

Recharging

There are plenty of devices for recharging electric vehicles and they are different each other in:

- The output power, and therefore, the recharging time.
- Type of information exchanges with the vehicle recharging point.
- Physical connector that must fit into the electric vehicle.

Types of Recharge

Five types of charging are considered according to how long it takes recharging the batteries, which depends directly on the available power. Usually be summed up in two, slow charging and recharging.

- Very slow charging, when the current is limited to 10A or less, to protect from not having a dock with specific protection and proper electrical installation. Recharging full battery of an electric car with 22 to 24 kWh of capacity, can take up to ten or twelve hours.
- Slow recharging, or normal/conventional recharge. This is a normal charge at 16A, with an output power of 3.6 kW. A complete battery recharge, can take between six and eight hours.
- Semi-fast charging, or quick-charge, not as fast than the fast-charge. It has a power of 22 kW. Renault is quite committed to this type of charging, for example with its low cost Chameleon, Renault ZOE-compatible charger. Recharging can take an hour or hour and a half.
- Fast charge, the power that is demand is very high, between 44 and 50 kW. Those 22 to 24 kWh of battery recharging can take half an hour. It is more effective to make a recharge of not more than 80 or 90%
- Ultra fast recharge, hardly used, and should be considered something still experimental, in electric vehicles to the test with batteries of type supercapacitors (for example, some electric buses). Recharge power is very high, and in about five or ten minutes, the batteries may be charged. Lithium-ion batteries do not support such high temperature that causes this type of charging because it severely impairs its useful life.

Charge modes

The charge modes have to do with the level of communication between electric vehicles and recharging infrastructure, and the grade of control that you can have of the charging process, in order to program it, view status, stop it and resume it, or even tip over electricity network.

- Mode 1, without communication with the network. The one is applied to a conventional socket schuko connector.
- Mode 2, low degree of communication with the network. The cable has an intermediate control device pilot which serves to check the correct connection of the vehicle charging cord. It works with a schuko.
- Mode 3, high degree of communication with the network. Control and protection devices are located within the point of recharge, and cord includes built-in communication pilot wire (e.g. SAE J1772 connectors, Mennekes, combined or Scame).
- Mode 4, high degree of communication with the network. There is a converter to DC and only applies to rapid charging (e.g. CHAdeMO connector).

Plug types

The future of electric charging stations must also be equipped with a same plug, known as "Type 2", as it has been established by Brussels as the universal connectors in the EU.

- Type 2: Connector Mennekes, is a German industrial connector, VDE-AR-E 2623-2-2, mainly specific for electric vehicles. It measures 55 mm diameter. It has seven terminals, four for (three-phase), the land and two for communications.



- "Type 2" is both AC and DC, accepts both currents, and its rated with a max of 43.5 kW with AC and 38 kW with DC. It is also 1-phase and 3-phase, up to 63A. So it works on garages wallbox (AC, 1-phase) and public fast charging station (AC, 3-phase) with the same plug.
 - single phase, up to 16 A, slow reloading.
 - three-phase, up to 63 (43.8 kW) for rapid charging.

Although "Type 2" is the only one accepted by European Commission, for a transitional period that will end January 1, 2019, quick charging points can also be fitted with CHADEMO connectors. Anyway the CHADEMO charging points installed within three years prior to the entry of the directive, may remain in service after 2020.

- CHADEMO, is the standard of the Japanese manufacturers (Mitsubishi, Nissan, Toyota and Fuji, who depends on Subaru). It is specifically designed for rapid charging in DC. It has ten terminals, taking land and communication with the network. It supports up to 200 A current (for ultra-rapidas refills). It is the largest diameter, both the connector and the cable.



There are also other existing connectors, with different size and properties:

- Combo2: Combined unique connector; It has five terminals, power, protection of land and communication with the network. It supports both slow and fast recharge.



- Household connector schuko type, responds to the EEC 74 type F standard and is compatible with European outlets. It has two terminals and ground and supports currents up to 16 a, only to slowly recharges and integrated communication. We can be found in many household appliances.



- Connector SAE J1772, sometimes also known as Yazaki. It is a North American standard, and is designed specifically for electric vehicles. Measures 43 mm in diameter. It has five terminals, the two current, the Earth, and two complementary proximity detection (the car cannot move while it is plugged in) and control (communication with the network).
 - Level 1: up to 16 A, slow reloading.
 - Level 2: up to 80 A, for rapid charging.

- Scame connector, also known as EV Plug-in Alliance, mainly supported by French manufacturers. It has five or seven terminals, either single-phase or three-phase, power ground and communication with the network. Supports up to 32 A (for semi-fast charging).

