18 ton vehicle
2 axles

- 4 lithium-ion batteries on the sides
- High voltage lithium-ion battery
- Low voltage device that disconnects the high voltage
- Low voltage battery
- Air tank
- Seat adjustment
- Height control
- Cable cut: Cutting this cable disconnects the high voltage.
- Steering wheel tilt control
- High voltage component
- High voltage cable
- Gas strut, pre-loaded spring
- Ignition key / Starter switch
- Airbag

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VNR ELECTRIC
PRODUCTION START: 2022

33 ton vehicle with 3 axles

- 2 lithium-ion batteries on the back side of the cab
- 4 lithium-ion batteries on the sides

Components:
- High voltage lithium-ion battery
- Low voltage device that disconnects the high voltage
- Low voltage battery
- Air tank
- Seat adjustment
- Height control
- Cable cut: Cutting this cable disconnects the high voltage.
- Steering wheel tilt control
- High voltage component
- High voltage cable
- Gas strut, pre-loaded spring
- Ignition key / Starter switch
- Airbag
1. Identification/recognition

Vehicle Identification Number (VIN)

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2. Immobilisation/stabilization/lifting

Always approach the vehicle from the sides to stay out of the potential travel path. Due to less noise it may be difficult to determine the state of vehicle.

1. Chock the wheels.

2. Apply the parking brake.

3. Disable direct hazards/safety regulations

Primary procedure

1. Check the instrument cluster for any of the symbols (1) and (2) appearing with a beep sound. If yes, a thermal runaway is detected in the lithium-ion batteries.

<table>
<thead>
<tr>
<th>Code</th>
<th>Manufacturer</th>
<th>Series</th>
<th>Fuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>K</td>
<td>volvo</td>
<td>E1</td>
<td>Electric</td>
</tr>
</tbody>
</table>
2 Turn off the starter switch and remove the key.

3 Turn off the chassis switch (up) to initiate the high voltage disconnection process.

Note
All the components are designed to discharge their own capacitance within five seconds.

If unable to perform the primary procedure

1 Locate the communication cable harness (low voltage) (1) connected to any of the traction batteries.

2 Cut the communication cable harness on each side of the label to disconnect the traction voltage supply from the traction batteries.

Note
Cutting at any of the locations shown will disable the traction voltage supply.

If the truck is charging

1 Unlock the cab using key fob.

2 Press the stop button (1) and wait for the steady yellow light (2) on the charging inlet.

3 Remove the charging plug from the charging inlet when the yellow light (2) turns off.
If the charging plug cannot be pulled out: retract the pin manually

1. Turn off the chassis switch (up) to initiate the high voltage disconnection process.

2. Remove the screws (1) and the step (2).

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

4. Access to the occupants

Opening doors from the outside

1. Insert the key (1) in door lock and turn in anticlockwise direction to unlock the right-hand side door.

2. Turn the key (1) in clockwise direction to unlock the left-hand side door.

3. To open the door, grasp the handle (2) and pull out while exerting some force on the door.

Opening doors from the inside

1. To open the door, pull the handle (1) while exerting some force on the door.
Seat adjustment

1 To adjust the seat height, push the switch (1).

2 Push the switch (2) for sliding the seat to the desired position.

Steering column adjustment

1 Press the pedal (1) all the way to adjust the telescopic length and angle of the column.

2 Press the pedal (1) to first position to adjust the angle of the steering wheel.

Windows and wind screen

Note
The windshield and rear glasses are made of laminated glass (1). Window glass are made of tempered glass (2).

High strength zone

Note
There are no High-Strength and Ultra-High-Strength Steel in the cab. The cab structure is made predominantly of plain carbon sheet steel that does not exceed 340 Mpa.
### 5. Stored energy/liquid/gases/solid

<table>
<thead>
<tr>
<th>High-voltage component location</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image_url" alt="Diagram of high-voltage components" /></td>
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</table>

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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<tbody>
<tr>
<td>1. <strong>Traction Battery</strong>: Four Li-ion battery packs supply a maximum of 738V at 110A. Battery electrodes are made of Carbon, Lithium, Nickel, Manganese and Cobalt.</td>
<td>2. <strong>Charging switch unit (CSU)</strong>: The primary function of the Charging Switch Unit (CSU) is to act as a circuit breaker for the charging plug.</td>
<td>3. <strong>DC/DC converter</strong>: The DC/DC converter converts the traction voltage of 600 V DC to 24 V DC. In electric trucks, the DC/DC converter charges the 12 V batteries and handles the loads connected to the 24 V system.</td>
</tr>
<tr>
<td>4. <strong>Traction Voltage Junction Box (TVJB)</strong>: The TVJB has 2 variant combinations depending on the number of high-current and low-current connection interfaces. The TVJB distributes power in the electric propulsion system.</td>
<td>5. <strong>Electric Motor Drive (EMD)</strong>: The EMD converts 600V DC to three-phase AC. The EMD runs the electric motor and controls the speed, torque and calibration.</td>
<td>6. <strong>Charging inlet, CCS 1 type</strong>: The CCS inlet is used for 600V DC charging. The CCS inlet is equipped with an actuator that prevents accidental disconnection of the charging plug on truck side.</td>
</tr>
<tr>
<td>7. <strong>Traction Voltage Monitoring Unit (TVMU)</strong>: The TVMU performs measurements in the traction voltage system, detects any potential hazardous situation and communicates this to the HPCU (Hybrid Powertrain Control Unit).</td>
<td>8. <strong>Electric Motor</strong>: 2 three-phase AC motors with 400kW to 334 kW capacity power the truck.</td>
<td>9. <strong>Onboard Charger and electrical power supply (OCEPS)</strong>: The OCEPS converts AC to DC for charging the traction batteries through AC charging. The OCEPS provide AC and DC Power Take Off (PTO) for other applications like chiller, compressor etc.</td>
</tr>
<tr>
<td>10. <strong>12V Batteries</strong>: Two 12V 170 Ah (Ampere hour) 900 A (Ampere) lead-acid batteries connected in series to power, and controls all the 24 V DC electrical and electronic components.</td>
<td>11. <strong>600V Air compressor</strong>: The electrical air compressor is a screw compressor. Its main function is to produce compressed dry air in a hybrid or fully electric vehicle.</td>
<td></td>
</tr>
</tbody>
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<td>7</td>
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</table>
6. In case of fire

Use a large sustained volume of water to extinguish lithium-ion battery related fire.

**Note**
Extinguishing a lithium-ion battery-related fire with water can produce hydrofluoric acid. Efforts should be made to control and collect run off water.

If other materials are involved, use class ABC fire extinguisher.

In case of thermal runaway, the lithium-ion batteries can release hydrogen fluoride and other toxic gases.

In case of thermal runaway, the traction battery can explode or breather valves (1) may emit large flames as a result of thermal runaway.

Personal Protective Equipment (PPE) of the first responders may be contaminated due to the exposed to hazardous chemicals.

7. In case of water submersion

The damage level of a submerged vehicle may not be visible.

Submersion in water can damage 12 V, 24 V and 600 V components.

Handling a submerged truck without appropriate Personal Protective Equipment (PPE) may result in serious injury or death due to electric shock.

Avoid any contact with the traction voltage cables and electric components.

If possible disable direct hazards (Refer to “3. Disable direct hazards/safety regulations”).
8. Towing/transportation/storage

Check the condition of the lithium-ion batteries before towing. If the traction batteries are damaged, there is a risk of thermal or chemical reaction. It is recommended to take guidance from emergency response personnel before towing.

Delayed thermal event in the lithium-ion batteries can occur after they are damaged or after battery fire / heat suppression. A heat camera may be used to identify the thermal event.

To ensure the battery safety, it is recommended to:
- Park the electric truck involved in an accident in a suitable place maintaining a safe distance from other vehicles, buildings and combustible objects.
- Perform risk analysis based on the local situation. Observe the electric truck for the amount of time decided during the risk analysis.

Before towing an electric truck with rear wheels on the ground, it is mandatory to disconnect the drive to the wheels.

The drive to the wheels is disabled by either uncoupling the propeller shaft (1) from the driven axle (2) or by removing the drive shafts (3).

Note
Moving an electric truck with the rear wheels on the ground without disabling the drive may cause damage to the electric motor and the gearbox.

In case of a physical damage or a thermal event on the lithium-ion batteries it is recommended to tow an electric truck with the rear wheels lifted.
When an electric truck is towed with the rear wheels lifted, lock the steering wheel.

Maximum loading during lifting and towing:
This information specifies the loading which can be applied when using towing hook, towing hitch cross-member, axles and torque stay anchorages.

Double towing hooks: Do not load each hook more than half the vehicle gross weight.

Maximum load on towing cross member are:
- Lengthways: 30 tons
- Vertically (lift): 7 tons
- Sideways: 17 tons

Note
When the vehicle is towed with the rear suspension lifted, the steering wheel must be locked with the steering lock.

Note
If roof deflectors cannot be removed, tow from the front of vehicle only.
9. Important additional information

Do not cut any orange cables.
Do not touch any high voltage cables and electric components.
Do not perform any operation on a damaged truck without appropriate Personal Protective Equipment (PPE).

10. Explanation of pictograms used

<table>
<thead>
<tr>
<th>Pictogram</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Fire extinguisher" /></td>
<td>Use water to extinguish the fire</td>
</tr>
<tr>
<td><img src="image" alt="Fire extinguisher" /></td>
<td>Use ABC powder to extinguish the fire</td>
</tr>
<tr>
<td><img src="image" alt="Warning" /></td>
<td>General warning sign</td>
</tr>
<tr>
<td><img src="image" alt="Warning" /></td>
<td>Warning, Electricity</td>
</tr>
<tr>
<td><img src="image" alt="Thermal Infrared" /></td>
<td>Use thermal Infrared camera</td>
</tr>
<tr>
<td><img src="image" alt="Flammable" /></td>
<td>To indicate the risk of flammability</td>
</tr>
<tr>
<td><img src="image" alt="Explosion" /></td>
<td>To indicate the risk of an explosion</td>
</tr>
<tr>
<td><img src="image" alt="Corrosive" /></td>
<td>To indicate the risk of corrosive material/substances</td>
</tr>
<tr>
<td><img src="image" alt="Hazardous" /></td>
<td>Hazardous to the human health</td>
</tr>
<tr>
<td><img src="image" alt="Toxic" /></td>
<td>To indicate the risk of acute toxicity</td>
</tr>
</tbody>
</table>