

## European union ac charging stations

Recharging electric vehicles is relatively new and technology develops in a rapid pace. As a result, lots of different terms and definitions are used, often referring to the same phenomenon. This page enables the reader to familiarize with the relevant terms. These terms are grouped per theme. This page aims to give clear definitions and explanations on relevant aspects of electric vehicle charging.

A recharging pool consists of one or more recharging stations at a specific location, including, as the case may be, the dedicated parking places adjacent to them. The recharging pool is operated by one charge point operator (CPO) at one location/address and GPS coordinates. The recharging pool is an object relevant for "cartographic view", guiding tools and all features that represent a recharging infrastructure element on a map. A recharging pool is defined by: One location/address and GPS coordinates; One charge point operator.

A Recharging Station is a physical object with one or more recharging points, sharing a common user identification interface. All the physical "human-machine" interfaces are located at the recharging station. Some recharging stations have a badge / RFID reader, buttons, displays, LEDs. Other stations are "Plug & Charge", without buttons, display, etc. In those cases, a vehicle is automatically identified. A recharging station is defined by: One physical object; One user interface.

The electric energy is delivered through a recharging point. A recharging point may have one or several connectors (outlets or plugs) to accommodate different connector types. Only one can be used at the same time. A recharging point is defined by: Recharging one vehicle at a time. In other words: per recharging station the number of recharging points and (dedicated) parking spots are equal.

Usually, the number of recharging points and the number of connectors is equal, but not always. For example, there are recharging stations consisting of 2 recharging points and 3 connectors. In that case not more than 2 connectors can be used, no more than 2 vehicles can be charged at a time (one AC and the other DC).

To date, not all battery electric vehicles and plug-in hybrid electric vehicles can recharge at every recharging point in the world. This is because the EV recharging connector and vehicle inlet vary across geographies and models.

For the EU, the Alternative Fuels Infrastructure Directive 2019/94/EU (AFID) currently requires that all recharging points are, for interoperability purposes, equipped at least with socket outlets or vehicle connectors of Type 2, Mennekes (for AC normal and high power recharging points), and connectors of the combined charging system, CCS/Combo 2 (for DC high power recharging points). The figure below provides an illustrated overview of these requirements:

At the same time, AFID does not prohibit the addition of other connectors to a recharging point. While prior to

the adoption of AFID, a number of recharging points with AC connectors other than Type 2 were deployed in the EU, the prescription of the Type 2 standard through the Directive put an end to this. Similarly, while it has for some time been market practice to equip in particular 50 kW recharging points with an additional CHAdeMO connector, more and more providers of high power recharging points choose to equip their stations with CCS/Combo 2 connectors only.

The Society of Automobile Engineers (SAE) has developed the J1772 and J3068 connector standards. They are mostly applied in the North-American markets, while J1772 is also used in Japan for AC recharging purposes.

SAE J1772 (IEC 62196 Type 1) defines four levels of single-phase recharging: AC Level 1, AC Level 2, DC Level 1, and DC Level 2. Although the SAE J1772 CCS connector for DC recharging is quite similar (though slightly different) from the EU CCS connector, the AC J1772 connector is entirely different. This is largely due to the fact that the electricity is commonly supplied at 120 volts in the US, compared to 230V in Europe.

SAE J3068 complements SAE J1772 with solutions for three-phase recharging. The J3068 connector is mechanically identical to the Type 2 connector, and is based on the IEC 62196-2 and -3 standards.

The Japanese utility TEPCO developed CHAdeMo. It is the official Japanese DC recharging standard and virtually all Japanese DC fast recharging stations offer a CHAdeMO connector. In Europe, while it has for some time been market practice to equip in particular 50kW recharging points with an additional CHAdeMO connector, the importance of CHAdeMO is fading. Mainly this is due to the choices by Japanese (but also some French) car manufacturers to increasingly equip their EU market electric vehicles with a CCS inlet.

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