

**FACT SHEET**

# **EMC Solutions and Directives for Off-Board Electric Vehicle Charging Equipment**



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# EMC Solutions for Off-Board Electric Vehicle Charging Equipment

The fast adoption of electric vehicles (EV) brings with it an increased demand for charging stations. At Schaffner, we have been ahead of this trend for several years with products in charging stations around the world – operating different standards and supporting AC and DC charging. New products from Schaffner are continuously launched on the market as an even better fit for growing EMC requirements in this area.

The electromagnetic compatibility (EMC) is substantial when developing electric vehicle supply equipment (EVSE) like charging stations or wall boxes. Manufacturers have to ensure that the EVSE does not generate electromagnetic interferences (EMI) that can disturb other electronic devices or systems. To maintain proper interoperability between the various associating systems (like battery charging systems for EV, battery storage and PV installations) EMC/EMI topics need to be considered carefully, otherwise the expected service levels cannot be guaranteed.



## EV Charging Types

The main types of charging stations are as follows:

### AC Charging Stations

AC charging stations provide power to the vehicle's onboard charger (typically 11 kW), which converts the AC power into DC power to recharge the vehicle's battery.

### DC Fast Charging Stations

DC fast charging stations provide high-power DC electricity directly to the vehicle's battery, bypassing the onboard charger up to several 100kW

### DC Wallbox

Wallboxes (AC or DC system) are becoming increasingly common in residential areas, workplaces, public parking lots, and other locations where EVs are likely to be parked. AC wallboxes typically deliver power levels from 3.6 kW to 11 kW, while DC wallboxes deliver power levels from 11 kW up to 30 kW or more, allowing very short charging times.

### Vehicle-to-Grid (V2G)

Vehicle-to-Grid is a technology that allows electric vehicles to not only consume electricity but also to feed electricity into the grid. V2G and other bidirectional charging standards like V2L (Vehicle-to-load) or V2H (Vehicle-to-home) offer the potential to play a significant role in the transition to a more sustainable and resilient energy system.

## Relevant EMC/EMI Standards and Limits

Compliance with these standards ensures that an EVSE does not interfere with other electronic devices or systems, and that it is unaffected by external electromagnetic disturbances.

The following are the main EMC relevant standards to EV charging equipment:

**IEC 61851-21-2** – defines the EMC requirements for off-board electric vehicle charging equipment communication.

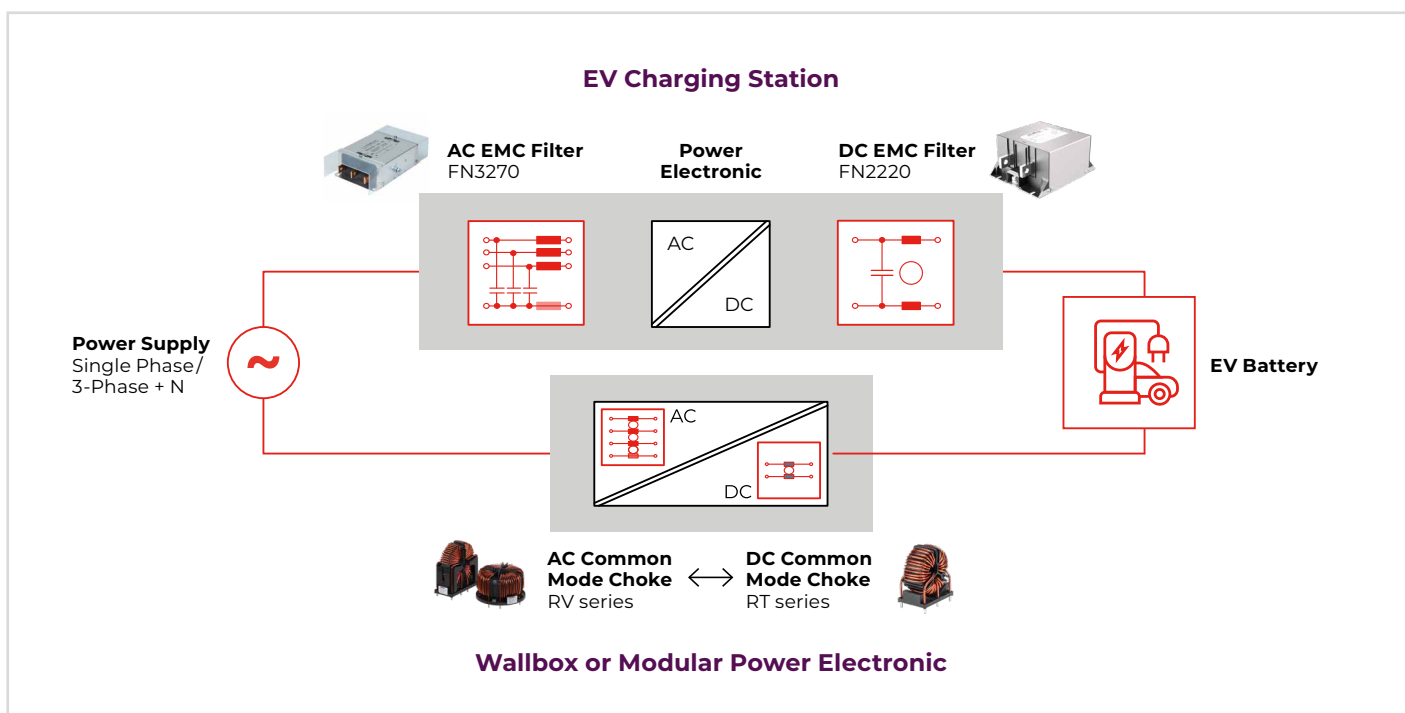
**FCC Part 15** – is the applicable EMC standard for North America

**GB/T 18487.2** – is the applicable EMC standard for China.

The limit values differ depending on the use of the devices in the industrial area (**Class A**) and the residential area (**Class B**). Also, the rated power of the charging system is relevant. For further details, please see Schaffners EMC Application Note from 2023.

Additionally, to be considered are the safety regulations like **IEC 61851 part 23 and 25** or **UL 2202**.

Schaffner filters and chokes are designed to reduce the common mode and differential mode distortions, which can occur in both the AC and DC circuits of the charging



stations. Schaffner components feature high attenuation characteristics, which are necessary to reduce EMI to levels that are compliant with EMC standards.

In addition to their EMI reduction capabilities, Schaffner filters are designed to be easily installed. They are compact and lightweight and can be mounted inside the charging station's enclosure for convenient integration

into the system. EMC chokes should be integrated on the PCB to bring the distortion generated from power electronics down to required EMC limits.

Overall, Schaffner filters and chokes are a reliable choice for EV charging equipment designers and manufacturers who require high-performance EMC filters that are compliant with relevant standards.

**RV/RT Choke Series**



**Features and Benefits**

- Cost efficient PCB design
- Vertical or horizontal orientation
- Up to 63 A application
- Broad range of inductance ratings

**Link to Data Sheets**



RV Choke Series



RT Choke Series

**FN3270/FN3271**



**Features and Benefits**

- Compact and light weight design
- Quick and easy installation
- High attenuation performance

**Link to Data Sheet**



**FN2220/FN2230/FN2240**



**Features and Benefits**

- Ultra compact DC Filter
- Multiple performance and leakage current options
- Designed acc. to EVC station safety standards (IEC/EN 61851-23 / UL2202)

**Link to Data Sheet**



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