Checklist

for a sustainable charging station/wallbox

Future-proof and intelligent charging infrastructure

This checklist will help you ask your provider about the most important criteria.

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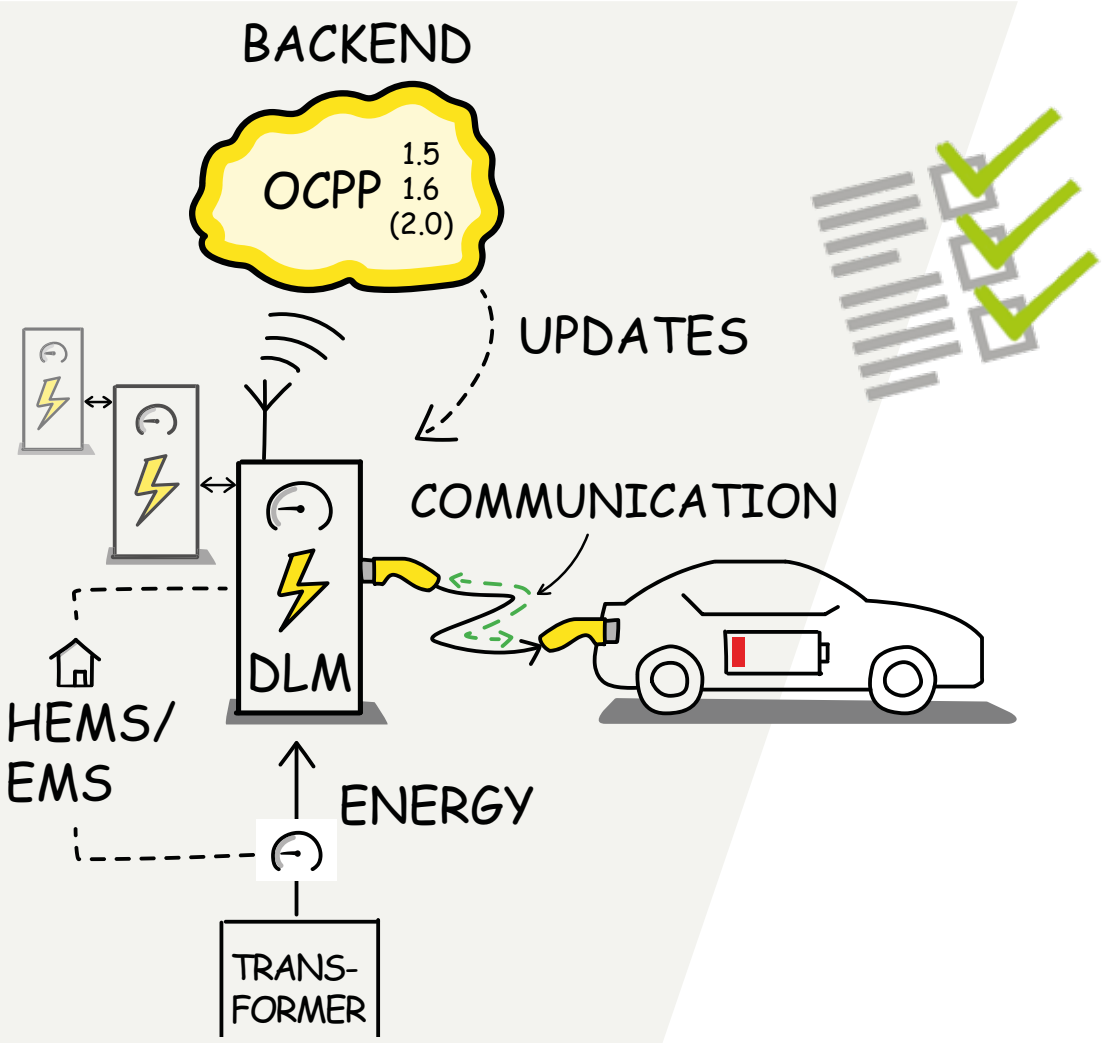
The charging station of the future works efficiently and cost-effectively with intelligent load management. It supports bi-directional communication with the vehicle in accordance with ISO 15118 and is updatable. In addition, it also meets the requirements of the German measurement and calibration law in applications where electricity consumption is calculated on the basis of kWh.

AC charging is the most frequent type of charging as it has the major advantage that the existing AC 230 V/400 V power supply can be used, and the charging infrastructure can be connected by an electrician. AC charging stations are also much more economical than DC charging stations.
AC charging stations can be found in locations such as homes, hotels, public car parks or workplaces.



Ask your provider about the following criteria:

Number

☐ How many charging stations are required?

It can be assumed that there will be increasing regulations for parking spaces with a charging infrastructure, at least in public areas. Car parks should therefore be prepared for e-mobility.

☐ **System monitoring software (e.g. cloud service)**

Centralised monitoring is recommended when a large number of charging points are operated. Service measures and maintenance can therefore be effectively planned, and an evaluation can help optimise the use of existing and future charging points. This also means that centralised control is possible.

☐ **Dynamic load management (DLM) is required if the number of charge controllers is critical for the power supply line (see charge controllers, section "DLM").**

Location

What requirements result from the location of the charging station?

☐ Private: In a private house or apartment for personal use

The revised EU directive on the energy performance of buildings (EPBD) 2018/844 obliges the real estate industry to provide pre-cabling in all parking spaces during basic renovation and new construction work on residential buildings with more than ten parking spaces for a subsequent installation of charging points.

☐ **Apartment owners require authorisation from the co- owners prior to installation**

☐ **Does a photovoltaic system/supply with its own solar power need to be integrated?**

Storage and a Home Energy Management System (EMS) are required in order to use a solar power supply.

- ☐ **Storage**
- ☐ **HEMS/EMS**

☐ **Will it be used as a vehicle-to-grid/vehicle-to-home system?**

Vehicle-to-grid/vehicle-to-home allows the energy stored in the vehicle's battery to be fed back into the power grid or household power supply during periods of increased energy demand. A Home Energy Management System (HEMS) is required for use as a vehicle-to-grid/vehicle-to-home system

- ☐ **HEMS/EMS**

☐ **Communication: Is there any need for a communication link between the charging station and an EMS/HEMS, for example, as a result of the required functions?**

The charging station should ideally use the existing communication infrastructure for this.
Refer to the "Communication" section below for information on charge controller requirements.

☐ **Charge only: when no other demands are placed on the charging station.**

Simple charging stations are sufficient in this case. These cannot be expanded to accommodate future extensions or functions.

☐ Semi-public: Apartment buildings for tenants, in companies for employees and customers

The revised EU directive on the energy performance of buildings (EPBD) 2018/844 obliges the real estate industry to provide pre-cabling in all parking spaces during basic renovation and new construction work on residential buildings with more than ten parking spaces for a subsequent installation of charging points. In the case of commercial property, this applies to 20 % of all parking spaces. In addition, at least one charging point must be installed and operated in these areas from now on.

☐ **Apartment owners require authorisation from the co-owners prior to installation**

☐ **Does a photovoltaic system/supply with its own solar power need to be integrated?**

No storage is required for daytime usage only (e.g. in company parking areas). Storage and a Home Energy Management System (HEMS/EMS) are required in order to use a solar power supply.

- ☐ **Storage**
- ☐ **HEMS/EMS**

☐ **Will it be used as a vehicle-to-grid/vehicle-to-home system?**

Vehicle-to-grid/vehicle-to-home allows the energy stored in the vehicle's battery to be fed back into the power grid or household power supply during periods of increased energy demand. A Home Energy Management System (HEMS) is required for use as a vehicle-to-grid/vehicle-to-home system.

- ☐ **HEMS/EMS**

☐ **Is a measurement and billing concept required?**

(Refer to the "Billing in compliance with German calibration law" section below for information on charge controller requirements)

- ☐ **Billing per charging process for shared or generally accessible charging stations**
- ☐ **Billing through tenant's electricity bill, payroll, etc.**
- ☐ **Billing for company car when charging at home**

☐ **Recommendation for three or more charging points: dynamic load management**

The investment generally pays for itself when at least three charging points are used, as there is no need to increase the capacity of the grid connection, which would require a construction cost subsidy to the grid operator. Refer to the "Dynamic load management (DLM)" section below for information on charge controller requirements.

☐ **Access protection/access restriction**

Access protection or access restriction ensure that the charging stations are only used by authorised persons. Refer to the "Access protection/access restriction" section below for information on charge controller requirements

☐ **Communication: Is there any need for a communication link between the charging station and an EMS/HEMS, for example, as a result of the required functions?**

The charging station should ideally use the existing communication infrastructure for this.
Refer to the "Communication" section below for information on charge controller requirements.

☐ Public:
Public parking areas, multi-storey car parks

☐ **Does a photovoltaic system/supply with its own solar power need to be integrated?**
Storage and a Home Energy Management System (HEMS/EMS) are required in order to use a solar power supply.

- ☐ **Storage**
- ☐ **HEMS/EMS**

☐ **A measurement and billing concept is required.**
(Refer to the "Billing in compliance with German calibration law" section below for information on charge controller requirements)

- ☐ **Requirement: Billing per charging process**

☐ **Is a measurement and billing concept required?**
(Refer to the "Billing in compliance with German calibration law" section below for information on charge controller requirements)

☐ **Recommendation: Dynamic load management**
The DLM provides for an intelligent distribution of the available energy and guarantees stability in the power grid.
Refer to the "Dynamic load management (DLM)" section below for information on charge controller requirements.

☐ **Access protection/access restriction**
Access protection or access restriction ensure that the charging stations are only used by authorised persons.
Refer to the "Access protection/access restriction" section below for information on charge controller requirements.

☐ **Communication: The communication link between the charging station and e.g. an EMS/HEMS and a backend must be guaranteed.**
The charging station should ideally use the existing communication infrastructure for this.
Refer to the "Communication" section below for information on charge controller requirements.

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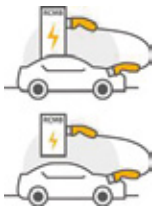
Type of charging/charging modes

Decision concerning the type of charging/charging modes at charging stations

Deciding between AC and DC charging also means deciding between quick charging with high procurement costs at the charging point and slower charging at a much more economical charging station. This decision can easily be made with regard to the use of charging parking areas: AC charging is sufficient in areas in which the charging station is used as a side benefit of parking rather than a stopping point to recharge. This type of charging is becoming more common as the charging infrastructure expands, particularly because not all vehicles are designed for DC charging.

☐ Recommendation for use at home, in hotels or at the workplace: charging station/ wallbox AC charging (mode 3)



AC charging uses the standard single-phase or 3-phase low-voltage system, which means that the required charging infrastructure can be kept relatively simple. Sustainable planning: Charging stations have a service life of several years and it is therefore advisable to equip AC charging stations with a charging power between 11 and 22 kW.

☐ **Charging power of less than 12 kW**
In Germany, charging stations with a charging power of less than 12 kW have to be reported to the grid operator.

☐ **Charging power 12-22 kW**
In Germany, charging stations with a charging power of more than 12 kW are subject to the approval of the grid operator.

☐ Recommendation for larger charging stations and quick-charging stations: quick charging with mode 4 (DC charging)

DC charging stations place the most complex and expensive demands on the electrical infrastructure in order to supply the necessary power. An unearthed power supply system is generally used when charging with direct current. For DC charging, direct voltage is applied to the batteries connected in series. In order to guarantee a flow of electricity, the voltage applied must be adjusted to always be slightly higher than the current cell voltage of the batteries connected in series. This requires a complex charging adjustment as currents of several 100 A may occur. The battery can be recharged within a few minutes using this procedure. This concept is particularly suitable for recharging a vehicle quickly during a break, for example at a motorway service station.

☐ Level of available charging power

Recommendation for DC charging stations: A charging power of 150 kW is now considered standard. However, it should also be possible for the charging power to be increased at a later stage. The charging power can be increased to up to 150 kW and the intention is for it to reach 350 kW in future.

☐ Electrical infrastructure that provides the necessary power

☐ Electrical safety – Insulation monitoring in the charging station

To prevent the insulation monitoring devices in the vehicle and in the charging station from influencing each other, the insulation monitoring device in the vehicle is usually deactivated during the charging process. The insulation monitoring device in the charging station then monitors the entire charging current circuit to detect any symmetrical and asymmetrical insulation faults during and prior to charging.

☐ **DC charging stations are subject to the approval of the grid operator.**

Plug or cable?

☐ Permanently attached cable

Vehicle owners do not require their own charging cable if a permanently attached cable is available. However, this predetermines the plug type, which means that an adapter may be required.

☐ **Provide cable brackets**

☐ **Avoid tripping hazards**

☐ **Provide cable theft protection**

☐ Type 2 sockets

European standard for the use of mode 3 charging cables
(Refer to the "Universal charging plug control/actuator control" section below for information on charge controller requirements)

☐ **Protect the socket with a shutter in the plug enclosure**

☐ **Lock the plug in the socket during charging (protects against theft and prevents unintentional interruption of charging by third parties)**

☐ **Important note: The plug must have an emergency opener in the event of a power failure**

☐ DC charging: CCS and/or CHAdeMO

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Charging station enclosure

The installation site and type of use (see above) determine the requirements for the charging station enclosure

☐ **Mechanical stability of the charging station**

- ☐ Ramming protection/impact resistance of the enclosure
- ☐ Climbing protection
- ☐ Vandalism protection
- ☐ Vibration resistance

☐ **Weather resistance**

- ☐ Choice of suitable degree of protection
- ☐ Operating temperature range
- ☐ UV light resistance of material and printing
- ☐ Corrosion resistance

☐ **Use as an advertising surface**

- ☐ Individual selection of enclosure colours
- ☐ Individual printing

Charge controller requirements

The most important technical functions of the charging station are determined by the properties of the charge controller.

☐ Integrated dynamic load management (DLM) capable of controlling up to 250 charging points within a local eDLM system

For operators, intelligent distribution of the available energy and maintaining a stable power supply grid are becoming increasingly important challenges that need to be addressed. Dynamic load management (DLM) allows for an intelligent distribution of the available energy and thereby guarantees a stable power grid.

Sustainable charging infrastructure units support a load management system capable of controlling up to 250 charging points within a local eDLM system. To do this, the total amount of available energy is distributed dynamically and effectively with the aid of different profiles so as not to overload a shared feeder line. The eDLM software, which is continuously developed further, is interoperable with other charging points from all manufacturers who also use eDLM software. This enables operators to easily expand their charging parks, independent of the manufacturer.

☐ Protection against unbalanced loads

The DLM needs to monitor individual phase currents to ensure that the N conductor is not overloaded (fire hazard).

☐ Communication

For implementation with various backend and roaming platform providers (e.g. Plugsurfing and Hubject). Charging stations are simple to connect to the grid as they support OCPP 1.5 and OCPP 1.6 protocols (and OCPP 2.0 in future) in addition to 4G modems, Ethernet and WiFi.

☐ Protocol

- ☐ OCPP 1.5 (minimum requirement)
- ☐ OCPP 1.6 (minimum requirement)
- ☐ OCPP 2.0

☐ Type of connection

- ☐ Ethernet
- ☐ WIFI
- ☐ 4G modem
- ☐ USB

☐ What kind of information needs to be recorded for each charging procedure?

- ☐ Charging point ID
- ☐ Customer ID
- ☐ Meter data (meter ID, initial meter reading in kWh, final meter reading in kWh, energy charged in kWh)
- ☐ Charging time
- ☐ Connection time

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☐ Smart-grid-capable through PLC communication according to ISO 15118

The increasing importance of PLC communication in accordance with ISO 15118 enables the charging station to implement plug & charge as well as bi-directional communication with the vehicle as a basis for intelligent c onnection to energy management systems (EMS).

☐ Updateable

It must be possible to install future versions of the OCPP protocol, additional backend providers, new DLM functions and general feature enhancements by means of software updates at a later stage. Continuous adaptation to upgraded standards is only possible by means of firmware updates. Contact the manufacturer to find out how updates are offered and how often.
Free software updates (typically on a quarterly basis) guarantee that the charging systems are up to date and thus help to reflect dynamic developments in the market. Remote service for fault identification is possible, as is on-site maintenance. Updates and configurations can also be uploaded and duplicated via a service USB stick.

☐ Support of master/slave communication

Through master/slave communication, at least two charging points can be connected to a backend as a charging station with two connectors.

☐ Minimum of 2 USB interfaces required for smooth commissioning/configuration

Two USB interfaces enable local configuration, an expansion port for peripheral USB devices (Ethernet/WLAN home applications) and master/slave hardware configuration

☐ With universal charging plug control/actuator control

Universal charging plug control/actuator control is required for the support of various type 2 socket manufacturers.

☐ Access restriction

- ☐ **Minimum requirement: RFID reader interface**
- ☐ **Authentication by starting the backend remotely (e.g. via a mobile app)**
- ☐ **ISO standard 15118 (plug & charge)**
- ☐ **Recommendation: It should be possible to configure free charging without authorisation**

☐ Billing option in compliance with German measurement and calibration law

Billing in compliance with German calibration law is legally required not only for the public sphere, but also for charging company vehicles at private domestic connections with subsequent reimbursement by the employer.

Put simply, German calibration law demands that all components involved in the recording and processing of measured values to obtain the invoice amount must be trustworthy or, at least, that it be possible to check the invoice exclusively on the basis of trustworthy components.

It is technically not possible or reasonable to fulfil this requirement for all meter and controller components in the charging station over the various backends to the invoice.

☐ Decentralised automated solution: Charging system compliant with German measurement and calibration law

In the charging station, the necessary measured values can be signed and transmitted in a trustworthy manner by means of a trustworthy device. The transmitted values are then incorporated in the invoice and can be easily checked online using the transparency software provided by the manufacturer.

The combination of a charge controller with a type-examination certificate from the calibration authority, an encrypted energy meter and transparency software forms the technical basis for billing in compliance with German calibration law.

Advantage: Thanks to the generic nature of the solution, operators of charging infrastructure (CPO), backend operators and end customers are no longer forced to opt for a proprietary combination of charging point hardware and backend.

☐ Local solution: Invoice verification required directly at the charging station using a tested and trustworthy measuring device

This requires thorough invoice verification on site, including in the case of legal disputes.

Operation and maintenance

Predictive planning also considers the time after the commissioning of the charging station

☐ **Guarantee electrical safety of the charging points through regular checks**

☐ **Is easy access to the charging station during maintenance ensured?**

☐ **Who is responsible for DGUV V3 (German Accident Prevention Regulation 3) tests?**

☐ **Who is responsible for technical support?**

☐ **Are there sufficient documents/operating instructions available for the charging station?**

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