

**Load Infrastructure**

- Charging infrastructure includes the public and private charging stations for charging electric passenger vehicles, vans, trucks and buses, as well as the pantographs for charging buses.
- Found in the public and private domain.
- Depending on the type of charging station: - alternating current or direct current low power (passenger vehicles) or high power (trucks, buses)
- Locations and operator of public charging station can be found via: <https://www.oplaadpunten.nl/>.
- The operator's telephone number is always stated on a public charging station.
- Switching off the power from a public charging station to the vehicle can be done remotely via the operator. The grid connection of the charging station remains under current.
- All public charging stations are equipped in such a way that there is only voltage between the charging station and the vehicle
- when the charging cable and electric car are connected correctly. If the plug is unexpectedly pulled out of the car during charging, the communication protocol between charging station and vehicle will detect this and the power is immediately cut off so that the cable becomes voltage-free.
- If the voltage is removed from the charging station (mode 3/4), the plug is unlocked.
- The charging cable on the car side can often be mechanically unlocked from the inside. Look for this per car the CRS or contact the manufacturer's 24h service.

**Risks**

- Electrocution risk with high-power charging infrastructure (type: distribution).
- Risk of short circuit in the battery pack of the vehicle due to defective charging infrastructure or careless handling by the fire brigade.

**Firefighter**

Firefighting action near electricity is in accordance with the Attention Card safe action near electricity. Three domains are distinguished in terms of voltage risk: use, distribution and transport.

When charging infrastructure is involved in the use of electricity:

- Do not touch
- Bound jet only if the nozzle operator can rely on his PPE
- When cutting the charging cable: 1000V gloves and full PPE (including breathing air).
- When charging infrastructure is involved in the electricity distribution domain:
- Set-up line at 25 meters
- Only if urgent task: approach to 2.5 meters
- Defensive extinguishing only: no extinguishing agent towards installation.

**Cut / Measure**

The table below indicates for each type of charging infrastructure whether it is possible / recommended to:

- Measure the voltage in the charging cable and/or charging station.
- Cut the cable between the charging station and the vehicle with hydraulic shears.

**Type & Loading Infrastructure**

There are various types of charging infrastructure (mode 1/2/3/4, pantograph). In the table below is per type charging infrastructure (mode) given the following information:

- Explanation
- Image charging infrastructure
- Method of recognition (indicators)
- Electricity domain
- Voltage type
- Ability to measure voltage
- Advice to cut cable

When in doubt between mode 3 and mode 4: treat the charging station as mode 4.

Type Style	Image	Explanation	Recognizable by Domain	Current	Measure V	To Cut	
Mode 1		In mode 1, charging is done via a cable between the socket and the vehicle. This charging method lacks communication between charging station and vehicle and therefore a system for safety.	Charging cable with a plug for the socket on one side, a plug for the car on the other side	Usage	Alternating current (uses inverter in car)	Niet mogelijk Not possible	Mogelijk Possible
Mode 2		Mode 2 charging usually takes place via a socket or via a charging station at home. The control/control (ICCB: In-Cable Control Box) built into the cable functions as a mobile safety device and regulates the charging capacity.	Charging cable with ICCB, shown in the red area	Usage	Alternating current (uses inverter in car)	Niet mogelijk Not possible	Mogelijk Possible

<p>Mode 3</p>	<p>Charging station with separate cable:</p>  <p>Charging station with fixed cable:</p>  <p>Mode 3 Charging station</p> 	<p>Mode 3 is charging via a charging station. Communication takes place between the charging station and the vehicle about the correct power. This is an important safety feature. If a deviation is found, the charging process stops and there is no more power on the cable.</p>	<p>Charging cable between charging station and vehicle without ICCB. The charging cable can be detached from the charging station, but this is not always the case. A fixed charging cable is usually coiled loosely around the charging station.</p>	<p>Usage</p>	<p>Alternating current (uses inverter in car)</p>	<p>Niet mogelijk</p> <p>Not possible</p>	<p>Mogelijk</p> <p>Possible</p>
---------------	--	---	---	--------------	---	--	---------------------------------

<p>Mode 4 Passenger Vehicles</p>	<p>Mode 4 charging station with holster</p>   	<p>Charging mode 4 for passenger vehicles is charging with direct current and is mainly used for fast charging of passenger cars. The conversion from alternating current to direct current takes place in the charging station itself or in an adjacent cabinet (inverter)</p>	<p>The charging cable is inextricably connected to the charging station. The charging plug for the passenger car is in a holster on the charging station. A public charging station with more than 50 kWh charging capacity is a mode 4 charging station (to be checked via <a href="http://www.laadpunten.nl">www.laadpunten.nl</a> and via any sticker present on the charging station with the charging capacity).</p>	<p>Usage</p>	<p>DC (inverter in the charging station or cabinet next to the charging station)</p>	<p>Niet mogelijk  Not possible</p>	<p>Niet geadviseerd: het doorknippen van de kabel veroorzaakt kortsluiting in de batterypack, met mogelijk een thermal runaway tot gevolg.</p> <p>Not advised: cutting the cable will cause a short circuit in the battery pack, possibly resulting in a thermal runaway.</p>
--	--	---	---	--------------	--	--	---

<p>Mode 4 Trucks, Buses</p>		<p>Mode 4 charging for trucks and buses is charging with direct current and may involve high voltages and currents. There is communication between charging station and vehicle.</p>	<p>The charging cable has a diameter greater than 3cm. The inverter is placed externally Charging bus or truck</p>	<p>Distribution</p>	<p>DC (the inverter is placed elsewhere)</p>	<p>Niet mogelijk  Not possible</p>	<p>Niet mogelijk  Not possible</p>
<p>Pantograph</p>		<p>This charging method delivers high energy transfer from the charging infrastructure to large electric vehicles such as buses and trucks in a very short time</p>	<p>Pantograph from vehicle to charge point (up) or charge point to vehicle (top-down)</p>	<p>Distribution</p>	<p>DC (the inverter is placed elsewhere)</p>	<p>Niet mogelijk  Not possible</p>	<p>Niet mogelijk  Not possible</p>