

TO EMERGENCY SERVICES

Product information on electric
trucks

June 2020

Valid from 12.02.2020 to 01.01.2099

1. Introduction

This document aims to provide technical product information to establish procedures and methods for rescue operations in accidents involving electric trucks. This document is intended for emergency services personnel and provides information about potential hazards during rescue operations involving electric trucks where the safety systems may have been compromised.

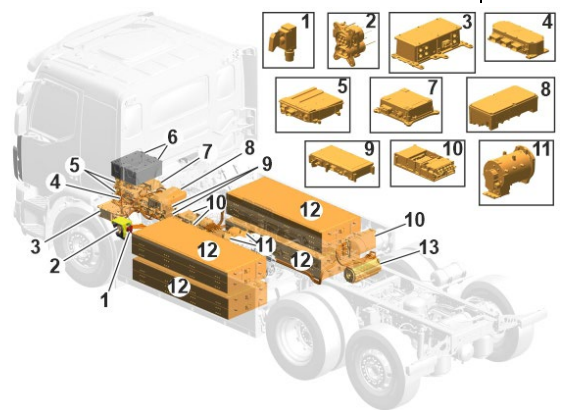
A voltage range of 400 V – 1500 V is considered as traction voltage in automotive vehicles.

2. Electric truck

Traction batteries for propulsion power the full-electric truck.

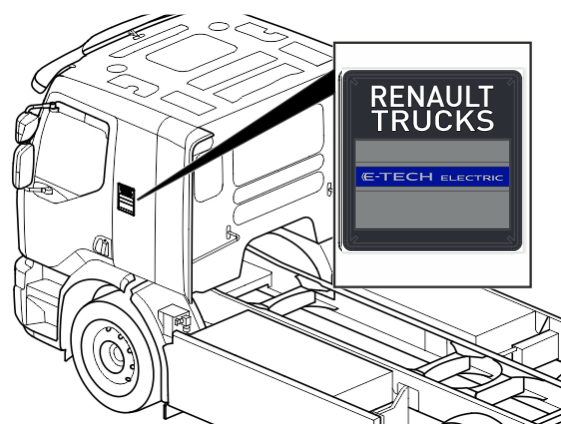
Main components in a full-electric truck are:

1. Chassis switch
2. CCS (Combined Charging System) inlet
3. CSU (Charging Switch Unit)
4. Junction box, 400 VAC
5. OnBC (On-Board Charger)
6. 24 V battery
7. TVMU (Traction Voltage Monitoring Unit)
8. TVJB (Traction Voltage Junction Box)
9. DC/DC (Direct Current) converters
10. EMDs (Electric Motor Drive)
11. EM (Electric motor)
12. Traction batteries
13. Electric motor, ePTO (Power Take-Off) (Optional)



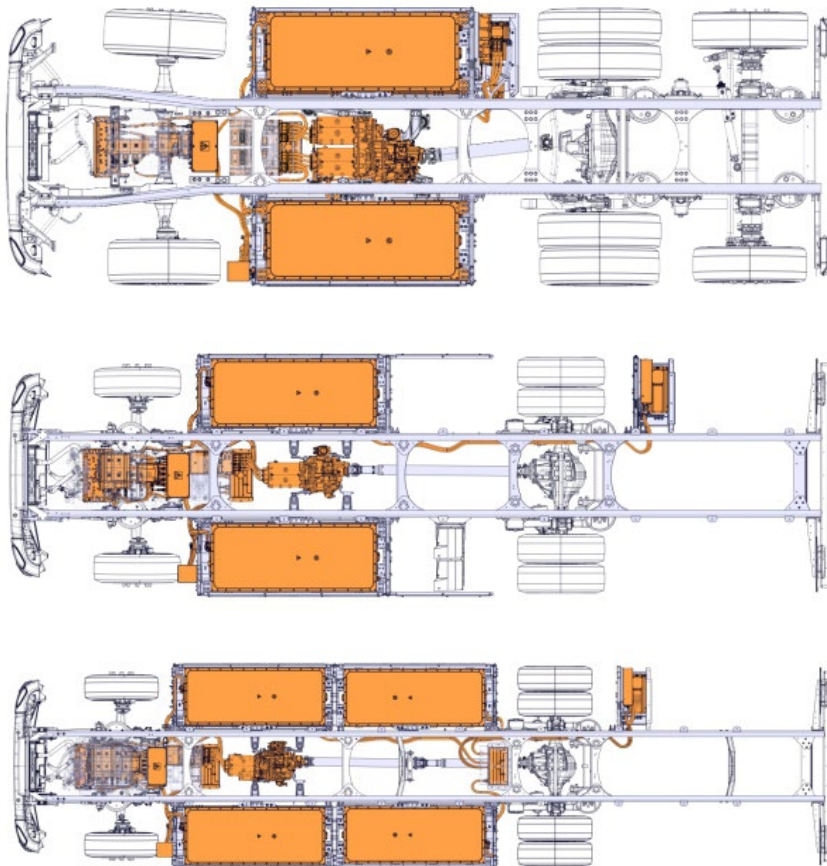
3. Identification of electric truck

An emblem near the cab door identifies Electric trucks.



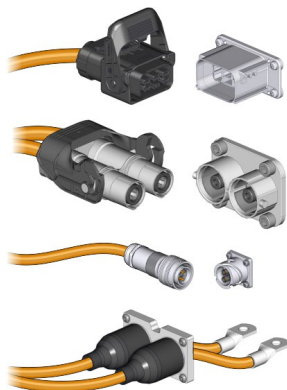
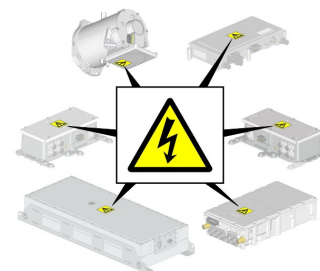
4. Traction voltage components location

The traction voltage components and their location in different vehicle variants are highlighted in orange color for easy identification.



5. Identifying traction voltage components, connectors and cables

Traction voltage components are marked with a warning symbol.



Traction voltage cables are in orange color for easy identification.

6. Key points of an electric vehicle



DANGER:

Risk of electrical discharge. Incorrect handling of the traction voltage system (>600V –nominal value) can cause electric shocks and arcs that in turn can cause serious burns or death.

►The operation must only be carried out by personnel with adequate training (according to **Safety regulation**).

- Always assume that the traction battery and the associated traction voltage components are energized and fully charged.
- Exposed electrical components, wires and traction batteries present a potential hazardous situation.
- Physical damage to the vehicle or traction battery may result in immediate or delayed release of toxic and flammable gases.
- Thermal runaway in the traction battery means that a serious fault in the traction battery has started an unstoppable chain reaction that most likely will lead to a fire in the traction battery.

7. Various rescue scenarios

7.1. In case of a collision

- Always approach the vehicle from the sides to stay out of the potential travel path. It may be difficult to determine if the vehicle is running due to lack of noise.
- If possible, chock the wheels, apply the hand brake.
- Check for thermal runaway detection; see “Thermal runaway detection”.
- Turn off the ignition and remove the key.
- Evacuate and secure the area.
- The traction batteries (600 V) are located on either side of the vehicle, which is why collision on the traction battery may have a large impact on the rescue operation.
- There is risk of serious electric shock if the traction battery cover has been opened or deformed and the inside is exposed.
- Cut the power to the vehicle; see “Break the traction voltage circuit” and “Electrical system, 24V”.

7.2. In case of fire

- Emergency services personnel must wear Personal Protective Equipment (PPE) and Self-Contained Breathing Apparatus (SCBA).
- Always approach the vehicle from the sides to stay out of the potential travel path. It may be difficult to determine if the vehicle is running due to lack of noise.
- If possible, chock the wheels, apply the hand brake.

- Check for thermal runaway detection; see “Thermal runaway detection”.
- Turn off the ignition and remove the key.
- Evacuate and secure the area.
- Cut the power to the vehicle; see “Break the traction voltage circuit” and “Electrical system, 24V”.
- Class ABC fire extinguishers can be used on all parts of the truck excluding traction batteries.
- In case of traction battery fire, use large sustained volumes of water to cool down and protect the area
- Be alert. There is a potential for delayed fire with the damaged traction batteries.

7.3. In case of water submersion

DANGER:



Risk of electrical discharge: the damage level of a submerged vehicle may not be visible. Handling a submerged vehicle without appropriate Personal Protective Equipment (PPE) will result in serious injury or death from electric shock.

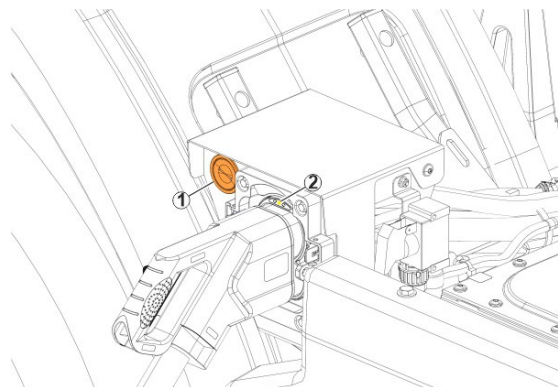
Avoid any contact with the 600 V cables and electrical components

- If possible, turn off the ignition and remove the key.
- If possible, cut the power to the vehicle; see “Break the traction voltage circuit” and “Electrical system, 24 V”.
- Transport the truck away from the water and drain to avoid electric shock.
- Evacuate and secure the area.
- Submersion in water can damage low and traction voltage components. Although not a common occurrence, this could result in an electrical short and potential fire once the vehicle re-moved from the water.

7.4. Accident while charging

If the charging vehicle is involved in an accident:

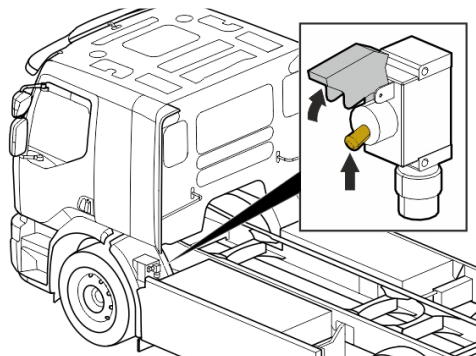
- Unlock the cab.
- Press the stop button (1) and wait for the steady yellow light (2).
- Pull the charging plug out of the charging inlet once the yellow light goes off.
- If the charging plug cannot be pulled out, see “Manually retracting the locking pin” and “various rescue scenarios”.



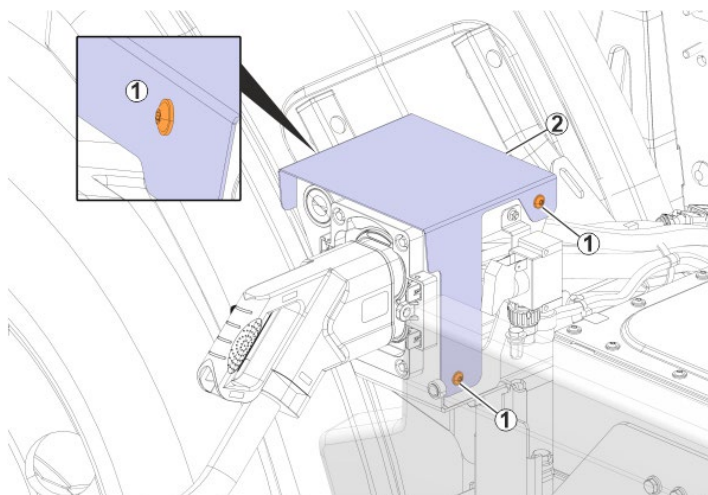
7.5. Manually retracting the locking pin

If the locking pin does not retract automatically when you press the stop button, you can retract it **manually**:

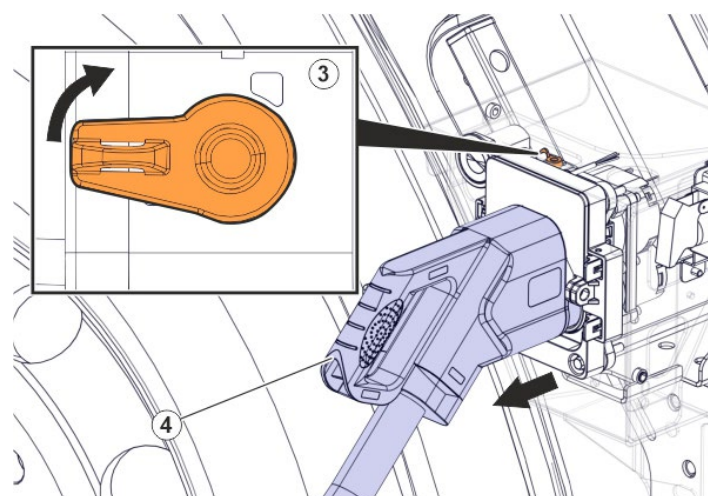
- Lift the cover of the chassis switch and tilt the lever upwards.



- Remove the screws (1) and remove the cover (2).



- Rotate the lever (3) and remove the charging plug (4).



7.6. Additional safety information

- The electric vehicle involved in the accident must be parked in a suitable place outside and maintain a safe distance from other vehicles, buildings and combustible objects.
- After the fire suppression, observe the vehicle for a minimum period of one day in the safe open area.
- A thermal imaging camera is preferred to check if there is any active thermal reaction in the traction battery.
- As with any vehicle fire, the by-products of combustion can be toxic and all individuals must move to a safe distance.
- Use Personal Protective Equipment (PPE) and Self-contained Breathing Apparatus SCBA to handle the traction voltage components or wiring harness (orange color wires).
- Caution before towing. If the traction batteries are damaged, there can be a risk of thermal or chemical reaction. If in doubt, contact the fire department before towing.

7.7. Break the traction voltage circuit

The system should be powered down in a controlled manner so that normal rescue operations can then be carried out.



Note:

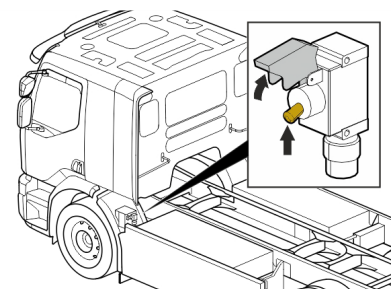
Never assume that a drive system is disengaged just because it is silent. Turn off the system to make sure.

Turn off the ignition and remove the key. The first task in a rescue operation is, if possible, disengage the electrical drive system using the chassis switch. All the components are designed to discharge their own capacitance within 5 seconds.

Chassis switch:

The electric truck is equipped with a chassis switch beside the charging inlet and is used to enable or disable the electronics controlling the traction voltage in the vehicle.

- Chassis switch position “down” means 600 V can be enabled.
- Chassis switch position “up” means 600 V disabled.



When the chassis switch is in “up” position the system is required to:

- Shut down the 600 V properly by stopping load, opening contactors in the traction batteries and discharge the remaining voltage.
- Shut down the electronics that is possible and open the 24 V main switch.

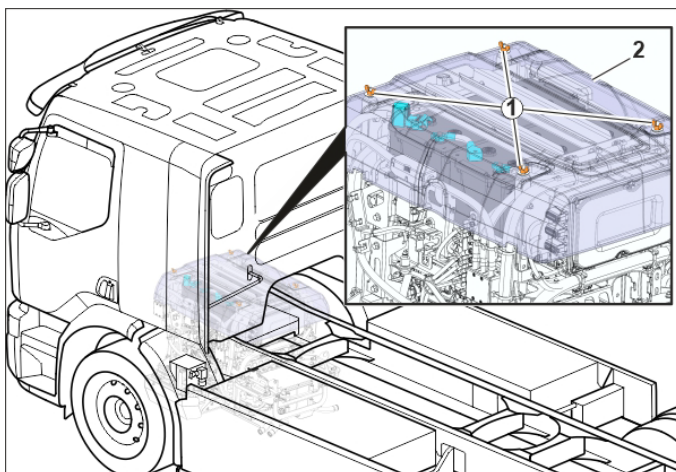
Note the following restrictions for the chassis switch function:

- The chassis switch is an electronic command, which launches the high-voltage disconnection process. It is not equivalent to commissioning or decommissioning of the 600 V.
- The chassis switch has no influence on the direct 24 V distribution. Some functions in the 24 V system remain powered like tachograph, instrument cluster and hazard switch.

7.8. Electrical system, 24 V

The 24 V batteries are located under the cab, so for manual disconnection it is necessary to tilt the cab, which may not be possible in all rescue operations.

If possible, remove the wing nuts (1), remove the cover (2) and disconnect the negative terminal of the 24 V batteries for complete shutdown of 24 V system.



7.9. Thermal runaway detection

Check in the instrument cluster for the following information:

- The symbol for thermal runaway (1) and the message stop safely is shown in the DID (Driver Information Display) with a beep sound
- The stop symbol (2) comes on in the instrument cluster with a beep sound



If thermal runaway is detected, observe the traction batteries for visible smoke. Typical smoke exit areas are the burst openings and tray seal of the traction batteries.

A thermal imaging camera can be useful for heat detection.

If smoke is detected during the observation, see “In case of fire rescue scenario”.

7.10. Towing

Note:



Before towing the vehicle to a long distance after an accident/submersion/fire, it is mandatory to observe the vehicle for a minimum period of 48 hours using thermal infrared camera.

- Cut the power to the vehicle; see “Break the traction voltage circuit” and “Electrical system, 24V”
- Remove the propeller shaft from the driven axle