



repair manual

Renault Zoe · Smart Fortwo

(2012 - 2019)

with motor codes 5AQ-601, 5AL
Ajusa reference EV000200



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general information



WARNING!

Electric vehicle propulsion

This vehicle works with high-voltage electricity which can present **risks of severe or even lethal damages**.



SAFETY PRECAUTIONS

When working with high-voltage circuits or components, make sure that the **following safety guidelines** are fulfilled:

Make sure all the staff working with the high-voltage systems of electric propulsion have been provided with **proper training** to conduct the necessary procedures.

Put up **high-voltage warning** signs to guarantee the staff safety in the work area.

Make sure that the staff who don't have proper training doesn't have access to any high-voltage circuits and components.

Always wear **insulation gloves** under the related local safety rules.

Insulate the high-voltage batteries ensemble.

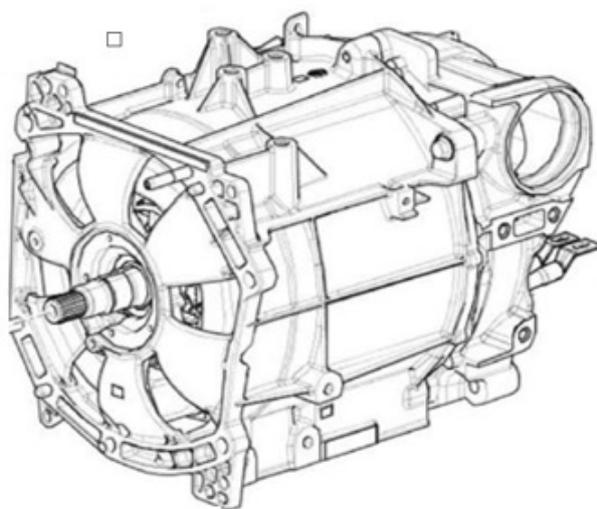
Before working with the electric propulsion system, make sure that the recommended **waiting time after insulating** the high-voltage batteries ensemble has passed by.

Check that the **residual voltage**, which may be in the circuit, is under the recommended safety level.

Make sure that all **test equipment and tools** are suitable to be used in high-voltage circuits or components.

To **ease the identification**, the high-voltage cabling in the electric propulsion system can be covered by an orange insulation.

technical information



Types of failure

Insulation failure.
Problems with the main bearing of the rotor.

References

Ajusa kit is reference **EV000200**.

This technical datasheet is related to model **Renault Zoe 2012-2019** with motor code 5AQ 601.

Also for **Smart Fortwo W453**, years 2016-2019 with motor code 5AL.

battery disconnection

Recommendations to connect and disconnect the battery in electric vehicles

Before getting started it is important to highlight that, in usual inspection and maintenance operations, as well as to disconnect the main battery of the vehicle it **is not necessary to disconnect** the batteries ensemble.

Disconnect the battery only when:

- Replacing the battery.
- When resetting certain parameters of the vehicle.
- When the car is going to be parked for a long lapse of time, so that the battery doesn't get fully discharged.

Safety precautions

The batteries ensemble both in electric and hybrid vehicles work with **high voltage**.

- Any worker who doesn't have proper training mustn't have access to any high-voltage circuits and components.
- Always wear suitable personal protective equipment (PPE).

It is essential to put up the related signs to guarantee the safety of both the area and the workers.

The **battery ensemble** of the electric vehicle must be insulated at all times to prevent potential short circuits. To insulate and strip the batteries ensemble there are different special tools:

- Tool number 1076921-00-B. Insulation multimeter.
- Tool number 1130480-00-A. Cable for insulation multimeter.
- You must be sure that all the testing devices and equipment are compatible with high-voltage applications.

When the batteries are insulated, a recommended **waiting time must pass** by before proceeding to handling the electric propulsion system.

With the insulation multimeter you will check the residual voltage value in the circuit to be sure that such value is under the recommended value.

The high-voltage cabling in electric vehicles has an orange insulation. Knowing this feature, it is easy to identify it.

Disconnection/insulation of the electric vehicle batteries ensemble

1) Find the battery. For this step, it is advisable to look it up in the **vehicle's manual**, as the method to reach the battery differs from one vehicle to another.

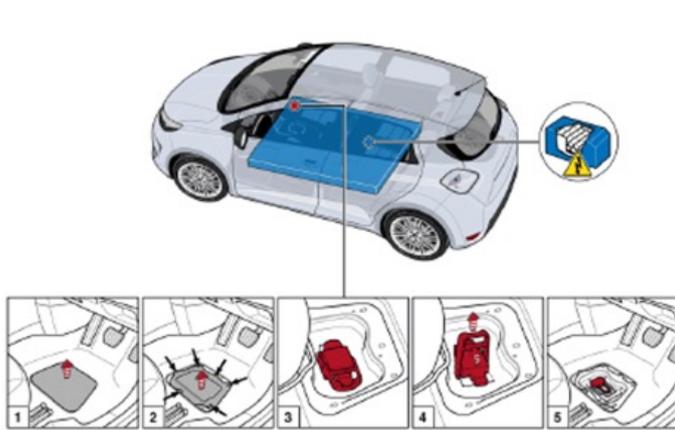


Figure 2. Access to the batteries ensemble Renault ZOE

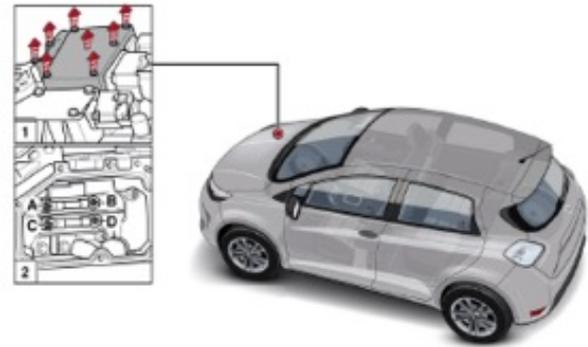


Figure 3. Fuse box Renault ZOE

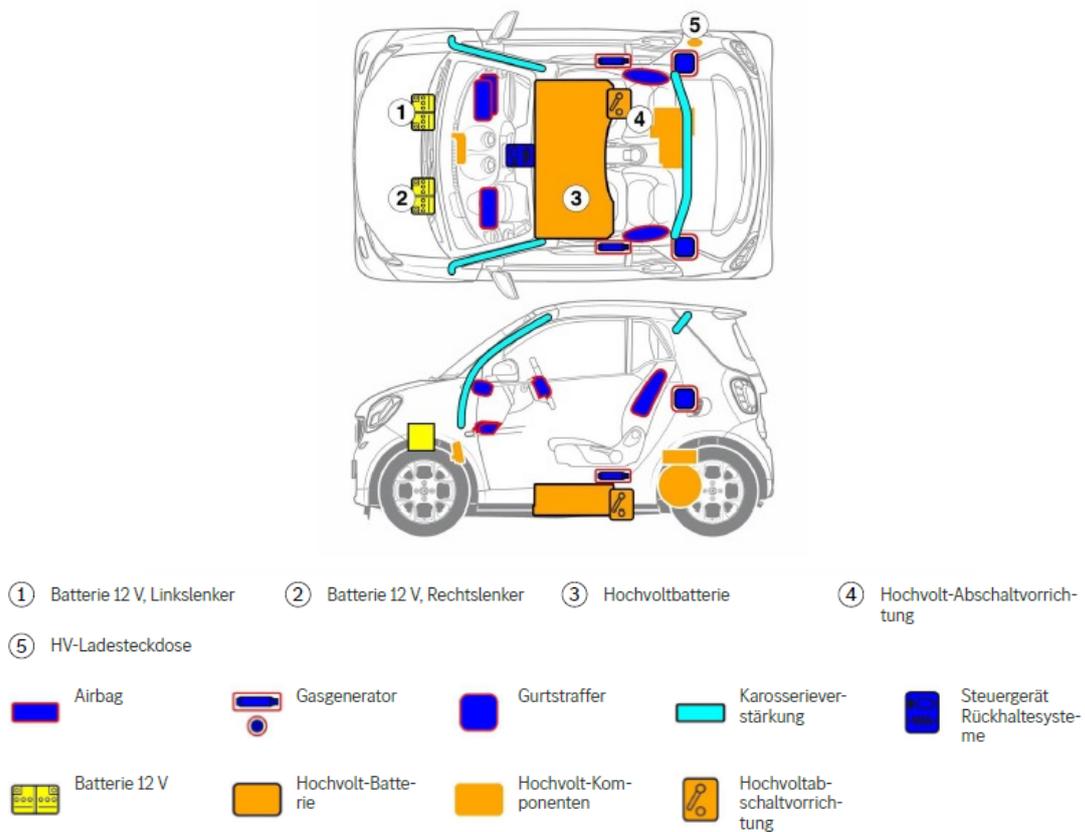


Figure 4. Access to the Fortwo batteries ensemble

In the case of Renault ZOE:

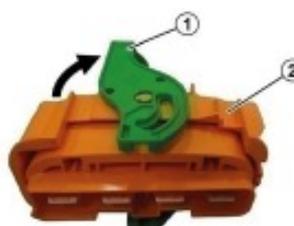
- 2) Check that the vehicle's charging cable is disconnected.
- 3) Start the vehicle and verify that the instrument cluster works properly and that it doesn't show any warning or failure.
- 4) It is recommended to **fully lower the driver's window** and slightly the passenger's window as a safety measure.
- 5) **Check that the gearbox** is neutral and that the parking brake is activated.
- 6) Disable the auto heating function and make sure that the power is not connected, and that the keys are not inside the vehicle. Make sure that all electric components are off.
- 7) Open the hood and open the front doors.
- 8) Activate manually the open-doors fastener with a suitable tool (screwdriver).
- 9) Block the vehicle and wait **3 minutes**.
- 10) Make sure that the power doors lock system's LED and the instrument cluster screen switched off.
- 11) Follow steps 1 - 2 - 3 - 4 - 5 in figure 2.
- 12) Secure the safety cover of the connection plug of the insulator of the battery ensemble with a lock in order to prevent it from connecting involuntarily. Tools number Ele. 2005 and Ele. 2211.
- 13) Wait 5 minutes and **disconnect the main battery** of the vehicle.
- 18) Stick insulating tape in the vehicle's main battery negative terminal to prevent any accidental connection.
- 19) Disassemble the cover access to the electric vehicle's charger fuse box figure 3.
- 20) Check the voltage between terminals A and C, B and D, A and ground, B and ground, C and ground and D and ground. It must be below 0V.

21) Assemble the cover access to the electric vehicle's charger fuse box with a new gasket figure 3.

22) Tighten screws manually.

In the case of Smart Fortwo:

1) Disconnect high-voltage system figure 4.4. We open the socket lock and take the high-voltage socket of the battery out.



1. Socket lock
2. Socket

2) To make sure that there is no residual voltage in the high-voltage system, wait 20 seconds after disconnection.

Warning: Passive safety systems, such as airbags and belt tensioners, are still fueled by the 12V on board electric system.

Connection of the electric vehicle's batteries ensemble

- 1) Check that the power is not activated and that the keys are not inside the car.
- 2) Undo previous steps and access to failures memory and delete failure codes.
- 3) Connect the vehicle's main battery and check that everything works properly.

composition



Front bearing¹
(1 unit)



Phases connections gasket²
(1 unit)



Fuses cover gasket (big)³
(1 unit)



Inverter gasket⁴
(1 unit)



Back bearing⁵
(1 unit)



Fuses cover gasket (small)⁶
(1 unit)



Rotor entry seal⁷
(1 unit)



Transmission oil seals⁸
(2 units)



Filling cap washer⁹
(1 unit)



Draining cap washer¹⁰
(1 unit)

repair

As follows, we will show you in simple steps the repair of this motor.

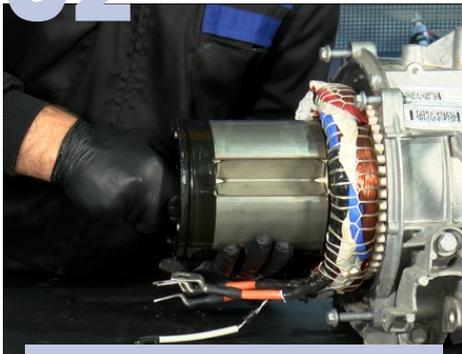
01



Front and back bearings

The first step will be assembling the bearings in the rotor. We will place the **front bearing**¹ in the brushes part, and the **back bearing**⁵ in the part where the primary shaft is located.

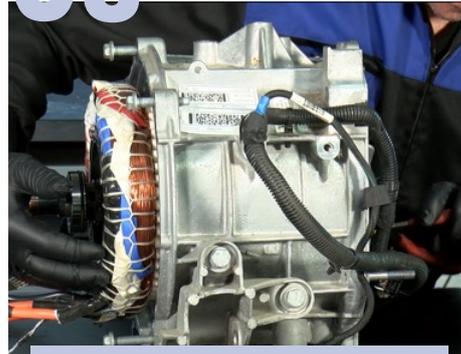
02



Rotor's position in the stator

Once the bearings are assembled, we can put the rotor into the stator.

03



Safety washer

We must make sure that the safety washer fits in the bearing's slot. It is important to check that the safety washer is assembled before continuing with the following steps.

04

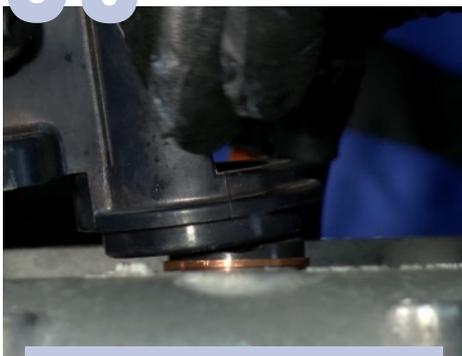


Back cover position

Then, we proceed to assemble the back cover brushes holder using sealant AjusEV. We will conduct a tightening of 25 Nm.



05



Brushes assembly

Once the cover is assembled, we will place the brushes, tightening their screws 8 Nm.

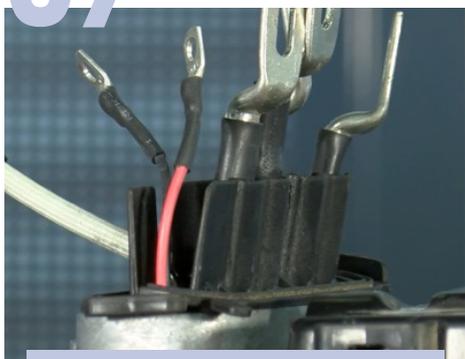
06



Brushes holder cover

Next step will be assembling the brushes holder cover, with a tightening torque of 6 Nm.

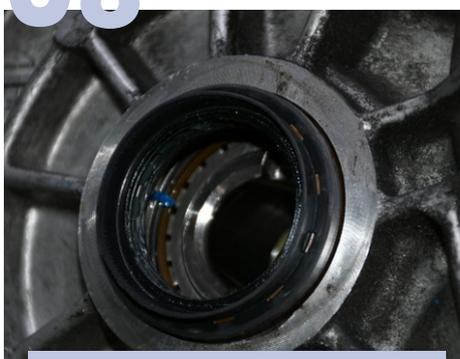
07



Connections feedthrough

We will assemble the three-phase connections feedthrough.

08



Gear seals

We will assemble the **gears oil seals**⁸ on both sides, using for that purpose, a special implement.

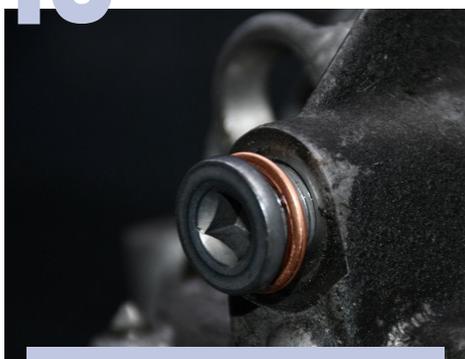
09



Oil draining cap

We will change the **draining cap washer**¹⁰. Tightening on the cap of 15 Nm.

10



Oil filling cap

We will also change the **filling cap washer**⁹.

11



Primary's seal in the transfer gearbox

We will assemble the **entry seal**⁷ with the help of a specific implement.

12



Transfer box assembly

Now we can assemble the transfer gearbox over the motor and tighten with a tightening torque of 31 Nm.

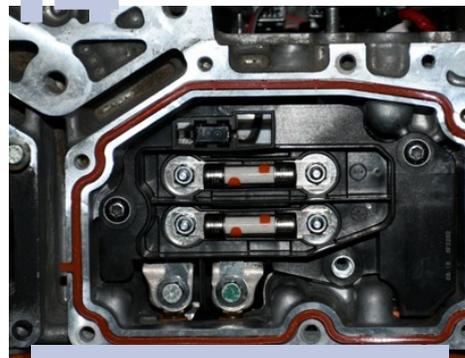
13



Electronics box

We will assemble the box where the different electronic modules are located, such as the inverter and the converter, assembling the **inverter gasket⁴** and we will apply a tightening torque of 15 Nm.

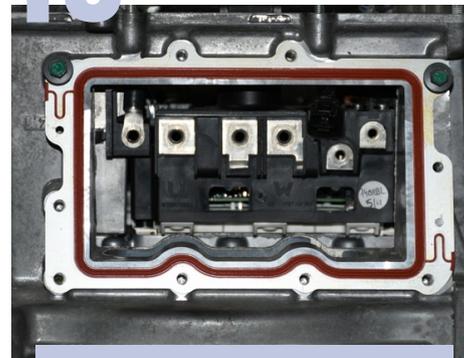
14



Fuses cover

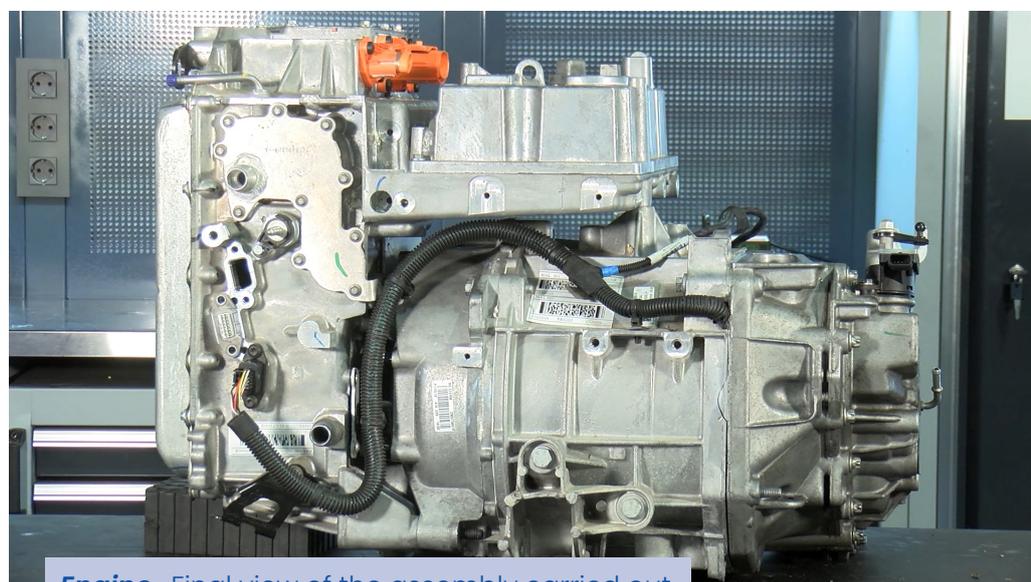
We install the fuse **fuse box cover gasket (small or large)^{3 or 6}** depending on the vehicle version and the size of its batteries. In this case, the small one. We will apply a tightening torque of 15 Nm.

15



Phases connections

The last step will be conducting the phases connections, where we will assemble the **phases connections gasket²**.



Engine · Final view of the assembly carried out.

additional information

Do you know **which are the tools you need** to repair the motor of an electric vehicle? Do you know the **safety measures** to conduct this repair? Is it that you don't know where to start?

Visit the electric vehicle section on our website where we will give you the answers to all these doubts and much more.

You will be able to see the **safety measures video** as well as the **video tutorial** in which you'll see step by step the assembly of the Ajusa kit related to this vehicle.

Furthermore, you can contact our technical assistance department to solve any doubt.

Subscribe to our Youtube channel and learn everything you must know about mechanics.



Click here to watch the **assembly video**:

VIDEO