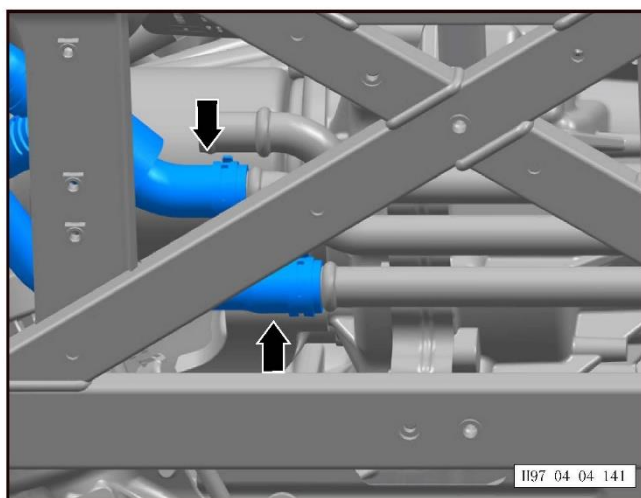
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the radiator bracket assembly.
 - a. Disconnect 2 pipe clamps on the water pipe assembly.



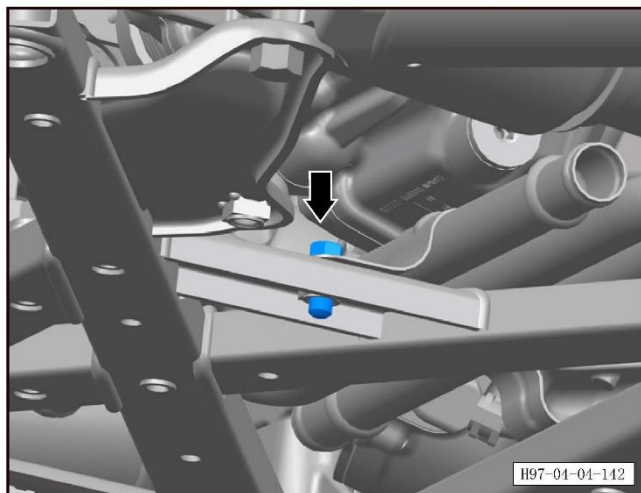
- b. Disconnect 2 hoses connecting the water pipe assembly.



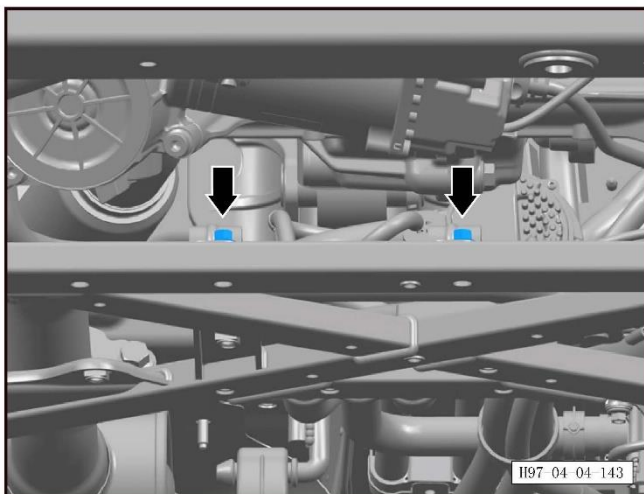
c. Disconnect 2 pipe clamps on the water pipe assembly.



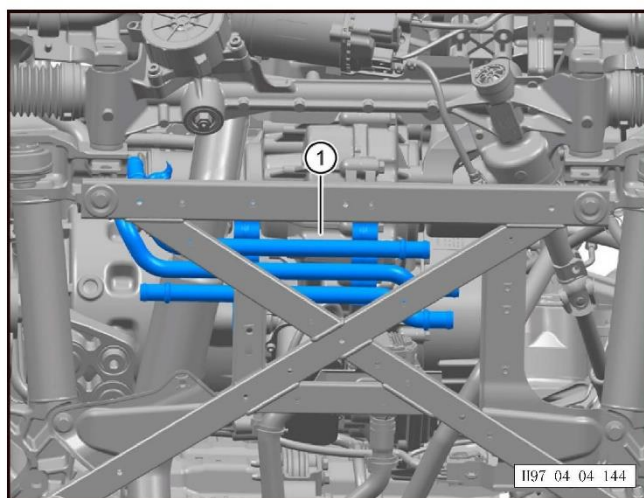
d. Disconnect 2 hoses connecting the water pipe assembly.



e. Unscrew 1 bolt on the water pipe assembly.
Tightening torque of bolt: $10\pm 1\text{Nm}$.



f. Unscrew 2 bolts on the water pipe assembly.
Tightening torque of bolt: $10\pm 1\text{Nm}$.



g. Take out the water pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

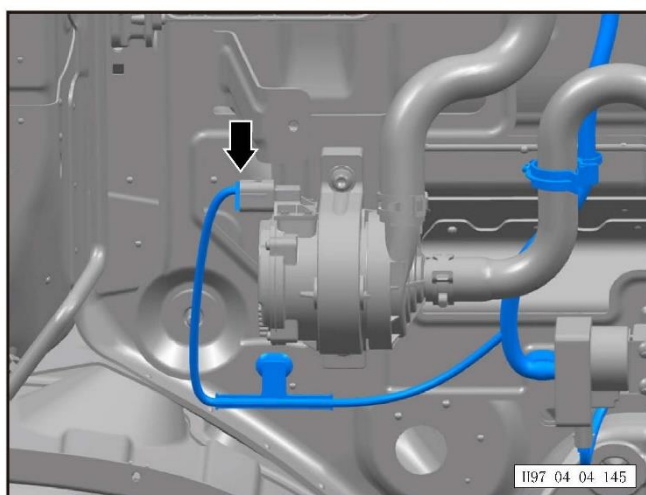
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.38 Removal and refitting of water pump assembly

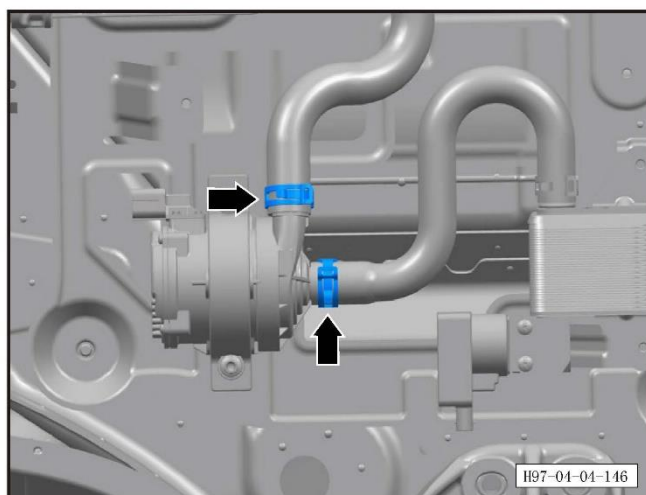
Removal procedure

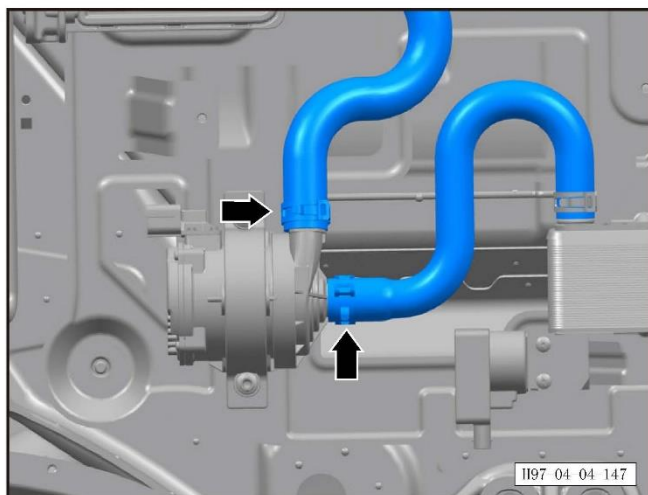
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump assembly.

a. Disconnect 1 connector on the water pump assembly.



b. Disconnect 2 clamps on the water pump assembly connecting hose.

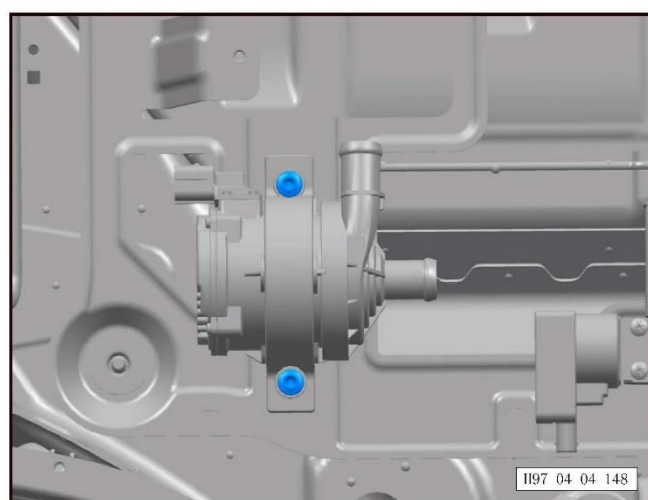




c. Disconnect 2 hoses connecting the water pump assembly.

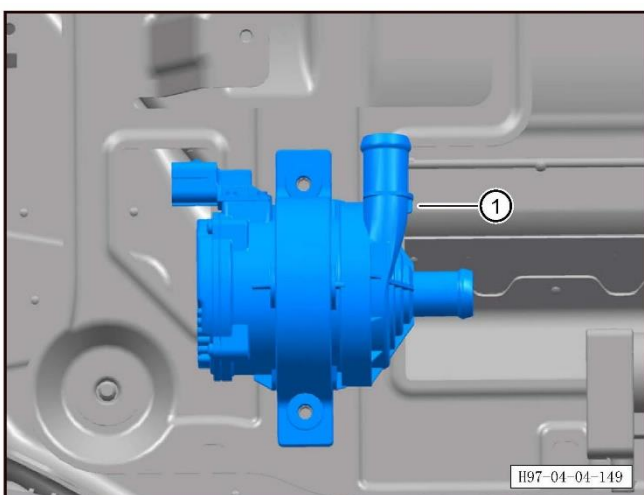
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



d. Unscrew 2 bolts on the water pump assembly.

Tightening torque of bolt: $8\pm 1\text{Nm}$.



e. Take out the water pump assembly ①.

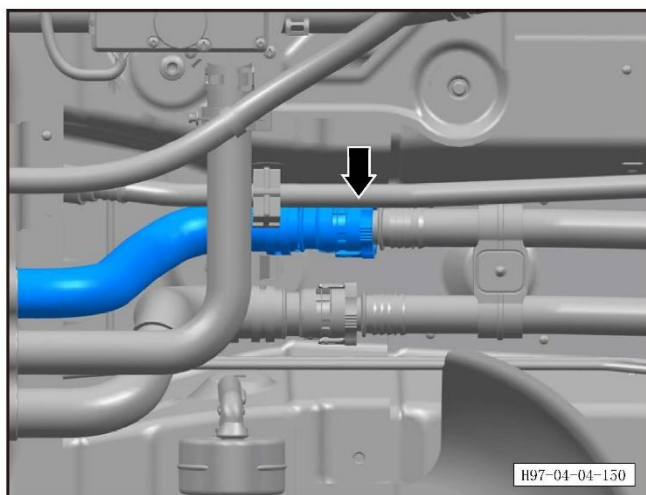
Refitting procedure

The refitting procedure is performed in reverse order.

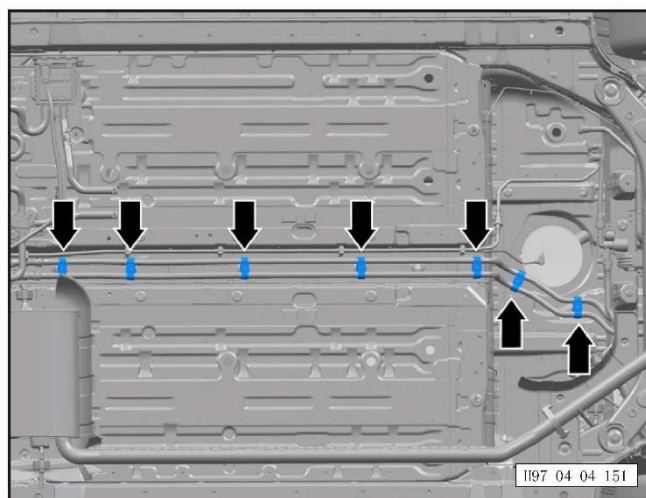
4.4.8.39 Removal and refitting of middle channel water outlet pipe

Removal procedure

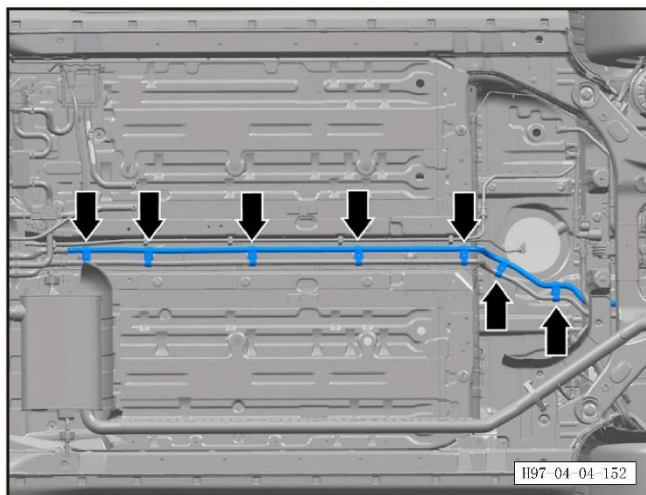
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the middle channel water outlet pipe.



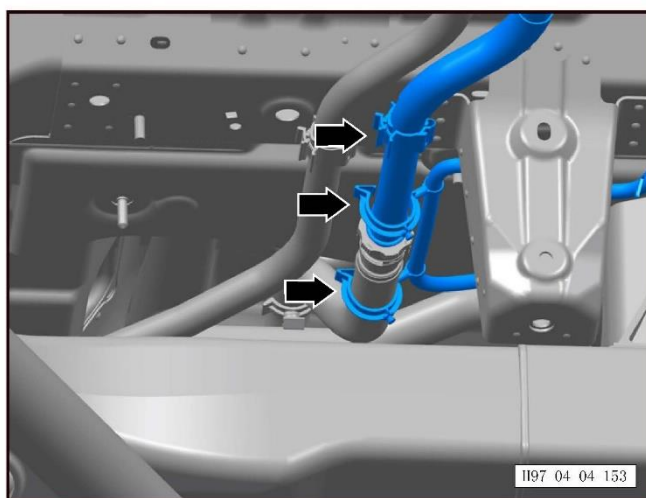
- a. Disconnect 1 clip of the middle channel water outlet pipe.



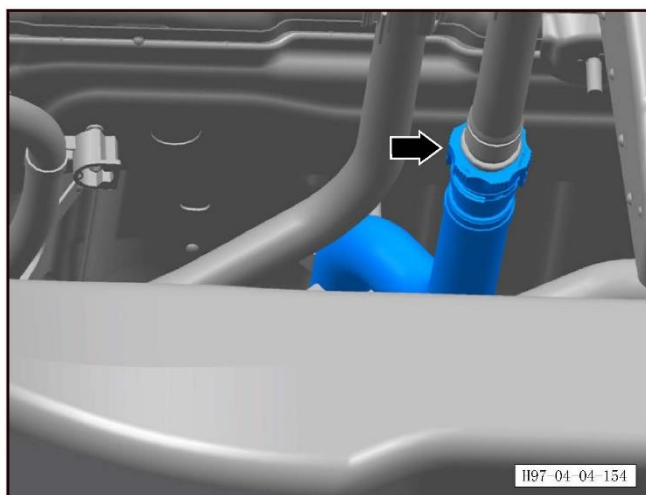
- b. Unscrew the 7 bolts connecting the middle channel water outlet pipe clamp to the underbody.



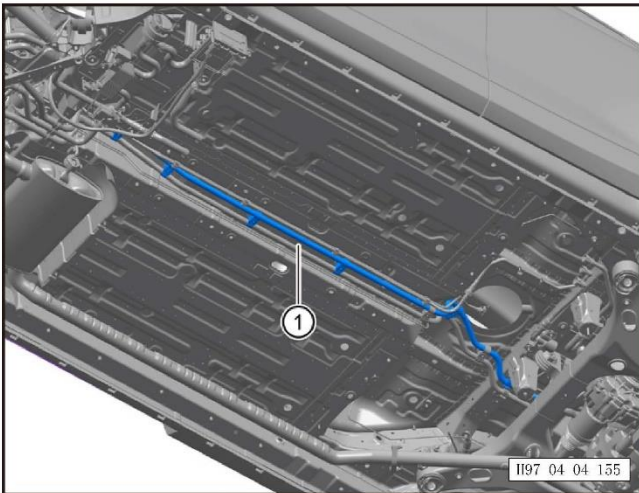
c. Disconnect the middle channel water outlet pipe from the 7 pipe clamps.



d. Disconnect the 2 connecting pipe clamps of the middle channel water outlet pipe to the harness pipe clamp.



e. Disconnect 1 clip connecting the middle channel water outlet pipe to the rear motor water outlet hose.



f. Take out the middle channel water outlet pipe ①.

Refitting procedure

The refitting procedure is performed in reverse order.

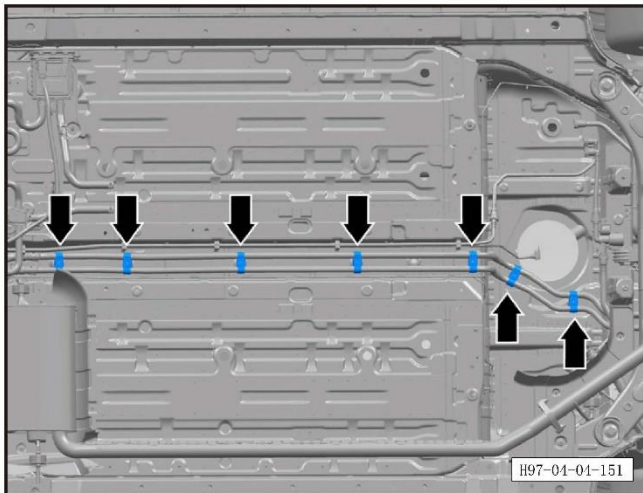
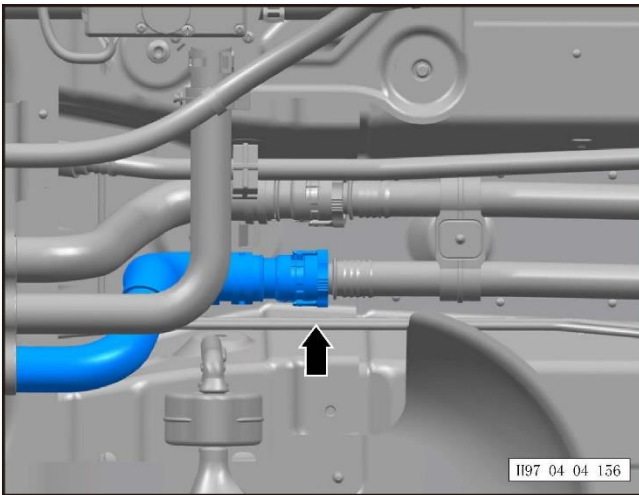
CAUTION:

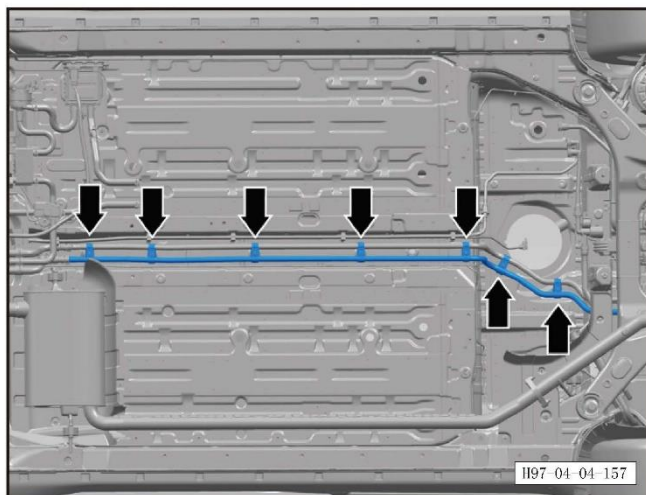
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.40 Removal and refitting of middle channel water inlet pipe

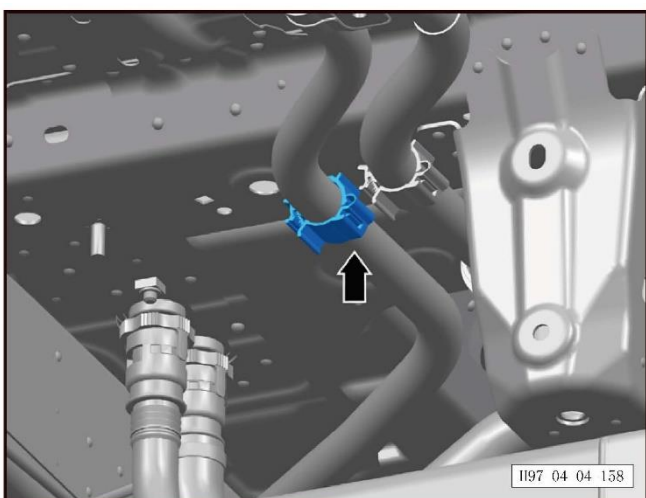
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the middle channel water inlet pipe.
 - a. Disconnect 1 clip connecting the middle channel water inlet pipe to the water pump outlet hose.
 - b. Unscrew the 7 bolts connecting the middle channel water inlet pipe clamp to the underbody.

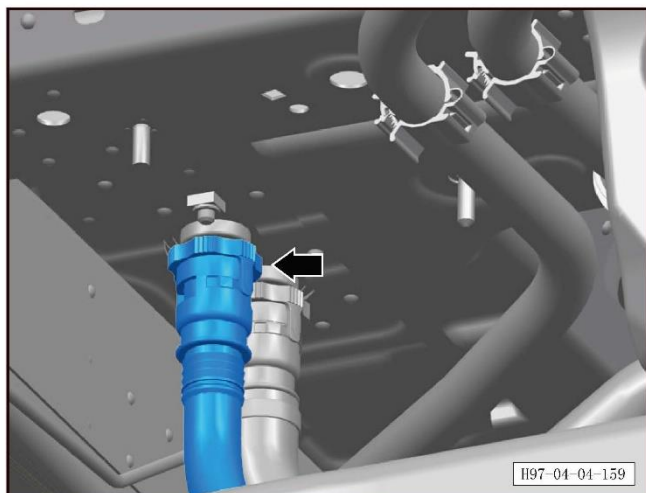




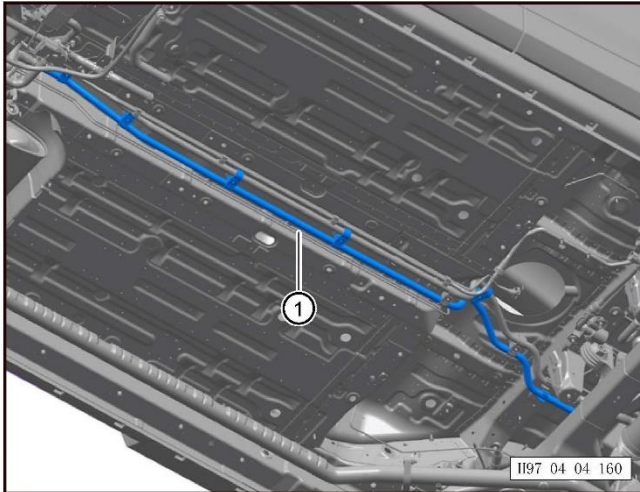
c. Disconnect 7 clips on the middle channel water inlet pipe.



d. Disconnect 1 pipe clamp connecting the middle channel water inlet pipe to the body.



e. Disconnect 1 clip connecting the middle channel water inlet pipe to the charger water pipe assembly.



f. Take out the middle channel water inlet pipe ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.41 Removal and refitting of rear motor water outlet hose

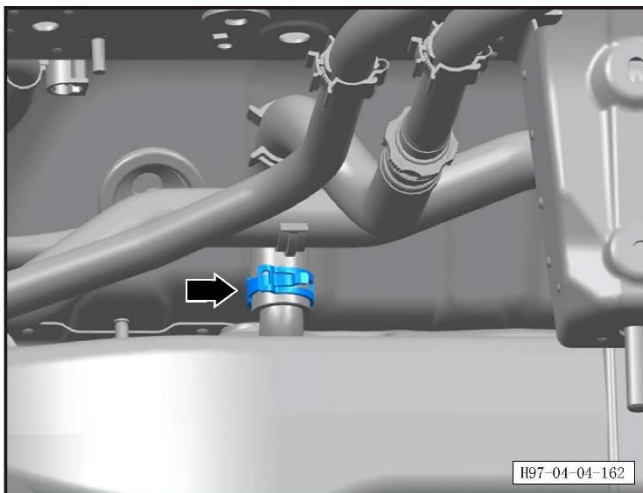
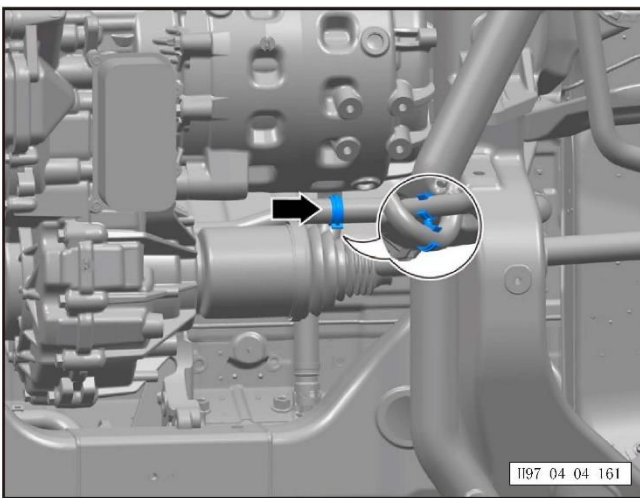
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the rear lower protective plate.
4. Disconnect the battery negative terminal.
5. Remove the rear drive motor assembly (refer to [5.2.4.1 Removal and refitting of rear drive motor assembly](#))
6. Remove the rear motor water outlet hose.

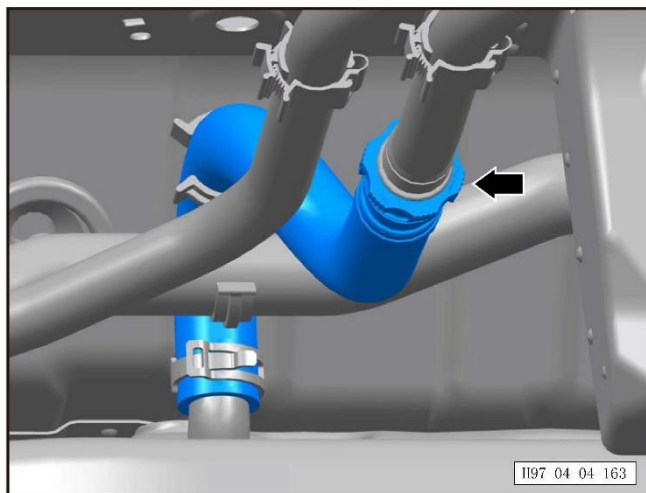
- a. Disconnect 1 clamp connecting the rear motor water outlet hose to the rear motor water inlet hose.

Note:

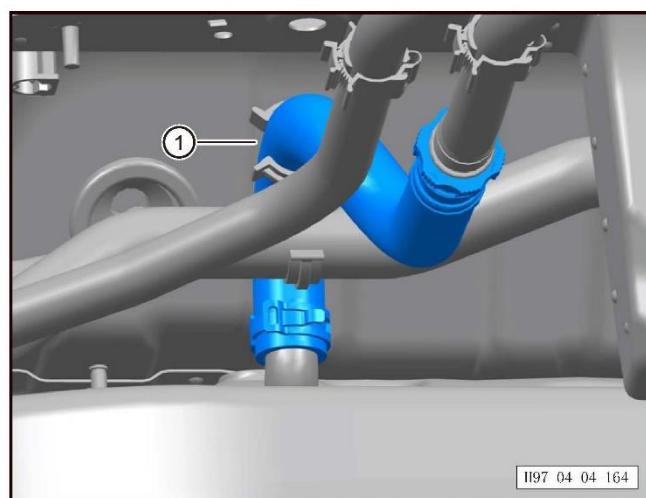
- The rear motor water outlet hose can be disconnected when the rear drive motor assembly and the rear suspension assembly are removed and lowered together.



- b. Disconnect 1 clamp of the rear motor water outlet hose.



c. Disconnect 1 pipe clamp connecting the middle channel water outlet hose to the middle channel water outlet pipe.



d. Take out the rear motor water outlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.42 Removal and refitting of rear motor water inlet hose

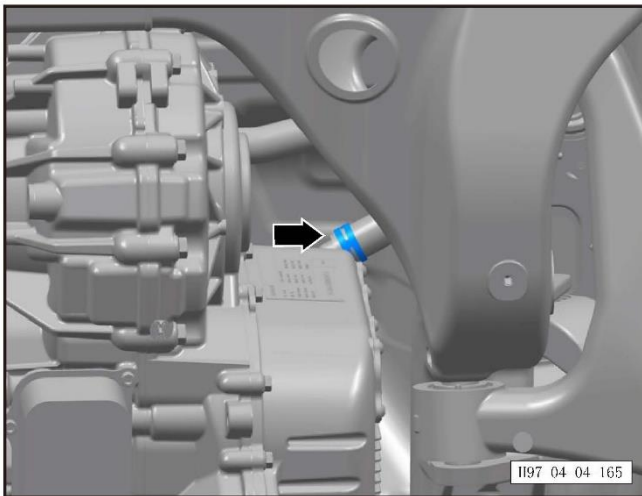
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the rear lower protective plate.
4. Disconnect the battery negative terminal.
5. Remove the rear drive motor assembly (refer to [5.2.4.1 Removal and refitting of rear drive motor assembly](#))
6. Remove the rear motor water inlet hose.

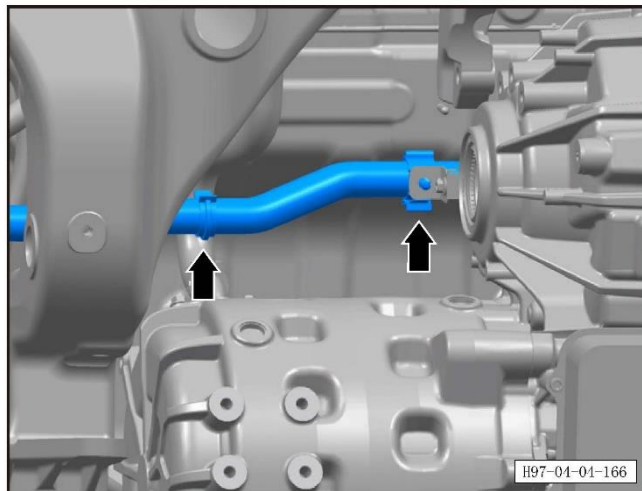
- a. Disconnect 1 clamp and hose on the rear motor water inlet hose.

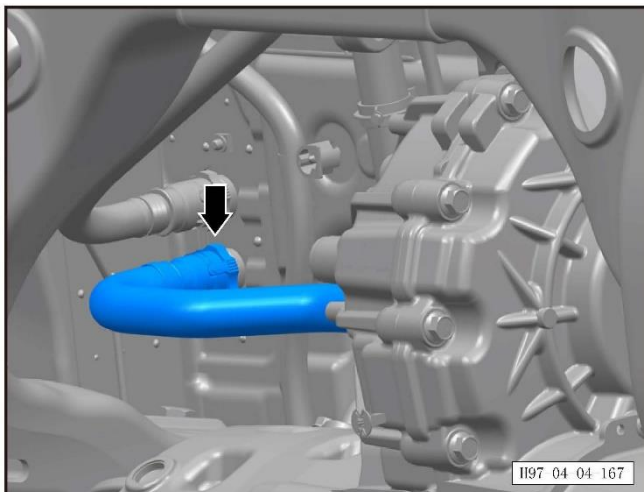
Note:

- The rear motor water outlet hose can be disconnected when the rear drive motor assembly and the rear suspension assembly are removed and lowered together.

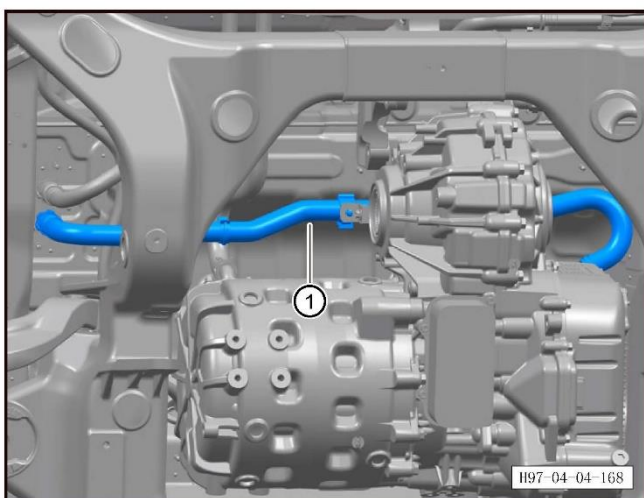


- b. Disconnect 2 pipe clamps on the rear motor water inlet hose.





c. Disconnect 1 pipe clamp connecting the rear motor water inlet hose to the charger water pipe assembly.



d. Take out the rear motor water inlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

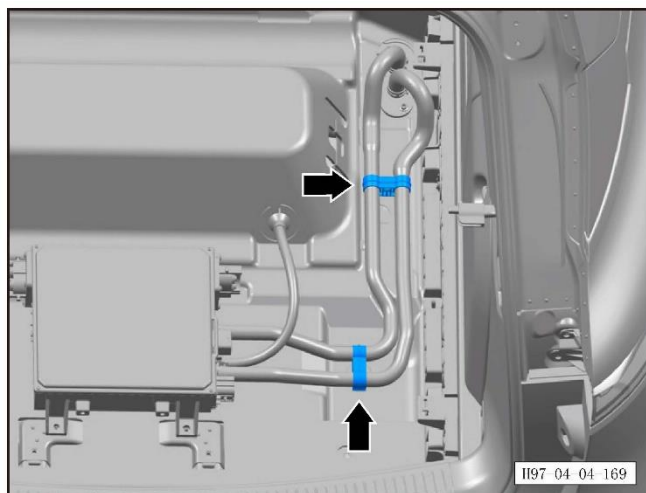
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.43 Removal and refitting of charger water pipe assembly

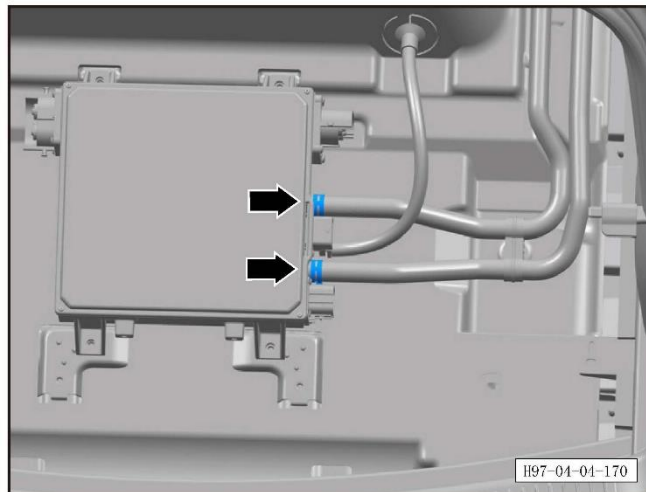
Removal procedure

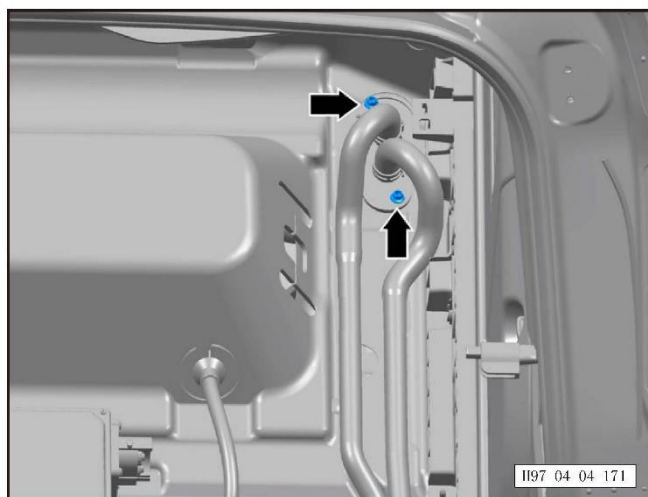
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the charger water pipe assembly.

a. Disconnect 2 pipe clamps on the charger water pipe assembly.

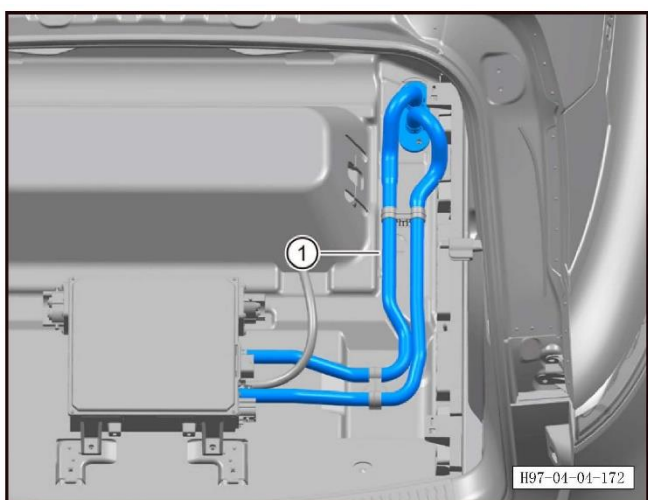


b. Disconnect 2 pipe clamps connecting the charger water pipe assembly to the charger.





c. Unscrew 2 bolts on the charger water pipe assembly.



d. Take out the charger water pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

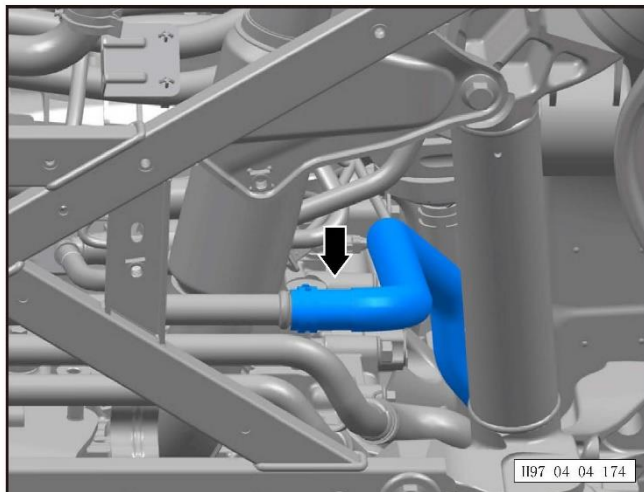
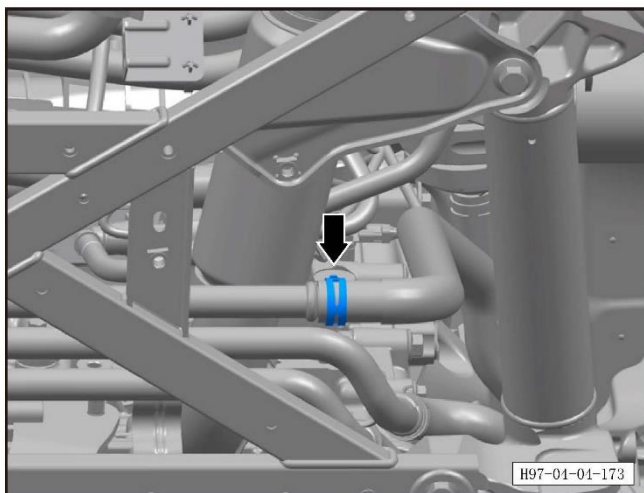
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

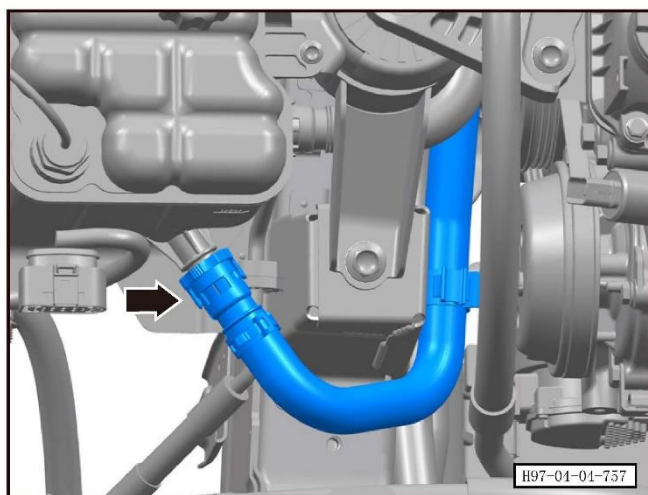
4.4.8.44 Removal and refitting of water bottle outlet hose (REV)

Removal procedure

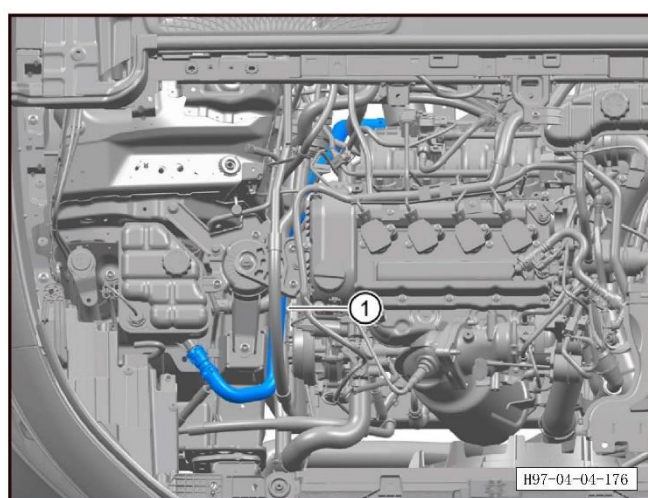
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water bottle outlet hose.
 - a. Disconnect 1 clamp on the water bottle outlet hose.



- b. Disconnect the water bottle outlet hose.



c. Disconnect the connection pipe clamp of the water bottle outlet hose.



d. Take out the water bottle outlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

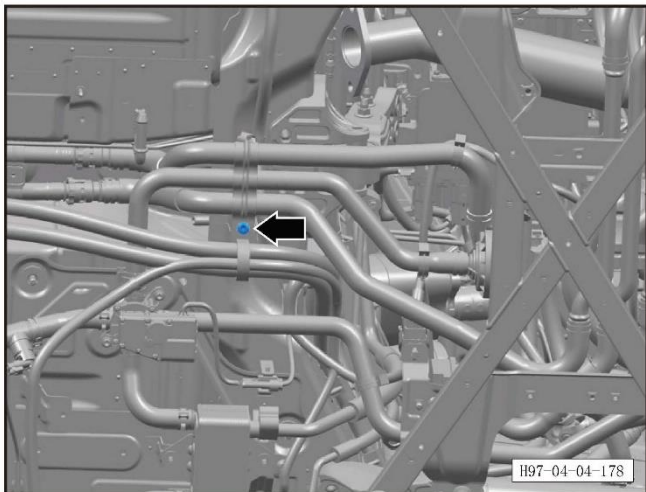
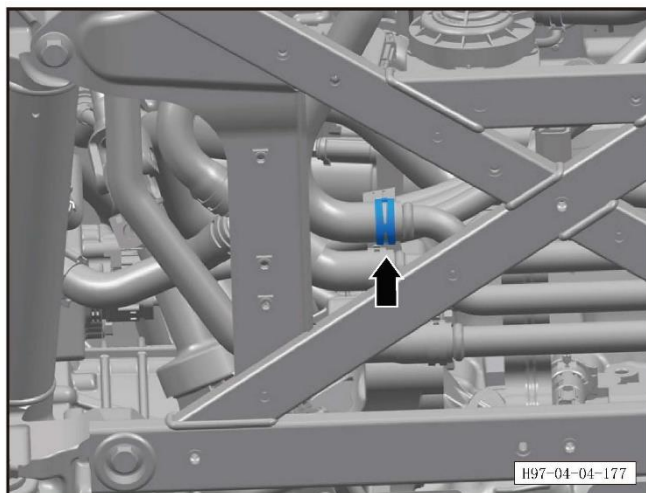
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

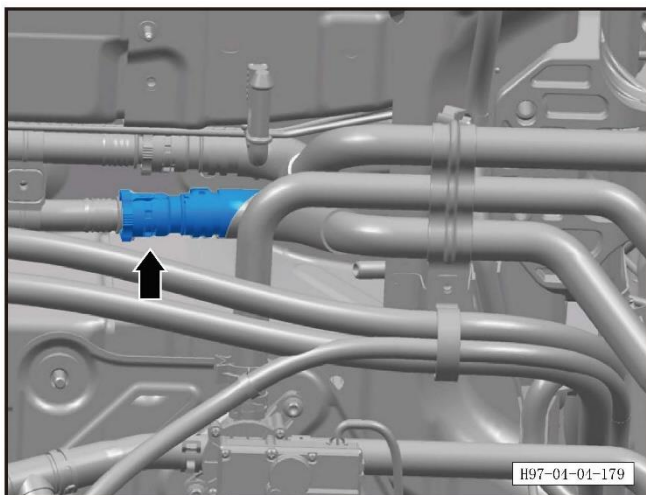
4.4.8.45 Removal and refitting of middle channel water outlet hose

Removal procedure

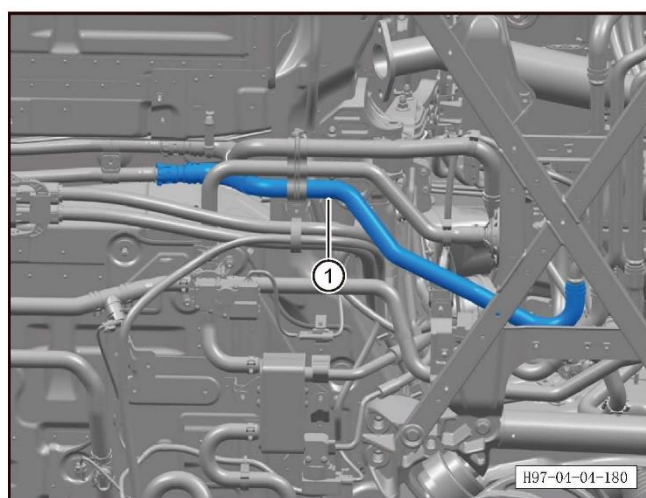
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the middle channel water outlet hose.
 - a. Disconnect 1 clamp on the middle channel water outlet hose.



- b. Remove 1 bolt from the middle channel water outlet hose fixing bracket.



c. Disconnect the clip of the middle channel water outlet hose.



d. Take out the middle channel water outlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.46 Removal and refitting of heater water return pipe assembly

Removal procedure

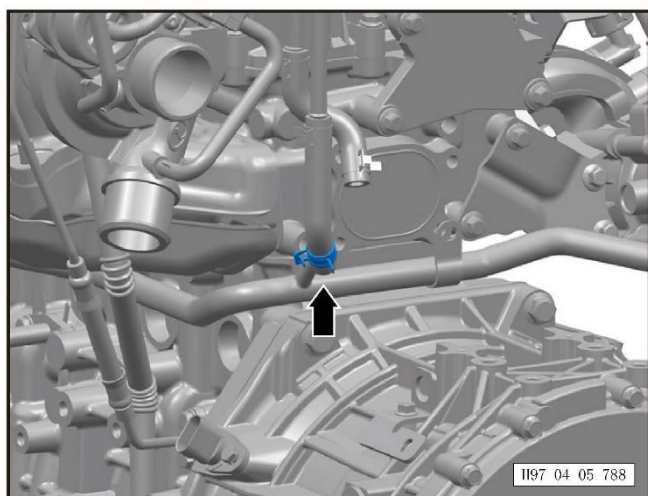
1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))

2. Remove the heater water return pipe assembly.

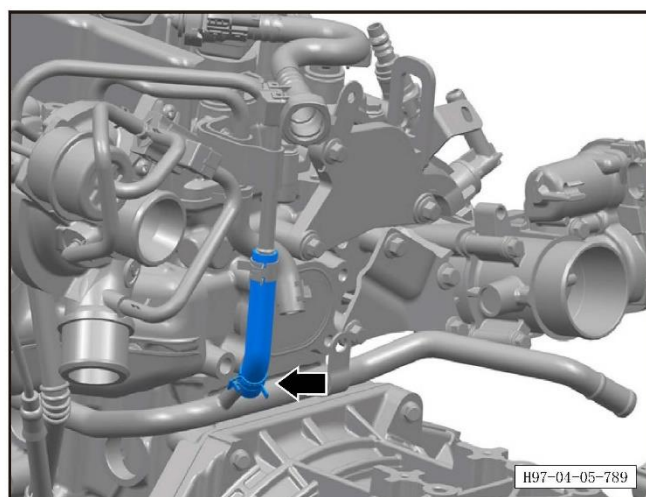
CAUTION:

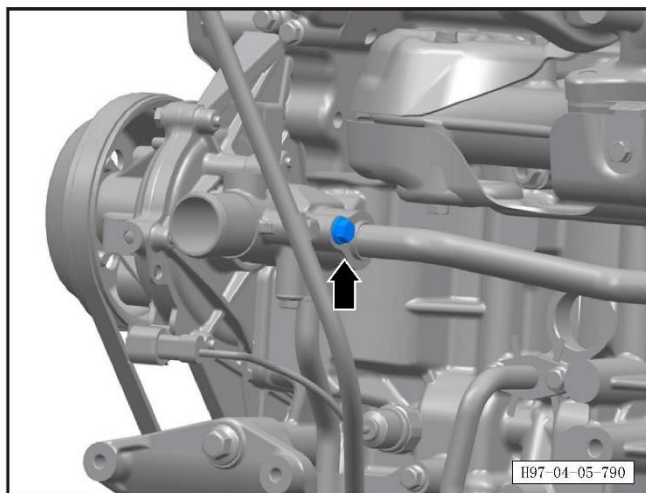
- Before removing the range extender assembly, it is necessary to drain the two lubricating oils of the range extender and the generator.

a. Disconnect 1 pipe clamp on the heater water return pipe assembly.



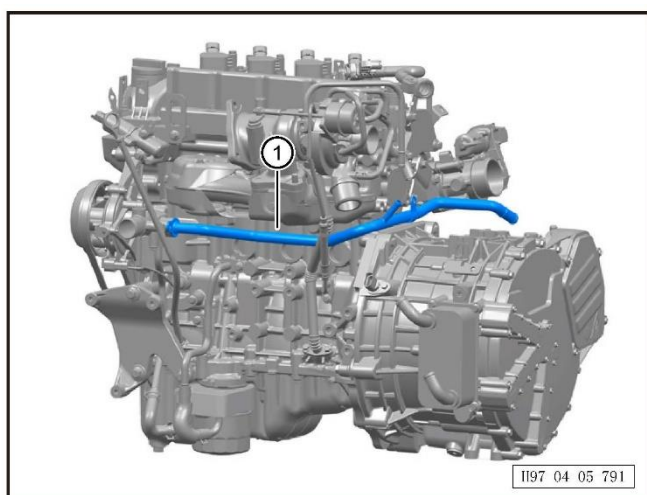
b. Disconnect 1 pipe clamp on the heater water return pipe assembly.





c. Remove 1 fixing bolt connecting the range extender to the heater water return pipe assembly.

Tightening torque of bolt: $15\pm 2\text{Nm}$.



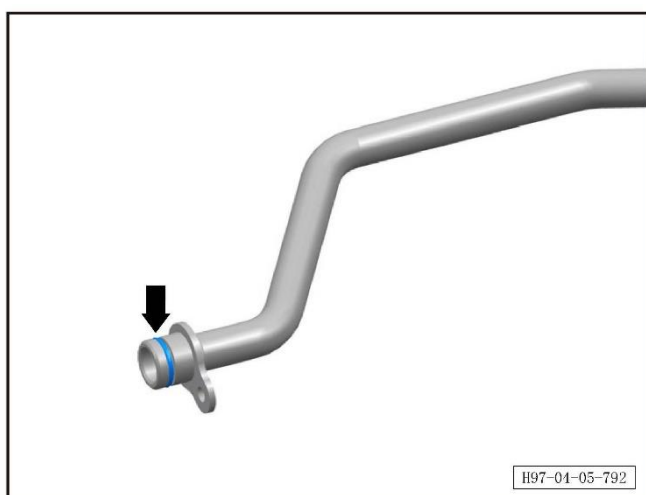
d. Take out the heater water return pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- When refitting the heater water return pipe assembly, the seal rings need to be replaced with new ones.



4.4.8.47 Removal and refitting of range extender controller water inlet hose

Removal procedure

CAUTION!

- Wait for the coolant temperature to drop below 60 °C before performing service operations.

- Before removing the water inlet hose, it is necessary to open the water bottle cap first for pressure relief.

- After the servicing operation is completed, it is necessary to add coolant to the specified level.

1. Turn off all electrical appliances and turn off the start switch.

2. Open the engine hood.

3. Remove the engine compartment trim panel.

4. Disconnect the battery negative terminal.

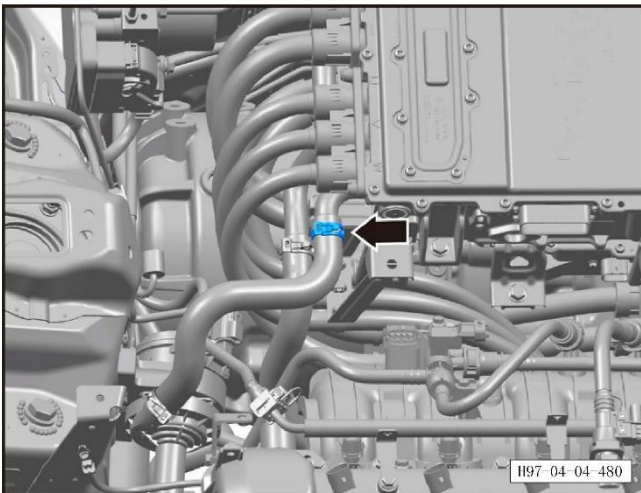
5. Open the water bottle cap for pressure relief.

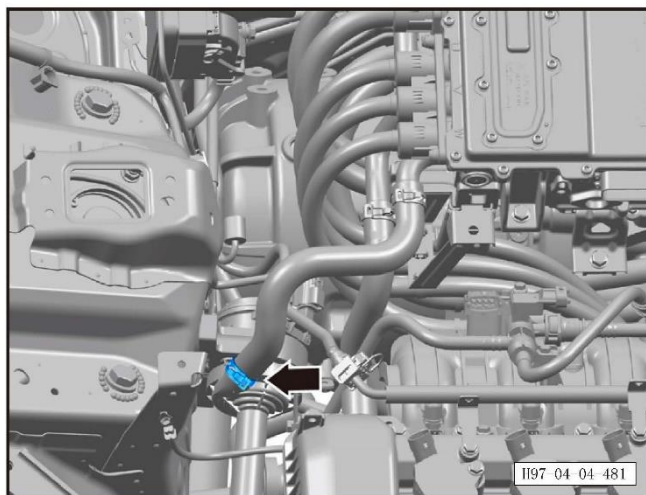
6. Remove the range extender controller water inlet hose.

a. Disconnect the water inlet hose clamp on the range extender controller.

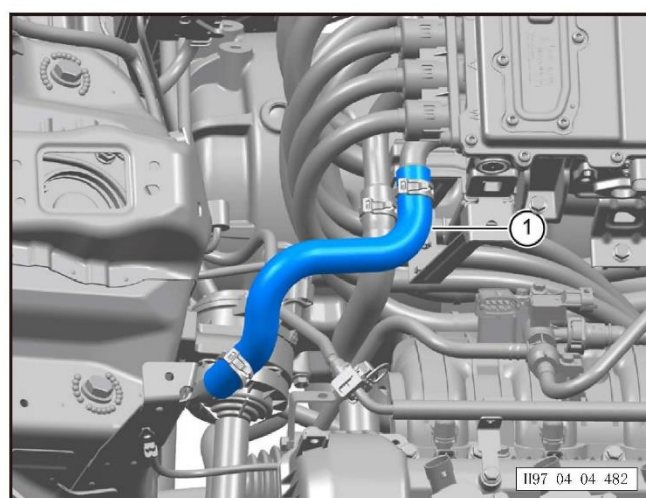
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.





b. Disconnect 1 clamp connecting the range extender controller water inlet hose to the electric water pump.



c. Take out the range extender controller water inlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION!

- After the servicing operation is completed, it is necessary to add coolant to the specified level.

4.4.8.48 Removal and refitting of range extender controller water outlet hose

Removal procedure

CAUTION!

- Wait for the coolant temperature to drop below 60 °C before performing service operations.

- Before removing the water outlet hose, it is necessary to open the water bottle cap first for pressure relief.

- After the servicing operation is completed, it is necessary to add coolant to the specified level.

1. Turn off all electrical appliances and turn off the start switch.

2. Open the engine hood.

3. Remove the engine compartment trim panel.

4. Disconnect the battery negative terminal.

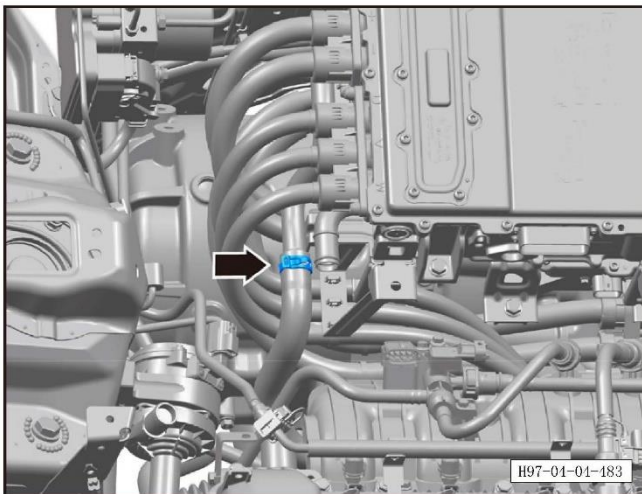
5. Open the water bottle cap for pressure relief.

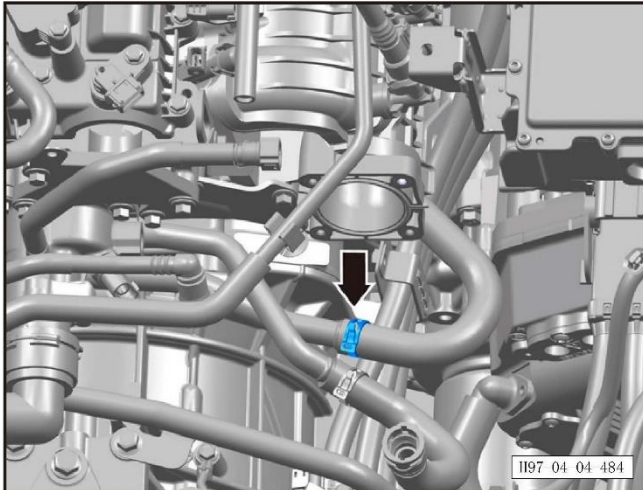
6. Remove the range extender controller water outlet hose.

a. Disconnect the water outlet hose clamp on the range extender controller.

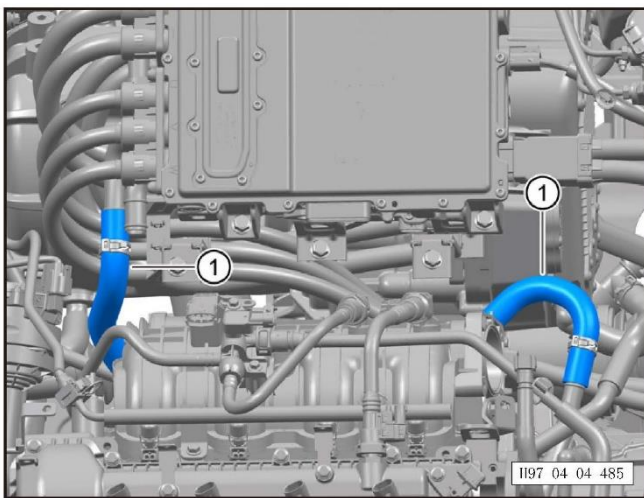
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.





b. Disconnect the clamp connecting the range extender controller water inlet hose to the cooler metal water inlet pipe assembly.



c. Take out the range extender controller water outlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION!

- After the servicing operation is completed, it is necessary to add coolant to the specified level.

4.4.8.49 Removal and refitting of middle channel water pipe (right)

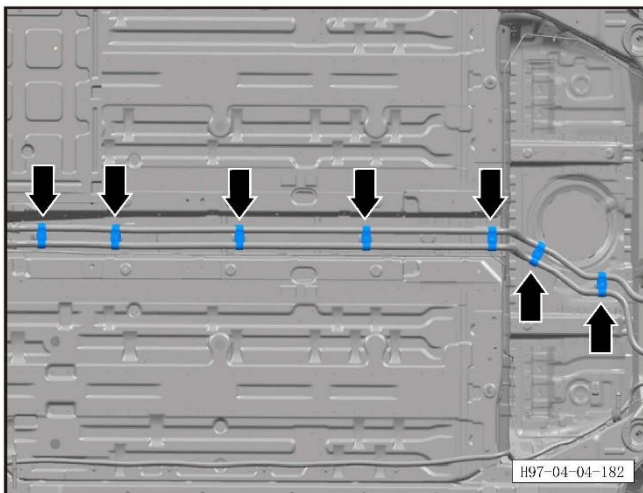
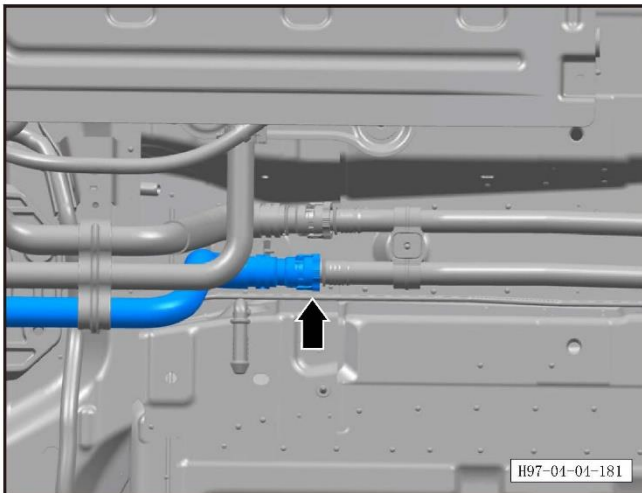
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the middle channel water pipe (right).

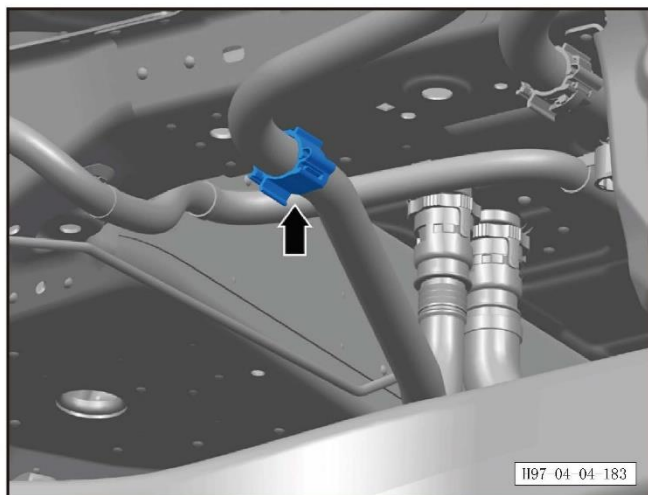
- a. Disconnect the clip of the middle channel water pipe (right).

CAUTION:

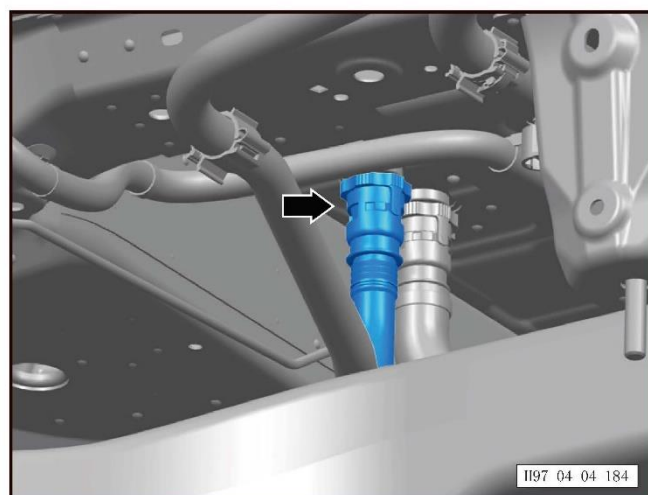
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



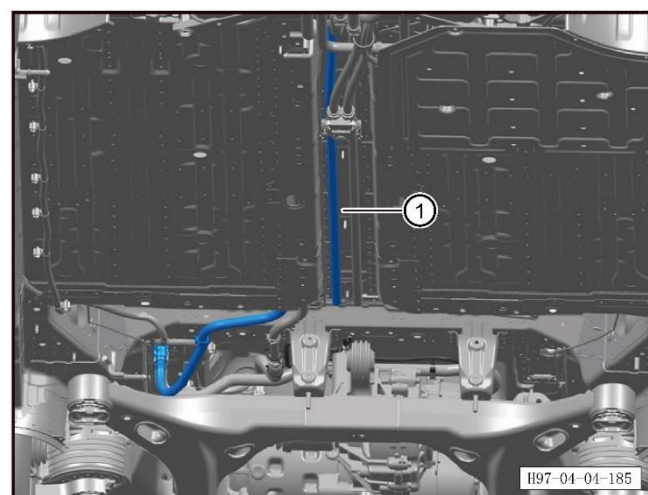
- b. Disconnect 7 pipe clamps fixing the middle channel water pipe (right) on the body chassis.



c. Disconnect 1 pipe clamp connecting the middle channel water pipe (right) to the body.



d. Disconnect 1 clip connecting the middle channel water pipe (right) to the charger water pipe assembly.



e. Take out the middle channel water pipe (right) ①.

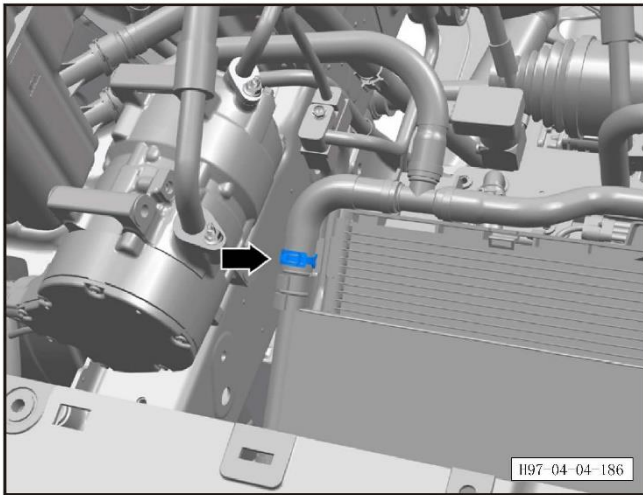
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.50 Removal and refitting of low temperature radiator water inlet pipe assembly

Removal procedure

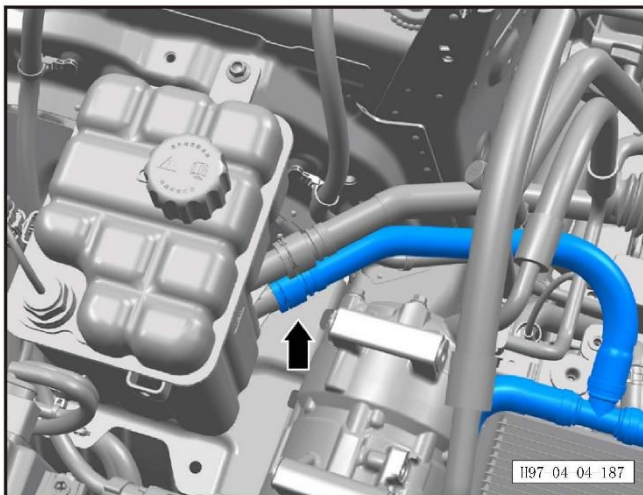
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the low temperature radiator water inlet pipe assembly.



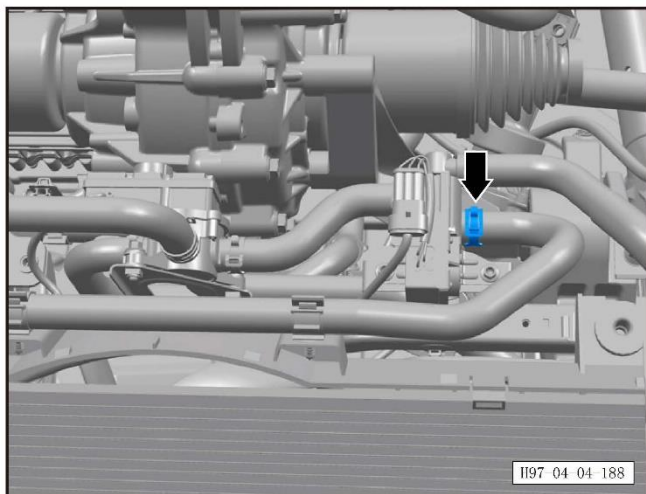
- a. Disconnect 1 clamp connecting the low temperature radiator water inlet pipe assembly to the low temperature radiator.

CAUTION:

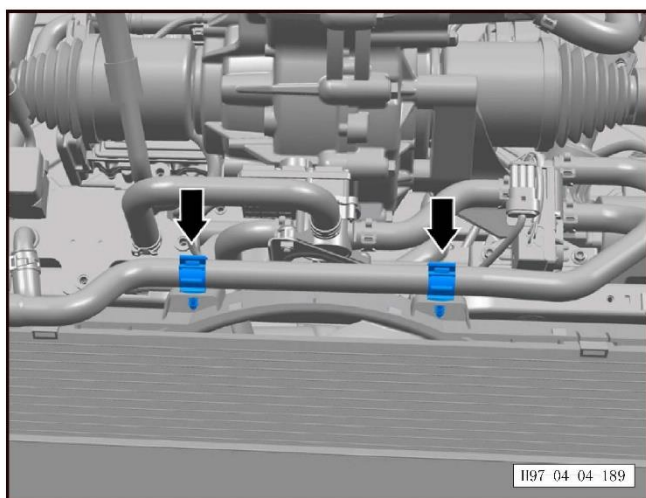
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



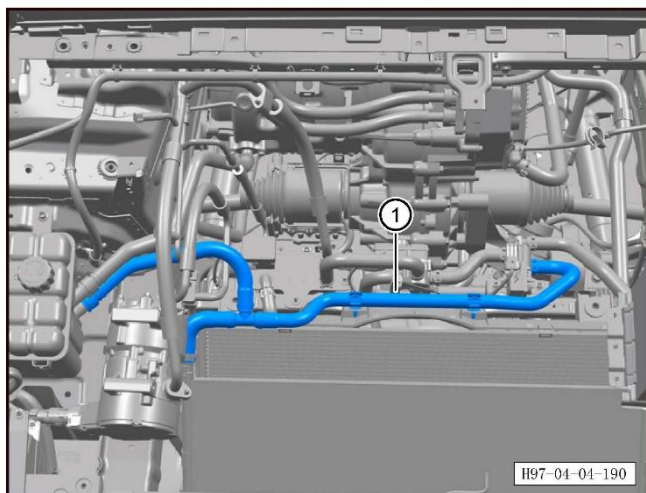
- b. Disconnect 1 pipe clamp connecting the low temperature radiator water inlet pipe assembly to the auxiliary water bottle assembly.



c. Disconnect 1 clamp connecting the low temperature radiator water inlet pipe assembly to the three-way proportional valve assembly.



d. Disconnect the 2 pipe clamps fixing the low temperature radiator water inlet pipe assembly.



e. Take out the low temperature radiator water inlet pipe assembly ①.

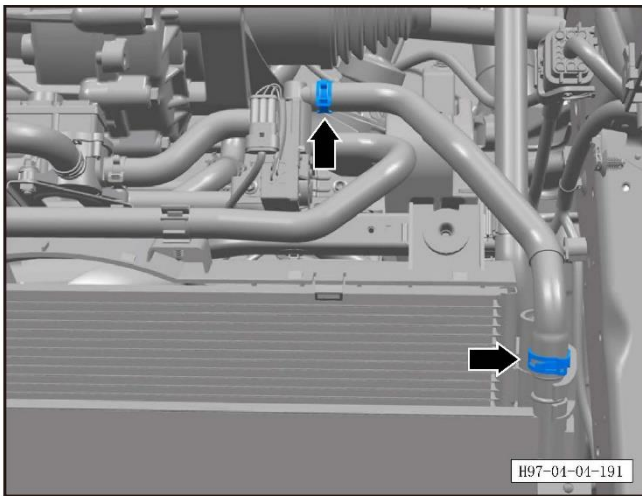
Refitting procedure

The refitting procedure is performed in reverse order.

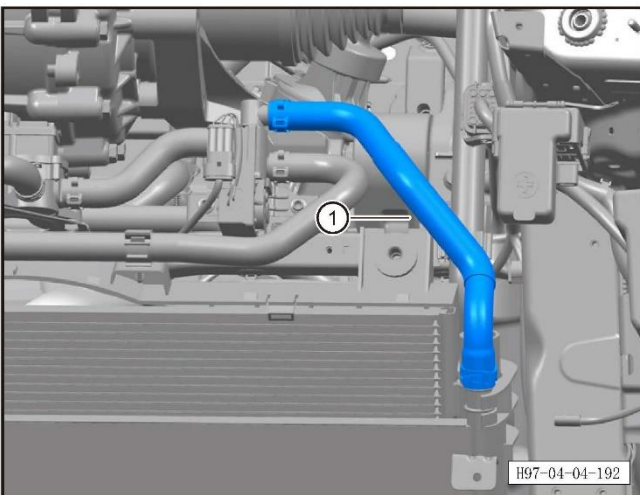
4.4.8.51 Removal and refitting of low temperature radiator water outlet pipe

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the low temperature radiator water outlet pipe.



- a. Disconnect 2 pipe clamps on the low temperature radiator water outlet pipe.



- b. Take out the low temperature radiator water outlet pipe ①.

Refitting procedure

The refitting procedure is performed in reverse order.

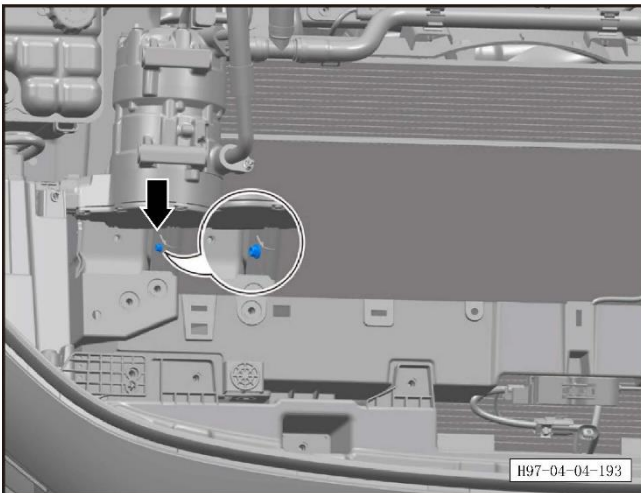
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.52 Removal and refitting of low temperature radiator

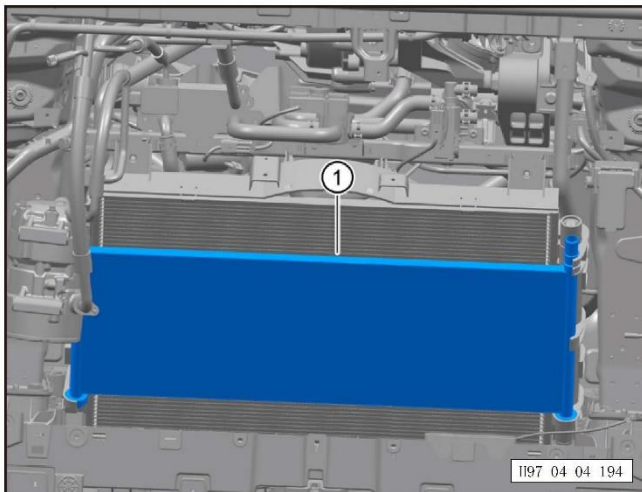
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the low temperature radiator.



- a. Remove 1 bolt on the side of the low temperature radiator.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



- b. Take out the low temperature radiator ①.

Refitting procedure

The refitting procedure is performed in reverse order.

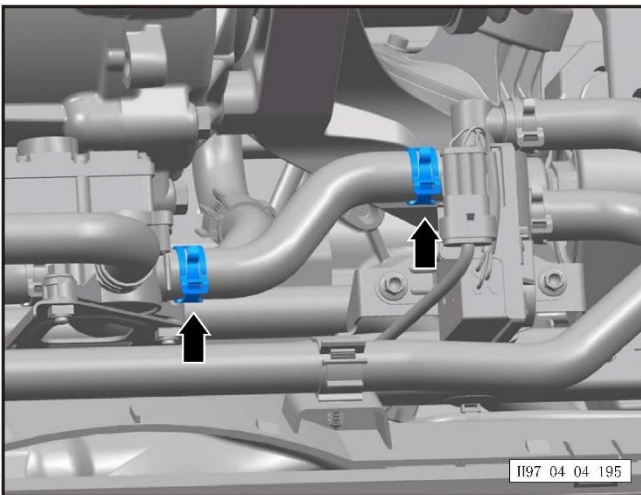
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

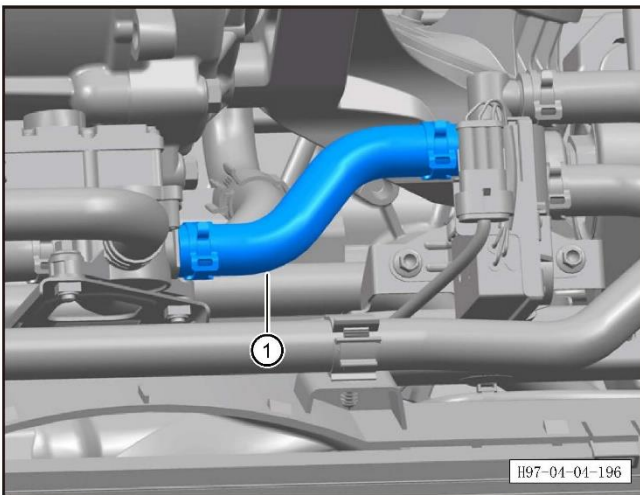
4.4.8.53 Removal and refitting of four-way control valve water pipe I

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the four-way control valve water pipe I .



- a. Disconnect the pipe clamps at both ends of the four-way control valve water pipe I .



- b. Take out the four-way control valve water pipe I ①.

Refitting procedure

The refitting procedure is performed in reverse order.

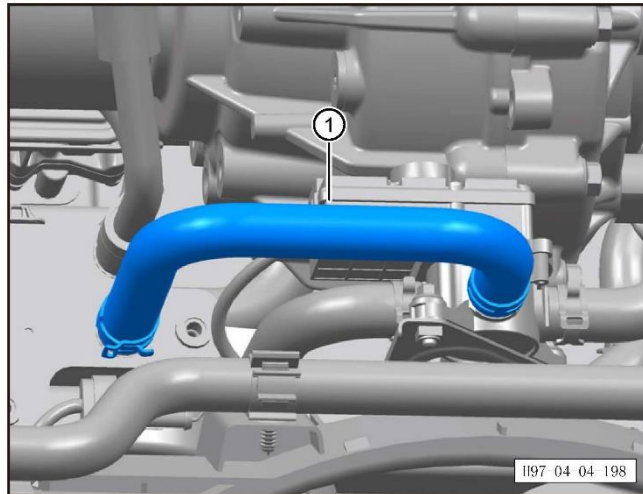
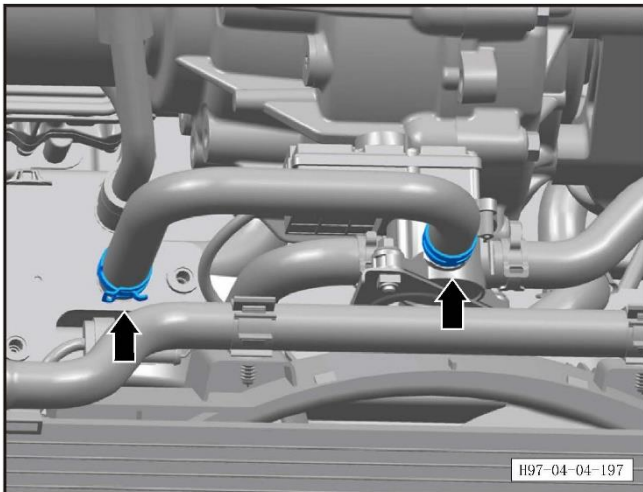
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.54 Removal and refitting of four-way control valve water pipe III

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the four-way control valve water pipe III.
 - a. Disconnect the pipe clamps at both ends of the four-way control valve water pipe III.



- b. Take out the four-way control valve water pipe III ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.55 Removal and refitting of generator radiator

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))

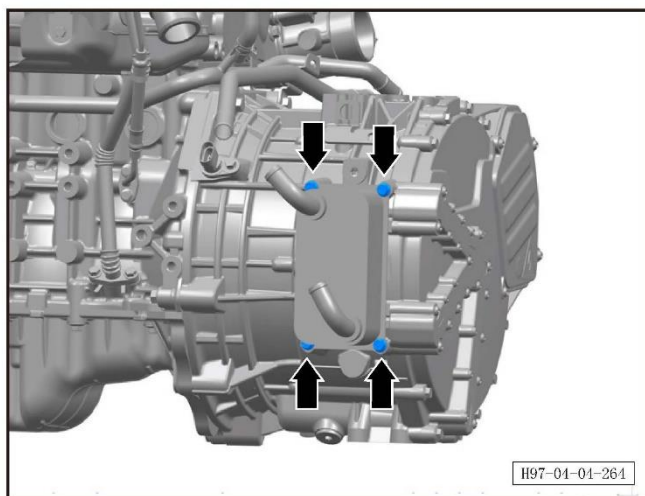
2. Remove the generator radiator.

CAUTION:

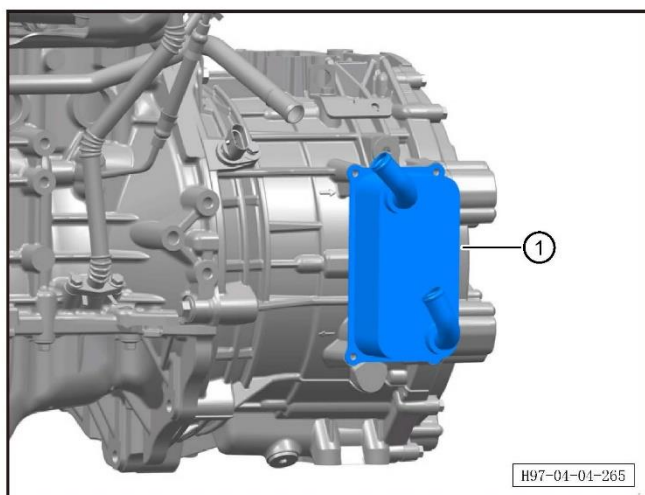
- Before removing the range extender assembly, it is necessary to drain the two lubricating oils of the range extender and the generator.

a. Remove 4 bolts on the generator radiator.

Tightening torque of bolt: $13\pm 2\text{Nm}$.

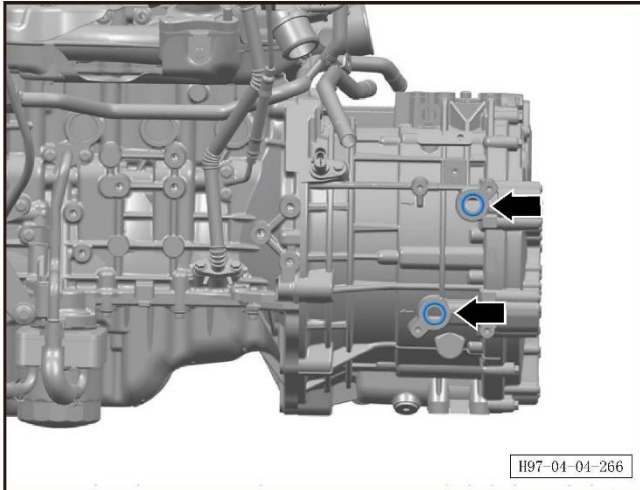


b. Take down the generator radiator ①.



Refitting procedure

The refitting procedure is performed in reverse order.

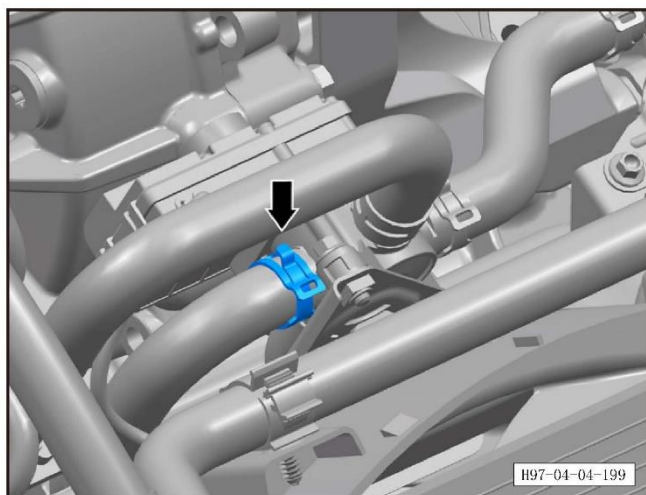
**CAUTION:**

- When refitting the generator radiator, the seal rings need to be replaced with new ones.

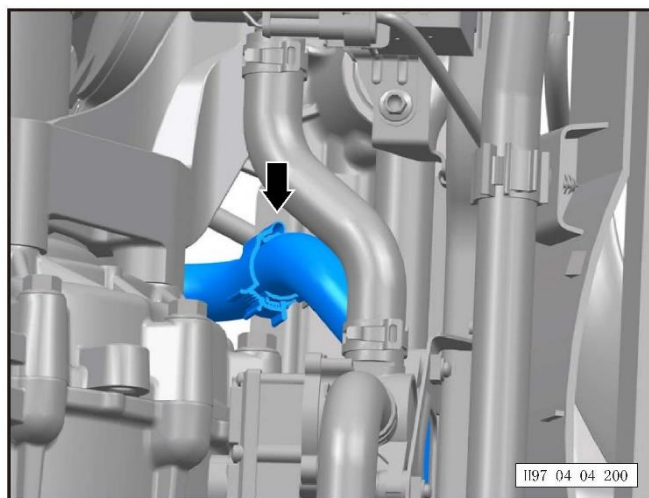
4.4.8.56 Removal and refitting of four-way control valve water pipe IV

Removal procedure

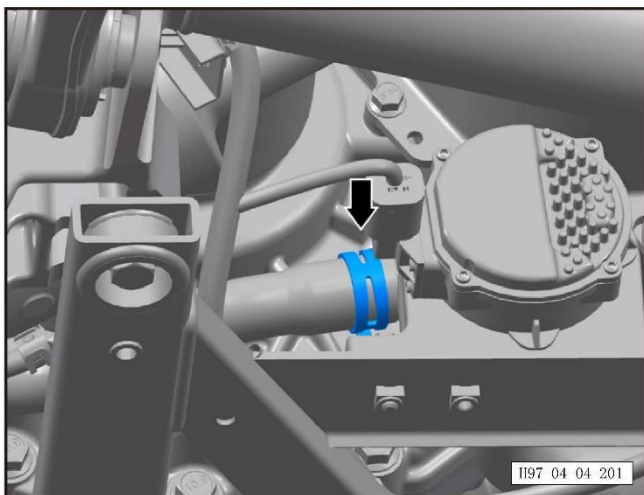
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the four-way control valve water pipe IV.



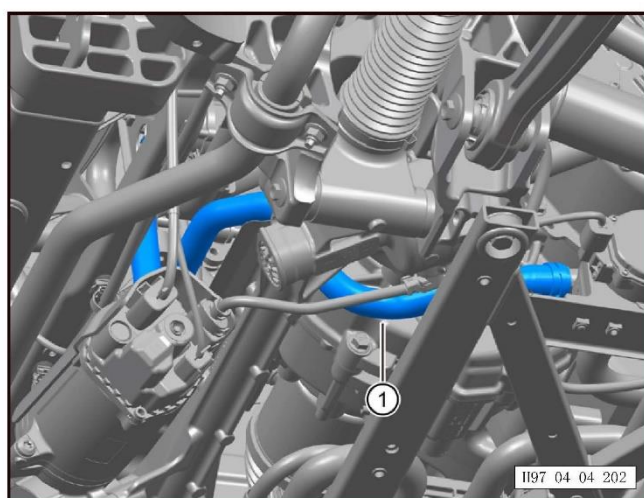
- a. Disconnect 1 pipe clamp connecting the four-way control valve water pipe IV to the four-way control valve.



- b. Disconnect 1 clip on the four-way control valve water pipe IV.



c. Disconnect 1 pipe clamp connecting the four-way control valve water pipe IV to the water pump.



d. Take out the four-way control valve water pipe IV ①.

Refitting procedure

The refitting procedure is performed in reverse order.

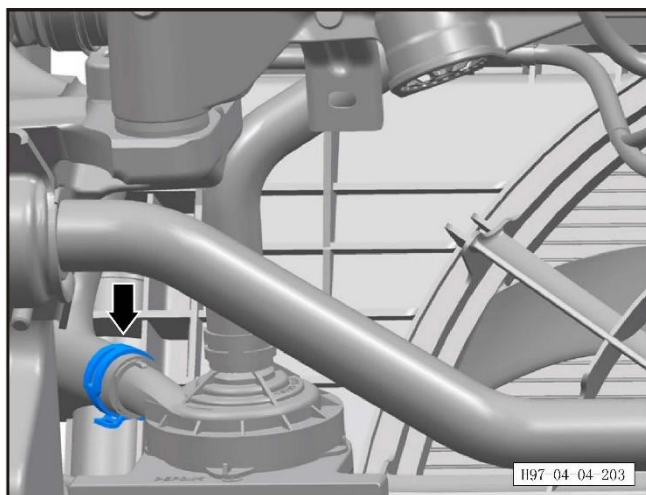
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

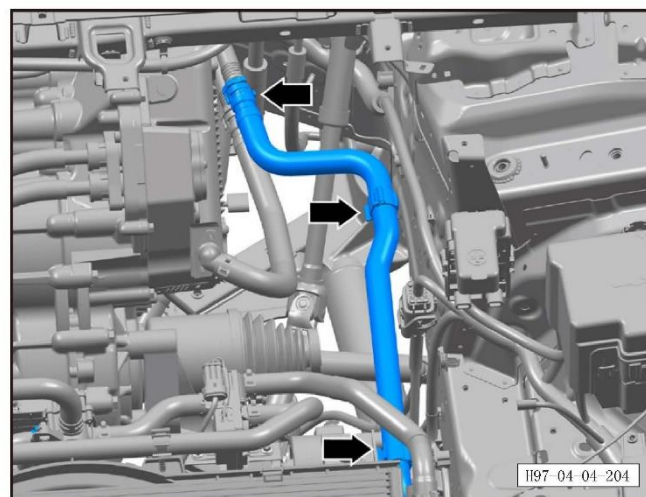
4.4.8.57 Removal and refitting of DC-DC inflow pipe 1#

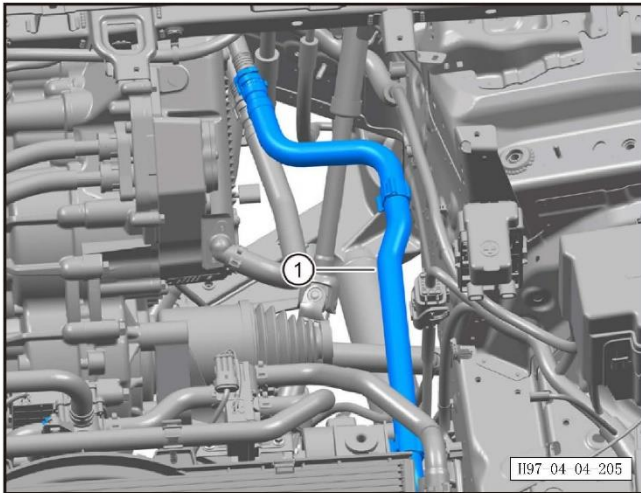
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the DC-DC inflow pipe 1#.
 - a. Disconnect 1 pipe clamp connecting the DC/DC inflow pipe 1# to the water pump.



- b. Disconnect 3 clips on the DC/DC inflow pipe 1#.





c. Take out the DC-DC inflow pipe 1# ①.

Refitting procedure

The refitting procedure is performed in reverse order.

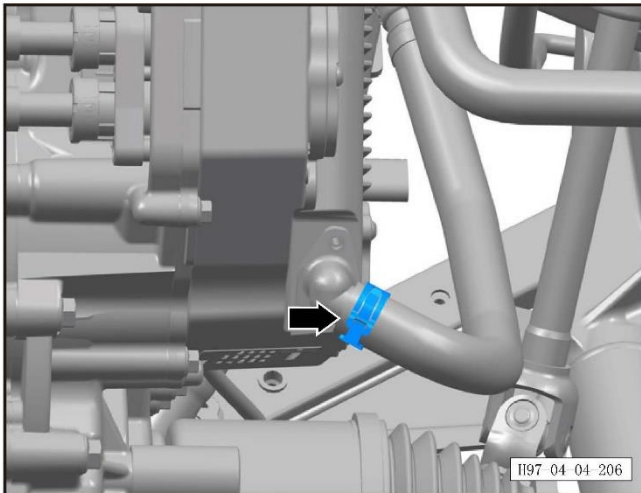
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

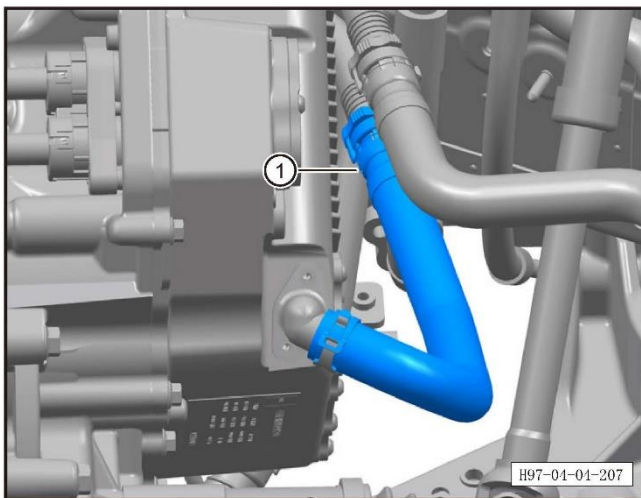
4.4.8.58 Removal and refitting of front motor water inlet hose

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front motor water inlet hose.



- a. Disconnect 1 pipe clamp connecting the front motor water inlet hose to the drive motor.



- b. Pull out the motor water inlet hose.

Refitting procedure

The refitting procedure is performed in reverse order.

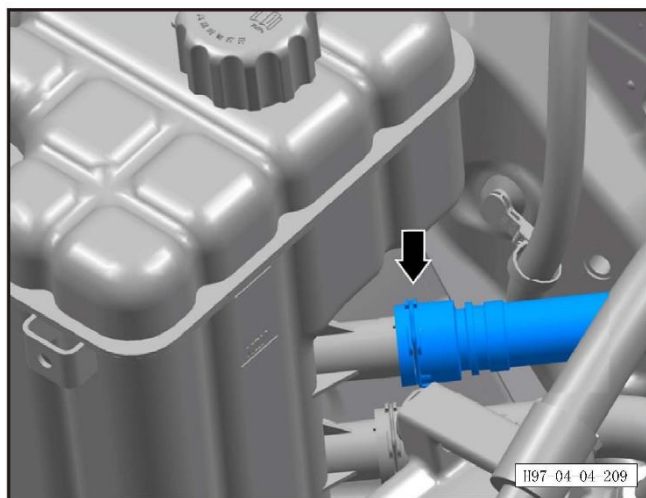
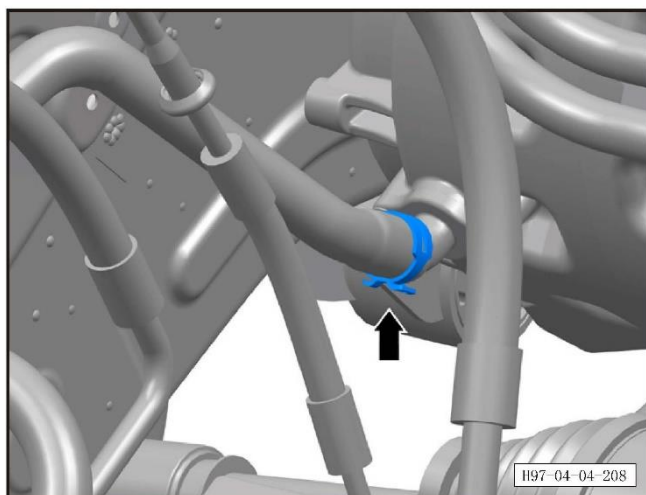
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

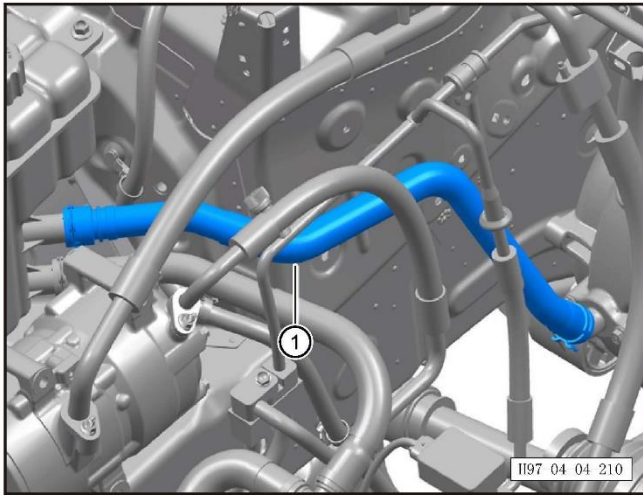
4.4.8.59 Removal and refitting of water bottle inlet hose

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water bottle inlet hose.
 - a. Disconnect the connection clamp between the water bottle inlet hose and the drive motor.



- b. Disconnect the connection pipe clamp between the water bottle inlet hose and the auxiliary water bottle assembly.



c. Take out the water bottle inlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

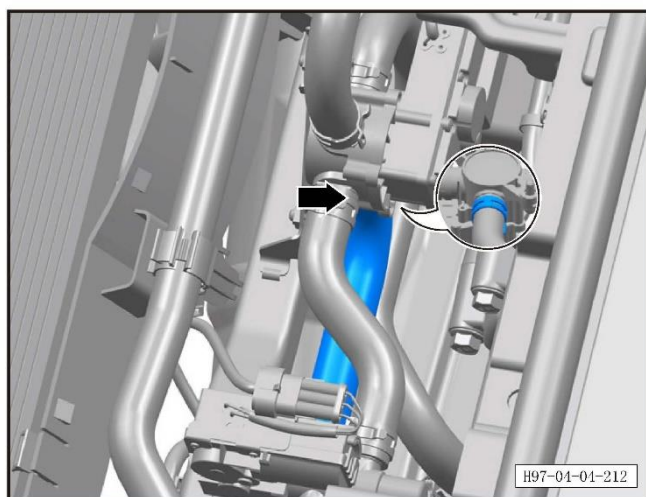
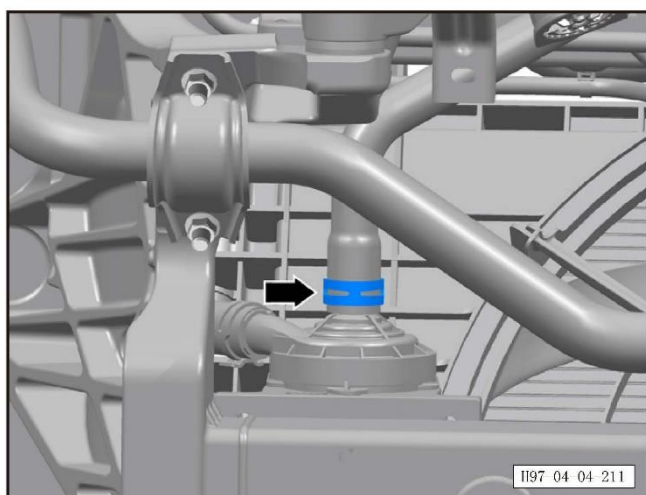
CAUTION:

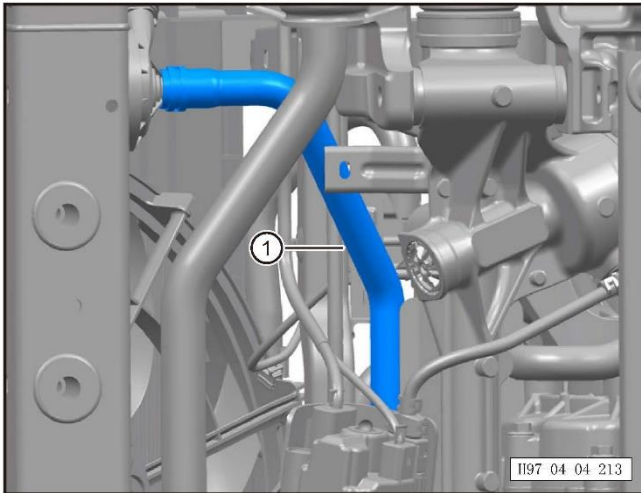
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.60 Removal and refitting of four-way control valve water pipe II

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the four-way control valve water pipe II.
 - a. Disconnect 1 pipe clamp connecting the four-way control valve water pipe II to the water pump.
 - b. Disconnect 1 pipe clamp connecting the four-way control valve water pipe II to the four-way control valve.





c. Take out the four-way control valve water pipe II ①.

Refitting procedure

The refitting procedure is performed in reverse order.

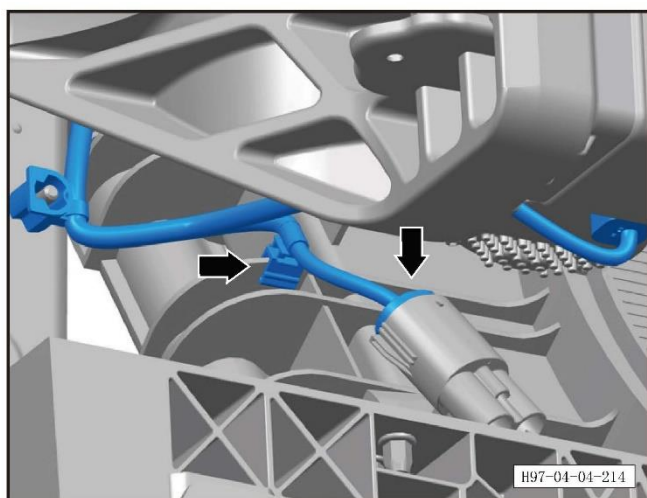
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

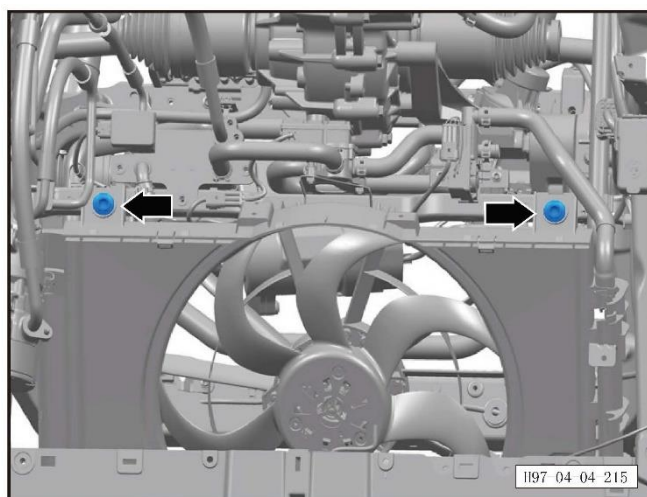
4.4.8.61 Removal and refitting of low temperature radiator assembly (EV)

Removal procedure

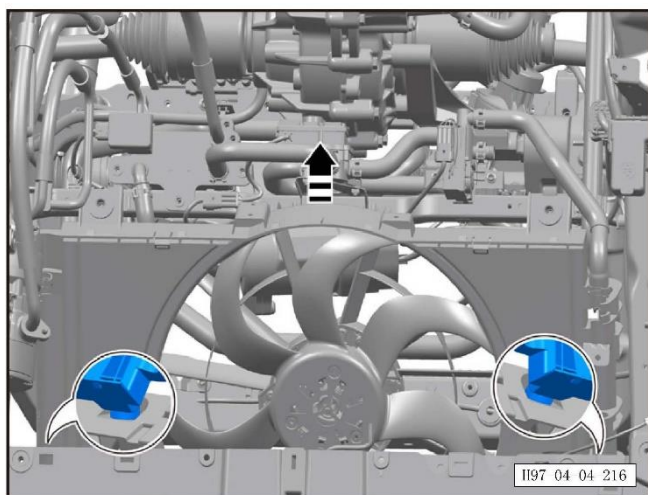
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the low temperature radiator assembly (EV).



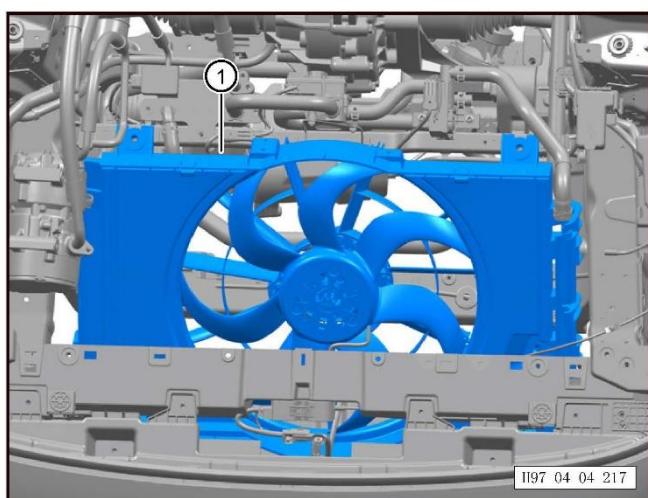
- a. Disconnect 1 connector and 1 clip on the low temperature radiator assembly (EV).



- b. Remove 2 bolts on the low temperature radiator assembly (EV).



c. Lift the low temperature radiator assembly (EV) and disconnect the clips.



d. Take out the low temperature radiator assembly (EV) ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.62 Removal and refitting of water pump assembly

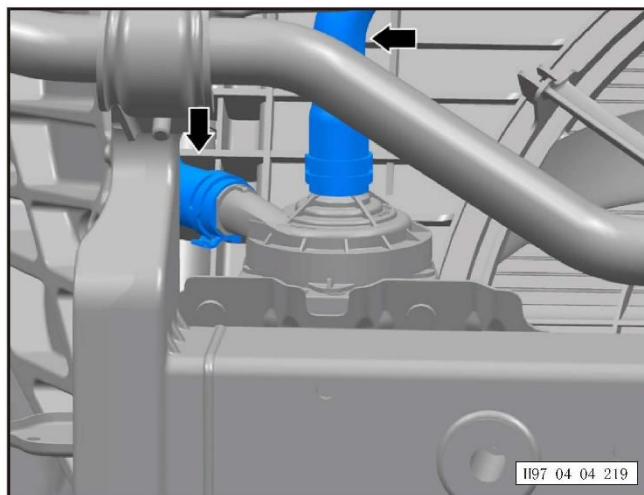
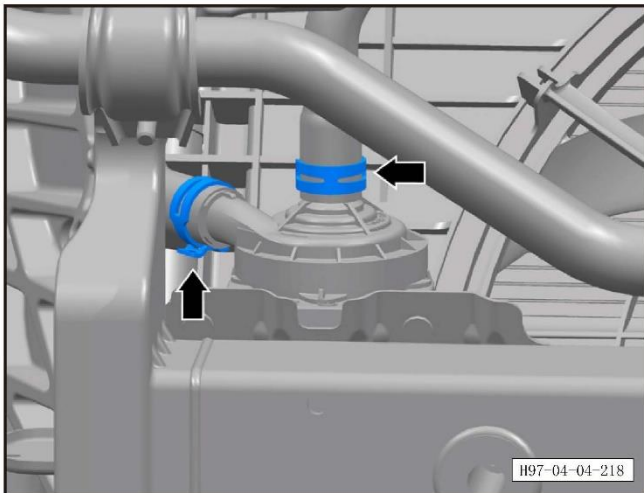
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump assembly.

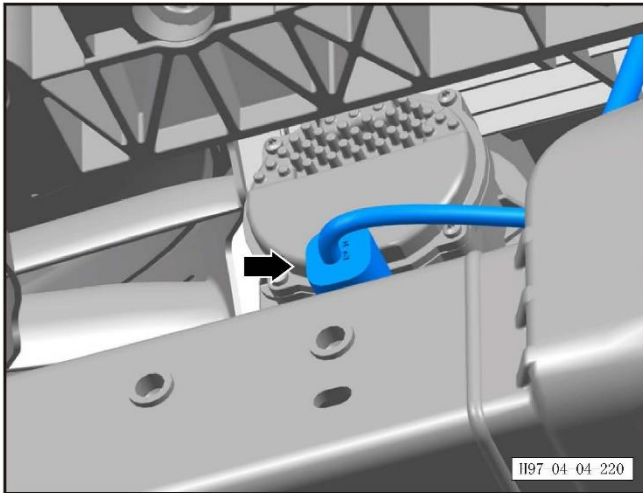
- a. Disconnect 2 pipe clamps connecting the water pump assembly.

CAUTION:

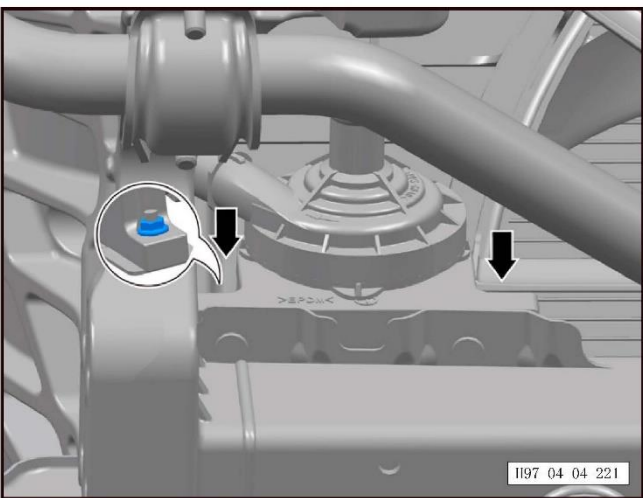
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



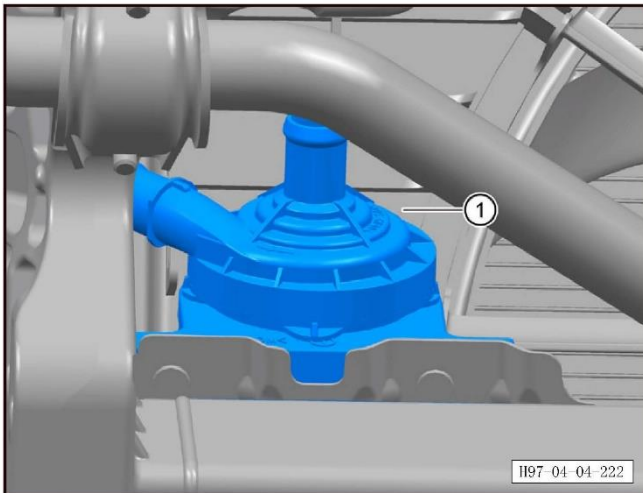
- b. Disconnect 2 hoses connecting the water pump assembly.



c. Disconnect 1 connector of the water pump assembly.



d. Remove 2 bolts on the water pump assembly.



e. Take out the water pump assembly ①.

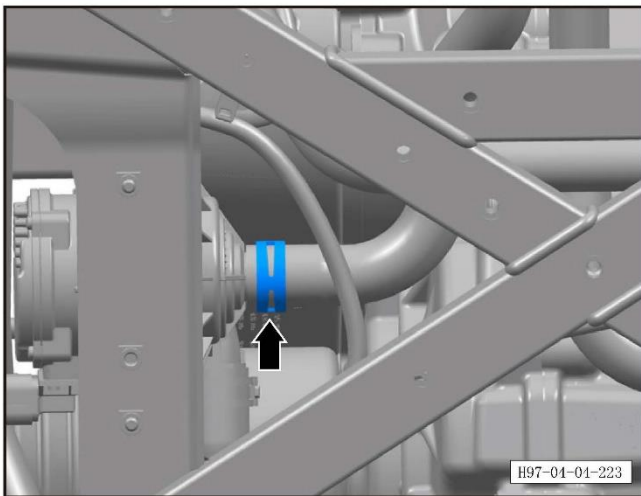
Refitting procedure

The refitting procedure is performed in reverse order.

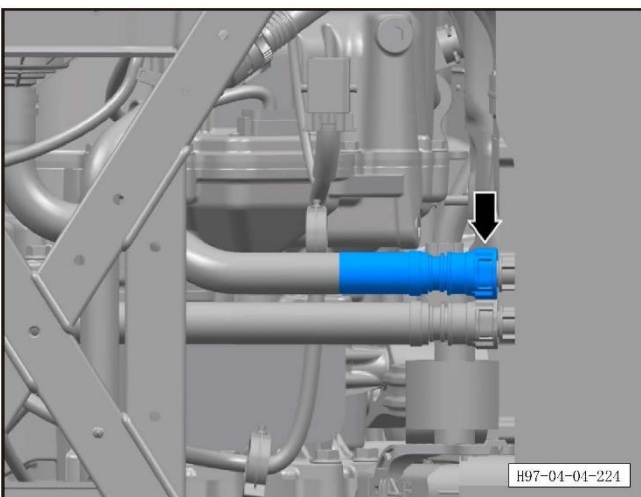
4.4.8.63 Removal and refitting of battery pack water outlet pipe assembly

Removal procedure

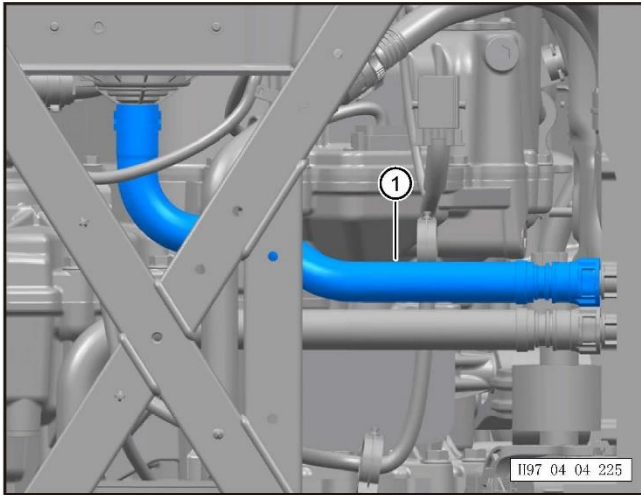
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the battery pack water outlet pipe assembly.



- a. Disconnect 1 clamp on the battery pack water outlet pipe assembly.



- b. Disconnect 1 pipe clamp connecting the battery pack water outlet pipe assembly to the battery pack.



c. Take out the battery pack water outlet pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

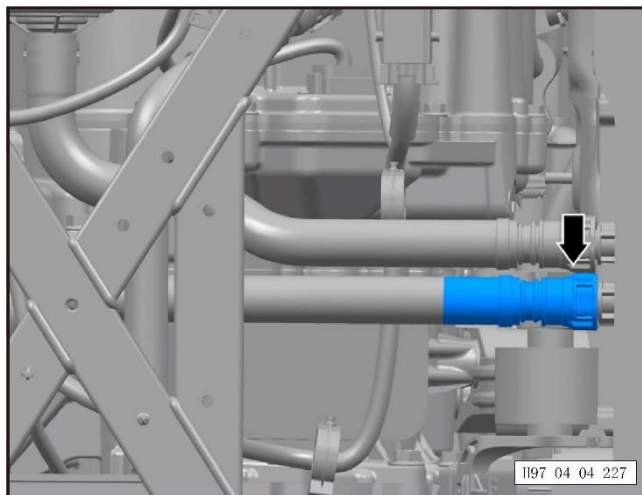
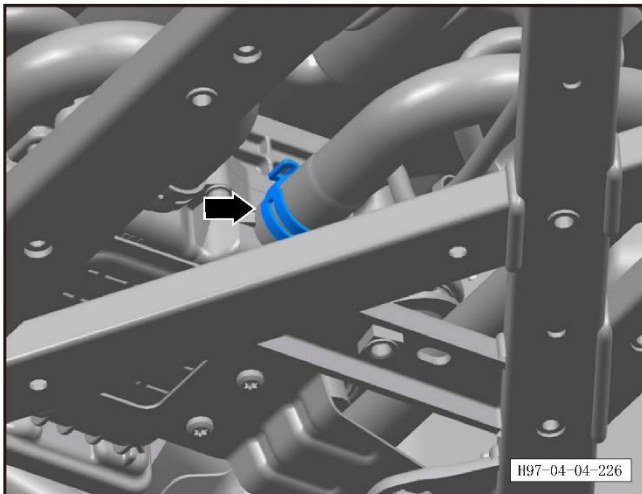
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

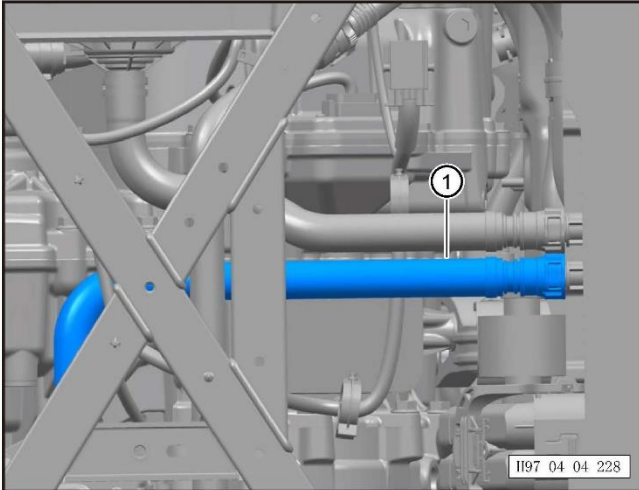
4.4.8.64 Removal and refitting of battery pack inflow pipe assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the radiator bracket assembly.
 - a. Disconnect 1 clamp of the battery pack inflow pipe assembly.



- b. Disconnect 1 clip connecting the battery pack inflow pipe assembly to the battery pack.



c. Take out the battery pack inflow pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

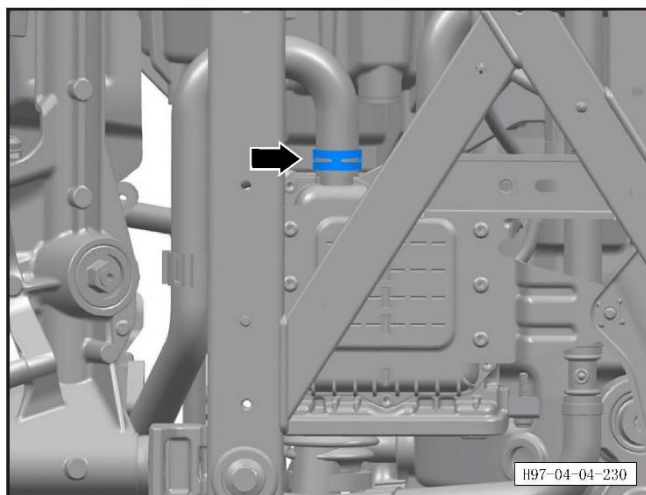
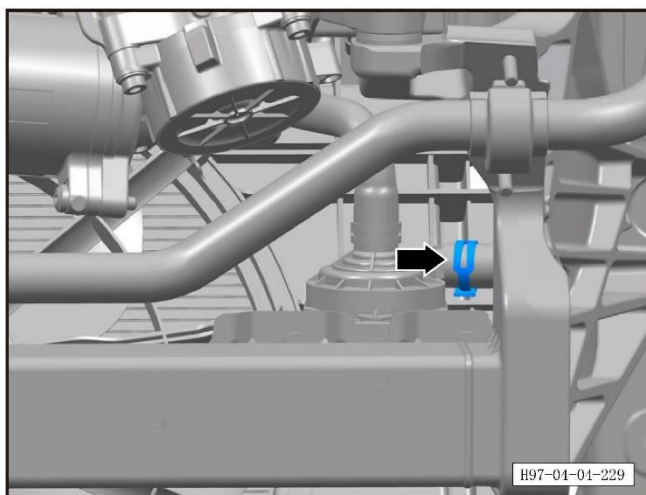
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

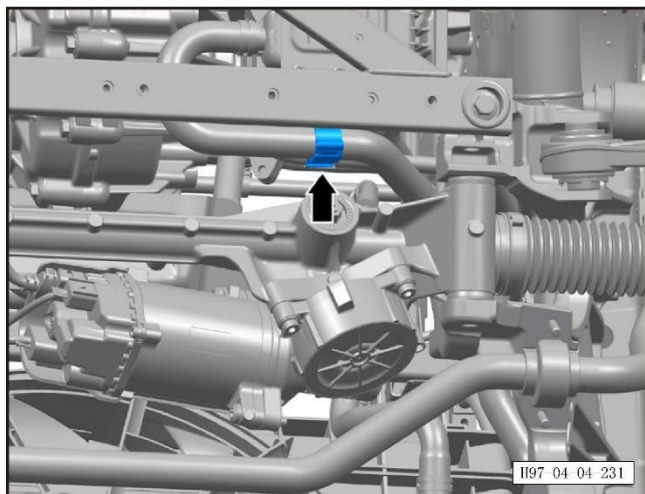
4.4.8.65 Removal and refitting of PTC heater inflow pipe assembly

Removal procedure

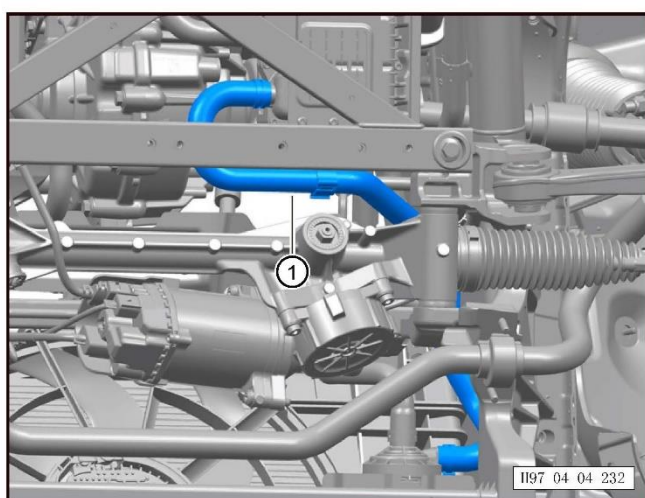
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the radiator bracket assembly.
 - a. Disconnect 1 pipe clamp of the PTC heater inflow pipe assembly.



- b. Disconnect 1 pipe clamp of the PTC heater inflow pipe assembly.



c. Disconnect 1 pipe clamp of the PTC heater inflow pipe assembly.



d. Take out the PTC heater inflow pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

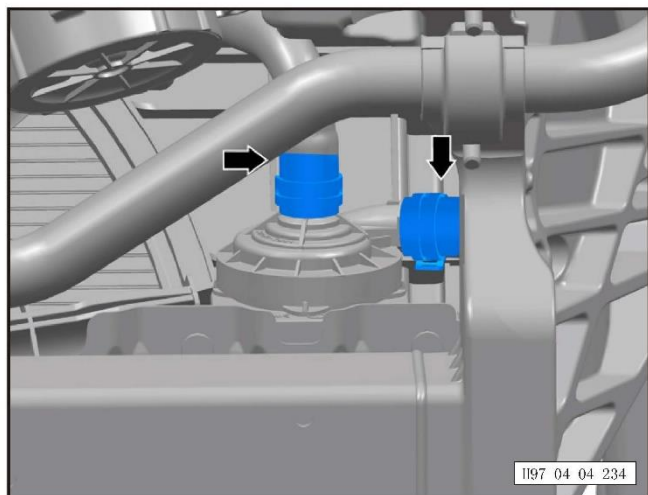
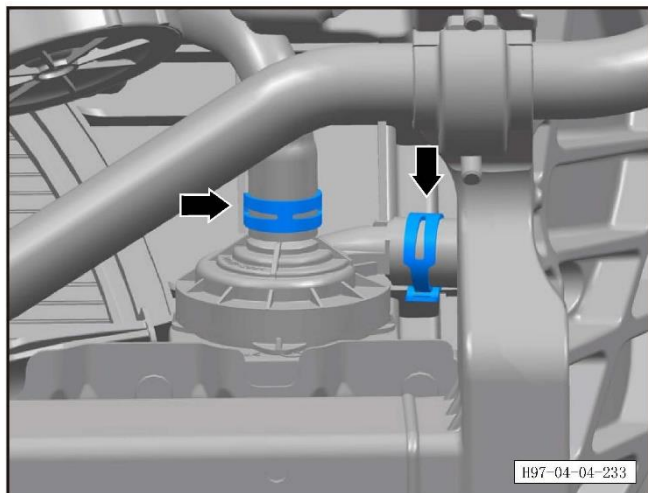
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

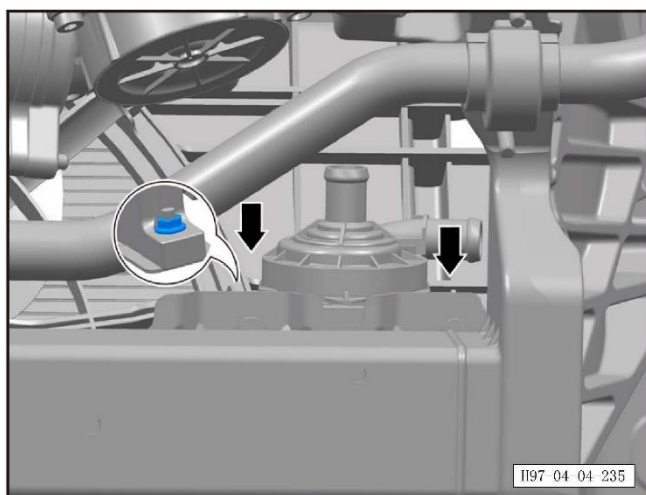
4.4.8.66 Removal and refitting of water pump assembly

Removal procedure

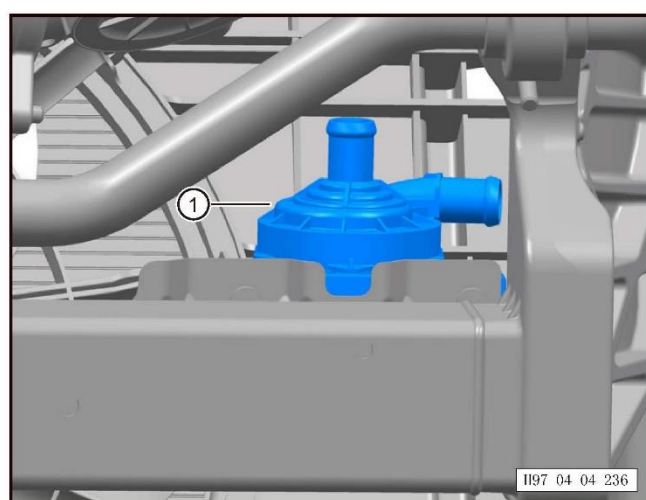
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump assembly.
 - a. Disconnect the 2 clamps connecting the water pump assembly to the hose.



- b. Disconnect 2 hoses connecting the water pump assembly.



c. Remove 2 bolts on the water pump assembly.
Tightening torque of bolt: $10\pm 1\text{Nm}$.



d. Take out the water pump assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

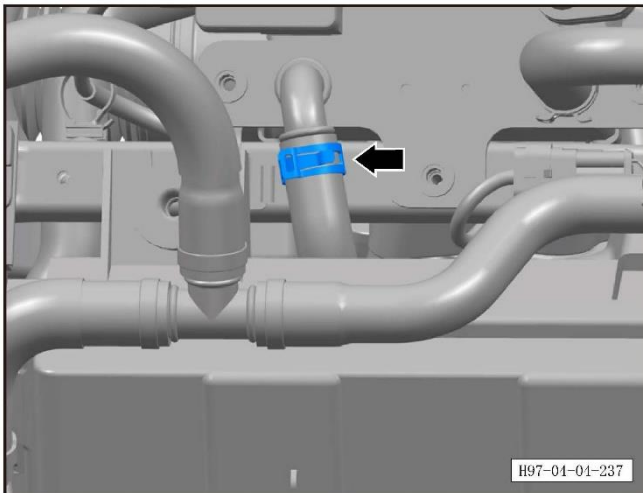
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

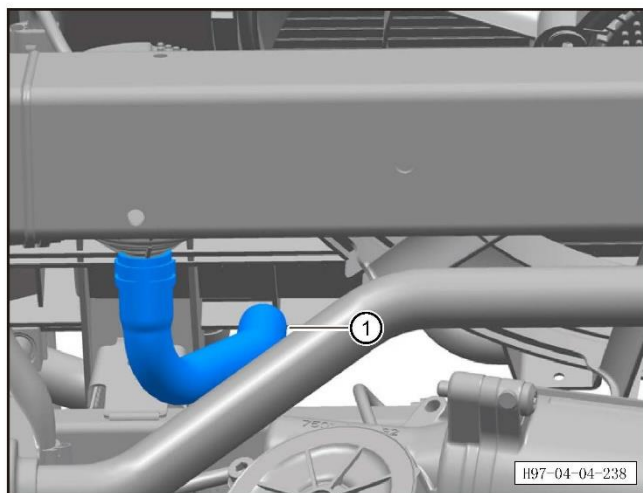
4.4.8.67 Removal and refitting of battery cooler water outlet pipe assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the battery cooler water outlet pipe assembly.



- a. Disconnect 1 pipe clamp on the battery cooler water outlet pipe assembly.



- b. Take out the battery cooler water outlet pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.68 Removal and refitting of battery cooler assembly

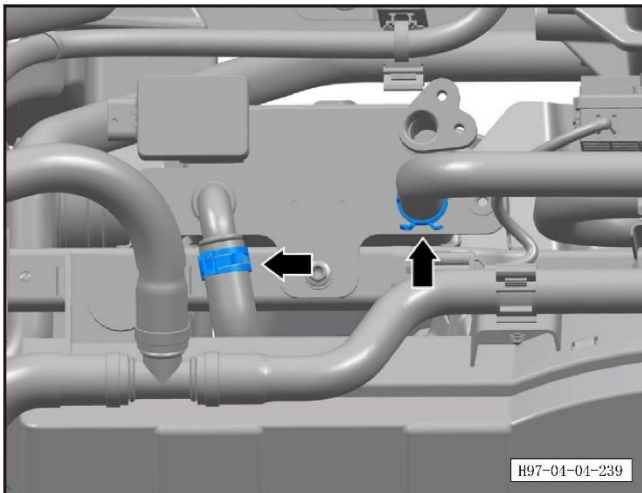
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the battery cooler assembly.

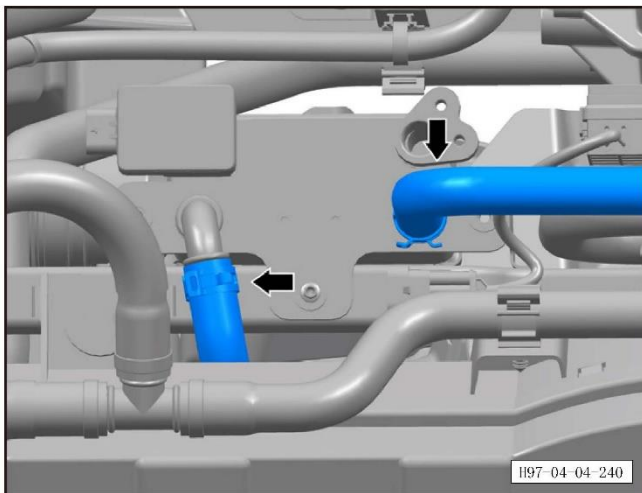
- a. Disconnect 2 pipe clamps on the cooler assembly.

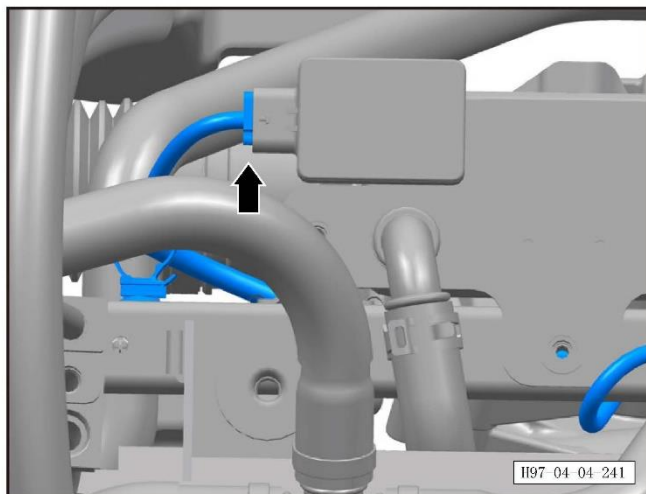
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

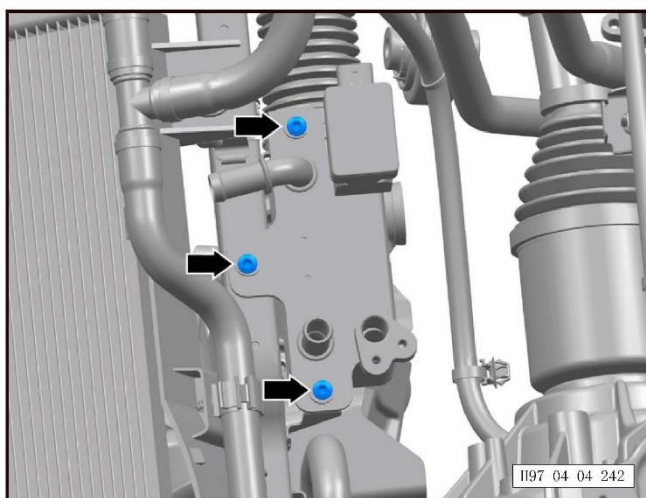


- b. Disconnect 2 hoses on the cooler assembly.



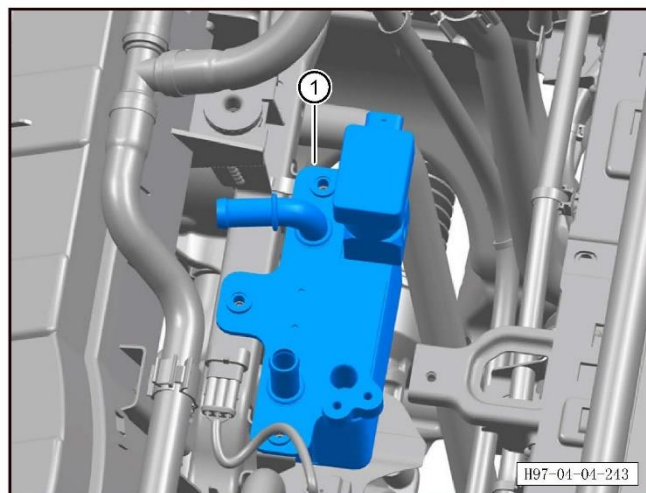


c. Disconnect 1 connector of the battery cooler assembly.



d. Unscrew the 3 bolts on the battery cooler assembly.

Tightening torque of bolt: 8 ± 1 Nm.



e. Take out the battery cooler assembly ①.

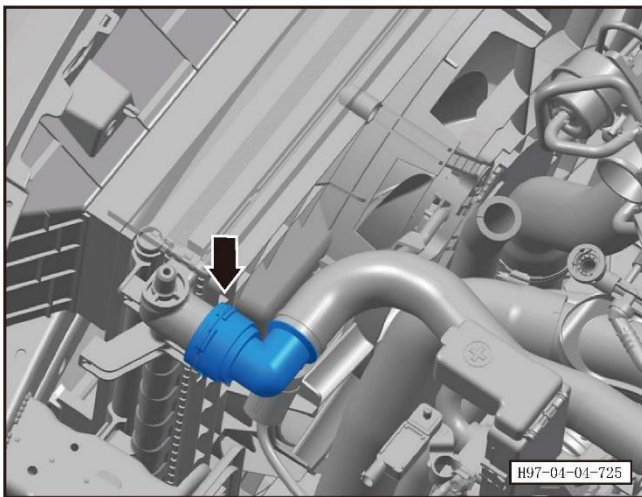
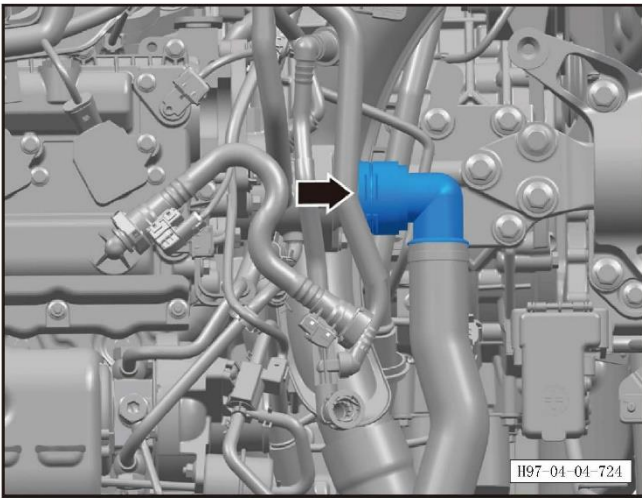
Refitting procedure

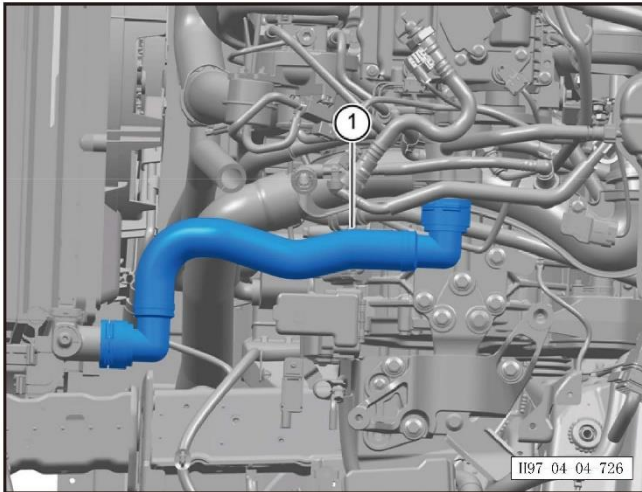
The refitting procedure is performed in reverse order.

4.4.8.69 Removal and refitting of radiator water inlet hose

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Depressurize the cooling system.
6. Remove the radiator water inlet hose assembly.
 - a. Disconnect 1 pipe clamp connecting the radiator water inlet hose to the thermostat.
 - b. Disconnect 1 pipe clamp connecting the radiator water inlet hose to the radiator.





c. Take out the radiator water inlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

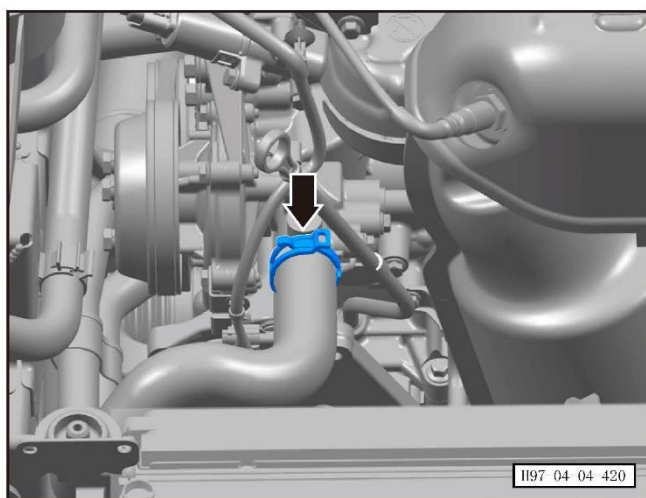
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

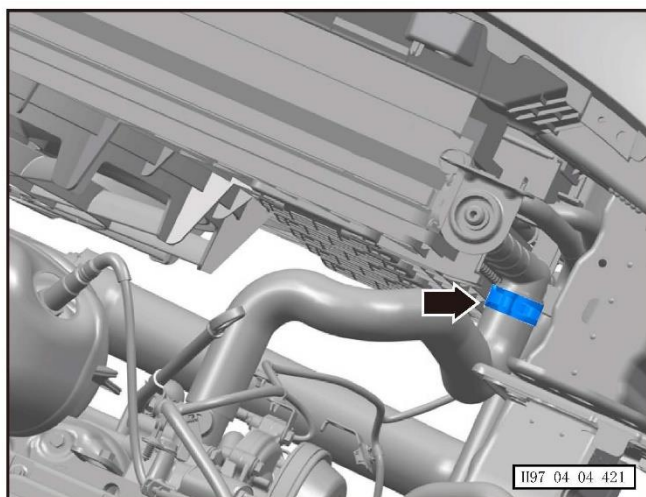
4.4.8.70 Removal and refitting of radiator water outlet hose

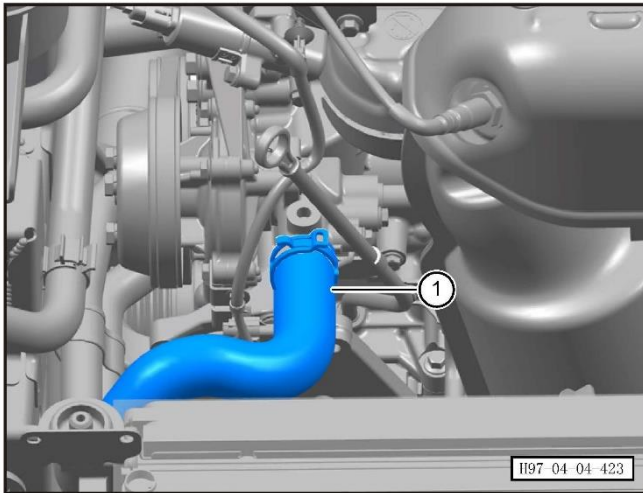
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Depressurize the cooling system.
6. Remove the radiator water outlet hose assembly.
 - a. Disconnect 1 pipe clamp connecting the radiator water outlet hose to the water pump.



- b. Disconnect 1 pipe clamp connecting the radiator water outlet hose to the radiator.





c. Take out the radiator water outlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

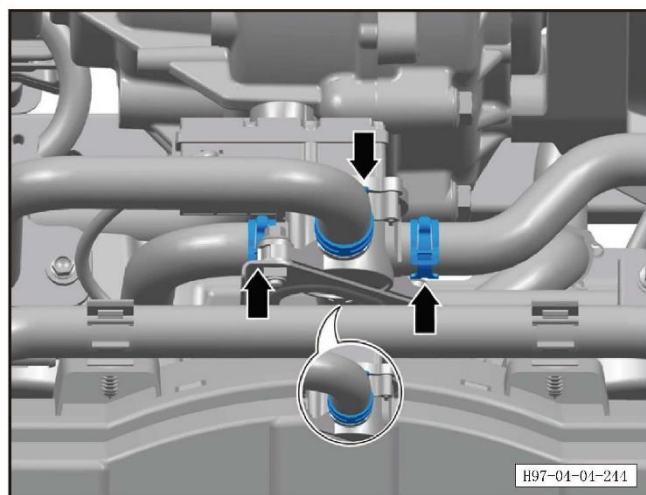
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.71 Removal and refitting of four-way control valve assembly

Removal procedure

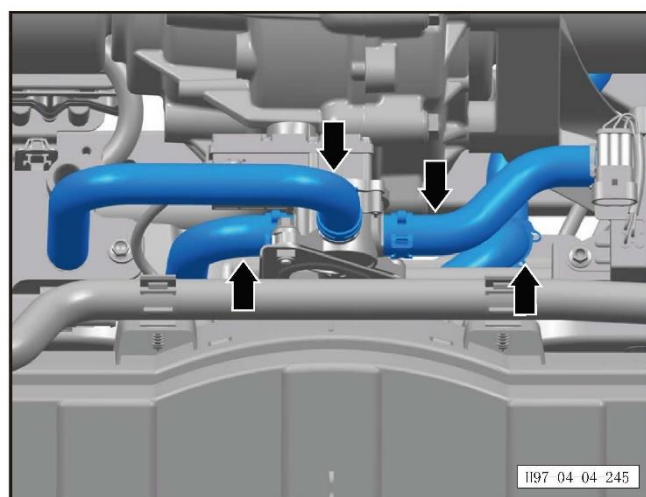
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the four-way control valve assembly.



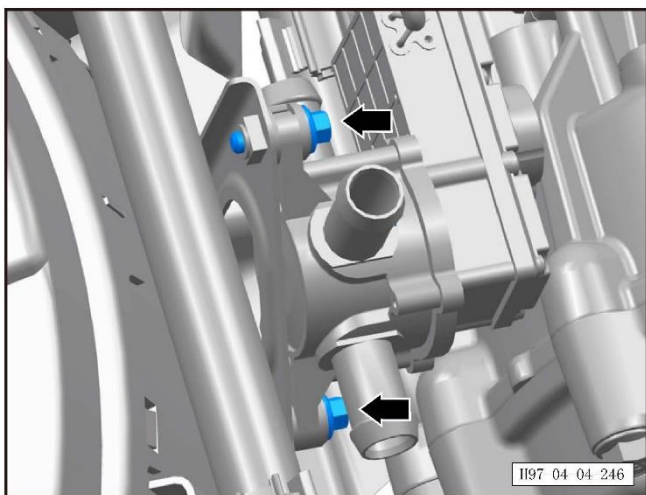
- a. Disconnect the 4 clamps connecting the 4-way control valve assembly.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

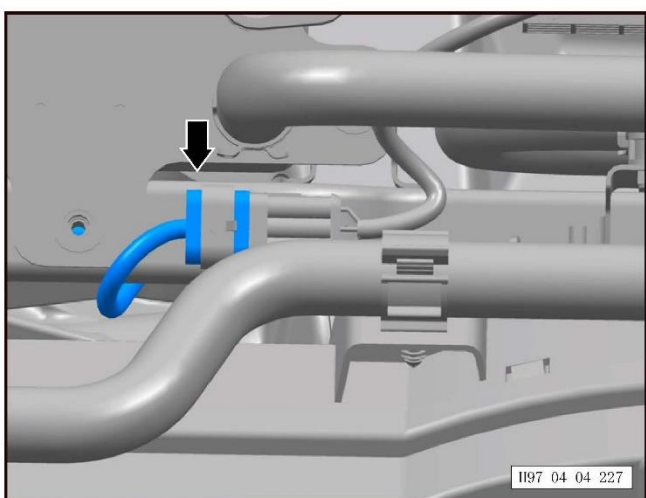


- b. Disconnect the 4 hoses connecting the 4-way control valve assembly.

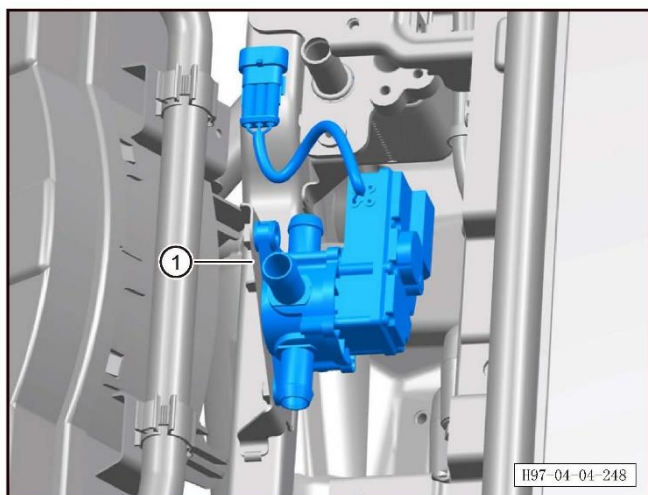


c. Remove the 2 bolts on the 4-way control valve assembly.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



d. Disconnect 1 connector on the 4-way control valve assembly.



c. Take out the four-way control valve assembly ①.

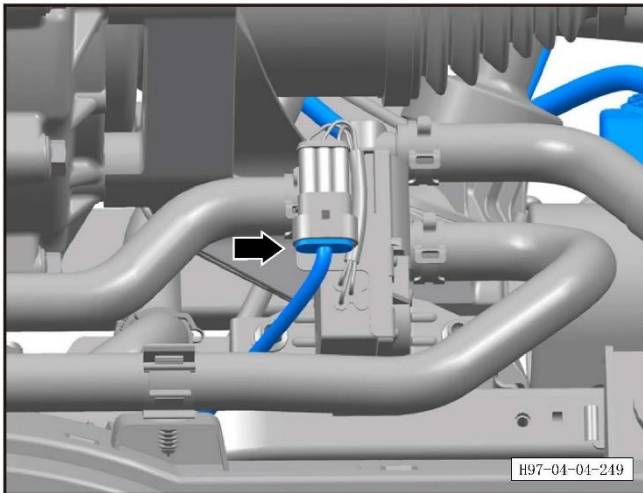
Refitting procedure

The refitting procedure is performed in reverse order.

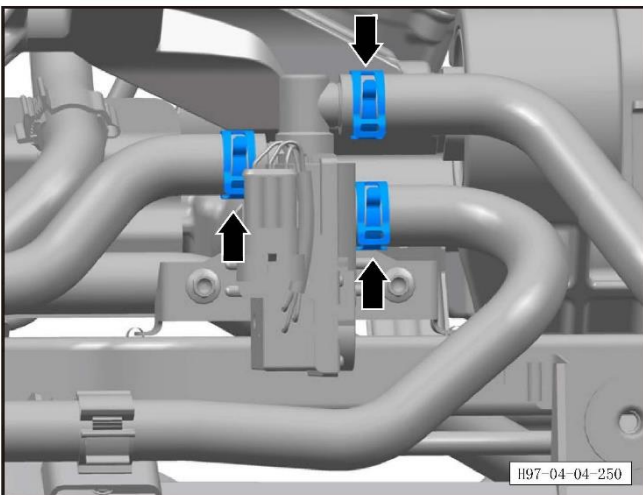
4.4.8.72 Removal and refitting of three-way proportional valve assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the 3-way proportional valve assembly.



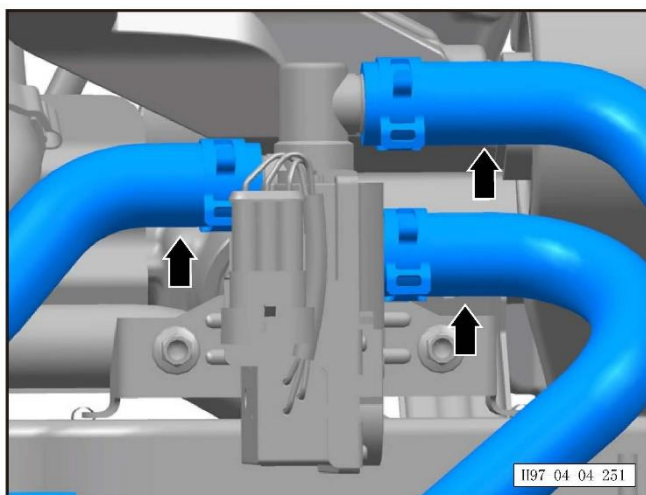
- a. Disconnect 1 connector on the 3-way proportional valve assembly.



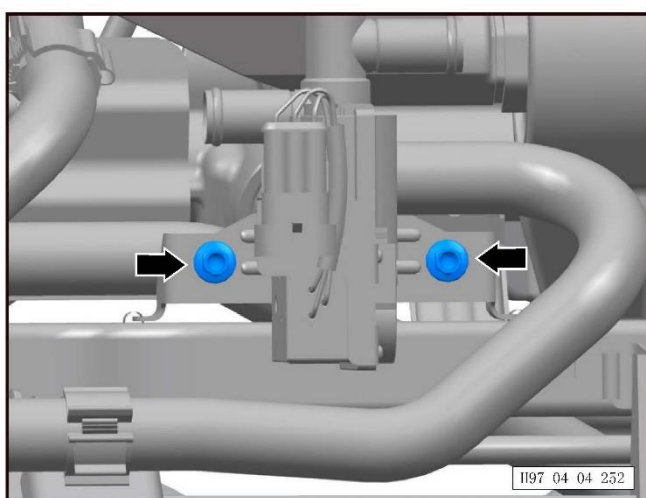
- b. Disconnect the 3 clamps on the 3-way proportional valve assembly.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

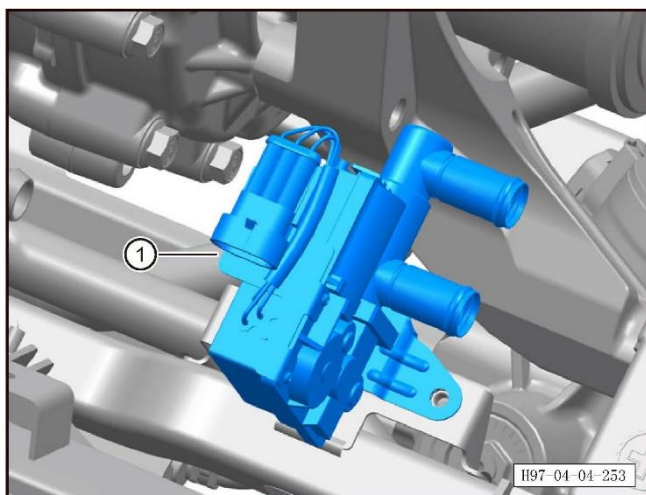


c. Disconnect the 3 hoses on the 3-way proportional valve assembly.



d. Unscrew 2 bolt on the 3-way proportional valve assembly.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



e. Take out the 3-way proportional valve assembly ①.

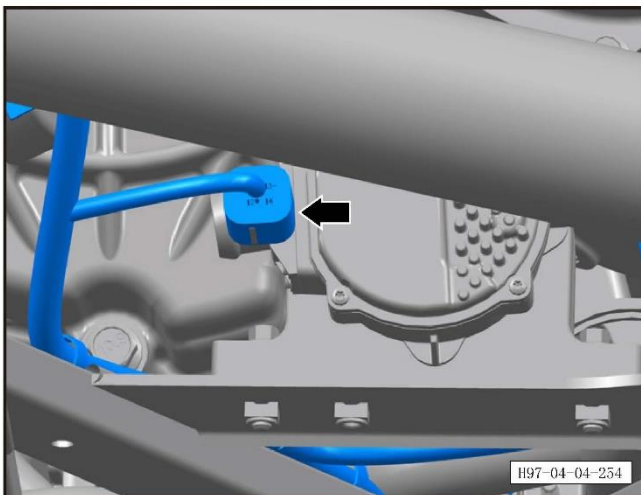
Refitting procedure

The refitting procedure is performed in reverse order.

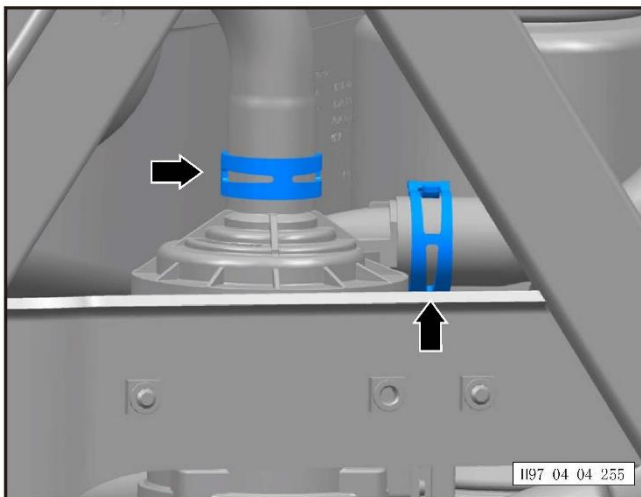
4.4.8.73 Removal and refitting of water pump assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump assembly.



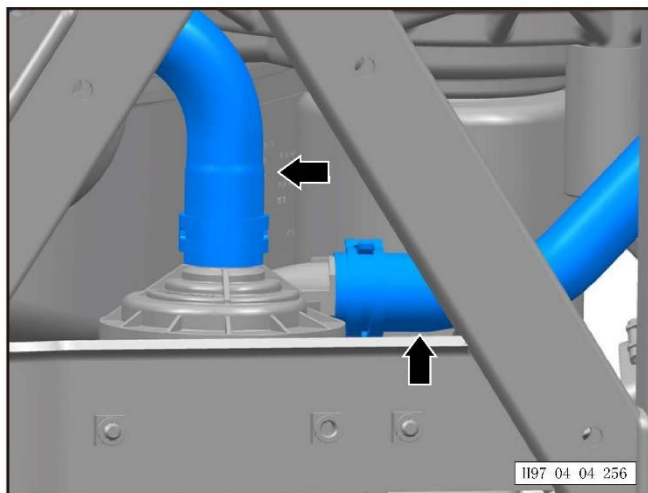
- a. Disconnect 1 connector of the water pump assembly.



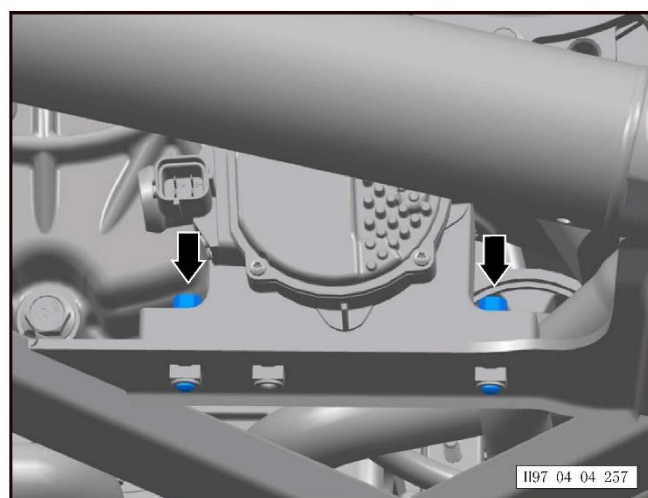
- b. Disconnect 2 pipe clamps connecting the water pump assembly.

CAUTION:

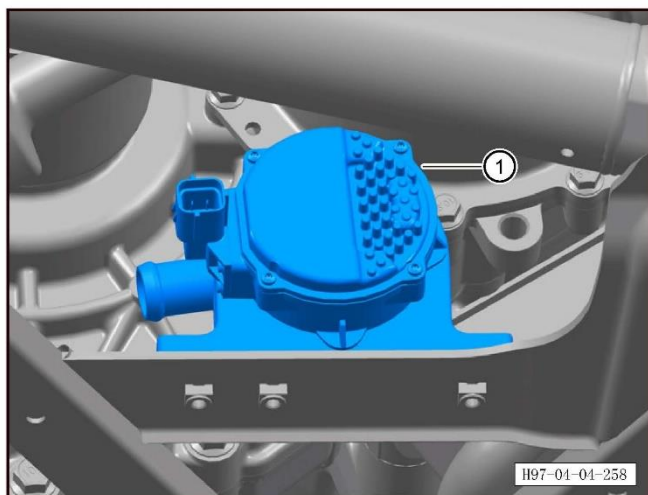
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



c. Disconnect 2 hoses connecting the water pump assembly.



d. Unscrew 2 bolts on the water pump assembly.
Tightening torque of bolt: $10 \pm 1 \text{ Nm}$.



e. Take out the water pump assembly ①.

Refitting procedure

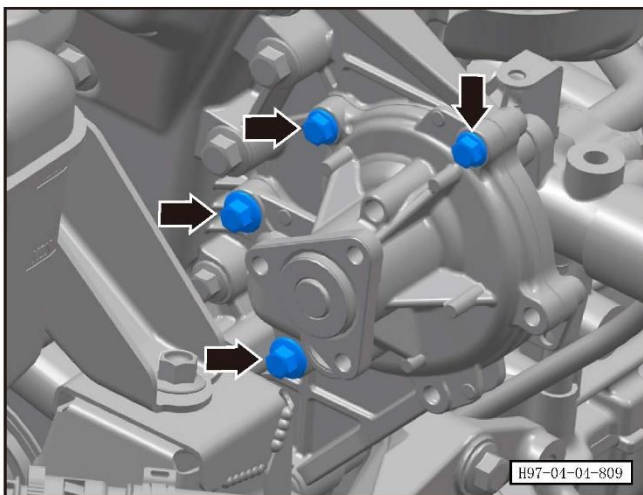
The refitting procedure is performed in reverse order.

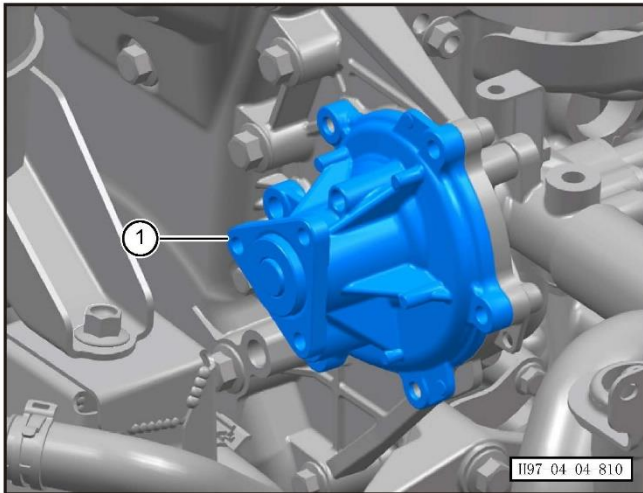
4.4.8.74 Removal and refitting of water pump assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the accessory belt (refer to [4.5.11.1 Removal and refitting of water pump belt](#))
6. Remove the water pump pulley (refer to [4.5.11.2 Removal and refitting of water pump pulley](#))
7. Remove the water pump fixing harness bracket I (refer to [4.5.11.3 Removal and refitting of water pump fixing harness bracket I](#))
8. Remove the water pump fixing harness bracket II (refer to [4.5.11.4 Removal and refitting of water pump fixing harness bracket II](#))
9. Remove the water pump assembly.
 - a. Unscrew the remaining 4 bolts securing the water pump.

Tightening torque of bolt: $13\pm 2\text{Nm}$.





b. Take out the water pump assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

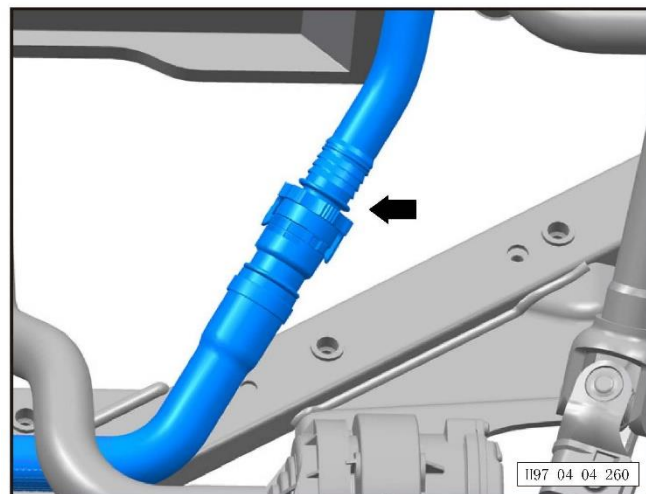
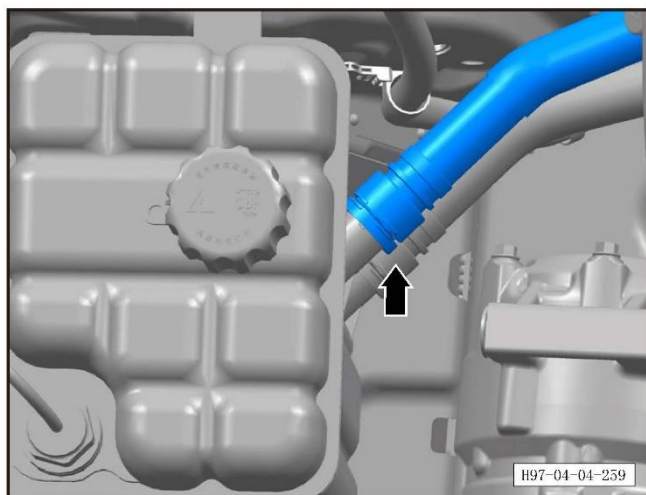
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

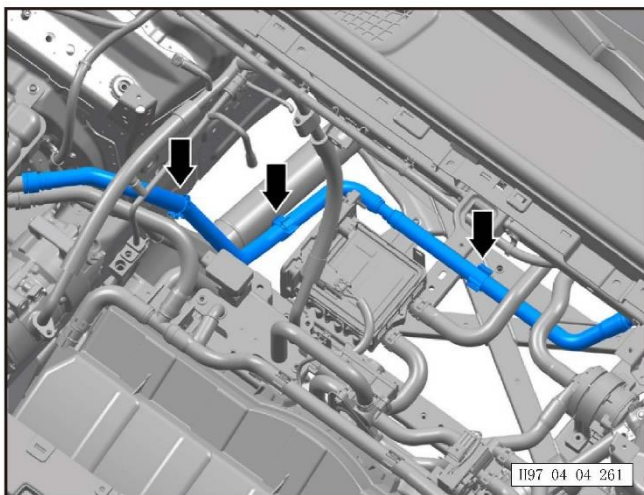
4.4.8.75 Removal and refitting of water bottle inlet hose

Removal procedure

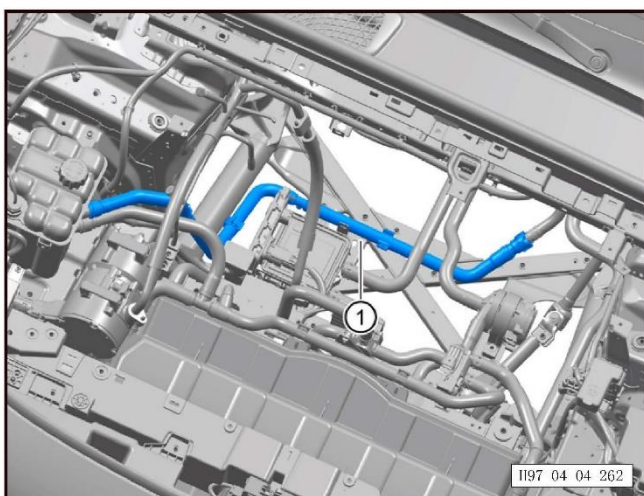
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water bottle inlet hose.
 - a. Disconnect the clip of the water bottle inlet hose.



- b. Disconnect 1 clip connecting the water bottle inlet hose.



c. Disconnect 3 pipe clamps on the water bottle inlet hose.



d. Take out the water bottle inlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

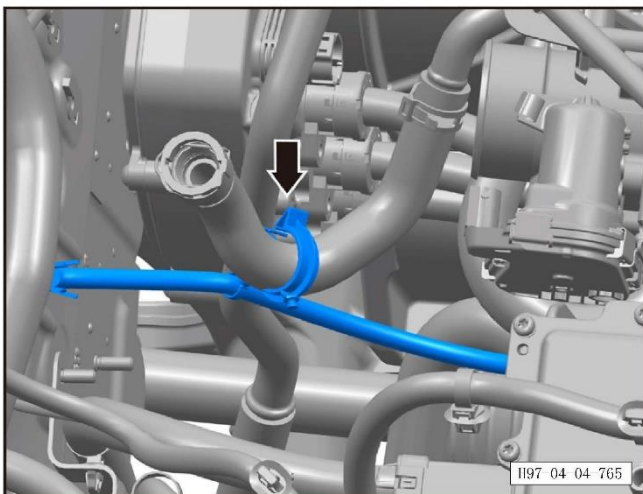
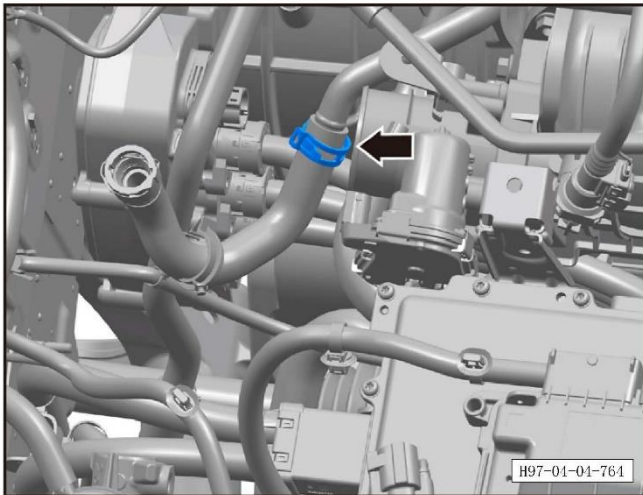
CAUTION:

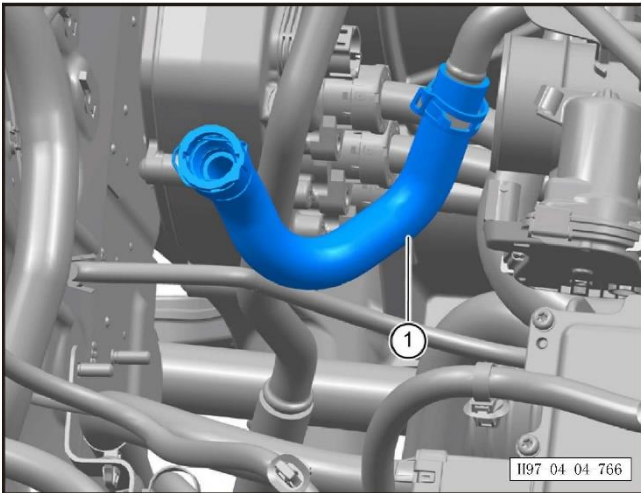
- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.76 Removal and refitting of water bottle inlet hose

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Depressurize the cooling system.
6. Remove the water bottle assembly (refer to [4.4.8.79 Removal and refitting of water bottle assembly and accessories](#))
7. Remove the water bottle inlet hose.
 - a. Disconnect 1 clamp connecting the water bottle inlet hose and the range extender water outlet pipe.
 - b. Disconnect 1 pipe clamp connecting the water bottle inlet hose and the range extender ground wire.





c. Take out the water bottle inlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

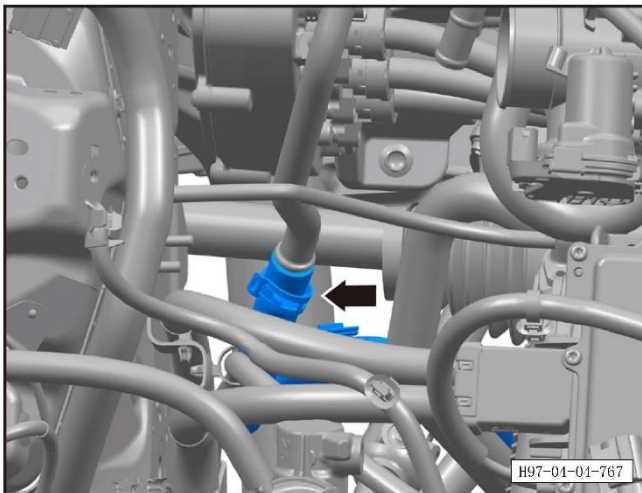
CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

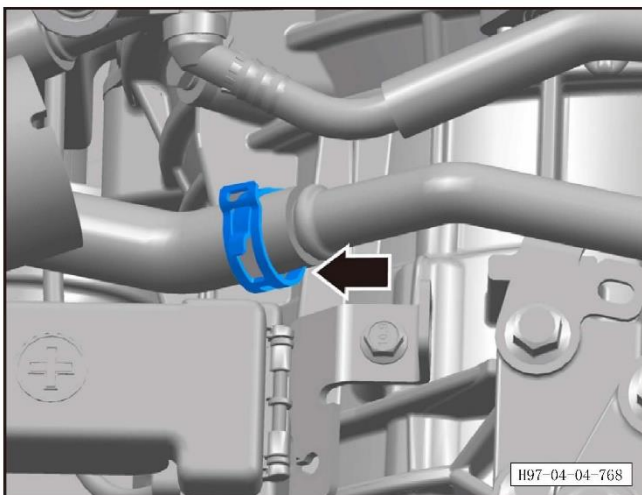
4.4.8.77 Removal and refitting of ranger extender water outlet pipe

Removal procedure

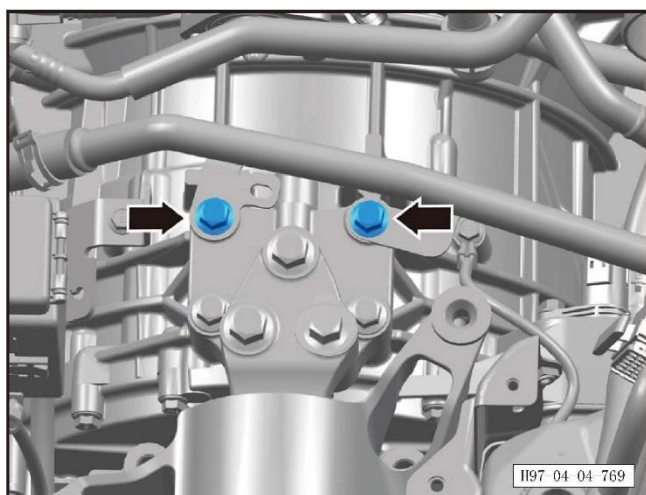
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Depressurize the cooling system.
6. Remove the intercooler air outlet pipe assembly (refer to [4.1.9.8 Removal and refitting of intercooler air outlet pipe assembly](#))
7. Remove the water bottle and accessories (refer to [4.4.8.79 Removal and refitting of water bottle assembly and accessories](#))
8. Remove the range extender water outlet pipe.



- a. Disconnect 1 pipe clamp and hose connecting the generator water outlet pipe rear section hose and the range extender water outlet pipe.

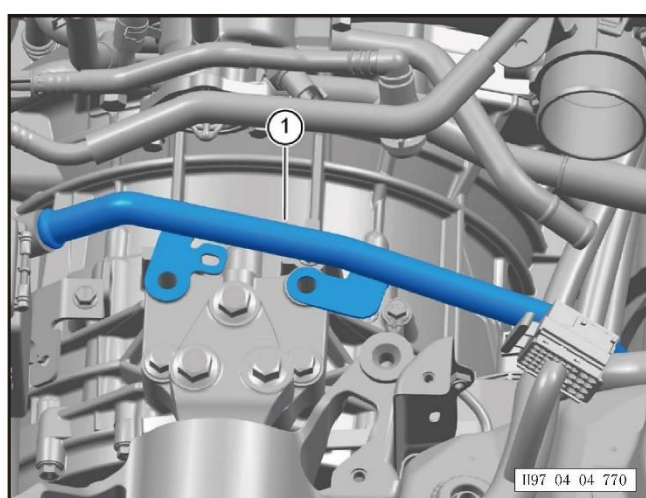


- b. Disconnect 1 pipe clamp and hose connecting the generator water outlet hose and the range extender water outlet pipe.



c. Unscrew the 2 connecting bracket bolts of the range extender water outlet pipe.

Tightening torque of bolt: $20 \pm 1 \text{ Nm}$.



d. Take out the range extender water outlet pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.

4.4.8.78 Removal and refitting of auxiliary water bottle assembly

Removal procedure

CAUTION!

- Wait for the coolant temperature to drop below 60 °C before performing service operations.

- Before removing the water inlet/outlet hose, it is necessary to open the auxiliary water bottle cap first for pressure relief.

- After the servicing operation is completed, it is necessary to add coolant to the specified level.

1. Turn off all electrical appliances and turn off the start switch.

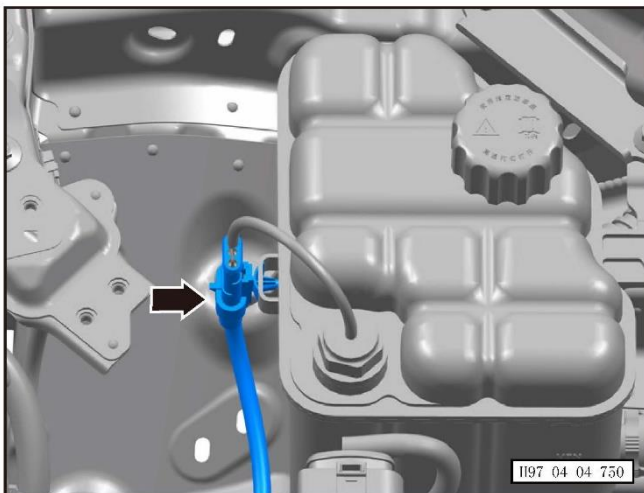
2. Open the engine hood.

3. Remove the engine compartment trim panel.

4. Disconnect the battery negative terminal.

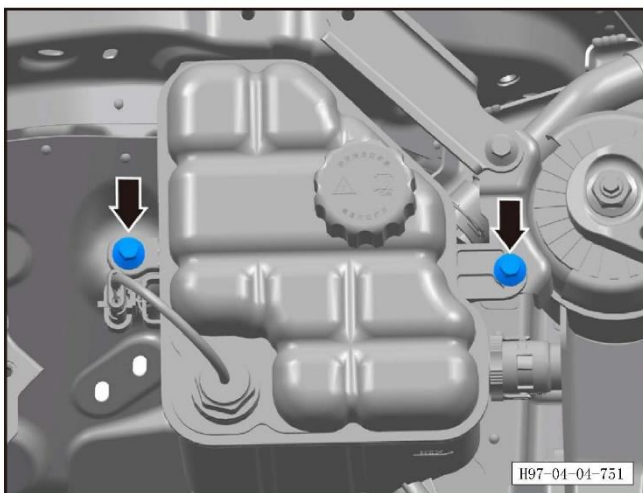
5. Remove the auxiliary water bottle assembly.

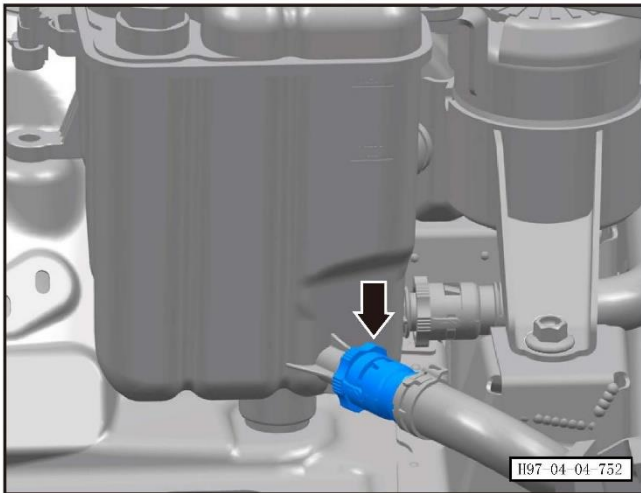
a. Disconnect 1 connector connecting the liquid level sensor on auxiliary water bottle assembly to the front wall harness.



b. Unscrew the 2 bolts that secure the auxiliary water bottle assembly.

Tightening torque of bolt: 10±1Nm.

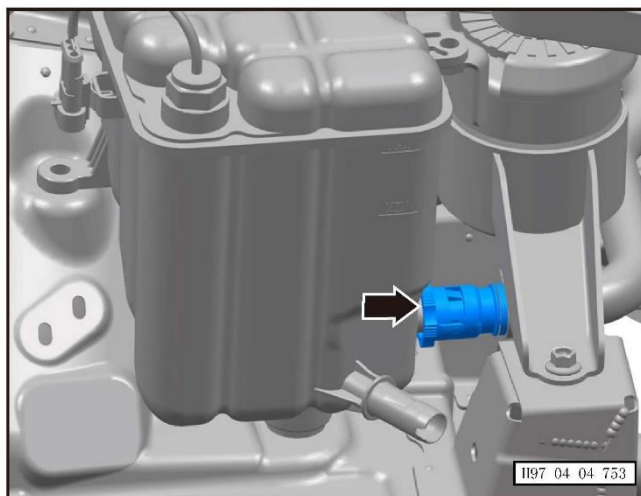




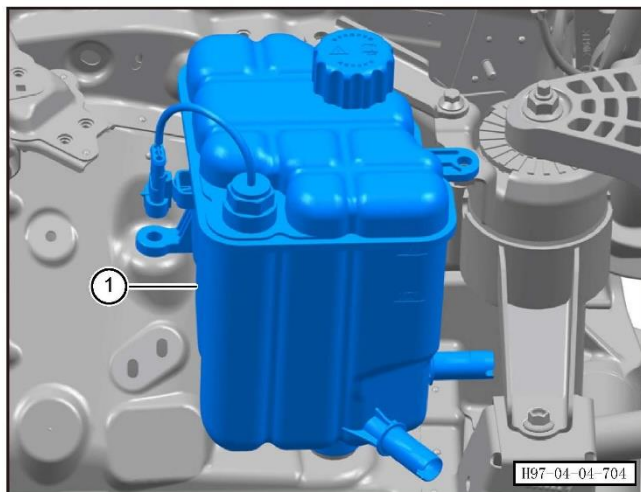
c. Disconnect 1 clip connecting the auxiliary water bottle assembly to the water inlet hose.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.
- After refitting, coolant must be added as required.



d. Disconnect 1 clip connecting the auxiliary water bottle assembly to the water outlet hose.



e. Take out the auxiliary water bottle assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.79 Removal and refitting of auxiliary water bottle assembly and accessories

Removal procedure

CAUTION!

- Wait for the coolant temperature to drop below 60 °C before performing service operations.

- Before removing the water inlet/outlet hose, it is necessary to open the auxiliary water bottle cap first for pressure relief.

- After the servicing operation is completed, it is necessary to add coolant to the specified level.

1. Turn off all electrical appliances and turn off the start switch.

2. Open the engine hood.

3. Remove the engine compartment trim panel.

4. Disconnect the battery negative terminal.

5. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))

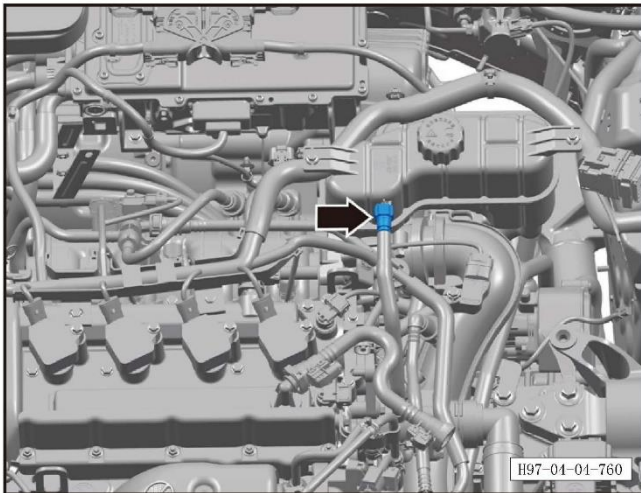
6. Remove the water bottle assembly and accessories.

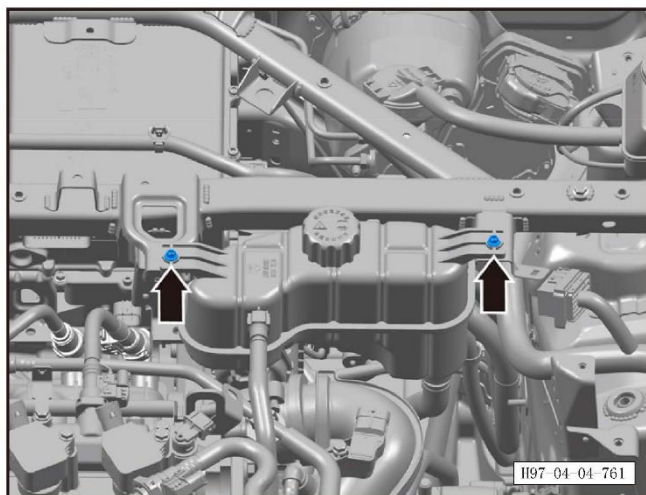
a. Disconnect 1 clip connecting the water bottle assembly to the water bottle vent hose.

CAUTION:

- Drain the coolant from the corresponding pipelines before removing them.

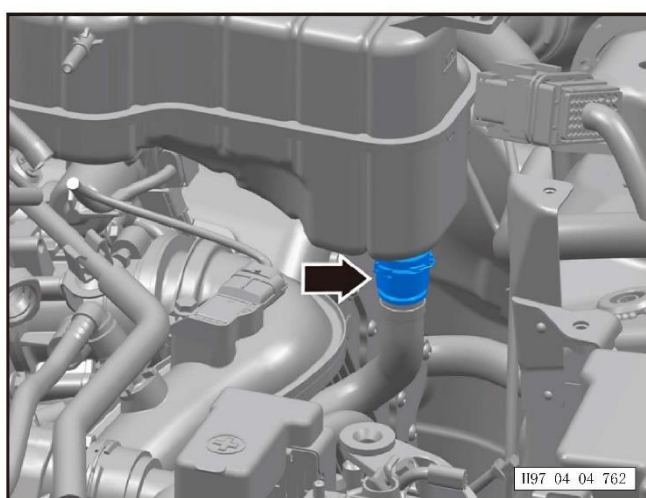
- After refitting, coolant must be added as required.



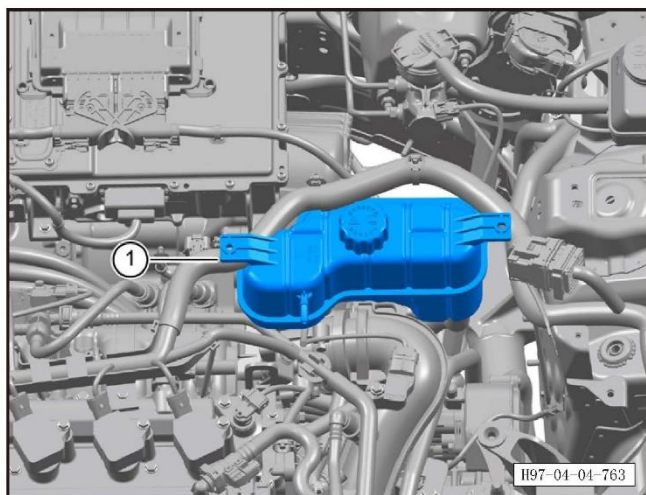


b. Unscrew 2 bolts that secure the water bottle assembly.

Tightening torque of bolt: $8\pm 1\text{Nm}$.



c. Disconnect 1 clip connecting the water bottle assembly to the water bottle supply pipe.



d. Take out the water bottle assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

New chapter for facelift

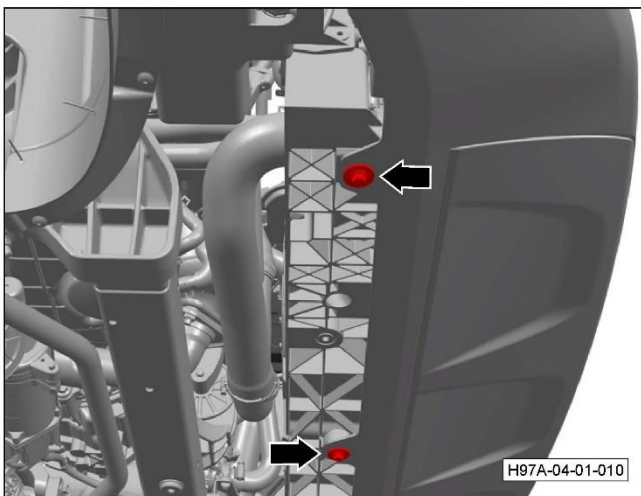
4.1.9.2 Removal and refitting of intercooler air inlet hose 1 (Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
6. Remove the intercooler air inlet hose 1.

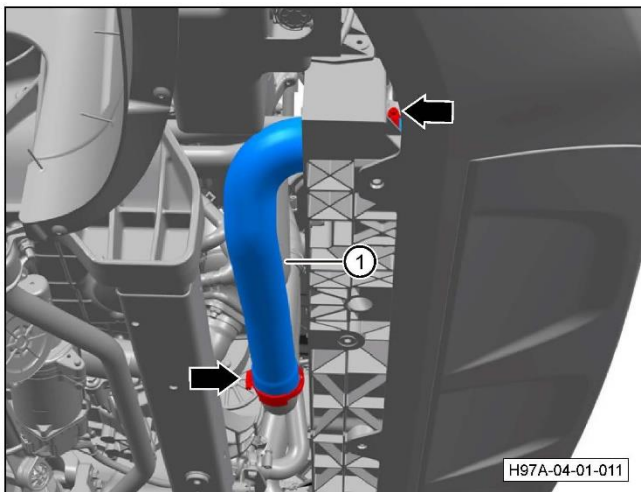
- a. Unscrew the 2 fixing bolts on the lower part of the front bumper.

Tightening torque of bolt: $2\pm 0.5\text{Nm}$.



- b. Loosen the pipe clamp bolts at both ends to remove the intercooler air inlet hose 1 ①.

Tightening torque of bolt: $6\pm 1\text{Nm}$.



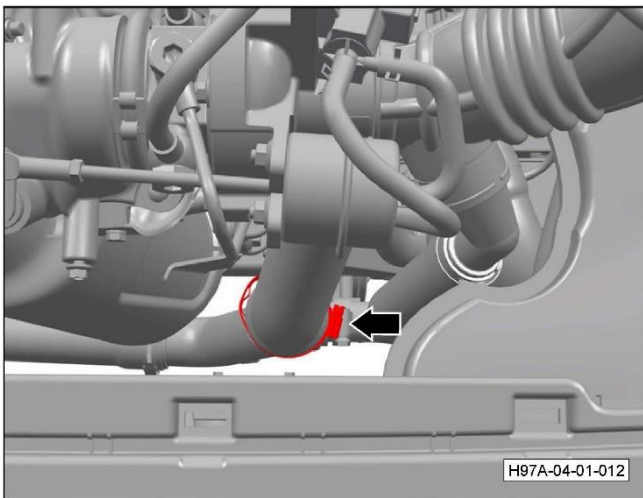
Refitting procedure

The refitting procedure is performed in reverse order.

4.1.9.3 Removal and refitting of intercooler air inlet hose 2 (Facelift)

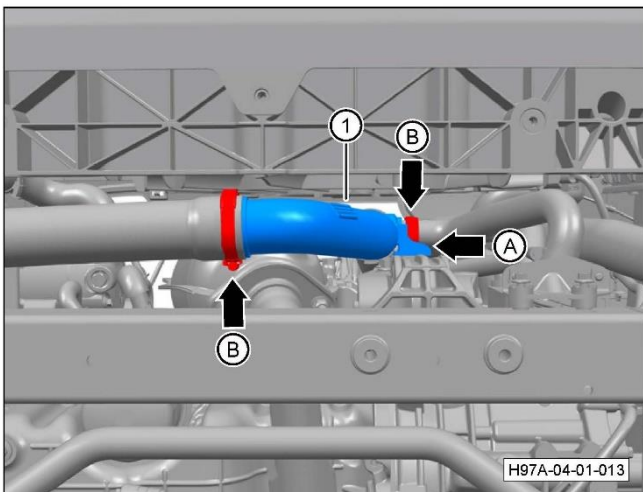
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
6. Remove the intercooler air inlet hose 2.



- a. Unscrew the upper clamp bolt of the intercooler air inlet hose 2.

Tightening torque of bolt: $6\pm 1\text{Nm}$.



- b. Unscrew the fixing bolt A, loosen the pipe clamp bolt B at both ends, and remove the intercooler air inlet hose 2 ①.

Tightening torque of bolt A: $8\pm 1\text{Nm}$.

Tightening torque of bolt B: $6\pm 1\text{Nm}$.

Refitting procedure

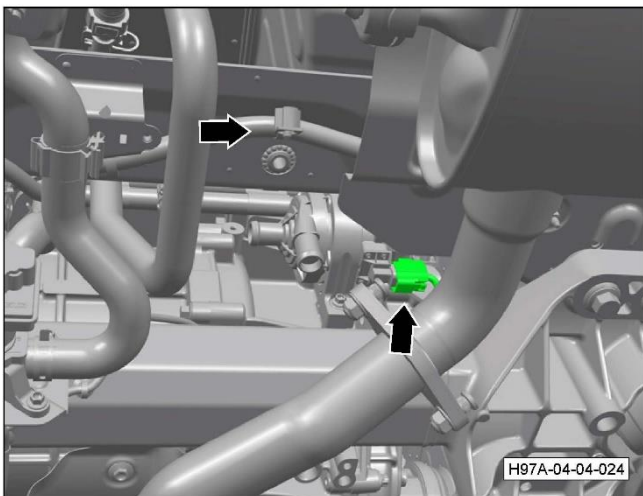
The refitting procedure is performed in reverse order.

4.4.8.21 Removal and refitting of water pump assembly (REV Facelift)

Removal procedure

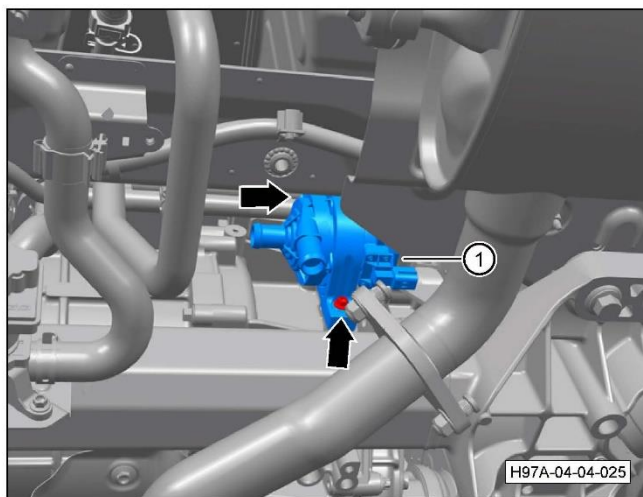
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the motor water pump inlet pipe assembly (refer to [X Removal and refitting of motor water pump inlet pipe assembly](#))
6. Remove the water pump assembly.

a. Disconnect the connector of the water pump assembly.



b. Unscrew the 2 fixing bolts of the water pump assembly to remove the water pump assembly ①.

Tightening torque of bolt: $8\pm 1\text{Nm}$.



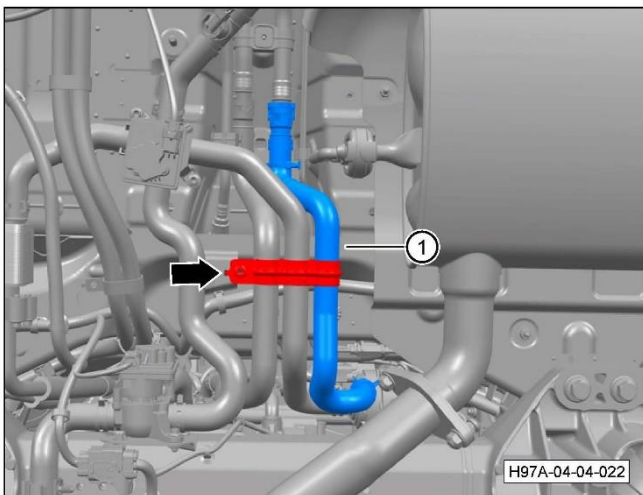
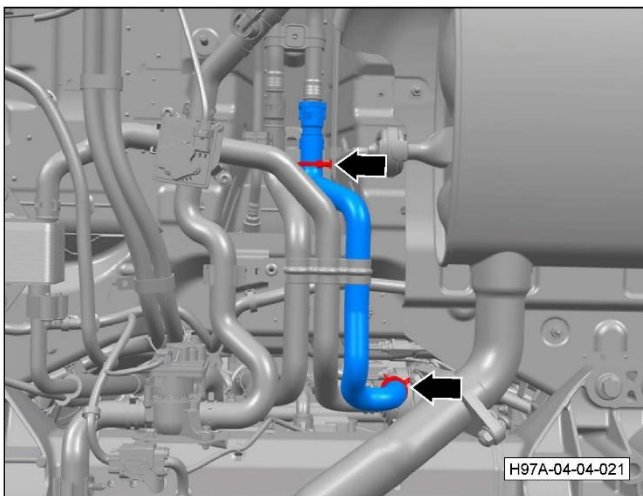
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.22 Removal and refitting of water pump outlet hose (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the middle lower protective plate (refer to [X Removal and refitting of middle lower protective plate](#))
6. Remove the water pump outlet hose.
 - a. Disconnect the clip and fastening clamp of the water pump outlet hose.



- b. Unscrew the pipe clamp fixing nut of the water pipe III to remove the water pump outlet hose ①.

Tightening torque of nut: $10 \pm 2 \text{Nm}$.

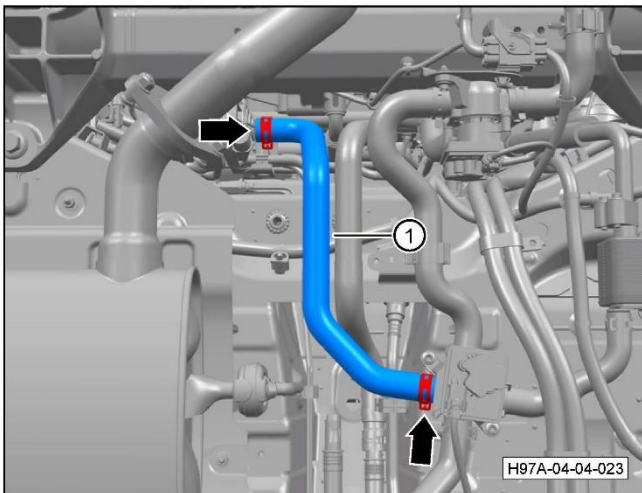
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.23 Removal and refitting of motor water pump inlet pipe assembly (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump outlet hose (refer to [X Removal and refitting of water pump outlet hose](#))
6. Remove the motor water pump inlet pipe assembly.
 - a. Disconnect the motor water pump inlet pipe assembly fastening clamp, and remove the motor water pump inlet pipe assembly ①.



Refitting procedure

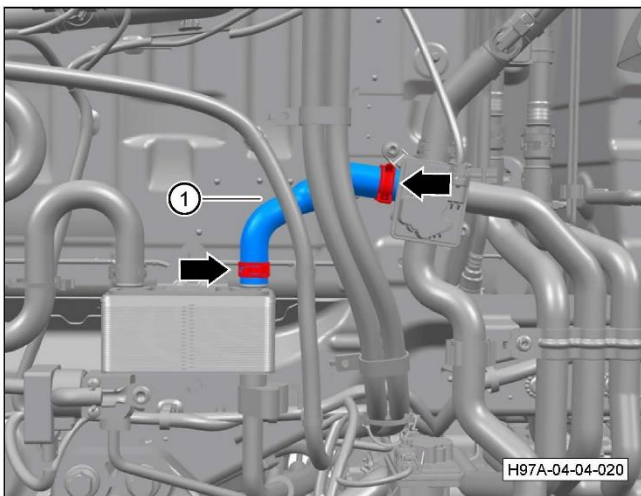
The refitting procedure is performed in reverse order.

4.4.8.24 Removal and refitting of four-way control valve water pipe 3 (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the rear drive motor assembly (refer to [X Removal and refitting of rear drive motor assembly](#))
6. Remove the four-way control valve water pipe 3.

- a. Disconnect the four-way control valve water pipe 3 and the battery cooler and the four-way control valve assembly fastening clamp, and remove the four-way control valve water pipe 3 ①.



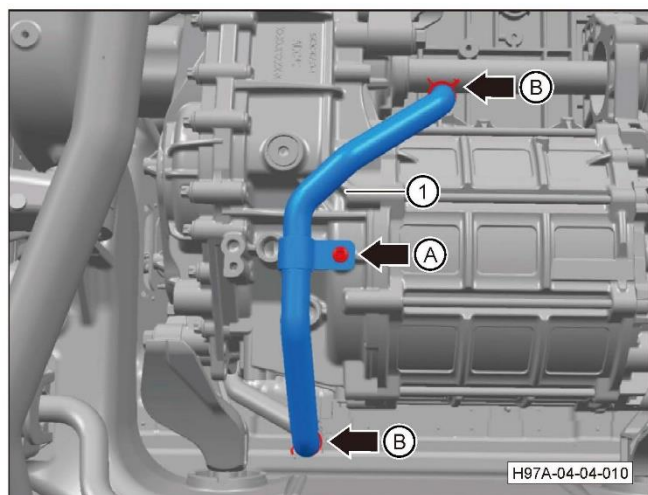
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.41 Removal and refitting of motor water outlet pipe 1 (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the motor water outlet pipe 1.



- a. Unscrew 1 fixing bolt A of the motor water outlet pipe 1, then disconnect the fastening clamps B at both ends of the motor water outlet pipe 1, and remove the motor water outlet pipe 1 ①.

Tightening torque of bolt: $11 \pm 2 \text{Nm}$.

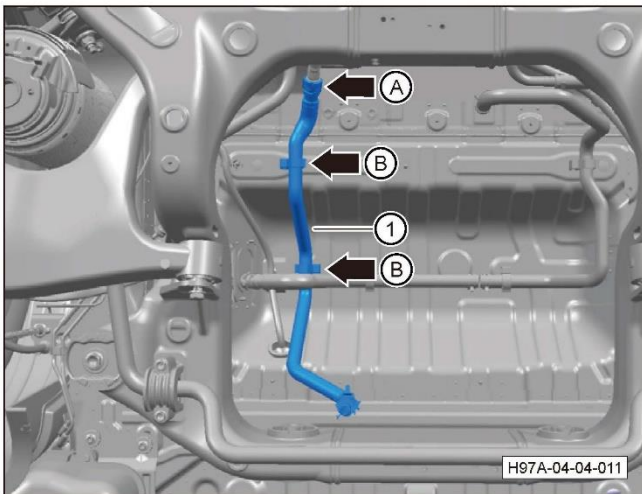
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.42 Removal and refitting of motor water outlet pipe 2 (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the rear drive motor assembly (refer to [X Removal and refitting of rear drive motor assembly](#))
6. Remove the motor water outlet pipe 2.



- a. Disconnect the motor water outlet pipe 2 and the middle channel water outlet pipe joint A, then disconnect the two clips B of the motor water outlet pipe 2, and remove the motor water outlet pipe 2 ①.

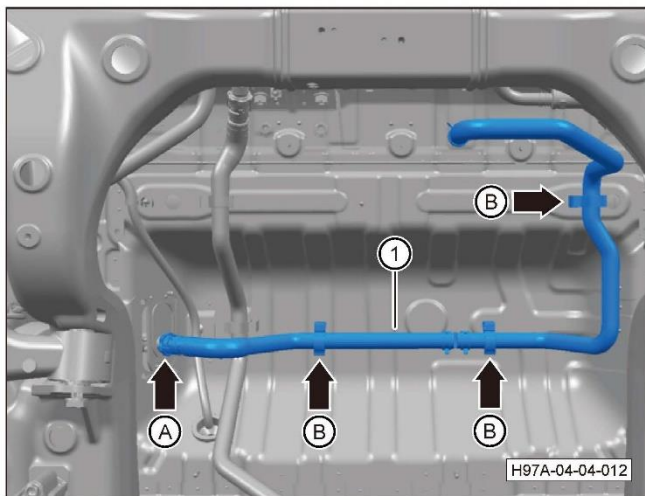
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.43 Removal and refitting of rear motor water inlet hose (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the rear drive motor assembly (refer to [X Removal and refitting of rear drive motor assembly](#))
6. Remove the rear motor water inlet hose.



- a. Disconnect the rear motor water inlet hose and the charger water pipe assembly joint A, then disconnect the three clips B of the rear motor water inlet hose, and remove the rear motor water inlet hose ①.

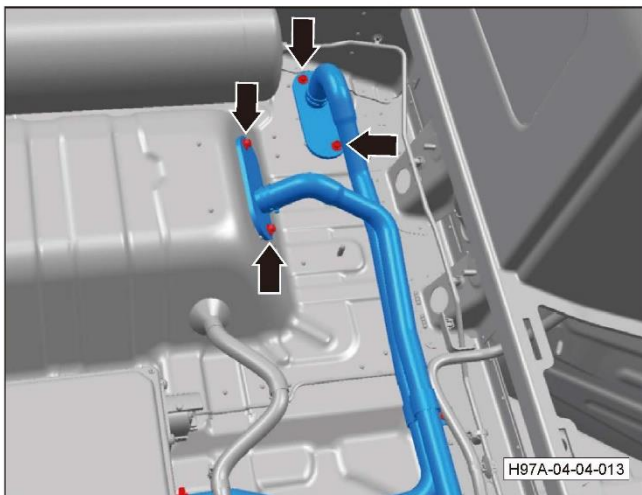
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.44 Removal and refitting of charger water pipe assembly (REV Facelift)

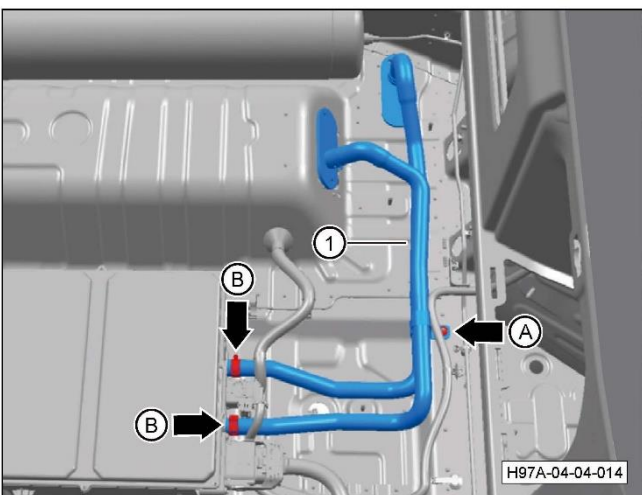
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the rear motor water inlet hose (refer to [X Removal and refitting of rear motor water inlet hose](#))
6. Remove the rear motor water outlet pipe 2 (refer to [X Removal and refitting of rear motor water outlet pipe 2](#))
7. Remove the charger water pipe assembly.



- a. Unscrew the 4 fixing bolts of the charger water pipe assembly.

Tightening torque of bolt: $11 \pm 2 \text{Nm}$.



- b. Unscrew one fixing nut A of the charger water pipe assembly, disconnect the two clamps B of the charger water pipe assembly, and remove the charger water pipe assembly ①.

Tightening torque of nut: $11 \pm 2 \text{Nm}$.

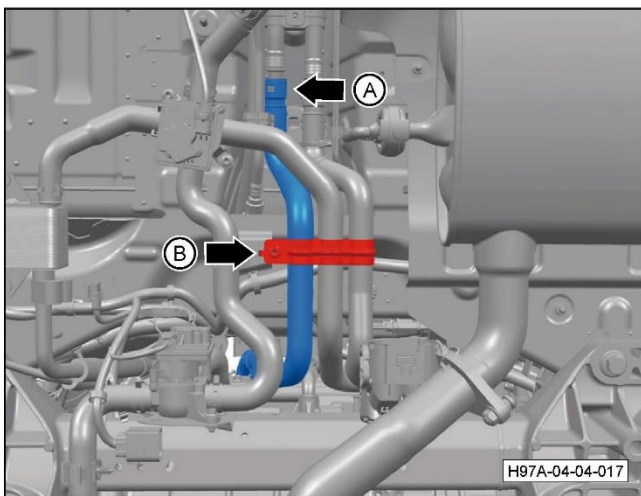
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.45 Removal and refitting of middle channel water outlet hose (REV Facelift)

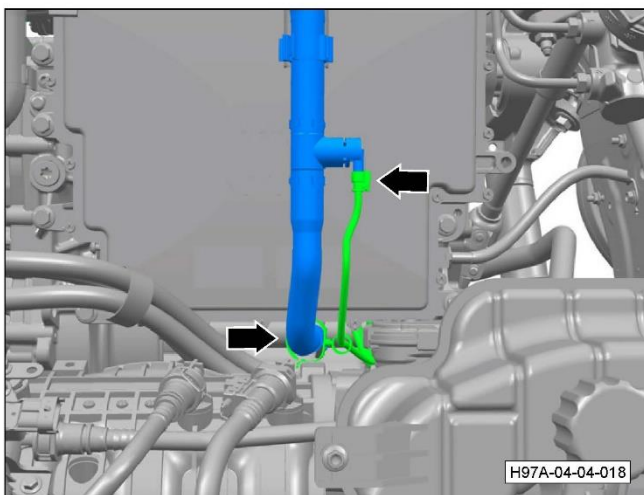
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the rear drive motor assembly (refer to [X Removal and refitting of rear drive motor assembly](#))
6. Remove the middle channel water outlet hose.

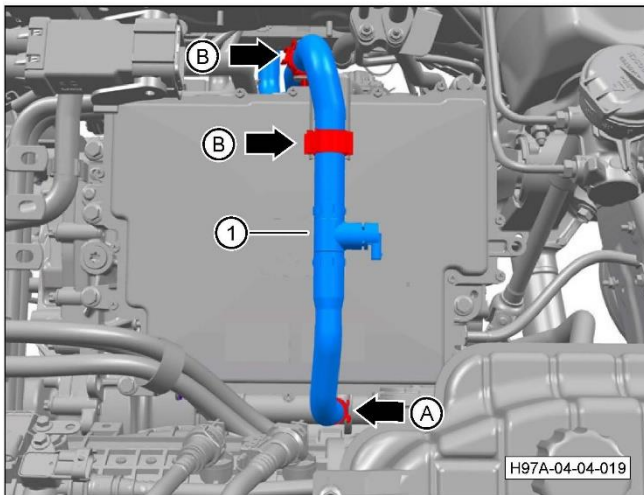


- a. Disconnect the middle channel water outlet hose and the middle channel water outlet pipe joint A, unscrew the pipe clamp fixing nut of water pipe III, and disconnect the pipe clamp B of water pipe III.

Tightening torque of nut: $10 \pm 2 \text{ Nm}$.



- b. Disconnect the middle channel water outlet hose connector and release the harness clip.



c. Disconnect the fastening clamp A of the middle channel water outlet hose, release the two pipe clamps B of the middle channel water outlet hose, and remove the middle channel water outlet hose ①.

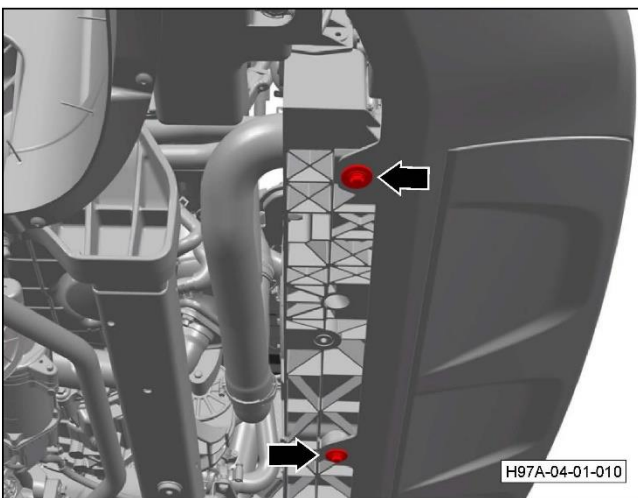
Refitting procedure

The refitting procedure is performed in reverse order.

4.1.9.2 Removal and refitting of intercooler air inlet hose 1 (Facelift)

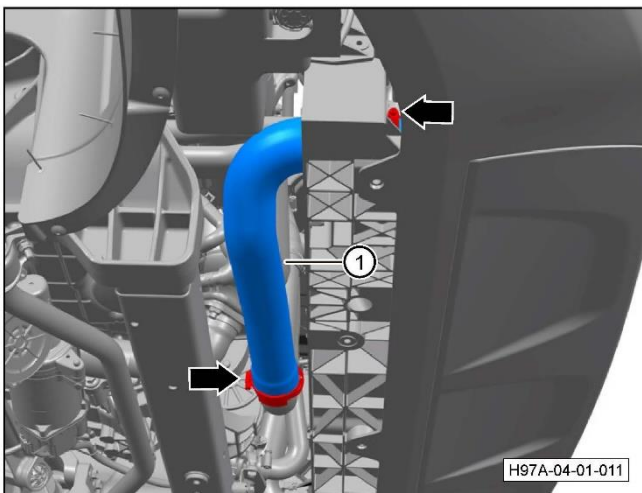
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
6. Remove the intercooler air inlet hose 1.



- a. Unscrew the 2 fixing bolts on the lower part of the front bumper.

Tightening torque of bolt: $2\pm 0.5\text{Nm}$.



- b. Loosen the pipe clamp bolts at both ends to remove the intercooler air inlet hose 1 ①.

Tightening torque of bolt: $6\pm 1\text{Nm}$.

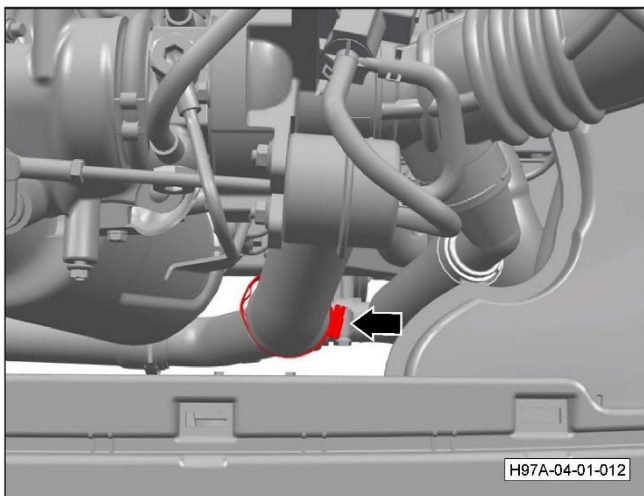
Refitting procedure

The refitting procedure is performed in reverse order.

4.1.9.3 Removal and refitting of intercooler air inlet hose 2 (Facelift)

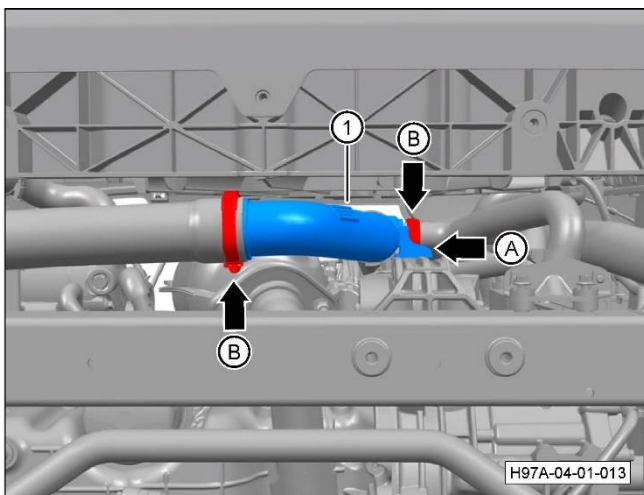
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
6. Remove the intercooler air inlet hose 2.



- a. Unscrew the upper clamp bolt of the intercooler air inlet hose 2.

Tightening torque of bolt: $6\pm 1\text{Nm}$.



- b. Unscrew the fixing bolt A, loosen the pipe clamp bolt B at both ends, and remove the intercooler air inlet hose 2 ①.

Tightening torque of bolt A: $8\pm 1\text{Nm}$.

Tightening torque of bolt B: $6\pm 1\text{Nm}$.

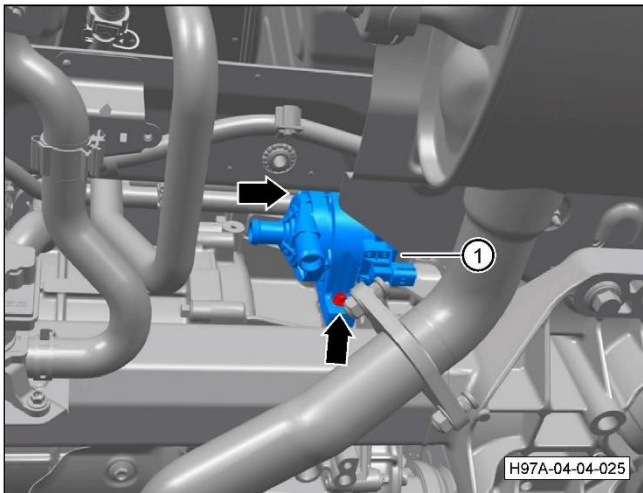
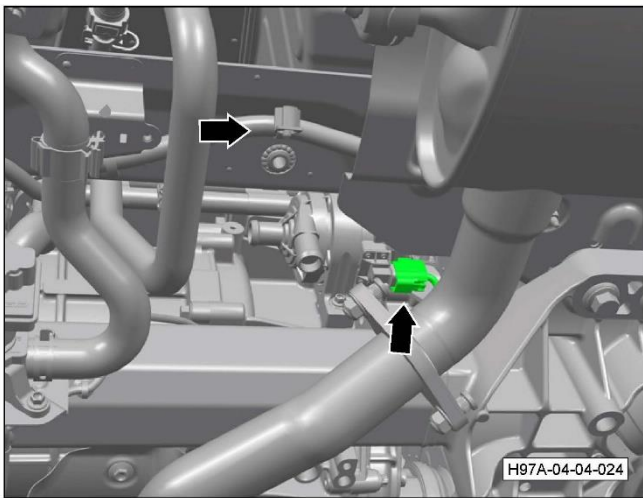
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.21 Removal and refitting of water pump assembly (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the motor water pump inlet pipe assembly (refer to [X Removal and refitting of motor water pump inlet pipe assembly](#))
6. Remove the water pump assembly.
 - a. Disconnect the connector of the water pump assembly.



- b. Unscrew the 2 fixing bolts of the water pump assembly to remove the water pump assembly ①.
Tightening torque of bolt: $8\pm 1\text{Nm}$.

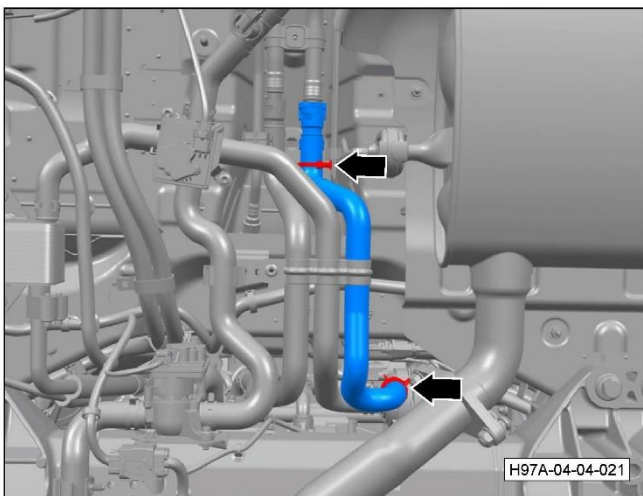
Refitting procedure

The refitting procedure is performed in reverse order.

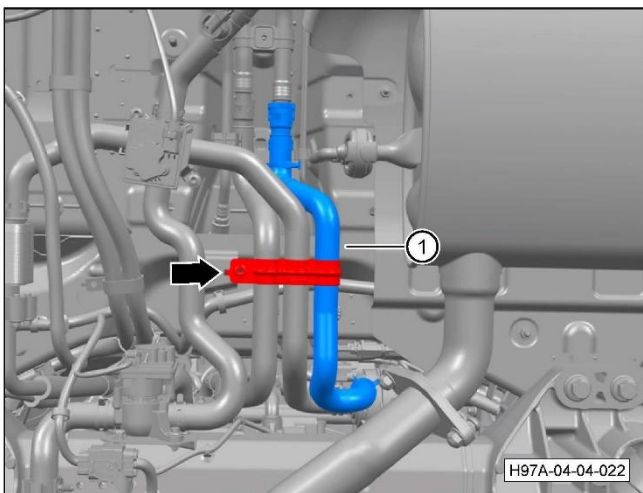
4.4.8.22 Removal and refitting of water pump outlet hose (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the middle lower protective plate (refer to [X Removal and refitting of middle lower protective plate](#))
6. Remove the water pump outlet hose.
 - a. Disconnect the clip and fastening clamp of the water pump outlet hose.



- b. Unscrew the pipe clamp fixing nut of the water pipe III to remove the water pump outlet hose ①.
- Tightening torque of nut: $10 \pm 2 \text{ Nm}$.



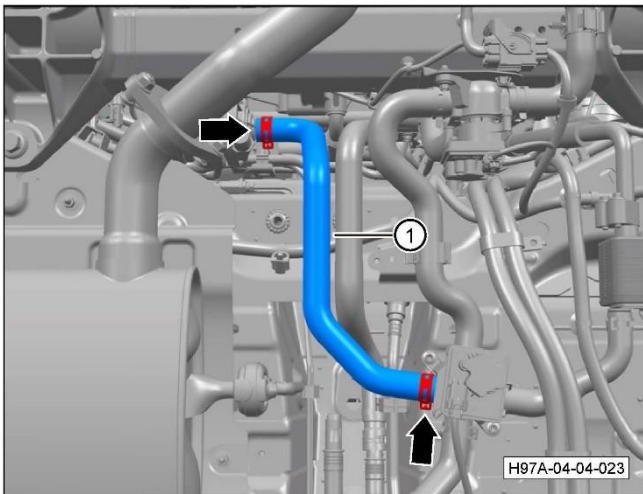
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.23 Removal and refitting of motor water pump inlet pipe assembly (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump outlet hose (refer to [X Removal and refitting of water pump outlet hose](#))
6. Remove the motor water pump inlet pipe assembly.
 - a. Disconnect the motor water pump inlet pipe assembly fastening clamp, and remove the motor water pump inlet pipe assembly ①.



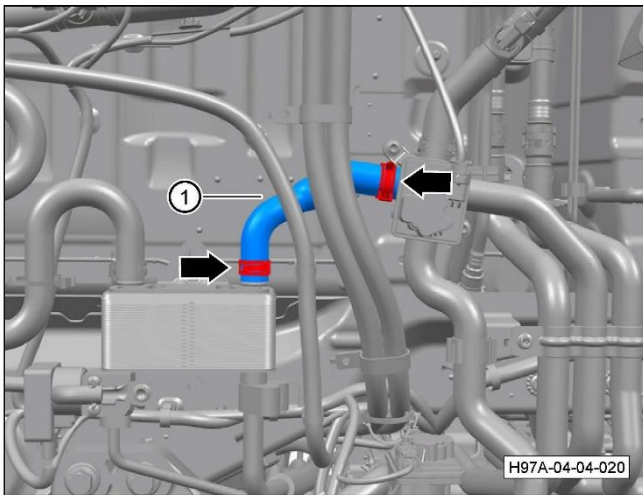
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.24 Removal and refitting of four-way control valve water pipe 3 (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the rear drive motor assembly (refer to [X Removal and refitting of rear drive motor assembly](#))
6. Remove the four-way control valve water pipe 3.
 - a. Disconnect the four-way control valve water pipe 3 and the battery cooler and the four-way control valve assembly fastening clamp, and remove the four-way control valve water pipe 3 ①.



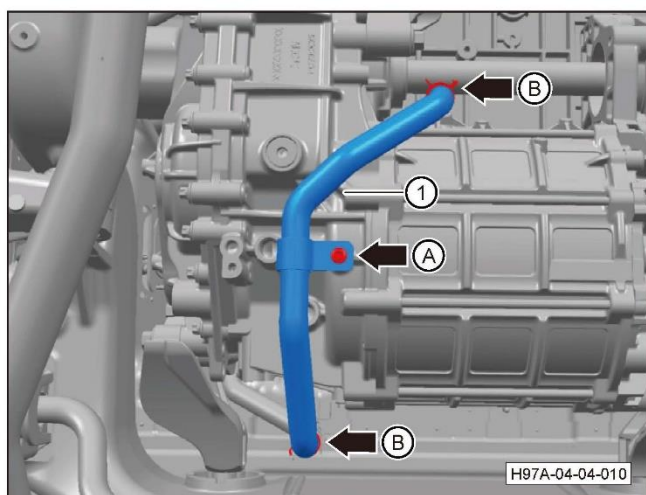
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.41 Removal and refitting of motor water outlet pipe 1 (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the motor water outlet pipe 1.



- a. Unscrew 1 fixing bolt A of the motor water outlet pipe 1, then disconnect the fastening clamps B at both ends of the motor water outlet pipe 1, and remove the motor water outlet pipe 1 ①.

Tightening torque of bolt: $11 \pm 2 \text{Nm}$.

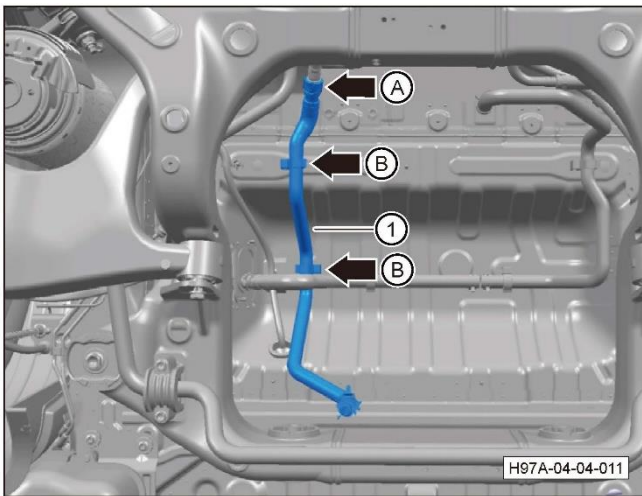
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.42 Removal and refitting of motor water outlet pipe 2 (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the rear drive motor assembly (refer to [X Removal and refitting of rear drive motor assembly](#))
6. Remove the motor water outlet pipe 2.



- a. Disconnect the motor water outlet pipe 2 and the middle channel water outlet pipe joint A, then disconnect the two clips B of the motor water outlet pipe 2, and remove the motor water outlet pipe 2 ①.

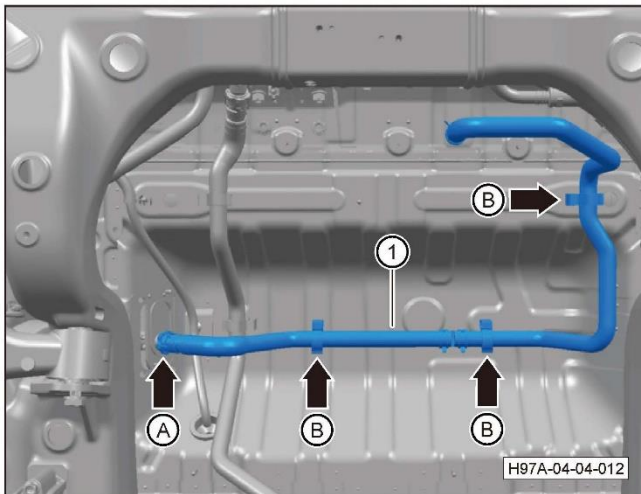
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.43 Removal and refitting of rear motor water inlet hose (REV Facelift)

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the rear drive motor assembly (refer to [X Removal and refitting of rear drive motor assembly](#))
6. Remove the rear motor water inlet hose.



- a. Disconnect the rear motor water inlet hose and the charger water pipe assembly joint A, then disconnect the three clips B of the rear motor water inlet hose, and remove the rear motor water inlet hose ①.

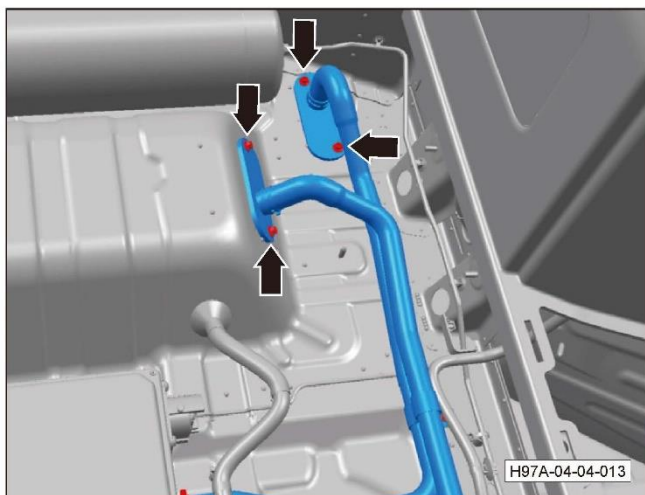
Refitting procedure

The refitting procedure is performed in reverse order.

4.4.8.44 Removal and refitting of charger water pipe assembly (REV Facelift)

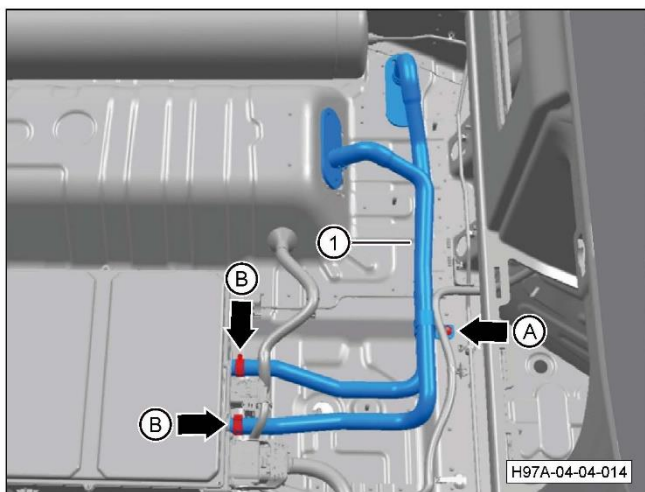
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the rear motor water inlet hose (refer to [X Removal and refitting of rear motor water inlet hose](#))
6. Remove the rear motor water outlet pipe 2 (refer to [X Removal and refitting of rear motor water outlet pipe 2](#))
7. Remove the charger water pipe assembly.



- a. Unscrew the 4 fixing bolts of the charger water pipe assembly.

Tightening torque of bolt: $11 \pm 2 \text{ Nm}$.



- b. Unscrew one fixing nut A of the charger water pipe assembly, disconnect the two clamps B of the charger water pipe assembly, and remove the charger water pipe assembly ①.

Tightening torque of nut: $11 \pm 2 \text{ Nm}$.

Refitting procedure

The refitting procedure is performed in reverse order.

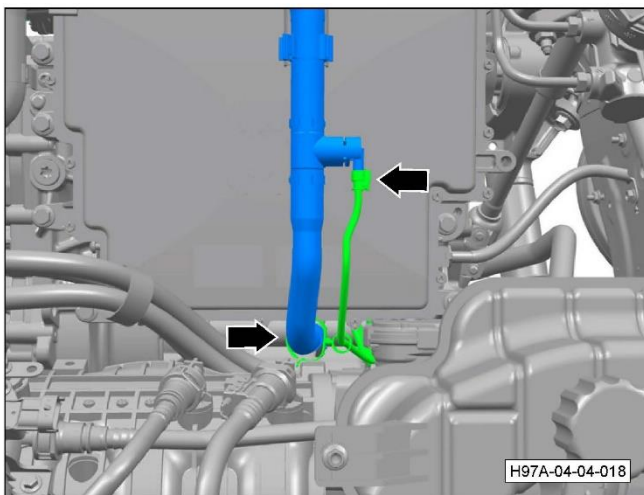
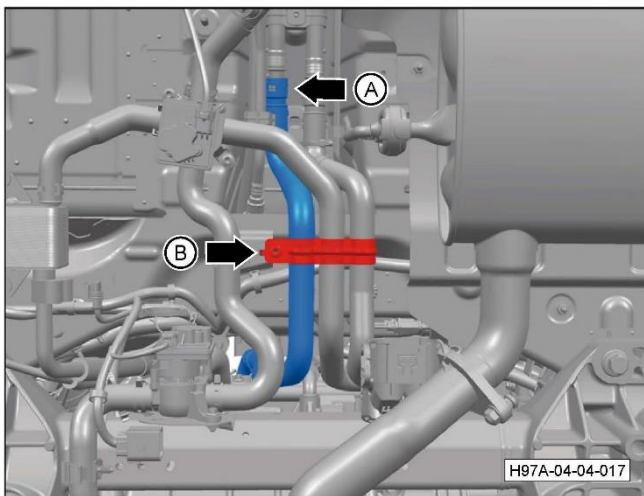
4.4.8.45 Removal and refitting of middle channel water outlet hose (REV Facelift)

Removal procedure

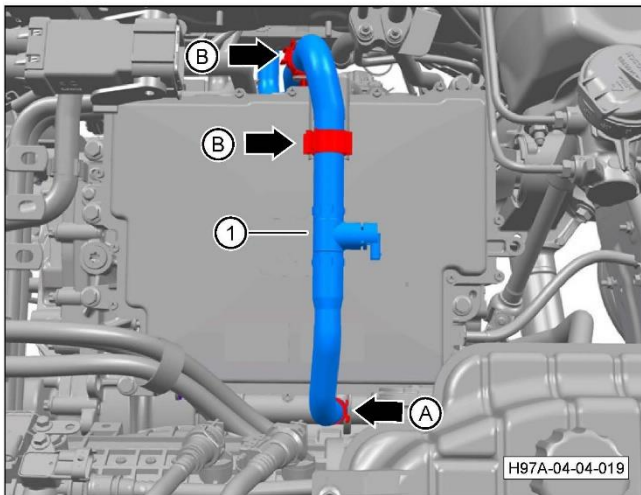
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the rear drive motor assembly (refer to [X Removal and refitting of rear drive motor assembly](#))
6. Remove the middle channel water outlet hose.

- a. Disconnect the middle channel water outlet hose and the middle channel water outlet pipe joint A, unscrew the pipe clamp fixing nut of water pipe III, and disconnect the pipe clamp B of water pipe III.

Tightening torque of nut: $10\pm 2\text{Nm}$.



- b. Disconnect the middle channel water outlet hose connector and release the harness clip.



c. Disconnect the fastening clamp A of the middle channel water outlet hose, release the two pipe clamps B of the middle channel water outlet hose, and remove the middle channel water outlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.5 Range extender assembly

4.5.1 Overview and precautions

- VOYAH FREE REV is equipped with SFG15TR range extender assembly (including 1.5T engine and 65KW permanent magnet synchronous motor). The emission conforms to China VI b, and the range is effectively increased.
- It features compact structure, high power per liter, low fuel consumption, high power generation efficiency, and excellent NVH etc.
- Advanced electronic control system is employed to make the range extender always work in the best condition.
- Driving comfort, optimum fuel economy, perfect range and environmental performance are ensured.
- Coolant: Check the coolant for the range extender (usually between the MIN and MAX lines of the water bottle). If the coolant is insufficient, add coolant. Oil: Check the oil level of the oil dipstick. If the oil is found to be insufficient, it should be replenished in time. Standard oil (SN grade 5W-30) must be used. If non-standard oil is used, the service life of the range extender will be shortened.
- Fuel: Gasoline of No. 92 and above in accordance with GB 17930 is recommended.
- There are five driving modes for REV, namely economy mode, comfort mode, sport mode, free mode, and rapid acceleration mode:
 - (1) In any driving mode, when the vehicle speed reaches $\geq 20\text{km/h}$, the range extender will start automatically; when the SOC $< 20\%$, the range extender control system will force the range extender to start.
 - (2) If the range extender cannot be started after repeated attempts, please go to the special service center for servicing of the fuel system, intake system, electrical system and electronic control system.
- Traveling: When the car is traveling, it should be ensured that the cooling system is in good condition, the oil pressure is normal, and the IHU does not report any faults.
- Parking: When stopping, do not park on flammable materials such as hay to avoid fire caused by the high temperature of the three-way catalytic converter.
- Rainy days or wading: When driving through a flooded road on a rainy day or when wading at ordinary times, make sure that the air cleaner, range extender and control system are well sealed, otherwise it may cause water to enter the range extender cylinder, resulting in damage to the connecting rod and other components; besides, it may cause water to enter the range extender generator and range extender controller, resulting in damage to the generator and the corresponding controller.
- Gasoline pipeline: Fuel supply pressure up to 0.4MPa. The fuel inlet pipe employed must be explosion-proof rubber pipe or plastic pipe, and regularly check whether the pipe joint is leaking.
- According to the condition of gasoline actually used in China at present, when the vehicle is parked for a long time, the range extender should be started every two weeks for 2 to 3 minutes to avoid clogging the injector due to the gelling of gasoline.
- When the fuel is insufficient, please pay attention to the battery power of the vehicle before driving, otherwise the electric fuel pump will not work normally after starting the range extender; it is prohibited to drive a vehicle with a very low amount of fuel remaining. Otherwise, the emission control system and range extender system may be damaged due to fuel depletion.
- The range extender generator is a high-voltage generator unit, of which various performance indicators have been adjusted to be acceptable before leaving the factory. Users are not allowed to adjust related parameters during use at discretion, otherwise the correctness of the relevant parameters will be destroyed, thereby affecting the power generation performance of the range extender generator. Besides, there are warning signs such as "Danger! High Voltage" on the nameplate of the range extender generator, which should not be touched at will, and should be serviced by professionals if faulty.
- Do not open the cover or housing of any ECU. If the pin tube of the integrated circuit is touched, the integrated circuit board may be damaged by static electricity. Besides, for HV ECU equipment, personnel who have not obtained the qualification certificate or have not received special training cannot carry out the servicing of HV equipment.
- Cotter pins, gaskets, "O" rings, oil seals, gaskets and other parts cannot be reused.
- During the operation, if any abnormal phenomenon is found, stop and check in time.

4.5.2 Introduction to structure and principle

- Engine composition

- The engine block is the skeleton that constitutes the engine, and is the installation base for the various mechanisms and systems of the engine, inside and outside of which are equipped with all the main parts and accessories of the engine to bear various loads. Therefore, the engine block must have sufficient strength and rigidity. The engine block is mainly composed of cylinder block, cylinder liner, cylinder head and cylinder head gasket and other parts.

- Valve

- Valve, specifically Gench Engine Valve for VOYAH, is an important part of the engine. From the engine structure, it is divided into intake valve and exhaust valve. The intake valve is used to draw air into the engine and mix it with fuel for combustion; the exhaust valve is used to discharge the burned exhaust gas and push the turbocharger vanes.

- Piston

- The engine is like the "heart" of the car, and the piston can be understood as the "center" of the engine, which is in a harsh working environment and is constantly reciprocating from BDC to TDC, and from TDC to BDC for suction, compression, work, exhaust.

- VCP assembly

- The advantages of the car engine using the VCP system are fuel saving and high power-to-liter ratio. The phase of the engine cam is adjusted through the equipped control and execution system, so that the valve opening and closing time changes with the change of the engine speed, so as to improve the charging efficiency and increase the engine power.

- Ignition system

- The ignition system is an important part of the gasoline engine, and the performance of which has a great influence on the power, fuel consumption and exhaust pollution of the engine. All equipment capable of generating an electrical spark between the electrodes of a spark plug is called an engine "ignition system". It usually consists of engine controller, ignition coil and spark plug.

- Oil pump

- The oil pump is a light and compact pump that requires a power source to operate, which is driven by the engine crankshaft gear.

- Lubrication system

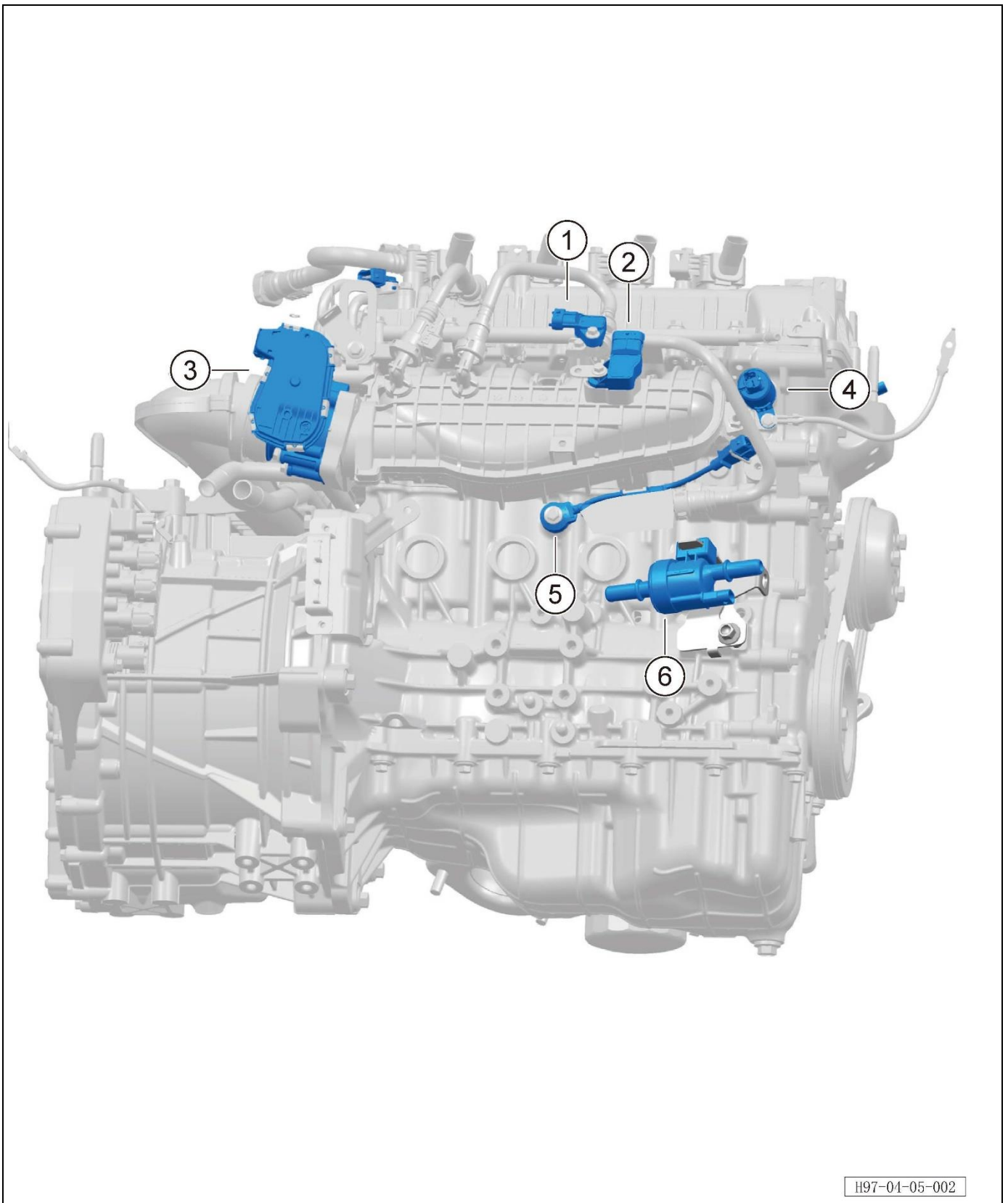
- When the engine is working, each moving part acts on another part with a certain force, and a high-speed relative motion occurs. With relative motion, friction will inevitably occur on the surface of the parts, which will accelerate wear. Therefore, in order to alleviate wear, reduce frictional resistance and prolong service life, there must be a lubrication system on the engine.

- The lubrication system is used to continuously deliver a sufficient amount of clean oil with appropriate temperature to the friction surfaces of all transmission parts when the engine is working, and form an oil film between the friction surfaces to achieve liquid friction and reduce frictional resistance. reduce power consumption, alleviate the wear of parts, in order to achieve the purpose of improving the reliability and durability of the engine. There are four types of lubrication methods: pressure lubrication, splash lubrication, grease lubrication and jet lubrication.

4.5.3 Position diagram of parts

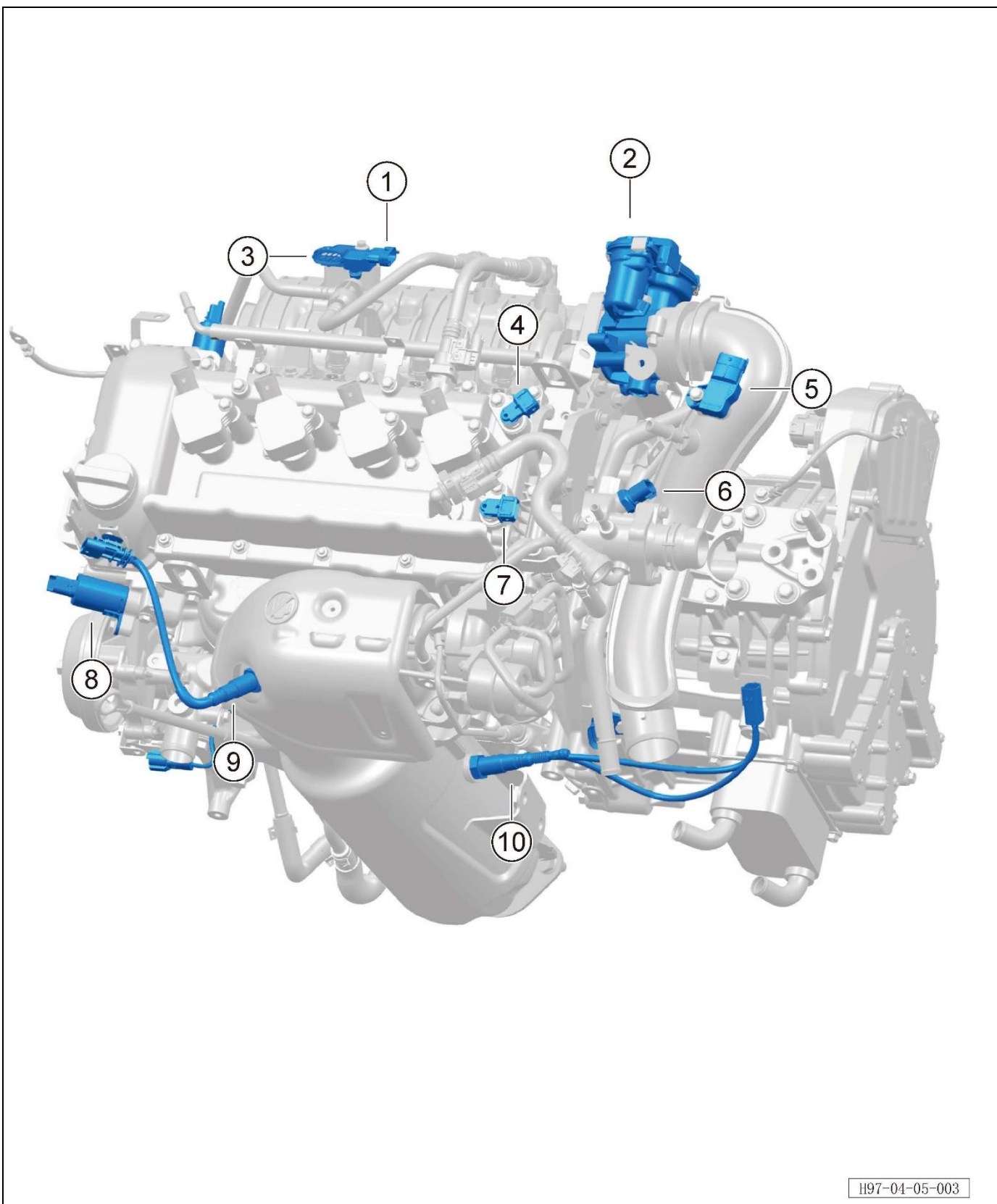


| S/N | Part name | Loading quantity | Remarks |
|-----|-------------------------------------|------------------|--------------|
| 1 | Engine controller | 1 | |
| 2 | Oxygen sensor I | 1 | |
| 3 | Intake temperature/pressure sensor | 1 | |
| 4 | OCV control valve | 1 | Exhaust side |
| 5 | Oil pressure alarm assembly | 1 | |
| 6 | Crankshaft position sensor assembly | 1 | |
| 7 | Oxygen sensor II | 1 | |
| 8 | RCV assembly | 1 | |



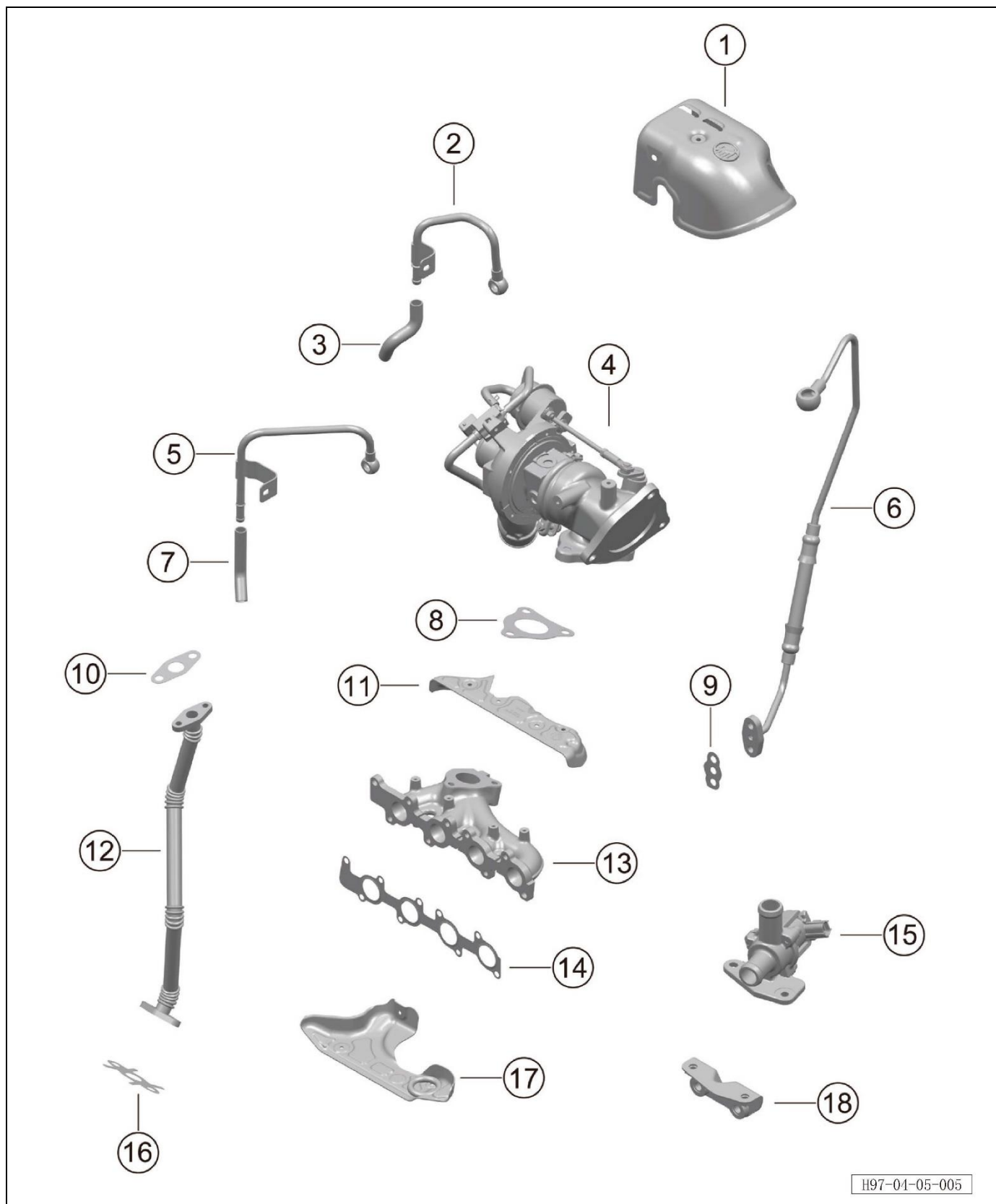
H97-04-05-002

| S/N | Part name | Loading quantity | Remarks |
|-----|------------------------------------|------------------|-------------|
| 1 | Ambient pressure sensor | 1 | |
| 2 | Intake temperature/pressure sensor | 1 | |
| 3 | Electronic throttle assembly | 1 | |
| 4 | OCV control valve | 1 | Intake side |
| 5 | Knock sensor assembly | 1 | |
| 6 | Canister control valve assembly | 1 | |



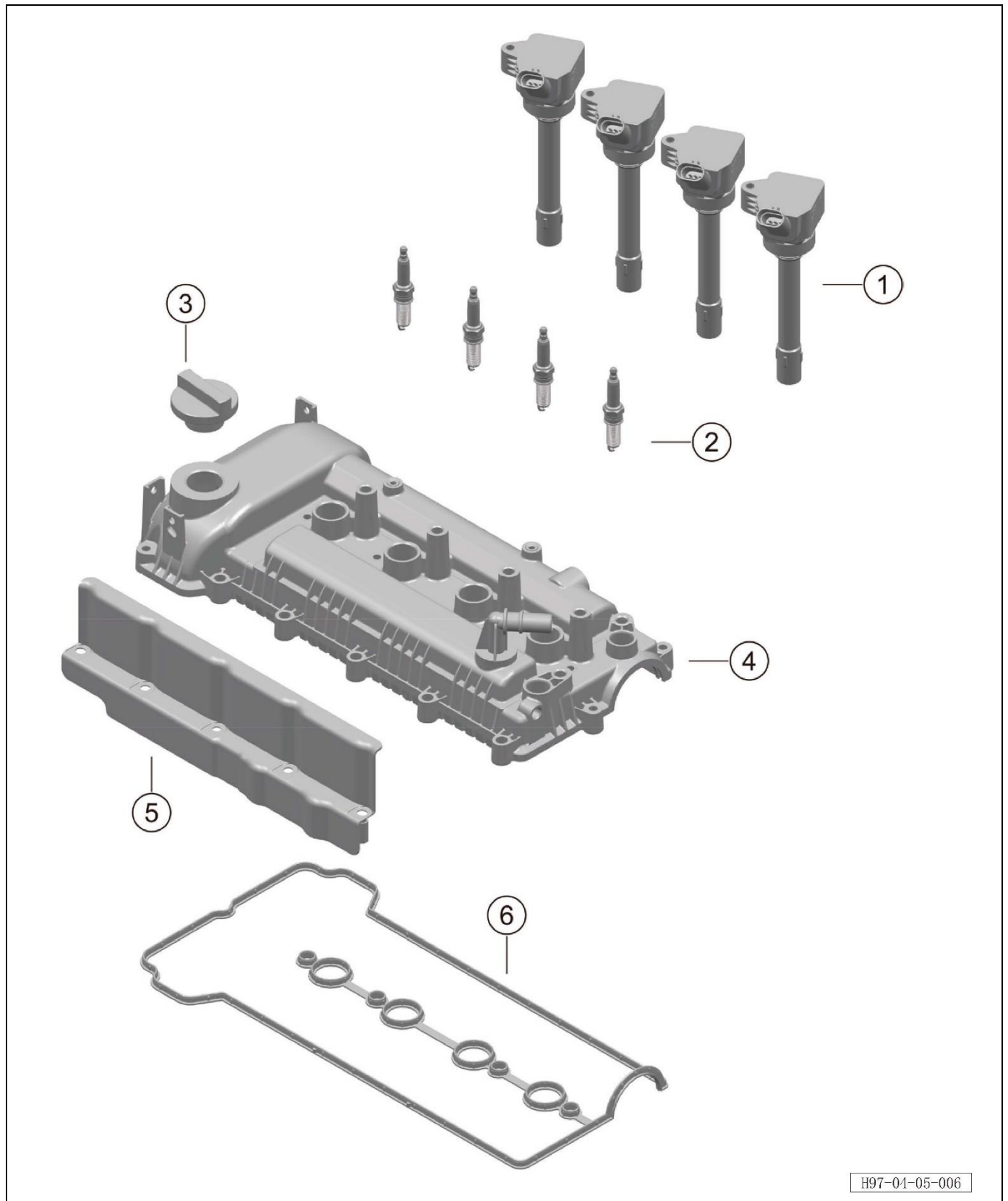
| S/N | Part name | Loading quantity | Remarks |
|-----|------------------------------------|------------------|--------------|
| 1 | Ambient pressure sensor | 1 | |
| 2 | Electronic throttle assembly | 1 | |
| 3 | Intake temperature/pressure sensor | 1 | |
| 4 | Camshaft position sensor | 1 | Intake side |
| 5 | Intake temperature/pressure sensor | 1 | |
| 6 | Water temperature sensor | 1 | |
| 7 | Camshaft position sensor | 1 | Exhaust side |
| 8 | OCV control valve | 1 | Exhaust side |
| 9 | Oxygen sensor I | 1 | |
| 10 | Oxygen sensor II | 1 | |

4.5.4 Exploded view



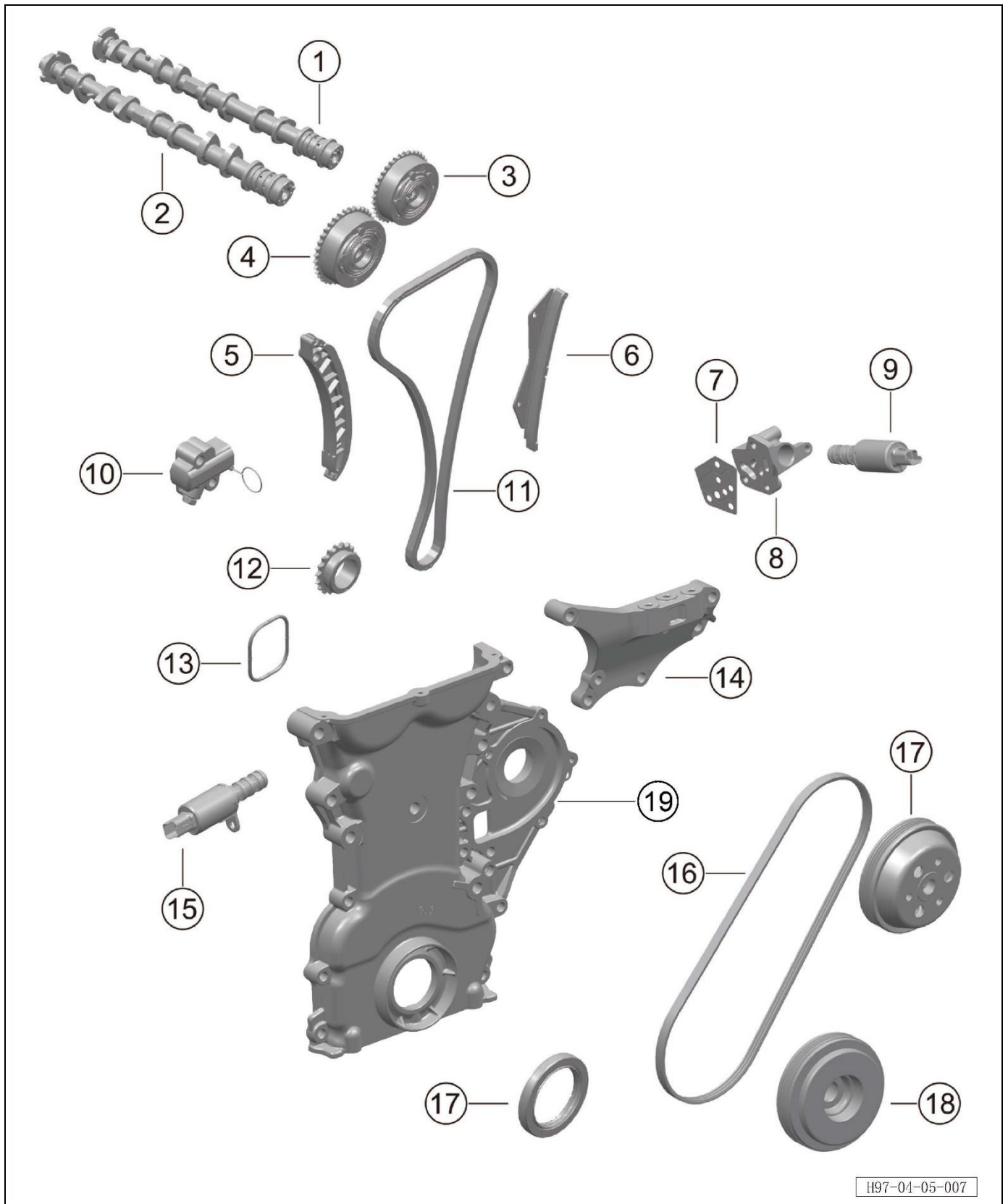
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| S/N | Part name | Loading quantity | Remarks |
|-----|---|------------------|---------|
| 1 | Turbocharger upper heat shield assembly | 1 | |
| 2 | Turbocharger metal water inlet pipe assembly | 1 | |
| 3 | Turbocharger water inlet hose | 1 | |
| 4 | Turbocharger assembly | 1 | |
| 5 | Turbocharger metal water return pipe assembly | 1 | |
| 6 | Turbocharger oil inlet pipe assembly | 1 | |
| 7 | Turbocharger water return hose | 1 | |
| 8 | Turbocharger air inlet gasket | 1 | |
| 9 | Turbocharger oil inlet pipe gasket | 1 | |
| 10 | Turbocharger oil return pipe gasket | 1 | |
| 11 | Upper heat shield assembly | 1 | |
| 12 | Turbocharger oil return pipe assembly | 1 | |
| 13 | Exhaust manifold assembly | 1 | |
| 14 | Exhaust manifold gasket assembly | 1 | |
| 15 | RCV assembly | 1 | |
| 16 | Turbocharger oil return pipe gasket II | 1 | |
| 17 | Lower heat shield assembly | 1 | |
| 18 | RCV mounting bracket | 1 | |

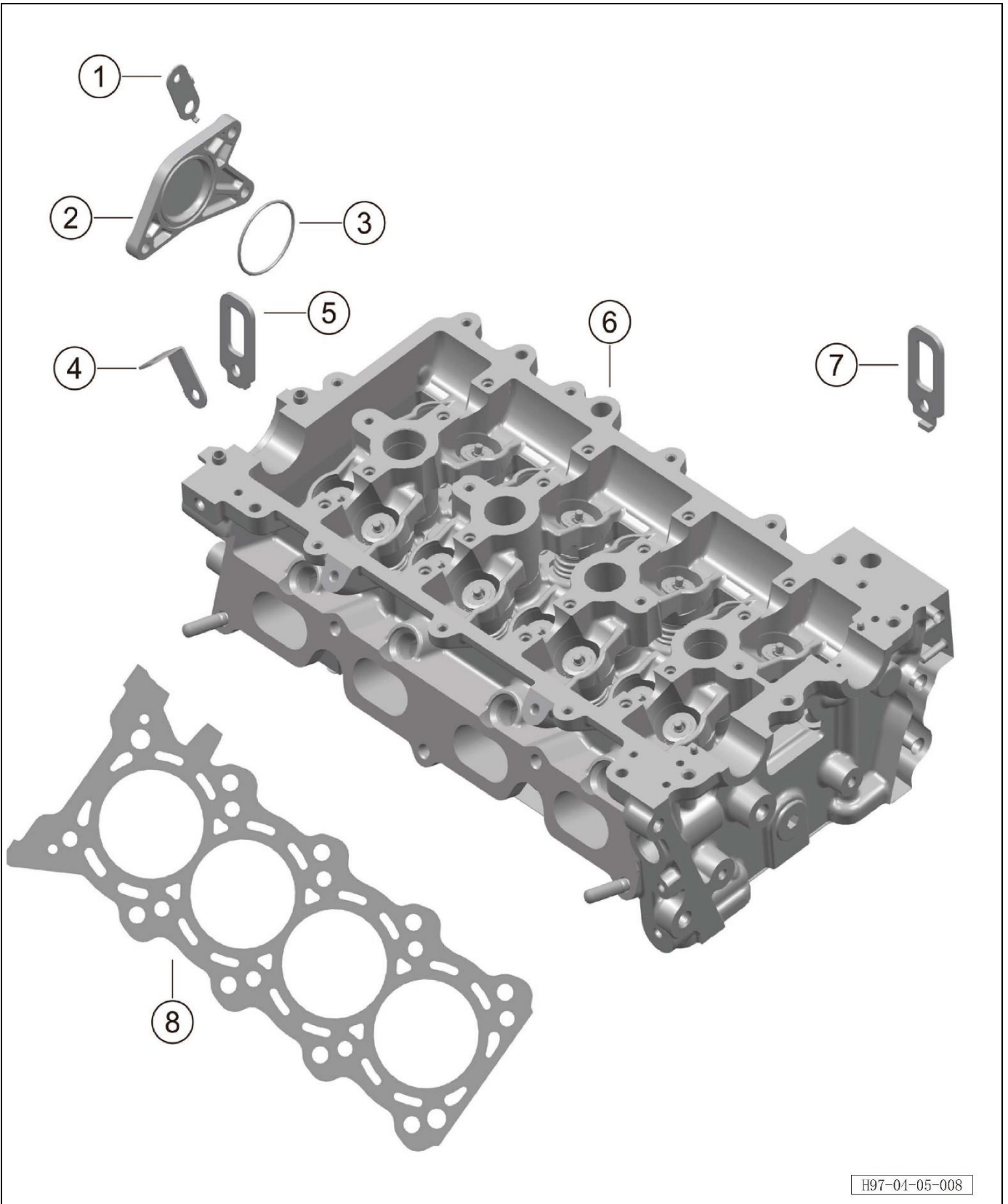


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| S/N | Part name | Loading quantity | Remarks |
|-----|---------------------------------|------------------|---------|
| 1 | Ignition coil assembly | 1 | |
| 2 | Spark plug assembly | 1 | |
| 3 | Filler cap assembly | 1 | |
| 4 | Cylinder head cover assembly | 1 | |
| 5 | Cylinder head cover heat shield | 1 | |
| 6 | Cylinder head cover gasket | 1 | |

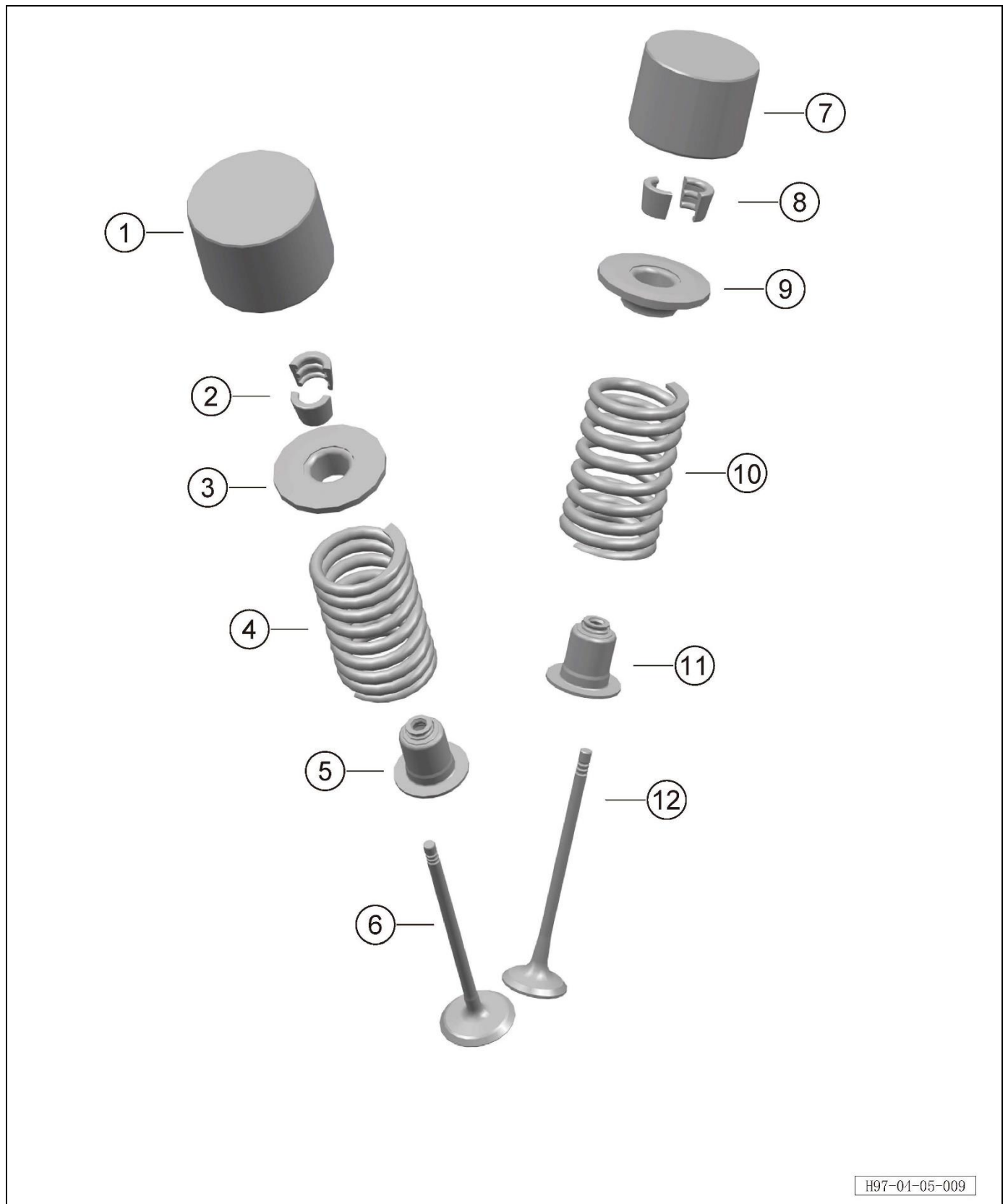


| S/N | Part name | Loading quantity | Remarks |
|-----|----------------------------------|------------------|---------|
| 1 | Exhaust camshaft assembly | 1 | |
| 2 | Intake camshaft assembly | 1 | |
| 3 | Exhaust VCP assembly | 1 | |
| 4 | Intake VCP assembly | 1 | |
| 5 | Timing chain tensioner rail | 1 | |
| 6 | Timing chain guide rail assembly | 1 | |
| 7 | OCV seat gasket | 1 | |
| 8 | OCV seat | 1 | |
| 9 | OCV control valve | 1 | |
| 10 | Hydraulic tensioner assembly | 1 | |
| 11 | Timing chain assembly | 1 | |
| 12 | Crankshaft timing sprocket | 1 | |
| 13 | Water pump seat seal ring | 1 | |
| 14 | Right mounting bracket | 1 | |
| 15 | OCV control valve | 1 | |
| 16 | Water pump belt | 1 | |
| 17 | Water pump pulley | 1 | |
| 18 | Driving pulley assembly | 1 | |
| 19 | Timing chain cover assembly | 1 | |

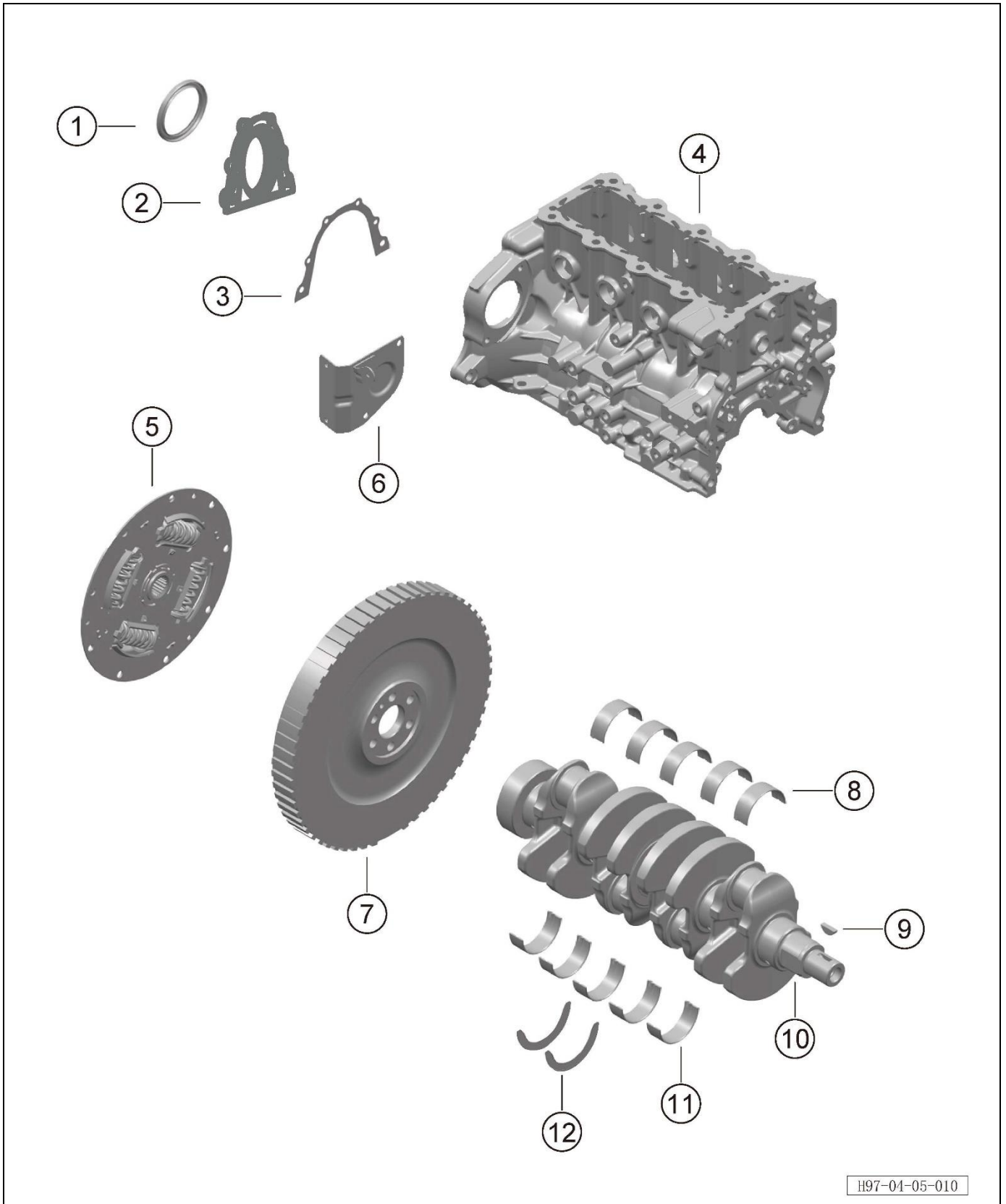


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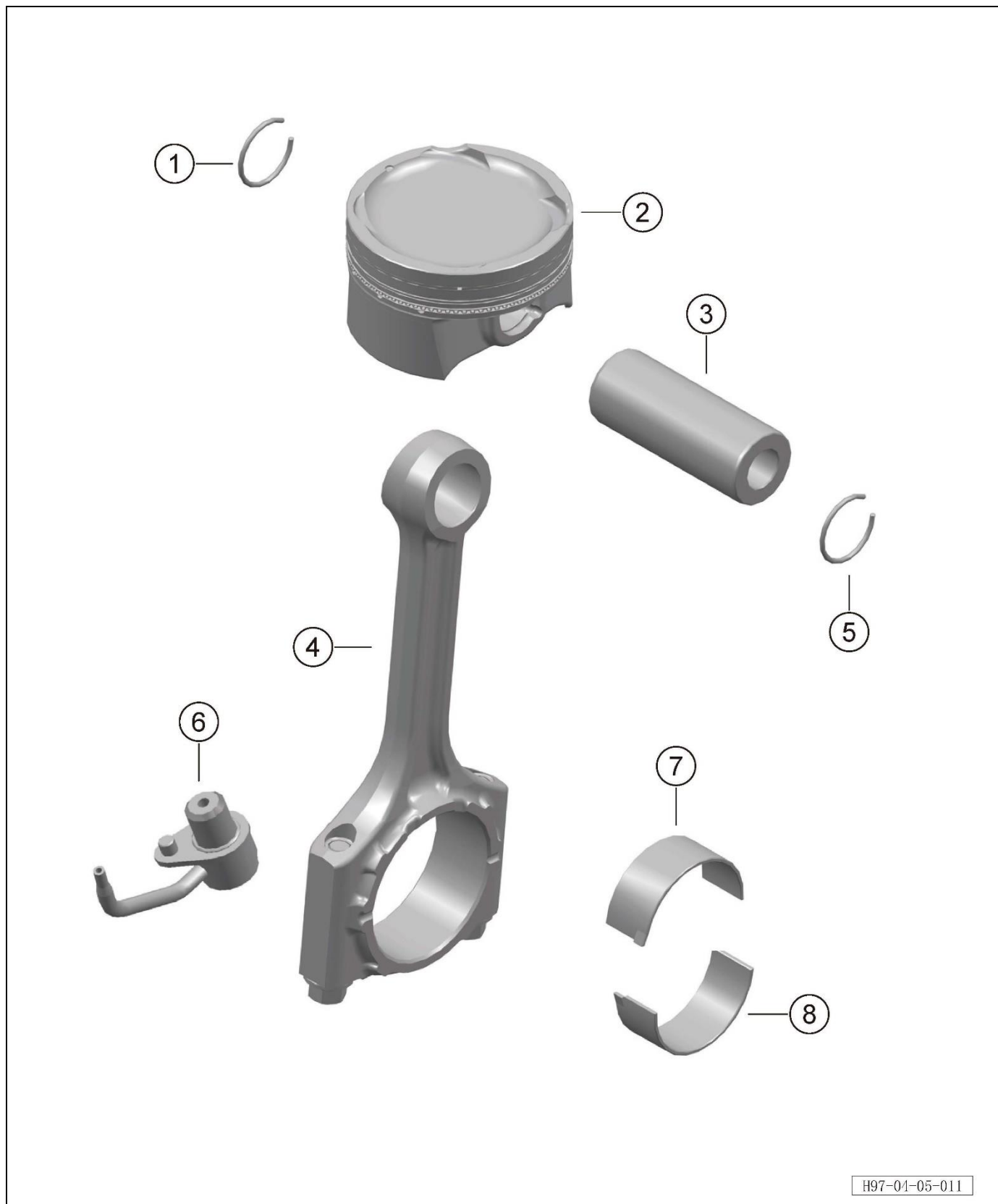
| S/N | Part name | Loading quantity | Remarks |
|-----|-----------------------------------|------------------|---------|
| 1 | Harness bracket II | 1 | |
| 2 | Vacuum pump cover plate | 1 | |
| 3 | Vacuum pump cover plate seal ring | 1 | |
| 4 | Bracket | 1 | |
| 5 | Engine lug | 1 | |
| 6 | Cylinder head assembly | 1 | |
| 7 | Engine lug | 1 | |
| 8 | Cylinder head gasket assembly | 1 | |



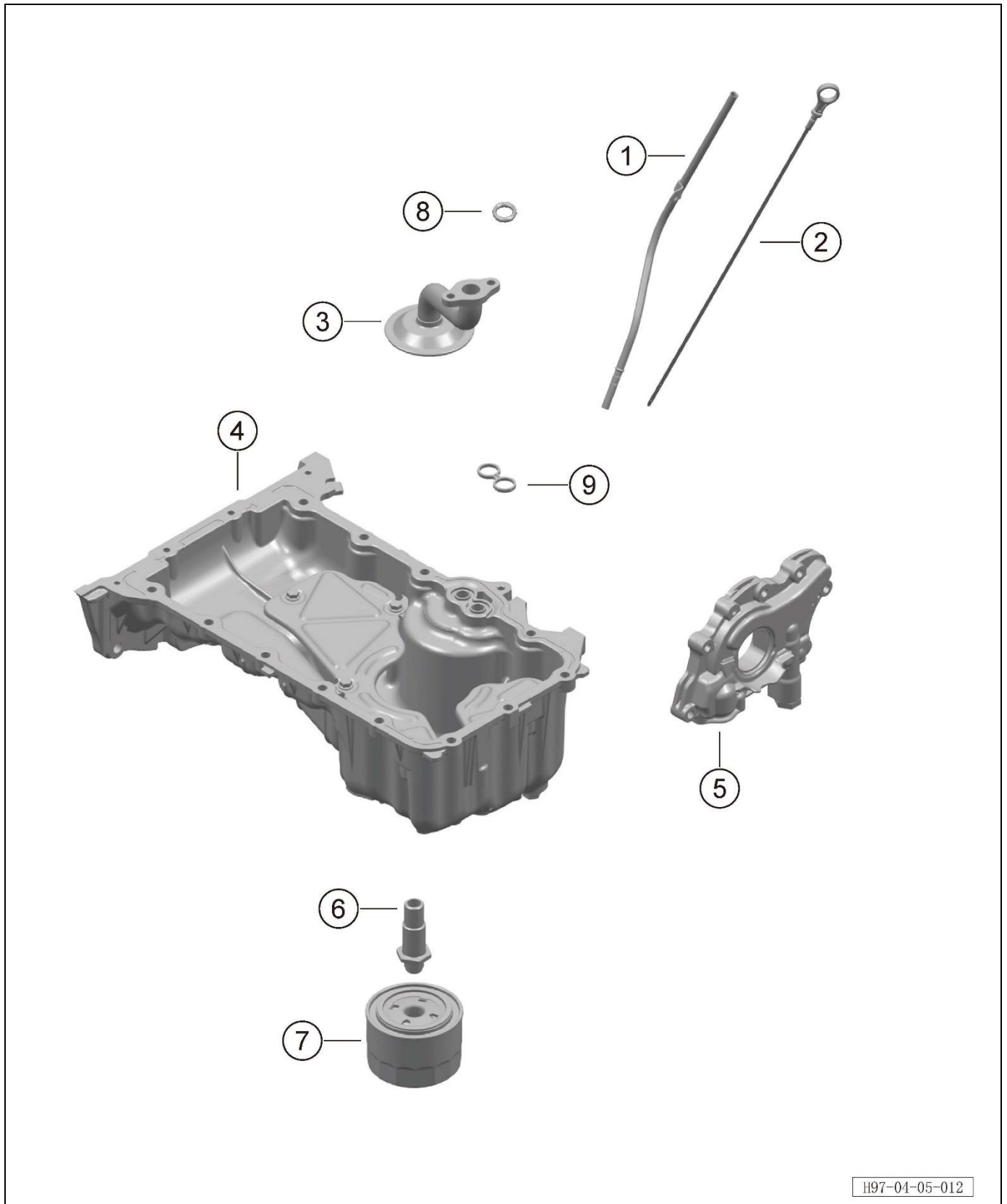
| S/N | Part name | Loading quantity | Remarks |
|-----|-------------------------|------------------|---------------|
| 1 | Valve tappet | 8 | Intake valve |
| 2 | Valve taper lock block | 16 | Intake valve |
| 3 | Valve spring seat | 8 | Intake valve |
| 4 | Valve spring | 8 | Intake valve |
| 5 | Valve oil seal assembly | 8 | Intake valve |
| 6 | Intake valve | 8 | Intake valve |
| 7 | Valve tappet | 8 | Exhaust valve |
| 8 | Valve taper lock block | 16 | Exhaust valve |
| 9 | Valve spring seat | 8 | Exhaust valve |
| 10 | Valve spring | 8 | Exhaust valve |
| 11 | Valve oil seal assembly | 8 | Exhaust valve |
| 12 | Exhaust valve | 8 | Exhaust valve |



| S/N | Part name | Loading quantity | Remarks |
|-----|------------------------------------|------------------|---------|
| 1 | Crankshaft rear oil seal | 1 | |
| 2 | Crankshaft rear end cover assembly | 1 | |
| 3 | Crankshaft rear end cover gasket | 1 | |
| 4 | Cylinder block assembly | 1 | |
| 5 | Torque limiter assembly | 1 | |
| 6 | Starter cover plate | 1 | |
| 7 | Flywheel assembly | 1 | |
| 8 | Upper main bearing bush | 5 | |
| 9 | Woodruff key | 1 | |
| 10 | Crankshaft | 1 | |
| 11 | Lower main bearing bush | 5 | |
| 12 | Crankshaft thrust plate | 2 | |



| S/N | Part name | Loading quantity | Remarks |
|-----|--------------------------------|------------------|---------|
| 1 | Piston pin snap ring | 4 | |
| 2 | Piston assembly | 4 | |
| 3 | Piston pin | 4 | |
| 4 | Connecting rod assembly | 4 | |
| 5 | Piston pin snap ring | 4 | |
| 6 | Piston cooling nozzle assembly | 4 | |
| 7 | Connecting rod upper bush | 4 | |
| 8 | Connecting rod lower bush | 4 | |



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| S/N | Part name | Loading quantity | Remarks |
|-----|----------------------------------|------------------|---------|
| 1 | Oil level gauge conduit assembly | 1 | |
| 2 | Oil level gauge assembly | 1 | |
| 3 | Oil strainer assembly | 1 | |
| 4 | Oil sump assembly | 1 | |
| 5 | Oil pump assembly | 1 | |
| 6 | Connecting pipe | 1 | |
| 7 | Oil filter assembly | 1 | |
| 8 | Oil strainer O ring | 1 | |
| 9 | Combined gasket | 1 | |

4.5.5 Technical parameters

4.5.5.1 Performance parameters and structural parameters of range extender assembly

| Item | Units | Type and parameter |
|-------------------------------|----------|---|
| Type | / | In-line four-cylinder four-stroke range extender assembly |
| Rated generator power/rpm | KW/r/min | 60±2.5/3700 |
| Max. generator power/rpm | KW/r/min | 72±3.6/4000 |
| Rated generator voltage | V | 350 |
| Maximum generating current | A | 220 |
| Total displacement | L | 1.498 |
| Minimum power consumption | L/kW·h | 0.38 |
| Maximum generation efficiency | % | 92 |
| Generator control mode | / | Constant power/power following |
| Fuel type | / | Gasoline of No. 92 and above in accordance with GB 17930 |
| Discharge | / | China 6b |
| Communication | / | CAN communication |
| Insulation class | / | H |
| Fault Diagnosis | / | OBD |
| Outline dimension | mm | 790×610×630 (excluding the accessories) |
| Net mass | kg | 172 (excluding the accessories) |
| Operating conditions | / | Maximum temperature ≤ 45°C; minimum temperature ≥ -30°C; altitude ≤ 4800m |

4.5.5.2 Type and main parameters of range extender

| | |
|-------------------------------|---|
| Type | In-line four-cylinder four-stroke, water-cooled, double overhead camshaft, 16-valve, digital multi-point sequential EFI, silent chain drive, DVVT, turbocharged, range extender generator |
| Number of cylinder | 4 |
| Compression ratio | 9.2: 1 |
| Maximum net torque/speed | 191±9.55/1800~4000 |
| Minimum fuel consumption rate | 2000r/min 25Nm: ≤ 430; 4000r/min 120Nm: ≤ 280 |
| Air inlet | Exhaust turbocharger |
| Ignition method | Multi-point electronic ignition |
| Firing order | 1 -3 -4 -2 |
| Rotation direction | Clockwise |
| Starting mode | Range extender motor starting |
| Cooling method | Compulsory cooling |
| Coolant | Ethylene glycol coolant in accordance with GB 29743, freezing point ≤ -40 °C |
| Lubricating mode | Combination of splash and force feed system |
| Oil pressure | 750r/min: ≥ 90; 4000r/min: ≥ 300 |
| Oil filling amount | 4L |
| Oil grade | SAE 5W-30 API quality grade: SN and above |

4.5.5.3 Main parameters of generator

| Item | Units | Type and parameter | |
|-----------------------------------|---------------------|--------------------|---|
| Rated power/rpm | r/min | 65/3700 | |
| Peak power/rpm | Kw/r/min | 90/6000 | |
| Peak power duration | s | 60 | |
| Rated torque | N.m | 206 | |
| Permanent magnet flux linkage | Wb | 0.0758 | |
| Working temperature | °C | -40 ~ 85 | |
| Cooling oil | | ATF Dexron VI | |
| Lubricating oil capacity | L | 0.7 | |
| Insulation class | / | H | |
| IP grade (high voltage line part) | / | IP67 | |
| Coolant | Category | / | Ethylene glycol coolant in accordance with GB 29743, freezing point ≤ -40 °C |
| | Flow | L/min | 10 ~ 12 |
| | Maximum temperature | °C | 60 |
| | Working pressure | MPa | 0.2 |

4.5.5.4 Performance parameters and structural parameters of control system

| | | | |
|-----------------------------------|-----------------------------------|---|--|
| Electronic control unit (ECU) | Working voltage | 8V~16V | |
| | Working temperature | -40℃~125℃ | |
| | Storage temperature | -40℃~85℃ | |
| | Humidity | 0~75% | |
| | Level of dustproof and waterproof | IP67 | |
| Generator controller (GCU) | Rated/peak power | 100W | |
| | Working voltage | High voltage part: 250V ~ 720V Low voltage part: 9V~30V | |
| | Continuous current/peak current | 280/420A | |
| | Peak duration | 5S | |
| | Rated efficiency | 98% | |
| | Frequency range | 0~600HZ | |
| | Working temperature | -40℃~85℃ | |
| | Storage temperature | -40℃~105℃ | |
| | Torque response time | Zero torque to rated torque ≤ 300ms | |
| | Torque control accuracy | ±3N (below 100N) ±3N (above 100N) | |
| | Speed control accuracy | ±20rpm | |
| | Coolant | Ethylene glycol coolant in accordance with GB 29743, freezing point ≤ -40 ℃ | |
| | | Minimum flow 12L/min | |
| | | Maximum working temperature 65℃ | |
| | | Minimum working pressure: 0.4MPa | |
| Level of dustproof and waterproof | IP67 | | |

4.5.5.5 Main inspection and adjustment parameters

| | | |
|---|---|----------------|
| Cold valve clearance | Intake valve | 0.2 ± 0.03 |
| | Exhaust valve | 0.3 ± 0.03 |
| Cylinder compression pressure at starting speed (kPa) | ≥ 900 (pressure difference between any two cylinders no more than 90kPa) | |
| Spark plug clearance (mm) | 0.7 ~ 0.8 | |
| Oil pressure (kPa) | 750rpm | ≥ 90 |
| | 4000rpm | ≥ 300 |
| Oil filling amount (L) | 4.0 | |
| Oil temperature ($^{\circ}\text{C}$) | <130 | |
| Coolant temperature ($^{\circ}\text{C}$) | Range extender engine | 85 ~ 95 |
| | Range extender generator | ≤ 60 |
| Water pump belt tension | 200 ~ 300 | |

4.5.5.6 Tightening torque limit

| S/N | Part name | Torque (N.m) | Remarks |
|-----|--|-------------------------------|---------|
| 1 | Spark plug | 25 ± 2 | |
| 2 | Oil pressure alarm | 15 ± 2 | |
| 3 | Water temperature sensor | 18 ± 2 | |
| 4 | PCV assembly bolt | 2.5 ± 0.5 | |
| 5 | Driving pulley bolt | (30±2) Nm+(60±3)° | |
| 6 | Main bearing cap bolt | (20±2) Nm+(90±3)° | |
| 7 | Connecting rod bolt | (20±2) N.m+(60±3)° | |
| 8 | Cylinder head bolt | (30±2) Nm + (100±3)° +(90±3)° | |
| 9 | Camshaft front bearing cap bolt | 23 ± 2 | |
| 10 | Camshaft bearing cap bolt | 12 ± 1 | |
| 11 | Tensioner rail bolt | 10 ± 1 | |
| 12 | Flywheel bolt | 74 ± 2 | |
| 13 | Torque limiter bolt | 23 ± 2 | |
| 14 | Range extender generator assembly bolt | 45 ± 5 | |
| 15 | Supercharging intake temperature/pressure sensor | 5 ± 1 | |
| 16 | Exhaust manifold nut | 34 ± 2 | |
| 17 | Turbocharger bolt | 45 ~ 50 | |
| 18 | Turbocharger nut | 45 ~ 50 | |
| 19 | Turbocharger oil inlet pipe bolt | 23 ± 2 | |
| 20 | Turbocharger water inlet pipe bolt | 23 ± 2 | |
| 21 | Turbocharger water return pipe bolt | 23 ± 2 | |
| 22 | Oil cooler connecting pipe | 45 ± 5 | |
| 23 | Oil filter assembly | 23 ± 2 | |

4.5.5.7 General bolt tightening torque limit

| Thread specification | Tightening torque (N•m) |
|----------------------|-------------------------|
| M6 | 9 ~ 11 |
| M8 | 21 ~ 25 |
| M10×1.25 | 45 ~ 55 |
| M12×1.25 | 65 ~ 75 |

4.5.6 Special tools

| S/N | Tool Name | Tool No. | Remarks |
|-----|---|-----------|---------|
| 1 | Special tool for engine timing | H52212000 | |
| 2 | Special tool for crankshaft fixing | H52217000 | |
| 3 | Special tool for refitting of crankshaft front oil seal | H52208000 | |
| 4 | Special tool for refitting of crankshaft rear oil seal | H52208001 | |
| 5 | Special tool for removal and refitting of water pump belt | H52201000 | |

4.5.7 Common faults

4.5.7.1 Unstart or difficult starting of range extender assembly

| Fault causes | Countermeasures |
|--|---|
| 1. Startup system failure No connection or undervoltage of battery terminals Poor connection of battery Fuse blowout ECU failure | Check terminals, charge or replace the battery Clean the terminals and tighten the battery cables Replace the fuse Repair or replace the associated ECU |
| 2. Ignition system failure Harness looseness of ignition coil Damage of ignition coil Harness looseness of crankshaft position sensor Damage of crankshaft position sensor Looseness or electric leakage of ignition coil Improper electrode clearance of spark plug Damp of spark plug or carbon deposits on electrode Spark plug insulator rupture Looseness of ECU harness Damage of ECU | Securely insert the harness Replace the ignition coil Securely insert the harness Replace the crankshaft position sensor Securely fix or replace the ignition coil Adjust the electrode clearance Dry off or remove carbon deposits Replace the spark plug Securely insert the harness Replace the ECU |
| 3. Fuel supply system failure Insufficient fuel supply of electric fuel pump Damage or blockage of injector Damage or harness looseness of crankshaft position sensor Damage of gasoline pump relay Short circuit or open circuit of harness Damage of ECU Blockage of electric gasoline pump (gasoline filter integrated type) Blockage or air resistance of gasoline pipeline | Repair or replace the electric fuel pump Replace or clean the injector Replace or securely insert crankshaft position sensor Replace the gasoline pump relay Check or repair the harness Replace the ECU Replace the electric fuel pump Clean the pipeline or remove the air resistance |
| 4. Range extender powertrain in poor condition Air leakage or burnout of valve Damage of cylinder head gasket Wear of piston, piston ring and cylinder block assembly Air leakage of intake manifold Improper clearance adjustment or damage of valve | Repair or replace the valve Replace Repair or replace Check intake manifold and gasket and tighten nuts Adjust, repair or replace |

4.5.7.2 Range extender assembly cannot be charged

| Fault causes | Countermeasures |
|---|---|
| 1. Ignition system failure Poor performance of spark plug Poor contact of connector Damage of ignition coil | Check or replace the spark plug Check the contact of connector or replace the harness Replace the ignition coil |
| 2. Range extender engine failure Air leakage or burnout of valve Poor compression of cylinder Air leakage of cylinder head gasket Air leakage of intake manifold | Repair or replace the valve Repair or replace related parts Replace the cylinder head gasket Check intake manifold and gasket and tighten nuts |
| 3. Turbocharger failure Volute side damage caused by metal foreign matter Impeller rotation interference caused by inflow of foreign matter on the exhaust side Blade damage caused by foreign matter process Bearing burn due to insufficient fuel supply on the turbine side | Replace the turbocharger Replace the turbocharger Replace the turbocharger Replace the turbocharger |
| 4. Generator system failure Damage of generator Damage of high voltage wire Damage of ECU | Repair or replace the generator Replace the high voltage wire Repair or replace the associated ECU |

4.5.7.3 Excessive gasoline consumption

| Fault causes | Countermeasures |
|--|--|
| 1. Oil leakage in gasoline pipeline | Tighten joints and clips everywhere |
| 2. Blockage of air filter | Check and clean the air filter or replace the air filter element |
| 3. Ignition system failure Ignition coil fault Spark plug fault | Replace the ignition coil Check or replace the spark plug |
| 4. Poor compression of gasoline engine | Check the cylinder pressure |
| 5. Inappropriate tire pressure | Adjust the tire inflation pressure |

4.5.7.4 Range extender underpower

| Fault causes | Countermeasures |
|--|--|
| 1. Poor compression of gasoline engine Air leakage of valve Insufficient elastic force or breakage of valve spring Air leakage of cylinder head gasket Sticking or breakage of piston ring Excessive wear of piston or cylinder block assembly | Grind the valve Replace the valve spring Replace the cylinder head gasket Replace the piston ring Repair or replace related parts |
| 2. Ignition system failure Damage of ignition coil Poor performance of spark plug | Replace the ignition coil Clean, adjust or replace the spark plug |
| 3. Poor gasoline supply Damage or blockage of injector Damage of throttle position sensor Insufficient fuel supply pressure of electric fuel pump Fouling in gasoline tank Blockage of gasoline pipeline Blockage of electric gasoline pump (gasoline filter integrated type) Air in fuel system | Clean or replace the injector Replace the throttle assembly Repair or replace the electric fuel pump Clean the fuel tank, and replace it if necessary Clean the gasoline pipeline Replace the electric fuel pump Check and tighten connections |
| 4. Gasoline specification non-conforming 5. Air leakage of intake manifold 6. Blockage of air filter 7. Overheating of gasoline engine | Select gasoline as required Check intake manifold and gasket Clean the housing, blow out the filter element, or replace the air filter element Check the cooling system |

4.5.7.5 Minimum power generation speed of range extender too high

| Fault causes | Countermeasures |
|---|---|
| 1. Damage of electronic throttle sensor 2. Failure of throttle to close completely 3. Air leakage of intake system | Replace the electronic throttle Remove dirt or replace the electronic throttle Check and repair the intake system |

4.5.7.6 Tempering, blasting, deflagration of range extender

| Fault causes | Countermeasures |
|---|---|
| 1. Ignition system failure Looseness of ignition system wiring Poor performance of spark plug Improper calorific value of spark plug | Check and tighten connectors Clean, adjust or replace the spark plug Replace with spark plugs with proper calorific value |
| 2. Improper mixture composition Poor gasoline supply Air leakage of intake manifold | Check the fuel system Tighten the relevant nut or replace the gasket |
| 3. Valve mechanism failure Air leakage or sticking of valve Insufficient elastic force of valve spring | Grind or replace the valve Replace the valve spring |
| 4. Poor condition of cylinder head Carbon deposits in combustion chamber Overheating or poor cooling of cylinder head assembly Damage of cylinder head assembly | Remove the carbon deposits Drain the air from the cooling water jacket Replace the cylinder head assembly |

4.5.7.7 Internal abnormal sound of range extender assembly

| Fault causes | Countermeasures |
|---|---|
| 1. Improper valve clearance | Adjust |
| 2. Looseness of piston pin | Replace the piston pin |
| 3. Wear of piston, piston ring and cylinder block assembly | Service or replace |
| 4. Wear of connecting rod bearing bush | Replace the connecting rod bearing bush |
| 5. Wear of main bearing bush | Replace the main bearing bush |
| 6. Wear of crankshaft thrust plate | Replace the crankshaft thrust plate |
| 7. Excessive thrust clearance of camshaft assembly | Replace the camshaft assembly |
| 8. Impurities in motor | Remove impurities and service |
| 9. Abnormal wear of motor bearing | Replace the bearing |

4.5.7.8 Excessive oil consumption

| Fault causes | Countermeasures |
|--|--|
| 1. Oil leakage Looseness of oil sump drain plug Looseness of oil sump fixing bolt Uneven coating of oil sump Damage of oil pump gasket Damage of crankshaft front and rear oil seal Looseness of oil pressure alarm | Tighten the drain plug Tighten the fixing bolt Recoat Replace the oil pump gasket Replace the oil seal Tighten the oil pressure alarm |
| 2. Excessive wear or damage of piston ring 3. Wear of piston and cylinder block assembly 4. Incorrect opening position of piston ring 5. Damage of valve oil seal 6. Severe wear of valve stem or valve guide 7. Blockage of cylinder block assembly ventilation unit | Replace the piston ring Replace the piston or bore the cylinder Adjust the opening position of piston ring Replace the valve oil seal Replace the valve stem or valve guide Check, clean, unblock |

4.5.7.9 Range extender overheating

| Fault causes | Countermeasures |
|--|--|
| 1. Insufficient cooling water 2. Looseness or damage of water pump belt 3. Water pump failure 4. Thermostat failure 5. Blockage or leakage of radiator, cylinder block assembly water jacket, cylinder head assembly water jacket and pipeline 6. Excessive carbon deposits in combustion chamber of cylinder head assembly 7. Too little oil or too low viscosity 8. Obstruction of exhaust system | Add cooling water and check for leakage Adjust tension of the belt or replace the belt Service or replace water pump Replace the thermostat Clean, repair or replace related parts Remove carbon deposits Add or change oil Clean or replace exhaust system parts |

4.5.7.10 Engine not flamed out after fully charged

| Fault causes | Countermeasures |
|--|--|
| 1. Range extender engine overheating | Idle the range extender engine to reduce the water temperature to below 80°C, then turn off the ignition switch. |
| 2. Spark plug overheating | Select spark plug of the specified type |
| 3. Excessive carbon deposits in combustion chamber | Remove carbon deposits |
| 4. Incorrect ignition timing | Adjust the ignition timing |

4.5.7.11 VCP inoperative

| Fault causes | Countermeasures |
|-------------------------------------|--|
| Insufficient oil pressure | Check the oil dipstick to see whether the amount of lubricating oil meets the requirements, and add lubricating oil if it is insufficient; check the oil pump pressure relief valve and the oil outlet seal ring, and replace if necessary |
| Blockage of lubricating oil circuit | Check whether the lubricating oil circuit is unobstructed; check whether the filter screen of the OCV is blocked, and clean it with kerosene and blow it clean, or replace the filter screen. |
| Open circuit or short circuit | Check circuit and replace damaged components |
| VCP failure | Replace the VCP |

4.5.7.12 Range extender assembly MIL always on

| Fault causes | Countermeasures |
|--------------------------------------|---|
| 1. Range extender engine EFI failure | Diagnose with a scan tool (see DTC table) |
| 2. Harness failure | Check whether the connectors are firmly connected, and whether the harness is short-circuited or open-circuited |
| 3. Generator system failure | Check the generator system circuit and controller |

4.5.7.13 Low oil pressure

| Fault causes | Countermeasures |
|---|---|
| 1. Oil leakage 2. Too little or too thin oil 3. High oil temperature 4. Oil pump pressure regulating valve failure 5. Oil pump failure 6. Blockage of oil strainer, leakage of oil pan | Check for oil leakage Add or change oil Service the oil cooling system Service or regulate the pressure regulating valve Service or replace the oil pump Clean and unclog, and tighten the oil pan bolts |
| 7. Oil pressure sensor failure 8. Excessive wear of main bearing bush and connecting rod bearing bush 9. Blockage of oil filter | Replace the oil pressure sensor Replace the corresponding bearing bush Replace oil filter |

4.5.7.14 Emissions unacceptable

| Fault causes | Countermeasures |
|--|--|
| 1. The use of leaded gasoline caused damage to the oxygen sensor and three-way catalytic converter 2. The misfire caused by failure of the ignition system and long-term use result in damage to the oxygen sensor and the three-way catalytic converter 3. The exhaust system is subjected to air leakage, and the ECU cannot get the correct oxygen sensor signal, causing the air-fuel ratio to become richer | Use unleaded gasoline, and replace oxygen sensor and three-way catalytic converter Service the ignition system, and replace the oxygen sensor and three-way catalytic converter Service the exhaust system |

4.5.8 Range extender assembly

4.5.8.1 Removal and refitting of range extender assembly

Removal procedure

CAUTION:

- Before the removal and refitting the range extender assembly, please refer to the removal and refitting of other accessories around the range extender.

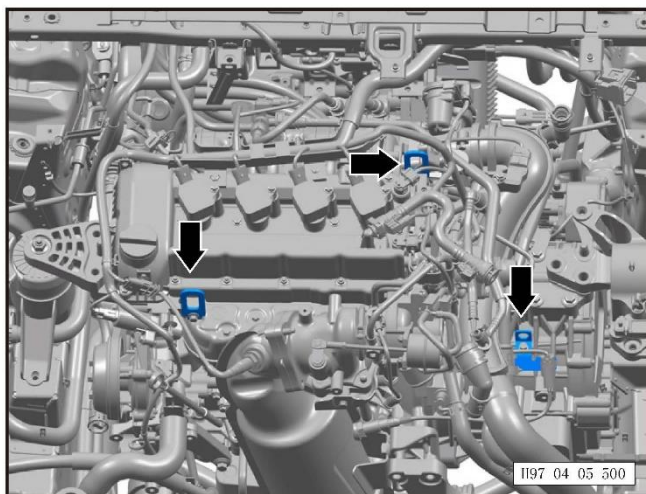
- Pay attention to the working relationship between the components, and the sequence of removal and refitting.

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Remove the high voltage (refer to [3.1.7.2 High voltage removal](#))
5. Remove the battery assembly.
6. Remove the front bumper assembly (refer to [8.6.4.1 Removal and refitting of front bumper assembly](#))
7. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
8. Drain range extender engine oil (refer to [3.1.4.1 Replacement of engine lubricating oil and oil filter \(Facelift\)](#))
9. Drain range extender engine coolant (refer to [3.1.4.9 Replacement of engine coolant](#))
10. Disconnect the relevant pipelines (canister solenoid valve) connected under the intake manifold (refer to [4.1.8.7 Removing and refitting of intake manifold assembly](#))
11. Remove the radiator assembly (refer to [4.4.8.6 Removal and refitting of radiator assembly](#))
12. Disconnect the fuel rail from the fuel inlet pipe 3# assembly (refer to [4.3.8.3 Removal and refitting of fuel inlet pipe 3# assembly](#))
13. Remove the intercooler assembly (refer to [4.1.9.1 Removal and refitting of intercooler assembly](#))
14. Remove the engine water outlet pipe (refer to [4.4.8.77 Removal and refitting of engine water outlet pipe](#))
15. Remove the radiator water inlet hose (refer to [4.4.8.69 Removal and refitting of radiator water inlet hose](#))
16. Remove the radiator water outlet hose (refer to [4.4.8.70 Removal and refitting of radiator water outlet hose](#))

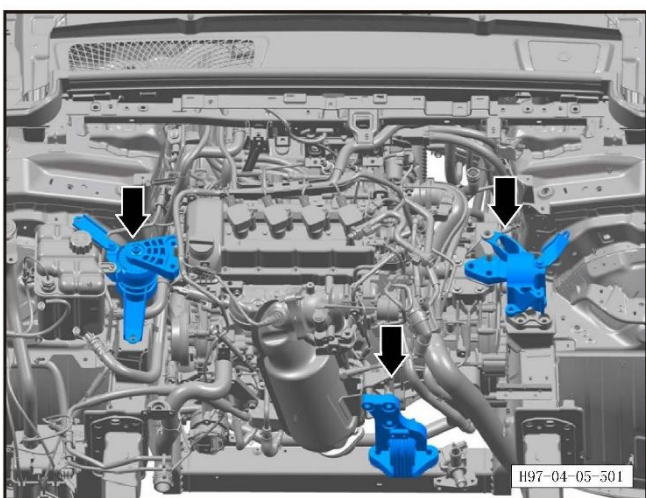
17. Remove the ground wire between range extender generator upper housing and engine compartment (refer to [4.5.16.11 Removal and refitting of ground wire between range extender generator upper housing and engine compartment](#))
18. Remove the ground wire between engine and engine compartment (refer to [4.5.16.12 Removal and refitting of ground wire between engine and engine compartment](#))
19. Remove 2 connectors of the range extender engine controller (refer to [4.5.8.3 Removal and refitting of engine controller](#))
20. Disconnect the LV harness from the generator (refer to [4.5.8.4 Removal and refitting of generator controller assembly](#))
21. Remove the right mounting cushion assembly (refer to [4.5.15.5 Removal and refitting of right mounting cushion assembly](#))
22. Remove the powertrain mounting front bracket (refer to [4.5.15.2 Removal and refitting of powertrain mounting front bracket](#))
23. Remove the left mounting bracket (refer to [4.5.15.4 Removal and refitting of left mounting bracket](#))
24. Lift out the range extender assembly with a special crane tool.

CAUTION:

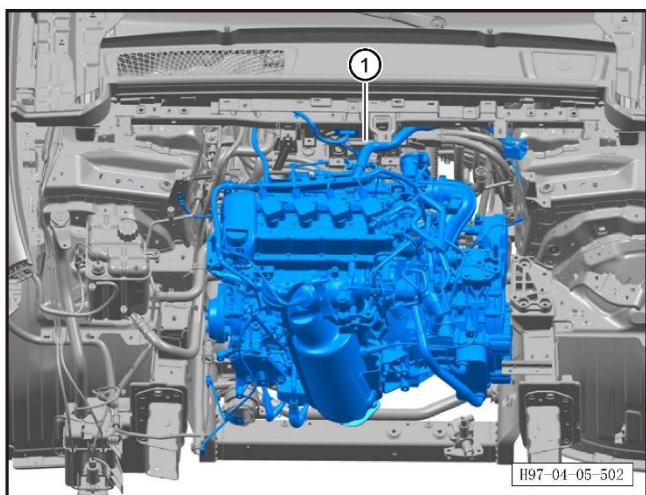
- Before hoisting, thoroughly check and disconnect the range extender from the body-related parts.
- Disconnect the range extender fuel pipeline, cooling system pipeline and A/C system pipeline.
- Install the hoisting chain or sling according to the lifting lugs reserved for the range extender.
- When hoisting, strictly follow the instructions in the instruction manual of the special crane.
- When hoisting, it is recommended that 2-3 people work together to avoid damage to the range extender assembly.
- After all parts are refitted on the vehicle, the range extender lubricating oil and coolant must be replaced. It is strictly forbidden to mix old and new oils to avoid shortening the service life of the oil and reducing the use effect.



a. Hook the 3 hooks of the range extender with the special engine hanger.



b. Remove the 3 mounts connecting the range extender assembly to the body.



c. Lift out the range extender assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

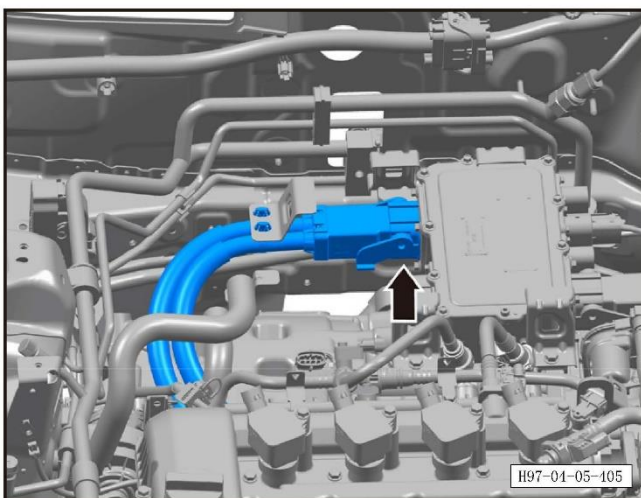
4.5.8.2 Removal and refitting of engine compartment high voltage box

Removal procedure

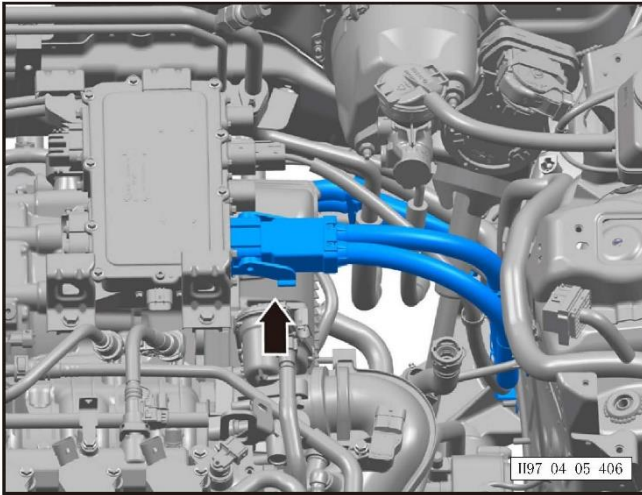
CAUTION:

- Remove and refit the engine control unit carefully, avoiding collision and preventing moisture. During the removal and refitting process, do not touch the pins of the connector, or forcibly disassemble the casing, so as not to damage the internal electrical components.

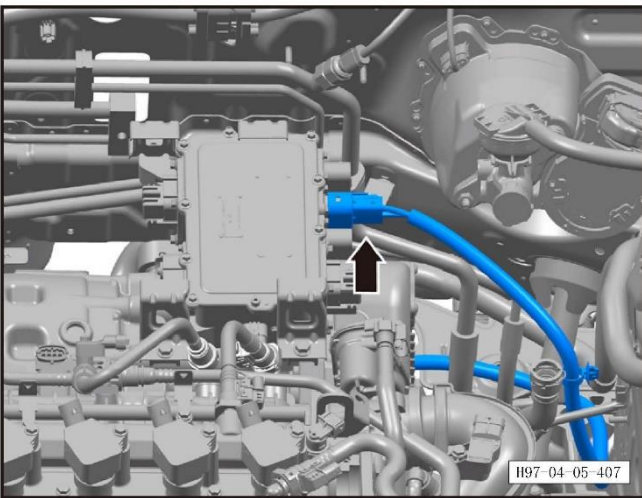
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Remove the high voltage (refer to [3.1.7.2 High voltage removal](#))
5. Remove the left front wiper arm assembly (refer to [8.6.13.3 Removal and refitting of left front wiper arm assembly](#))
6. Remove the right front wiper arm assembly (refer to [8.6.13.6 Removal and refitting of right front wiper arm assembly](#))
7. Remove the windshield lower trim panel (refer to [8.6.13.25 Removal and refitting of windshield lower trim panel assembly](#))
8. Remove the generator controller assembly (refer to [4.5.8.3 Removal and refitting of generator controller](#))
9. Remove the generator controller assembly (refer to [4.5.8.4 Removal and refitting of generator controller assembly](#))
- 10.. Remove the engine compartment high voltage box assembly



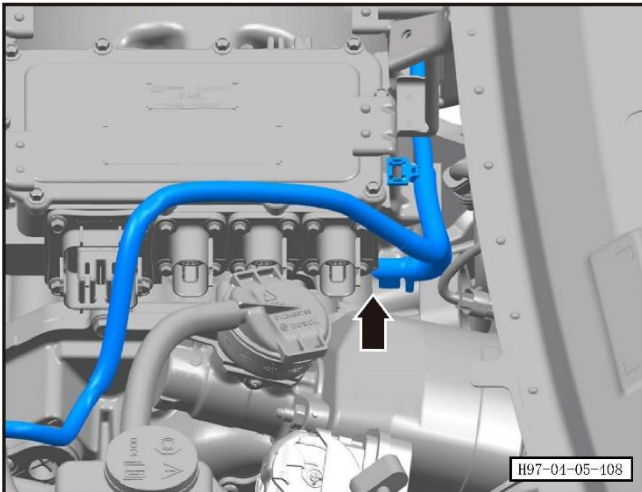
- a. Disconnect the connectors of the engine compartment high voltage box assembly and the front motor high voltage harness assembly.



b. Disconnect the connectors of the engine compartment high voltage box assembly and the battery pack front high voltage harness.

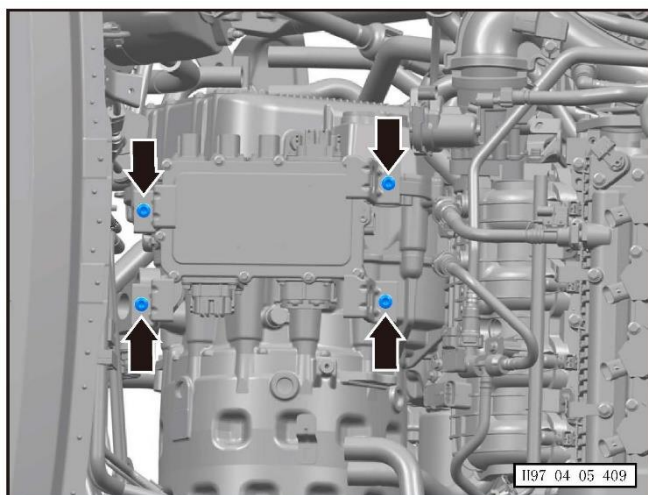


c. Disconnect the connectors of the engine compartment high voltage box assembly and the battery PTC high voltage harness.



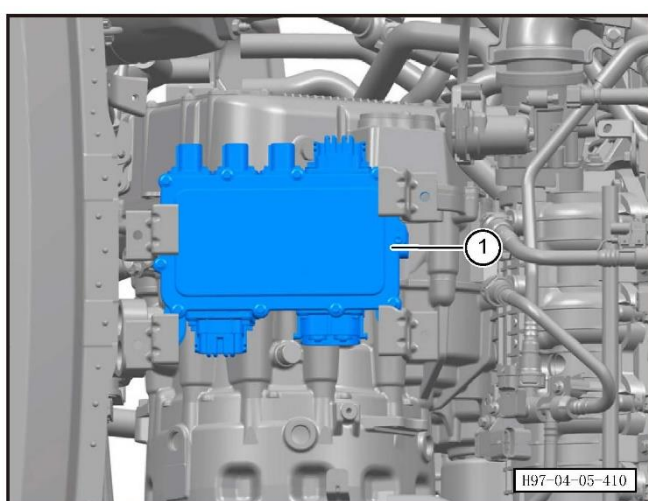
d. Unscrew the bolts of the ground wire at the lower part of the engine compartment high pressure box assembly.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



e. Remove the 4 bolts of the engine compartment high pressure box assembly.

Tightening torque of bolt: $10 \pm 1 \text{ Nm}$.



f. Take out the engine compartment high voltage box assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.5.8.3 Removal and refitting of engine controller

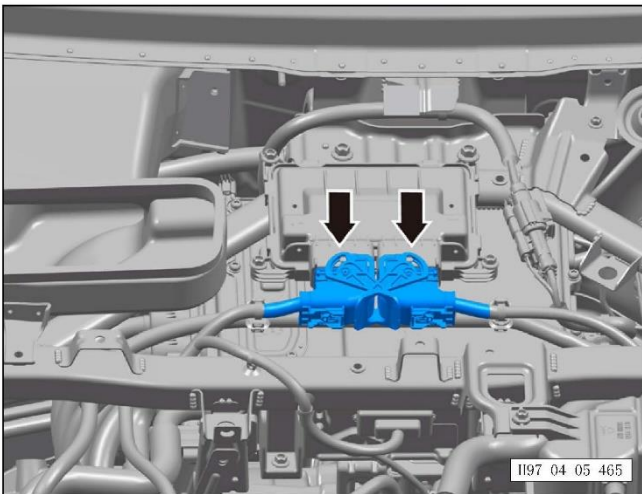
Removal procedure

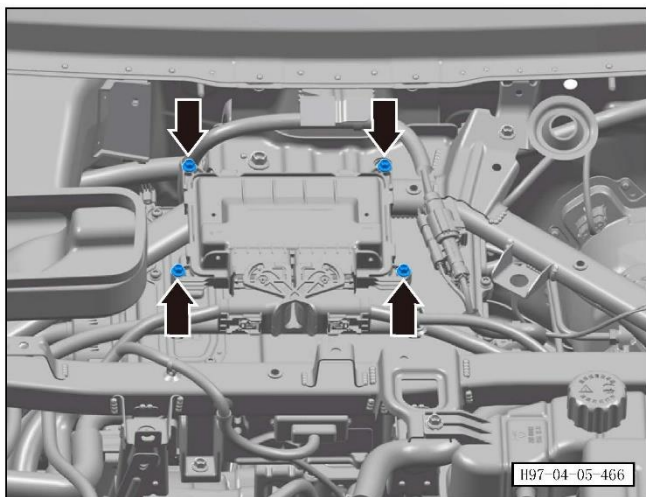
CAUTION:

- Remove and refit the engine control unit carefully, avoiding collision and preventing moisture. During the removal and refitting process, do not touch the pins of the connector, or forcibly disassemble the casing, so as not to damage the internal electrical components.

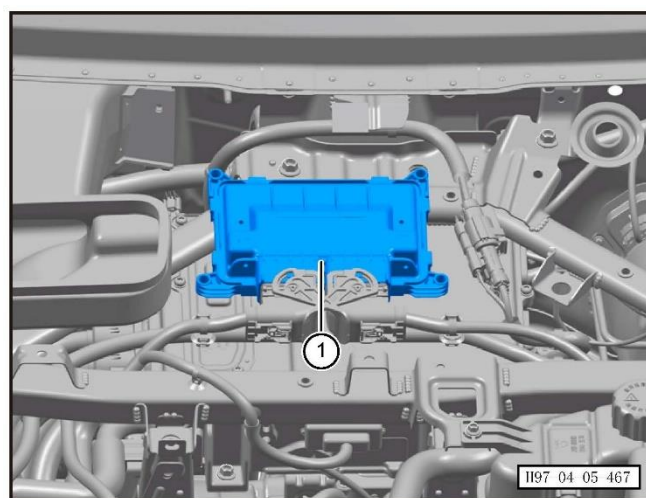
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front wiper arm assembly (refer to [8.6.7.8 Removal and refitting of front wiper arm assembly](#))
6. Remove the windshield lower trim panel (refer to [8.6.6.22 Removal and refitting of windshield lower trim panel assembly](#))
7. Remove the engine controller.

- a. Disconnect the 2 connectors of the engine control unit.





b. Unscrew the 4 bolts of the engine control unit.
Tightening torque of bolt: $10\pm 1\text{Nm}$.



c. Take down the engine control unit ①.

Refitting procedure

The refitting procedure is performed in reverse order.

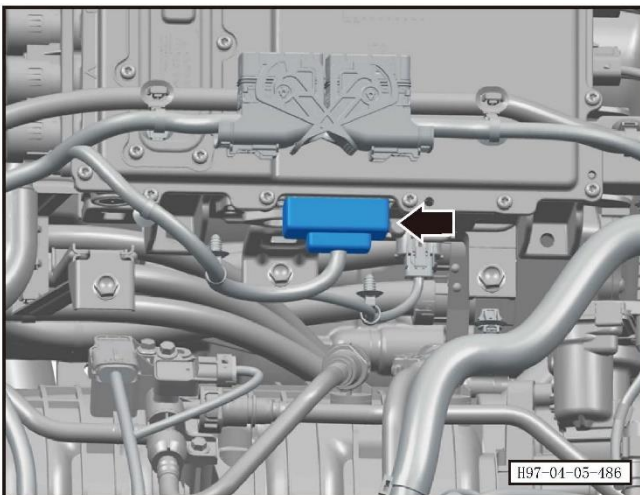
4.5.8.4 Removal and refitting of generator controller assembly

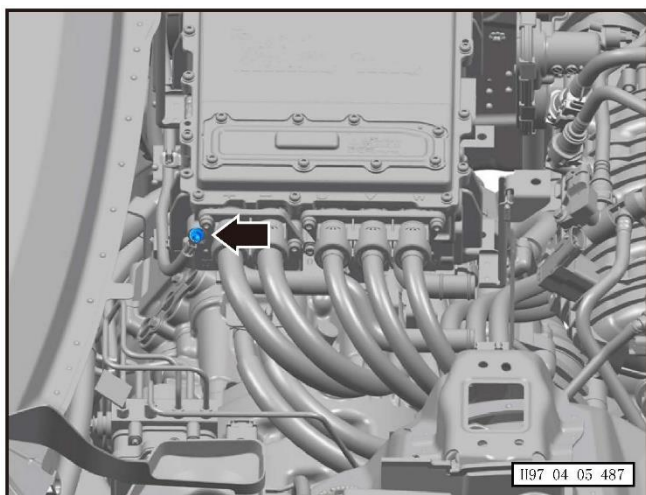
Removal procedure

CAUTION:

- Remove and refit the range extender control unit carefully, avoiding collision and preventing moisture. During the removal and refitting process, do not touch the pins of the connector, or forcibly disassemble the casing, so as not to damage the internal electrical components.

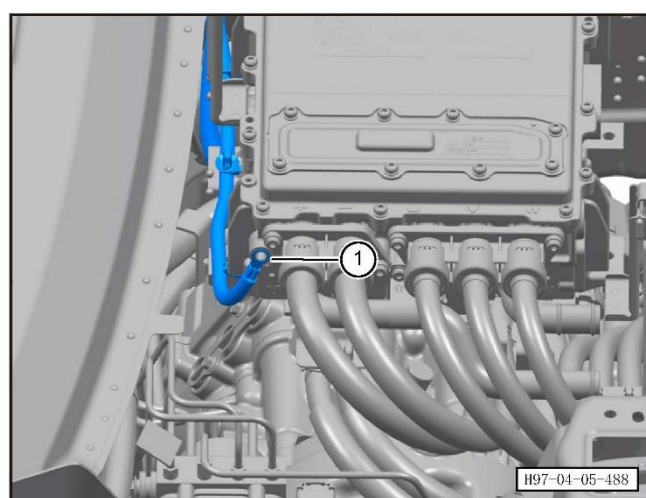
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Remove the high voltage (refer to [3.1.7.2 High voltage removal](#))
5. Remove the generator controller (refer to [4.5.8.3 Removal and refitting of generator controller](#))
6. Remove the range extender controller water inlet hose (refer to [4.4.8.47 Removal and refitting of range extender controller water inlet hose](#))
7. Remove the range extender controller water outlet hose (refer to [4.4.8.48 Removal and refitting of range extender controller water outlet hose](#))
8. Remove the generator controller.
 - a. Disconnect the generator controller connector.





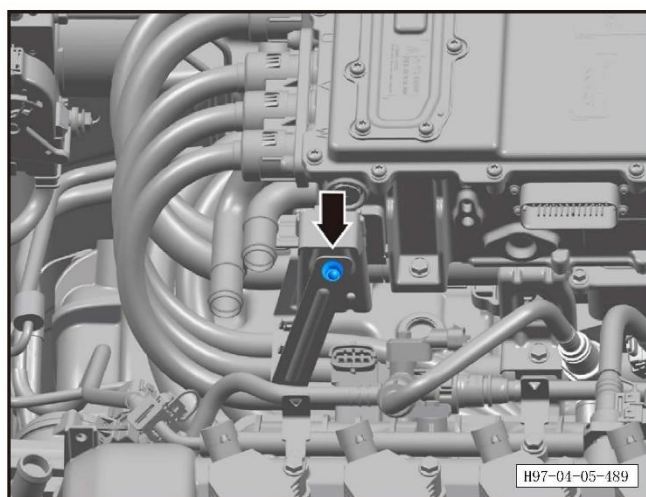
b. Unscrew the ground wire bolt on the generator controller.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



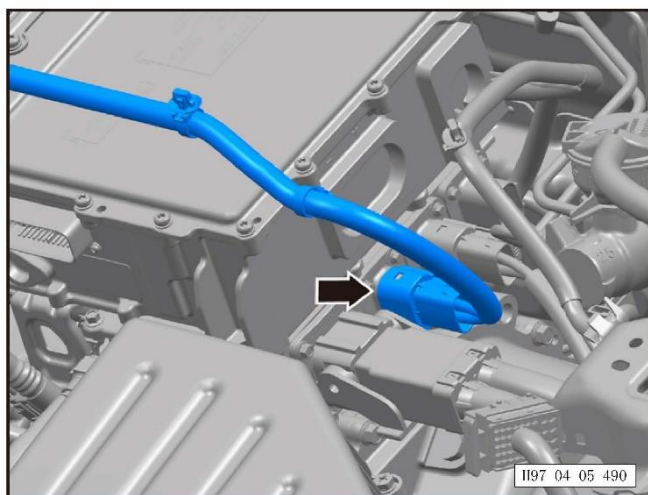
c. Disconnect the ground harness ① on the generator controller.

Tightening torque of bolt: $10\pm 1\text{Nm}$.

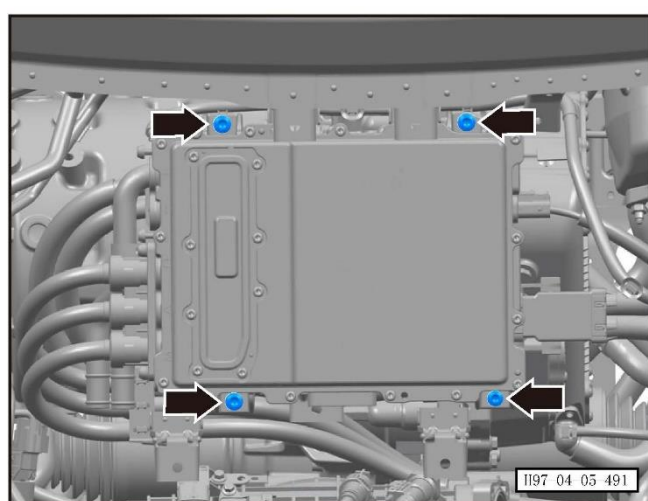


d. Unscrew 1 bolt of the high voltage harness fixing bracket on the generator controller.

Tightening torque of bolt: $10\pm 1\text{Nm}$.

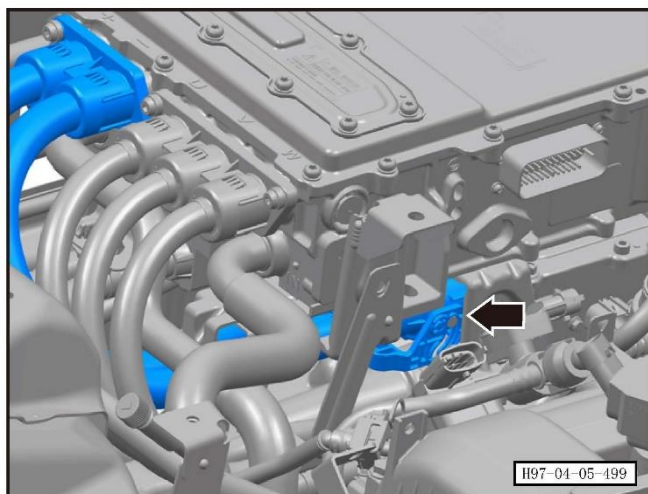


e. Disconnect the harness connector on the engine compartment high pressure box assembly.

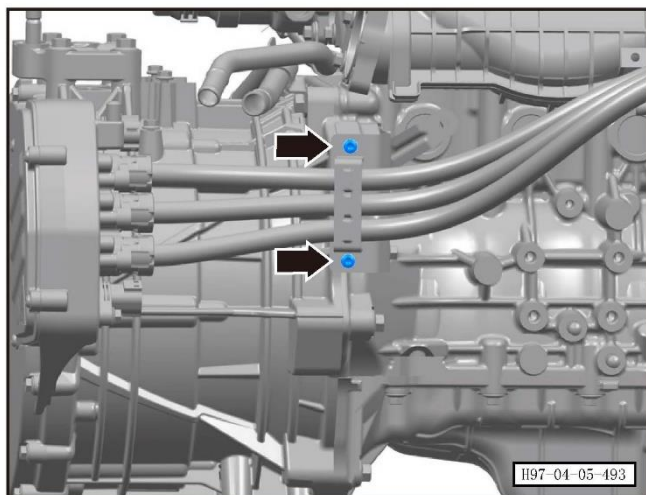


f. Unscrew the 4 bolts between the generator control box and the fixing bracket.

Tightening torque of bolt: $10 \pm 1 \text{ Nm}$.

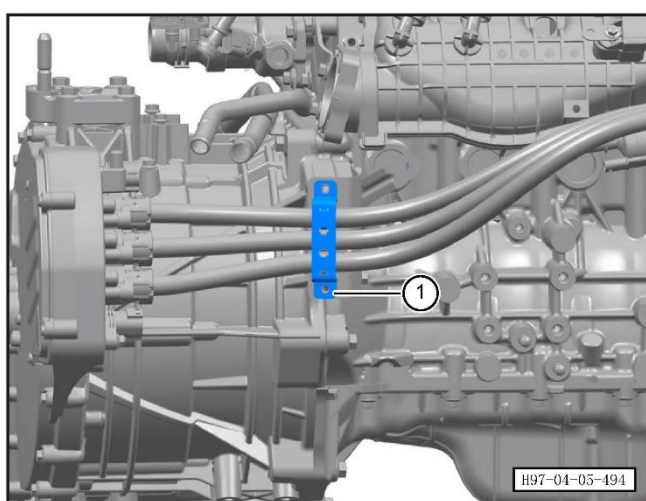


g. Disconnect the connector between the generator controller high voltage harness assembly and the engine compartment high voltage box assembly.

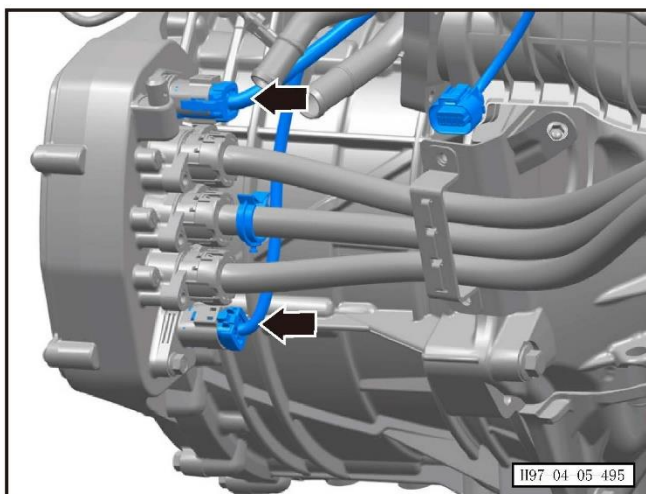


h. Unscrew 2 bolts of the high voltage harness fixing bracket on the generator controller.

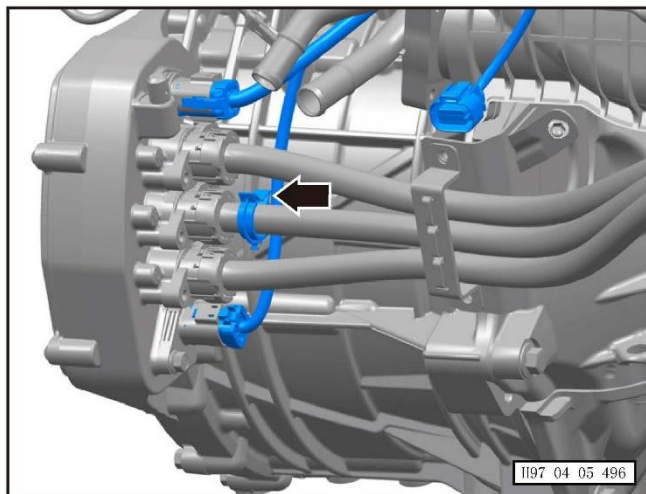
Tightening torque of bolt: $10 \pm 1 \text{ Nm}$.



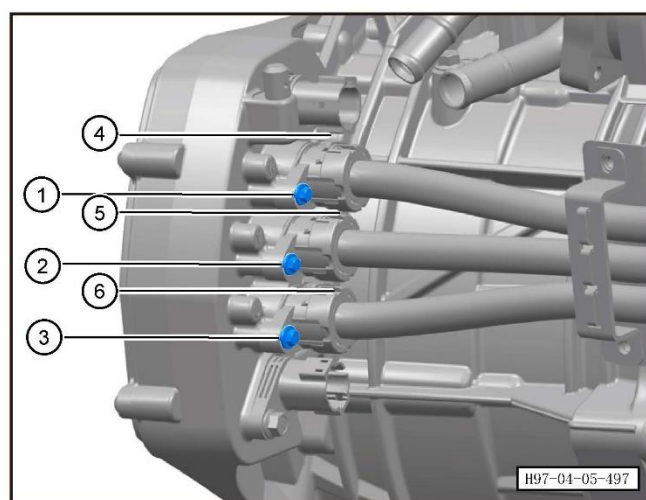
i. Disconnect the high voltage harness fixing bracket on the range extender assembly.



j. Disconnect the engine harness from the 2 sensor connectors.

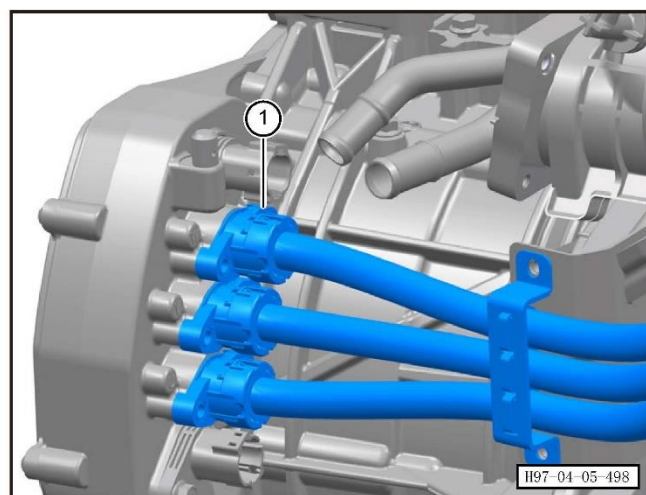


k. Disconnect the clips on the engine harness and high voltage harness assembly.

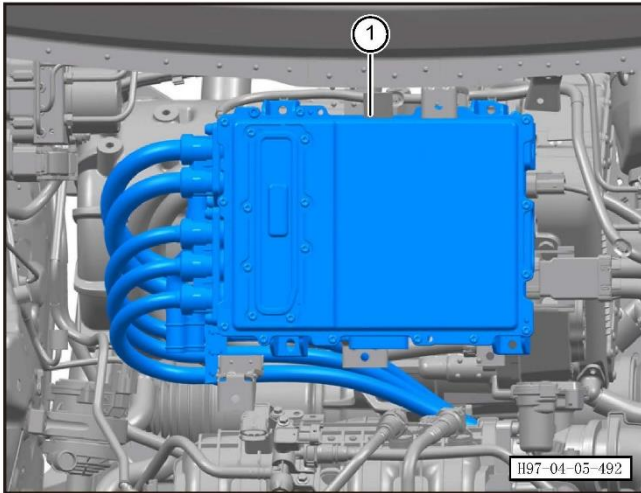


l. Unscrew the 6 bolts corresponding to the 3 connectors on the high voltage harness assembly.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



m. Pull out the 3 connectors ① on the high voltage harness assembly.



n. Take down the generator controller assembly ①.

Refitting procedure

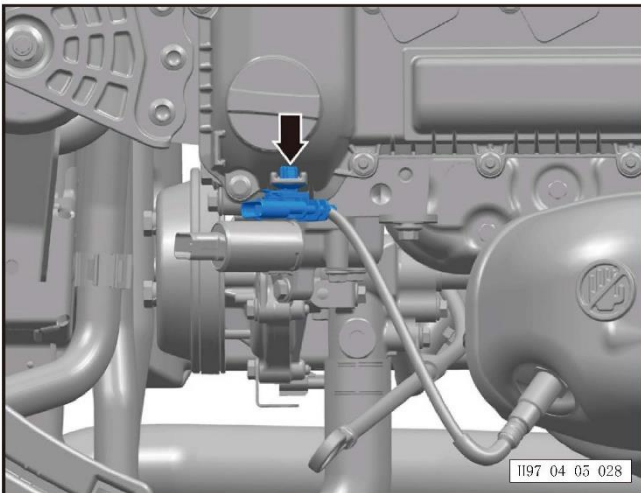
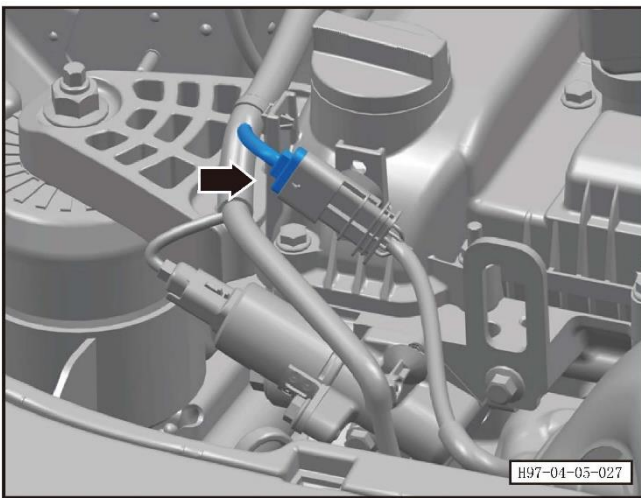
The refitting procedure is performed in reverse order.

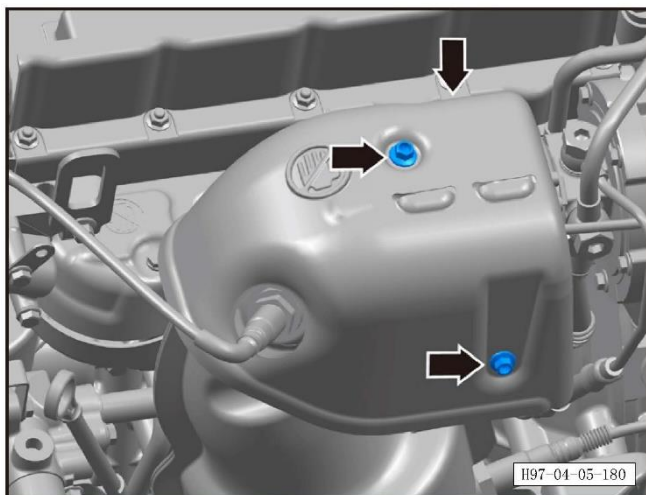
4.5.9 Turbocharger

4.5.9.1 Removal and refitting of turbocharger upper heat shield assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the turbocharger upper heat shield assembly.
 - a. Disconnect the engine harness from the upper oxygen sensor I connector.



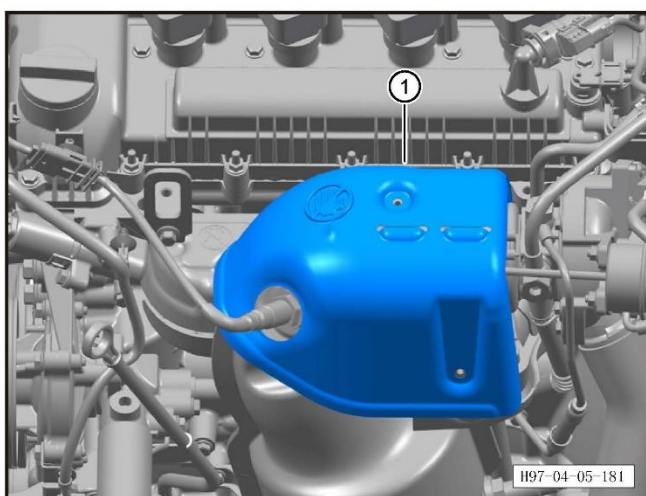


c. Unscrew the 3 bolts of the turbocharger upper heat shield assembly.

Tightening torque of bolt: $10\pm 1\text{Nm}$.

CAUTION:

- There is 1 more bolt behind the turbocharger upper heat shield.



d. Take out the turbocharger upper heat shield assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

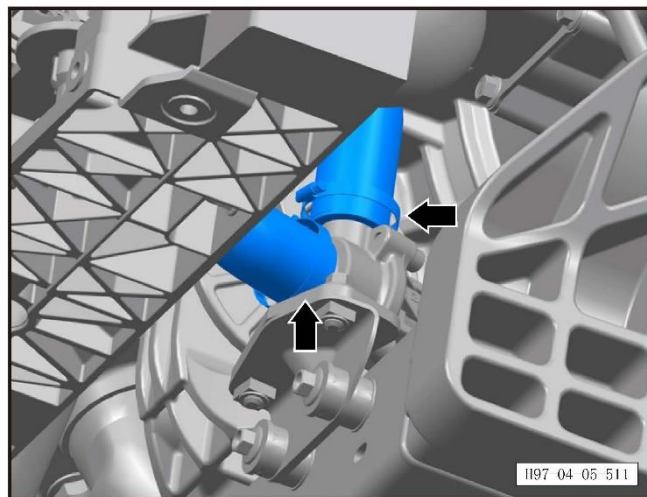
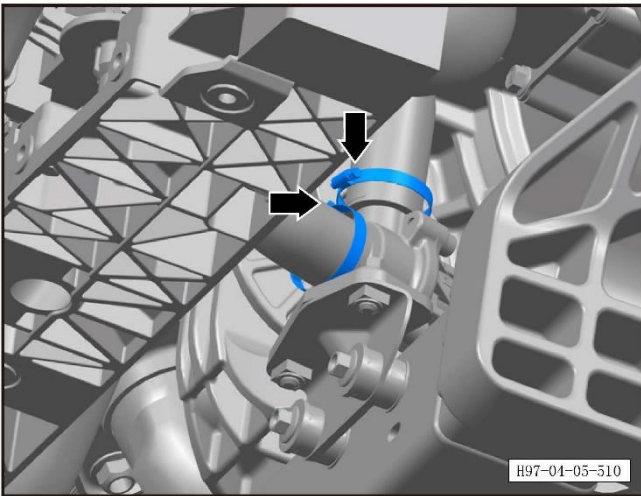
4.5.9.2 Removal and refitting of RCV assembly

Removal procedure

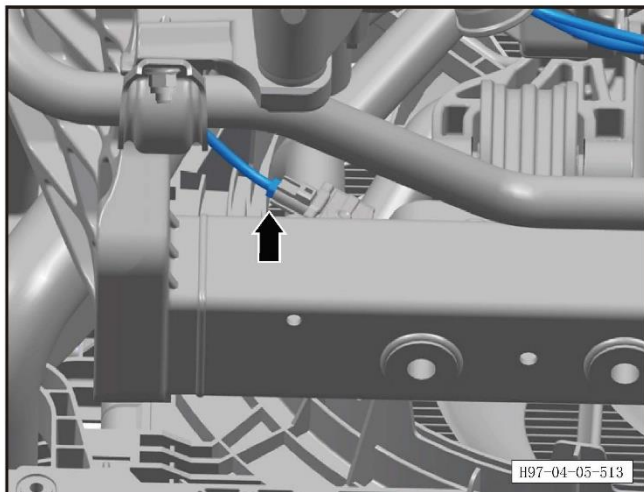
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
6. Remove the RCV assembly.

- a. Loosen the 2 hose clamps attached to the RCV assembly.

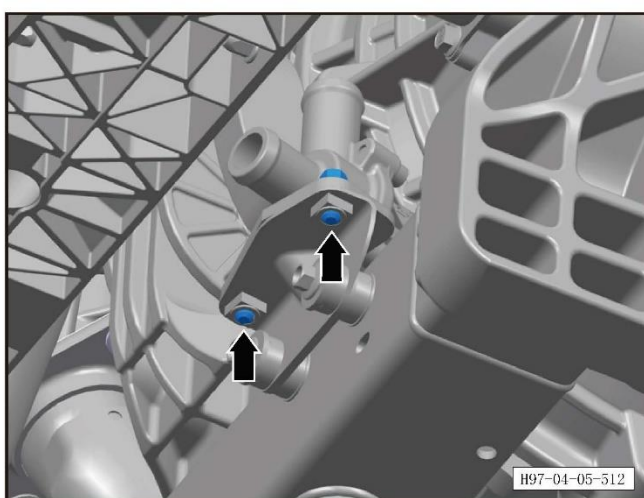
Tightening torque of bolt: $6\pm 1\text{Nm}$.



- b. Disconnect the 2 hoses and clamps attached to the RCV assembly.

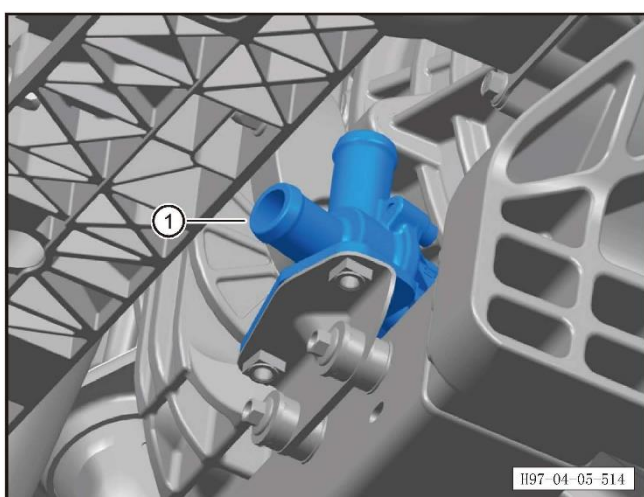


c. Disconnect the connector on the RCV assembly.



d. Unscrew the 2 bolts connecting the RCV assembly to the bracket.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



e. Take out the RCV assembly ①.

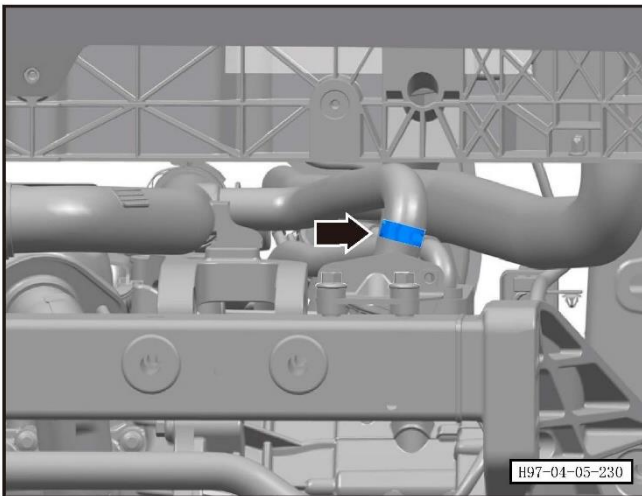
Refitting procedure

The refitting procedure is performed in reverse order.

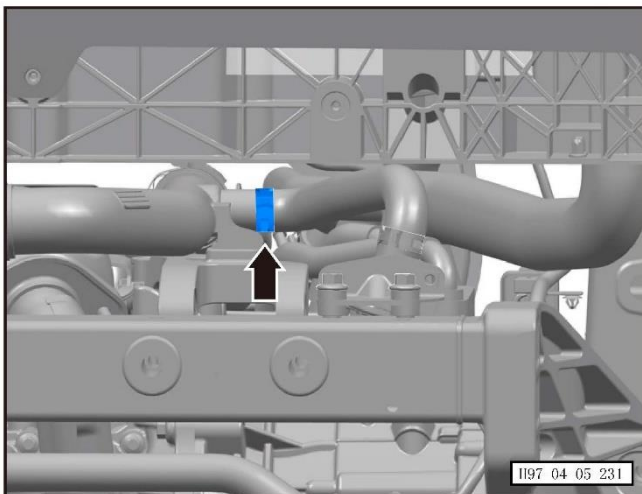
4.5.9.3 Removal and refitting of RCV air inlet hose

Removal procedure

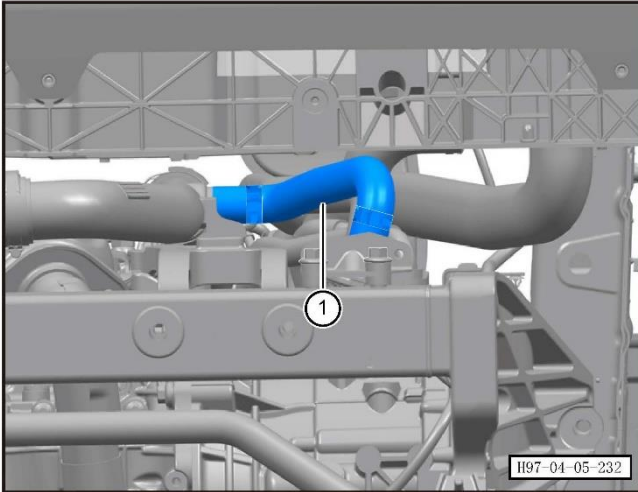
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
6. Remove the RCV air inlet hose.



- a. Loosen the connection clamp between the RCV air inlet hose and the RCV, and disconnect the hose.



- b. Loosen the connection clamp between the RCV air inlet hose and the turbocharger air outlet pipe, and disconnect the hose.



c. Take out the RCV air inlet hose assembly ①.

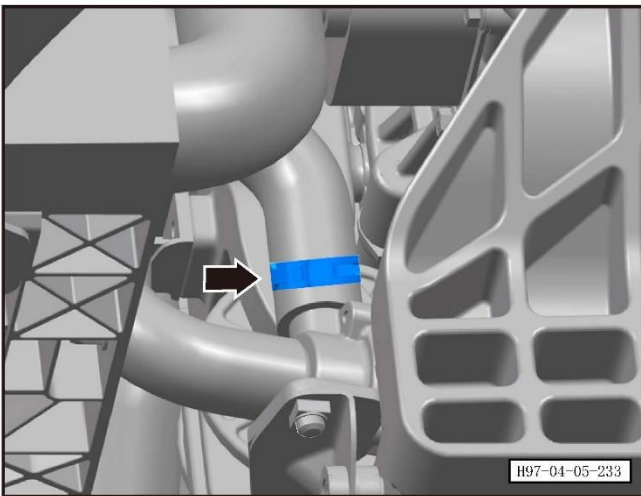
Refitting procedure

The refitting procedure is performed in reverse order.

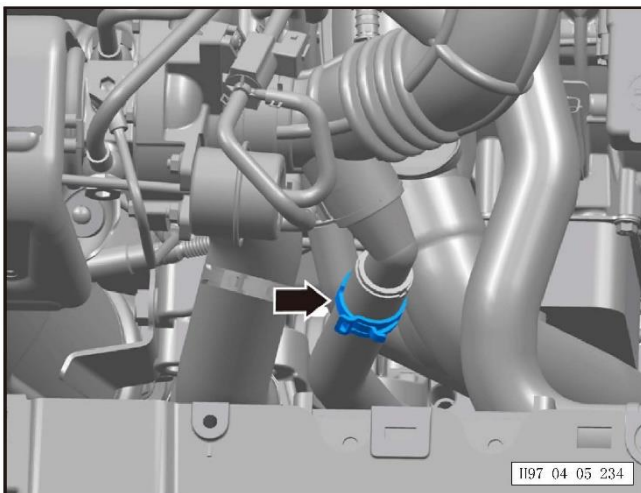
4.5.9.4 Removal and refitting of RCV air outlet hose

Removal procedure

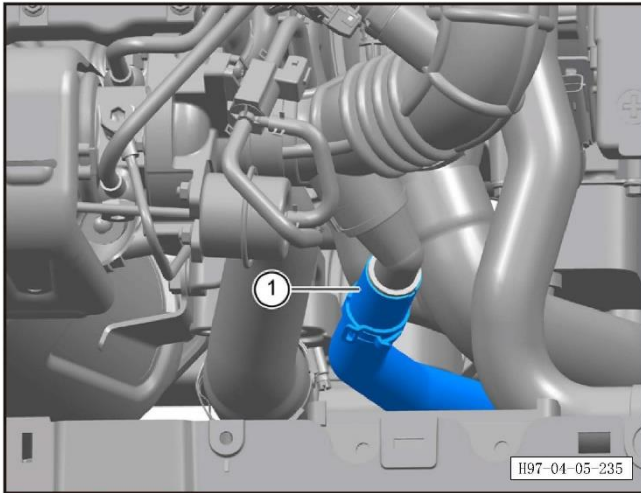
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
6. Remove the RCV air outlet hose.



- a. Loosen the connection clamp between the RCV air outlet hose and the RCV, and disconnect the hose.



- b. Loosen the connection clamp between the RCV air outlet hose and the air filter outlet pipe, and disconnect the hose.



c. Take out the RCV air outlet hose assembly ①.

Refitting procedure

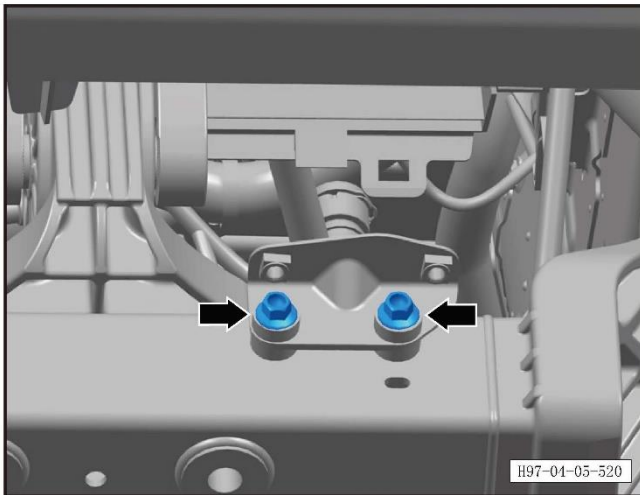
The refitting procedure is performed in reverse order.

4.5.9.5 Removal and refitting of RCV mounting bracket

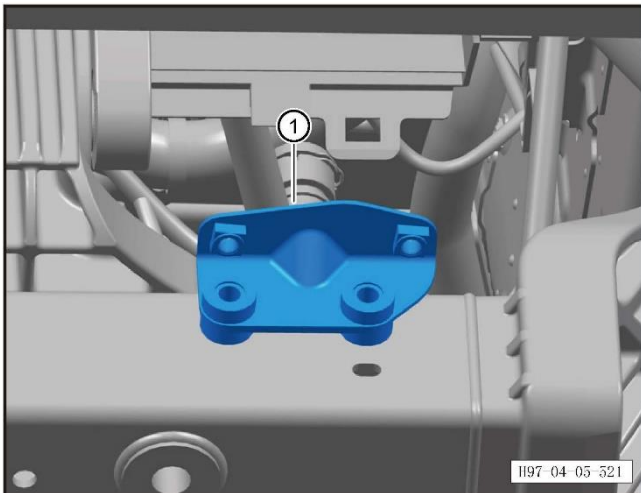
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the negative terminal of the battery.
5. Remove the RCV assembly (refer to [4.5.9.2 Removal and refitting of RCV assembly](#))
6. Remove the RCV mounting bracket.

- a. Unscrew 2 bolts on the RCV mounting bracket.
Tightening torque of bolt: $12\pm 2\text{Nm}$.



- b. Take out the RCV mounting bracket ①.



Refitting procedure

The refitting procedure is performed in reverse order.

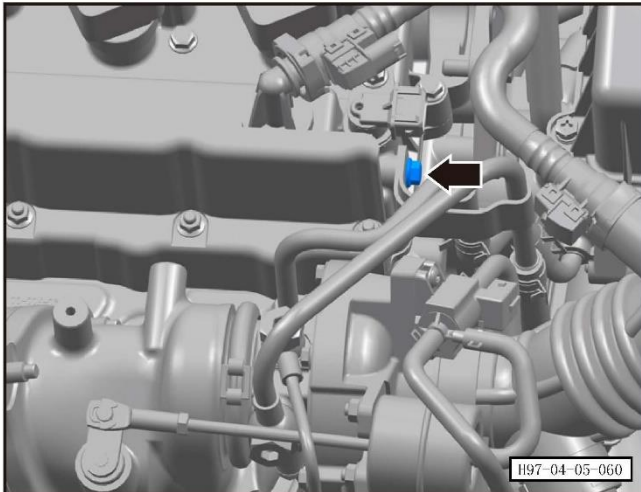
4.5.9.6 Removal and refitting of turbocharger metal water return pipe assembly

Removal procedure

CAUTION:

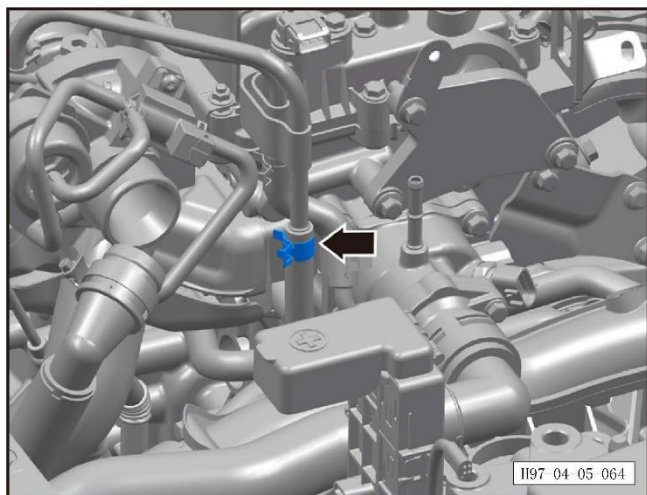
- When refitting the turbocharger metal water return pipe assembly, replace 2 gaskets with new ones.

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the negative terminal of the battery.
5. Remove the turbocharger upper heat shield assembly (refer to [4.5.9.1 Removal and refitting of turbocharger upper heat shield assembly](#))
6. Remove the three-way catalytic converter assembly (refer to [4.2.9.1 Removal and refitting of three-way catalytic converter assembly](#))
7. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
8. Remove the PCV vent pipe 1 (refer to [4.5.18.1 Removal and refitting of PCV vent pipe 1](#))
9. Remove the turbocharger metal water return pipe assembly.

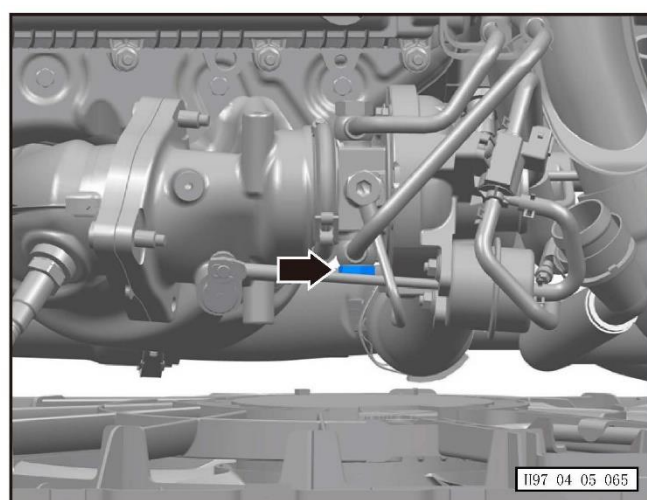


- a. Unscrew the turbocharger metal water inlet/return pipe assembly bracket bolts.

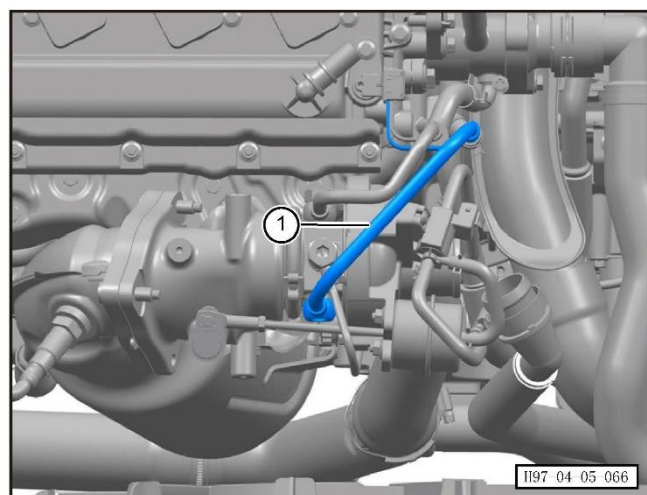
Tightening torque of bolt: $10\pm 1\text{Nm}$.



b. Loosen the clamp connecting the turbocharger metal water return pipe assembly to the hose.



c. Unscrew 1 bolt connecting the turbocharger metal water return pipe assembly and the turbocharger assembly.



d. Take out the turbocharger metal water return pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

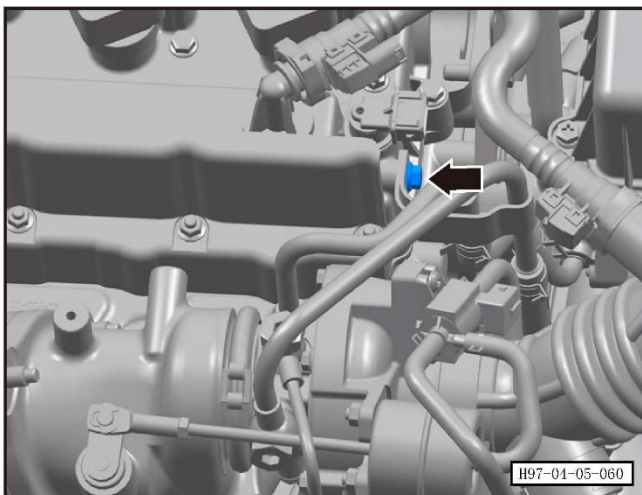
4.5.9.7 Removal and refitting of turbocharger metal water inlet pipe assembly

Removal procedure

CAUTION:

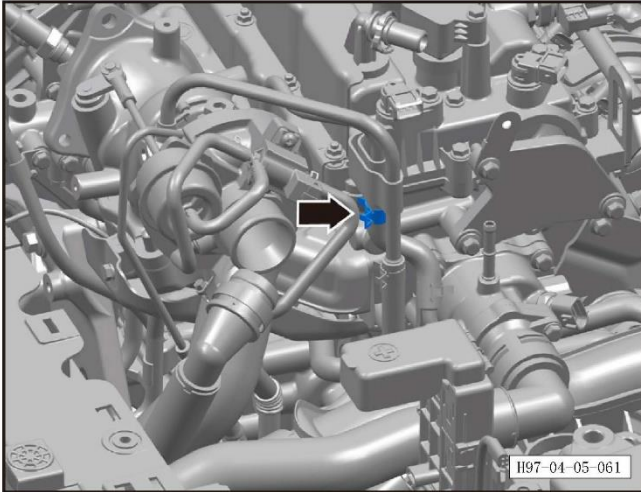
- When refitting the turbocharger metal water inlet pipe assembly, replace 2 gaskets with new ones.

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the negative terminal of the battery.
5. Remove the turbocharger upper heat shield assembly (refer to [4.5.9.1 Removal and refitting of turbocharger upper heat shield assembly](#))
6. Remove the three-way catalytic converter assembly (refer to [4.2.9.1 Removal and refitting of three-way catalytic converter assembly](#))
7. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
8. Remove the PCV vent pipe 1 (refer to [4.5.18.1 Removal and refitting of PCV vent pipe 1](#))
9. Remove the turbocharger metal water inlet pipe assembly.

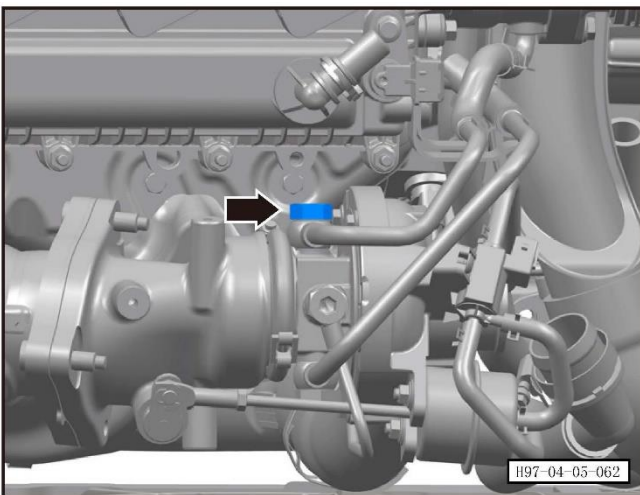


- a. Unscrew the turbocharger metal water inlet/return pipe assembly bracket bolts.

Tightening torque of bolt: $10\pm 1\text{Nm}$.

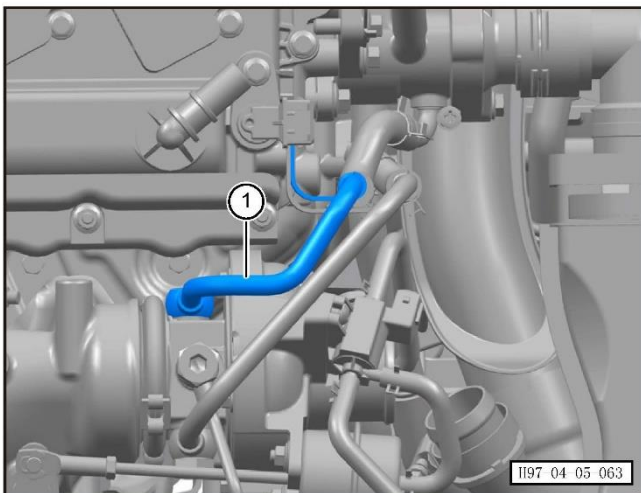


b. Loosen the clamp connecting the turbocharger metal water inlet pipe assembly to the hose.



c. Unscrew 1 bolt connecting the turbocharger metal water inlet pipe assembly and the turbocharger assembly.

Tightening torque of bolt: $23\pm 2\text{Nm}$.



d. Take out the turbocharger metal water inlet pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

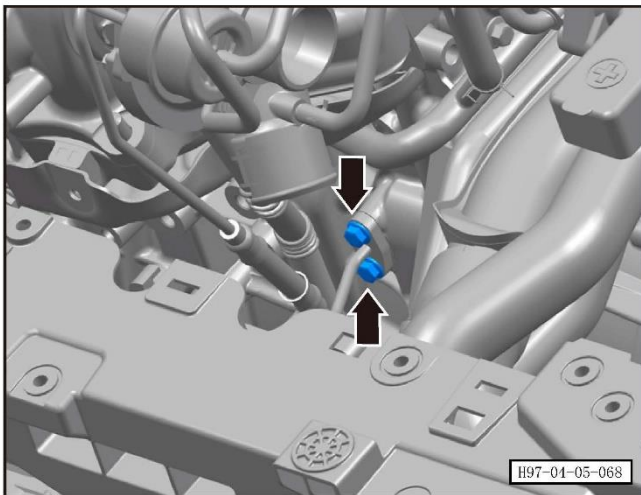
4.5.9.8 Removal and refitting of turbocharger oil inlet pipe assembly

Removal procedure

CAUTION:

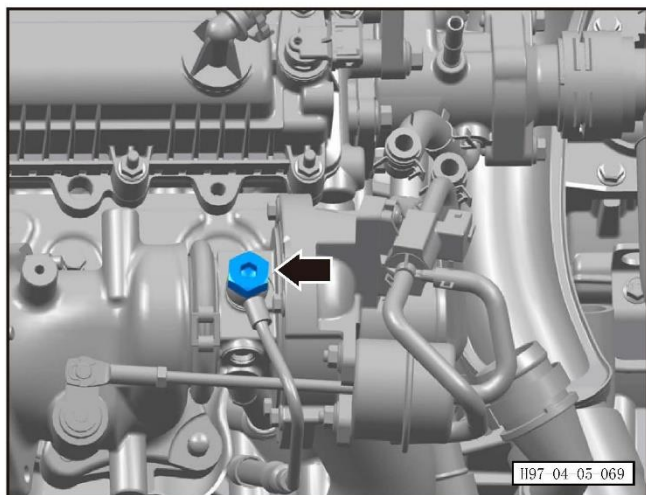
- When refitting the turbocharger oil inlet pipe assembly, replace the seal rings and gaskets with new ones.

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the negative terminal of the battery.
5. Remove the turbocharger upper heat shield assembly (refer to [4.5.9.1 Removal and refitting of turbocharger upper heat shield assembly](#))
6. Remove the three-way catalytic converter assembly (refer to [4.2.9.1 Removal and refitting of three-way catalytic converter assembly](#))
7. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
8. Remove the PCV vent pipe 1 (refer to [4.5.18.1 Removal and refitting of PCV vent pipe 1](#))
9. Remove the turbocharger oil inlet pipe assembly.



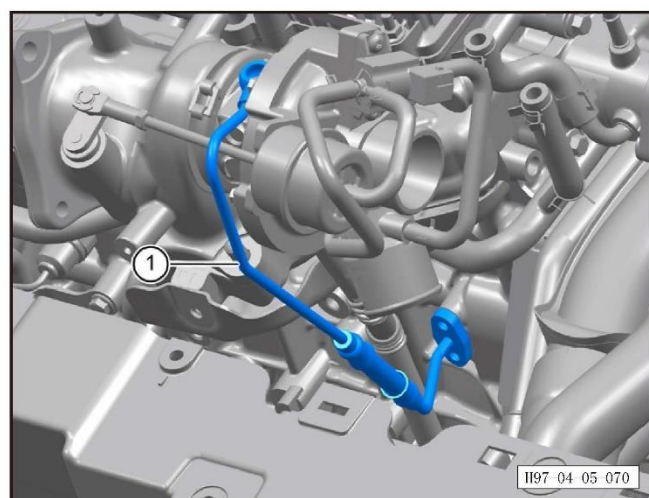
- a. Unscrew the 2 bolts connecting the lower part of the turbocharger oil inlet pipe assembly to the cylinder block assembly.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



b. Unscrew the 1 bolt connecting the turbocharger oil inlet pipe assembly to the turbocharger assembly.

Tightening torque of bolt: $23\pm 2\text{Nm}$.



c. Take out the turbocharger oil inlet pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.5.9.9 Removal and refitting of turbocharger oil return pipe assembly

Removal procedure

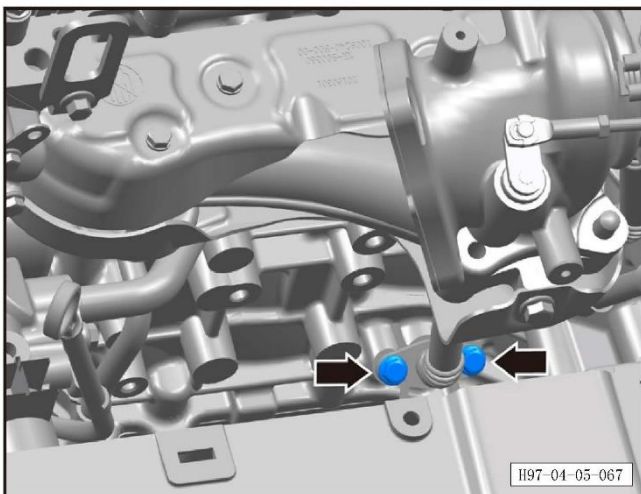
CAUTION:

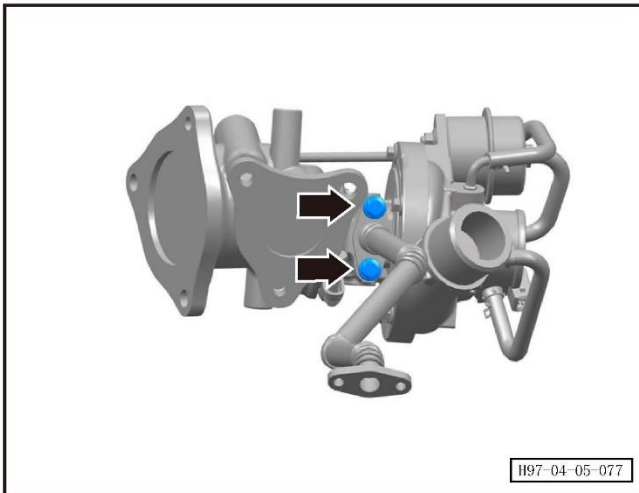
- When refitting the turbocharger oil return pipe assembly, replace the seal rings and gaskets with new ones.

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the negative terminal of the battery.
5. Remove the turbocharger upper heat shield assembly (refer to [4.5.9.1 Removal and refitting of turbocharger upper heat shield assembly](#))
6. Remove the three-way catalytic converter assembly (refer to [4.2.9.1 Removal and refitting of three-way catalytic converter assembly](#))
7. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
8. Remove the PCV vent pipe 1 (refer to [4.5.18.1 Removal and refitting of PCV vent pipe 1](#))
9. Remove the turbocharger assembly (refer to [4.5.9.10 Removal and refitting of turbocharger assembly](#))
10. Remove the turbocharger oil return pipe assembly.

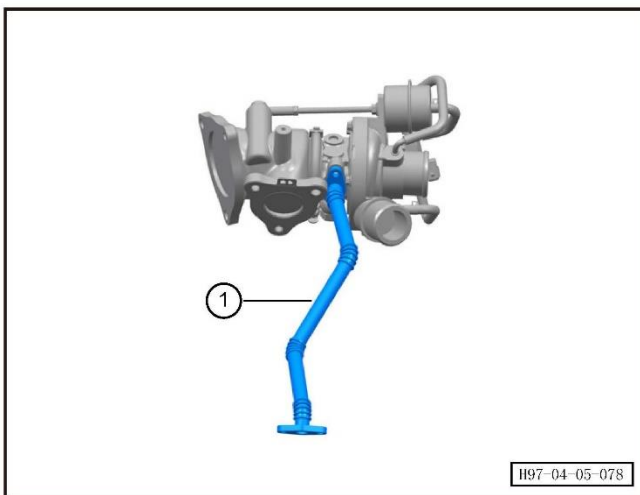
a. Unscrew the 2 bolts connecting the lower part of the turbocharger oil return pipe assembly to the cylinder block assembly.

Tightening torque of bolt: $10\pm 1\text{Nm}$.





b. Unscrew the 2 bolt connecting the turbocharger oil return pipe assembly to the turbocharger assembly.
Tightening torque of bolt: $10\pm 1\text{Nm}$.



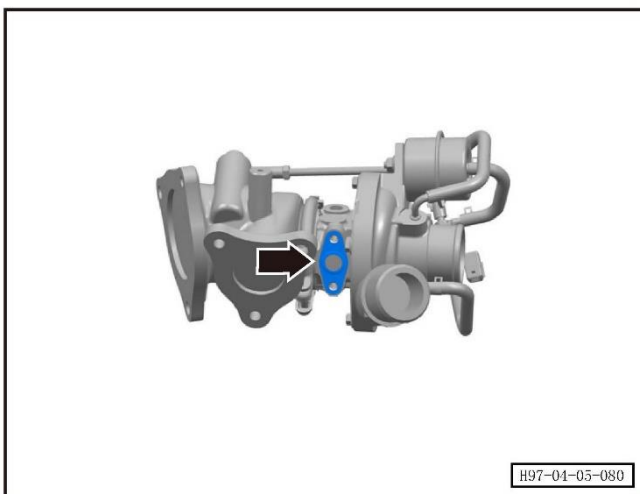
c. Take out the turbocharger oil return pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

Note:

- When refitting the turbocharger oil return pipe assembly, replace the gaskets with new ones.



4.5.9.10 Removal and refitting of turbocharger assembly

Removal procedure

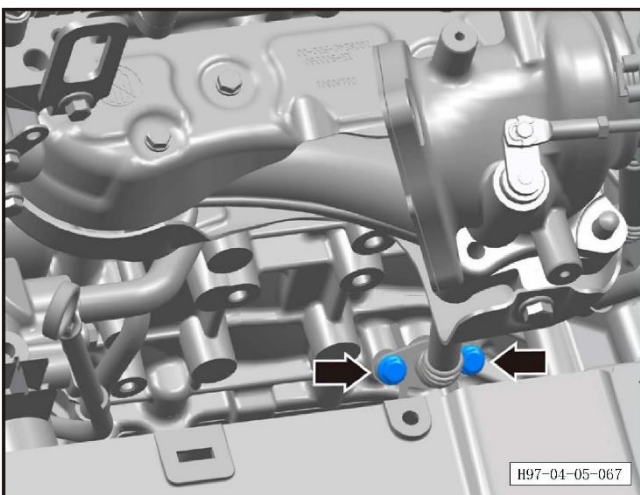
CAUTION:

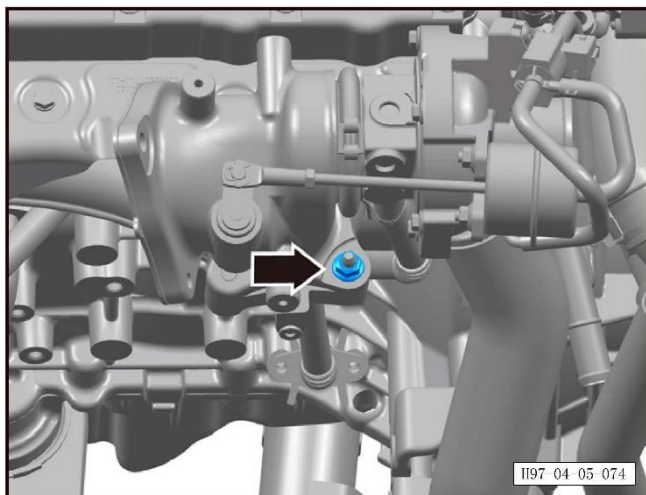
- When refitting the turbocharger oil return pipe assembly, replace the seal rings and gaskets with new ones.

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the negative terminal of the battery.
5. Remove the turbocharger upper heat shield assembly (refer to [4.5.9.1 Removal and refitting of turbocharger upper heat shield assembly](#))
6. Remove the three-way catalytic converter assembly (refer to [4.2.9.1 Removal and refitting of three-way catalytic converter assembly](#))
7. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
8. Remove the PCV vent pipe 1 (refer to [4.5.18.1 Removal and refitting of PCV vent pipe 1](#))
9. Remove the turbocharger oil return pipe assembly (refer to [4.5.9.9 Removal and refitting of turbocharger oil return pipe assembly](#))
10. Remove the exhaust manifold lower heat shield (refer to [4.2.9.5 Removal and refitting of exhaust manifold lower heat shield](#))
11. Remove the turbocharger assembly.

a. Unscrew the 2 bolts connecting the turbocharger oil return pipe assembly to the cylinder block assembly.

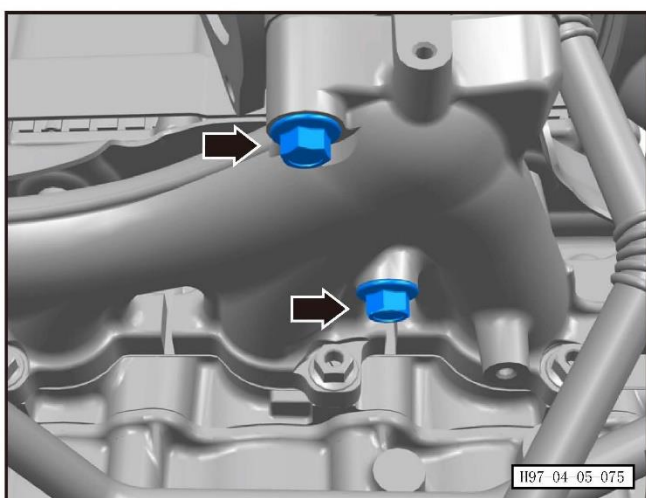
Tightening torque of bolt: $10\pm 1\text{Nm}$.





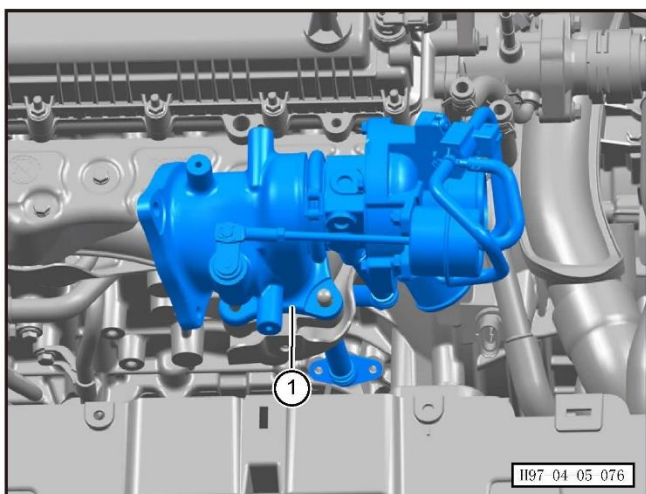
b. Unscrew the 1 nut connecting the turbocharger housing to the exhaust manifold assembly.

Tightening torque of nut: $23\pm 2\text{Nm}$.

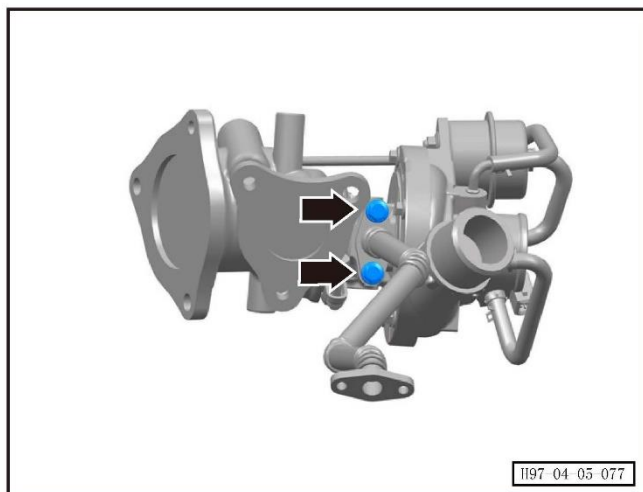


c. Unscrew the 2 bolts connecting the turbocharger housing to the lower part of exhaust manifold.

Tightening torque of bolt: $20\pm 2\text{Nm}$.

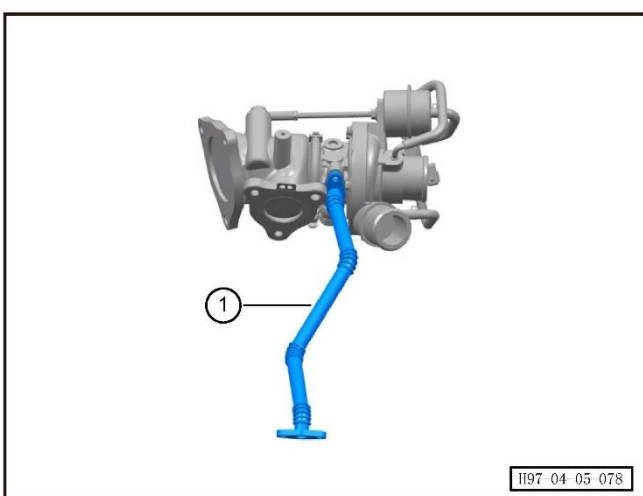


d. Take down the turbocharger assembly ① and the oil return pipe assembly.

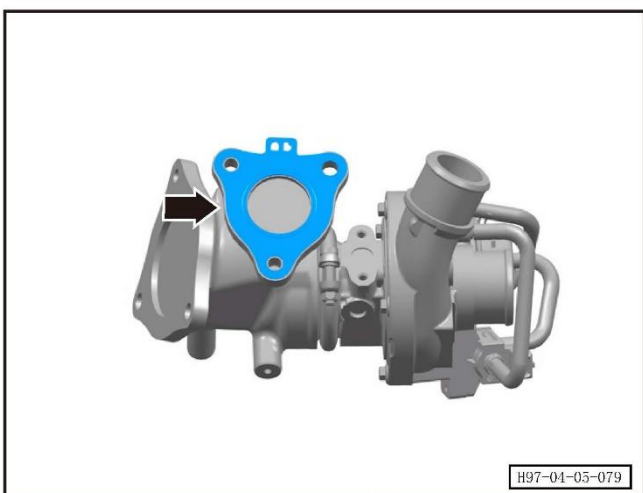


e. Unscrew the 2 bolts connecting the turbocharger assembly to the turbocharger oil return pipe assembly.

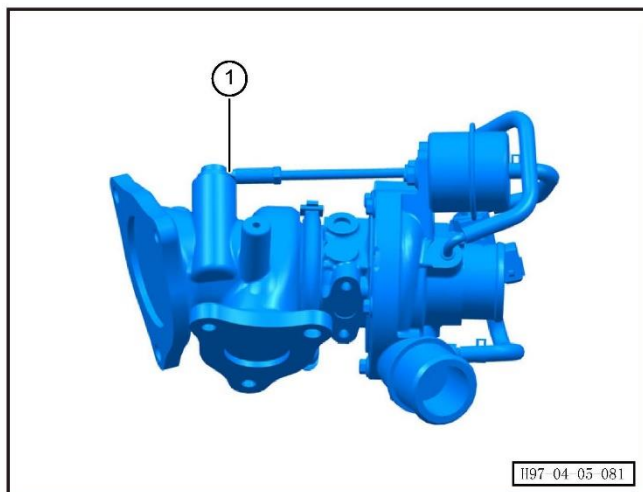
Tightening torque of bolt: $10\pm 1\text{Nm}$.



f. Take down the turbocharger oil return pipe assembly ①.



g. Take down and discard the gasket between the turbocharger assembly and the exhaust manifold assembly.



h. Take out the turbocharger assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

Note:

- When refitting the turbocharger oil return pipe assembly, replace the gaskets with new ones.
- When refitting the turbocharger assembly, the gasket between the turbocharger assembly and the exhaust manifold must be replaced with a new one.
- The exhaust pressure relief valve adjustment lever of the turbocharger assembly cannot be individually removed for adjustment or replacement.
- The turbocharger assembly must be handled with care to avoid collision and falling off. Otherwise, the assembly must be replaced with a new one.

4.5.10 Ignition system

4.5.10.1 Removal and refitting of ignition coil assembly

Removal procedure

CAUTION:

- Before removing the ignition coil, clean the dirt around the ignition coil to keep the area around the ignition coil hole clean.

1. Turn off all electrical appliances and turn off the start switch.

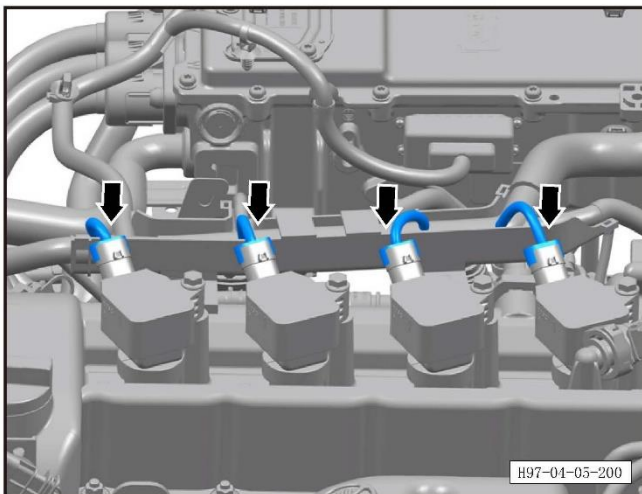
2. Open the engine hood.

3. Remove the engine compartment trim panel.

4. Disconnect the battery negative terminal.

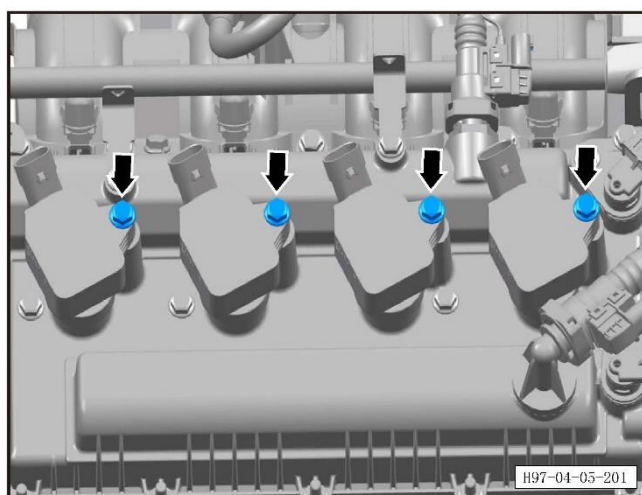
5. Remove the ignition coil.

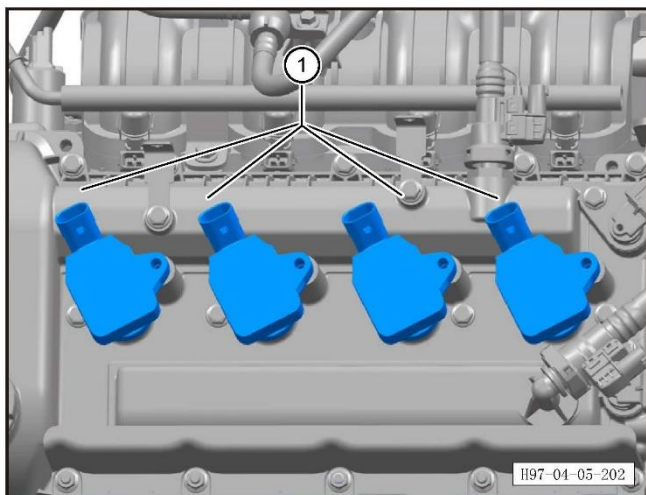
a. Disconnect the connectors of the 4 ignition coils.



b. Unscrew the fixing bolts of the 4 ignition coils.

Tightening torque of bolt: 12 ± 1 Nm.





c. Take out the 4 ignition coils ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Sequence of ignition coil connectors.
- When refitting, apply a thin layer of dielectric grease to the ignition coil rubber sleeve. Remove excess grease around the rubber sleeve and make sure there is no excess grease inside the rubber sleeve.

4.5.10.2 Removal and refitting of spark plug assembly

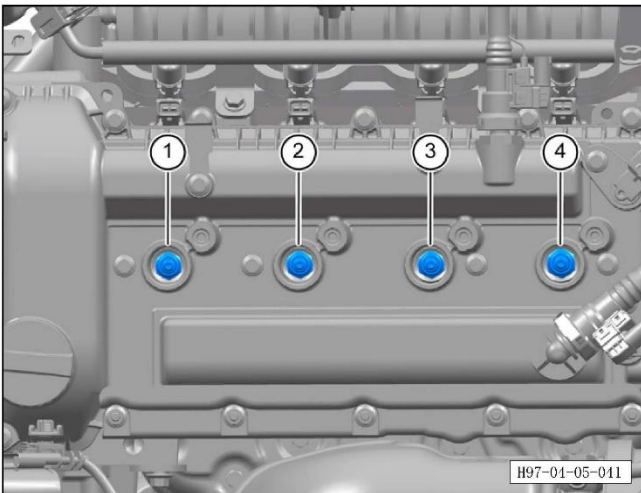
Note:

- To protect the range extender cylinder head. Do not remove the spark plug from a hot engine, but let it cool first. Removing the spark plug from a hot engine may result in damage to the spark plug threads or damage to the cylinder head.
- After removing the spark plug, plug the spark plug hole with a cloth ball to prevent debris from falling into the cylinder.
- After removal, the spark plugs should be placed in the same order as the original installation position on the vehicle, to facilitate the follow-up inspections.
- Pay attention to handling the spark plug gently to avoid damage to the spark plug head clearance.

Removal procedure

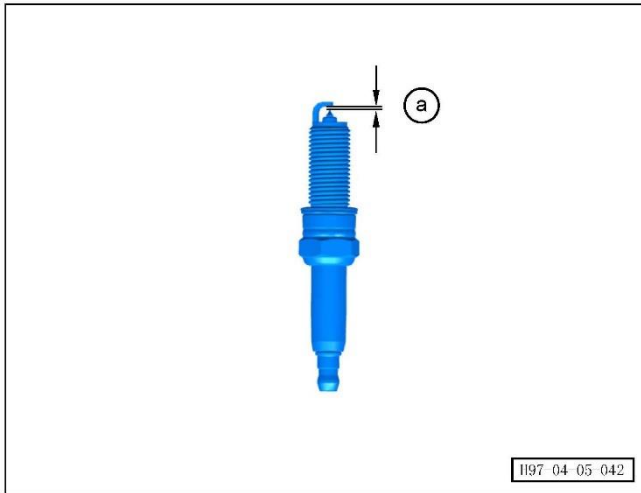
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the ignition coil (refer to [4.5.10.1 Removal and refitting of ignition coil assembly](#))
6. Remove the spark plug.

- a. Unscrew and take out 4 spark plugs in sequence. Tightening torque of spark plug: $25\pm 2\text{Nm}$.



Refitting procedure

The refitting procedure is performed in reverse order.

**CAUTION:**

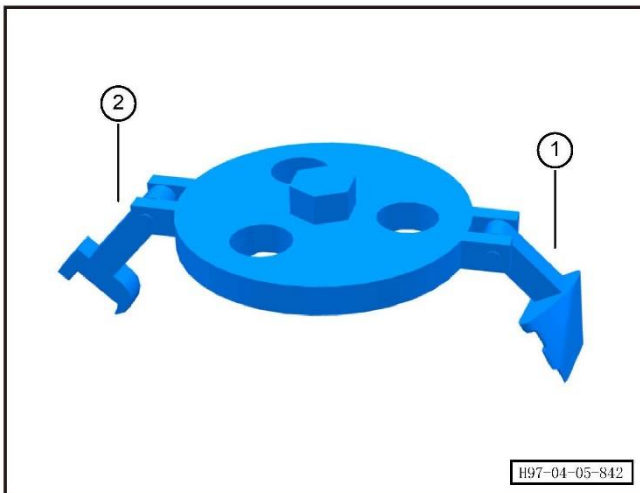
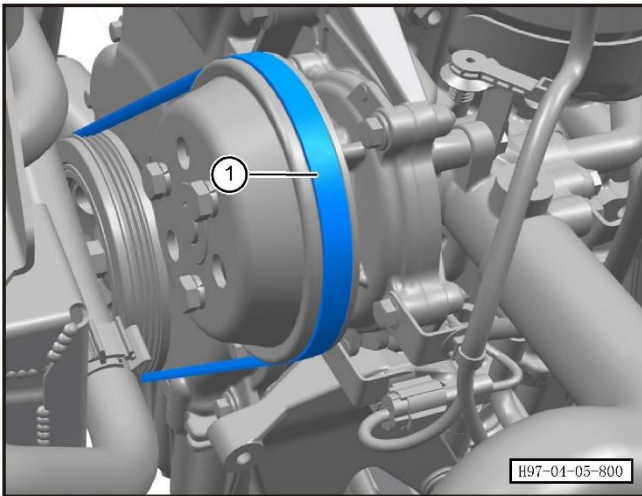
- The spark plug model is BOSCH YR6NI302S.
- The thread is M12×1.25.
- The electrode gap is: $a=(0.7 \sim 0.8)\text{mm}$.
- Replace the spark plug if it is subjected to burning loss of electrode, or damage to thread or insulator.

4.5.11 Timing chain system

4.5.11.1 Removal and refitting of water pump belt

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump belt.
 - a. Remove the water pump belt by a special tool.



Special Tool

Removal or refitting of belt:

- a. The special tool needs to be put on the water pump belt pulley;
- b. Choose to remove the arm or install the arm;
- c. Then rotate the special tool according to the rotation direction of the crankshaft;
- d. Remove or refit the belt.
 - Remove the arm ①;
 - Refit the arm ②.

Refitting procedure

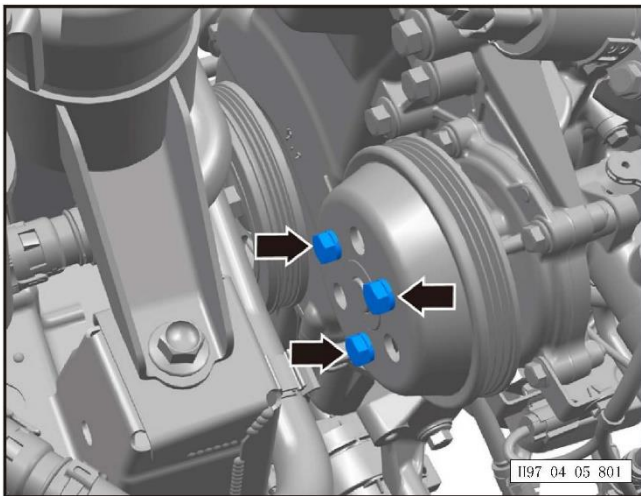
The refitting procedure is performed in reverse order.

4.5.11.2 Removal and refitting of water pump pulley

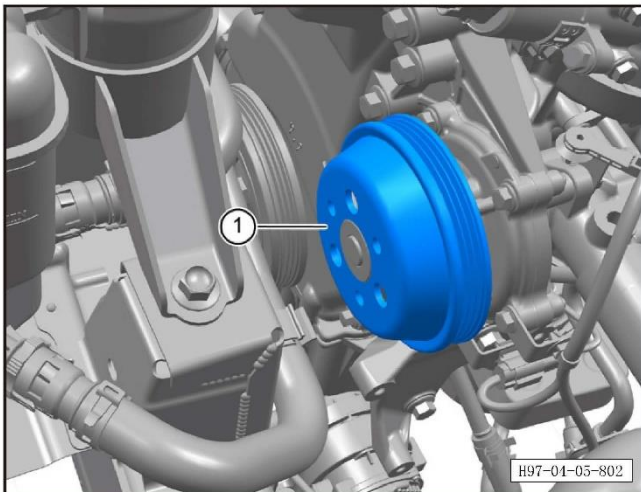
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump belt (refer to [4.5.11.1 Removal and refitting of water pump belt](#))
6. Remove the water pump pulley.

- a. Unscrew 3 bolts on the water pump Washer.
Tightening torque of bolt: $20\pm 2\text{Nm}$.



- b. Take out the water pump pulley ①.



Refitting procedure

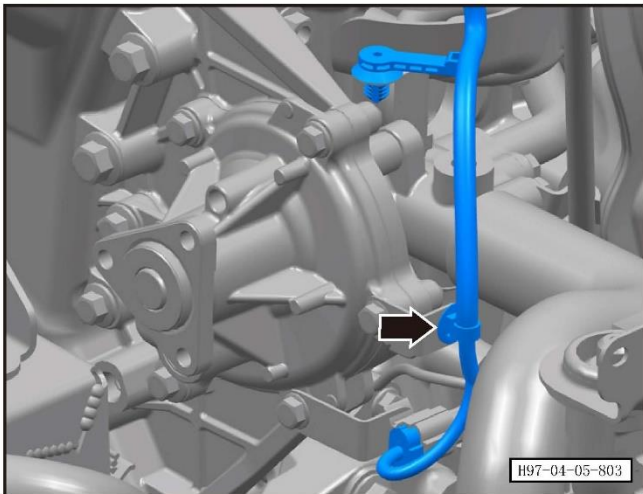
The refitting procedure is performed in reverse order.

4.5.11.3 Removal and refitting of water pump fixing harness bracket I

Removal procedure

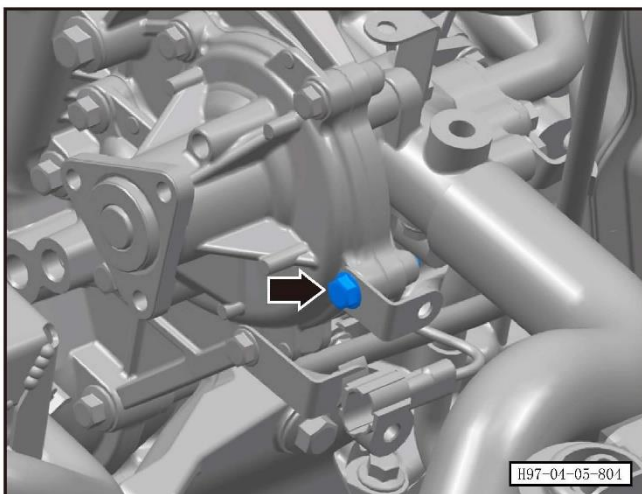
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump belt (refer to [4.5.11.1 Removal and refitting of water pump belt](#))
6. Remove the water pump pulley (refer to [4.5.11.2 Removal and refitting of water pump pulley](#))
7. Remove the water pump fixing harness bracket I.

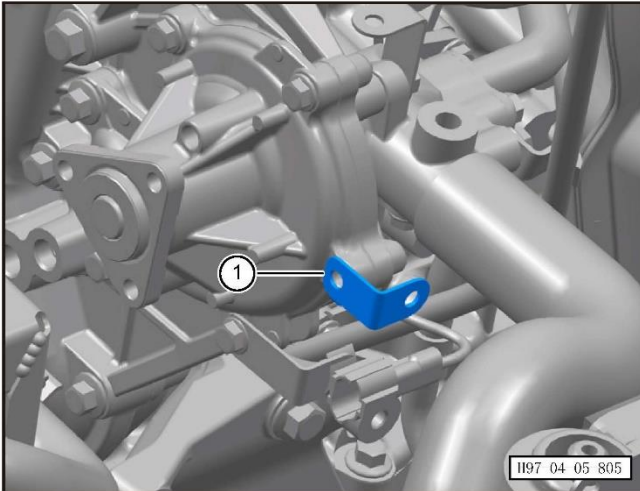
- a. Remove the clip on the water pump fixing harness bracket.



- b. Unscrew 1 bolt on the water pump fixing harness bracket.

Tightening torque of bolt: $10\pm 1\text{Nm}$.





c. Remove the water pump fixing harness bracket I assembly ①.

Refitting procedure

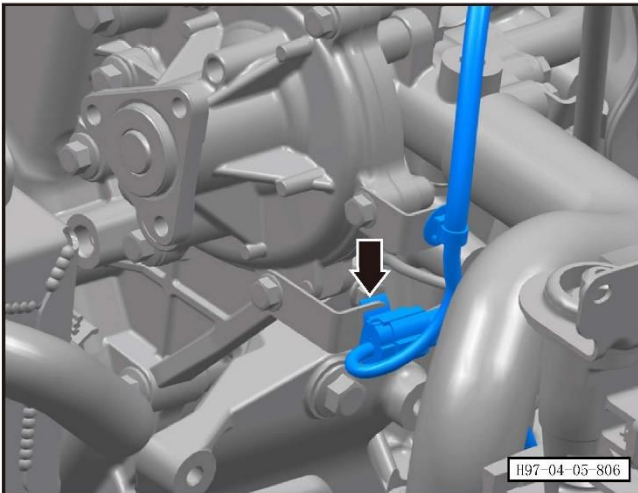
The refitting procedure is performed in reverse order.

4.5.11.4 Removal and refitting of water pump fixing harness bracket II

Removal procedure

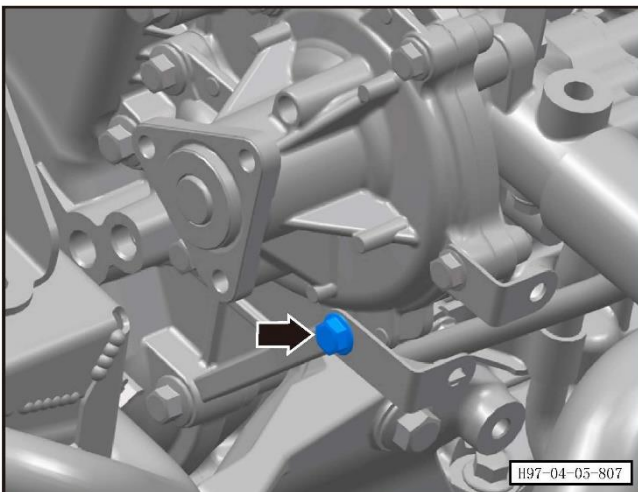
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the water pump belt (refer to [4.5.11.1 Removal and refitting of water pump belt](#))
6. Remove the water pump pulley (refer to [4.5.11.2 Removal and refitting of water pump pulley](#))
7. Remove the water pump fixing harness bracket II.

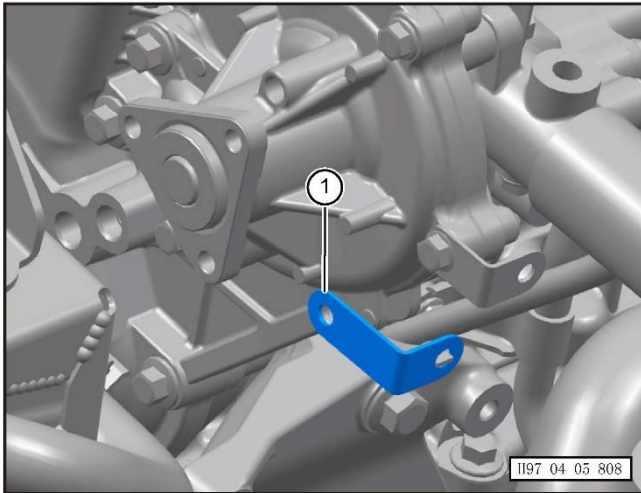
a. Remove the clip on the water pump fixing harness bracket.



b. Unscrew 1 bolt on the water pump fixing harness bracket.

Tightening torque of bolt: $10\pm 1\text{Nm}$.





c. Remove the water pump fixing harness bracket II assembly ①.

Refitting procedure

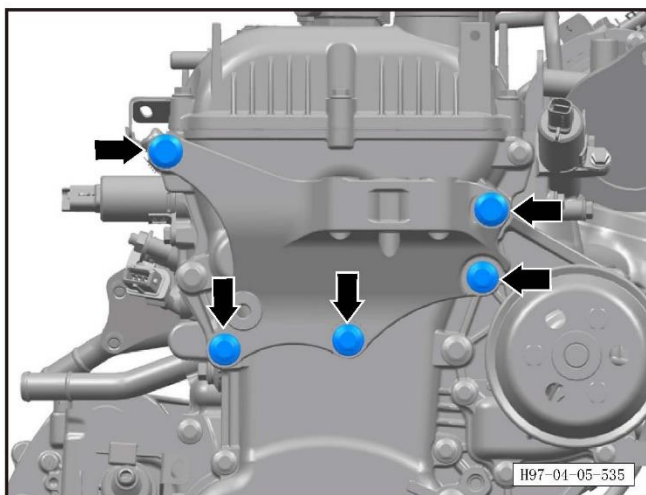
The refitting procedure is performed in reverse order.

4.5.11.5 Removal and refitting of right mounting bracket

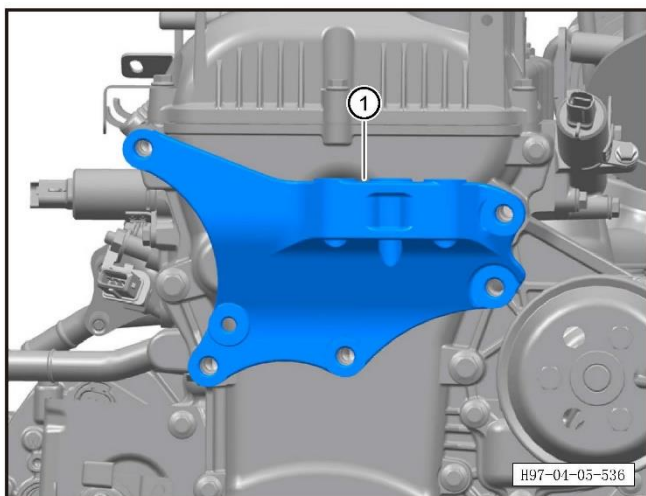
Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the tight mounting bracket.
 - a. Remove the 5 bolts connecting the right mounting bracket to the timing chain cover assembly.

Tightening torque of bolt: $23\pm 2\text{Nm}$.



- b. Take out the tight mounting bracket ①.



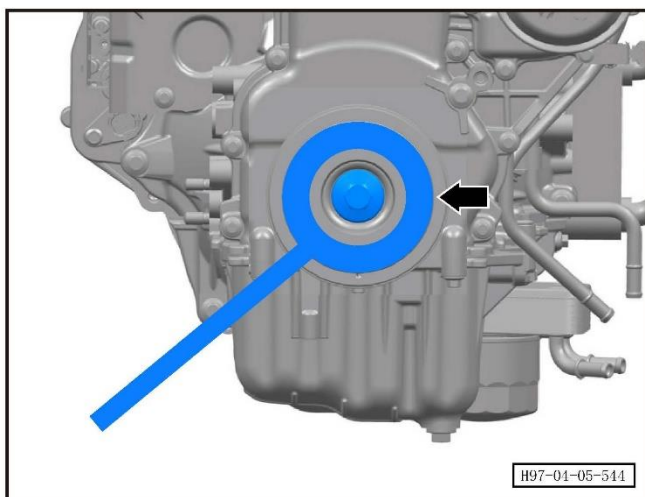
Refitting procedure

The refitting procedure is performed in reverse order.

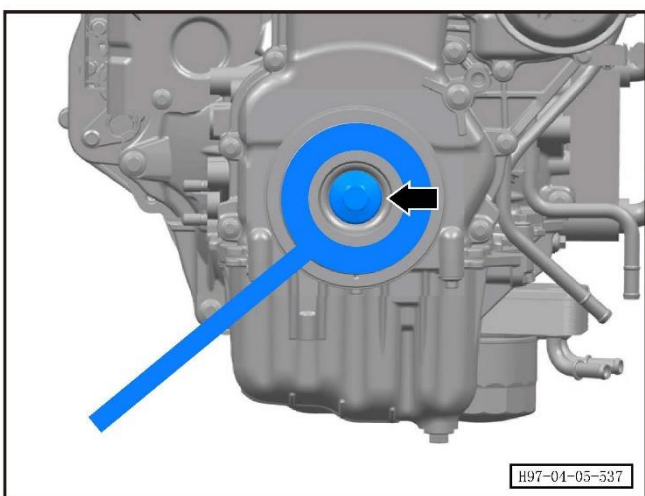
4.5.11.6 Removal and refitting of driving pulley

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the water pump belt (refer to [4.5.11.1 Removal and refitting of water pump belt](#))
3. Remove the driving pulley.

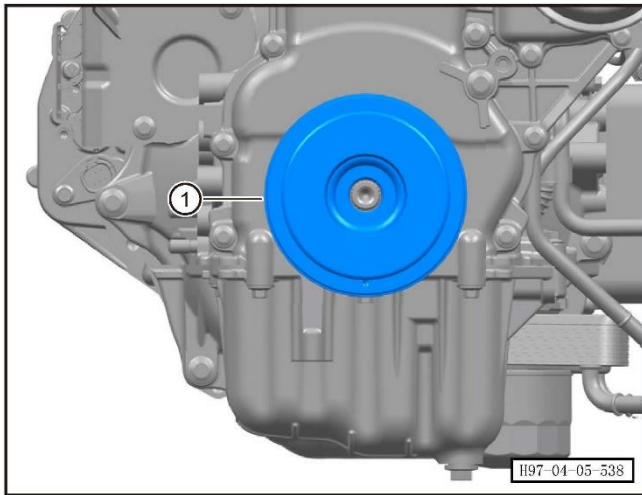


- a. Install the driving pulley fixing tool.



- b. Unscrew 1 bolt of the driving pulley.

Tightening torque of bolt: $(130 \pm 2) \text{ Nm} + (60 \pm 3)^\circ$



c. Take out the driving pulley ①.

CAUTION:

- Remove and refit the driving pulley with a special tool.
- Note that after the driving pulley is removed, it should be handled with care to avoid falling and bumping. Otherwise, it may cause unbalanced vibration of the crankshaft when the range extender is working.

Refitting procedure

The refitting procedure is performed in reverse order.

4.5.11.7 Removal and refitting of timing chain cover oil seal assembly

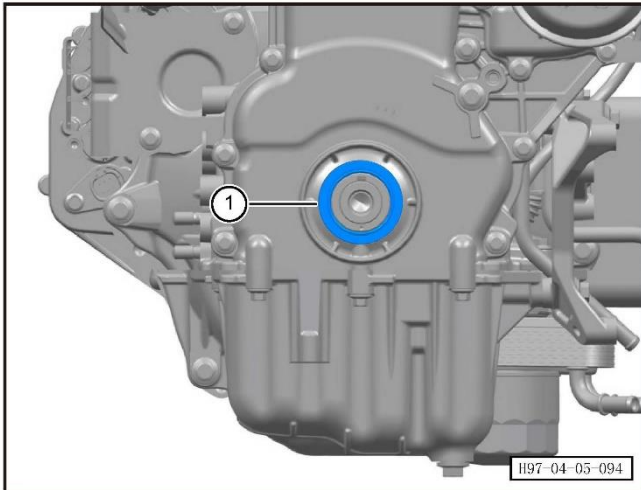
Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the driving pulley (refer to [4.5.11.6 Removal and refitting of driving pulley](#))
3. Remove the timing chain cover oil seal assembly.

- a. Take out the timing chain cover oil seal assembly ①.

CAUTION:

- Take out and refit the timing chain cover oil seal assembly with a special tool.
- Clean crankshaft sealing surfaces with a clean, lint-free towel.
- Inspect the crankshaft lead-in edge for burrs/sharp edges that could damage the rear main oil seal.
- If there are burrs/sharp edges, remove them with a fine emery cloth before proceeding.



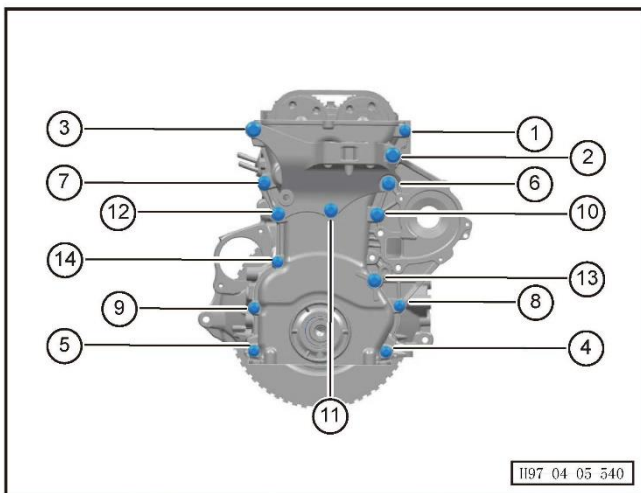
Refitting procedure

The refitting procedure is performed in reverse order.

4.5.11.8 Removal and refitting of timing chain cover assembly

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the driving pulley (refer to [4.5.11.6 Removal and refitting of driving pulley](#))
3. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
4. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
5. Remove the water pump assembly (refer to [4.4.8.74 Removal and refitting of water pump assembly](#))
6. Remove the timing chain cover assembly.

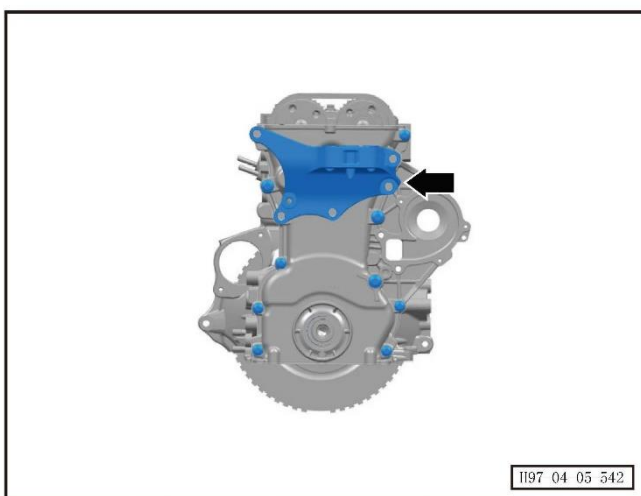


- a. Unscrew the 14 bolts in 2-3 steps in the order marked.

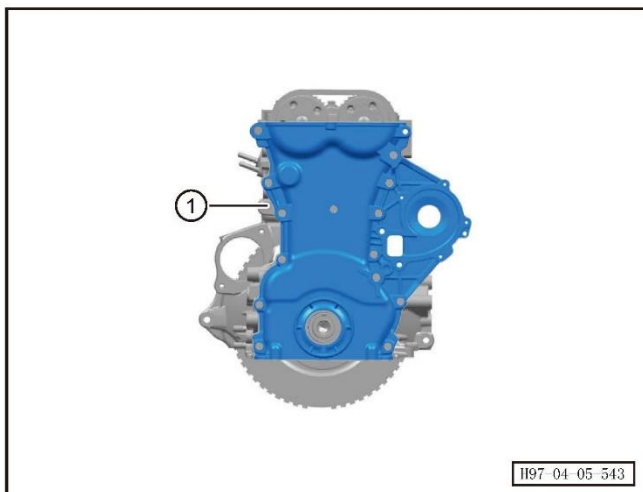
Tightening torque of bolt: $15 \pm 1 \text{ Nm}$.

CAUTION:

- Difference in bolts.
- Step 1: Loosen the bolts so that the bolts are unloaded.
- Step 2: Completely loosen the bolts.
- Step 3: Take out the bolts.
- Apply sealant to the inside of the timing chain cover assembly, and pay attention to the method of opening the chain cover assembly after taking out the bolts. It is forbidden to forcibly pry the chain cover assembly to avoid damage to the end face of the casing.



- b. Take down the right mounting bracket.



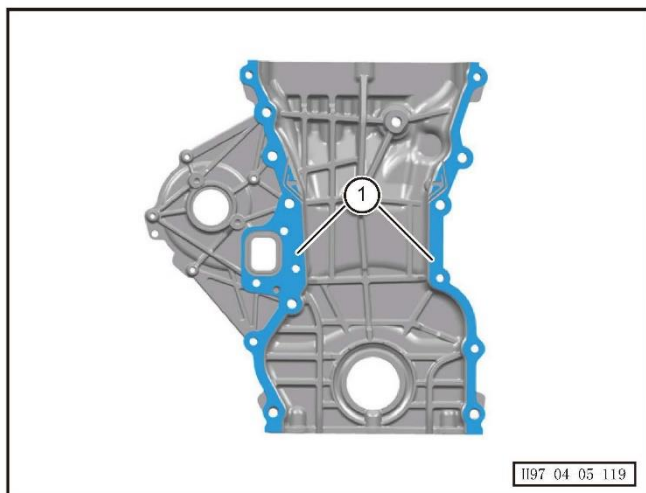
c. Take down the timing chain cover assembly ①.

Note:

- Remove a circle of sealant around the timing chain cover assembly with a spatula.

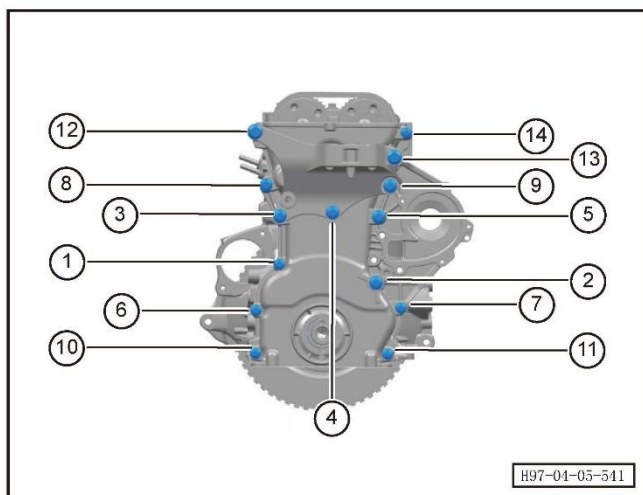
Refitting procedure

The refitting procedure is performed in reverse order.



Note:

- Clean all surfaces where the engine block is in contact with the timing chain cover assembly.
- When refitting the timing chain cover assembly, the gasket ① needs to be replaced with a new one.
- Apply sealant evenly to the new gasket.



- Tighten the 14 bolts in 3 steps in the order marked.

Tightening torque of bolt: $15 \pm 1 \text{ Nm}$.

CAUTION:

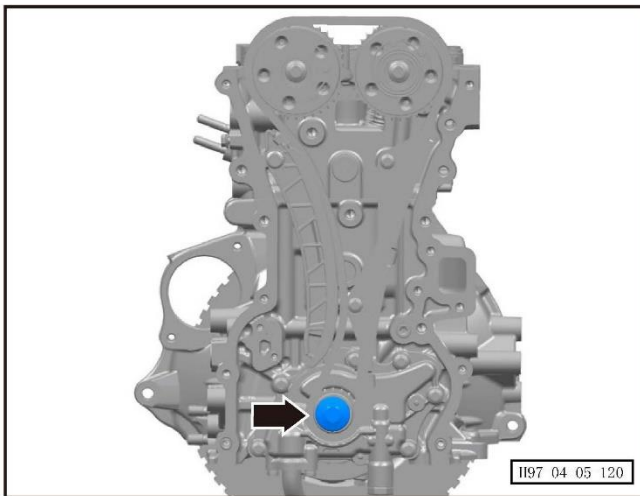
- Difference in bolts.
- Step 1: Screw in the bolts.
- Step 2: Pre-tighten the bolts.
- Step 3: Fully tighten the bolts to the required torque.

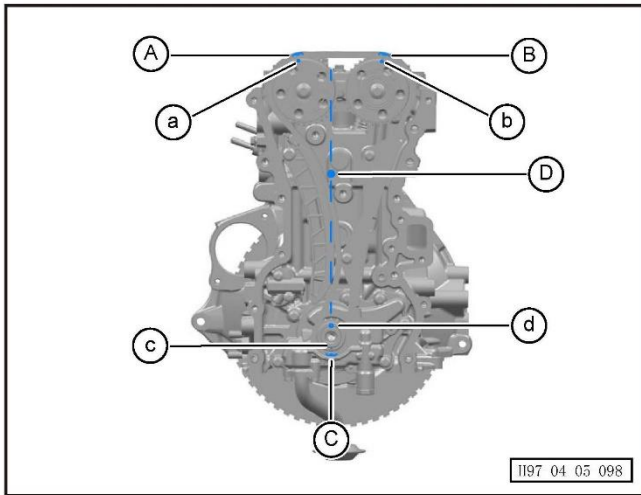
4.5.11.9 Alignment of timing chain marker points

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the driving pulley (refer to [4.5.11.6 Removal and refitting of driving pulley](#))
3. Remove the harness bracket on timing chain cover assembly (refer to [4.5.11.5 Removal and refitting of harness bracket on timing chain cover assembly](#))
4. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
5. Remove the water pump assembly (refer to [4.4.8.74 Removal and refitting of water pump assembly](#))
6. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
7. Fix the two camshafts with a special tool.
8. Align the timing chain marker points.
 - a. Install the connecting bolts between the driving pulley and the crankshaft.

Tightening torque of bolt: (30 ± 2) Nm + $(60\pm 3)^\circ$

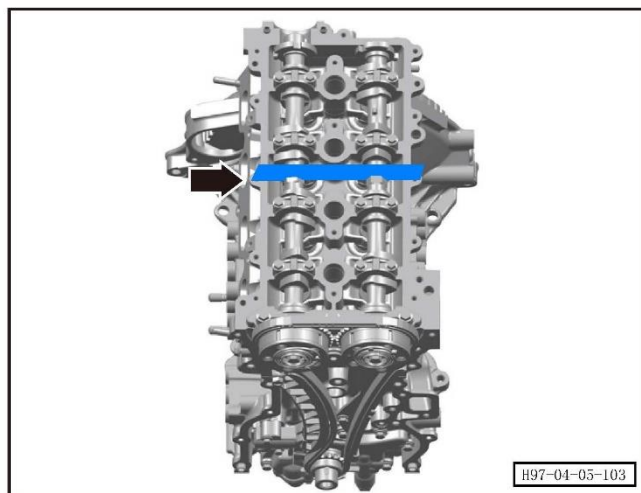




b. Turn the bolts connecting the driving pulley to the crankshaft following the direction of motion of the engine crankshaft as it rotates until the pistons of cylinders 1# and 4# are at the TDC of the compression stroke and all timing marker points are aligned.

Note:

- Align the groove of the intake VCP assembly (marked as point a) aligns with the middle of the colored link on the left side of the timing chain (marked as mark A).
- Align the groove of the intake VCP assembly (marked as point b) with the middle of the colored link on the right side of the timing chain (marked as mark B).
- Align the groove of the intake VCP assembly (marked as point c) with the middle of the colored link on the lower side of the timing chain (marked as mark C).
- Align the crankshaft sprocket keyway (marked as point d) with TDC of cylinders #1 and #4 (marked as mark D).
- Mark point D on the cylinder block on the vertical dashed line in the direction of the opening of the crankshaft sprocket keyway.



c. Clamp the two camshafts with a special tool.

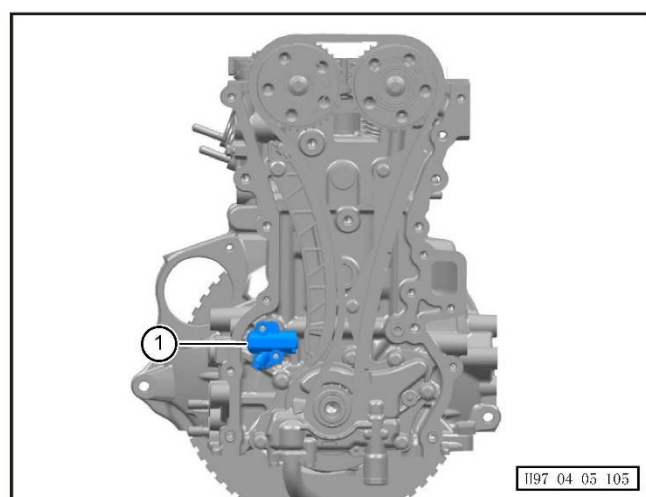
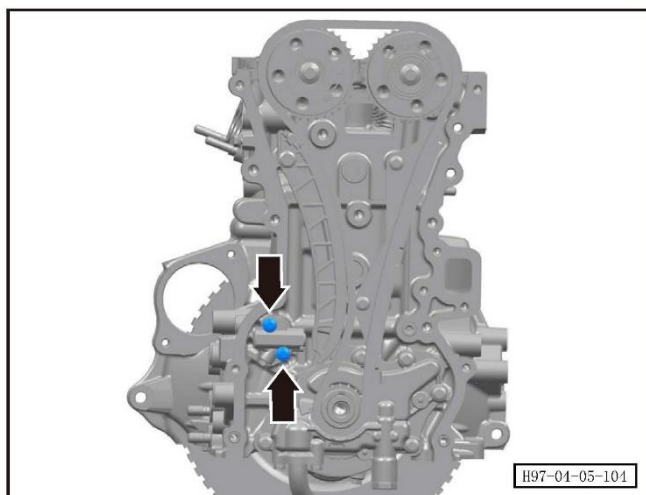
CAUTION:

- Application method of special tool.
- Remove and refit the timing chain so that the timing marks correspond one-to-one.
- After removing the timing chain, never turn the camshaft assembly and crankshaft arbitrarily, otherwise it will cause interference between the valve and the piston, which may damage the valve or the piston.
- Check the timing chain for excessive wear, elongation, broken links, etc. If any, replace the timing chain.
- Check the chain tensioner rail and guide rail for abnormal wear, cracks, etc., and replace them with new ones if there is any problem.
- Check the camshaft sprocket and crankshaft sprocket tooth surface for abnormal wear, and check the tooth root for crack. If any, replace the sprocket with a new one.

4.5.11.10 Removal and refitting of hydraulic tensioner

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Align the timing chain markers (refer to [4.5.11.9 Alignment of timing chain marker points](#))
5. Remove the hydraulic tensioner.
 - a. Unscrew 2 fixing bolts of the hydraulic tensioner. Tightening torque of bolt: $12\pm 1\text{Nm}$.



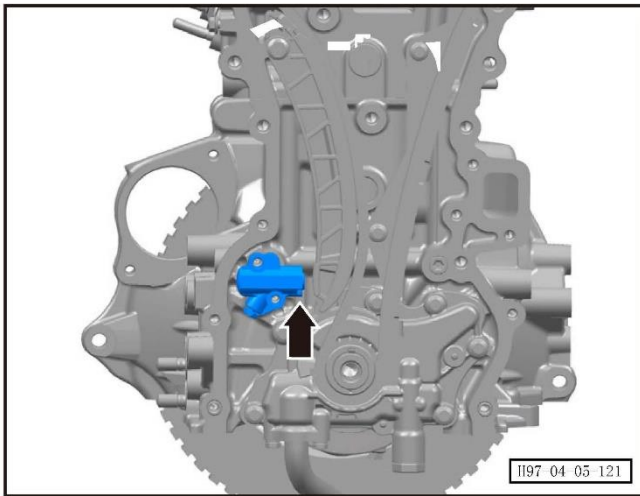
- b. Take down the hydraulic tensioner ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

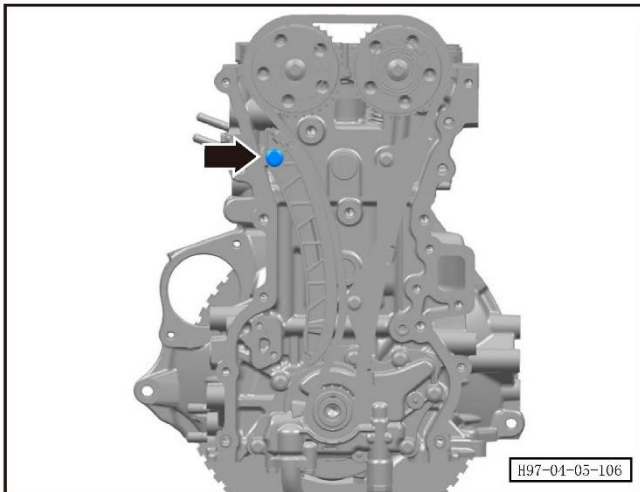
- Install the hydraulic tensioner assembly, fix the tensioner rail, and finally pull out the hydraulic tensioner fixing pin, and push the tensioner rail slightly to confirm that the hydraulic tensioner push rod is extended.



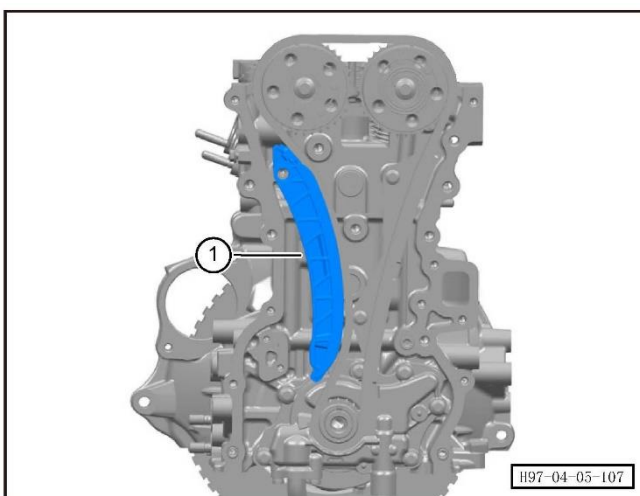
4.5.11.11 Removal and refitting of timing chain tensioner rail

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Align the timing chain markers (refer to [4.5.11.9 Alignment of timing chain marker points](#))
5. Remove the hydraulic tensioner. (refer to [4.5.11.10 Removal and refitting of hydraulic tensioner](#))
6. Remove the timing chain tensioner rail.



- a. Unscrew 1 bolt of the timing chain tensioner rail.
Tightening torque of bolt: $12\pm 1\text{Nm}$.



- b. Take down the timing chain tensioner rail ①.

Refitting procedure

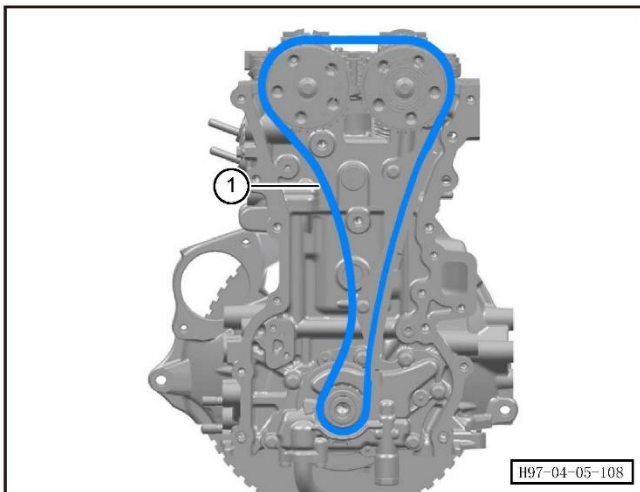
The refitting procedure is performed in reverse order.

4.5.11.12 Removal and refitting of timing chain

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Align the timing chain markers (refer to [4.5.11.9 Alignment of timing chain marker points](#))
5. Remove the hydraulic tensioner. (refer to [4.5.11.10 Removal and refitting of hydraulic tensioner](#))
6. Remove the timing chain tensioner rail (refer to [4.5.11.11 Removal and refitting of timing chain tensioner rail](#))
7. Remove the timing chain.

- a. Take down the timing chain ①.



Refitting procedure

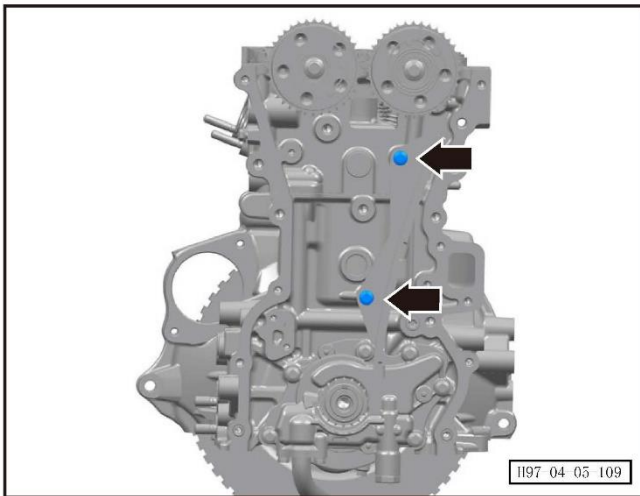
The refitting procedure is performed in reverse order.

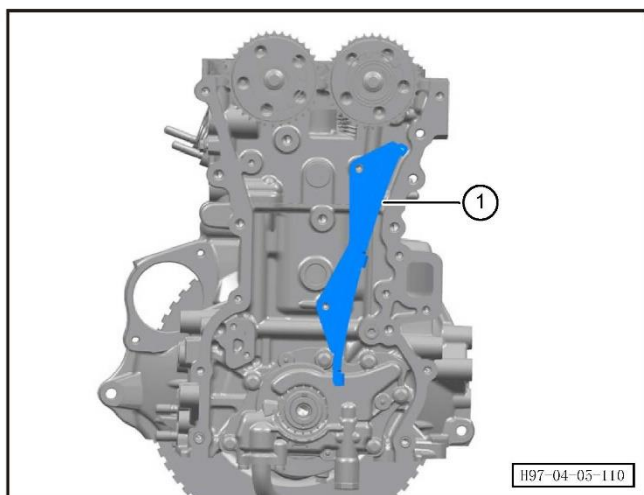
CAUTION:

- After removing the timing chain, never turn the camshaft assembly and crankshaft arbitrarily, otherwise it will cause interference between the valve and the piston, which may damage the valve or the piston.
- Check the timing chain for excessive wear, broken links, etc. If any, replace the timing chain.

4.5.11.13 Removal and refitting of timing chain guide rail assembly

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Align the timing chain markers (refer to [4.5.11.9 Alignment of timing chain marker points](#))
5. Remove the hydraulic tensioner. (refer to [4.5.11.10 Removal and refitting of hydraulic tensioner](#))
6. Remove the timing chain tensioner rail (refer to [4.5.11.11 Removal and refitting of timing chain tensioner rail](#))
7. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
8. Remove the timing chain guide rail assembly.
 - a. Unscrew 2 bolts of the timing chain guide rail.Tightening torque of bolt: $12\pm 1\text{Nm}$.





b. Take down the timing chain guide rail assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

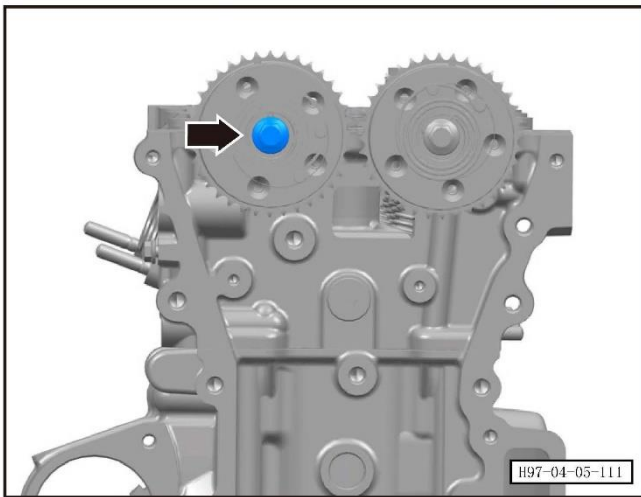
CAUTION:

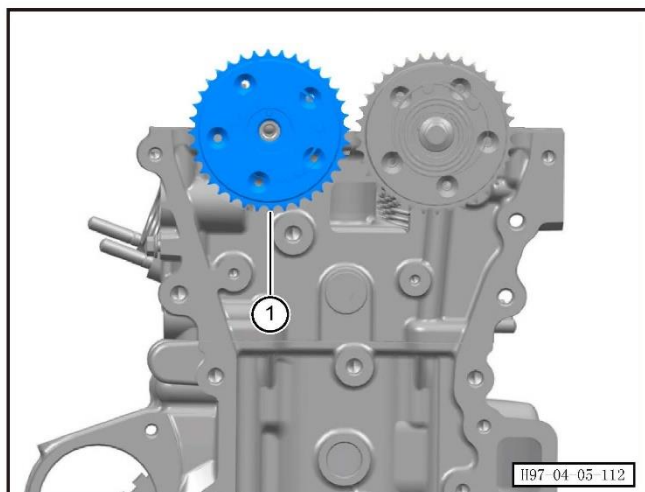
- After removing the timing chain, never turn the camshaft assembly and crankshaft arbitrarily, otherwise it will cause interference between the valve and the piston, which may damage the valve or the piston.
- Check the chain tensioner rail and guide rail for abnormal wear, cracks, etc. If any, replace the guide rail or tensioner rail with a new one, and check again.

4.5.11.14 Removal and refitting of intake VCP assembly

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Align the timing chain markers (refer to [4.5.11.9 Alignment of timing chain marker points](#))
5. Remove the hydraulic tensioner. (refer to [4.5.11.10 Removal and refitting of hydraulic tensioner](#))
6. Remove the timing chain tensioner rail (refer to [4.5.11.11 Removal and refitting of timing chain tensioner rail](#))
7. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
8. Remove the timing chain guide rail assembly (refer to [4.5.11.13 Removal and refitting of timing chain guide rail assembly](#))
9. Remove the intake VCP assembly.

- a. Unscrew 1 bolt on the intake VCP assembly.
Tightening torque of bolt: (20 ± 2) Nm + $(90\pm 3)^\circ$





b. Take out the intake VCP assembly ①.

Refitting procedure

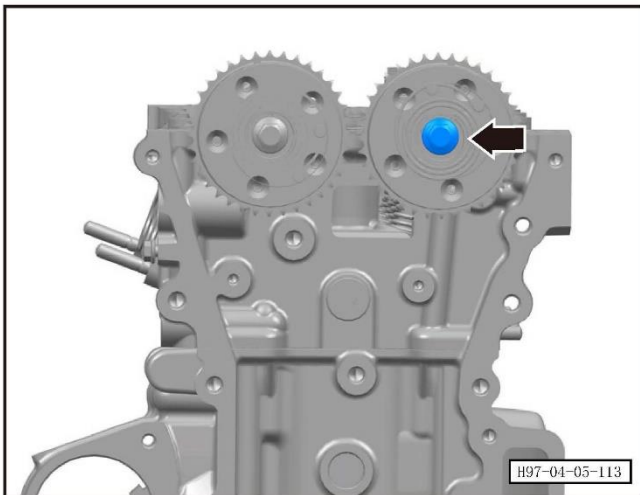
The refitting procedure is performed in reverse order.

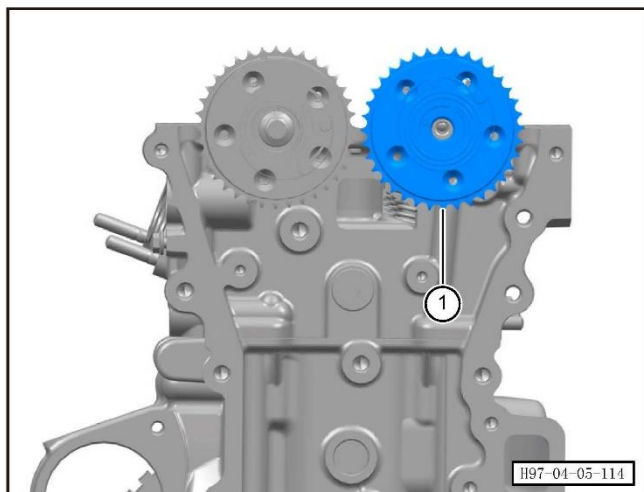
CAUTION:

- Fasten the camshaft with a tool, and do not remove the tool at will during the subsequent process.
- After removing the timing chain, never turn the camshaft assembly and crankshaft arbitrarily, otherwise it will cause interference between the valve and the piston, which may damage the valve or the piston.
- After removing the VCP valve, pay attention to the installation position of the camshaft. Usually, there will be a positioning groove between the valve and the shaft, which can also be marked for positioning.

4.5.11.15 Removal and refitting of exhaust VCP assembly

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Align the timing chain markers (refer to [4.5.11.9 Alignment of timing chain marker points](#))
5. Remove the hydraulic tensioner. (refer to [4.5.11.10 Removal and refitting of hydraulic tensioner](#))
6. Remove the timing chain tensioner rail (refer to [4.5.11.11 Removal and refitting of timing chain tensioner rail](#))
7. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
8. Remove the timing chain guide rail assembly (refer to [4.5.11.13 Removal and refitting of timing chain guide rail assembly](#))
9. Remove the exhaust VCP assembly.
 - a. Unscrew 1 bolt on the exhaust VCP assembly.
Tightening torque of bolt: (20 ± 2) Nm + $(90\pm 3)^\circ$





b. Take out the exhaust VCP assembly ①.

Refitting procedure

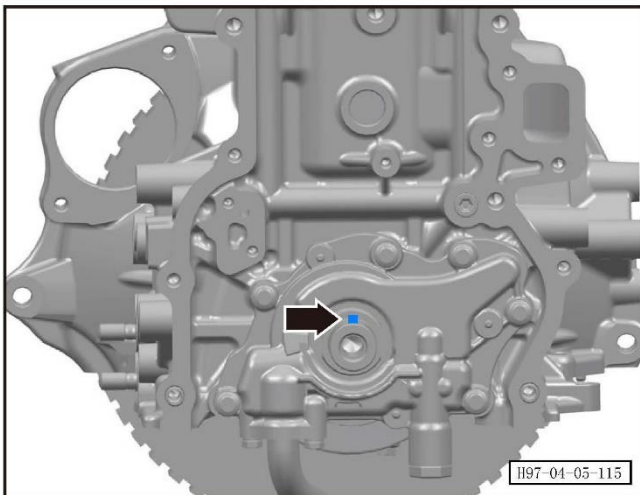
The refitting procedure is performed in reverse order.

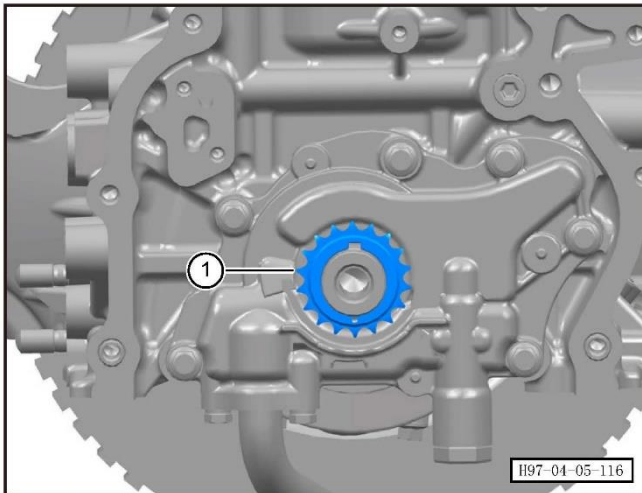
CAUTION:

- Fasten the camshaft with a tool, and do not remove the tool at will during the subsequent process.
- After removing the timing chain, never turn the camshaft assembly and crankshaft arbitrarily, otherwise it will cause interference between the valve and the piston, which may damage the valve or the piston.
- After removing the VCP valve, pay attention to the installation position of the camshaft. Usually, there will be a positioning groove between the valve and the shaft, which can also be marked for positioning.

4.5.11.16 Removal and refitting of crankshaft timing sprocket

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Align the timing chain markers (refer to [4.5.11.9 Alignment of timing chain marker points](#))
5. Remove the hydraulic tensioner. (refer to [4.5.11.10 Removal and refitting of hydraulic tensioner](#))
6. Remove the timing chain tensioner rail (refer to [4.5.11.11 Removal and refitting of timing chain tensioner rail](#))
7. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
8. Remove the timing chain guide rail assembly (refer to [4.5.11.13 Removal and refitting of timing chain guide rail assembly](#))
9. Remove and refit the crankshaft timing sprocket.
 - a. Take out the semicircular key of the sprocket.





b. Take out the timing sprocket ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.5.12 Cylinder head assembly

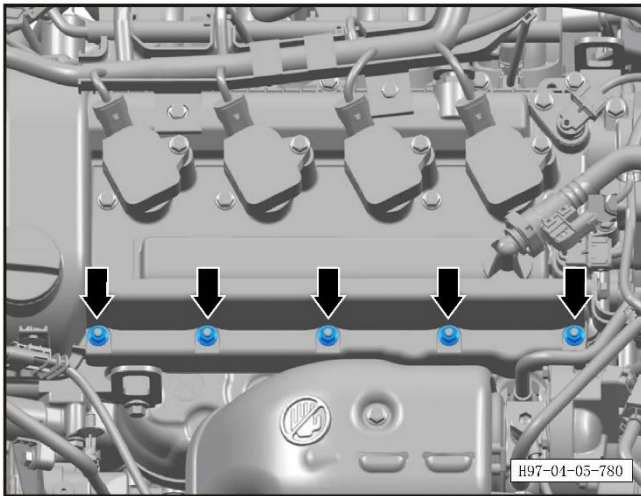
4.5.12.1 Removal and refitting of cylinder head heat shield

Removal procedure

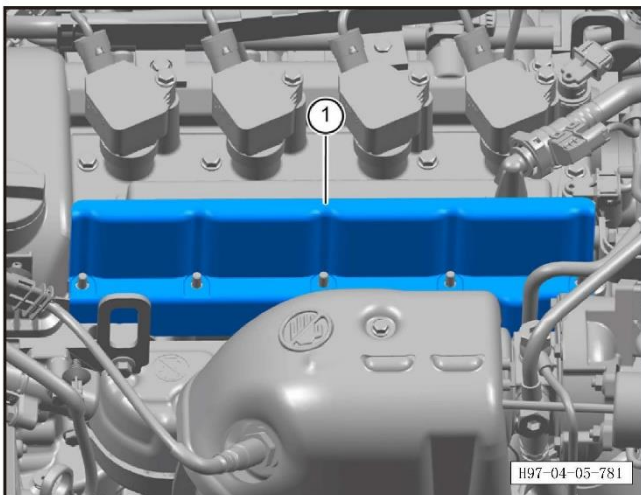
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the cylinder head heat shield.

a. Unscrew 5 bolts of the cylinder head heat shield.

Tightening torque of bolt: $12\pm 1\text{Nm}$.



b. Take out the cylinder head heat shield ①.



Refitting procedure

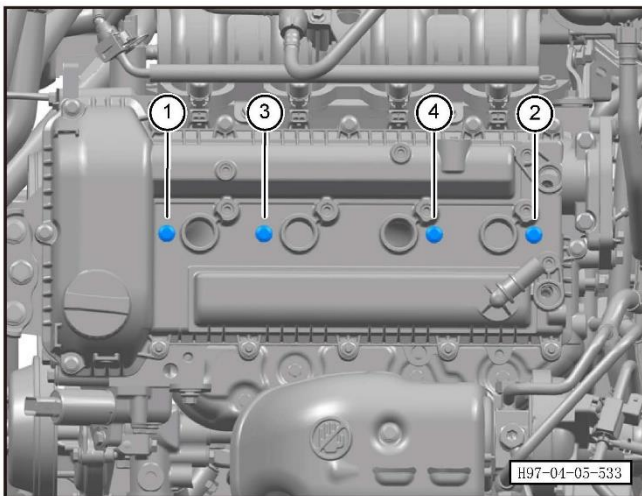
The refitting procedure is performed in reverse order.

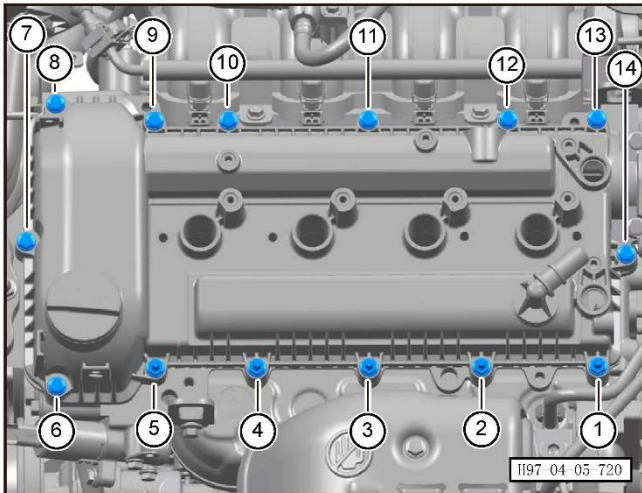
4.5.12.2 Removal and refitting of cylinder head cover assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the cylinder head heat shield (refer to [4.5.12.1 Removal and refitting of cylinder head heat shield](#))
6. Remove the intake/exhaust camshaft position sensor (refer to [4.5.16.2 Removal and refitting of camshaft position sensor \(intake/exhaust\)](#))
7. Remove the PCV vent pipe 1 (refer to [4.5.18.1 Removal and refitting of PCV vent pipe 1](#))
8. Remove the engine harness attached to the cylinder head cover.
9. Remove 4 ignition coils (refer to [4.5.10.1 Removal and refitting of ignition coil assembly](#))
10. Remove the cylinder head cover assembly.
 - a. Unscrew 4 bolts on the cylinder head cover in the order marked.

Tightening torque of bolt: $12\pm 1\text{Nm}$.





b. Unscrew 14 bolts on the cylinder head cover assembly.

Tightening torque of bolt: $12 \pm 1 \text{ Nm}$.

Note:

- Bolt loosening sequence: ① - ⑧ - ⑥ - ⑬ - ⑦

- ⑭ - ⑨ - ② - ⑤ - ⑫ - ④ - ⑩ - ③ - ⑪

- The removal of bolts is carried out in 3 steps:

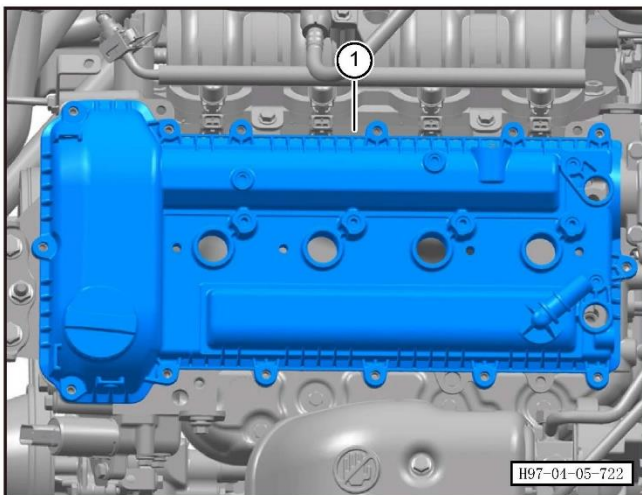
The first step is to remove the bolt tension, the second step is to loosen the bolt, and the third step is to remove and take out the bolt.

- Pay attention to the distinction of bolts:

① - ⑤ are studs;

⑥ - ⑭ are bolts.

- When removing the bolt ⑧, take down the harness bracket, which should be restored at the time of refitting.



c. Remove the cylinder head cover assembly ①.

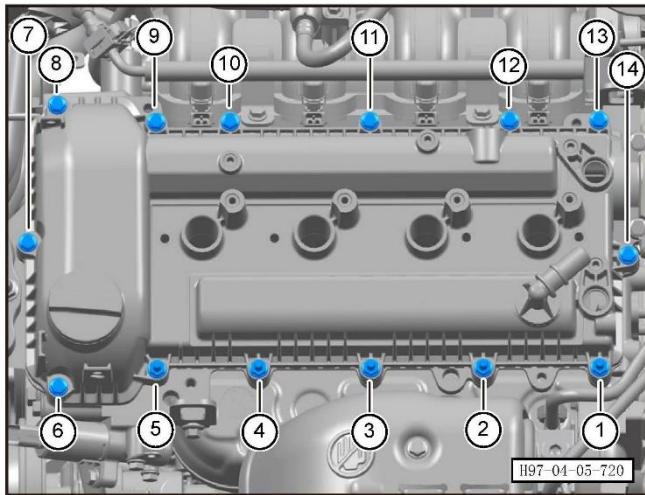
Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- To refit the cylinder head cover assembly, replace the cover seal ring with a new one.

- The tightening sequence of bolts is as follows:



a. Refit the 14 bolts on the cylinder head cover.

Tightening torque of bolt: $12 \pm 1 \text{ Nm}$.

Note:

- Tightening sequence of bolts: (11) - (3) - (10) - (4) - (12) - (5) - (2) - (9) - (14) - (7) - (13) - (6) - (8) - (1).

- The refitting of bolts is carried out in 3 steps:

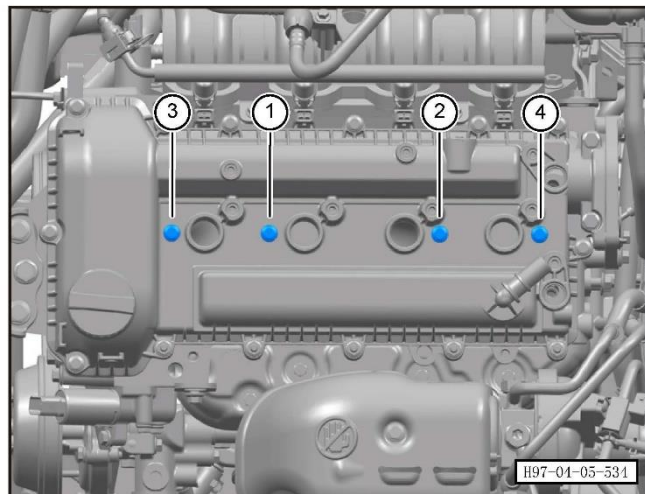
The first step is installation, the second step is pre-tightening, and the third step is tightening.

- Pay attention to the distinction of bolts:

(1) - (5) are studs;

(6) - (14) are bolts.

- When removing the bolt (8), take down the harness bracket, which should be restored at the time of refitting.



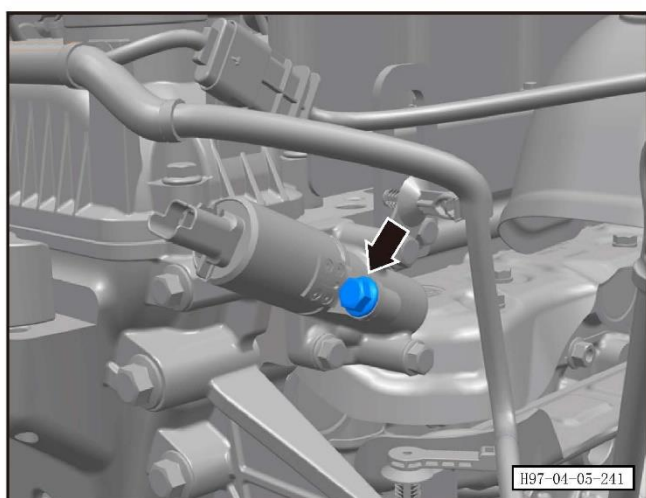
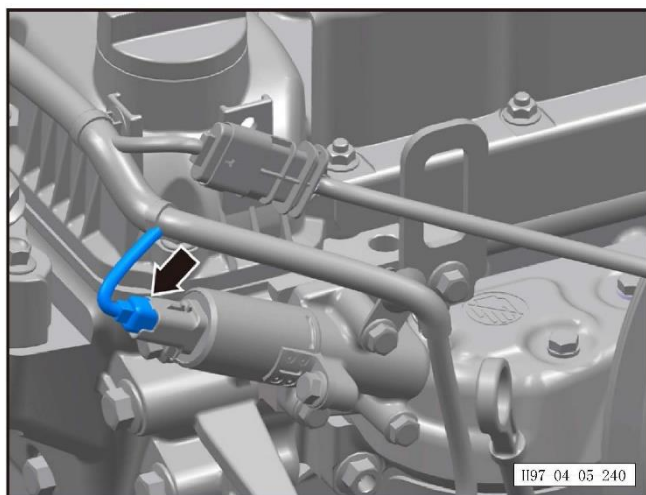
b. Refit the 4 bolts on the cylinder head cover in the order marked.

Tightening torque of bolt: $12 \pm 1 \text{ Nm}$.

4.5.12.3 Removal and refitting of exhaust OCV

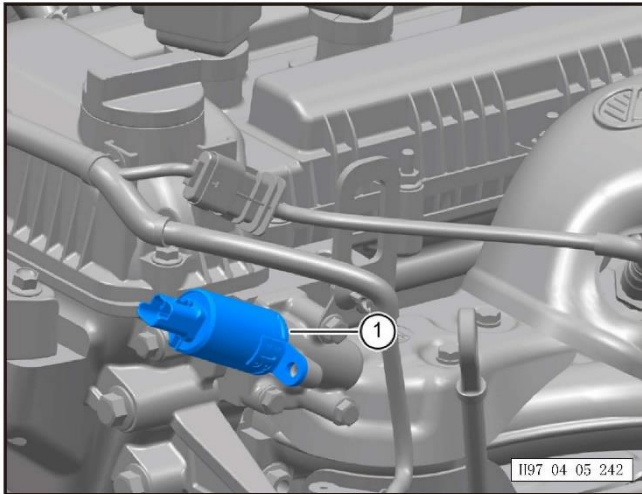
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the exhaust OCV.
 - a. Disconnect the connector between the engine harness and the exhaust OCV.



- b. Unscrew 1 bolt between the OCV and the valve seat.

Tightening torque of bolt: $12\pm 1\text{Nm}$.



c. Take out the exhaust OCV ①.

Refitting procedure

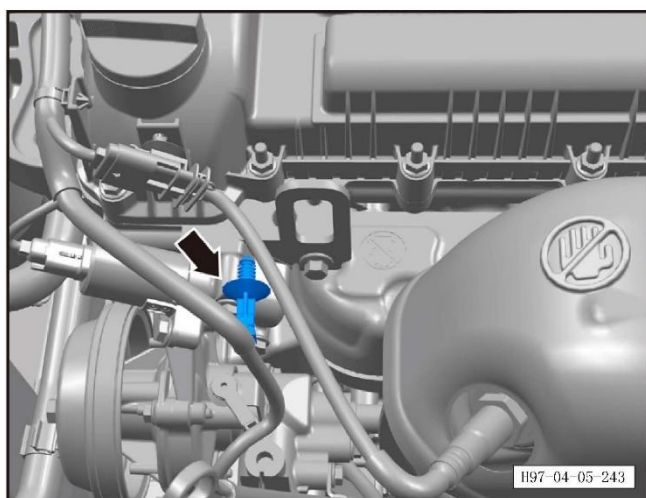
The refitting procedure is performed in reverse order.

4.5.12.4 Removal and refitting of harness fixing bracket for exhaust OCV seat

Removal procedure

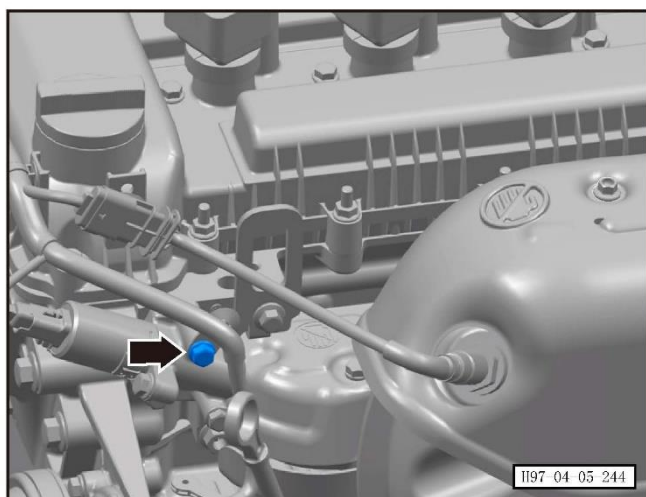
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the harness fixing bracket for exhaust OCV seat.

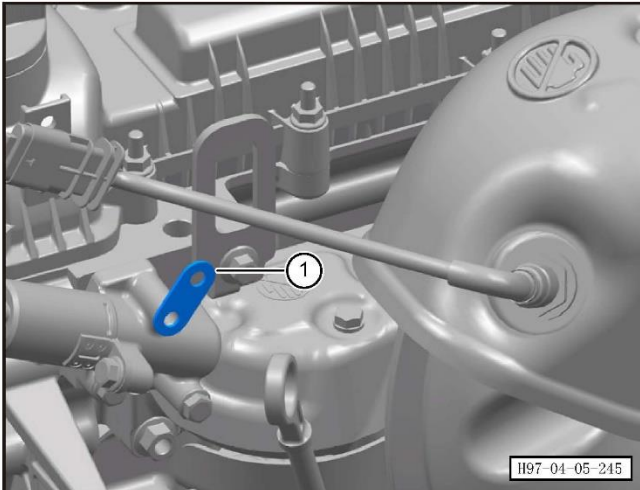
a. Remove the engine harness clip on the exhaust OCV seat fixing bracket.



b. Unscrew 1 bolt between the exhaust OCV seat and the fixing harness bracket.

Tightening torque of bolt: $12\pm 1\text{Nm}$.





c. Take out the fixing harness bracket for exhaust OCV seat ①.

Refitting procedure

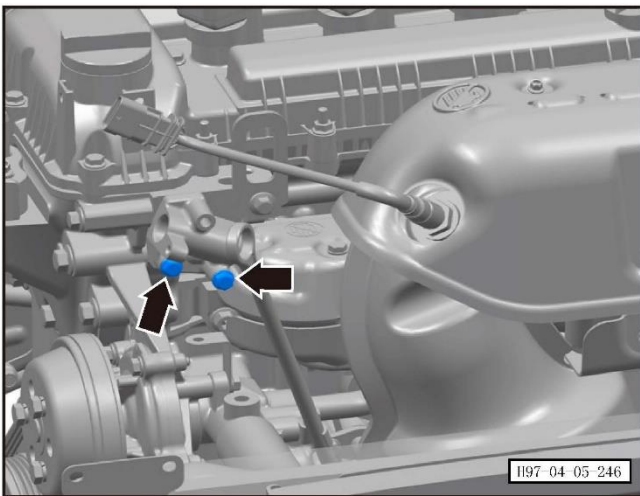
The refitting procedure is performed in reverse order.

4.5.12.5 Removal and refitting of exhaust OCV seat

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the harness fixing bracket for exhaust OCV seat (refer to [4.5.12.4 Removal and refitting of harness fixing bracket for exhaust OCV seat](#))
6. Remove the exhaust OCV seat.

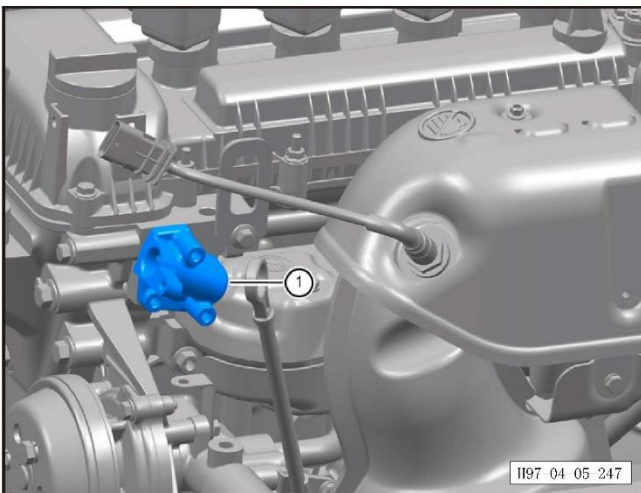
- a. Unscrew 2 fixing bolts under the exhaust OCV seat.
Tightening torque of bolt: $12\pm 1\text{Nm}$.



- b. Remove the exhaust OCV seat ①.

CAUTION:

- When refitting the OCV, the gasket needs to be replaced with a new one.



Refitting procedure

The refitting procedure is performed in reverse order.

4.5.12.6 Removal and refitting of intake camshaft assembly

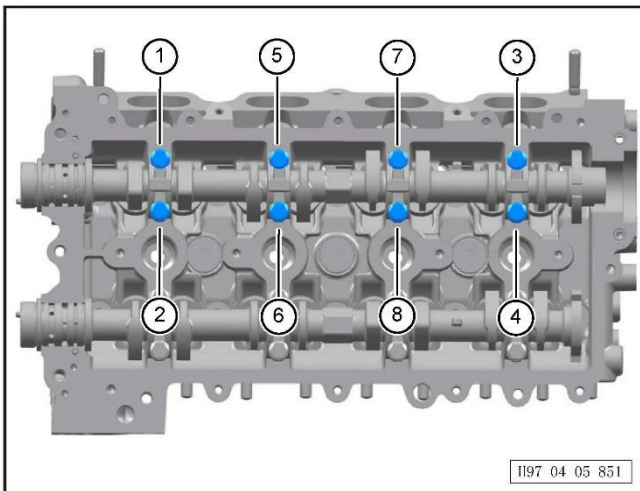
Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
5. Remove the intake VCP assembly (refer to [4.5.11.14 Removal and refitting of intake VCP assembly](#))
6. Remove the camshaft front bearing cap (refer to [4.5.12.10 Removal and refitting of camshaft front bearing cap](#))
7. Remove the intake camshaft assembly.

- a. Unscrew 8 bolts on the camshaft bearing cap in the order marked.

CAUTION:

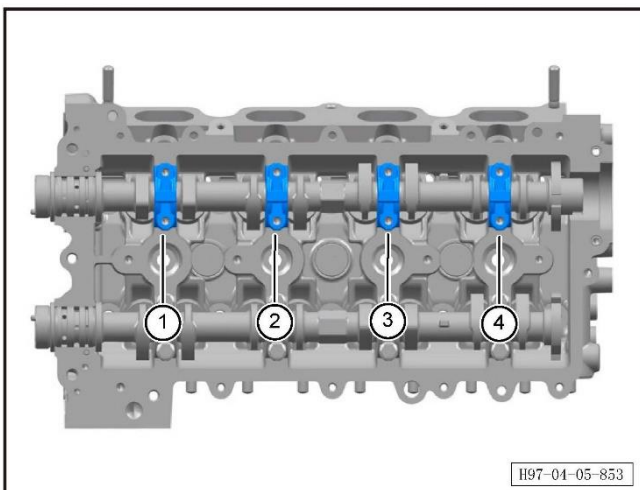
- Loosen all bolts in 2 to 3 steps and take them out.

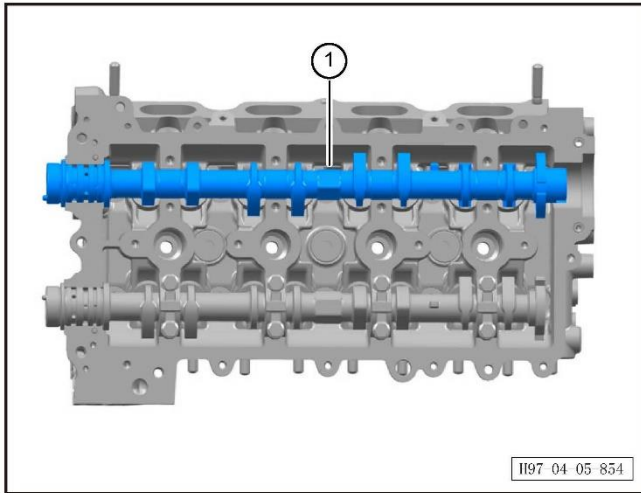


- b. Mark each camshaft bearing cap and remove 4 camshaft bearing caps in sequence.

CAUTION:

- Mark each camshaft bearing cap in turn.
- Take out the camshaft bearing caps and place them in the order marked.





c. Take out the intake camshaft assembly ①.

CAUTION:

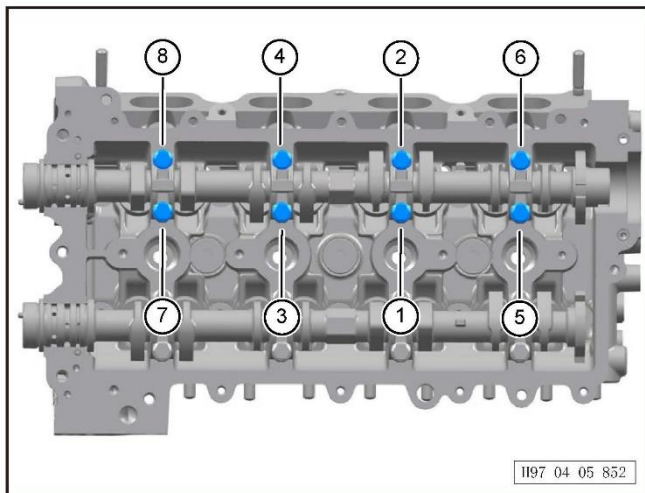
- Handle with care to avoid bruising the camshaft assembly.

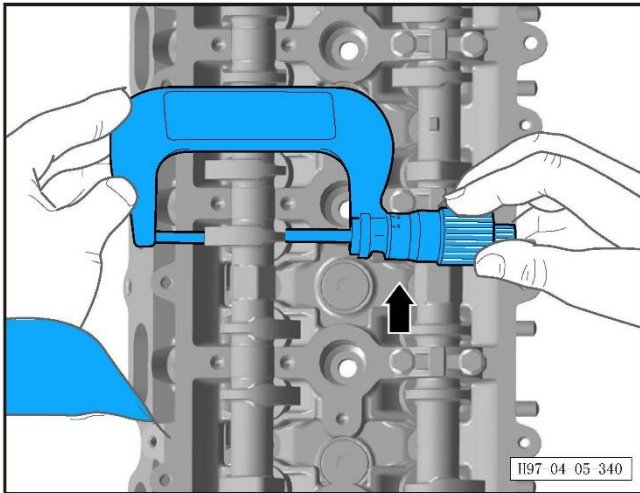
Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Refit the 8 bolts on the intake camshaft bearing cap in the order marked.
- The tightening of bolts on camshaft bearing cap is carried out in 2 to 3 steps:
- The tightening torque of the camshaft front bearing cap is $23\pm 2\text{Nm}$;
- The tightening torque of the camshaft rear bearing cap is $12\pm 1\text{Nm}$.
- Before refitting the camshaft assembly, clean the camshaft assembly and valve tappet with gasoline.
- Lubricate each journal and cam of the camshaft assembly, and the bearing cap hole surface of the camshaft assembly with oil, and assemble the camshaft assembly according to the corresponding relationship.
- Check the journals and bearing caps of camshaft assembly for damage. If any defects are found, replace the intake camshaft assembly, exhaust camshaft assembly or cylinder head assembly. As the camshaft assembly bearing cap and cylinder head assembly are processed in combination, the camshaft assembly bearing cap should not be replaced individually, but the cylinder head assembly needs to be replaced.





- Check the cam of camshaft assembly for wear: Measure the cam height with an outside micrometer. If the measured height is less than the limit, the camshaft assembly should be replaced.

Height of intake camshaft assembly:

Standard value: (42.48 ~ 42.52) mm.

Limit value: 42.28 mm.

- Measure the radial runout of the camshaft assembly journal with a dial indicator. If the radial runout exceeds the limit value, replace the camshaft assembly.

- Limit value of radial runout of camshaft assembly journal: 0.02 mm.

- Measure the journal diameter of each camshaft assembly with a micrometer, and measure the inner diameter of the camshaft assembly bearing hole of the cylinder head assembly with an inside dial indicator.

- The camshaft assembly journal clearance is obtained by subtracting the measured value of the corresponding camshaft assembly journal diameter from the measured value of the camshaft assembly bearing hole diameter of the cylinder head assembly. If it is checked that the camshaft assembly journal clearance exceeds the limit, replace the camshaft assembly and, if necessary, the cylinder head assembly.

Journal clearance of camshaft assembly:

Camshaft assembly bearing hole inner diameter: $\varnothing 23$ (0, +0.021)

Camshaft assembly journal diameter: $\varnothing 23$ (-0.051, -0.035)

Standard value of clearance: (0.035 ~ 0.072) mm.

Limit value of clearance: 0.12 mm.

4.5.12.7 Removal and refitting of exhaust camshaft assembly

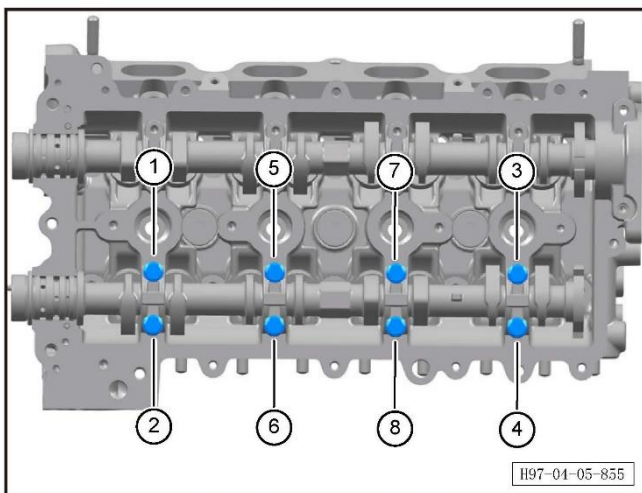
Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
5. Remove the exhaust VCP assembly (refer to [4.5.11.15 Removal and refitting of exhaust VCP assembly](#))
6. Remove the camshaft front bearing cap (refer to [4.5.12.10 Removal and refitting of camshaft front bearing cap](#))
7. Remove the exhaust camshaft assembly.

- a. Unscrew 8 bolts on the camshaft bearing cap in the order marked.

CAUTION:

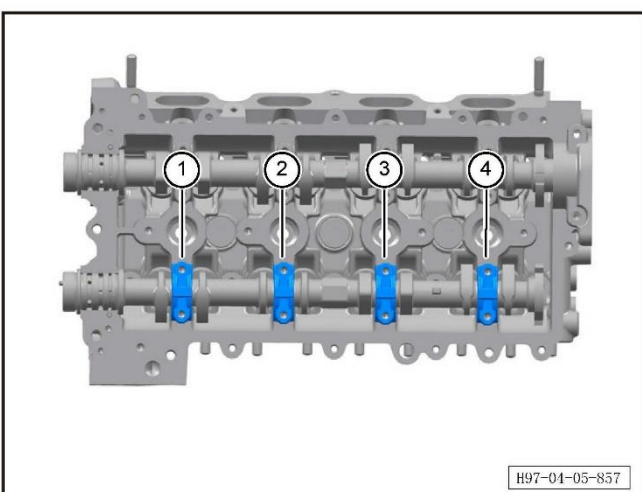
- Loosen all bolts in 2 to 3 steps and take them out.

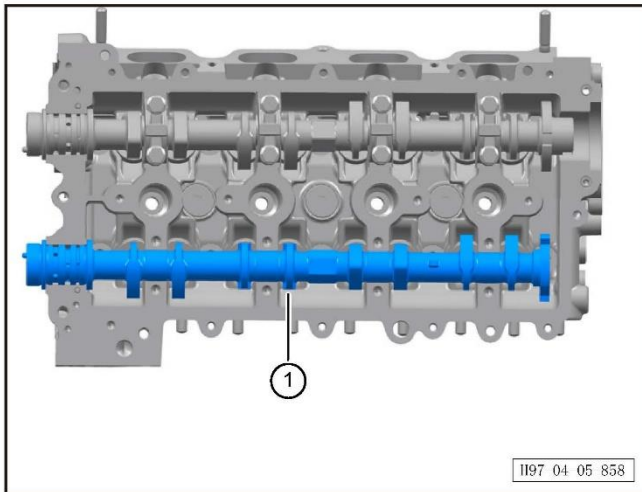


- b. Mark each camshaft bearing cap and remove 4 camshaft bearing caps in sequence.

CAUTION:

- Mark each camshaft bearing cap in turn.
- Take out the camshaft bearing caps and place them in the order marked.





c. Take out the exhaust camshaft assembly ①.

CAUTION:

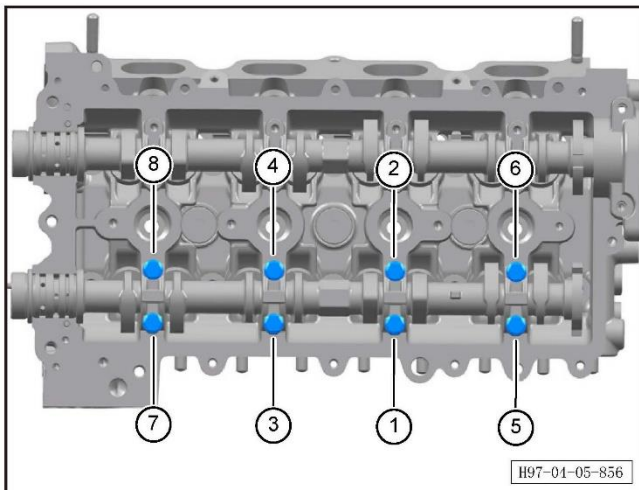
- Handle with care to avoid bruising the camshaft assembly.

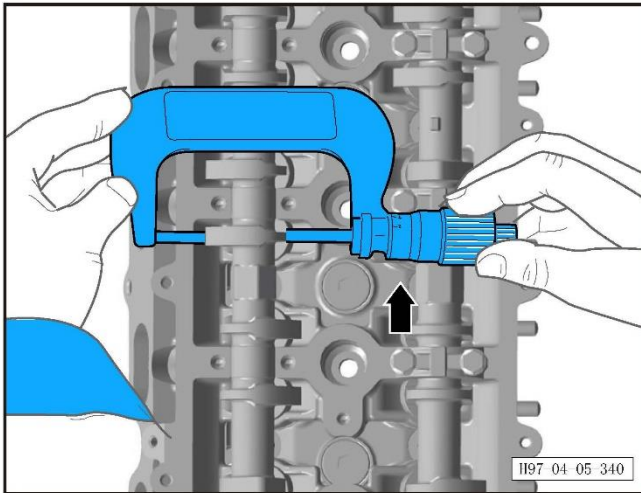
Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Refit the 8 bolts on the exhaust camshaft bearing cap in the order marked.
- The tightening of bolts on camshaft bearing cap is carried out in 2 to 3 steps:
- The tightening torque of the camshaft front bearing cap is $23\pm 2\text{Nm}$;
- The tightening torque of the camshaft rear bearing cap is $12\pm 1\text{Nm}$.
- Before refitting the camshaft assembly, clean the camshaft assembly and valve tappet with gasoline.
- Lubricate each journal and cam of the camshaft assembly, and the bearing cap hole surface of the camshaft assembly with oil, and assemble the camshaft assembly according to the corresponding relationship.
- Check the journals and bearing caps of camshaft assembly for damage. If any defects are found, replace the intake camshaft assembly, exhaust camshaft assembly or cylinder head assembly. As the camshaft assembly bearing cap and cylinder head assembly are processed in combination, the camshaft assembly bearing cap should not be replaced individually, but the cylinder head assembly needs to be replaced.





- Check the cam of camshaft assembly for wear: Measure the cam height with an outside micrometer. If the measured height is less than the limit, the camshaft assembly should be replaced. Height of exhaust camshaft assembly:

Standard value: (41.11 ~ 41.15) mm.

Limit value: 40.91 mm.

- Measure the radial runout of the camshaft assembly journal with a dial indicator. If the radial runout exceeds the limit value, replace the camshaft assembly.

- Limit value of radial runout of camshaft assembly journal: 0.02 mm.

- Measure the journal diameter of each camshaft assembly with a micrometer, and measure the inner diameter of the camshaft assembly bearing hole of the cylinder head assembly with an inside dial indicator.

- The camshaft assembly journal clearance is obtained by subtracting the measured value of the corresponding camshaft assembly journal diameter from the measured value of the camshaft assembly bearing hole diameter of the cylinder head assembly. If it is checked that the camshaft assembly journal clearance exceeds the limit, replace the camshaft assembly and, if necessary, the cylinder head assembly.

Journal clearance of camshaft assembly:

Camshaft assembly bearing hole inner diameter: $\varnothing 23$ (0, +0.021)

Camshaft assembly journal diameter: $\varnothing 23$ (-0.051, -0.035)

Standard value of clearance: (0.035 ~ 0.072) mm.

Limit value of clearance: 0.12 mm.

4.5.12.8 Removal and refitting of intake side valve tappet

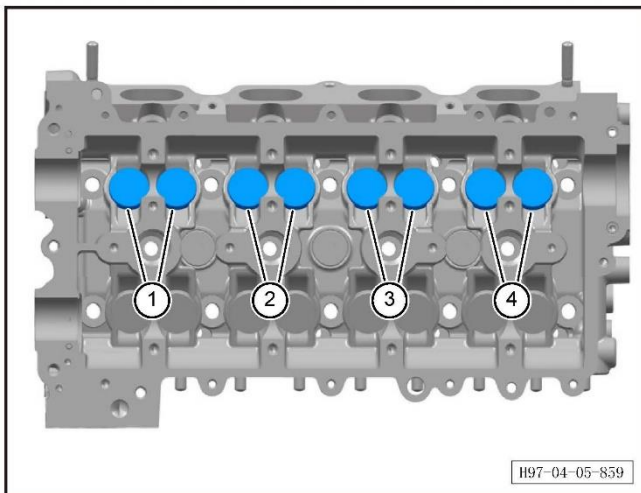
Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
5. Remove the intake VCP assembly (refer to [4.5.11.14 Removal and refitting of intake VCP assembly](#))
6. Remove the intake camshaft assembly (refer to [4.5.12.6 Removal and refitting of intake camshaft assembly](#))
7. Remove the intake side valve tappet.

a. Mark each valve tappet and take out the valve tappets of the 4 cylinder units (8 in total) on the intake side in sequence.

CAUTION:

- Mark each valve tappet in turn.
- Take out the valve tappets and place them in the order marked.

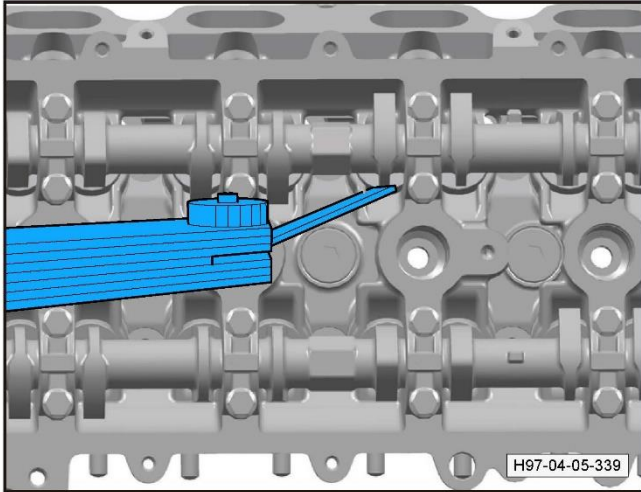


Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Before refitting the camshaft assembly, clean the camshaft assembly and valve tappet with gasoline.
- Take out the valve tappets and inspect the tappet surface for dents, wear, scratches or damage.
- If any, the valve tappet needs to be replaced.



- Rotate the base circle of the cam assembly to be measured to the position coincident with the center line of the valve, and measure the valve clearance, which should not exceed the limit value.

Limit value of valve clearance (cold state):

Intake valve: 0.2 ± 0.03 mm

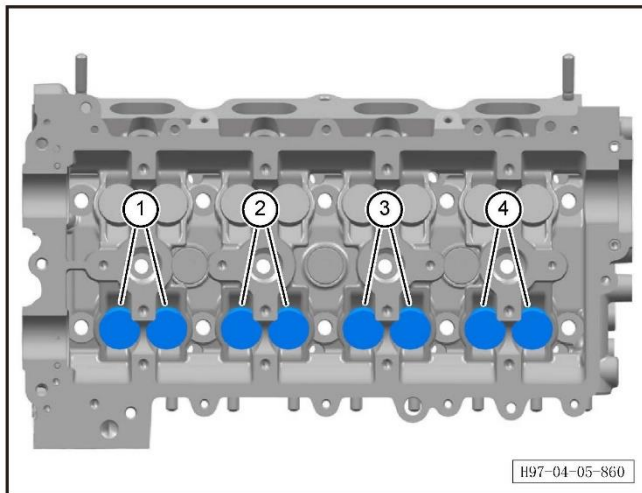
Exhaust valve: 0.3 ± 0.03 mm

If the valve clearance exceeds the limit, the valve tappet needs to be replaced.

4.5.12.9 Removal and refitting of exhaust side valve tappet

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
5. Remove the exhaust VCP assembly (refer to [4.5.11.15 Removal and refitting of exhaust VCP assembly](#))
6. Remove the exhaust camshaft assembly (refer to [4.5.12.7 Removal and refitting of exhaust camshaft assembly](#))
7. Remove the exhaust side valve tappet.



- a. Mark each valve tappet and take out the valve tappets of the 4 cylinder units (8 in total) on the exhaust side in sequence.

CAUTION:

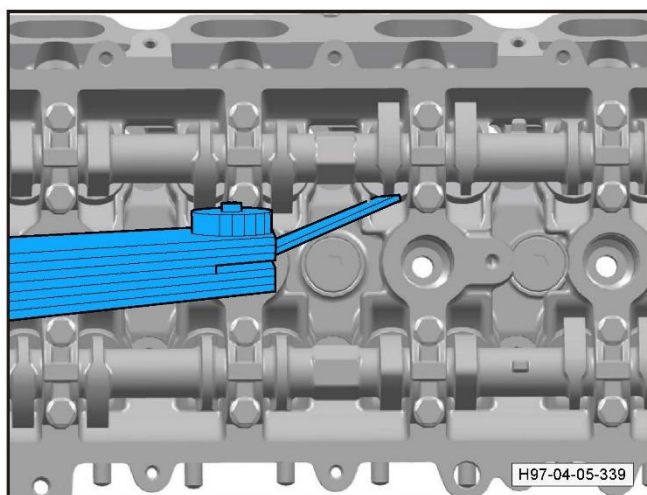
- Mark each valve tappet in turn.
- Take out the valve tappets and place them in the order marked.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Before refitting the camshaft assembly, clean the camshaft assembly and valve tappet with gasoline.
- Take out the valve tappets and inspect the tappet surface for dents, wear, scratches or damage.
- If any, the valve tappet needs to be replaced.



- Rotate the base circle of the cam assembly to be measured to the position coincident with the center line of the valve, and measure the valve clearance, which should not exceed the limit value.

Limit value of valve clearance (cold state):

Intake valve: 0.2 ± 0.03 mm

Exhaust valve: 0.3 ± 0.03 mm

If the valve clearance exceeds the limit, the valve tappet needs to be replaced.

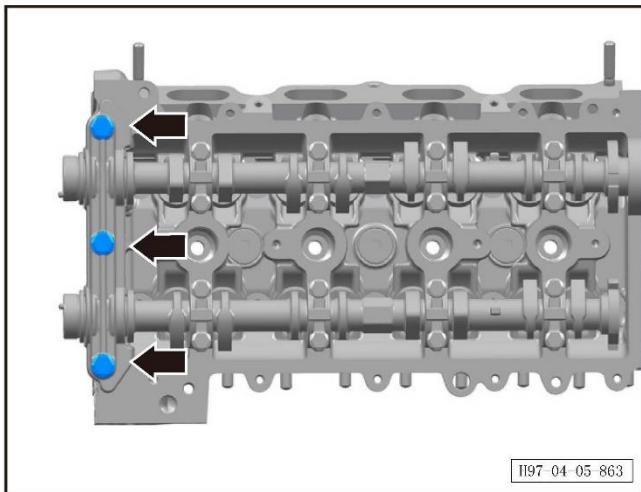
4.5.12.10 Removal and refitting of camshaft front bearing cap

Removal procedure

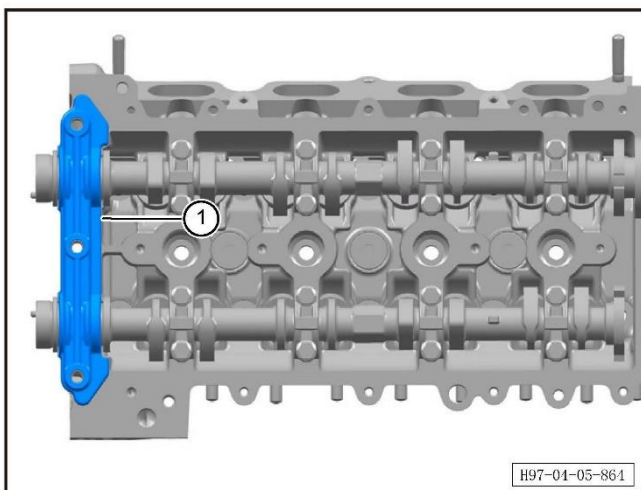
1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
5. Remove the camshaft front bearing cap.

a. Unscrew 3 bolts on the camshaft front bearing cap.

Tightening torque of bolt: $23 \pm 2 \text{Nm}$.



b. Take down the camshaft front bearing cap ①.



Refitting procedure

The refitting procedure is performed in reverse order.

4.5.12.11 Removal and refitting of vacuum pump cover plate and seal ring

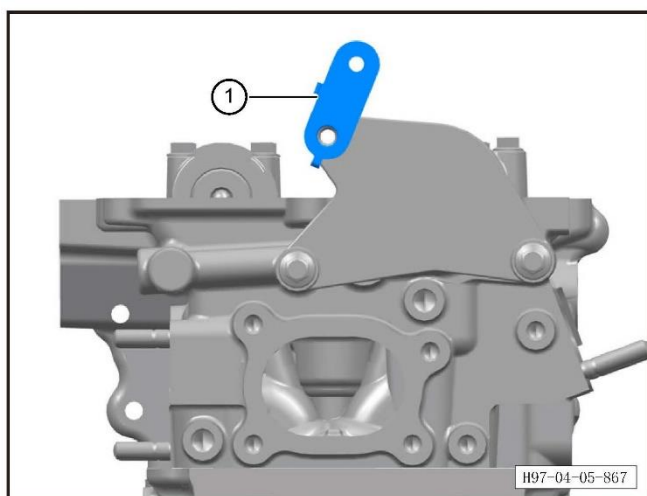
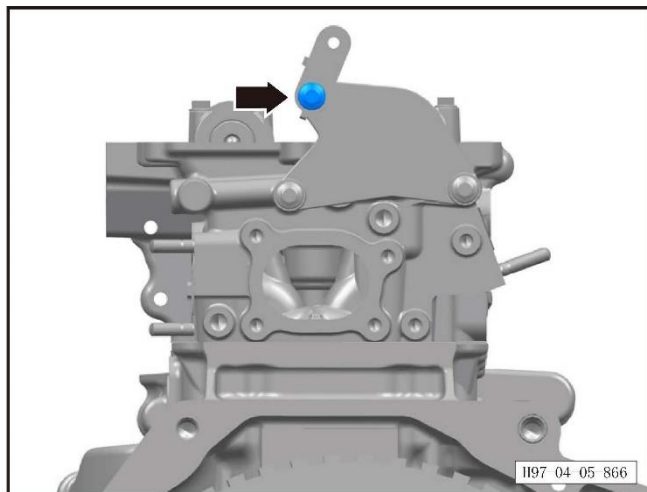
Removal procedure

1. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))

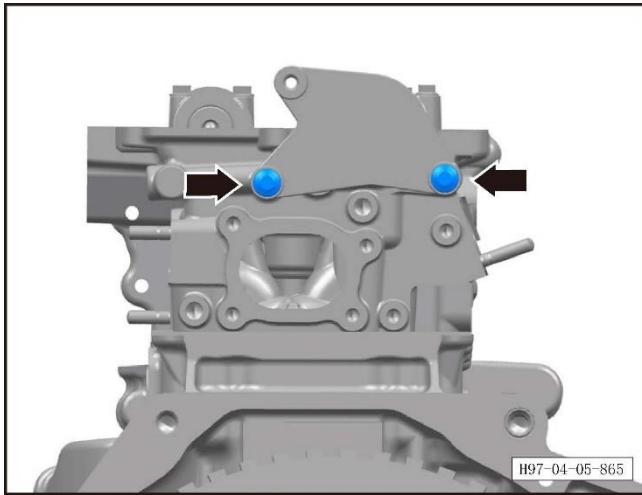
2. Remove the vacuum pump cover plate.

a. Unscrew 1 bolt connecting the vacuum pump cover plate to the harness bracket.

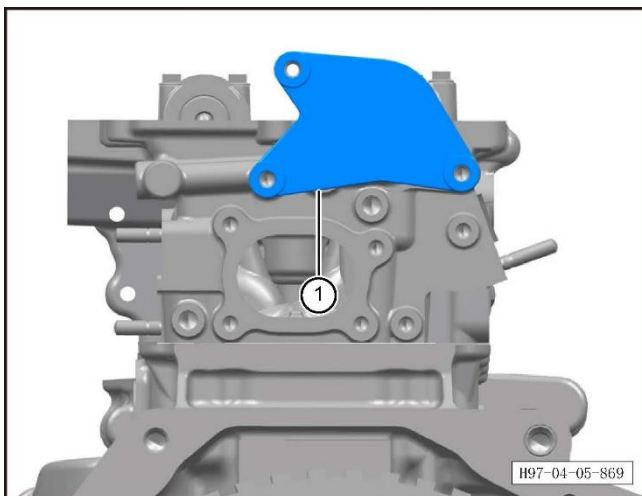
Tightening torque of bolt: $12\pm 1\text{Nm}$.



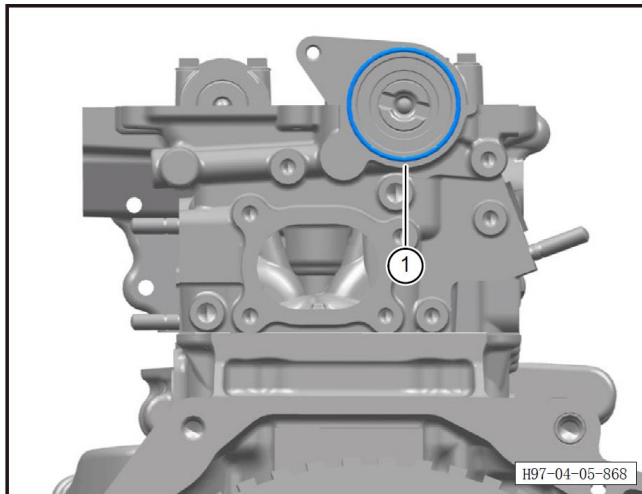
b. Take down the harness bracket ①.



c. Unscrew 2 bolts on the vacuum pump cover plate.
Tightening torque of bolt: $12\pm 1\text{Nm}$.



d. Take down the vacuum pump cover plate ①.



e. Take out the vacuum pump cover plate seal ring ①.

CAUTION:

- When refitting, the seal ring needs to be replaced with a new one.

Refitting procedure

The refitting procedure is performed in reverse order.

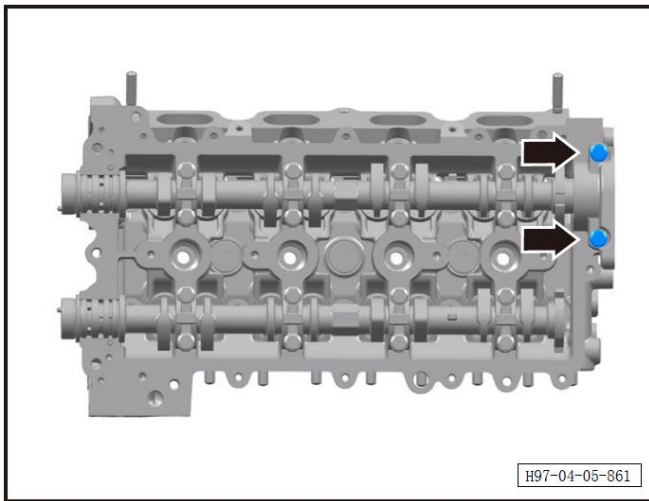
4.5.12.12 Removal and refitting of vacuum pump upper cover plate

Removal procedure

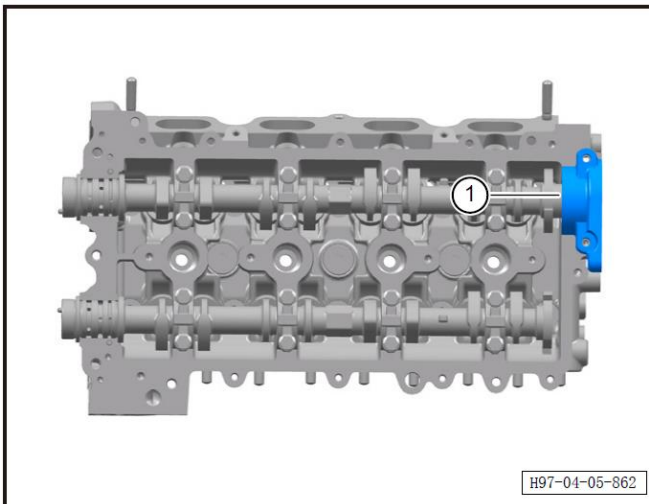
1. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
2. Remove the vacuum pump cover plate (refer to [4.5.12.11 Removal and refitting of vacuum pump cover plate and seal ring](#))
3. Remove the vacuum pump upper cover plate.

a. Unscrew 2 bolts on the vacuum pump upper cover plate.

Tightening torque of bolt: $12\pm 1\text{Nm}$.



b. Take down the vacuum pump upper cover plate ①.



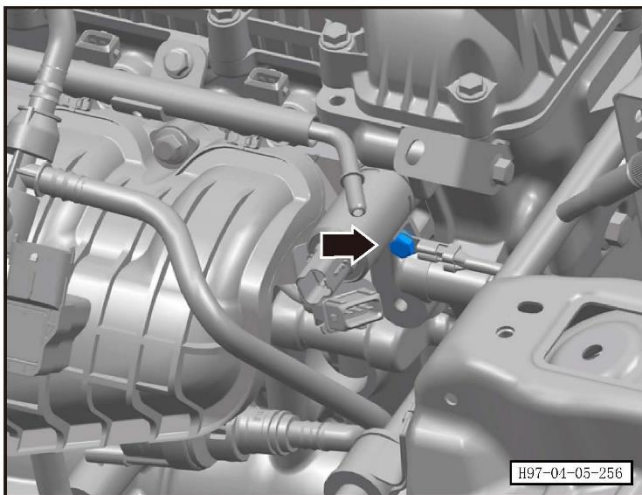
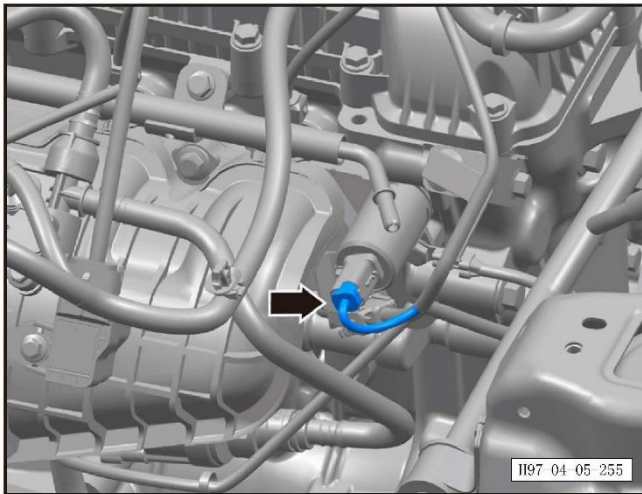
Refitting procedure

The refitting procedure is performed in reverse order.

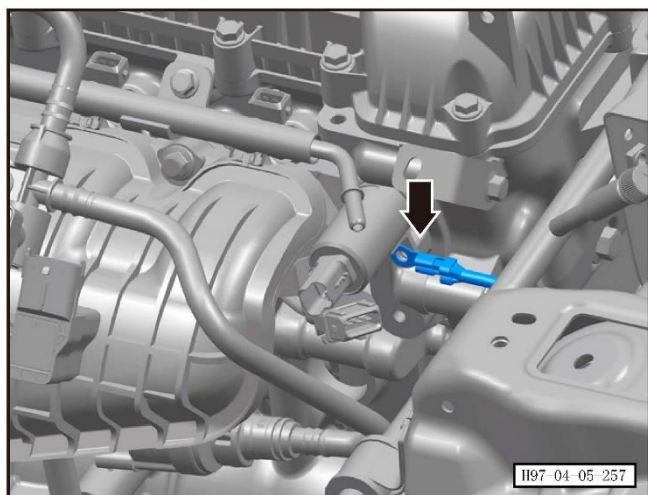
4.5.12.13 Removal and refitting of intake side OCV

Removal procedure

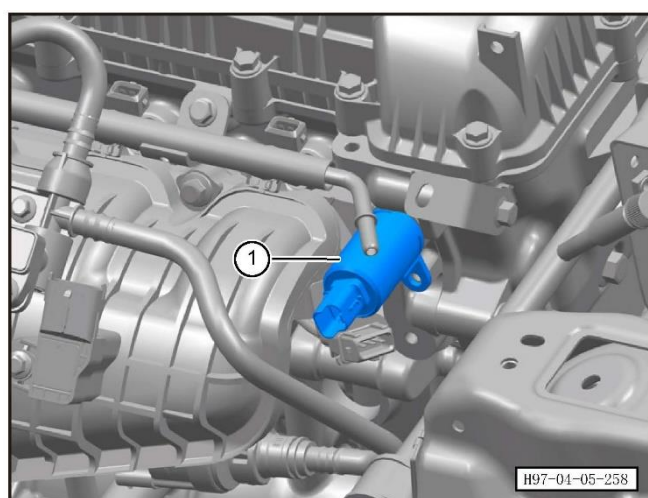
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the fuel inlet pipe 3# assembly (refer to [4.3.8.3 Removal and refitting of fuel inlet pipe 3# assembly](#))
6. Remove the intake side OCV.
 - a. Disconnect the connector of the intake side OCV.



- b. Unscrew the ground wire bolt on the engine.
Tightening torque of bolt: $12\pm 1\text{Nm}$.



c. Disconnect the ground wire from the engine.



d. Take down the intake side OCV ①.

Refitting procedure

The refitting procedure is performed in reverse order.

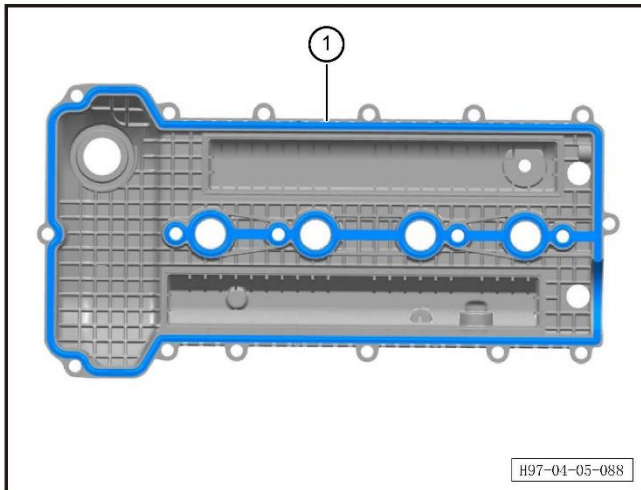
CAUTION:

- When refitting the OCV, the seal ring needs to be replaced with a new one.
- When refitting the OCV and the ground wire on the engine, pay attention to the cleanliness around the parts.

4.5.12.14 Removal and refitting of cylinder head cover gasket

Removal procedure

1. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
2. Remove the cylinder head cover gasket.
 - a. Take out the cylinder head cover gasket ①.



Refitting procedure

The refitting procedure is performed in reverse order.

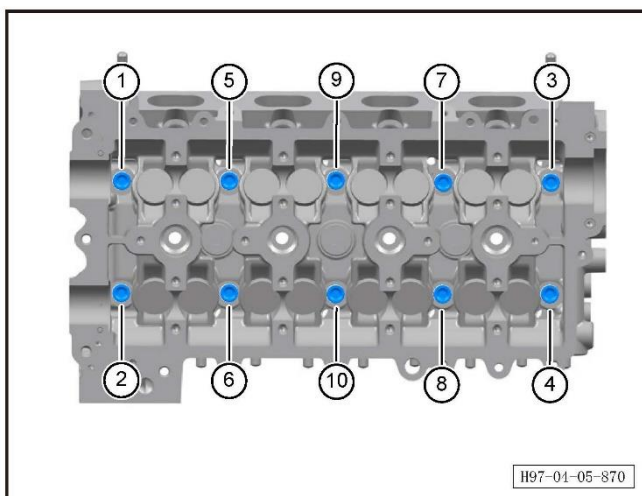
CAUTION:

- Make sure that the new cylinder head cover gasket is in the retaining groove of the cylinder head cover assembly.
- Apply sealing rubber strip approximately 5 mm (0.2 in) thick around the perimeter of the gasket between the cylinder head and cylinder head cover assembly.
- Pay attention to the assembly relationship of cylinder head cover assembly, gasket and vacuum pump upper cover plate.

4.5.12.15 Removal and refitting of cylinder head assembly

Removal procedure

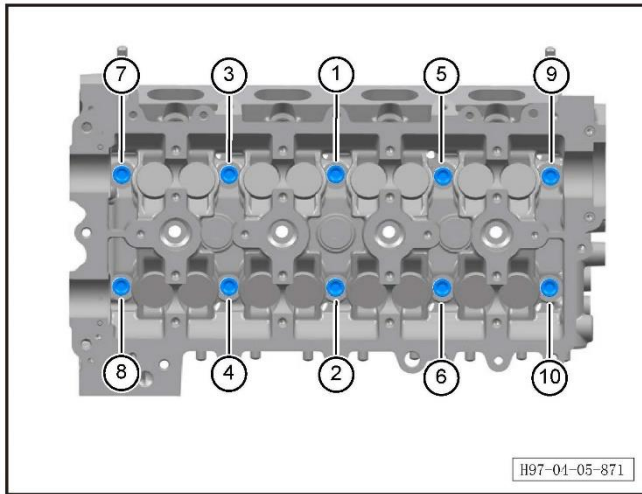
1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
5. Remove the intake VCP assembly (refer to [4.5.11.14 Removal and refitting of intake VCP assembly](#))
6. Remove the exhaust VCP assembly (refer to [4.5.11.15 Removal and refitting of exhaust VCP assembly](#))
7. Remove the camshaft front bearing cap (refer to [4.5.12.10 Removal and refitting of camshaft front bearing cap](#))
8. Remove the intake camshaft assembly (refer to [4.5.12.6 Removal and refitting of intake camshaft assembly](#))
9. Remove the exhaust camshaft assembly (refer to [4.5.12.7 Removal and refitting of exhaust camshaft assembly](#))
10. Remove the cylinder head assembly.



- a. Unscrew all cylinder head bolts in 2 to 3 steps in the order marked.

CAUTION:

- When removing the cylinder head assembly, after the gasoline engine is cooled, loosen the cylinder head bolts gradually in several steps according to the bolt sequence shown in the figure to avoid warping and deformation of the cylinder head assembly.



Refitting procedure

The refitting procedure is performed in reverse order.

a. Tighten all cylinder head bolts in 3 steps in the order marked.

Tightening torque of bolt:

Firstly, tighten to $30\pm 2\text{Nm}$;

Secondly, turn by $90\pm 3^\circ$

Thirdly, turn by $90\pm 3^\circ$ again.

CAUTION:

- When refitting the cylinder head assembly, tighten all the bolts to $30\pm 2\text{Nm}$ in the reverse order of removal, then turn them to $90\pm 3^\circ$, and finally turn them to $90\pm 3^\circ$.

- After the bolts are tightened according to the above steps, check the torque values of all bolts in the sequence from the front end to the rear end of the cylinder head. The torque value shall be between 60 and 110 Nm before the recalibration can be completed.

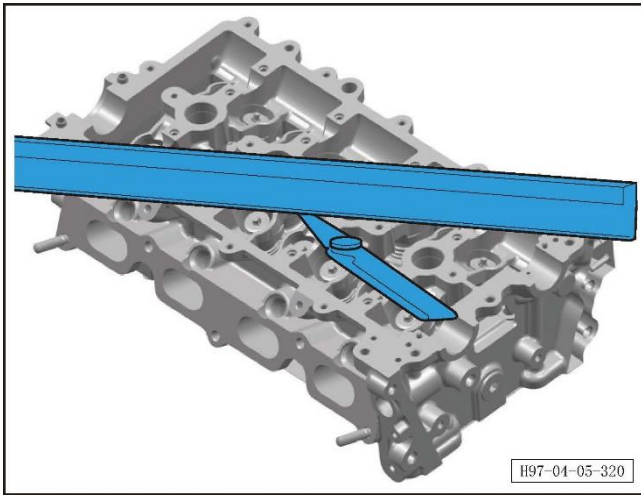
- Replace the cylinder head gasket each time the cylinder head assembly is removed and refitted.

- Pay attention to the installation direction of the cylinder head gasket. The oil hole on the cylinder head gasket must be aligned with the high pressure oil hole in the cylinder block and face the front end (timing end) of the engine.

- After removing the cylinder head assembly, scrape off the cylinder head gasket coating material adhering to the surface of the cylinder head assembly and cylinder block assembly, and pay attention to avoid scratching the contact surface, and prevent the cylinder head gasket coating material from entering the oil holes and cooling water in sleeve and bolt holes.

- Before refitting the cylinder head assembly, check whether there are blisters and whether the sealing belt is complete. If the above defects occur, the cylinder head assembly needs to be replaced.

- Remove carbon deposits from combustion chamber. When removing carbon deposits, it is not allowed to scrape the carbon deposits with any sharp tools, and do not damage or scratch the surface of the parts.



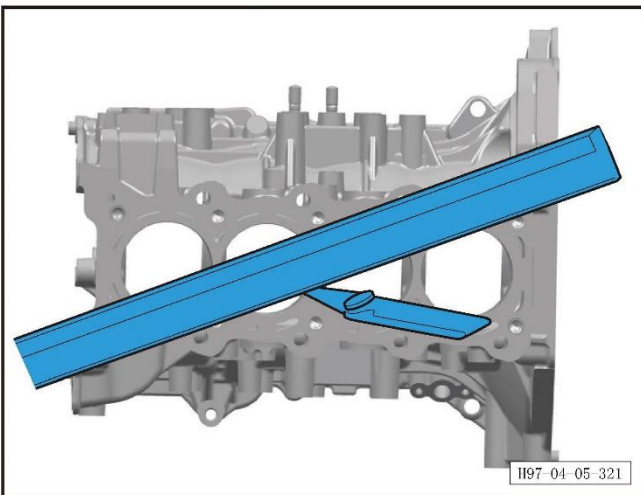
- Flatness measurement of cylinder head assembly:
- Remove carbon deposits from combustion chamber. When removing carbon deposits, it is not allowed to scrape the carbon deposits with any sharp tools, and do not damage or scratch the surface of the parts.
- After the carbon deposits are removed, check the cylinder head assembly for scratches on the intake and exhaust holes, combustion chamber and cylinder head assembly surfaces.
- Measure the flatness of the bottom plane of the cylinder head assembly and the mounting surfaces of the intake and exhaust manifolds with a knife edge ruler and feeler gauge.

- If the flatness exceeds the limit, replace the cylinder head assembly.

- Flatness limit of bottom plane of cylinder head assembly: 0.03 mm;

- Flatness limit of intake and exhaust manifold mounting surfaces: 0.05 mm.

- Every time the cylinder head cover assembly is removed, block the spark plug hole on the cylinder head with a clean cloth to prevent the oil in the camshaft chamber inside the cylinder head from flowing into the spark plug hole.



- Flatness check of the upper plane of the cylinder block:

- Check the deformation of the upper plane of the cylinder block assembly with a knife edge ruler and feeler gauge. If the flatness exceeds the limit, it should be corrected.

- Flatness of the upper plane of the cylinder block assembly,

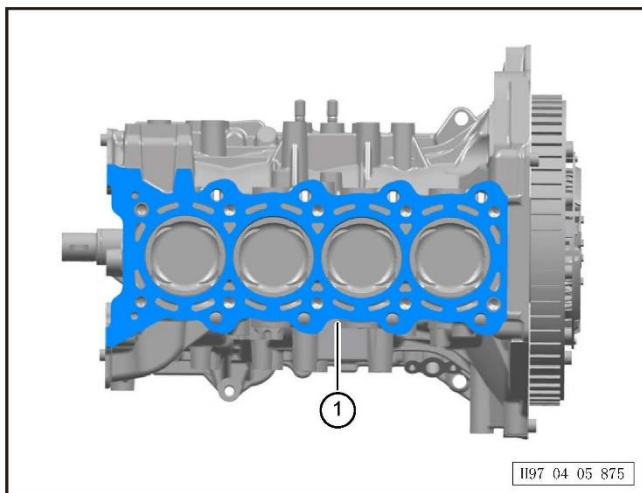
- Standard value: 0.03 mm;

- Limit value: 0.05mm.

4.5.12.16 Removal and refitting of cylinder head gasket

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
5. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
6. Remove the cylinder head gasket.
 - a. Take out the cylinder head gasket ①.



Refitting procedure

The refitting procedure is performed in reverse order.

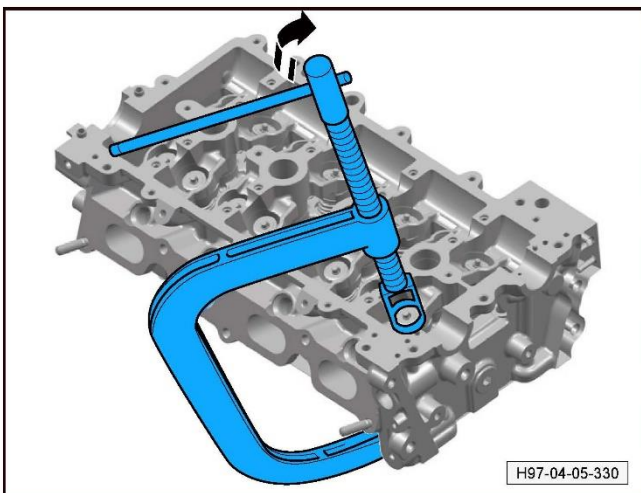
CAUTION:

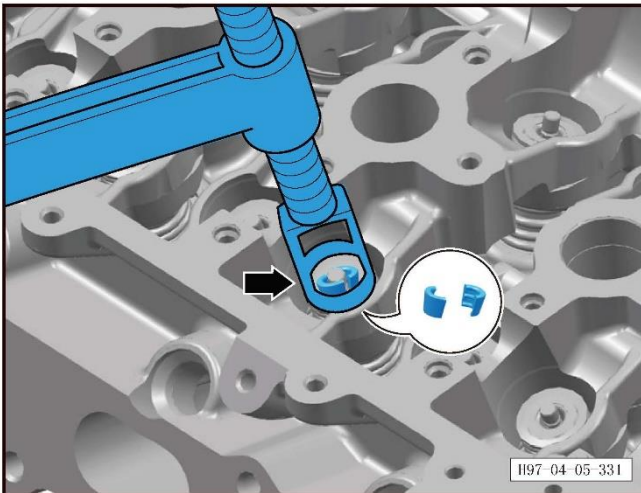
- Before installing a new cylinder head gasket, clean the contact surfaces of the cylinder head assembly and the cylinder block assembly and the cylinder head gasket.
- Pay attention to the installation direction when installing the cylinder head gasket. The oil hole on the cylinder head gasket must be aligned with the high pressure oil hole in the cylinder block and face the front end (timing end) of the engine.

4.5.12.17 Removal and refitting of intake and exhaust valve springs

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
5. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
6. Remove the intake camshaft assembly (refer to [4.5.12.6 Removal and refitting of intake camshaft assembly](#))
7. Remove the exhaust camshaft assembly (refer to [4.5.12.7 Removal and refitting of exhaust camshaft assembly](#))
8. Remove the intake side valve tappet (refer to [4.5.12.8 Removal and refitting of intake side valve tappet](#))
9. Remove the exhaust side valve tappet (refer to [4.5.12.9 Removal and refitting of exhaust side valve tappet](#))
10. Remove the intake and exhaust valve assembly.
 - a. Turn the valve spring assembly & disassembly pliers tool clockwise to depress the valve spring.

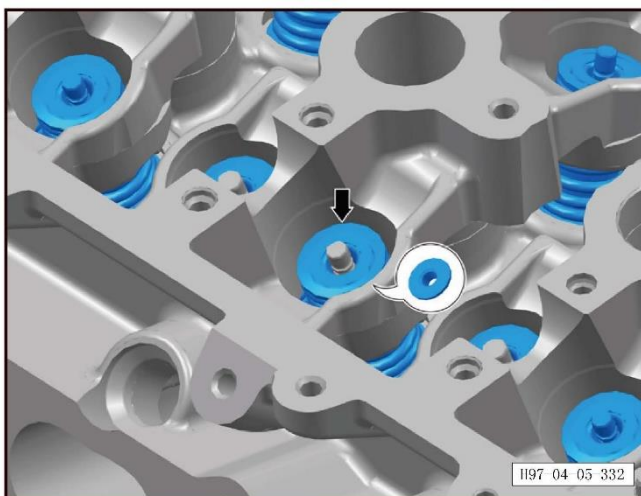




b. Take out the valve lock block. Slowly loosen and remove the valve spring assembly & disassembly pliers.

CAUTION:

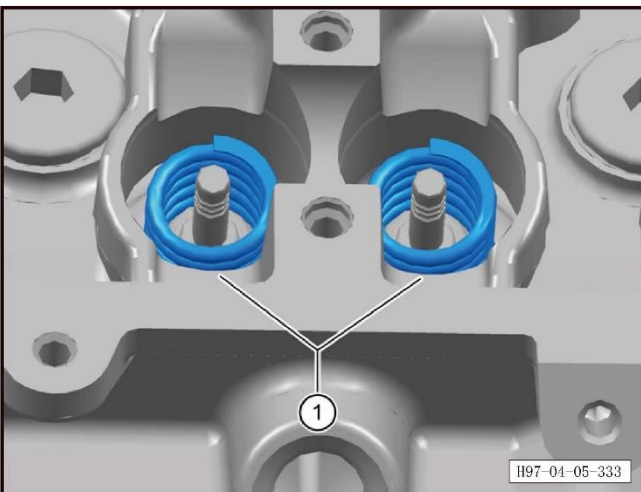
- All valve spring lock blocks are removed and refitted in the same way.
- There are a total of 32 pieces of intake and exhaust valve spring lock blocks.



c. Take out the valve spring seat.

CAUTION:

- All valve spring seats are removed and refitted in the same way.
- Place the intake and exhaust valve spring seats separately, and do not confuse them.



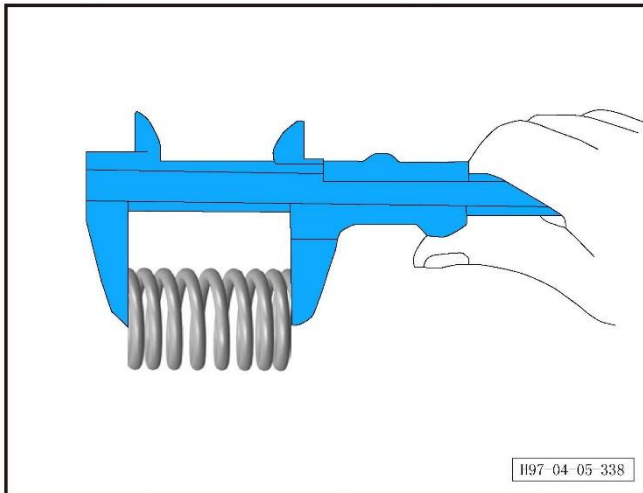
d. Take down the valve spring.

CAUTION:

- Place the removed intake and exhaust valve springs separately, and do not confuse them.
- When refitting the valve spring, be sure to have the color-coded end facing up.

Refitting procedure

Refit in reverse order of removal.

**CAUTION:**

- Check whether the valve springs are intact, damaged or weakened.
- Weakened valve springs may cause chattering, and may lead to poor sealing after valve return, resulting in air leakage and reduced engine output.
- Standard free length of valve spring: 44.2 mm
- Free length limit of valve spring: 38.9 mm
- Standard preload of valve spring: length of 34mm at 114N ~ 126N;
- Spring verticality: Check the verticality of the valve spring according to the clearance between the end of the valve spring and the straight edge using a straight edge and a flat plate. If the verticality exceeds the limit, the valve spring must be replaced.
Verticality limit of valve spring: 1.2 mm
- When refitting the valve spring, be sure to have the color-coded end facing up.

4.5.12.18 Removal and refitting of valve oil seal

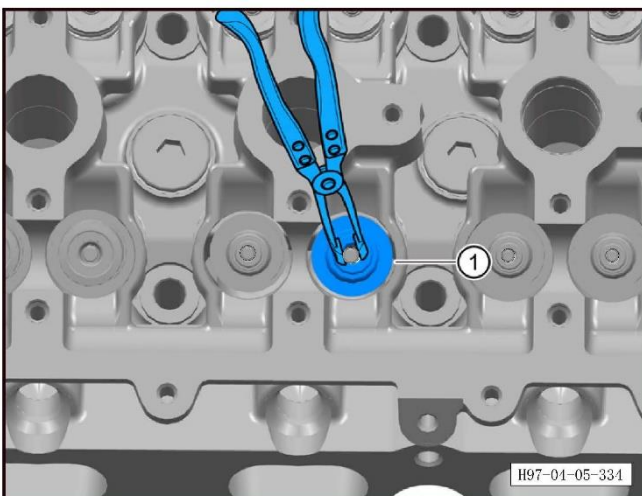
Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
5. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
6. Remove the intake camshaft assembly (refer to [4.5.12.6 Removal and refitting of intake camshaft assembly](#))
7. Remove the exhaust camshaft assembly (refer to [4.5.12.7 Removal and refitting of exhaust camshaft assembly](#))
8. Remove the intake side valve tappet (refer to [4.5.12.8 Removal and refitting of intake side valve tappet](#))
9. Remove the exhaust side valve tappet (refer to [4.5.12.9 Removal and refitting of exhaust side valve tappet](#))
10. Remove the intake and exhaust valve springs (refer to [4.5.12.17 Removal and refitting of intake and exhaust valve springs](#))
11. Remove the valve oil seal.

- a. Take out the valve oil seal ①.

CAUTION:

- Distinguish the oil seals of the intake and exhaust valves.
- Once the valve oil seal is removed, it must not be used again. When assembling, be sure to use a new oil seal.
- When refitting the valve oil seal, only push the special tool by hand, and never hit the special tool with a hammer or other things, so as to avoid damage to the oil seal.



Refitting procedure

Refit in reverse order of removal.

4.5.12.19 Removal and refitting of valve

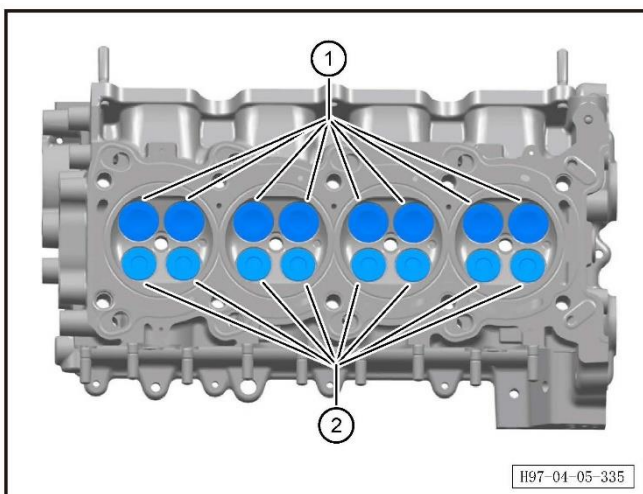
Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head cover assembly (refer to [4.5.12.2 Removal and refitting of cylinder head cover assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
5. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
6. Remove the intake camshaft assembly (refer to [4.5.12.6 Removal and refitting of intake camshaft assembly](#))
7. Remove the exhaust camshaft assembly (refer to [4.5.12.7 Removal and refitting of exhaust camshaft assembly](#))
8. Remove the intake side valve tappet (refer to [4.5.12.8 Removal and refitting of intake side valve tappet](#))
9. Remove the exhaust side valve tappet (refer to [4.5.12.9 Removal and refitting of exhaust side valve tappet](#))
10. Remove the intake and exhaust valve springs (refer to [4.5.12.17 Removal and refitting of intake and exhaust valve springs](#))
11. Remove the valve oil seal (refer to [4.5.12.18 Removal and refitting of valve oil seal](#))
12. Remove the valve.

- a. Push out 8 intake valves① and 8 exhaust valves②.

CAUTION:

- Remove the carbon deposits on the valve, then check the sealing surfaces of each valve for wear, ablation and deformation, and replace the valve if there is any abnormality.



Refitting procedure

Refit in reverse order of removal.

CAUTION:

- Measurement of valve stem diameter and valve guide inner diameter:

- Measure the valve stem diameter and the inner diameter of the valve guide respectively with an outside micrometer and an inside dial indicator, and ensure that there are no less than one measurement point. If the clearance exceeds the limit, the valve or valve guide should be replaced.

- Diameter of intake stem: 4.972 ~ 4.986 mm

- Diameter of exhaust valve stem: 4.972 ~ 4.964 mm

- Inner diameter of valve guide hole: 5~5.012 mm

- Standard fit clearance:

- Intake valve: 0.014~ 0.04 mm

- Exhaust valve: 0.036~ 0.06 mm

- Fit clearance limit:

- Intake valve: 0.07 mm

- Exhaust valve: 0.09 mm

- Measurement of valve head:

- Measure the valve head thickness. If the valve head thickness is less than the limit, the valve should be replaced.

Standard thickness T of valve head:

Intake valve: 2.3~2.7 mm

Exhaust valve: 3.14~ 3.54 mm

Valve head limit:

Intake valve: 2.1 mm

Exhaust valve: 2.9 mm

- Check the valve seat contact surface width:

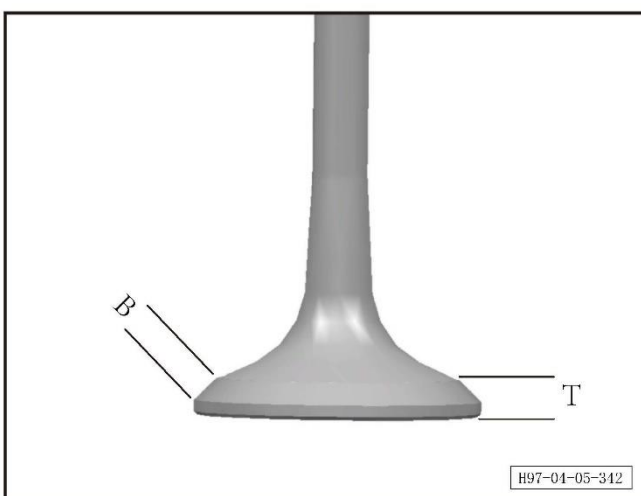
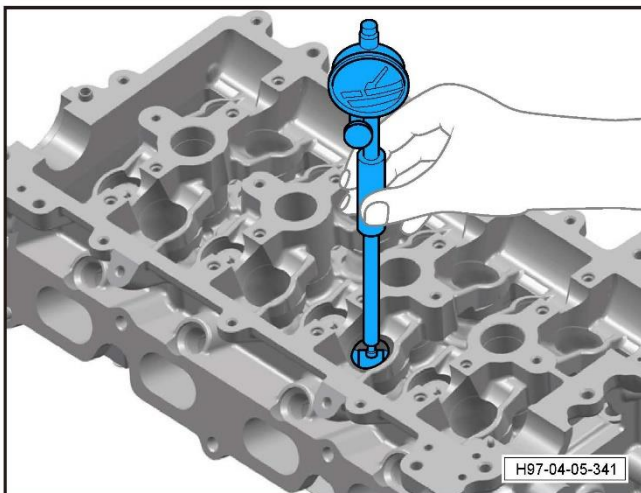
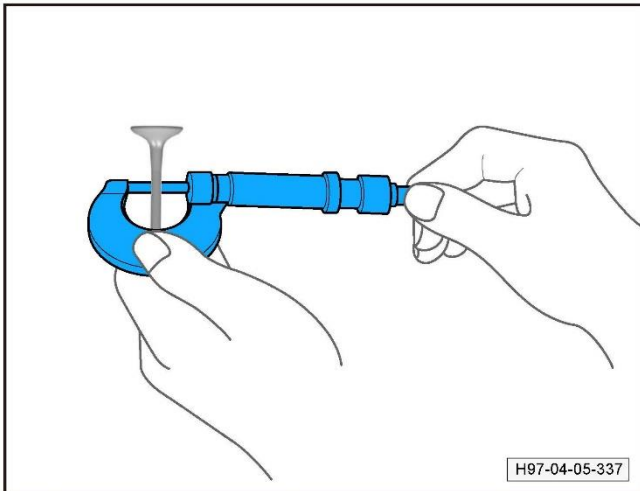
- Apply a layer of red powder evenly on the valve sealing cone, then press it on the valve seat to grind and rotate the valve for more than 10 circles.

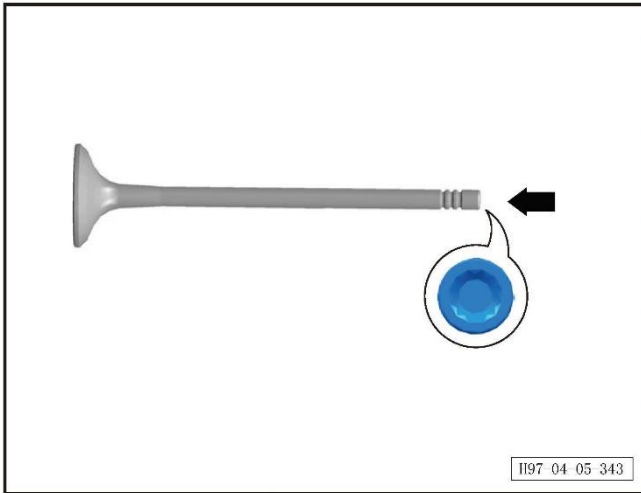
- The impression produced on the valve seal cone surface after grinding must be a continuous and uninterrupted ribbon, and its width must be within the specified range.

- Standard width B of valve seal cone impression:

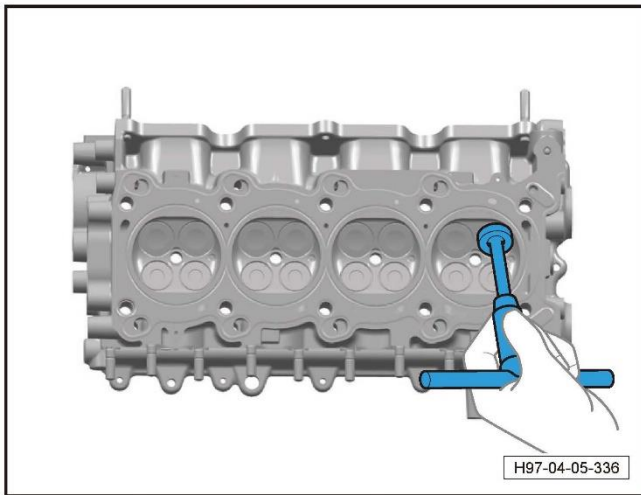
Intake valve: 2.51~2.91 mm

Exhaust valve: 2.80~ 3.36 mm





- Check valve stem end face for dents or wear.
- Grind with whetstone if necessary;
- Valves with worn out chamfers must be replaced.

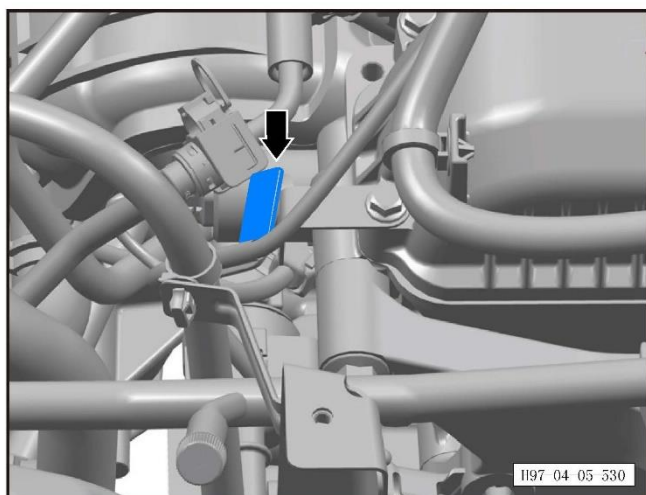


- Valve seat repair:
 - If the impression produced by grinding the valve seat and valve is uneven, or the impression width is not within the specified range, it must be reground, or ground or fine ground after cutting.
 - For the intake valve seat ring, using valve seat reamer:
 - Make a 60° cutting in the first step,
 - Make a 45° cutting in the second step,
 - Make a 30° cutting in the third step.
 - The second cutting must make the contact width of the taper surface that meets the requirements.
 - Exhaust valve seat ring: Use valve seat reamer:
 - Make a 60° cutting in the first step,
 - Make a 45° cutting in the second step,
 - Make a 30° cutting in the third step.
 - The second cutting must make the contact width of the taper surface that meets the requirements.
 - Grinding of valve cone:
 - The first step is grinding with coarse grinding paste;
 - The second step is grinding with a fine grinding paste.

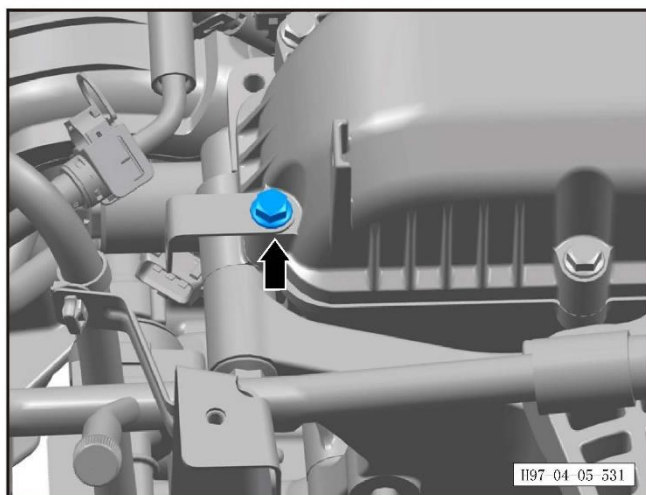
4.5.12.20 Removal and refitting of harness bracket on cylinder head cover assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the harness bracket on cylinder head cover assembly.

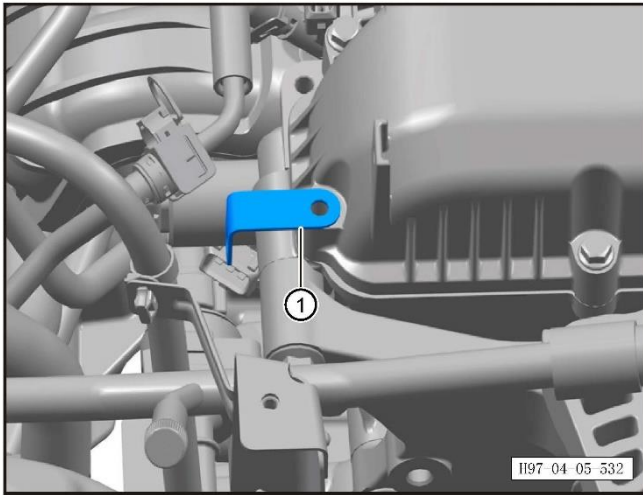


- a. Disconnect the engine harness from the bracket.



- b. Remove 1 bolt from the harness bracket on cylinder head cover assembly.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



c. Take out the harness bracket ① on cylinder head cover assembly.

Refitting procedure

The refitting procedure is performed in reverse order.

4.5.13 Cylinder block and flywheel assembly

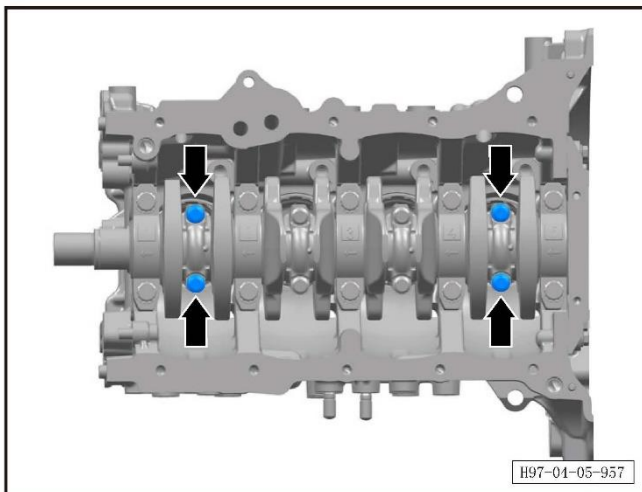
4.5.13.1 Removal and refitting of piston, connecting rod and bearing assembly

Removal procedure

CAUTION:

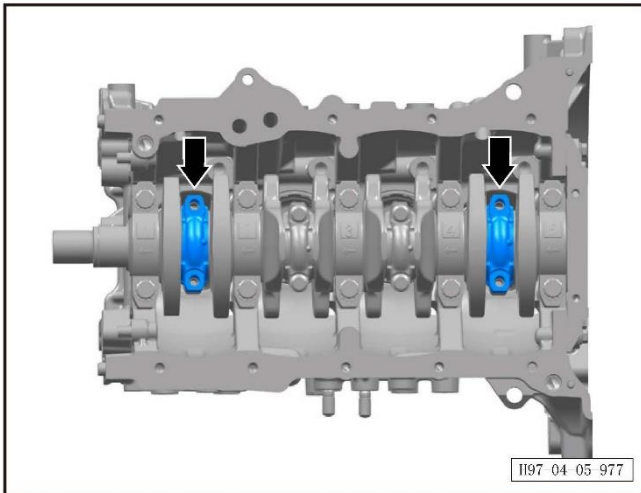
- Strictly follow the maintenance standard parameters, and implement the operation process of assembly & disassembly and replacement.

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
4. Remove the range extender generator assembly (refer to [4.5.17.1 Removal and refitting of range extender generator assembly](#))
5. Remove the torque limiter (refer to [4.5.13.13 Removal and refitting of torque limiter](#))
6. Remove the flywheel assembly (refer to [4.5.13.9 Removal and refitting of flywheel assembly](#))
7. Remove piston, connecting rod and bearing assembly.

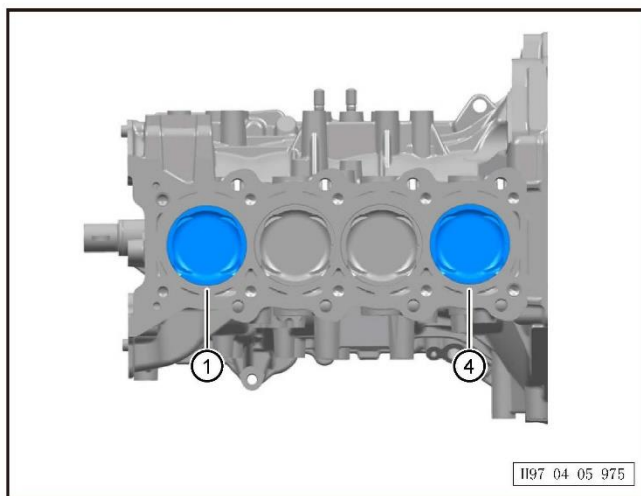


- a. Rotate the crankshaft in the direction of engine rotation, turn the pistons of cylinders #1 and #4 to the TDC, and unscrew the 4 bolts of the connecting rod bearing cap.

Tightening torque of bolt: (20 ± 2) Nm + $(90 \pm 3)^\circ$



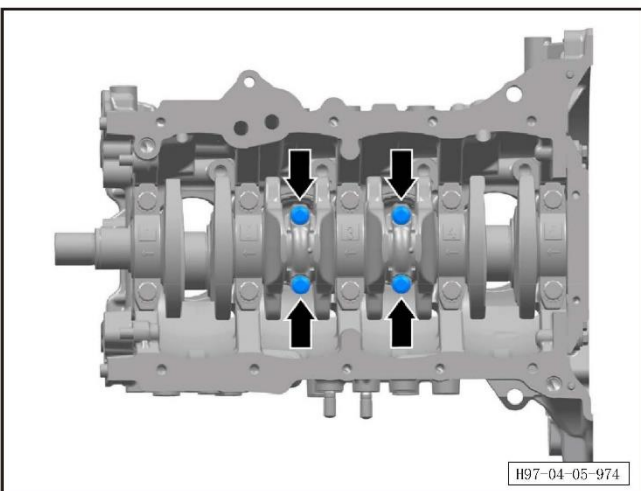
b. Take out the connecting rod bearing caps for cylinders #1 and #4.



c. Push the piston and connecting rod assembly of cylinders 1# and 4# out of the corresponding cylinder and mark them.

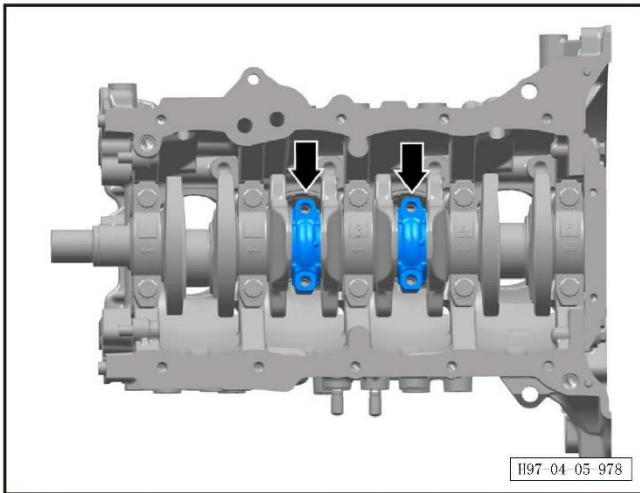
CAUTION:

- The shear faces of the connecting rod and connecting rod bearing cap form a unique fit and cannot be replaced or damaged. Do not lay flat on the cutting plane.

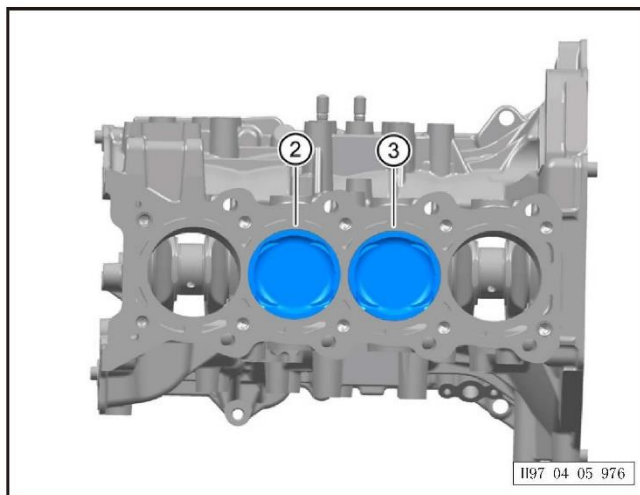


d. Rotate the crankshaft in the direction of engine rotation, turn the pistons of cylinders #2 and #3 to the TDC, and unscrew the 4 bolts of the connecting rod bearing cap.

Tightening torque of bolt: $(20 \pm 2) \text{ Nm} + (90 \pm 3)^\circ$



e. Take out the connecting rod bearing caps for cylinders #2 and #3.



f. Push the piston and connecting rod assembly of cylinders 2# and 3# out of the corresponding cylinder and mark them.

CAUTION:

- The shear faces of the connecting rod and connecting rod bearing cap form a unique fit and cannot be replaced or damaged. Do not lay flat on the cutting plane.

Refitting procedure

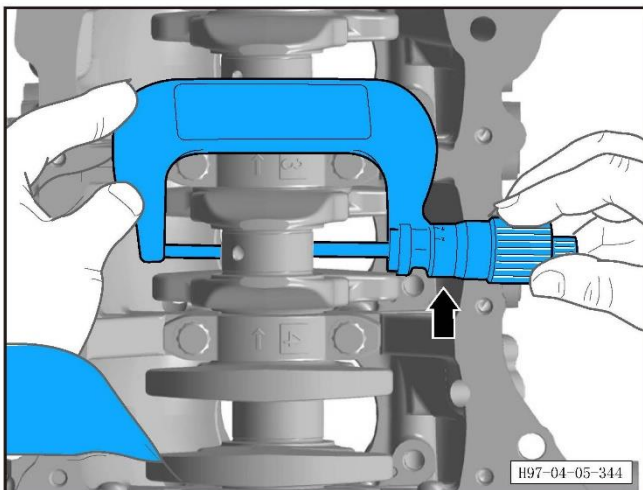
The refitting procedure is performed in reverse order.

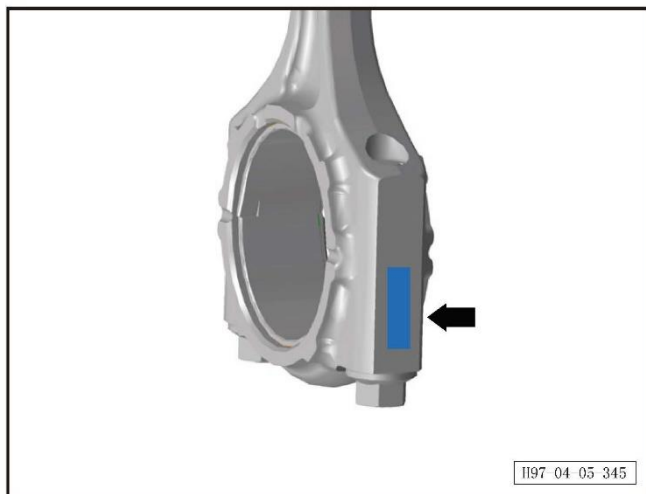
CAUTION:

- Check the crankshaft connecting rod journal for uneven wear or damage: Check the connecting rod journal diameter with a micrometer. If the connecting rod journal is damaged or the cylindricity exceeds the limit, the crankshaft should be replaced.

- Diameter of connecting rod journal: (43 ~ 43.018) mm.

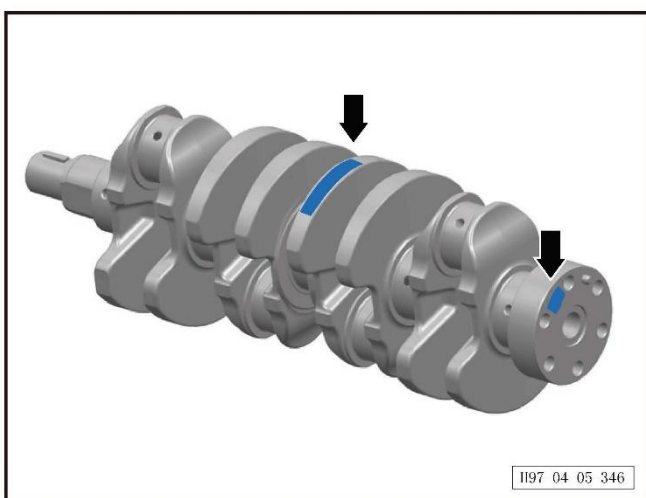
- Connecting rod cylindricity limit: 0.01 mm.





- The inner diameter of the big end hole of the connecting rod assembly is divided into three groups, marked as: 1, 2, 3, which are printed on the side of the big end of the connecting rod assembly.

| Matching identification | Connecting rod assembly big hole diameter group size (mm) |
|-------------------------|---|
| 1 | 46.000 ~ 46.006 |
| 2 | >46.006 ~ 46.012 |
| 3 | >46.012 ~ 46.018 |



- Crankshaft connecting rod diameter dimensions are also divided into three groups, marked as: A, B, C.

- Printed on the outer edge of the crankshaft crank plate or marked at the rear end of the crankshaft in the order of 1st to 4th crankpins (5-digit main bearing shaft diameter grouping number and 4-digit connecting rod shaft diameter grouping letter).

| Matching identification | Crank pin diameter group size (mm) |
|-------------------------|------------------------------------|
| 1 | >42.994 ~ 43.000 |
| 2 | >42.988 ~ 42.994 |
| 3 | 42.982 ~ 42.988 |

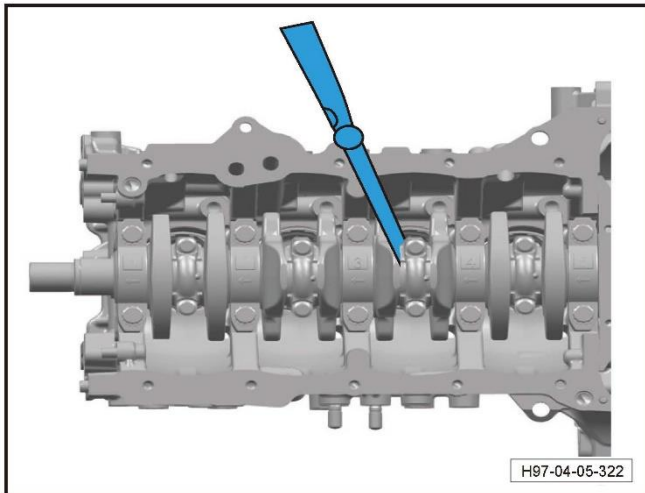


- Matching of connecting rod bearing bush clearance:

- The thickness of the connecting rod bearing bush is divided into five groups, marked as: 1, 2, 3, 4, 5, which are printed on the back of the connecting rod bearing bush.

- Match the connecting rod bearing bush according to the requirements in the table below to ensure the correct fit clearance.

| Connecting rod bearing bush grouping | | Crankshaft crankpin diameter grouping | | |
|--|---|---------------------------------------|---|---|
| | | A | B | C |
| Connecting rod assembly big end hole inner diameter grouping | 1 | 1 | 2 | 3 |
| | 2 | 2 | 3 | 4 |
| | 3 | 3 | 4 | 5 |



- Big end backlash: After refitting the connecting rod assembly according to the correct assembly process, check the big end backlash of the connecting rod assembly. If the backlash exceeds the specified limit, the connecting rod must be replaced.

- Check the connecting rod bearing bush for pits, ablation or peeling of the surface layer, etc., and observe the shape of the bearing bush. If the bearing bush is found to be of unacceptable quality, it must be replaced.

Inspection of connecting rod bearing clearance:

- Before checking the bearing bush clearance, clean the bearing bush and crankshaft connecting rod with gasoline, and then refit the bearing bush on the connecting rod assembly correctly;

- Place a piece of plastic plug gauge with the same width as the connecting rod journal parallel to the connecting rod journal, and take care to avoid the oil hole; be careful not to rotate the crankshaft when installing the plastic plug gauge.

- Refit the connecting rod cap:

- Before refitting, apply lubricating oil to the threaded part of the bolt;

- When refitting, note that the "protrusion" (forward mark) on the connecting rod cover should point to the crankshaft pulley end (front end), and tighten the connecting rod bolts according to the specified assembly method.

- Tightening method of connecting rod bolts:

- Step 1, pre-tighten to a torque of (20 ± 2) Nm and then stop;

- Step 2, rotate the connecting rod bolt to an angle of $(60^\circ \pm 3^\circ)$ at 20rpm. (Note: its inspection torque is about: 45 ~ 65Nm);

- Remove the connecting rod (bearing bush) cap, place the ruler on the surface of the plastic plug gauge, and measure the thickness of the plastic plug gauge at the widest point of the clearance. If the clearance is out of tolerance, replace the connecting rod bearing bush with a new standard one, and re-measure according to the above method until it is acceptable.

- Standard value of connecting rod bearing bush clearance: 0.02 ~ 0.04 mm.

- Limit value of connecting rod bearing bush clearance: 0.12 mm.

Bush matching rules:

- Main bearing bush: crankshaft main journal group number (a) + cylinder block main bearing hole group (b)-1=a+b-1

- Connecting rod bearing bush: crankshaft connecting rod journal group number (X) + connecting rod hole diameter group (Y)-1=X+Y-1

- Example: The group number of crankshaft main journal is 22222 (5 main journal diameters from left to right correspond to bearing seats 1 → 5 of cylinder block);

- The group number of connecting rod journal is BBBB (4 connecting rod shaft diameters from left to right correspond to cylinder connecting rods 1 → 4 respectively);

- The group number of the main bearing holes of the cylinder block is BBBBA (corresponding to bearing holes 1 → 5 of cylinder block from left to right)

- The group number of the connecting rod hole diameter is 2222 (the connecting rod hole diameter of the same engine is grouped identically)

- Main bearing: first gas ring: 2+B(2)-1=3; second track: 2+B(2)-1=3 # fifth gas ring: 2+A(1)-1=2 #;

- Connecting rod bearing bush: cylinder 1# : B(2)+2-1=3; cylinder 2#: B(2)+2-1=3 #.....

Note: Letter grouping number A=1, B=2, C=3.

4.5.13.2 Removal and refitting of piston and connecting rod assembly

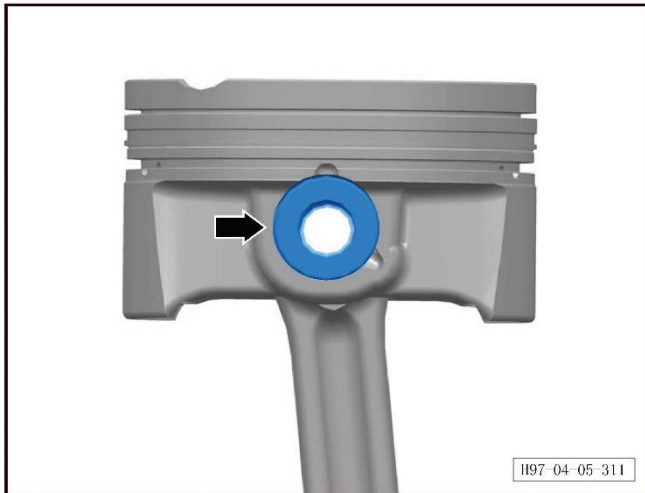
Removal procedure

CAUTION:

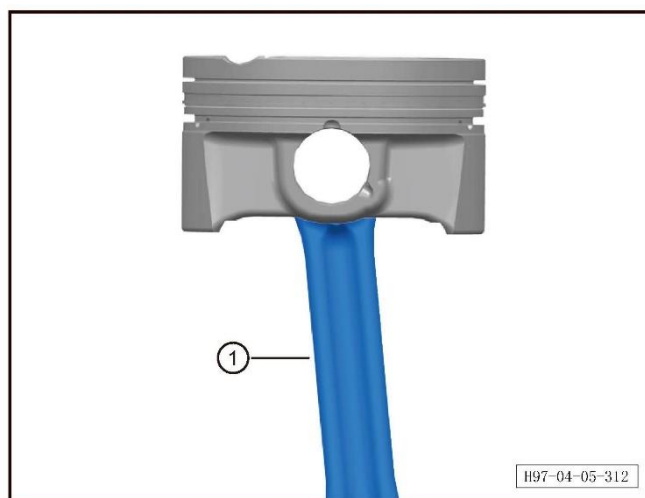
- Strictly follow the maintenance standard parameters, and implement the operation process of assembly & disassembly and replacement.

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
4. Remove the range extender generator assembly (refer to [4.5.17.1 Removal and refitting of range extender generator assembly](#))
5. Remove the torque limiter (refer to [4.5.13.13 Removal and refitting of torque limiter](#))
6. Remove the flywheel assembly (refer to [4.5.13.9 Removal and refitting of flywheel assembly](#))
7. Remove the piston and connecting rod assembly (refer to [4.5.13.1 Removal and refitting of piston and connecting rod assembly](#))
8. Remove piston and connecting rod assembly.
 - a. Take out the circlips on the left and right sides of the piston pin, 2 in total.





b. Take out 1 piston pin connecting piston and connecting rod assembly.



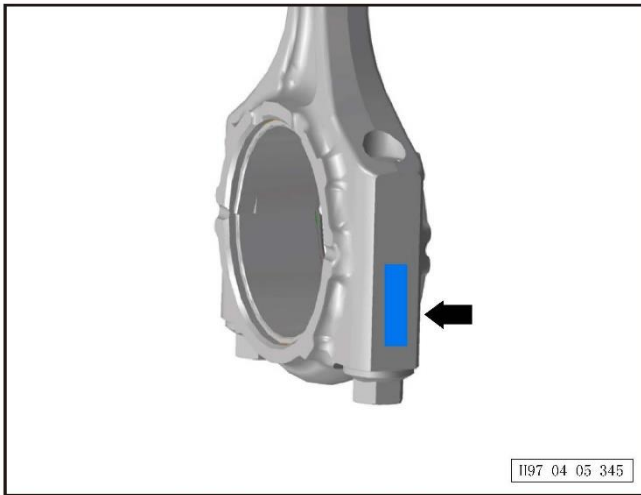
c. Disconnect the piston and connecting rod assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

Precautions for inspection of piston connecting rod assembly:

- Check the piston for abnormal wear, cracks, carbon deposits on the piston head, and serious ablation damage. If any, the piston must be replaced.
- Check the piston pin, connecting rod assembly small end hole, and piston pin hole for abnormal wear or damage. In case of severe wear or damage, the corresponding components should be replaced.



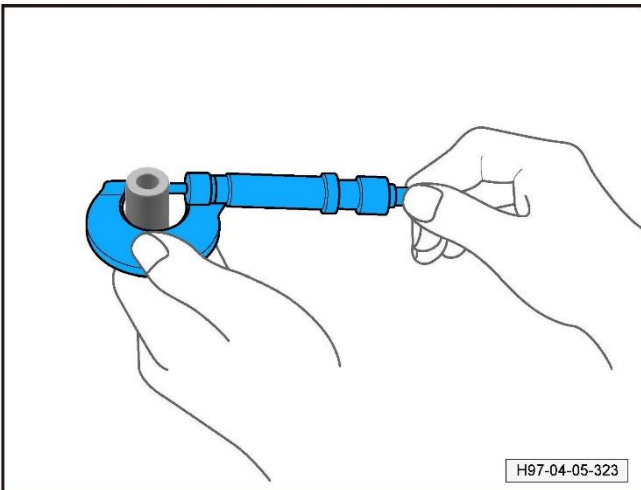
- Assembly of piston rod assembly:

- To ensure the normal operation of the gasoline engine, the 4 connecting rod assemblies of the same gasoline engine must be of the same quality group. The quality group number of the connecting rod assembly is on its side, represented by capital letters, in 10 groups from "A" to "J".

- Before refitting the assembled piston and connecting rod assembly into the cylinder block assembly, apply an appropriate amount of oil to the piston rings, pistons, cylinder walls of cylinder block assembly, connecting rod bearing bushes and crank pins, then align the forward mark "o" on the top surface of the piston with the front end of the engine (the end of the pulley), compress the ring with the special tooling and then align it with the cylinder hole of the cylinder block assembly, tap the top of the piston with a plastic rod, and slowly push the piston into the cylinder hole of cylinder block assembly to refit the connecting rod assembly on the crankshaft.

- With the forward mark on the connecting rod cap facing the front end of the engine, put the connecting rod cap on the connecting rod, and then tighten the bolts as specified.

- After the piston pin is assembled, the piston pin snap rings at both ends should be installed in place, and the opening direction of the snap ring should be upward or downward.



- Check the piston pin, connecting rod assembly small end hole, and piston pin hole for abnormal wear or damage. In case of severe wear or damage, the corresponding components should be replaced.

- Check the fit clearance between the small end hole of the connecting rod assembly and the piston pin. If it exceeds the limit, replace the piston pin or connecting rod assembly.

- Small end hole of connecting rod: 19.008 ~ 19.016 mm.

- Piston pin diameter: 18.996 to 19.000 mm.

- Piston pin assembly clearance: 0.008 to 0.02 mm.

- Fit clearance limit: 0.03 mm.

4.5.13.3 Removal and refitting of piston ring assembly

Removal procedure

CAUTION:

- Strictly follow the maintenance standard parameters, and implement the operation process of assembly & disassembly and replacement.

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
4. Remove the range extender generator assembly (refer to [4.5.17.1 Removal and refitting of range extender generator assembly](#))
5. Remove the torque limiter (refer to [4.5.13.13 Removal and refitting of torque limiter](#))
6. Remove the flywheel assembly (refer to [4.5.13.9 Removal and refitting of flywheel assembly](#))
7. Remove the piston and connecting rod assembly (refer to [4.5.13.1 Removal and refitting of piston and connecting rod assembly](#))
8. Remove the piston and connecting rod assembly (refer to [4.5.13.2 Removal and refitting of piston and connecting rod assembly](#))
9. Remove the piston ring assembly.

A. Take down the first air ring ① and the second air ring ② in the piston ring groove.

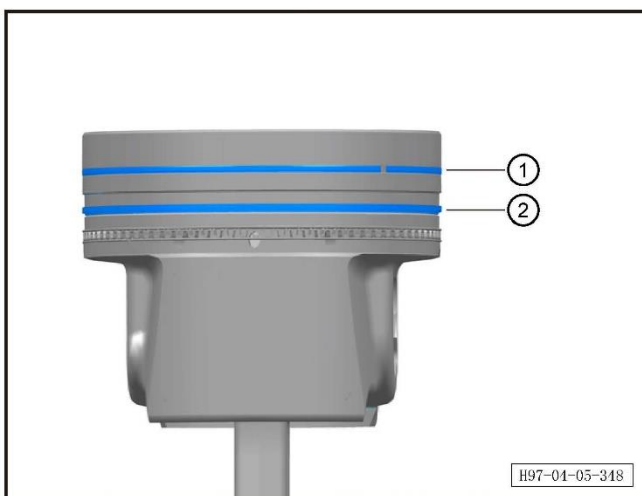
CAUTION:

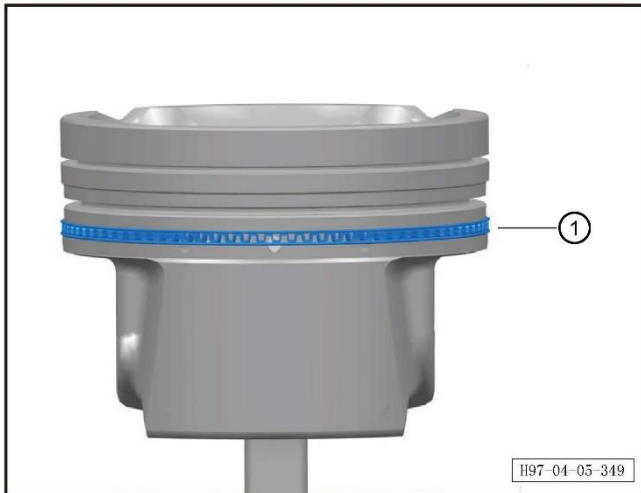
- Refitting of piston ring: The first air ring and the second air ring of the piston ring are marked with the manufacturer's mark on one side. When assembling, make sure that the marked side faces up.

- Distinction of piston rings:

The first gas ring is a nitrided steel belt ring, with a brighter outer surface;

The second gas ring is a phosphating cast iron ring with a gray surface.





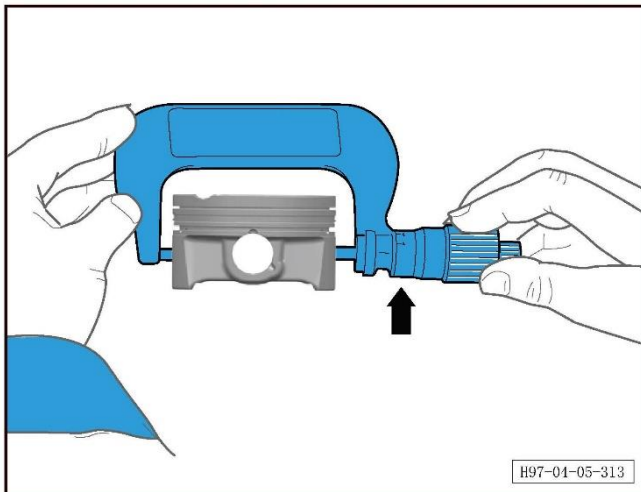
b. Take down the two oil scraper rings and bushing spring assembly ① in the third ring groove of the piston.

CAUTION:

- When refitting the combined oil ring, the bushing spring should be refitted before the two oil scraper rings.

Refitting procedure

The refitting procedure is performed in reverse order.



- The diameter of the piston should be measured 10mm upwards from the bottom of the piston.

- When measuring, the measuring direction should be perpendicular to the axis direction of the piston pin hole.

- Piston diameter:

$\Phi 74.975 \pm 0.005$ (red)

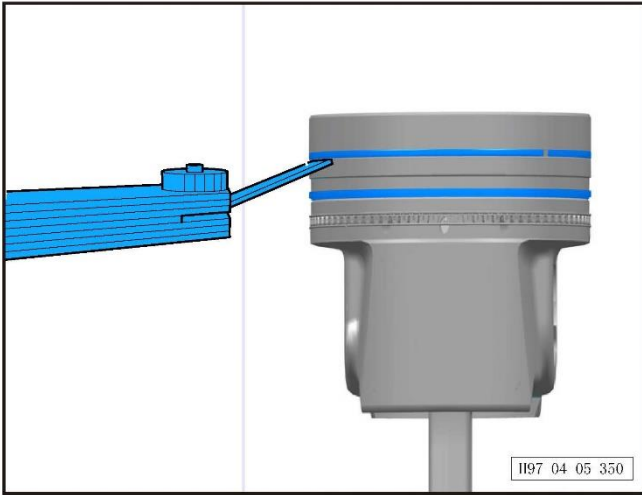
$\Phi 74.965 \pm 0.005$ (blue)

- Diameter of cylinder block assembly:

$\Phi 75 (+0.02 +0.0101)$ (red) mark 1.

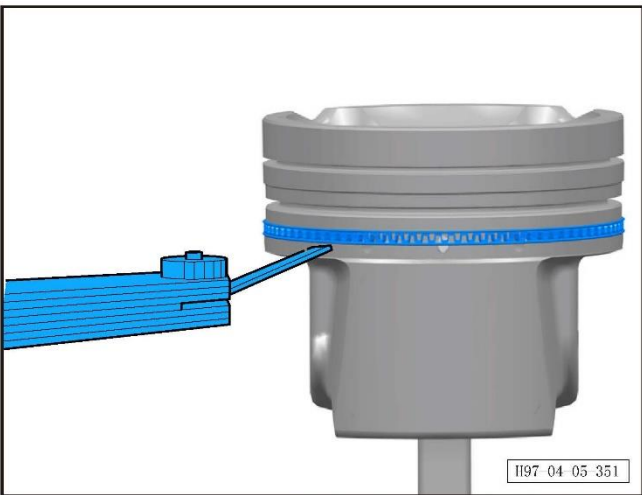
$\phi 75 (+0.01 +0)$ (blue) mark 2.

Fit clearance between piston and cylinder block assembly: (0.03 ~ 0.05) mm. During servicing, attention should be paid to matching to meet the requirements of the fit clearance.



- Piston ring groove clearance:
- The piston ring groove must be cleaned before inspection.
- Install the new piston ring into the piston ring groove and measure the clearance between the ring and the ring groove with a feeler gauge. If the clearance is out of tolerance, replace the piston.

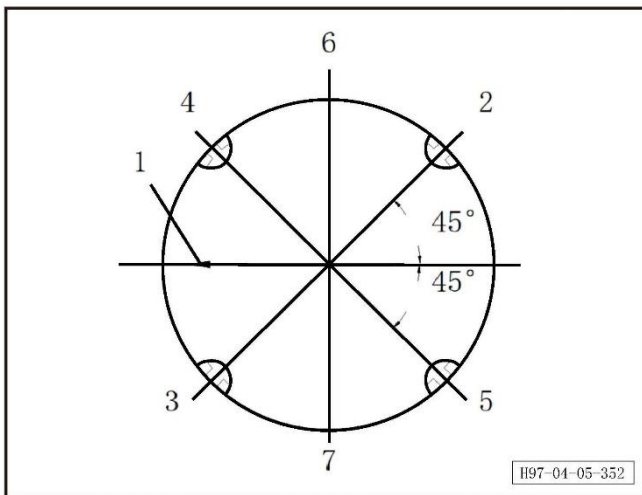
- Piston ring groove clearance:
 Standard value for the first air ring: 0.04 ~ 0.08 mm;
 Standard value of the second air ring: 0.03 ~ 0.07 mm.



- Standard value for oil scraper ring and bush ring: 0.06 ~ 0.15 mm.
- Measure the piston ring end clearance:
- Insert the piston ring into the cylinder and measure the clearance with a feeler gauge. If the clearance is out of tolerance, replace the piston ring.

- Before inserting piston rings, clean the top of the cylinder and the piston ring, and remove carbon deposits.

- Piston ring end clearance:
 Standard value for the first air ring: (0.2 ~ 0.32) mm; limit value: 0.7mm;
 Standard for the second air ring: (0.35 ~ 0.45) mm; the limit value is 1.00mm.



- When refitting the piston rings, it should be noted that their openings should be staggered from each other.

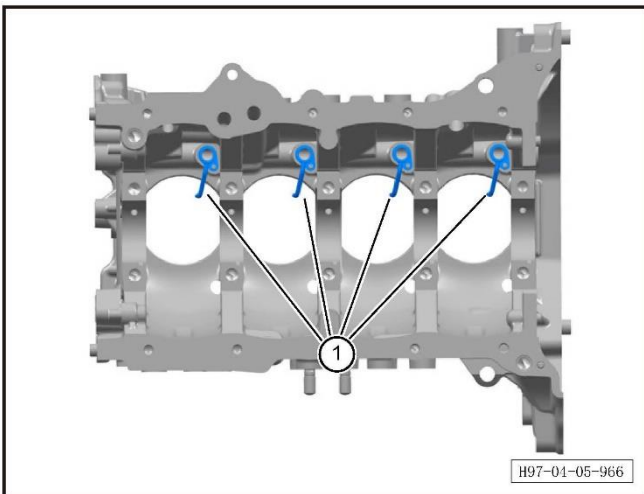
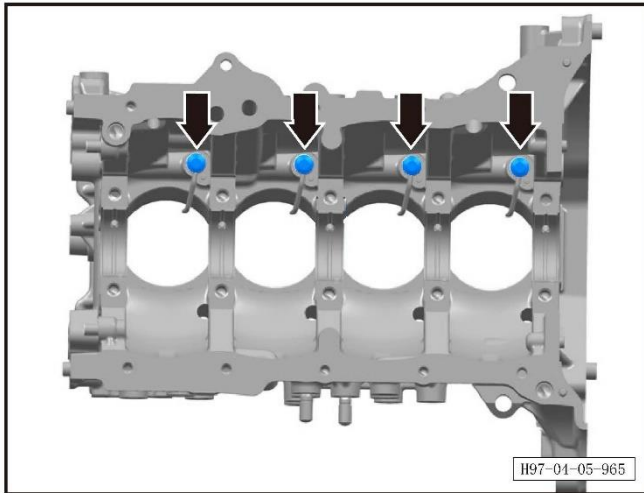
1. Arrow mark
2. End clearance of upper oil scraper ring
3. End clearance of the second air ring and the clearance of the oil scraper ring
4. End clearance of the first air ring
5. End clearance of lower oil scraper ring
6. Exhaust port side
7. Intake port side

4.5.13.4 Removal and refitting of piston cooling nozzle assembly

Removal procedure

1. Remove the piston assembly (refer to [4.5.13.1 Removal and refitting of piston, connecting rod and bearing assembly](#))
2. Remove the piston cooling nozzle assembly.
 - a. Unscrew 1 bolt for each piston cooling nozzle assembly, 4 total.

Tightening torque of bolt: $(20\pm 2)\text{Nm} + (90\pm 3)^\circ$



- b. Take out 4 piston cooling nozzle assemblies ①.

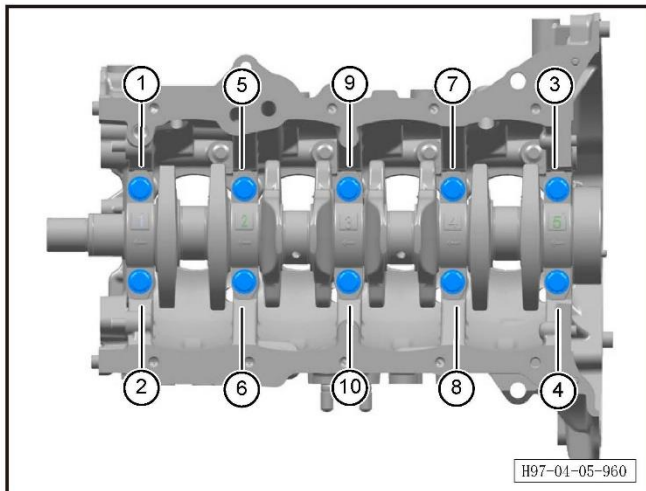
Refitting procedure

The refitting procedure is performed in reverse order.

4.5.13.5 Removal and refitting of crankshaft

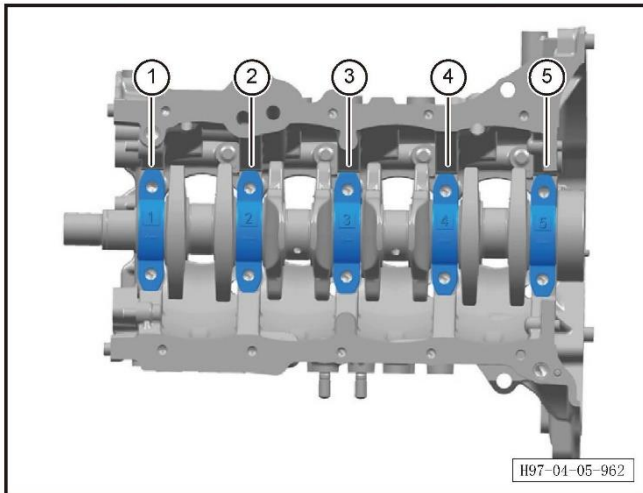
Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
4. Remove the range extender generator assembly (refer to [4.5.17.1 Removal and refitting of range extender generator assembly](#))
5. Remove the torque limiter (refer to [4.5.13.13 Removal and refitting of torque limiter](#))
6. Remove the flywheel assembly (refer to [4.5.13.9 Removal and refitting of flywheel assembly](#))
7. Remove the piston and connecting rod assembly (refer to [4.5.13.1 Removal and refitting of piston and connecting rod assembly](#))
8. Remove the crankshaft.



- a. Loosen all crankshaft main bearing bush cap bolts in 3 steps in the order marked.

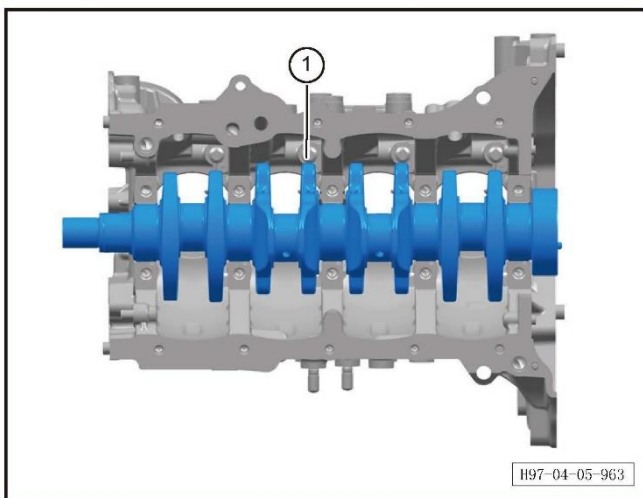
Tightening torque of bolt: $(20 \pm 2) \text{Nm} + (90 \pm 3)^\circ$



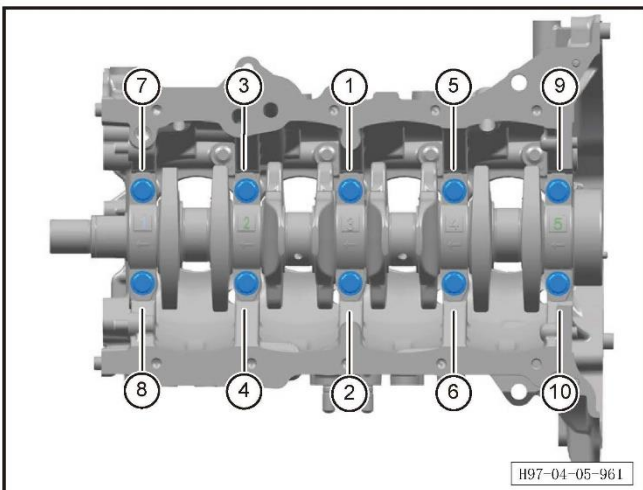
b. Take out the 5 main bearing bush caps and place them on the outside of the cylinder block according to the marked numbers.

CAUTION:

- The main bearing caps are stamped with the serial number and the forward arrow marks.



c. Take out the crankshaft ①.



Refitting procedure

The refitting procedure is performed in reverse order.

a. Tighten all crankshaft bearing bush cap bolts in 3 steps in the order marked.

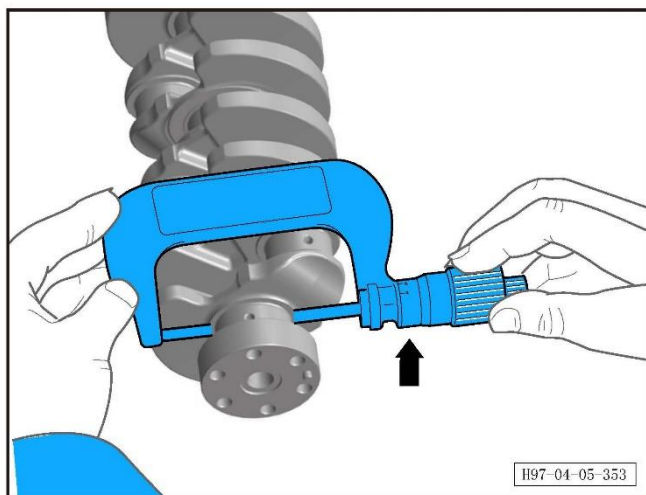
Tightening torque of bolt: 20 ± 2 Nm.

Final rotation for tightening: 90 ± 3 °

CAUTION:

- Lightly place the main bearing cap on the main bearing seat according to the sequence number (the arrow on the main bearing cap faces the front end of the engine), then put in the main bearing cap bolts, screw in by 2 to 3 threads, and tighten the bolts to the specified torque.

- After the main bearing cap bolts are tightened, turn the crankshaft with a torque of not more than 10Nm, and the crankshaft should be able to rotate smoothly.



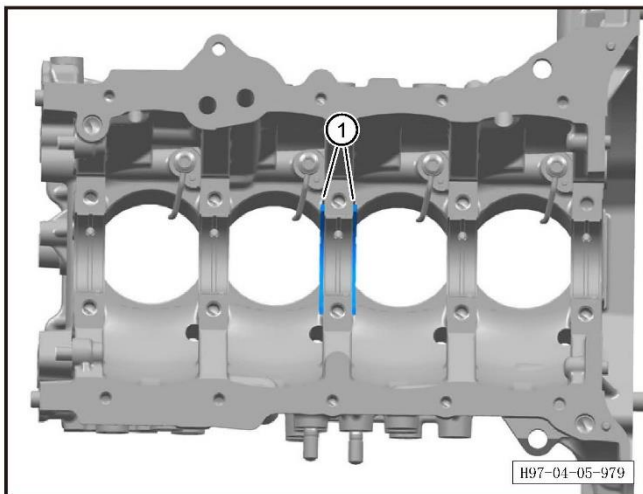
- Cylindricity of main journal:
- Measure the diameter of different points on the same section of the crankshaft and the diameters of different points in the length direction with a micrometer, and the difference therebetween can reflect the uneven wear of the crankshaft.
- If any one of the journals is severely damaged, or the unevenness and wear exceed the cylindricity limit.
- Grind the journal or replace the crankshaft.
- Crankshaft main journal cylindricity limit: 0.01 mm.

4.5.13.6 Removal and refitting of crankshaft thrust plate

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
4. Remove the range extender generator assembly (refer to [4.5.17.1 Removal and refitting of range extender generator assembly](#))
5. Remove the torque limiter (refer to [4.5.13.13 Removal and refitting of torque limiter](#))
6. Remove the flywheel assembly (refer to [4.5.13.9 Removal and refitting of flywheel assembly](#))
7. Remove the piston and connecting rod assembly (refer to [4.5.13.1 Removal and refitting of piston and connecting rod assembly](#))
8. Remove the crankshaft (refer to [4.5.13.5 Removal and refitting of crankshaft](#))
9. Remove the crankshaft thrust plate.

- a. Take down the crankshaft thrust plate ①.

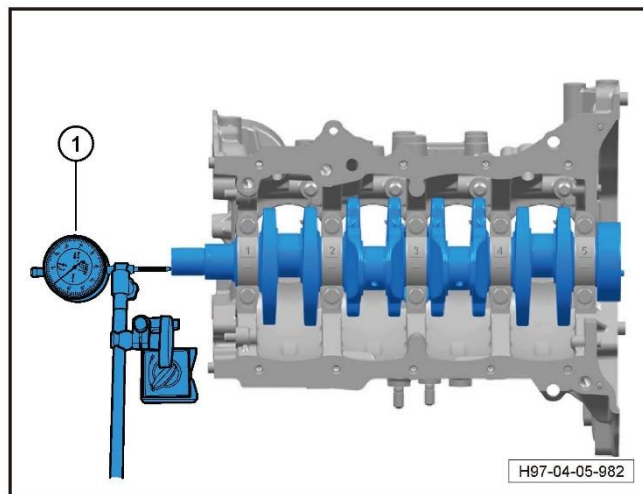
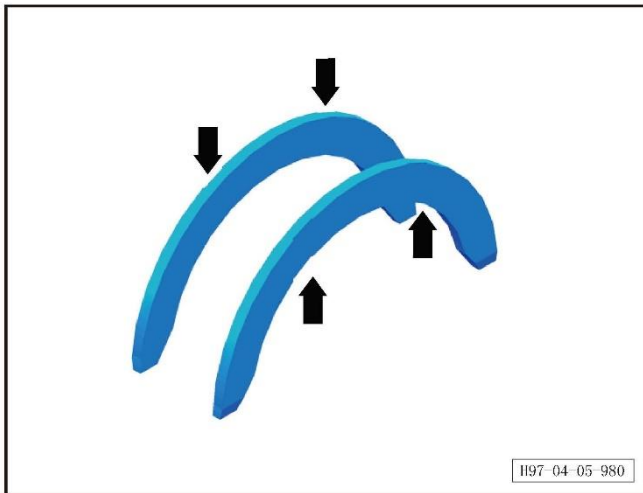


Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Two crankshaft thrust plates are refitted on both sides of the third main bearing seat respectively. When refitting, the oil groove of the thrust plate faces outwards (towards the crankshaft thrust plane), and must not be installed in reverse.



- Crankshaft straightness:

- Measure the offset of the intermediate journal with a dial indicator, and turn the crankshaft slowly. If the straightness exceeds the limit, the crankshaft needs to be replaced.

- Crankshaft journal straightness limit: 0.06mm.

- Thrust clearance of crankshaft: After correctly assembling the main bearing bush, thrust plate and rear main bearing cap, tighten them with the specified torque.

- Tightening torque of bolt: $20 \pm 2 \text{ Nm}$

- Final rotation for tightening: $90 \pm 3^\circ$

- Push the crankshaft back and forth in the axial direction, then measure the thrust clearance of the crankshaft with a dial indicator, and replace the thrust plate if the thrust clearance exceeds the limit value.

Standard value of crankshaft thrust clearance: 0.11 ~ 0.31 mm;

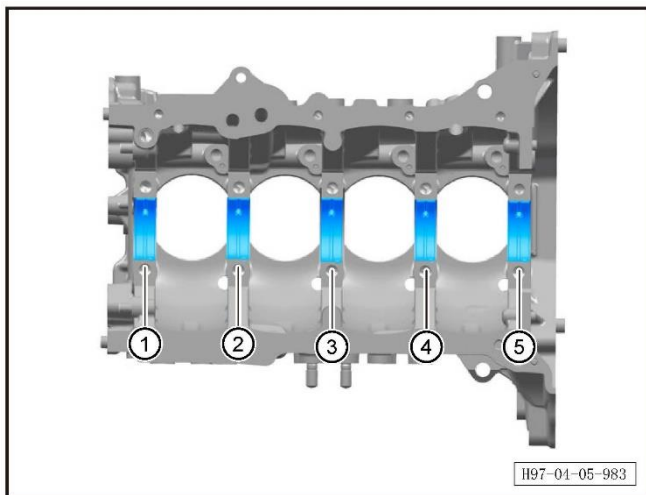
Limit value of crankshaft thrust clearance: 0.33 mm;

Standard thickness of crankshaft thrust plate: $2.5(+0.02, -0.03) \text{ mm}$.

4.5.13.7 Removal and refitting of upper main bearing bush

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
4. Remove the range extender generator assembly (refer to [4.5.17.1 Removal and refitting of range extender generator assembly](#))
5. Remove the torque limiter (refer to [4.5.13.13 Removal and refitting of torque limiter](#))
6. Remove the flywheel assembly (refer to [4.5.13.9 Removal and refitting of flywheel assembly](#))
7. Remove the piston and connecting rod assembly (refer to [4.5.13.1 Removal and refitting of piston and connecting rod assembly](#))
8. Remove the crankshaft (refer to [4.5.13.5 Removal and refitting of crankshaft](#))
9. Remove the crankshaft thrust plate (refer to [4.5.13.6 Removal and refitting of crankshaft thrust plate](#))
10. Remove the upper main bearing bush.



- a. Take out the 5 upper main bearing bushes and place them in the order marked.

CAUTION:

- The main bearing bush is divided into upper and lower main bearing bushes, which are installed on the cylinder block and the main bearing cap respectively.
- The upper main bearing bush (installed on the cylinder block) has oil holes. When refitting the main bearing bush, be careful not to refit the upper and lower bushes incorrectly.

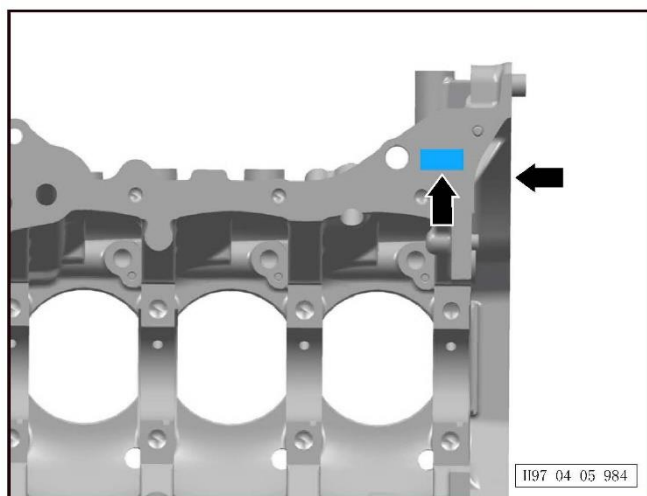
Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

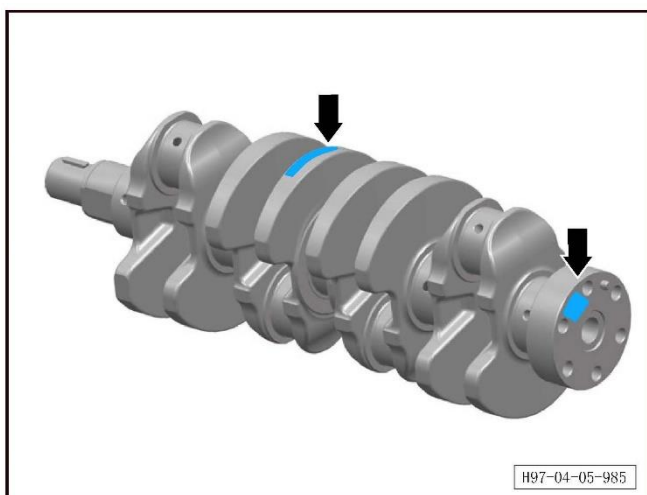
Selection of main bearing bush:

- The inner diameters of the main bearing holes are divided into three groups, marked as: A, B, C, which are printed on the specified plane on the exhaust side of the cylinder block near the range extender generator or marked on the rear end of the cylinder block in the order of the 1st to 5th main bearing holes (5 letters: XXXXX)



| Main bearing hole diameter grouping | |
|-------------------------------------|-------------------|
| Grouping identification | Dimensions (mm) |
| A | 53.000 ~ 53.006 |
| B | >53.0061 ~ 53.012 |
| C | >53.0121 ~ 53.018 |

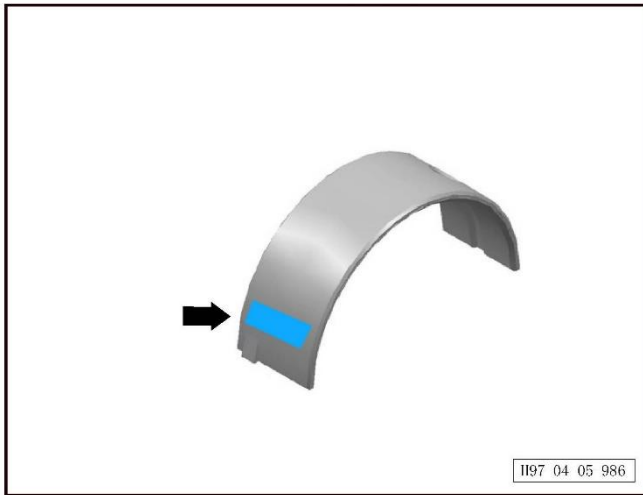
- The diameter of the crankshaft main journal is also divided into three groups, marked as: 1, 2, 3, which are printed on the outer edge surface of the fourth balance weight of the crankshaft or marked on the rear end of the crankshaft in the order of the 1st to 5th main journals (5-digit main bearing journal diameter grouping number and 4-digit connecting rod bearing diameter grouping letter).



| Spindle main journal diameter grouping | |
|--|-------------------|
| Grouping identification | Dimensions (mm) |
| 1 | >48.994 ~ 49.000 |
| 2 | >48.988 ~ 48.9939 |
| 3 | >48.982 ~ 48.9879 |

- Standard main bearing bushes are divided into five groups, marked as: 1, 2, 3, 4, 5, which are printed on the back of the bearing bushes.

- Match the main bearing bush according to the requirements in the table below to ensure the correct fit clearance.



| Main bearing bush grouping | | Crankshaft main journal diameter grouping | | |
|---|---|---|---|---|
| | | 1 | 2 | 3 |
| Main bearing hole inner diameter grouping | A | 1 | 2 | 3 |
| | B | 2 | 3 | 4 |
| | C | 3 | 4 | 5 |

- Main bearing bush clearance:
- Before checking the main bearing bush clearance, clean the bearing bush and main journal, and place a plastic plug gauge (parallel to the crankshaft) with the same width as the main bearing bush on the main journal, avoiding the oil hole. Be careful not to rotate the crankshaft when installing the plastic plug gauge.
- Refit the main bearing caps in the specified order and tighten the bolts as required.
- Take down the main bearing cap and measure its thickness with a ruler at the widest point of the plastic plug gauge. If the clearance exceeds the limit, replace the main bearing bush (the upper and lower bushes must be replaced together), and re-measure and reduce the clearance until it is acceptable.
- Standard value of main bearing bush clearance: 0.02 ~ 0.04 mm.
- Limit value of main bearing bush clearance: 0.06 mm.

Bush matching rules:

- Main bearing bush: crankshaft main journal group number (a) + cylinder block main bearing hole group (b)-1= $a+b-1$
- Connecting rod bearing bush: crankshaft connecting rod journal group number (X) + connecting rod hole diameter group (Y)-1= $X+Y-1$
- Example: The group number of crankshaft main journal is 22222 (5 main journal diameters from left to right correspond to bearing seats 1 → 5 of cylinder block);
- The group number of connecting rod journal is BBBB (4 connecting rod shaft diameters from left to right correspond to cylinder connecting rods 1 → 4 respectively);
- The group number of the main bearing holes of the cylinder block is BBBBA (corresponding to bearing holes 1 → 5 of cylinder block from left to right)
- The group number of the connecting rod hole diameter is 2222 (the connecting rod hole diameter of the same engine is grouped identically)
- Main bearing: first gas ring: $2+B(2)-1=3$; second track: $2+B(2)-1=3$ # fifth gas ring: $2+A(1)-1=2$ #;
- Connecting rod bearing bush: cylinder 1# : $B(2)+2-1=3$; cylinder 2# : $B(2)+2-1=3$ #.....

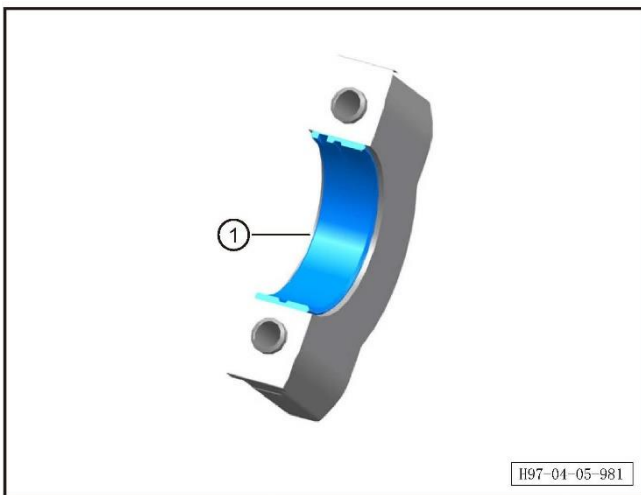
Note: Letter grouping number A=1, B=2, C=3.

4.5.13.8 Removal and refitting of lower main bearing bush

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
4. Remove the range extender generator assembly (refer to [4.5.17.1 Removal and refitting of range extender generator assembly](#))
5. Remove the torque limiter (refer to [4.5.13.13 Removal and refitting of torque limiter](#))
6. Remove the flywheel assembly (refer to [4.5.13.9 Removal and refitting of flywheel assembly](#))
7. Remove the piston and connecting rod assembly (refer to [4.5.13.1 Removal and refitting of piston and connecting rod assembly](#))
8. Remove the crankshaft (refer to [4.5.13.5 Removal and refitting of crankshaft](#))
9. Remove the crankshaft thrust plate (refer to [4.5.13.6 Removal and refitting of crankshaft thrust plate](#))
10. Remove the lower main bearing bush.

- a. Take out 1 lower main bearing bush in each crankshaft bearing bush cap, with a total of 5 lower main bearing bushes①.



Refitting procedure

The refitting procedure is performed in reverse order.

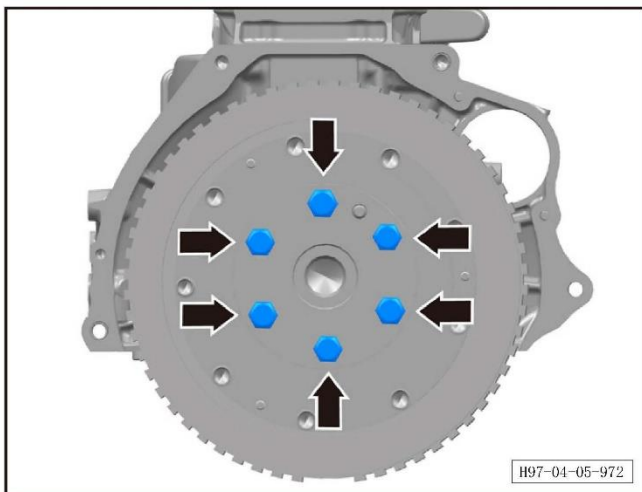
- The main bearing bush is divided into upper and lower main bearing bushes, which are installed on the cylinder block and the main bearing cap respectively.
- The upper main bearing bush (installed on the cylinder block) has oil holes. When refitting the main bearing bush, be careful not to refit the upper and lower bushes incorrectly.
- Standard main bearing bushes are divided into five groups, marked as: 1, 2, 3, 4, 5, which are printed on the back of the bearing bushes.
- Match the main bearing bush according to the requirements in the table below to ensure the correct fit clearance.

| Main bearing bush grouping | | Crankshaft main journal diameter grouping | | |
|---|---|---|---|---|
| | | 1 | 2 | 3 |
| Main bearing hole inner diameter grouping | A | 1 | 2 | 3 |
| | B | 2 | 3 | 4 |
| | C | 3 | 4 | 5 |

4.5.13.9 Removal and refitting of flywheel assembly

Removal procedure

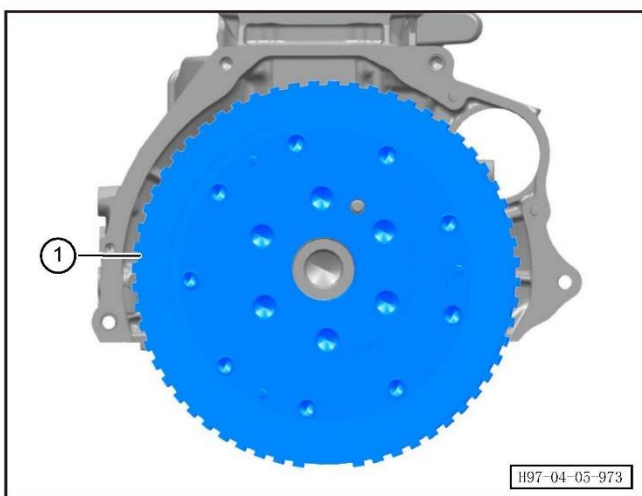
1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
4. Remove the generator assembly (refer to [4.5.17.1 Removal and refitting of range extender generator assembly](#))
5. Remove the torque limiter (refer to [4.5.13.13 Removal and refitting of torque limiter](#))
6. Remove the flywheel assembly.



- a. Unscrew 6 bolts connecting the flywheel assembly to the crankshaft.

CAUTION:

- Tighten the flywheel bolts evenly in 2 to 3 steps to the specified torque value of $74\pm 2\text{Nm}$.



- b. Take down the flywheel assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

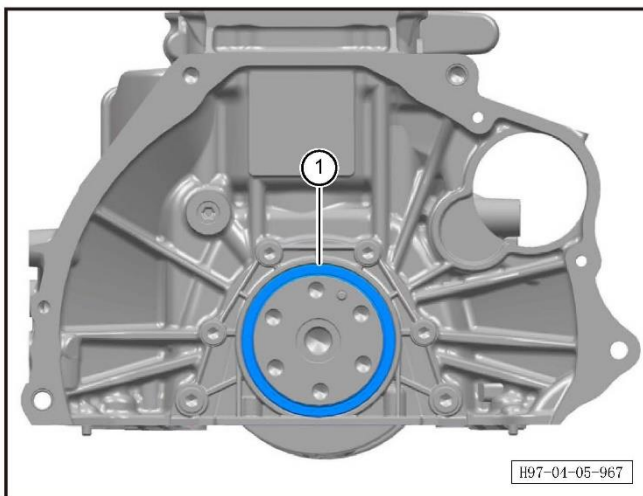
CAUTION:

- If a bolt breaks while removing the assembly, pull out the broken bolt and replace it with a new one.
- Spline bolts are used to fix the flywheel. Pay attention to the correct selection of tools to avoid damage to the bolts. In case of damage, the bolts need to be replaced with new ones.
- The concave-convex groove on the outer ring of the flywheel is the signal groove of the crankshaft position sensor. It is forbidden to use any tools to damage the surface of the groove.
- Check the flywheel: If the signal ring gear is damaged, broken or deformed, the flywheel should be replaced.
- When removing or refitting the flywheel, lock the flywheel body with a special tool, and be careful not to fix the groove surface.

4.5.13.10 Inspection of crankshaft rear oil seal

Removal procedure

1. Remove the range extender generator assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
3. Remove the flywheel assembly (refer to [4.5.13.9 Removal and refitting of flywheel assembly](#))
4. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
5. Check the crankshaft rear oil seal.



- a. Check whether there are burrs on the edge of crankshaft rear oil seal ①.
- b. Check whether there is oil leakage on the contact surface between the crankshaft rear oil seal and the rear end cover housing.
- c. Remove the rear end cover assembly and check the oil seal lip and oil seal spring in the crankshaft rear end cover for defects or damage.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- Assemble the crankshaft rear oil seal and the rear end cover body tightly. Do not remove and replace the oil seal separately to avoid damage to the inner ring surface of the rear end cover body.
- The rear end cover assembly must be removed to check the oil seal lip and oil seal spring in the crankshaft rear end cover for defects or damage; if any, they should be replaced in time.
- To remove the rear end cover, the oil sump assembly must be removed. When refitting, the contact surface between the oil sump assembly and the rear end cover must be applied with sealant.

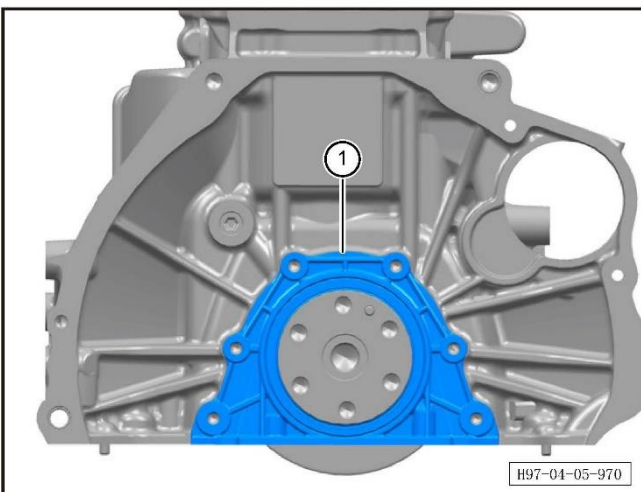
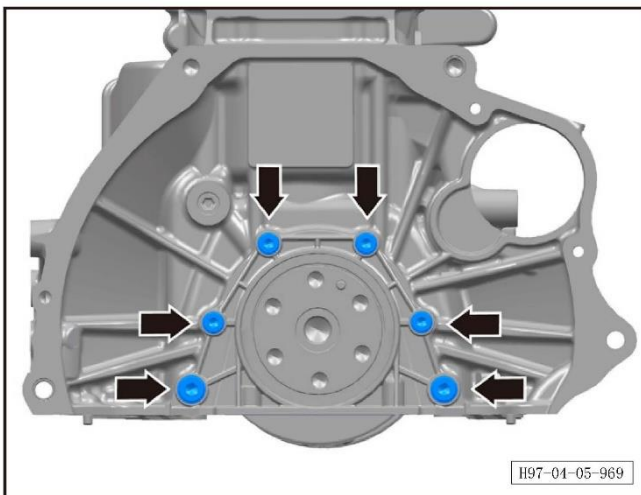
4.5.13.11 Removal and refitting of crankshaft rear end cover assembly

Removal procedure

1. Remove the range extender generator assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
3. Remove the flywheel assembly (refer to [4.5.13.9 Removal and refitting of flywheel assembly](#))
4. Remove the crankshaft rear oil seal (refer to [4.5.13.11 Removal and refitting of crankshaft rear end cover assembly](#))
5. Remove the crankshaft rear end cover assembly.

- a. Unscrew 6 bolts connecting the crankshaft rear end cover assembly to the cylinder block.

Tightening torque of bolt: $15 \pm 1 \text{ Nm}$.



- b. Remove the crankshaft rear end cover assembly ①.

CAUTION:

- Check the main bearing bush for rust, scratches, wear or damage.
- If any defect is found, replace the upper and lower main bearing bushes at the same time.

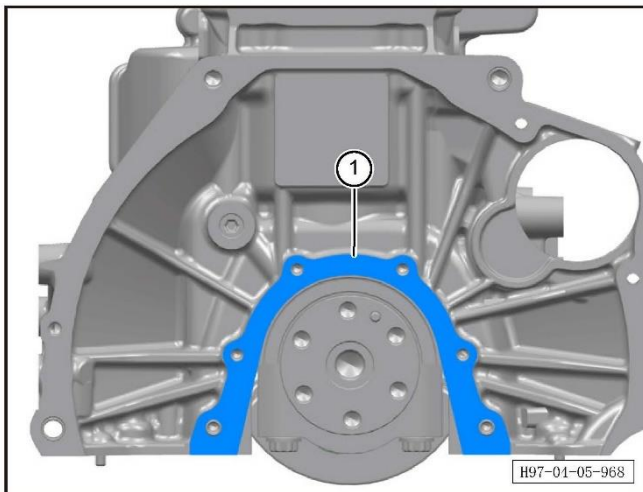
Refitting procedure

The refitting procedure is performed in reverse order.

4.5.13.12 Removal and refitting of crankshaft rear end cover gasket

Removal procedure

1. Remove the range extender generator assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the cylinder head assembly (refer to [4.5.12.15 Removal and refitting of cylinder head assembly](#))
3. Remove the flywheel assembly (refer to [4.5.13.9 Removal and refitting of flywheel assembly](#))
4. Remove the crankshaft rear oil seal (refer to [4.5.13.11 Removal and refitting of crankshaft rear end cover assembly](#))
5. Remove the crankshaft rear oil seal (refer to [4.5.13.11 Removal and refitting of crankshaft rear end cover assembly](#))
6. Remove the crankshaft rear end cover gasket.
 - a. Take down the crankshaft rear end cover gasket.



Refitting procedure

The refitting procedure is performed in reverse order.

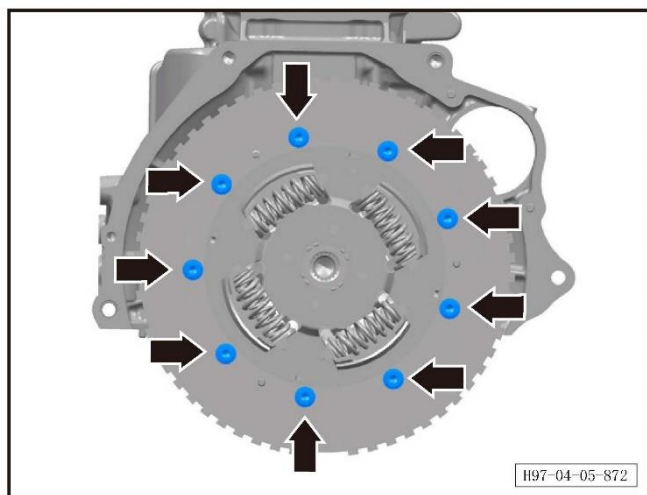
4.5.13.13 Removal and refitting of torque limiter

Removal procedure

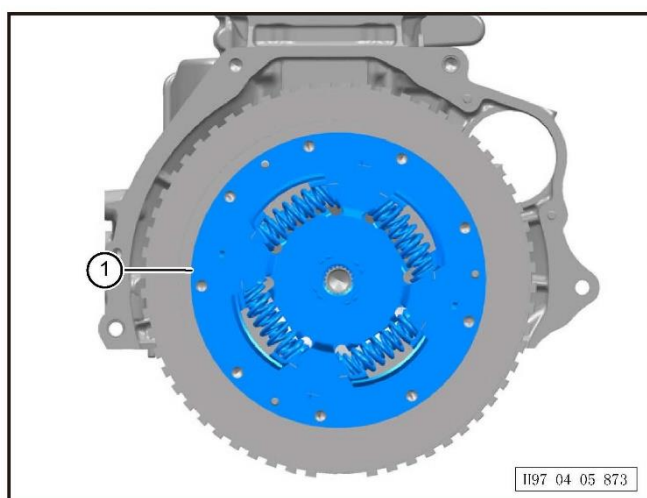
1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the generator assembly (refer to [4.5.17.1 Removal and refitting of range extender generator assembly](#))
3. Remove the torque limiter.

a. Unscrew 9 bolts on the torque limiter.

Tightening torque of bolt: $20 \pm 2 \text{ Nm}$.



b. Take down the torque limiter ①.



Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

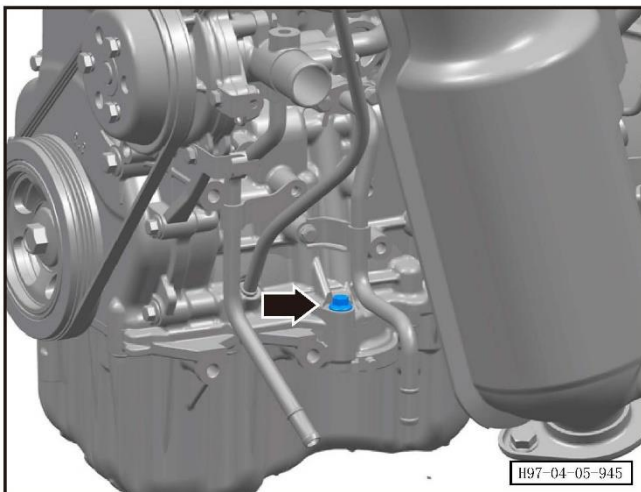
- When refitting the torque limiter, align the dowel pin holes.

4.5.14 Oil sump and lubrication assembly

4.5.14.1 Removal and refitting of oil sump assembly

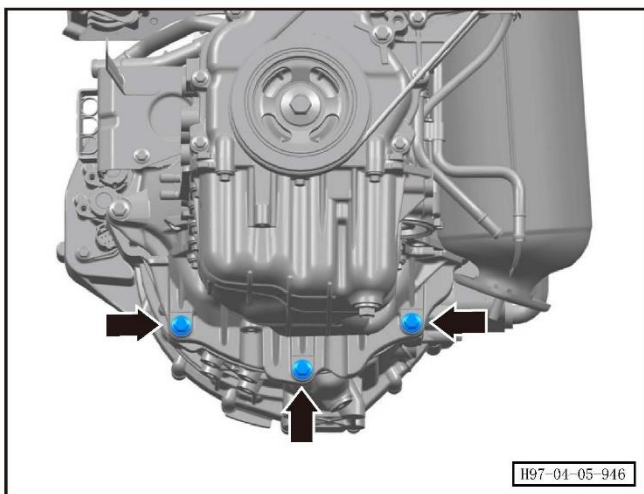
Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil filter assembly (refer to [4.5.14.3 Replacement of oil and removal and refitting of oil filter assembly](#))
3. Remove the oil radiator (refer to [4.5.14.6 Removal and refitting of oil radiator](#))
4. Remove the oil level gauge assembly (refer to [4.5.14.11 Removal and refitting of oil level gauge assembly](#))
5. Remove the compressor bracket assembly (refer to [4.5.19.1 Removal and refitting of compressor bracket](#))
6. Remove and refit the oil sump assembly.



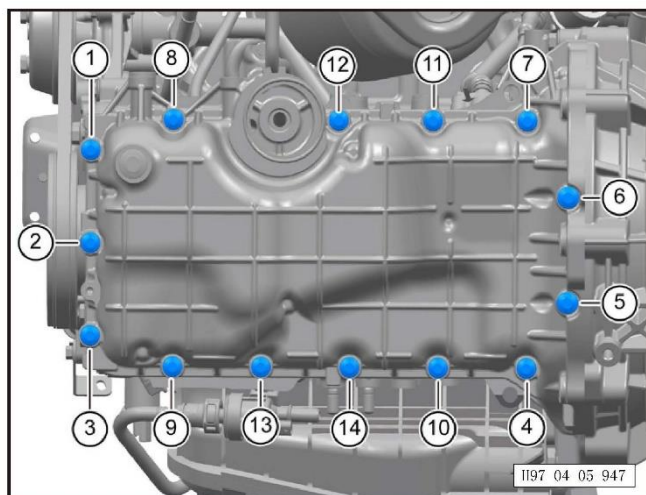
- a. Unscrew one bolt connecting the oil radiator upper housing to the cylinder block.

Tightening torque of bolt: $15\pm 1\text{Nm}$.



- b. Unscrew the 3 bolts connecting the side of the oil sump assembly to the generator assembly.

Tightening torque of bolt: $15\pm 1\text{Nm}$.

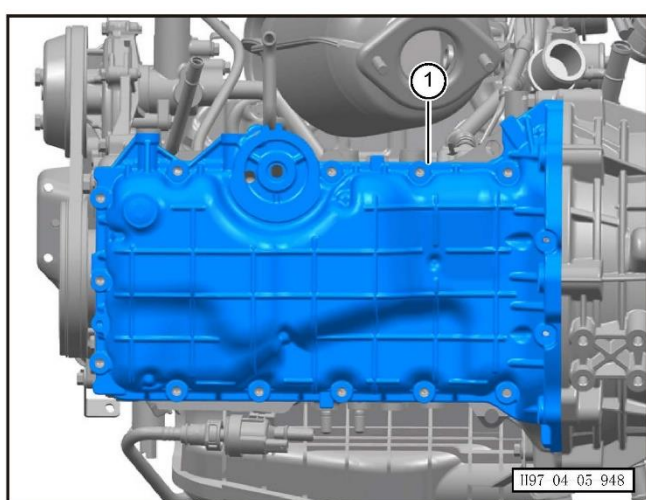


c. Unscrew the 14 bolts at the bottom of the oil sump assembly in the order marked ① - ⑭.

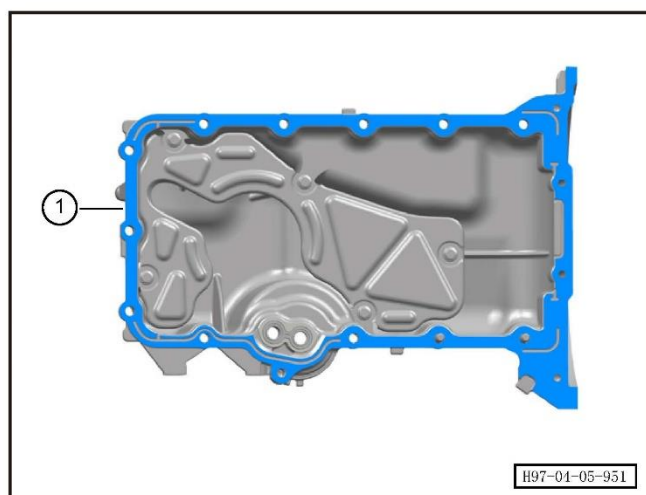
Tightening torque of bolt: $15\pm 1\text{Nm}$.

CAUTION:

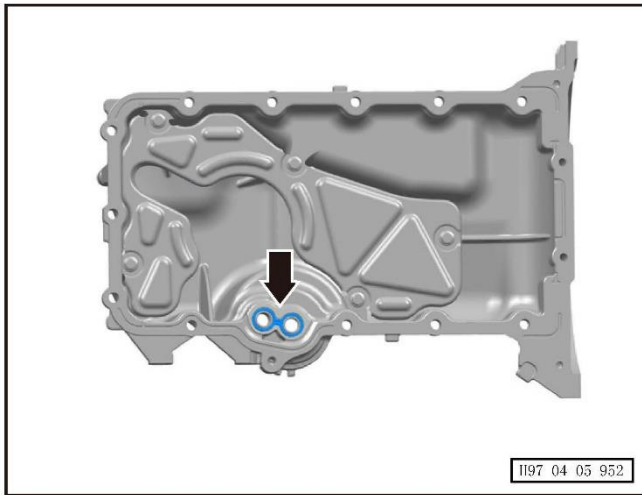
- The lengths of bolts ⑤ and ⑥ in the oil sump are different from that of other bolts.



d. Take down the oil sump assembly ①.



e. Take down the oil sump gasket ①, and clean the contact surface between the oil sump and the cylinder block.



f. Take down the seal ring between the oil passage hole of the oil radiator base in the oil sump and the cylinder block, and clean the oil sump assembly.

Refitting procedure

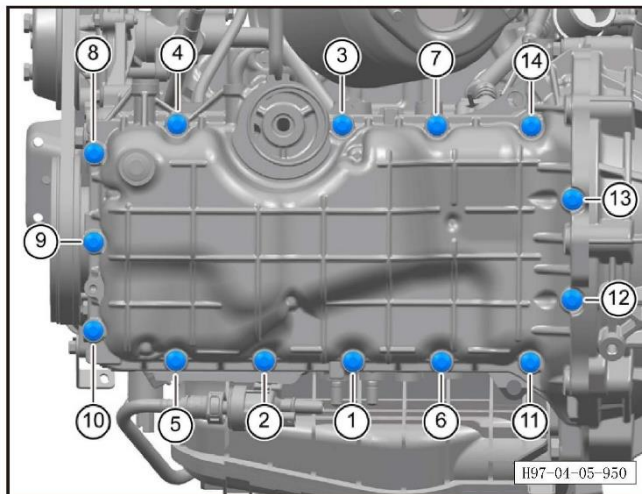
The refitting procedure is performed in reverse order.

CAUTION:

a. Refit the 14 bolts at the bottom of the oil sump assembly in the order marked ① - ⑭.

Tightening torque of bolt: $15 \pm 1 \text{ Nm}$.

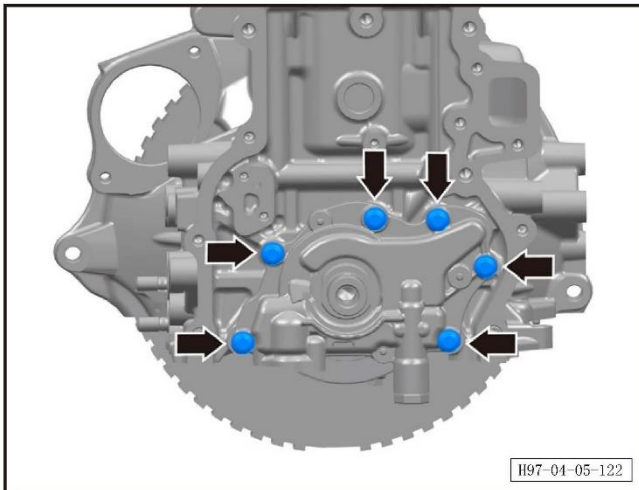
- Before removing the oil sump assembly, the oil in the engine must be drained.
- If a bolt breaks while removing the assembly, pull out the broken bolt and replace it with a new one.
- After removing the oil sump assembly, clean the lower surface of the crankcase and the surface of the oil sump assembly.
- When removing and refitting the oil pan assembly, follow the sequence of bolt markings. Pay attention to distinguish the different positions and lengths of the oil sump bolts.
- When refitting the oil sump assembly, replace the gasket with a new one after cleaning.
- Refit and position the oil sump on the cylinder block within 3 minutes of applying the sealant.
- The oil sump must be tightened to the final torque specification within 30 minutes of applying the sealant.
- Oil make: SAE 5W-30;
- API quality grade: SN and above;
- Oil filling amount: 4L.

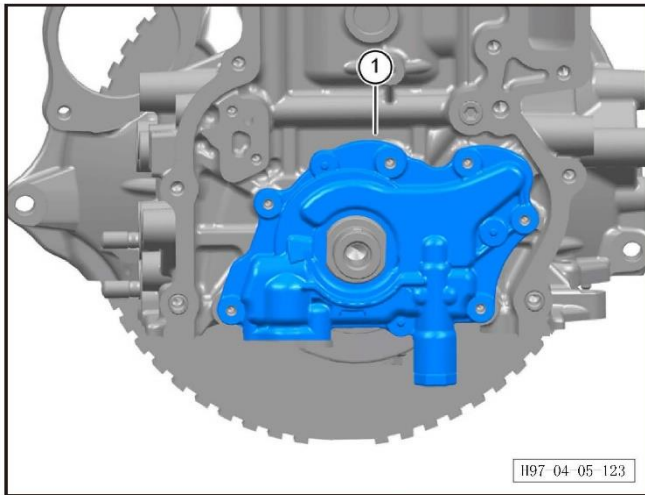


4.5.14.2 Removal and refitting of oil pump assembly

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the timing chain cover assembly (refer to [4.5.11.8 Removal and refitting of timing chain cover assembly](#))
4. Align the timing chain markers (refer to [4.5.11.9 Alignment of timing chain marker points](#))
5. Remove the hydraulic tensioner. (refer to [4.5.11.10 Removal and refitting of hydraulic tensioner](#))
6. Remove the timing chain tensioner rail (refer to [4.5.11.11 Removal and refitting of timing chain tensioner rail](#))
7. Remove the timing chain (refer to [4.5.11.12 Removal and refitting of timing chain](#))
8. Remove the timing chain (refer to [4.5.11.16 Removal and refitting of crankshaft timing sprocket](#))
9. Remove the timing chain guide rail assembly (refer to [4.5.11.13 Removal and refitting of timing chain guide rail assembly](#))
10. Remove the oil pump assembly.
 - a. Unscrew the 6 bolts that secure the oil pump.
Tightening torque of bolt: $12\pm 1\text{Nm}$.





b. Take down the oil pump assembly ①.

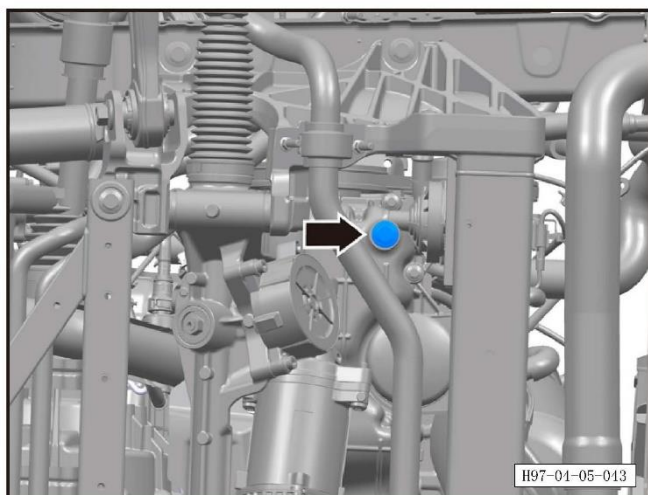
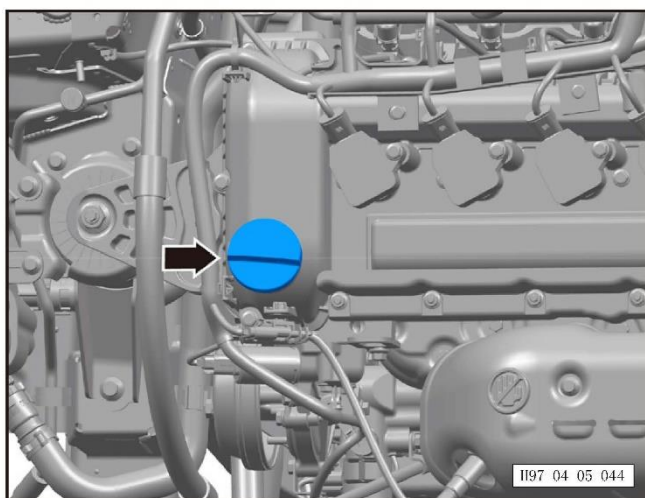
Refitting procedure

The refitting procedure is performed in reverse order.

4.5.14.3 Replacement of oil and removal and refitting of oil filter assembly

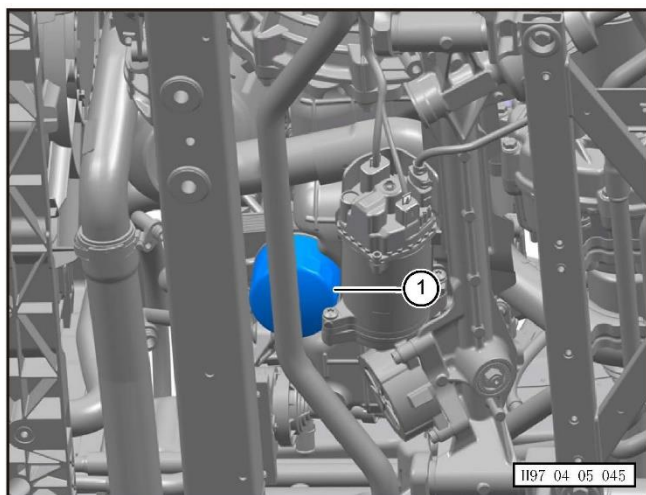
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
6. Replace the oil and oil filter.
 - a. Open the oil filler cap.



- b. Lift the vehicle, unscrew the oil sump drain bolt, and drain the old oil.

Tightening torque of bolt: $30 \pm 3 \text{ Nm}$.



c. Remove and discard the oil filter assembly ①.
Tightening torque of oil filter assembly: $23\pm 2\text{Nm}$.

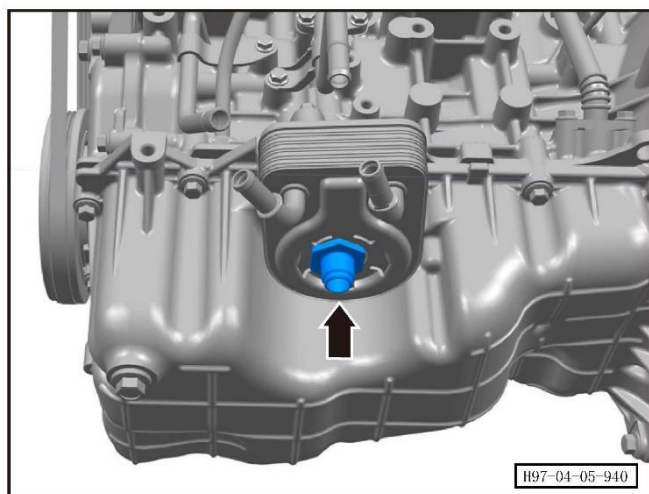
Refitting procedure

Refit in reverse order of removal and add 4L of new oil.

Note:

- Before refitting the oil filter, check that the connecting pipe is in place.

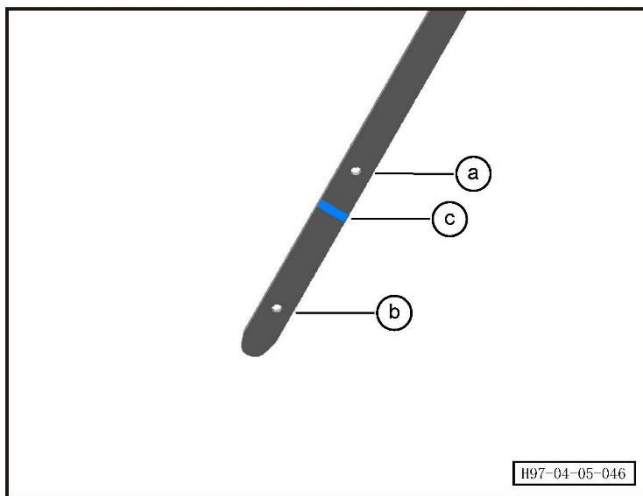
Tightening torque of connecting pipe: $45\pm 5\text{Nm}$.





- Before installing a new oil filter, apply clean oil to the seal ring.
- Tighten the oil filter by hand so that the seal ring is against the mounting surface, then tighten with the tool.

Tightening torque of oil filter: $23\pm 2\text{Nm}$.



- Check the final oil level, which should be approximately at position c.
 - Position a is the upper limit of the oil filling amount, position b is the lower limit of the oil filling amount, and position c is the position of the standard oil filling amount.
 - Oil filling amount: 4L.
 - Oil type: SAE 5W-30.
- API quality grade: SN and above.

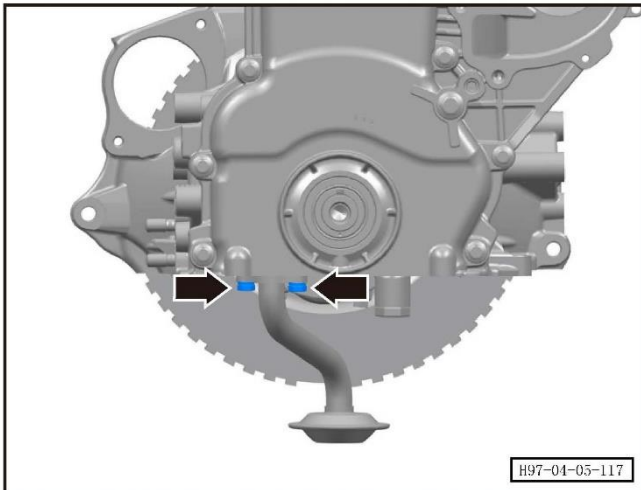
4.5.14.4 Removal and refitting of oil strainer assembly

Removal procedure

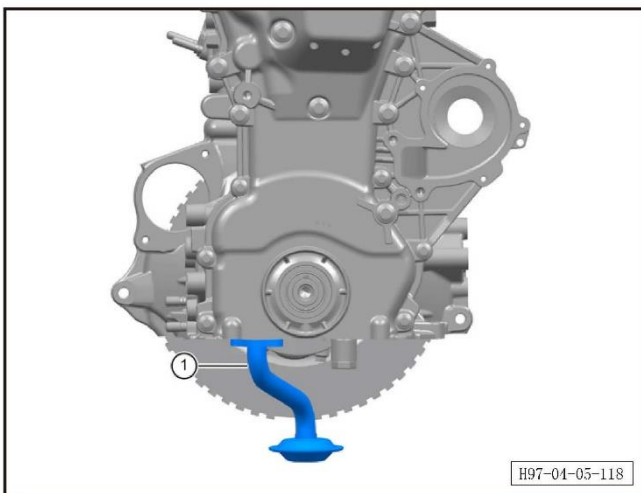
1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the oil strainer assembly.

a. Unscrew the 2 bolts that secure the oil strainer.

Tightening torque of bolt: $12\pm 1\text{Nm}$.



b. Take down the oil strainer assembly ①.



Refitting procedure

The refitting procedure is performed in reverse order.

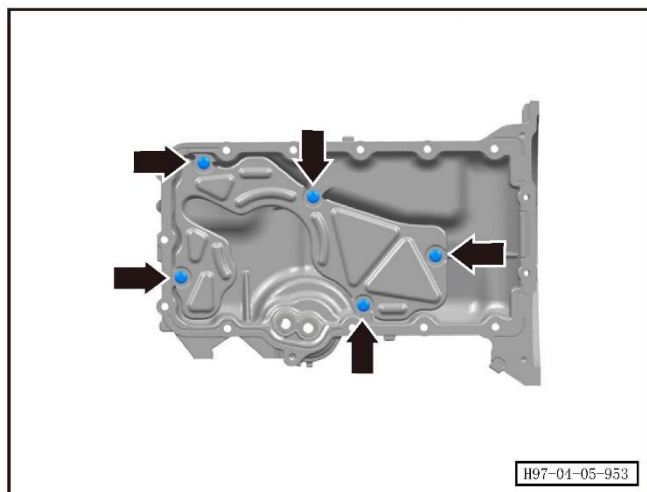
4.5.14.5 Removal and refitting of oil baffle assembly

Removal procedure

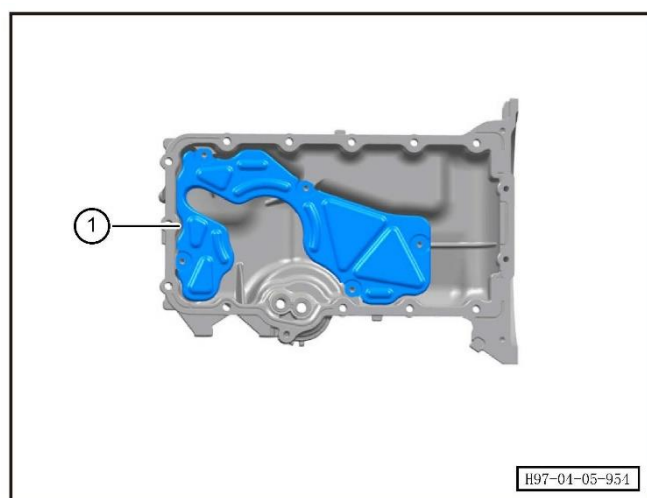
1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the oil sump assembly (refer to [4.5.14.1 Removal and refitting of oil sump assembly](#))
3. Remove the oil baffle assembly.

a. Unscrew 5 bolts connecting the oil baffle to the oil sump.

Tightening torque of bolt: $12\pm 1\text{Nm}$.



b. Take out the oil baffle assembly ①.



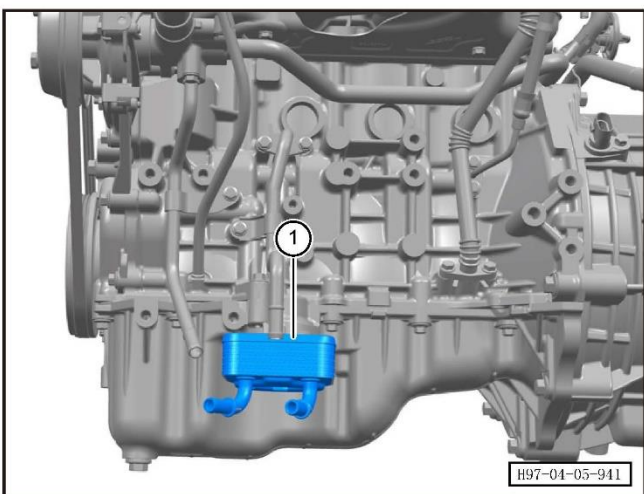
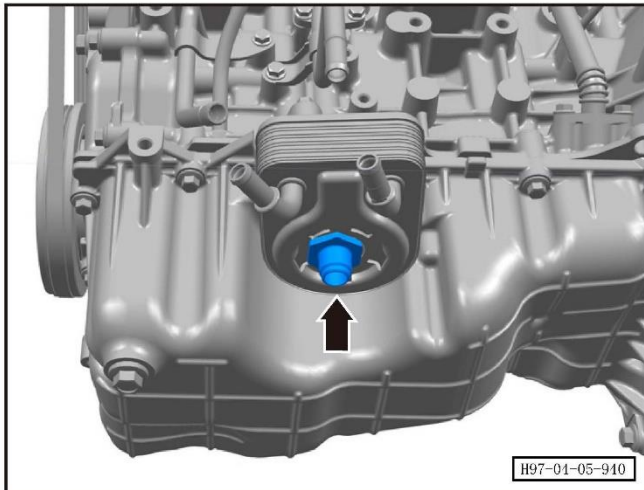
Refitting procedure

The refitting procedure is performed in reverse order.

4.5.14.6 Removal and refitting of oil radiator

Removal procedure

1. Drain the engine oil.
2. Remove the oil filter assembly (refer to [4.5.14.3 Replacement of oil and removal and refitting of oil filter assembly](#))
3. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
4. Remove the oil radiator water inlet hose (refer to [4.5.14.7 Removal and refitting of oil radiator water inlet hose](#))
5. Remove the oil radiator water outlet hose (refer to [4.5.14.8 Removal and refitting of oil radiator water outlet hose](#))
6. Remove the oil radiator assembly.
 - a. Unscrew the connecting pipe bolts between the oil sump assembly and the center of the oil radiator.
Tightening torque of connecting pipe bolt: $45\pm 5\text{Nm}$.



- b. Remove the oil radiator assembly ①.

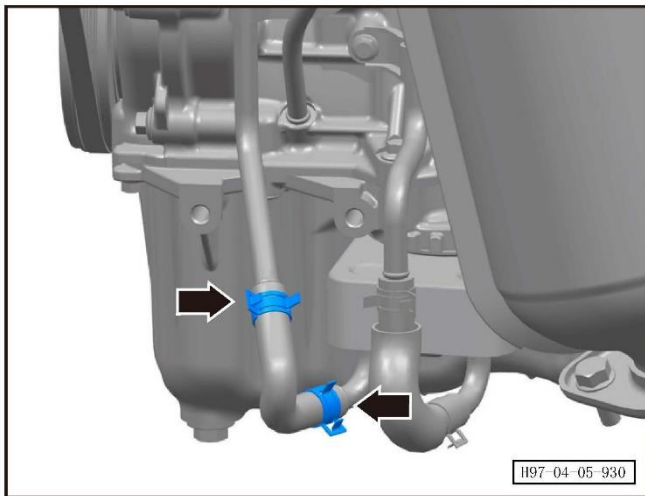
Refitting procedure

The refitting procedure is performed in reverse order.

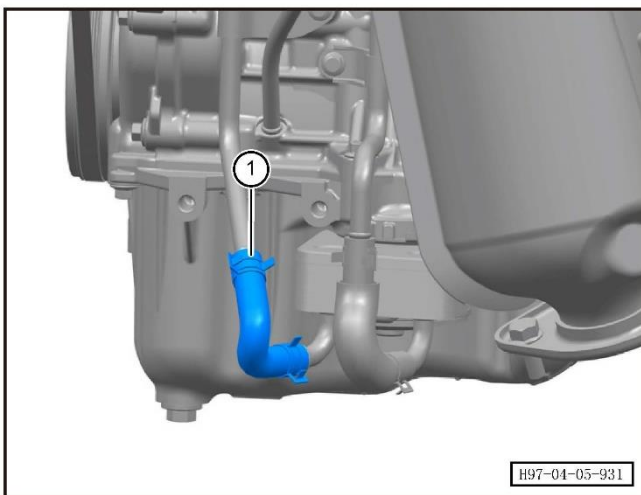
4.5.14.7 Removal and refitting of oil radiator water inlet hose

Removal procedure

1. Drain the engine oil.
2. Remove the oil filter assembly (refer to [4.5.14.3 Replacement of oil and removal and refitting of oil filter assembly](#))
3. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
4. Remove the oil radiator water inlet hose.
 - a. Loosen the clamps on both ends of the oil radiator water inlet hose.



- b. Remove the oil radiator water inlet hose ①.



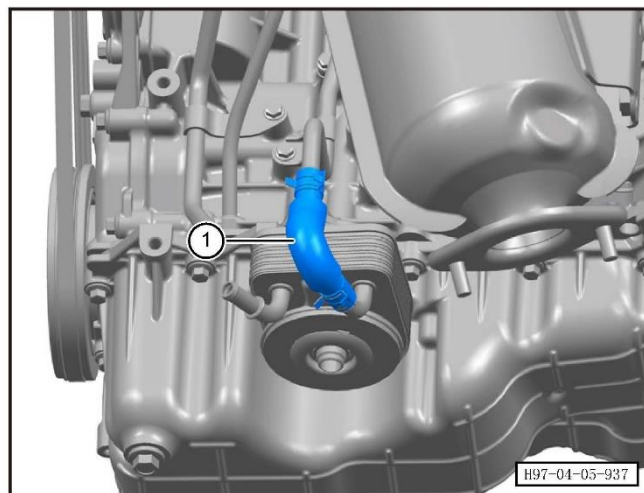
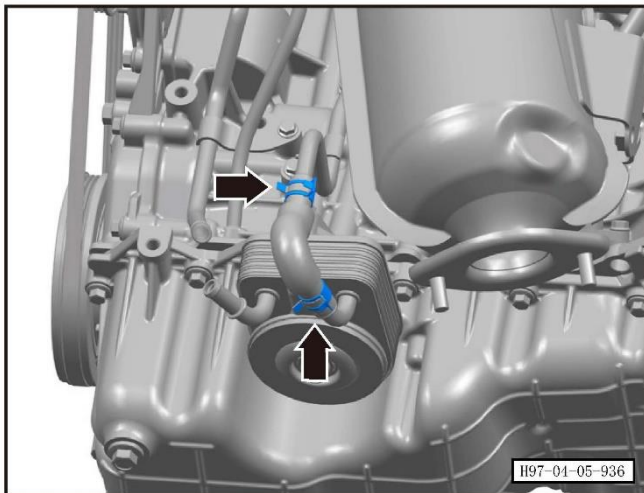
Refitting procedure

The refitting procedure is performed in reverse order.

4.5.14.8 Removal and refitting of oil radiator water outlet hose

Removal procedure

1. Drain the engine oil.
2. Remove the oil filter assembly (refer to [4.5.14.3 Replacement of oil and removal and refitting of oil filter assembly](#))
3. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
4. Remove the oil radiator water outlet hose.
 - a. Loosen the clamps on both ends of the oil radiator water outlet hose.



- b. Remove the oil radiator water outlet hose ①.

Refitting procedure

The refitting procedure is performed in reverse order.

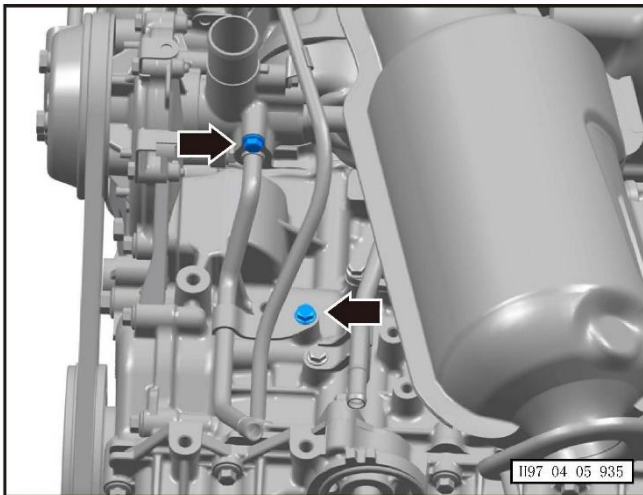
4.5.14.9 Removal and refitting of oil radiator water inlet pipe

Removal procedure

1. Drain the engine oil.
2. Remove the oil filter assembly (refer to [4.5.14.3 Replacement of oil and removal and refitting of oil filter assembly](#))
3. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
4. Remove the oil radiator water inlet hose (refer to [4.5.14.7 Removal and refitting of oil radiator water inlet hose](#))
5. Remove the oil radiator water inlet pipe.

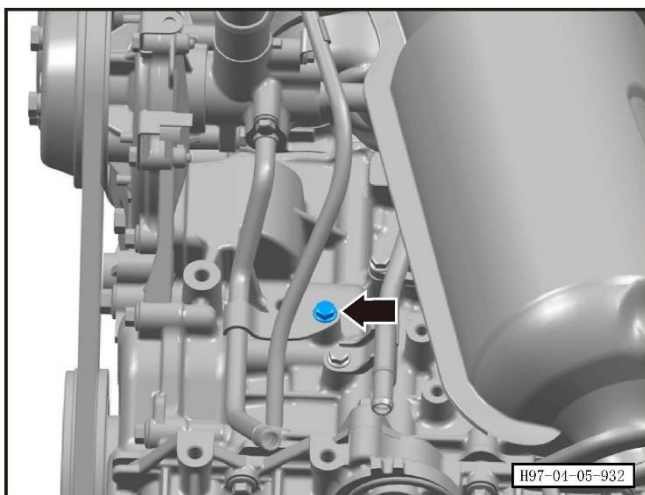
- a. Loosen the 2 bolts on the oil radiator water inlet pipe bracket.

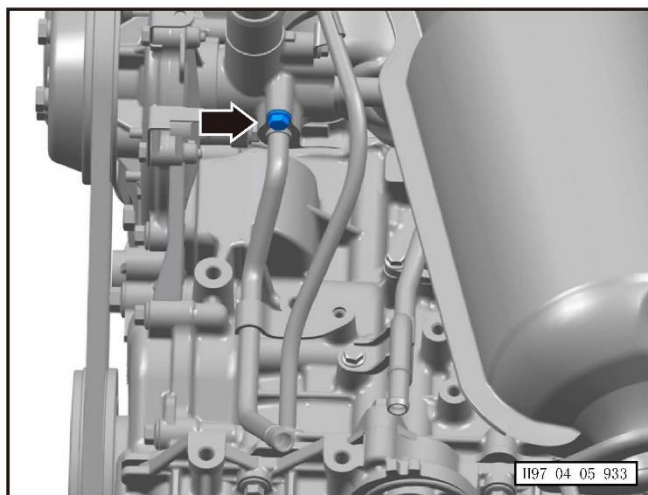
Tightening torque of bolt: $12\pm 1\text{Nm}$.



- b. Unscrew 1 bolt on the oil radiator water inlet pipe bracket.

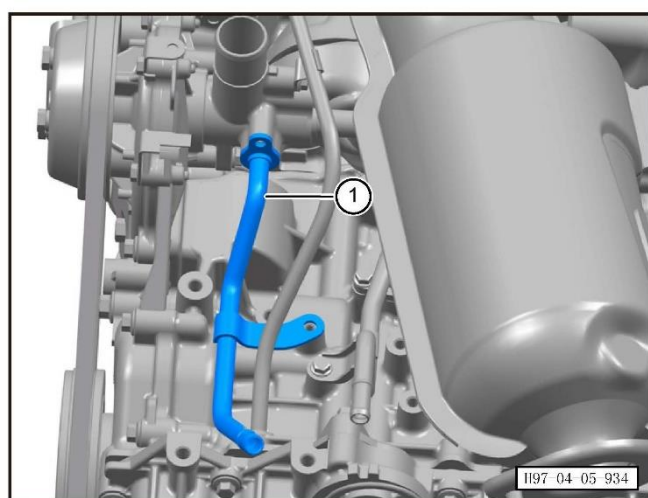
Tightening torque of bolt: $12\pm 1\text{Nm}$.





c. Unscrew a bolt connecting the oil radiator water inlet pipe and the water pump housing.

Tightening torque of bolt: $12\pm 1\text{Nm}$.



d. Remove the oil radiator water inlet pipe assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

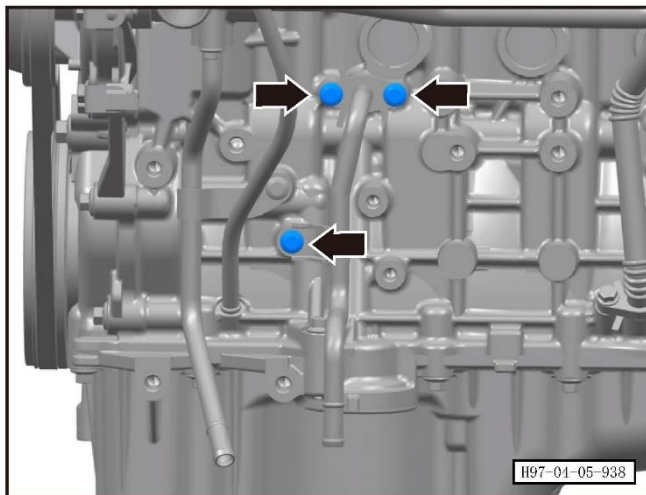
CAUTION:

- When refitting the oil radiator water inlet pipe, the seal ring must be replaced with a new one.

4.5.14.10 Removal and refitting of oil radiator water outlet pipe

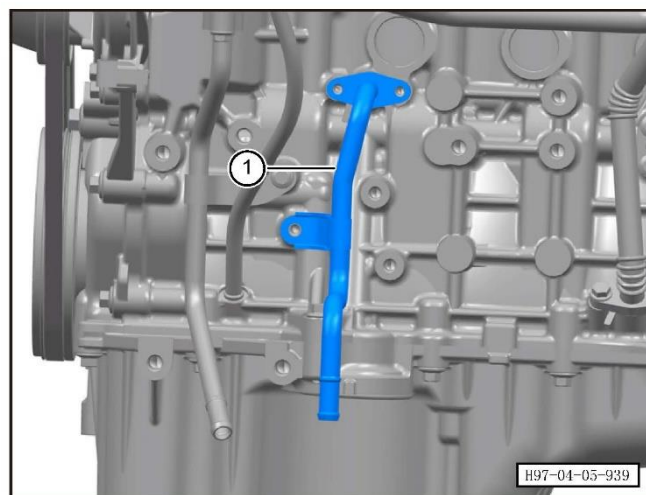
Removal procedure

1. Drain the engine oil.
2. Remove the oil filter assembly (refer to [4.5.14.3 Replacement of oil and removal and refitting of oil filter assembly](#))
3. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
4. Remove the oil radiator water outlet hose (refer to [4.5.14.8 Removal and refitting of oil radiator water outlet hose](#))
5. Remove the oil radiator water outlet pipe.



- a. Unscrew the 3 bolts on the oil radiator water outlet pipe bracket.

Tightening torque of bolt: $12\pm 1\text{Nm}$.



- b. Take out the oil radiator water outlet pipe assembly ①.

CAUTION:

- When refitting the oil radiator water outlet pipe, the seal ring must be replaced with a new one.

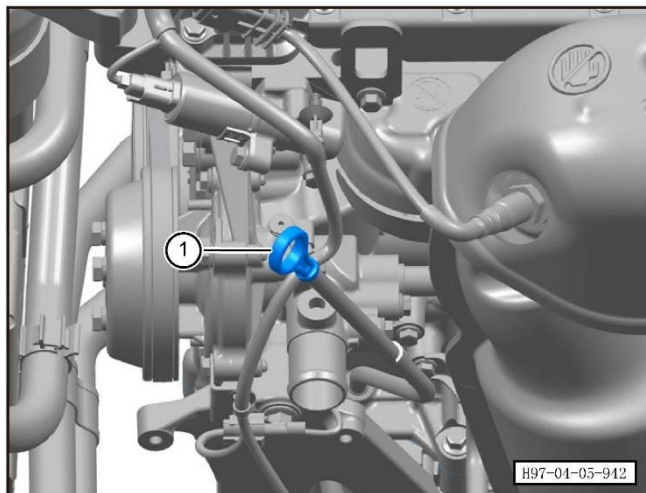
Refitting procedure

The refitting procedure is performed in reverse order.

4.5.14.11 Removal and refitting of oil level gauge assembly

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the oil level gauge assembly.
 - a. Take out the oil level gauge assembly ①.



Refitting procedure

The refitting procedure is performed in reverse order.

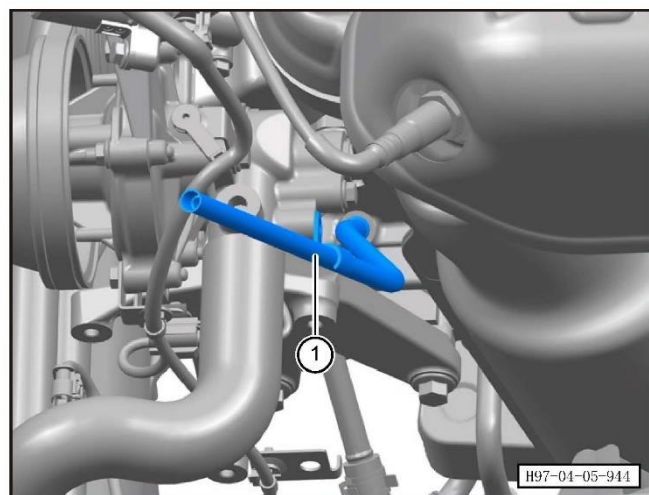
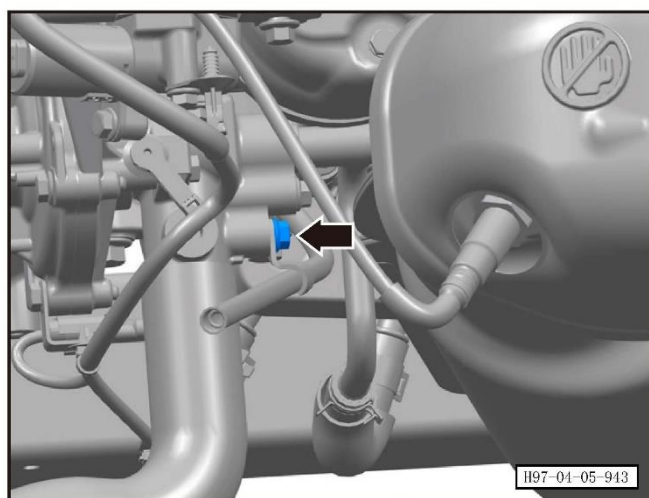
4.5.14.12 Removal and refitting of oil level gauge conduit assembly

Removal procedure

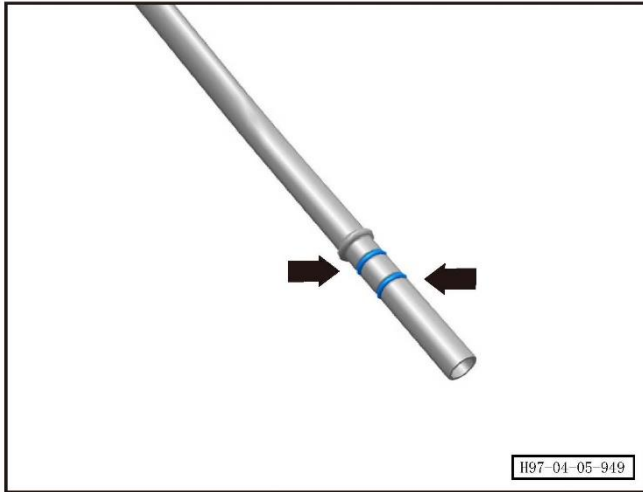
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the oil level gauge assembly (refer to [4.5.14.11 Removal and refitting of oil level gauge assembly](#))
6. Remove the oil level gauge conduit assembly.

- a. Unscrew 1 bolt of the oil level gauge conduit assembly.

Tightening torque of bolt: $12\pm 1\text{Nm}$.



- b. Take out the oil level gauge conduit assembly ①.



c. Replace the 2 seal rings of the oil level gauge conduit assembly with new ones.

Refitting procedure

The refitting procedure is performed in reverse order.

4.5.15 Range extender mounting assembly

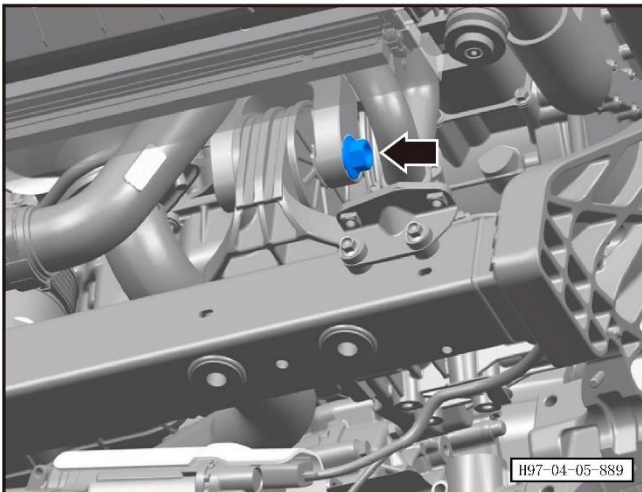
4.5.15.1 Removal and refitting of powertrain mounting front cushion

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Lift the vehicle.
6. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
7. Remove the powertrain mounting front cushion.

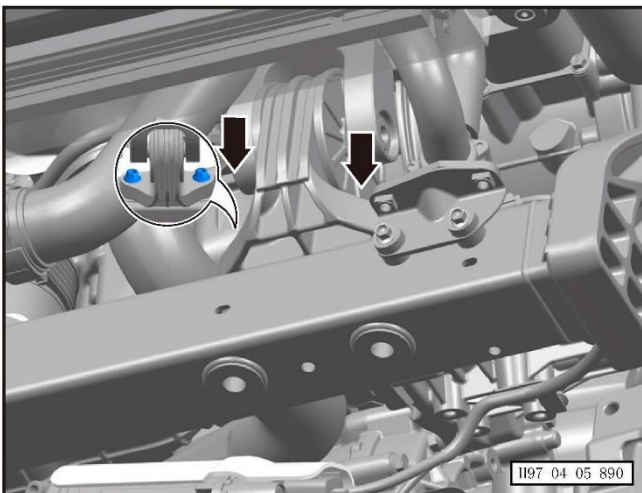
- a. Unscrew 1 bolt connecting the powertrain mounting front cushion to the front bracket.

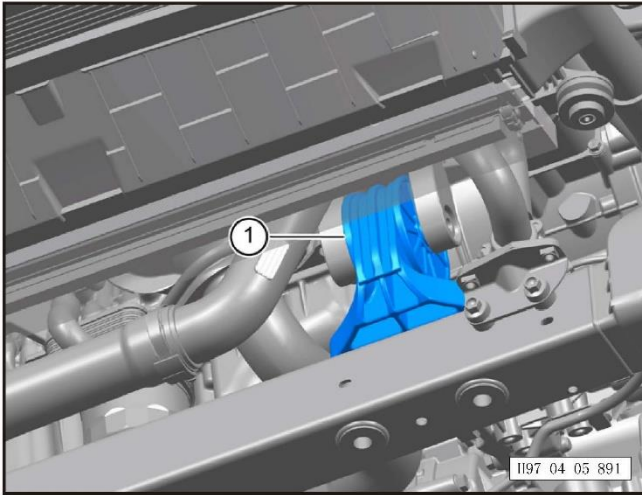
Tightening torque of bolt: $65\pm 10\text{Nm}$.



- b. Unscrew the 2 bolts connecting the powertrain mounting front cushion to the front subframe assembly.

Tightening torque of bolt: $110\pm 16\text{Nm}$.





c. Take out the powertrain mounting front cushion ①.

Refitting procedure

The refitting procedure is performed in reverse order.

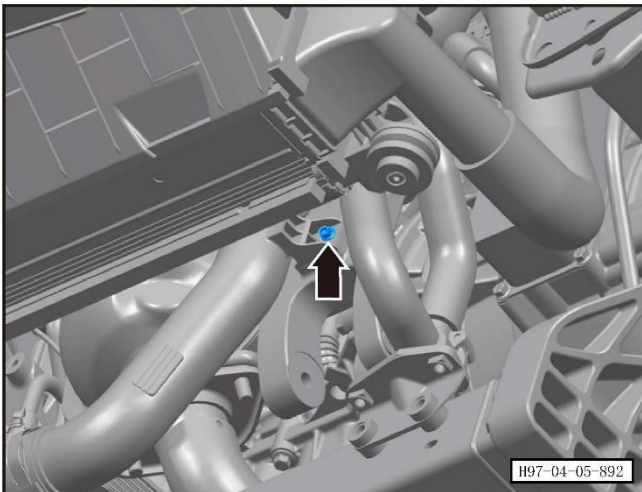
4.5.15.2 Removal and refitting of powertrain mounting front bracket

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Lift the vehicle.
6. Remove the front lower protective plate (refer to [8.6.4.3 Removal and refitting of front lower protective plate \(REV\)](#))
7. Remove the powertrain mounting front cushion (refer to [4.5.15.1 Removal and refitting of powertrain mounting front cushion](#))
8. Remove the powertrain mounting front bracket.

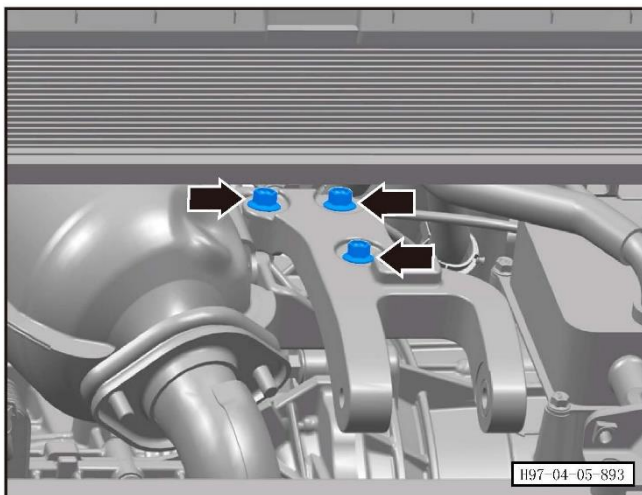
- a. Unscrew 1 bolt connecting the powertrain mounting front bracket to the intercooler air inlet pipe.

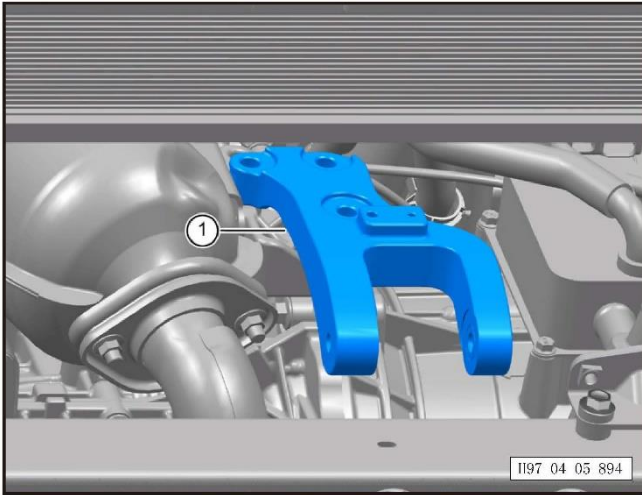
Tightening torque of bolt: $10\pm 1\text{Nm}$.



- b. Unscrew 3 bolts on the powertrain mounting front bracket.

Tightening torque of bolt: $65\pm 10\text{Nm}$.





c. Take out the powertrain mounting front bracket ①.

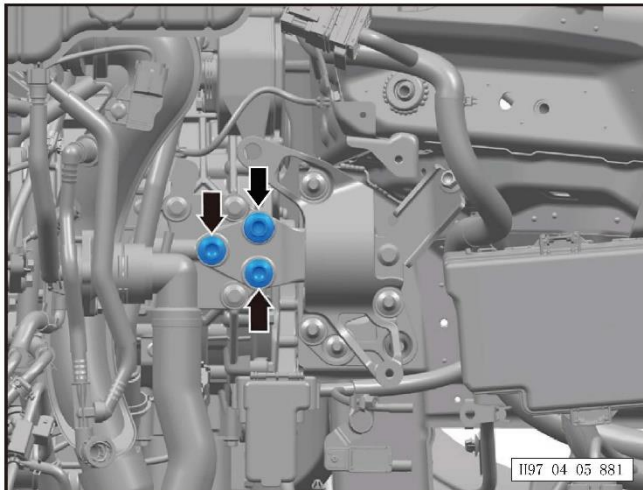
Refitting procedure

The refitting procedure is performed in reverse order.

4.5.15.3 Removal and refitting of left mounting cushion assembly

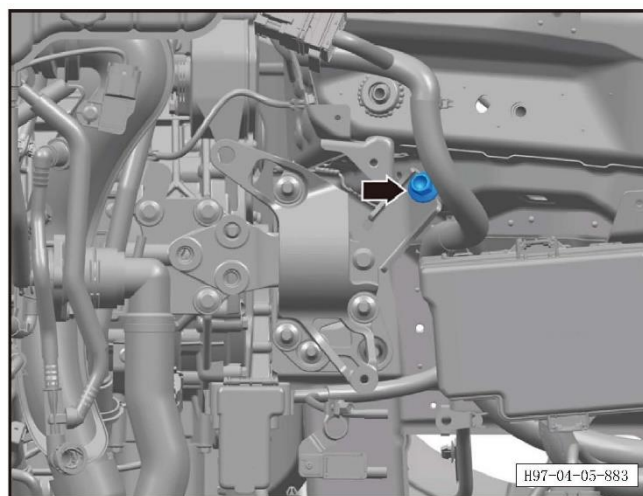
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
6. Remove the air filter lower rubber block (refer to [4.1.8.4 Removal and refitting of air filter rubber block](#))
7. Secure the range extender assembly with the engine hanger tool.
8. Remove the engine left mounting cushion assembly.



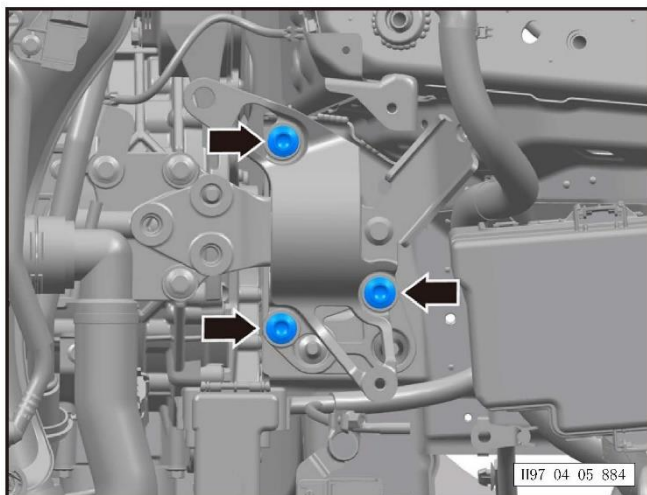
- a. Unscrew 3 bolts of the left mounting cushion assembly.

Tightening torque of bolt: $110\pm 16\text{Nm}$.



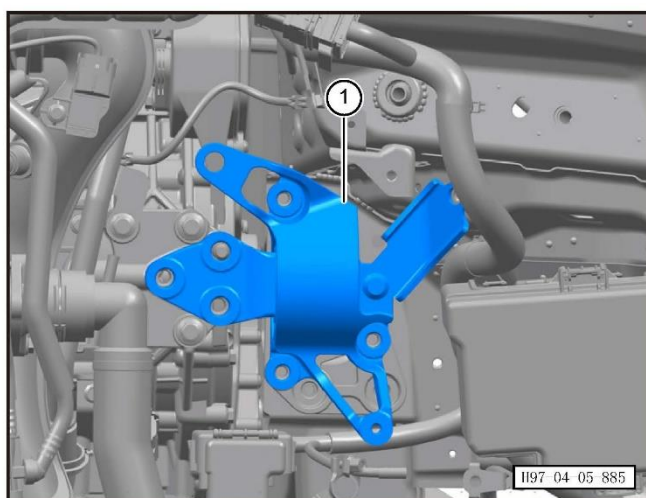
- b. Unscrew the 1 bolt that secures the left mounting cushion assembly to the body.

Tightening torque of bolt: $20\pm 3\text{Nm}$.



c. Unscrew the 3 bolts of the left mounting cushion assembly and the left mounting bracket.

Tightening torque of bolt: $65\pm 10\text{Nm}$.



d. Remove the left mounting cushion assembly.

Refitting procedure

The refitting procedure is performed in reverse order.

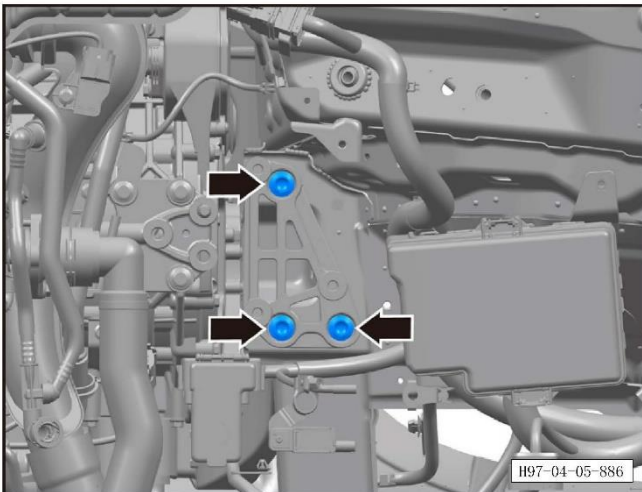
4.5.15.4 Removal and refitting of left mounting bracket

Removal procedure

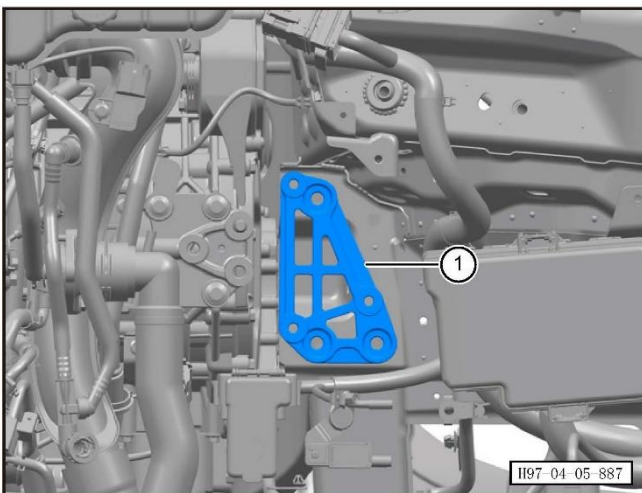
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
6. Remove the left mounting assembly (refer to [4.5.15.3 Removal and refitting of left mounting cushion assembly](#))
7. Secure the range extender assembly with the engine hanger tool.
8. Remove the left mounting bracket.

- a. Unscrew the 3 bolts of the left mounting bracket.

Tightening torque of bolt: $65\pm 10\text{Nm}$.



- b. Remove the left mounting bracket assembly.



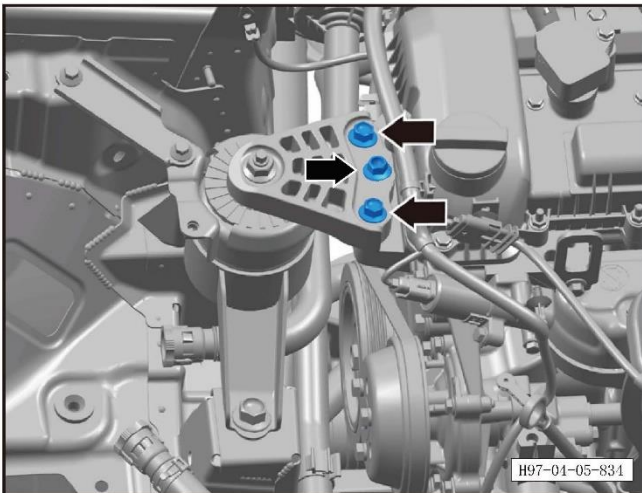
Refitting procedure

The refitting procedure is performed in reverse order.

4.5.15.5 Removal and refitting of right mounting cushion assembly

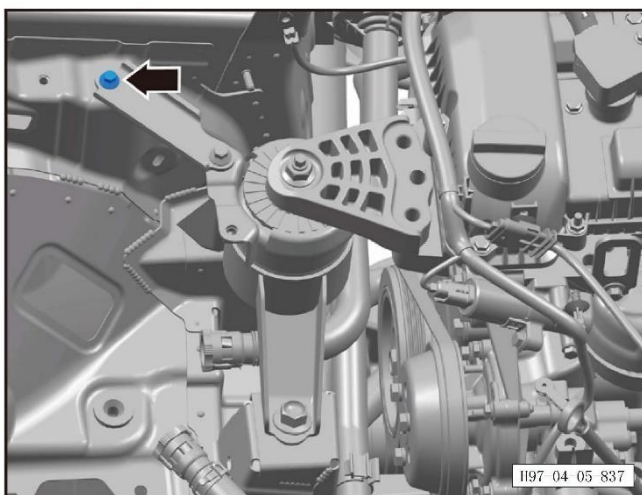
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the auxiliary water bottle assembly (refer to [4.4.8.78 Removal and refitting of auxiliary water bottle assembly](#))
6. Secure the range extender assembly with the special hanger tool.
7. Remove the engine right mounting cushion assembly.



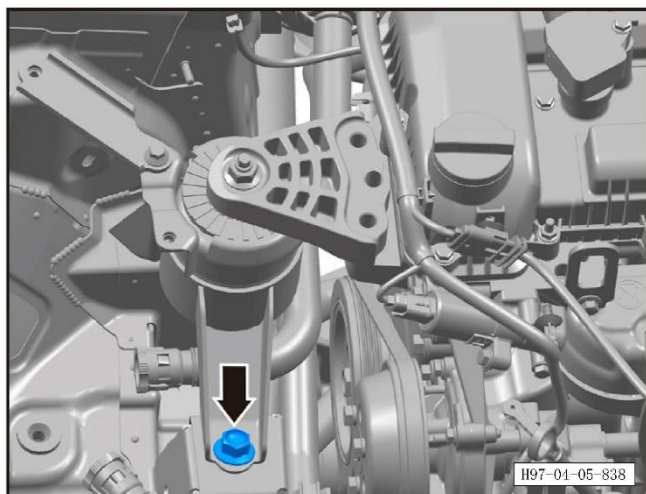
- a. Unscrew the 3 bolts of the right mounting assembly bracket.

Tightening torque of bolt: $75\pm 12\text{Nm}$.



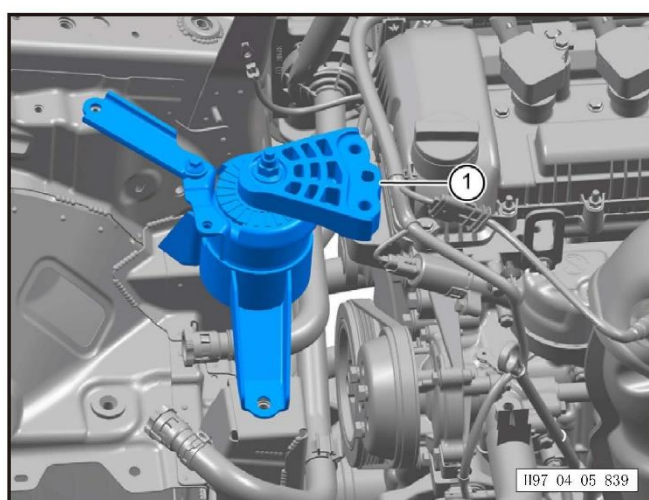
- c. Unscrew the 1 bolt that secures the right mounting assembly to the body.

Tightening torque of bolt: $10\pm 3\text{Nm}$.



d. Unscrew the 1 bolt that secures the right mounting assembly to the body.

Tightening torque of bolt: $65\pm 10\text{Nm}$.



e. Remove the right mounting cushion assembly ①.

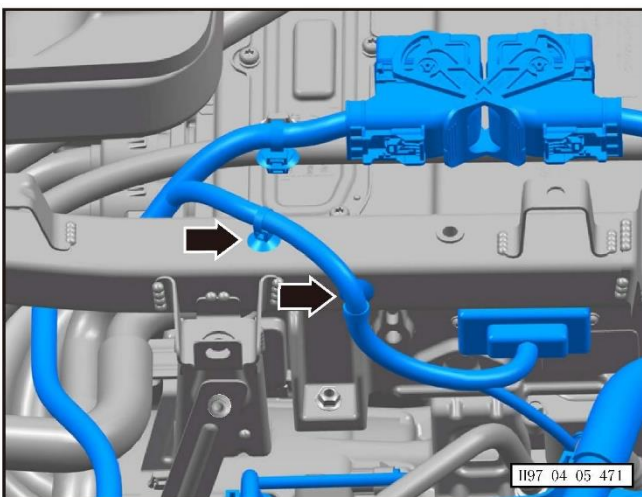
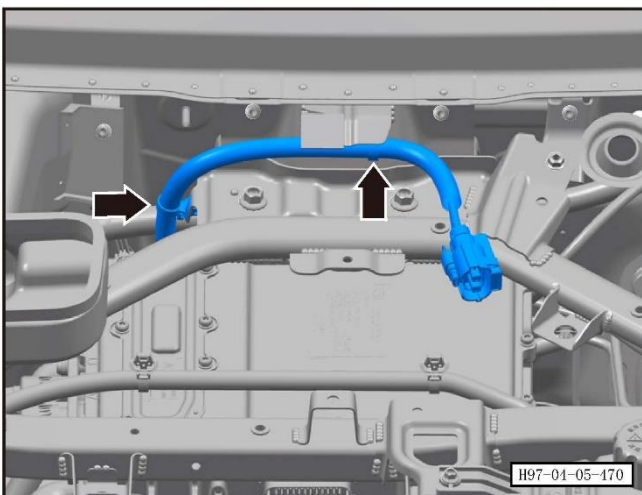
Refitting procedure

The refitting procedure is performed in reverse order.

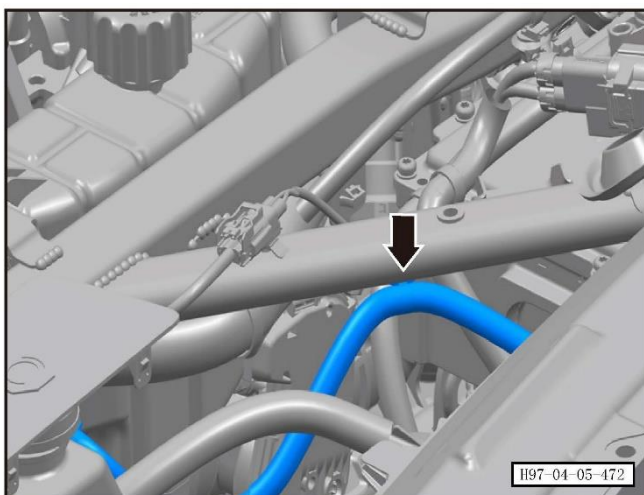
4.5.15.6 Removal and refitting of engine compartment combination rod assembly

Removal procedure

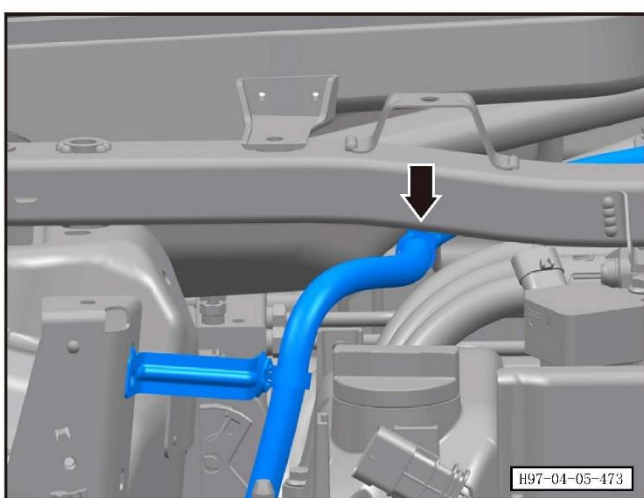
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the auxiliary water bottle assembly (refer to [4.4.8.78 Removal and refitting of auxiliary water bottle assembly](#))
6. Remove the A/C air inlet duct assembly (refer to [10.1.9.1 Removal and refitting of A/C air inlet duct assembly](#))
7. Remove the wiper motor and bracket assembly (refer to [8.6.13.2 Removal and refitting of front wiper motor and bracket assembly](#))
8. Remove the engine compartment combination rod assembly.
 - a. Disconnect the 2 clips on the PTC HV harness assembly and bracket.



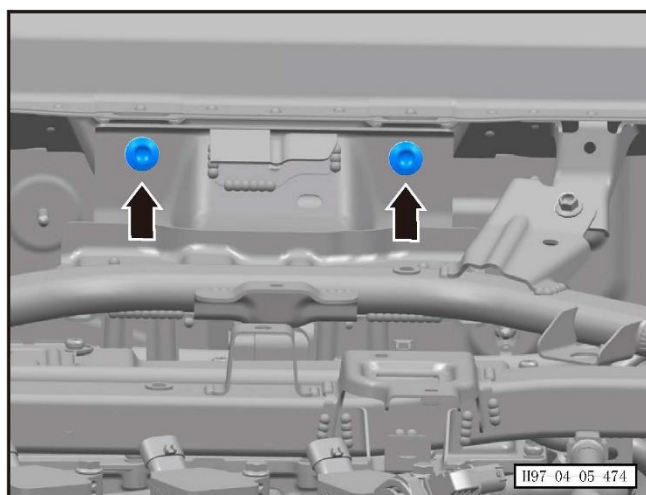
- b. Disconnect the 2 clips on the engine compartment combination rod that secure the engine harness assembly.



c. Disconnect the 1 clip on the engine compartment combination rod that secures the engine harness assembly.

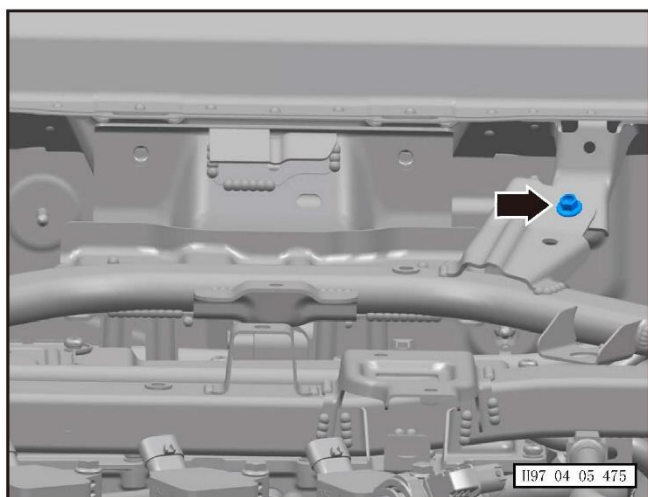


d. Disconnect the 1 clip on the engine compartment combination rod that secures the engine harness assembly.



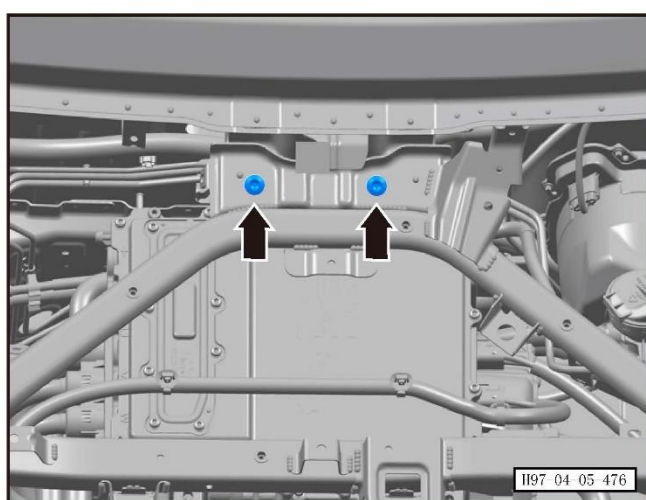
e. Unscrew the 2 bolts that secure the engine compartment combination rod to the body.

Tightening torque of bolt: $12\pm 1\text{Nm}$.



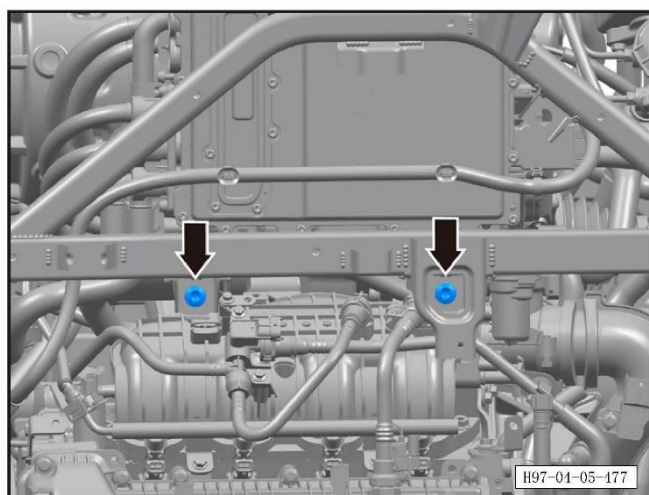
f. Unscrew the 1 bolt connecting the engine compartment combination rod to the body bracket.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



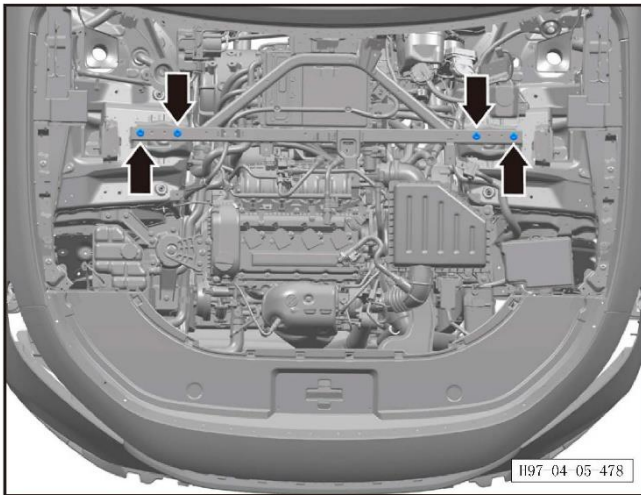
g. Unscrew the 2 bolts connecting the engine compartment combination rod to the bracket.

Tightening torque of bolt: $10\pm 1\text{Nm}$.

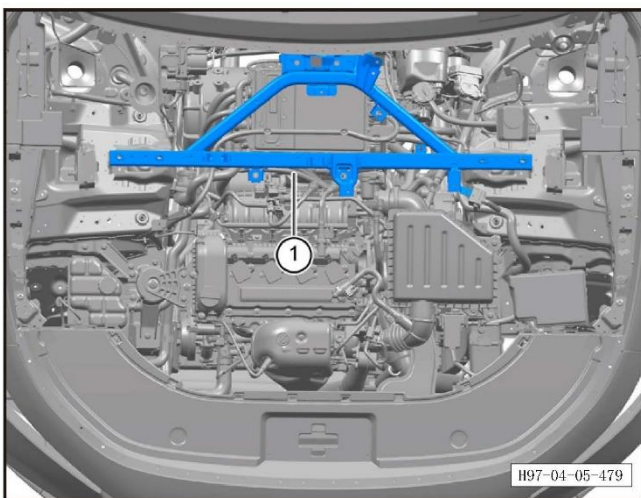


h. Unscrew the 2 bolts that secure the engine compartment combination rod to the generator control bracket.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



- i. Remove the 4 bolts connecting the engine compartment combination rod to the body bracket.
Tightening torque of bolt: $20 \pm 1 \text{ Nm}$.



- j. Take out the engine compartment combination rod assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

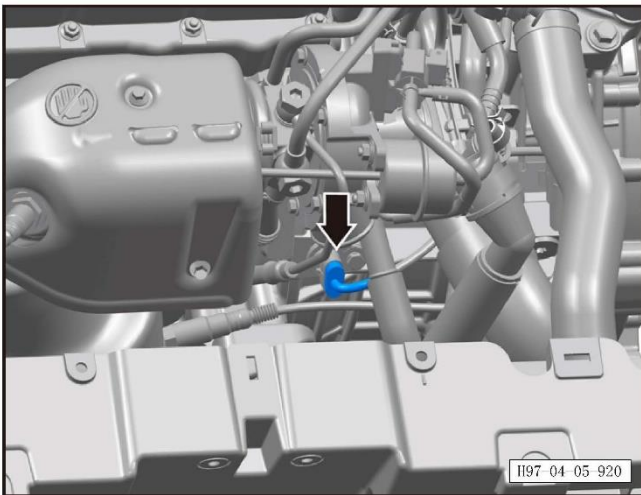
4.5.16 Electronic sensor

4.5.16.1 Removal and refitting of crankshaft position sensor

Removal procedure

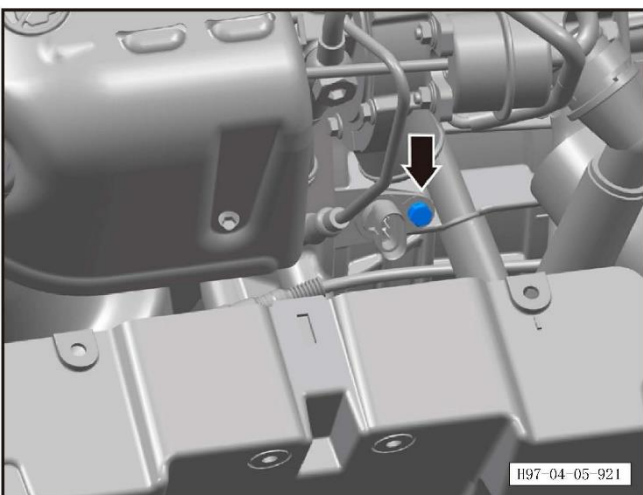
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the intercooler air inlet hose 2# (refer to [4.1.9.4 Removal and refitting of intercooler air inlet hose 2#](#))
6. Remove the crankshaft position sensor.

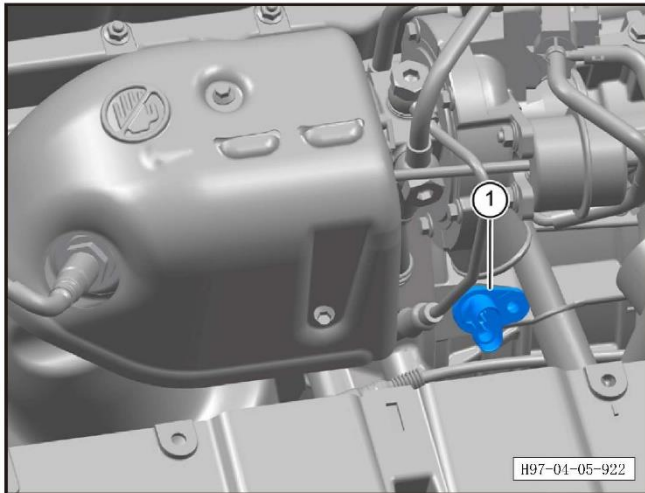
a. Disconnect the connector of crankshaft position sensor.



b. Unscrew the fixing bolt of crankshaft position sensor.

Tightening torque of bolt: 5 ± 1 Nm.





c. Take out the crankshaft position sensor ①.

Refitting procedure

The refitting procedure is performed in reverse order.

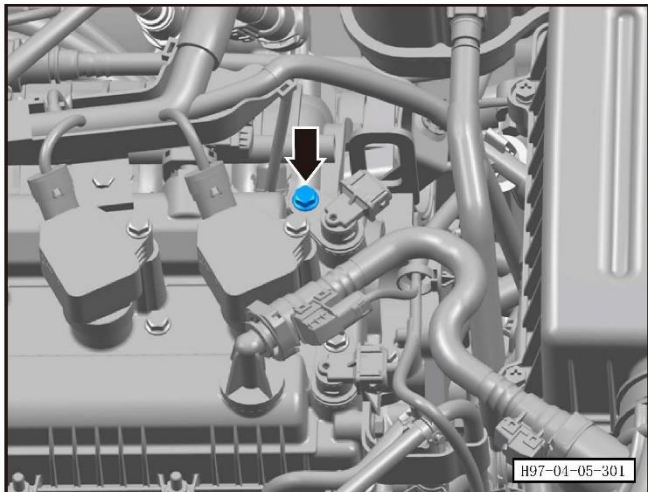
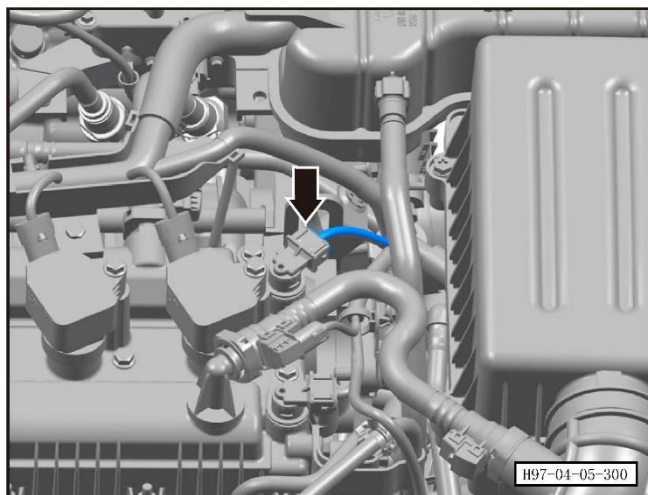
CAUTION:

- If a bolt breaks while removing the assembly, pull out the broken bolt and replace it with a new one.
- When refitting, the seal ring needs to be replaced with a new one.

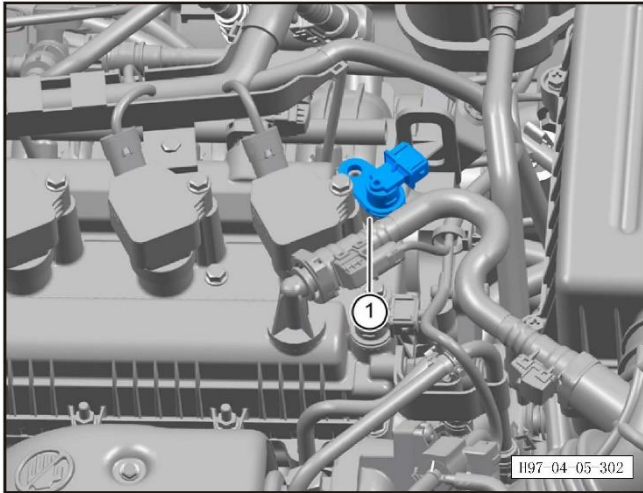
4.5.16.2 Removal and refitting of intake side camshaft position sensor

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the intake side camshaft position sensor.
 - a. Disconnect the connector of intake side crankshaft position sensor.



- b. Unscrew 1 bolt of the intake side crankshaft position sensor.
Tightening torque of bolt: $10\pm 1\text{Nm}$.



- c. Take out the intake side camshaft position sensor ①.

Refitting procedure

The refitting procedure is performed in reverse order.

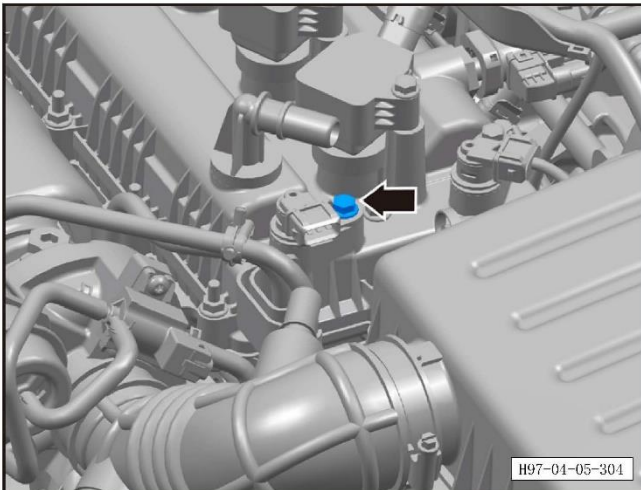
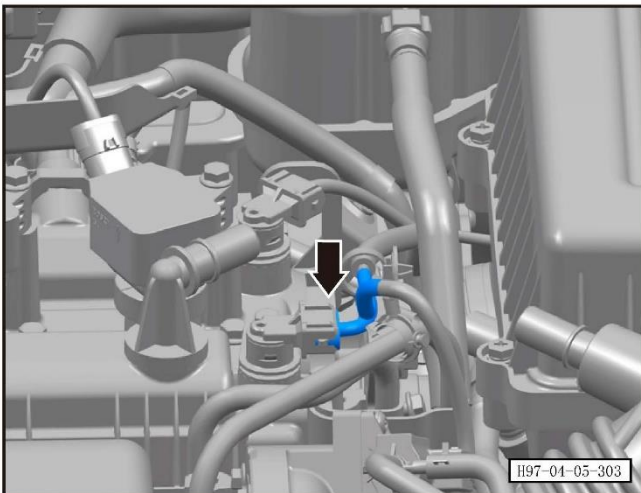
CAUTION:

- When refitting the intake side camshaft position sensor, the seal ring needs to be replaced with a new one.

4.5.16.3 Removal and refitting of exhaust side camshaft position sensor

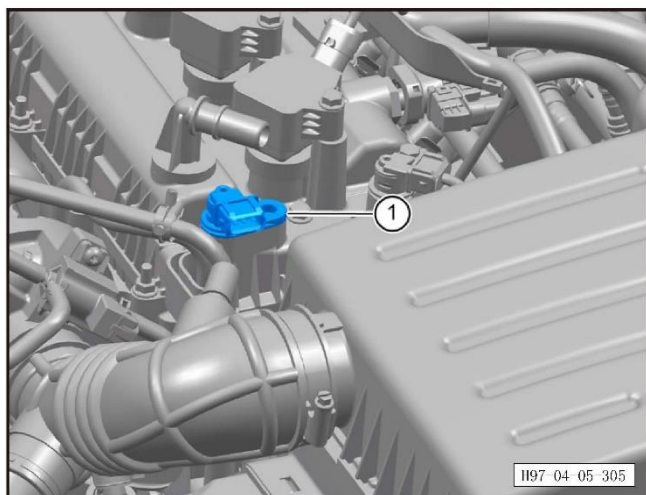
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the exhaust side camshaft position sensor.
 - a. Disconnect the connector of exhaust side crankshaft position sensor.



- b. Unscrew the bolt of the exhaust side crankshaft position sensor.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



c. Take out the exhaust side camshaft position sensor ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- When refitting the exhaust side camshaft position sensor, the seal ring needs to be replaced with a new one.

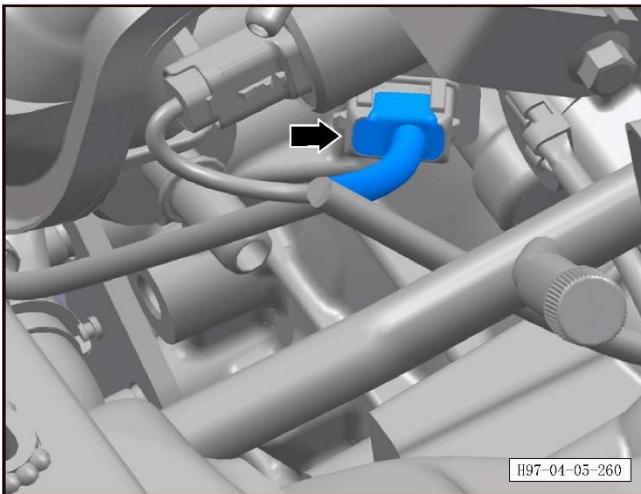
4.5.16.4 Removal and refitting of knock sensor

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the intake manifold assembly (refer to [4.1.8.7 Removal and refitting of intake manifold assembly](#))

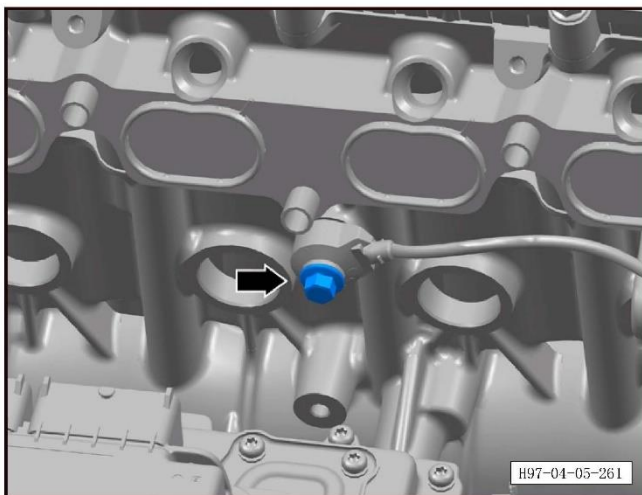
6. Remove the knock sensor.

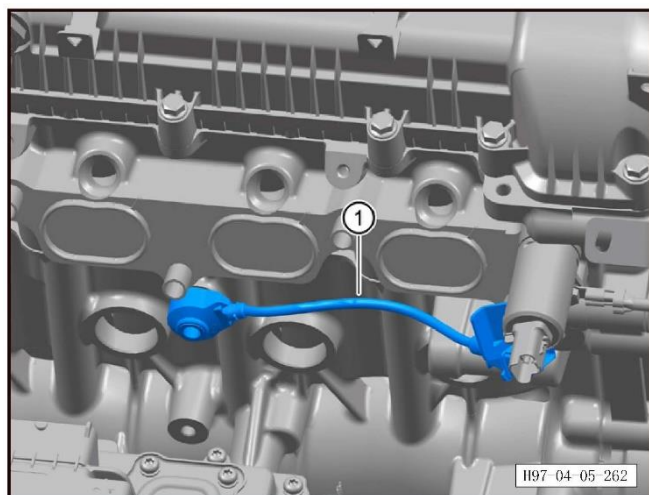
a. Disconnect the connector of knock sensor.



b. Unscrew 1 bolt of the knock sensor.

Tightening torque of bolt: $20 \pm 1 \text{ Nm}$.





c. Take out the knock sensor ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- When refitting the knock sensor, the tightening operation must be carried out strictly according to the standard torque.

4.5.16.5 Removal and refitting of water temperature sensor

Removal procedure

CAUTION:

- Park the vehicle for a period of time and wait for the water temperature to drop below 50 °C before servicing.

- To avoid being scalded, do not remove the auxiliary water bottle cap or any of the cooling pipelines before the engine has cooled down. If the auxiliary water bottle cap or cooling pipeline is removed while the engine and radiator are still not cooled, the cooling system will spray hot liquid and steam under pressure.

- Unscrew the auxiliary water bottle cap with a wet towel to relieve the pressure, and check whether the coolant is missing, and then tighten the auxiliary water bottle cap.

1. Turn off all electrical appliances and turn off the start switch.

2. Open the engine hood.

3. Remove the engine hood.

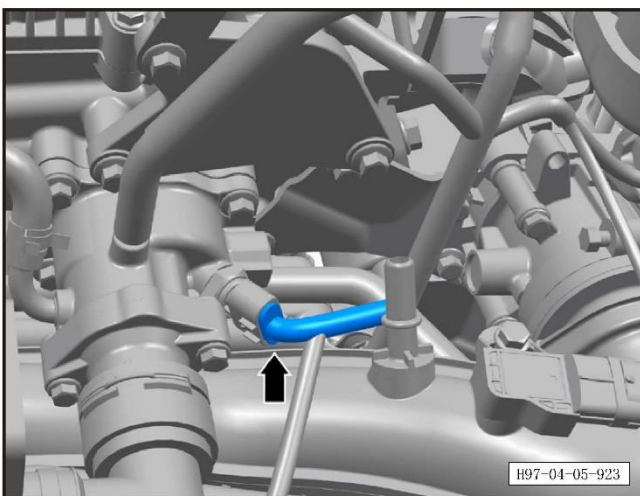
4. Disconnect the battery negative terminal.

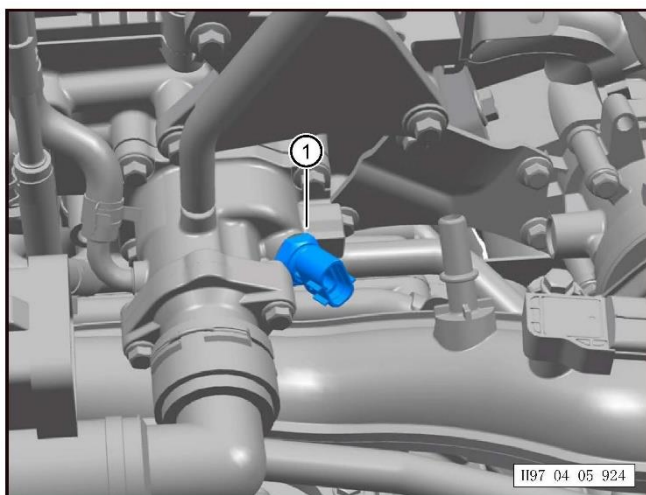
5. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))

6. Remove the high-pressure desorption tube assembly (refer to [4.3.8.7 Removal and refitting of high-pressure desorption tube assembly](#))

7. Remove the water temperature sensor.

a. Disconnect the connector of water temperature sensor.





b. Remove the water temperature sensor ①.

Refitting procedure

The refitting procedure is performed in reverse order.

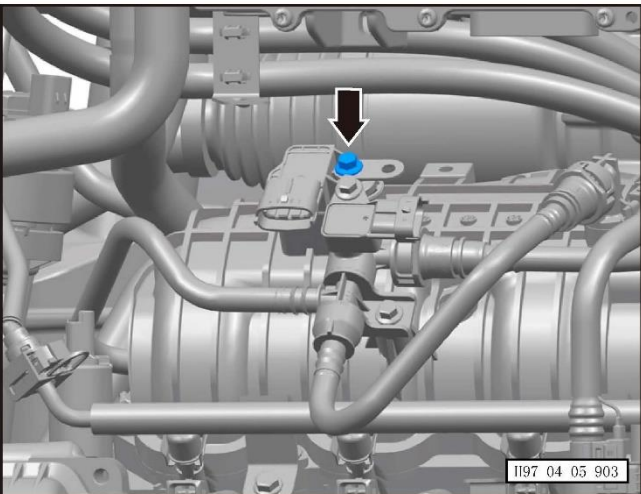
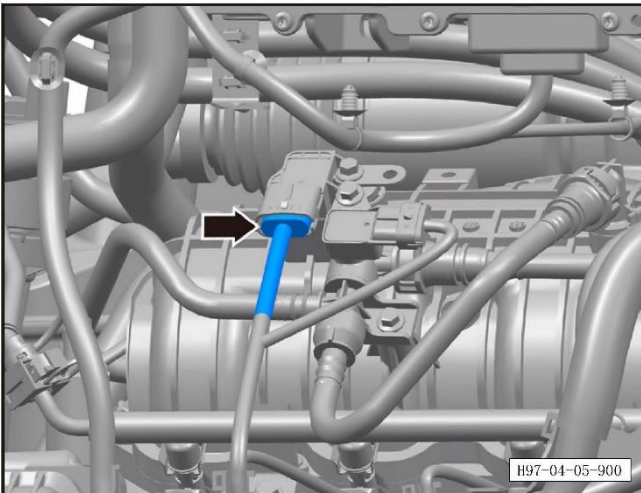
CAUTION:

- When refitting the water temperature sensor, the tightening operation must be carried out strictly according to the standard torque.
- If the water temperature sensor is broken during removal, it is necessary to remove the broken part of the sensor in time to avoid damage to the thermostat housing.
- If the sensor is not to be replaced, install a new seal.
- The head of the water temperature sensor is a temperature-sensing element, and the head cannot be covered with sealant, otherwise the sensor will fail.

4.5.16.6 Removal and refitting of intake pressure/temperature sensor

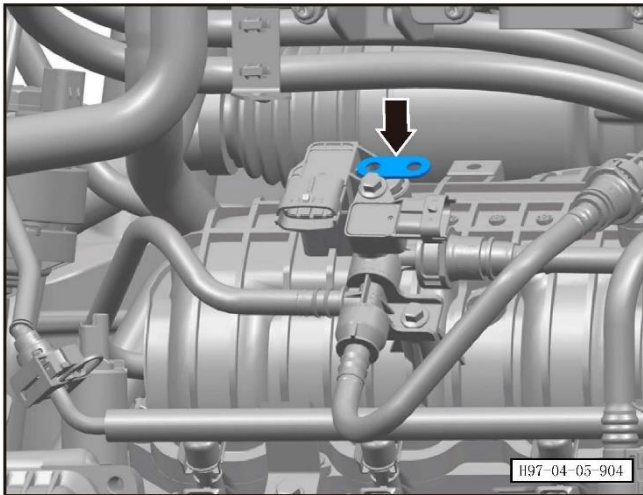
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the intake temperature/pressure sensor.
 - a. Disconnect the connector of intake temperature/pressure sensor.

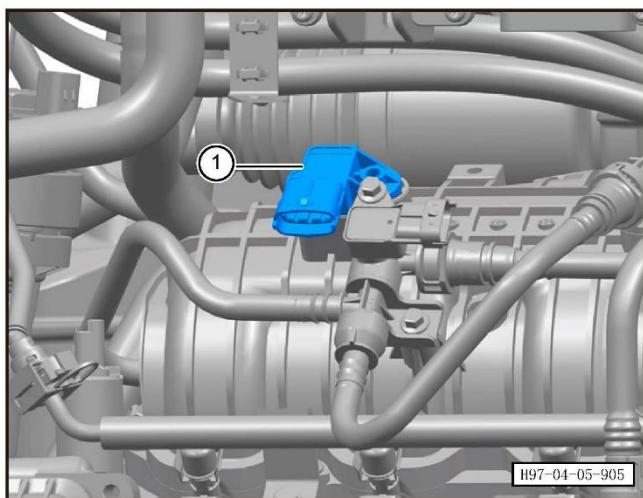


- b. Unscrew 1 bolt of the intake temperature/pressure sensor.

Tightening torque of bolt: $6\pm 1\text{Nm}$.



c. Take down the engine harness fixing bracket.



d. Take out the intake pressure/temperature sensor ①.

Refitting procedure

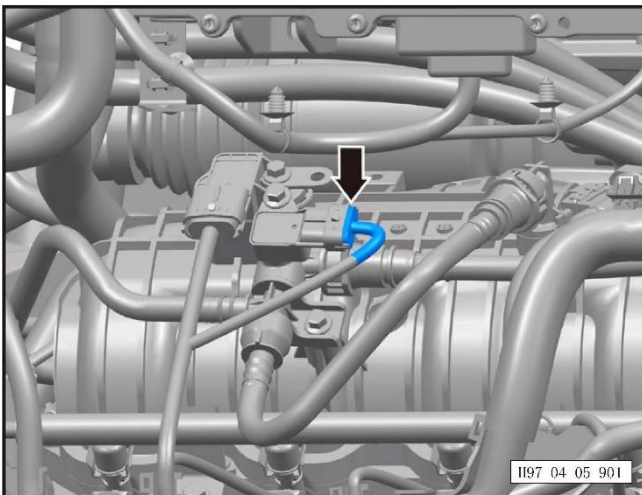
The refitting procedure is performed in reverse order.

4.5.16.7 Removal and refitting of ambient pressure sensor

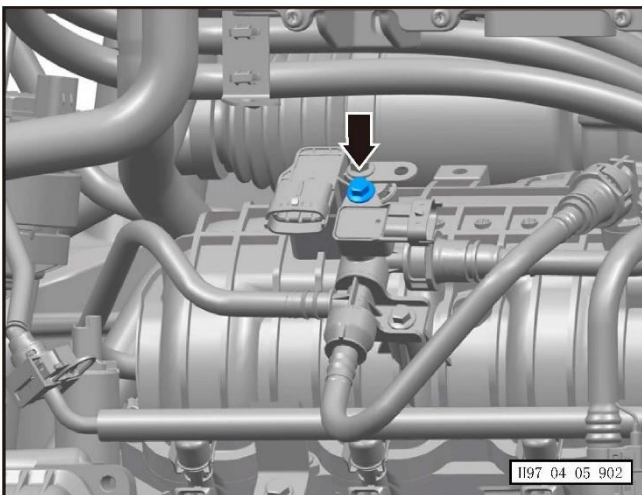
Removal procedure

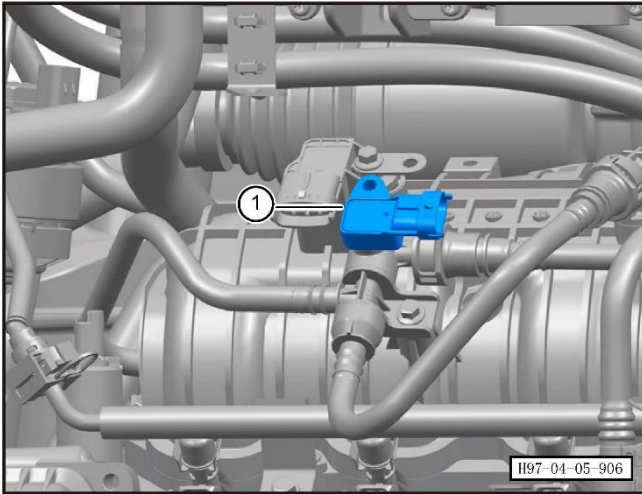
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the ambient pressure sensor.

a. Disconnect the connector of ambient pressure sensor.



b. Unscrew 1 bolt of the ambient pressure sensor.
Tightening torque of bolt: $6\pm 1\text{Nm}$.





c. Take out the ambient pressure sensor ①.

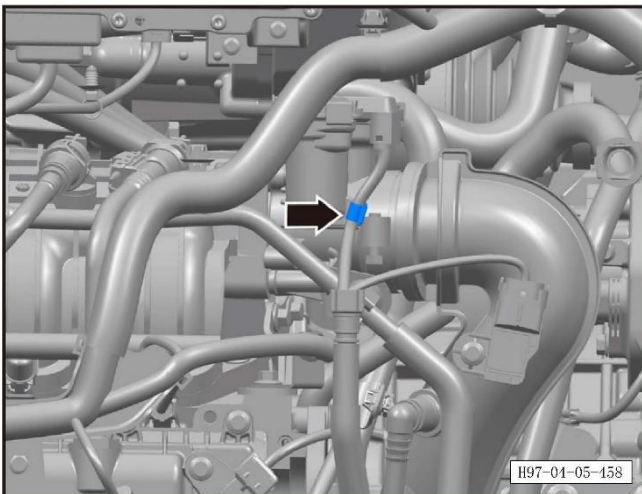
Refitting procedure

The refitting procedure is performed in reverse order.

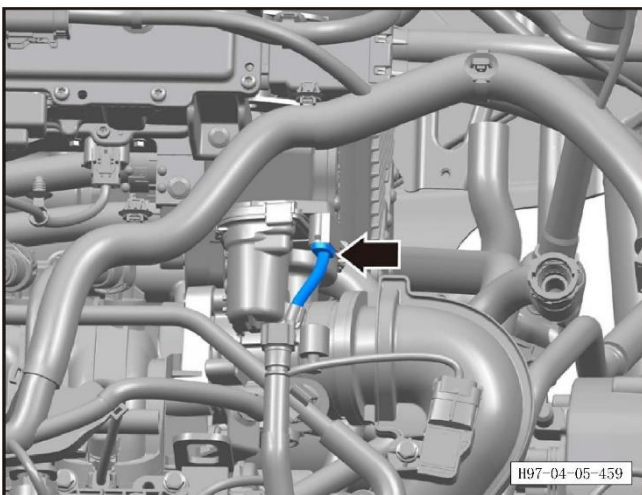
4.5.16.8 Removal and refitting of electronic throttle

Removal procedure

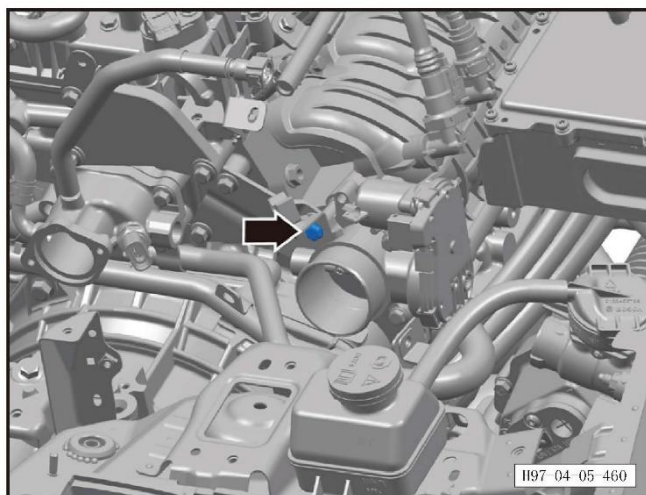
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
6. Remove the intercooler air outlet pipe assembly (refer to [4.1.9.8 Removal and refitting of intercooler air outlet pipe assembly](#))
7. Remove the electronic throttle.



- a. Disconnect the fixing clip of the electronic throttle harness.

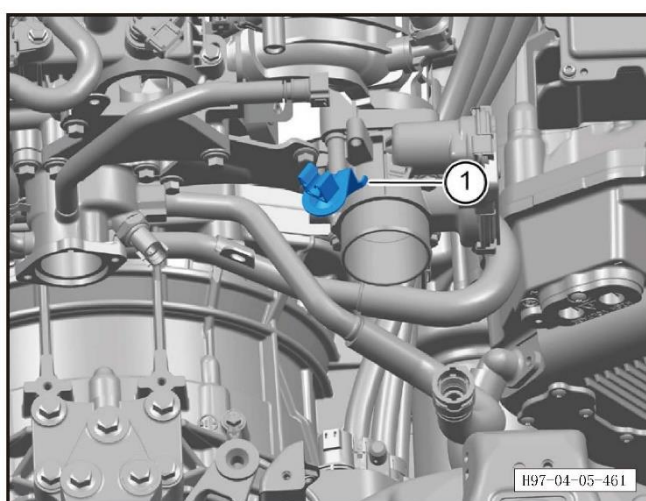


- b. Disconnect the connector of the electronic throttle harness.

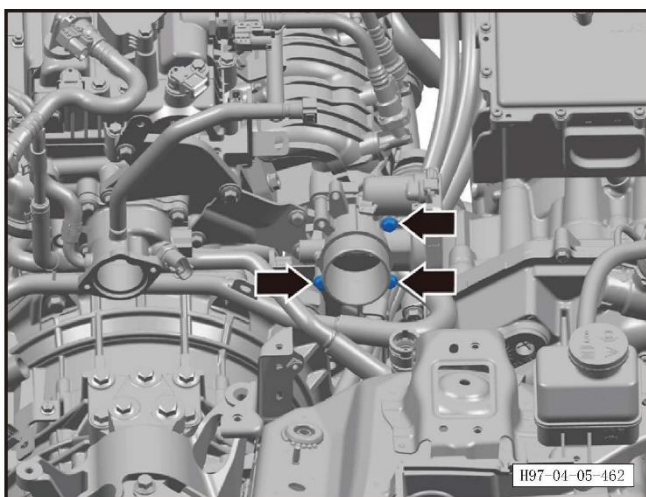


c. Unscrew 1 bolt on the electronic throttle that secures the engine high pressure desorption tube bracket.

Tightening torque of bolt: $10\pm 1\text{Nm}$.

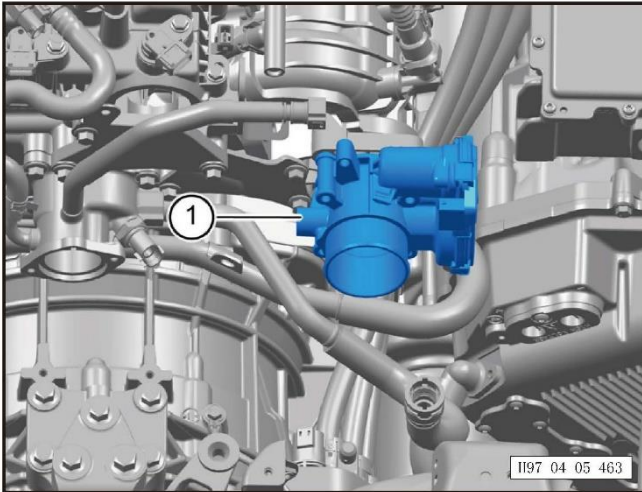


d. Take down the bracket ① on the electronic throttle that secures the engine high pressure desorption tube.



e. Unscrew 3 bolts on the electronic throttle body.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



f. Take down the electronic throttle ①.

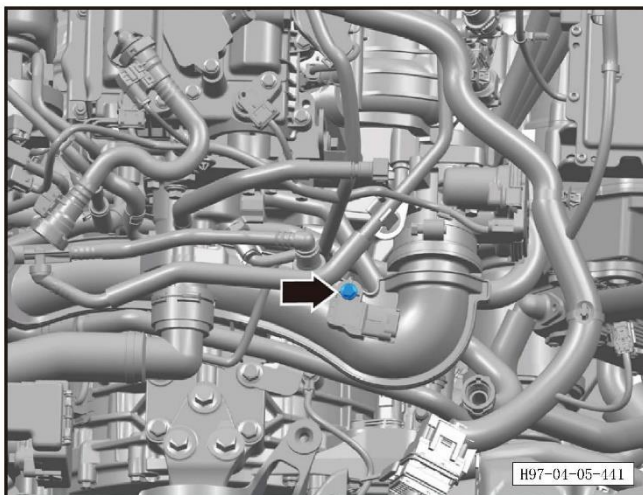
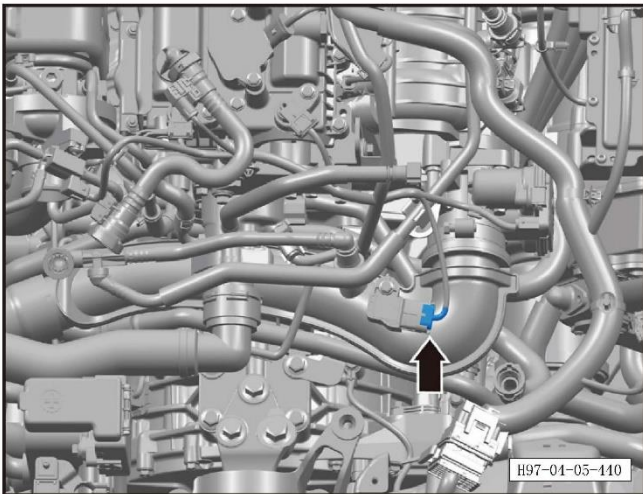
Refitting procedure

The refitting procedure is performed in reverse order.

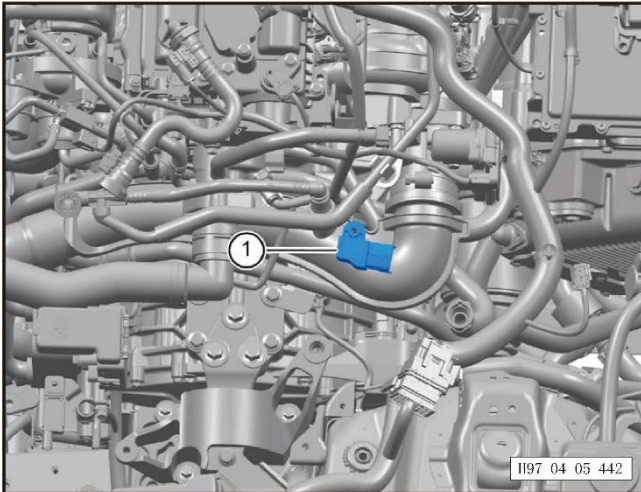
4.5.16.9 Removal and refitting of throttle front end intake pressure/temperature sensor

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the air filter assembly (refer to [4.1.8.1 Removal and refitting of air filter assembly](#))
6. Remove the intake pressure/temperature sensor.
 - a. Disconnect the connector of intake pressure/temperature sensor.



- b. Unscrew the fixing bolt of intake pressure/temperature sensor.
Tightening torque of bolt: $10\pm 1\text{Nm}$.



c. Take out the intake pressure/temperature sensor ①.

Refitting procedure

The refitting procedure is performed in reverse order.

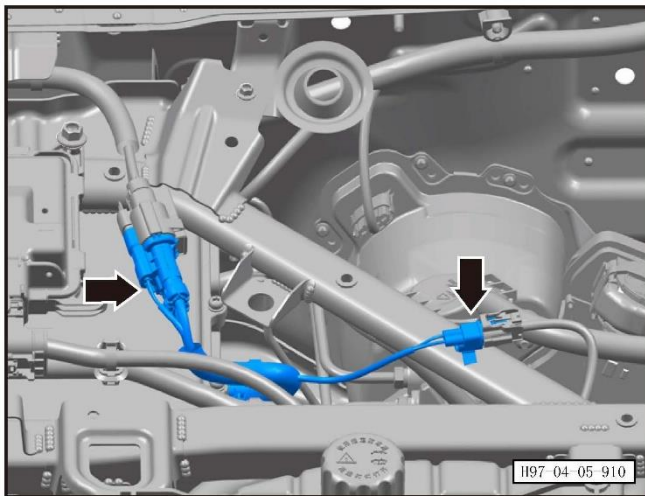
CAUTION:

- When refitting the intake pressure/temperature sensor, the seal ring needs to be checked and replaced if necessary.

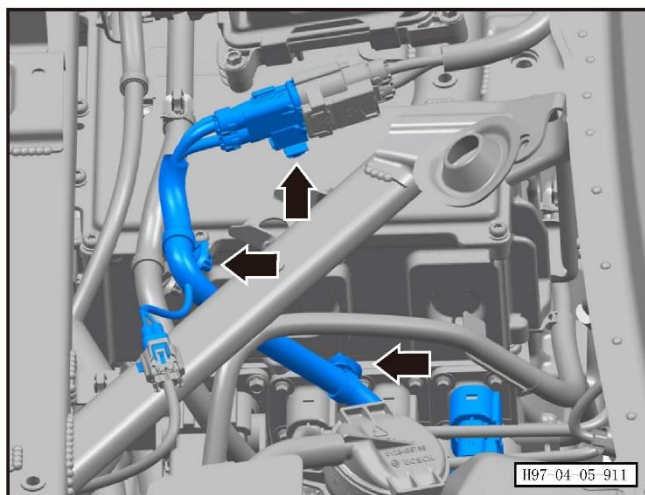
4.5.16.10 Removal and refitting of A/C PTC HV harness assembly 2

Removal procedure

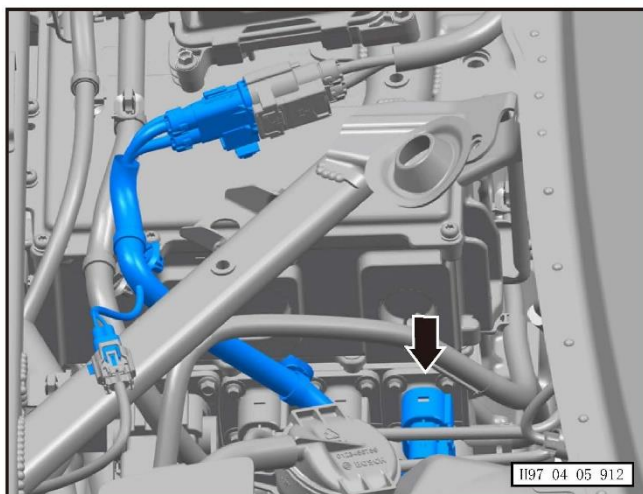
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove A/C PTC high pressure harness assembly 2.



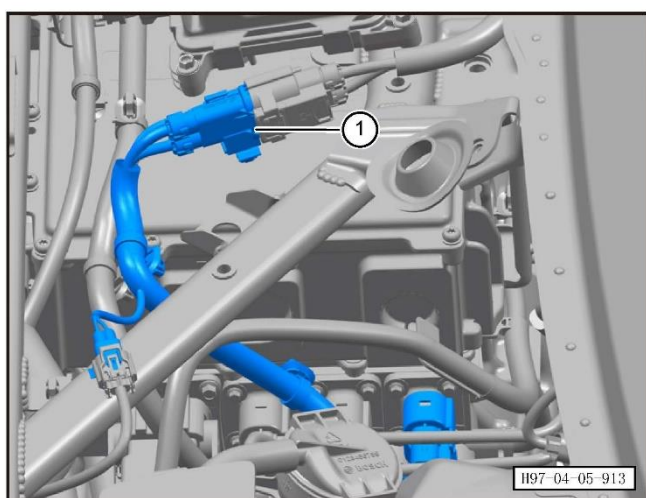
- a. Disconnect the connector (thick) between the A/C PTC HV harness assembly and the A/C PTC HV harness assembly 2; disconnect the connector (thin) between the A/C PTC HV harness assembly 2 and the engine harness.



- b. Disconnect the 3 clips that secure the A/C PTC HV harness assembly 2 to the engine compartment support rod.



c. Disconnect the connector of the A/C PTC HV harness assembly 2 and the engine compartment HV box assembly .



d. Take out the A/C PTC high voltage harness assembly 2 ①.

Refitting procedure

The refitting procedure is performed in reverse order.

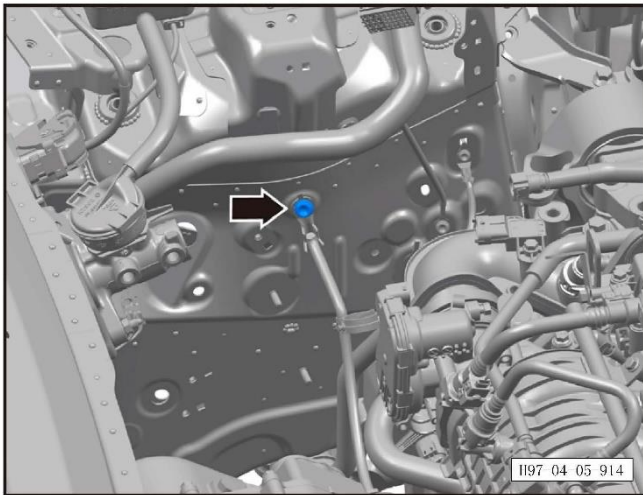
4.5.16.11 Removal and refitting of ground wire between range extender generator upper housing and engine compartment

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine hood.
4. Disconnect the battery negative terminal.
5. Remove the engine water outlet pipe (refer to [4.4.8.39 Refitting of middle channel water outlet pipe](#))
6. Remove the ground wire between range extender generator upper housing and engine compartment.

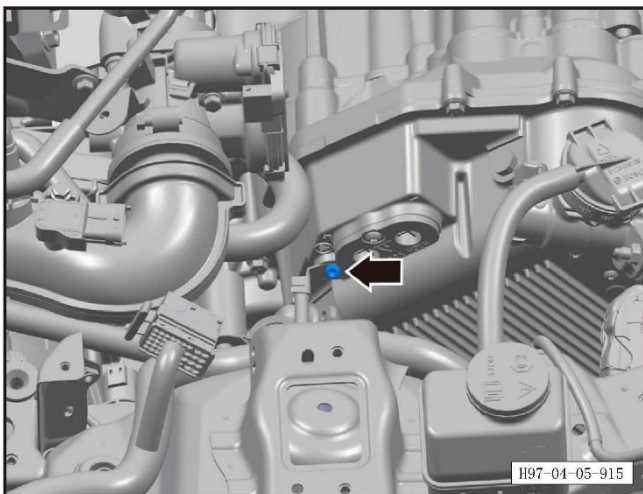
- a. Unscrew the ground wire bolts between the range extender generator upper housing and the engine compartment.

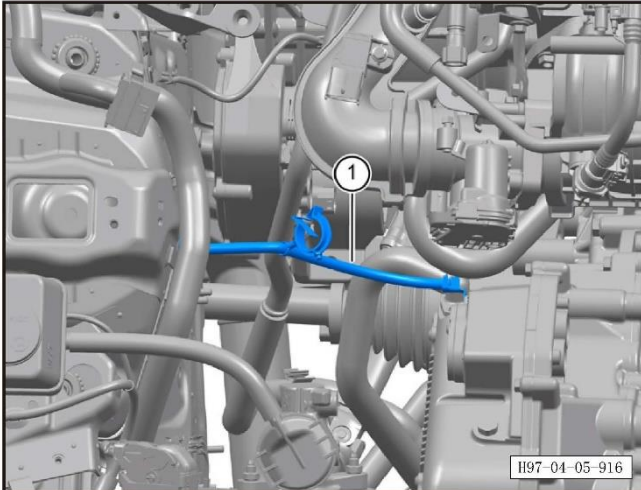
Tightening torque of bolt: $10\pm 1\text{Nm}$.



- b. Unscrew 1 bolt of the ground wire of the range extender generator upper housing.

Tightening torque of bolt: $10\pm 1\text{Nm}$.





c. Take out the ground wire ① between range extender generator upper housing and engine compartment.

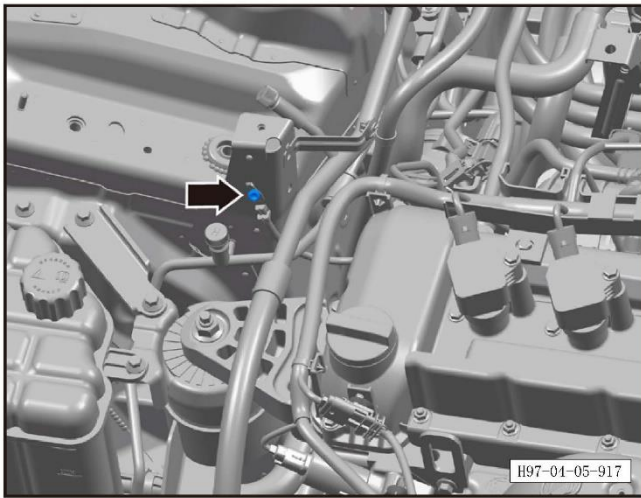
Refitting procedure

The refitting procedure is performed in reverse order.

4.5.16.12 Removal and refitting of ground wire between range extender and engine compartment

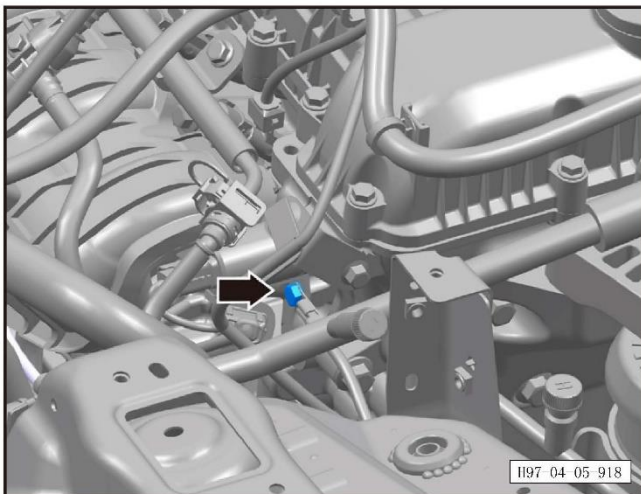
Removal procedure

1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the ground wire between range extender and engine compartment.



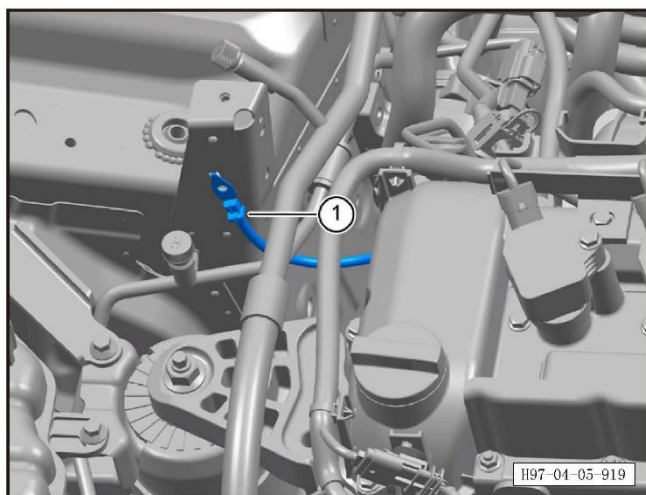
- a. Remove the ground wire bolts between the range extender and the engine compartment.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



- b. Remove 1 bolt of the range extender ground wire.

Tightening torque of bolt: $10\pm 1\text{Nm}$.



c. Take out the ground wire ① between range extender generator and engine compartment.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

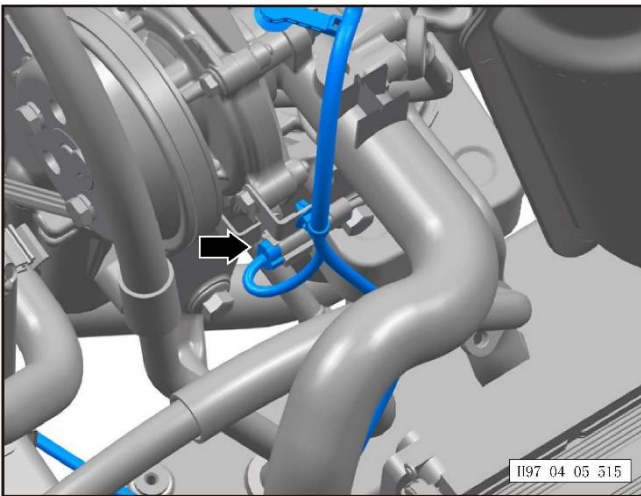
- The terminal on the side of the engine ground wire and the intake side OCV assembly are fixed by the same bolt.
- When removing the ground wire bolts, do not pull out the OCV assembly to avoid other failures.

4.5.16.13 Removal and refitting of oil pressure sensor

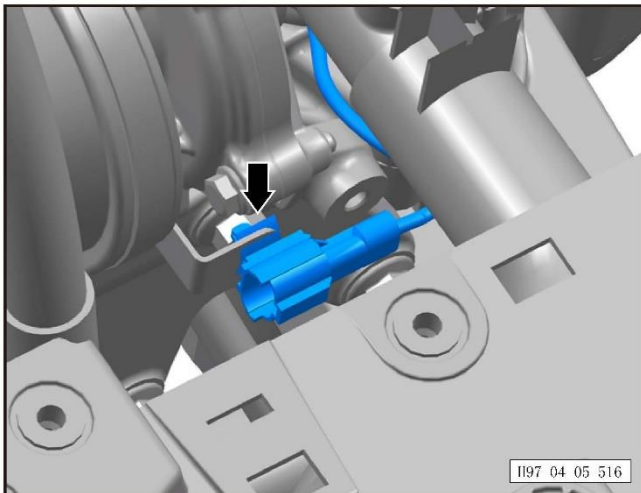
Removal procedure

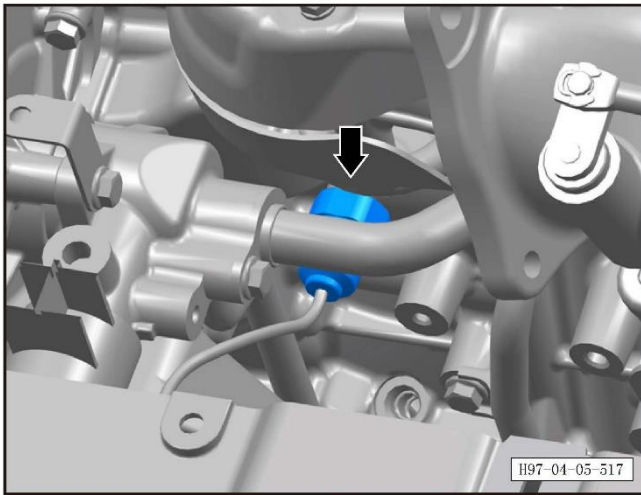
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the oil level gauge conduit assembly (refer to [4.5.14.12 Removal and refitting of oil level gauge conduit assembly](#))
6. Remove the oil pressure sensor.

- a. Disconnect the connector of oil pressure sensor.

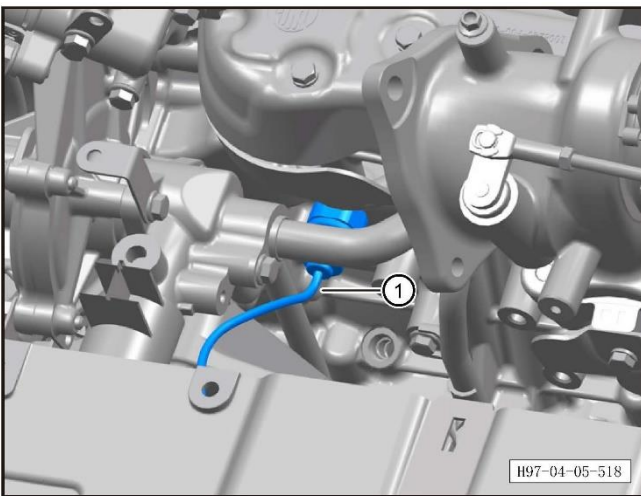


- b. Disconnect the oil pressure sensor connector from the bracket.





- c. Remove the oil pressure sensor.
Tightening torque of sensor: $15\pm 1\text{Nm}$.



- d. Take out the oil pressure sensor ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.5.17 Generator

4.5.17.1 Removal and refitting of generator assembly

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))

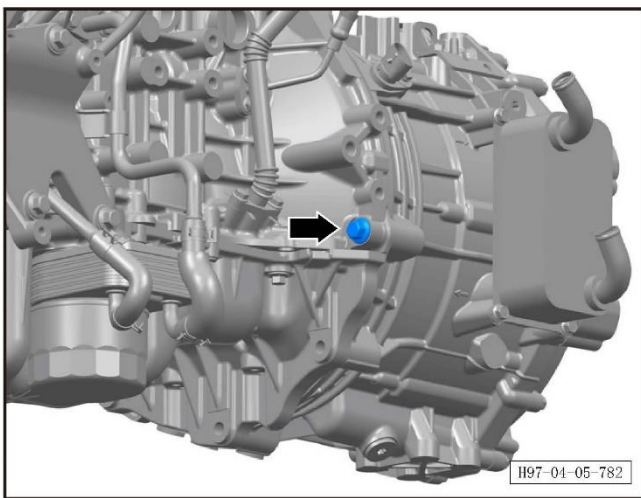
2. Remove the generator assembly.

CAUTION:

- Before removing the range extender assembly, it is necessary to drain the two lubricating oils of the range extender engine and the generator.

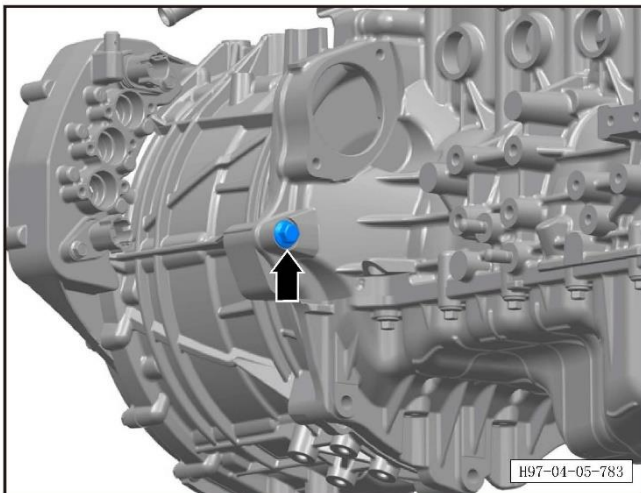
a. Unscrew 1 fixing bolt connecting the range extender engine and generator.

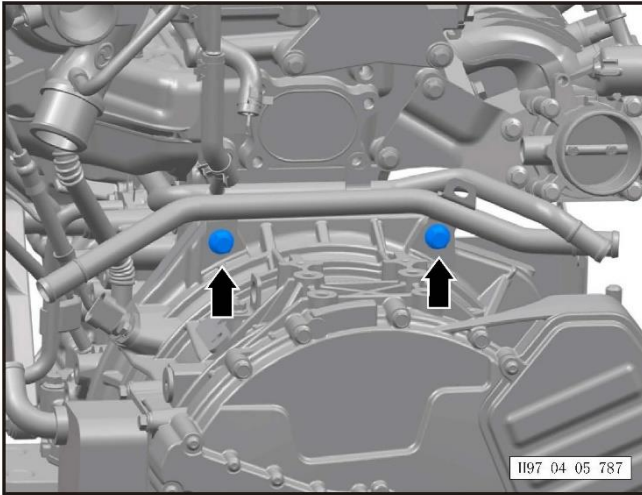
Tightening torque of bolt: $65\pm 2\text{Nm}$.



b. Unscrew 1 fixing bolt connecting the range extender engine and generator.

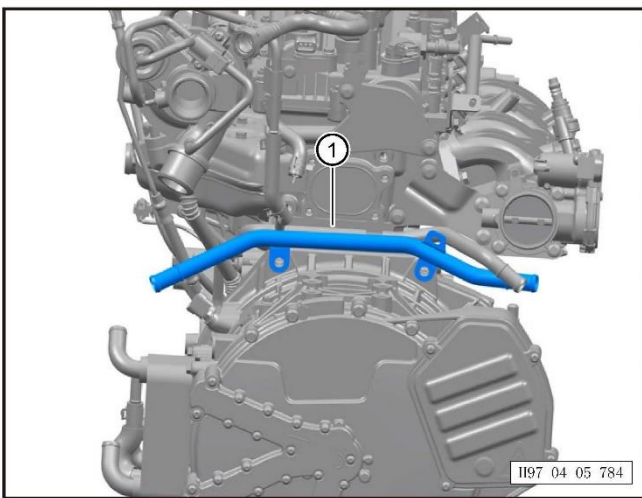
Tightening torque of bolt: $65\pm 2\text{Nm}$.



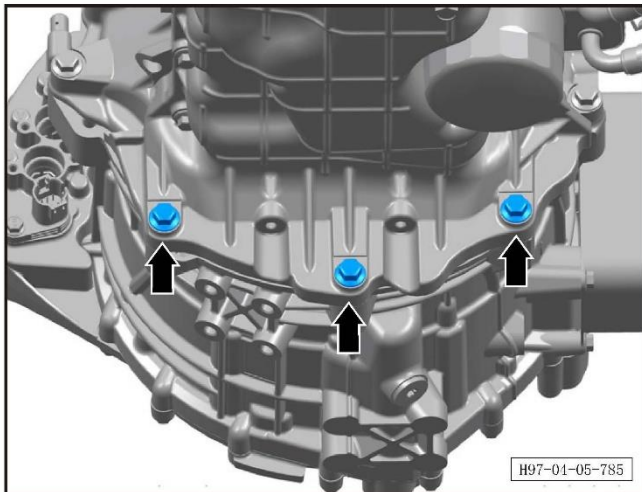


c. Unscrew 2 fixing bolts connecting the range extender engine and generator.

Tightening torque of bolt: $65\pm 2\text{Nm}$.

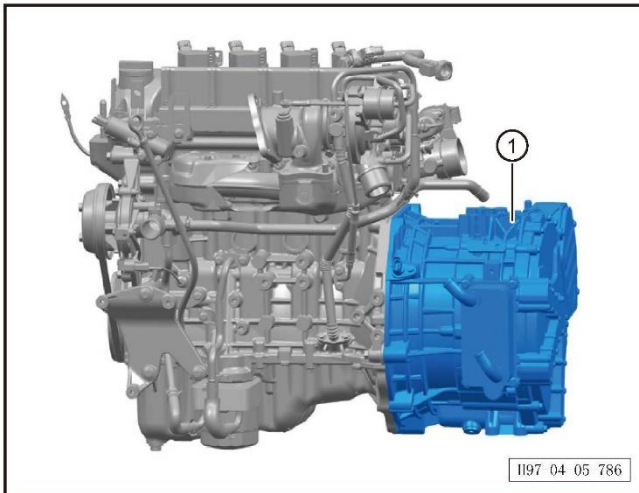


d. Take down the metal water outlet pipe ①.



e. Unscrew the 3 fixing bolts connecting the range extender engine oil sump to the generator.

Tightening torque of bolt: $65\pm 2\text{Nm}$.



f. Disconnect the generator assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

4.5.18 Engine crankcase ventilation system

4.5.18.1 Removal and refitting of PCV valve vent pipe 1

Removal procedure

1. Turn off all electrical appliances and turn off the start switch.

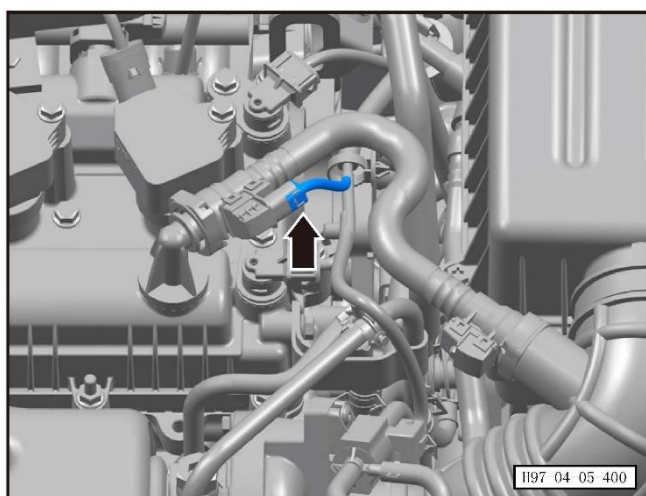
2. Open the engine hood.

3. Remove the engine compartment trim panel.

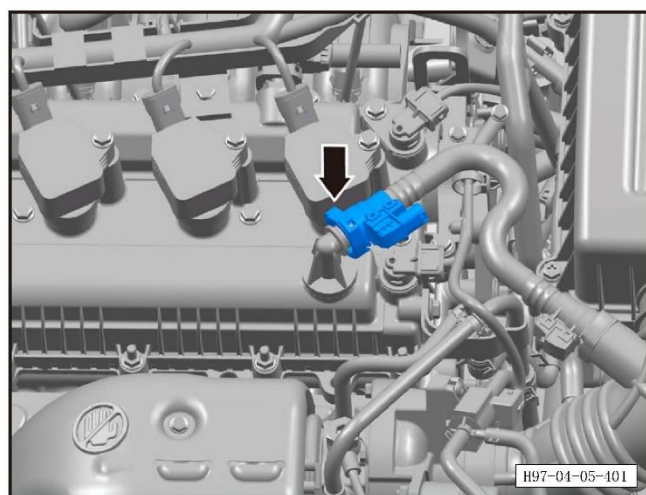
4. Disconnect the battery negative terminal.

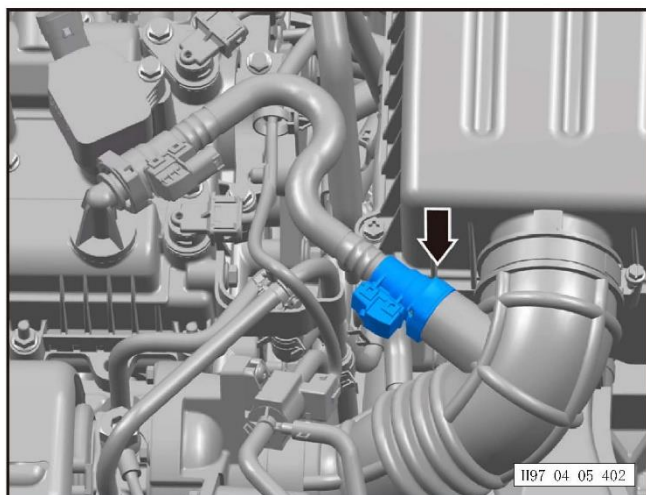
5. Remove the PCV valve vent pipe 1.

a. Disconnect the sensor connector of PCV valve vent pipe 1.

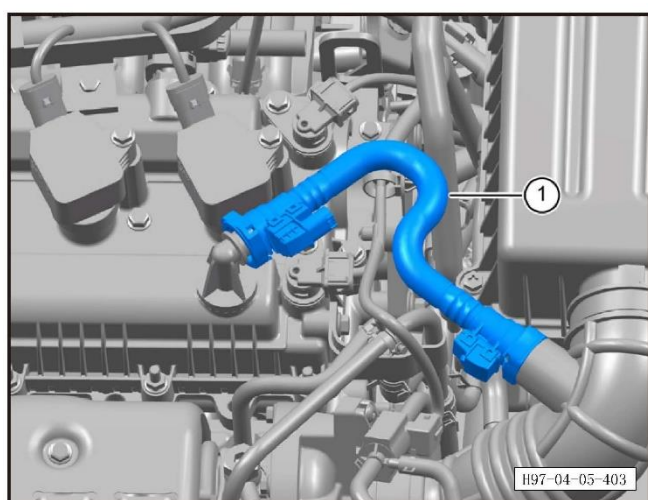


b. Disconnect PCV valve vent pipe 1 from cylinder head cover assembly.





c. Disconnect PCV valve vent pipe 1 from air filter outlet pipe.



d. Take out the PCV valve vent pipe 1 assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

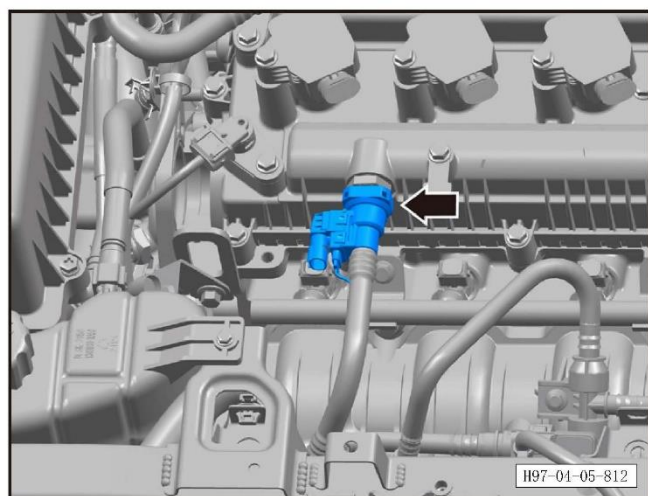
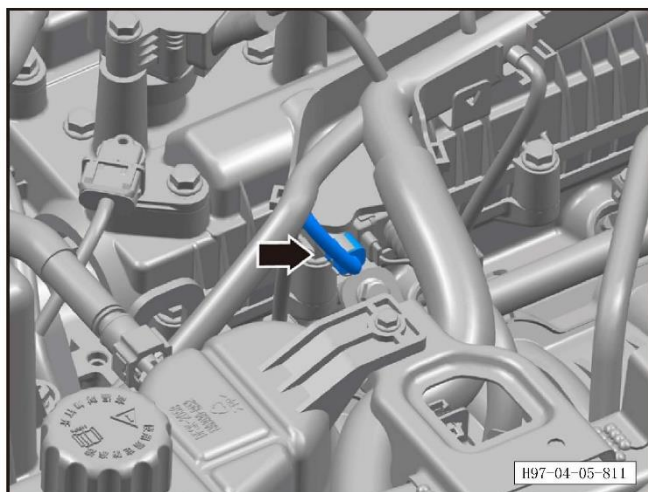
CAUTION:

- When refitting the PCV valve vent pipe 1, the seal ring needs to be replaced with a new one.

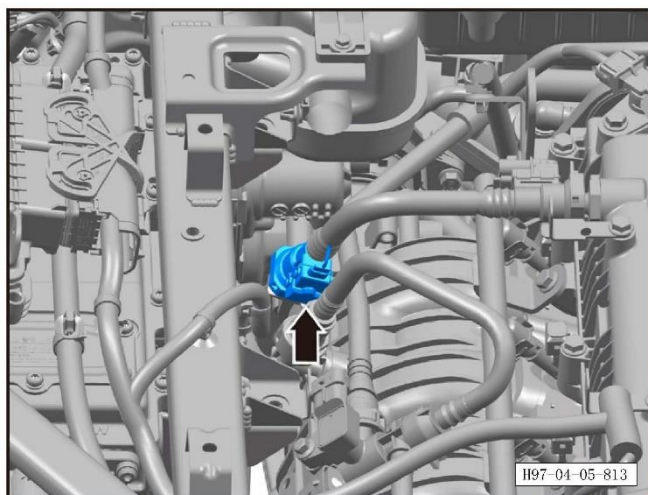
4.5.18.2 Removal and refitting of PCV valve vent pipe 2

Removal procedure

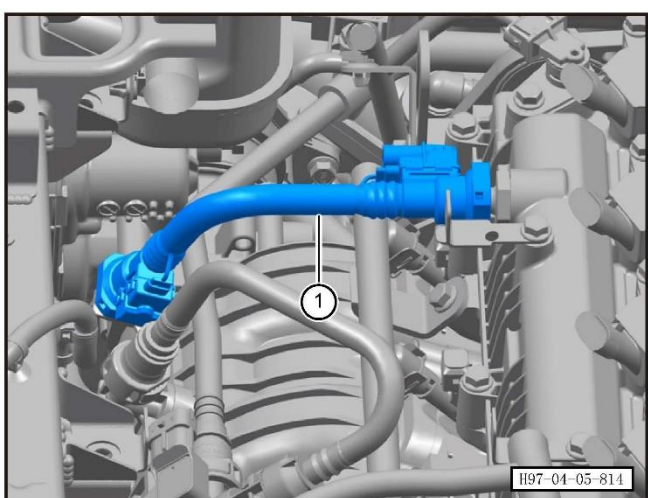
1. Turn off all electrical appliances and turn off the start switch.
2. Open the engine hood.
3. Remove the engine compartment trim panel.
4. Disconnect the battery negative terminal.
5. Remove the PCV valve vent pipe 2.
 - a. Disconnect the sensor connector of PCV valve vent pipe 2.



- b. Disconnect PCV valve vent pipe 2 from cylinder head cover assembly.



c. Disconnect PCV valve vent pipe 2 from intake manifold assembly.



d. Take out the PCV valve vent pipe 2 assembly ①.

Refitting procedure

The refitting procedure is performed in reverse order.

CAUTION:

- When refitting the PCV valve vent pipe 2, the seal ring needs to be replaced with a new one.

4.5.19 Range extender accessories

4.5.19.1 Removal and refitting of compressor bracket

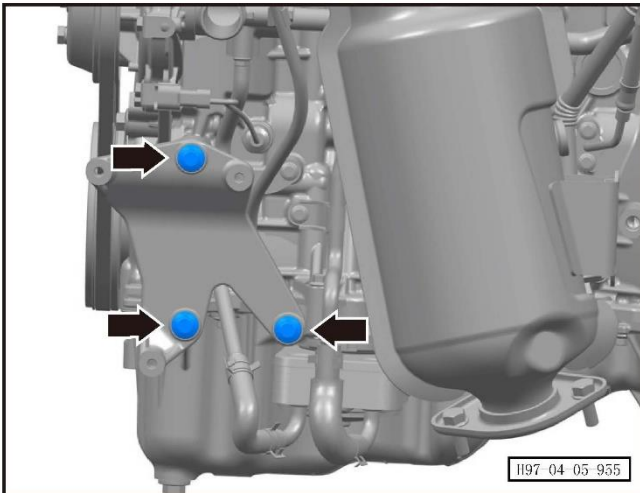
Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))

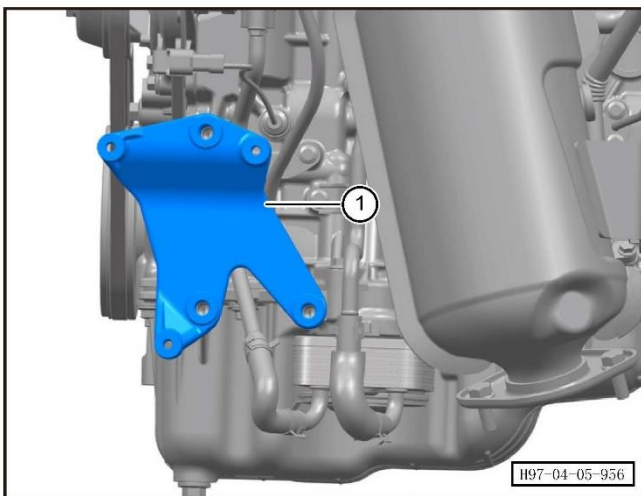
2. Remove the compressor bracket.

a. Unscrew the 3 fixing bolts of the compressor bracket.

Tightening torque of bolt: $20\pm 1\text{Nm}$.



b. Remove the compressor bracket assembly ①.



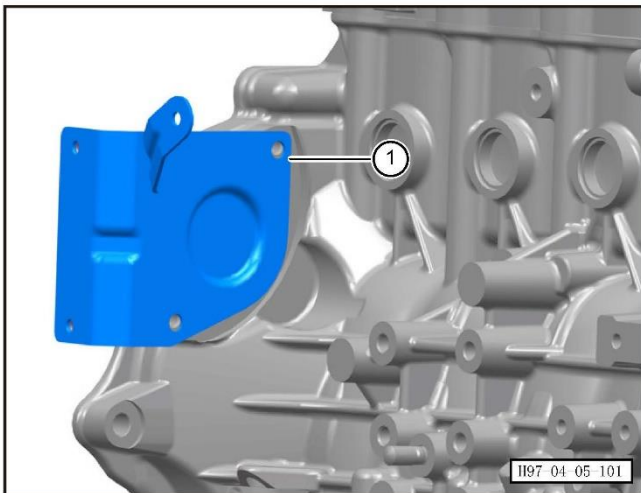
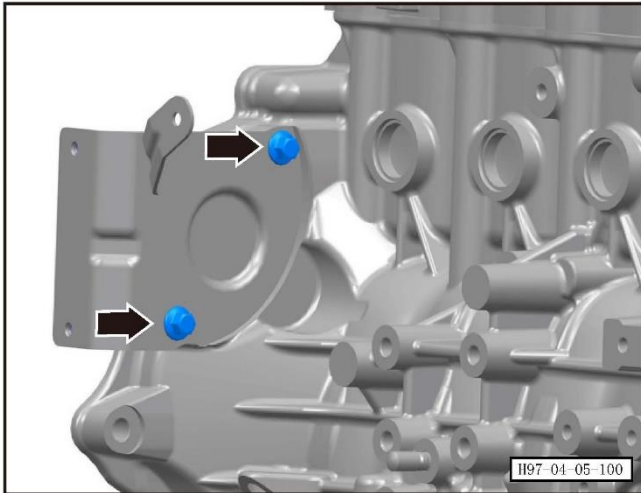
Refitting procedure

The refitting procedure is performed in reverse order.

4.5.19.2 Removal and refitting of starter cover plate

Removal procedure

1. Remove the range extender assembly (refer to [4.5.8.1 Removal and refitting of range extender assembly](#))
2. Remove the starter cover plate.
 - a. Unscrew 2 bolts of the starter cover plate.
Tightening torque of bolt: $10\pm 1\text{Nm}$.



- b. Take down the starter cover plate ①.

CAUTION:

- The vehicle is not equipped with a starter. It is only used as the range extender accessory cover plate.

Refitting procedure

The refitting procedure is performed in reverse order.