EMERGENCY RESPONSE GUIDE FOR FULL ELECTRIC (EV) , PLUG IN HYBRID (PHEV) and HYBRID(HEV) VEHICLES of RENAULT GROUP

Introduction

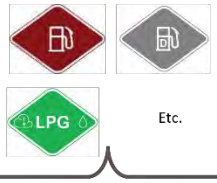
This document is intended to provide information to the emergency services for their training sessions regarding the procedure of intervention on full electric (EV), plug in hybrid (PHEV) and hybrid (HEV) vehicles of RENAULT GROUP. It can also be useful for road assistance.

The specific document made to be used on the scene of road rescue is the Rescue Sheet made for each model of our vehicles.

Our rescue sheets are available on the scene of the accident through different Apps : EuroRescue, Rescue Code , Moditech …

The names of all our concerned vehicles are added to the present document in the chapter 0.

The vehicles concerned by this ERG can have three different types of high voltage batteries as shown in the picture below:



Technology	Micro hybridation	Light Hybridation	Hybrid (HEV)	Plug-in Hybrid (PHEV)	100 % electric (EV)
$CO_{2\,g}$ain	~ 3 % à 5 %	~ 14 %	~ 20 %	60 à 75 %	100 %
Voltage (V)	12 à 48 V	48 V	~ 280 V	400 V	> 400 V
Energy	/	/	1 to 2 kWh	10 to 15 kWh	22 to 100 kWh
Electric Kms	/	/	< 10 km	> 50 km	> 200 km
HV battery weight	/	/	~ 40 kg	~ 100 kg	250 to 600 kg

This document provides a comprehensive set of useful, relevant information to enable first and second responders :

- to recognize an EV, a PHEV or an HEV model,
- to learn about its main technical features,
- to identify the risks inherent to the onboard technology and therefore to adapt their resources and methods to act effectively in full safety.

CONTENT

0.	Rescue Sheets	4
1.	Identification / recognition	4
2.	Immobilisation / stabilisation / lifting	9
3.	Disable direct hazards/safety regulations	11
4.	Access to the occupants	14
5.	Stored Energy / liquids / gasses / solids	15
6.	In case of fire	16
7.	In case of submersion	18
8.	Towing / transportation / storage	19
9.	Important additional information	20
10.	Explanation of pictograms used	20

0. Rescue Sheet

You will find in this chapter the name of all Renault Group vehicles sold in Europe which are :

- Full Electric Vehicles (EV),
- Plug in Hybrid Vehicles (PHEV)
- Hybrid (HEV).

The rescue sheets of all these vehicles are available on :

• The web site : https://rescue.renault.com/

• The free Apps :

  ▪ Apps « Rescuecode », developed by Desincar ,

  ▪ Apps « Euro Rescue », developed by EuroNCAP.

The models concerned by this ERG are :

FULL ELECTRIC family :

Renault FLUENCE ZE
Renault KANGOO E-TECH 100% Electric
Renault KANGOO VAN E-TECH 100% Electric
Renault MASTER E-TECH 100% Electric
Renault MEGANE E-TECH 100% Electric
Renault TWINGO E-TECH 100% Electric
Renault TWIZY E-TECH 100% Electric
Renault SCENIC E-TECH 100% Electric
Renault ZOE E-TECH 100% Electric

Dacia SPRING 100% Electric

PLUG IN HYBRID family

Renault CAPTUR E-TECH Plug-in Hybrid
Renault MEGANE E-TECH Plug-in Hybrid
Renault RAFALE E-TECH Plug-in Hybrid

HYBRID family

Renault ARKANA E-TECH Full Hybrid
Renault AUSTRAL E-TECH Full Hybrid
Renault CAPTUR E-TECH Full Hybrid
Renault CLIO E-TECH Full Hybrid
Renault ESPACE E-TECH Full Hybrid
Renault RAFALE E-TECH Full Hybrid
Renault SYMBIOZ E-TECH Full Hybrid

Dacia DUSTER Hybrid 140
Dacia JOGGER Hybrid 140

1. Identification / recognition

A. Exterior distinguishing features

FOR A FULL ELECTRIC VEHICLE (EV)

The main distinguishing features on the exterior of a full electric vehicle are :

- no fueling flap
- no exhaust pipe.
- a charging flap
- a specific naming
- a sticker on the left of the windscreen and another one on the right of the rear window to reach the appropriate rescue sheet via the Rescuecode and/or EuroRescue applications, or directly via the camera function of the tablet or phone connected to the network

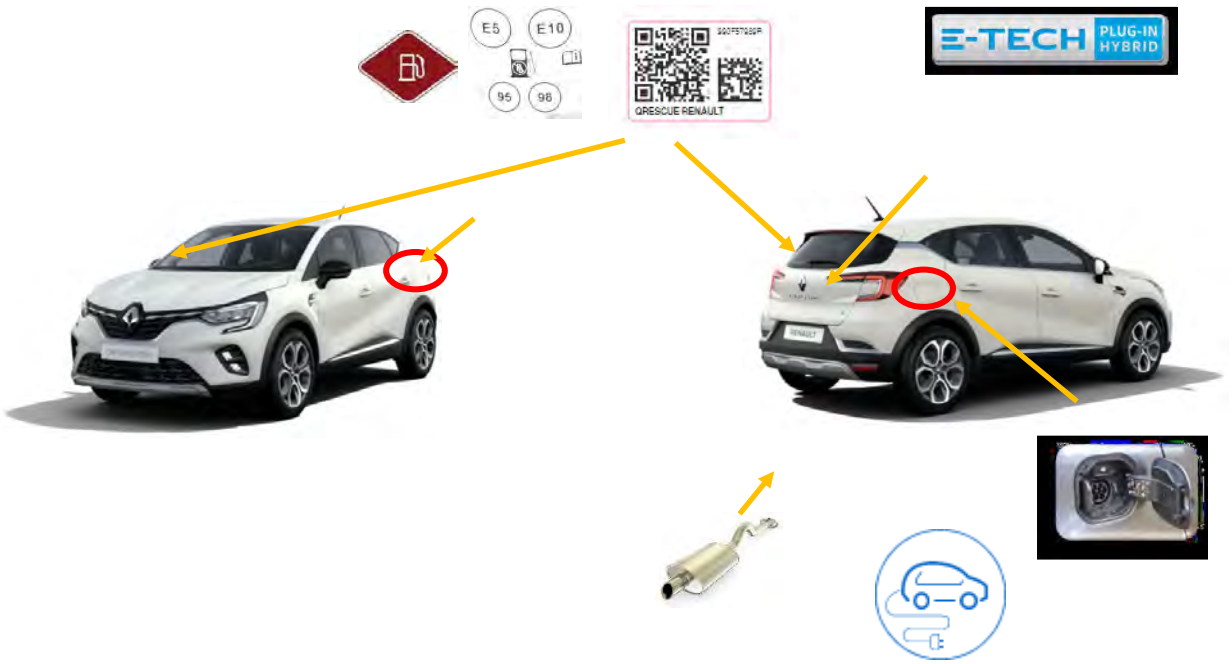
Example of one of our Electric Vehicles

FOR A PLUG-IN HYBRID VEHICLE (PHEV)

The main distinguishing features on the exterior of a plug in hybrid vehicle are :

- A fueling flap located on one side of the vehicle
- A charging flap. on the other side of the vehicle
- a specific naming
- a sticker on the left of the windscreen and another one on the right of the rear window to reach the appropriate rescue sheet via the Rescuecode and/or EuroRescue applications, or directly via the camera function of the tablet or phone connected to the network

Example of one of our Plug-In Hybrid vehicles



FOR AN HYBRID VEHICLE (HEV)

The main distinguishing features on the exterior of an Hybrid vehicle are :

- A fueling flap located on a side of the vehicle
- a specific naming
- a sticker on the left of the windscreen and another one on the right of the rear window to reach the appropriate rescue sheet via the Rescuecode and/or EuroRescue applications, or directly via the camera function of the tablet or phone connected to the network

Example of one of our Hybrid vehicles

B. Distinguishing features in the motor compartment

FOR A FULL ELECTRIC, PLUG-IN HYBRID VEHICLE, AND HYBRID VEHICLE

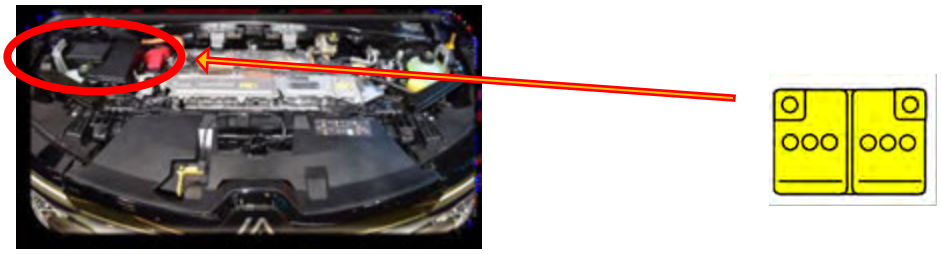
Presence of the electric engine and high voltage orange cables, connecting the high voltage battery to the electric engine.

C. Energy sources

1. 12 Volts battery

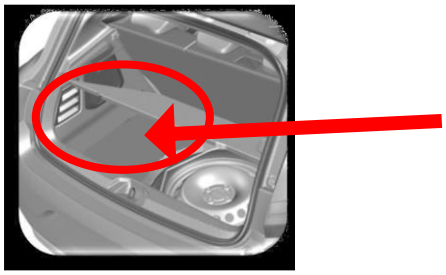
FOR A FULL ELECTRIC VEHICLE (EV)

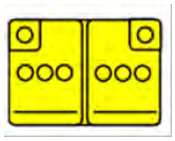
The 12V battery is generally located in the engine compartment.
In some cases, an additional 12V battery can be located in the cabin of the vehicle . This second 12V battery is disconnected automatically when the first one located in the engine compartment-has been disconnected by rescue teams.



FOR A PLUG-IN HYBRID VEHICLE (PHEV) AND AN HYBRID VEHICLE (HEV)

Because of the presence of two engines (electric and internal combustion) , the 12V battery has generally to be located in the trunk, on the left side





Features of the 12V batteries	
Battery type	Lead or Li-Ion
Voltage	12 V
Amperage	70 Ah

2. Traction battery (high voltage)

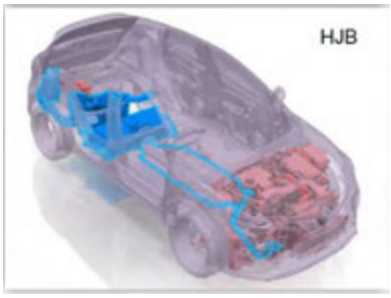
FOR A FULL ELECTRIC VEHICLE

The high voltage battery is generally located under the body of the full electric vehicle

Features of the High Voltage batterie of full EV	
Battery type	Li-Ion
Voltage	> 400 V
Energy	22 to 100kWh
Weight	250 to 600 kg

FOR A PLUG-IN HYBRID VEHICLE

The high voltage battery is generally located unc e body of the PHEV but does not take up all the space as the battery of a full EV.



Features of the High Voltage batterie of a PHEV	
Battery type	Li-Ion
Voltage	400 V
Energy	10 to 15kWh
Weight	100 kg

FOR AN HYBRID VEHICLE

The high voltage battery is generally located under a part of the body of the HEV; sometimes under the rear seat, sometimes under the front seat, sometimes under the trunk .

Features of the High Voltage batterie of a HEV	
Battery type	Li-Ion
Voltage	280 V
Energy	1 to 2kWh
Weight	40 kg

3. Energy transfer and insulation of the High voltage circuit

All high voltage cables can be distinguished by their ORANGE color.
The high voltage circuit is insulated from the metal vehicle chassis.

it is essential to refer to the Emergency plug of each model because the recommendation may be different depending on the technology embedded in this model.

2. Immobilisation / stabilisation / lifting

A. Immobilisation

① Place the gear lever in position P (Park). The drive wheels are then mechanically locked

② Switch off the ignition using the start and stop button

B Stabilization / wedge of the vehice

Usual wedge operations are compatible with high voltage battery presence but :

Do not fit vehicle supports under High Voltage orange cables which are located between the electric motor and the traction battery

3. Disable direct hazards/safety regulations

A. 12 Volts battery disconnection

The 12 V battery is disconnected in exactly the same way as with a traditional internal combustion engine vehicle.

① Check that the ignition is switched off
② Disconnect the negative terminal (-) of the 12 V battery

This procedure also guarantees in 99 % the electrical safety of the High Voltage battery by an internal security system, opening automatically the relays of power of High Voltage cables.

This relay opening is automatically done in case of road accident.

Nevertheless, for the electric vehicles of first generation, according to the possible high violence of the impact, a risk of non-opening of these relays is possible. The procedure below is needed to guarantee an electric safety in 100 %.
Check on the Rescue Sheet the recommendation adapted to each model

B. High Voltage battery disconnection

For the electric vehicles of first generation, a **manual action on the service plug is recommended to guarantee the electric safety in 100 %, in case of violent crash , and if the use of extrication tools is needed.**
The Service-plug is the traction battery safety circuit breaker. Check on the Rescue sheet the recommendation adapted to each model

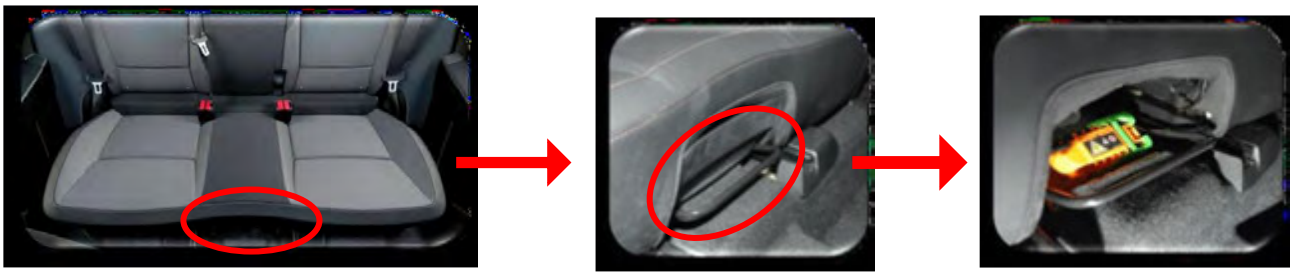
1. Service-plug localization:

For electrified vehicles with a manual high voltage battery disconnection system for rescue teams , the service plug disconnection is recommended only if rescuers have to cut the vehicle to extricate the victims.

Access to the Service-Plug as indicated on the rescue sheet ; depending on the model of the vehicle, it can be located in different places, but always directly on the high voltage battery .

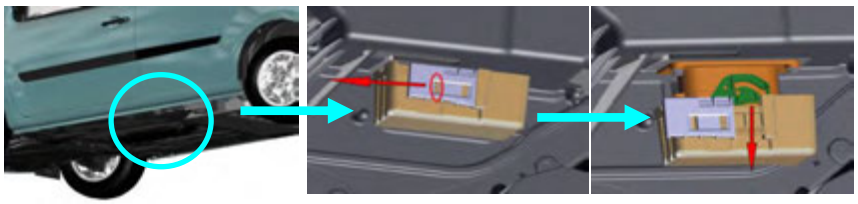
Below are all the examples of location of the service plug

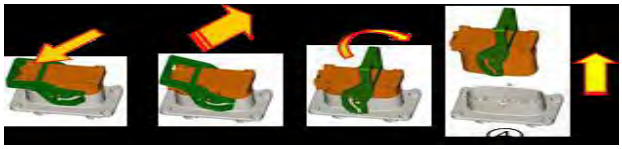
The Service-plug may be located under the rear seat and accessible from the front of the seat.



The Service-plug may be located in the trunck .

The Service plug may be located under the body of the car , and accessible from the outside





2. Personal protection equipment for manual 400V battery disconnection

Rescuers must wear :

- a face shield,
- correctly fitting electrical protection gloves.

ELECTRICAL PROTECTION GLOVES
Insulating gloves for electrical work, class 00, 2500 V test voltage, 500 V working voltage.

Class III personal protection equipment – to comply with:

EN 60 903: European standards
CEI 60 903: International standards

Example of electrical protection gloves

FACE SHIELD
Protects the face against liquid and solid splashes and short-circuit electric arcs.

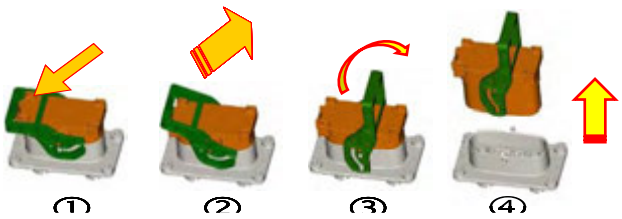
Personal protection equipment compliant with European standards:

EN 166: Personal eye protection
EN 170: Personal eye protection - ultraviolet filters

Example of face shield

3. Disconnection of Service-plug

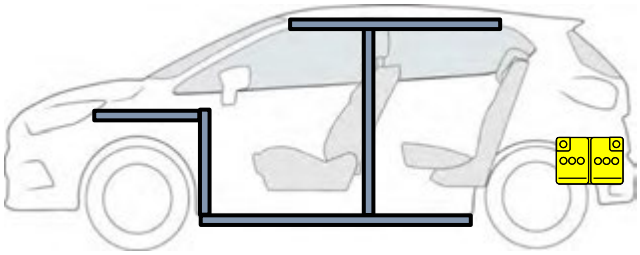
- Wear electrical protection gloves  and a face shield 
- Remove the cover of the high voltage battery safety circuit breaker
- Remove the high voltage battery safety circuit breaker:

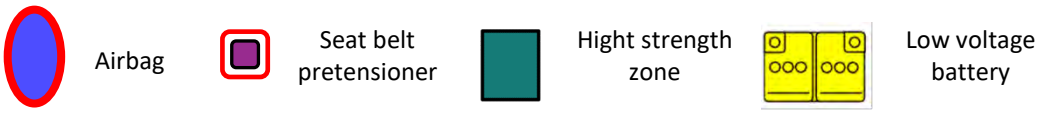


① Use the green handle
② To unclip, press the orange section
③ Raise the green handle until the possible maximum
④ Pull the green handle to remove the service plug

4. Access to the occupants

Electric and hybrid vehicles (EV, PHEV and HEV) are equipped with occupants protection systems such as conventional vehicles. As a result, access to occupants will be the same as on a conventional vehicle.





- Before beginning any cutting maneuver to access to occupants, it is necessary:
  - to have made the procedure of immobilization of the vehicle
  - to have disconnected the 12V battery
  - to have opened the high voltage circuit by disconnecting the Service-plug when it is indicated on the rescue sheet of the vehicle using protection gloves and a face shield to guarantee 100% electric safety..

- The residual risk, without Service-plug disconnection, is a risk of electric arc only in case of contact between an extrication tool and high voltage cables.
  This arc could deteriorate the extrication tool.
  But it should be noted that the high voltage cables are always positioned outside the usual cutting locations

  All explanations concerning the facilitation of extraction of victims - such as the cutting of the steering wheel, the opening of the trunk from the inside, the possible movements of the seats - are indicated in each rescue sheet of each model

5. Stored Energy / liquids / gasses / solids

A. Warning

Never break nor open the casing of the high voltage battery, whatever are circumstances, including during a fire, at the risk of grave electric burns, electric shocks or electrocution.

An electrolyte leak from the traction battery is unlikely.

However, in the event of an electrolyte leak, wear anti-corrosion chemical protective gloves and protection face shiled. Spread absorbent products and collect them up for treatment with standard organic solvents.

The electrolyte in the Lithium-ion traction battery is a clear liquid and has a distinctive organic solvent odor.

Electrolyte is a flammable solution.

In the event of a leak, ventilate the accident area, if necessary.

The battery electrolyte is corrosive. Contact with it may cause serious burns to the skin and damage to the eyes.

Do not breathe in the vapors while equipping yourself with an Open Circuit Self-contained breathing apparatus.

In the event of ingestion, inhalation, contact with the skin or the eyes, wash with plenty of water as quickly as possible; contact a poison control center or a doctor immediately.

6. In case of fire

A. Hazards and protective equipment

A burning EV, PHEV or HEV, just like as a standard internal combustion engine vehicle, produces toxic gases.

Firefighters should wear Open-Circuit Self-Contained Breathing Apparatus as well as their standard protective equipment when near a fire, both indoors and outdoors.

B. Action to extinguish the vehicle on fire

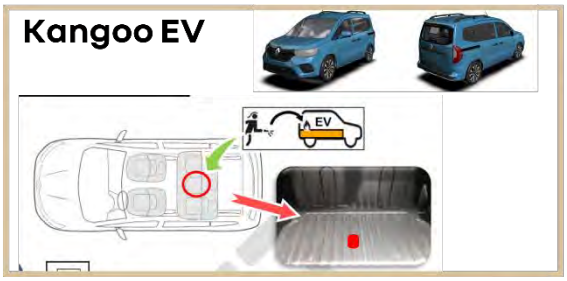
1. In the event of fire of both the vehicle and its high voltage battery:

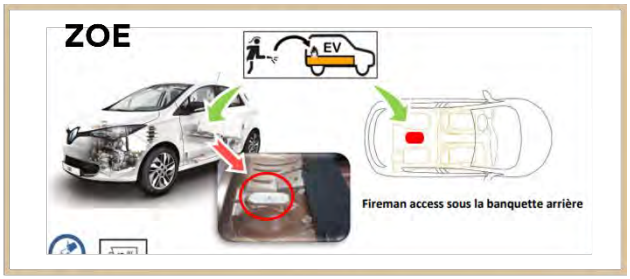
① Extinguish the body of the vehicle with water as usual.

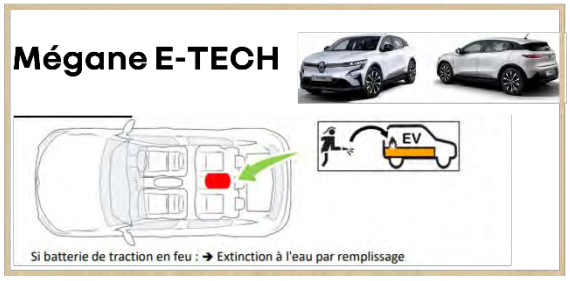
② The total and **definitive extinction of a high voltage Li-Ion battery** is only possible by flooding the battery **with water, to reach the cells** .

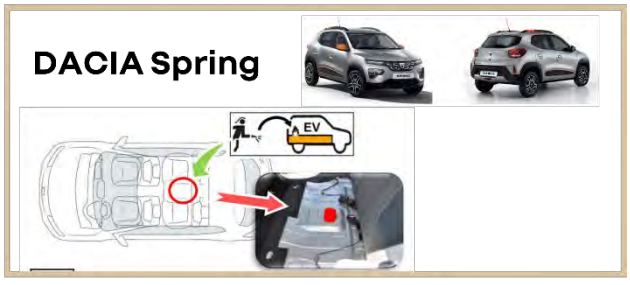
Such an extinguishment is possible thanks to the presence of a specific device developed by Renault for firefighters. Called FIREMAN ACCESS , it is available on all our 100% electric and plug-in hybrid models.
It is not necessary on plug-in hybrid models because their batteries burn quickly and do not need this specific access.
This system was designed to allow firefighters to reach the interior of the high voltage battery while remaining outside the vehicle.
Ten minutes will be enough to guarantee its definitive extinction.
This pictogram represents the FIREMAN ACCESS and is indicated on the rescue sheet of vehicles equipped with it .

Some examples of localization of the FIREMAN ACCESS









Note that the High Voltage battery is so well protected against thermal runaway, that it is possible that even if the car's chassis is completely on fire, its High Voltage battery is still not on fire. In this case, see Part 2 below.

2. In the event of fire of the body of the vehicle but not yet the high voltage battery:

① Extinguish the body of the vehicle.
② Cool the high voltage battery casing with water
③ Check repeatedly that there is no temperature increase in the high voltage battery using a thermal camera near the battery envelope.

7. In case of submersion

A. General points

The network of the high voltage battery is insulated by the body of the vehicle; and the insulation of the circuit of traction is verified by the battery management system (BMS). The risk of electrocution exists only when a person between is touching with both electric poles of a circuit linked to the traction battery. There is thus no danger to touch the water and the body of the immersed vehicle.

The victims of an accident can be helped, including if the vehicle is still in the water.

By precaution, during an intervention on a totally or partially immersed electrical vehicle, and in a general way in wet environment, don't touch directly high voltage orange cables, high voltage components nor the traction battery.

The electric disconnection of the electrical vehicle is possible only after having removed the vehicle of the water. In case of necessity of intervention in wet environment, please follow the following recommendations.

B. Safety procedure after removing it from the water.

After removing the vehicle from the water, it is essential to make the vehicle safe to prevent risks of a secondary accident in the recovery chain (breakdown, storage, etc.):

① Wear electrical protection gloves and a face shield
② Switch off the ignition
③ Disconnect 12V battery
④ Remove the high voltage battery disconnecting system (Service-plug)

8. Towing / transportation / storage

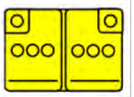
Our 100% electric, plug-in hybrid (PHEV) and non-refillable hybrid (HEV) vehicles can be transported after a-crash on a truck or towed according to the methods listed below.

If crashed EV, PHEV and HEV have to be placed in storage, always indicate that this is a full electric or hybrid vehicle with an electric potential risk, and park them outside and away from other cars

9. Important additional information

Nothing to report

10. Explanation of pictograms used

PICTOGRAM	DESIGNATION
	Général warning safety
	Warning electricity
	Electrical protection gloves
	Face shield
	Battery, low-voltage
	Hight voltage power cable

	Battery pack, high-voltage
	Disconnect high voltage device (Service-plug)
	Use water to extinguish the fire
	Fireman Access device made for firefighters to put water easily inside the High voltage battery if on fire - without any specific tool- and extinguish it quickly (10 minutes)