

Ask the
ExpertsCharging Ahead:
Understanding EMC Testing
for Electric Vehicle Chargers

Need some answers?

AMETEK CTS has been at the forefront of the EV revolution, providing technical assistance and state-of-the-art EMC test equipment to major car manufacturers worldwide since the early days of EVs.

We caught up with Thomas Handschin, AMETEK CTS Product Manager, to get some insights about the sometimes overlooked requirements of EMC compliance and testing for electric vehicle (EV) chargers.

Today, we'll discuss why EMC testing is crucial, what it entails, and how to navigate the intricate landscape of international standards. Whether you're a manufacturer or a testing professional, this conversation will highlight why AMETEK CTS is your trusted partner for EMC testing excellence.

Let's dive in!

Question Let's start at the beginning. Why are standards important for EMC testing of electric vehicles?

TH: EMC testing is heavily driven by standards. Without established standards, there's typically little or no EMC testing conducted. For electric vehicles, with their expanding features and capabilities, particularly autonomous controls and advanced driver assistance systems (ADAS), EMC immunity becomes a critical safety consideration. Standards ensure that these systems can function reliably in environments with electromagnetic disturbances, preventing potential malfunctions that could compromise vehicle safety or operation. They also provide a framework for consistent testing, ensuring compatibility and reliability across different manufacturers and technologies.

Question: How about EV chargers—why is EMC testing important, and which standards must be followed?

TH: EMC testing for EV chargers is vital because chargers interact with both the power grid and vehicles, making them susceptible to and sources of electromagnetic interference (EMI). This interference can disrupt communication, safety systems, and overall functionality if not properly managed. For instance, a poorly shielded charger could cause radio frequency interference or fail to withstand surges from the grid, potentially damaging connected vehicles or other near by equipment.

To address these challenges, several standards must be followed:

- IEC 61851: This is a product standard series for EV chargers, covering general requirements and specific aspects of charging infrastructure.
- IEC 61851-21: This standard focuses specifically on EMC requirements for onboard and offboard chargers, detailing emissions and immunity testing.
- CISPR Standards: These provide detailed guidelines on limiting electromagnetic emissions, ensuring devices don't interfere with one another.
- IEC 61000 Series: These cover broader EMC immunity and emissions standards, addressing surges, bursts, and other disturbances.

By adhering to these standards, manufacturers can ensure their chargers operate reliably in diverse environments and comply with regulatory requirements.

got a
QUESTION?

Contact us to get answers to your EMC compliance questions.



www.ametek-cts.com

AMETEK[®]
COMPLIANCE TEST SOLUTIONS

Ask the Experts

Question: What kinds of tests are performed on EV chargers?

TH: There are several critical tests we perform to ensure EV chargers meet compliance standards:

1. *Emission Measurements to check for disturbances emitted from the charger.*
2. *Immunity Tests to verify the charger's resilience to external disturbances.*
3. *Voltage Transient Disturbance Tests for DC chargers, which measure small spikes or pulses on DC supply lines*
- Limits: Pulse amplitude must be < 50V, and pulse width < 0.1 microseconds.
4. *Residual Voltage Measurement for Surges, which measures the remaining surge pulse energy on the DC side after it's applied to the AC side.*
- Limit: Voltage must be below 500V peak-to-peak.

Failing to conduct these tests or address issues revealed by them can lead to several serious consequences:

- *Interference with Nearby Devices: Unchecked emissions from a charger can disrupt other electronic devices, such as communication systems or medical equipment.*
- *Damage to Vehicles: A charger that can't handle surges or transient disturbances might damage the connected vehicle's sensitive electronics.*
- *Operational Failures: Immunity issues could cause the charger to malfunction in environments with high electromagnetic activity, leading to unreliable charging sessions.*
- *Safety Risks: Improperly tested chargers might pose safety risks to users, including electric shocks or fire hazards.*
- *Regulatory Non-Compliance: Chargers that fail to meet EMC standards may not be legally sold or used in certain regions, resulting in financial losses and reputational damage for manufacturers.*

Question: How are test setups configured, and what are some specific configurations for EV chargers?

TH: For emission and immunity tests, the EV charger is integrated into a setup featuring artificial mains networks (AMNs) and breakout boxes. These components ensure proper isolation and measurement. Communication and power lines are connected to the EV simulator via decoupling networks, enabling realistic testing scenarios.

For DC systems, energy-efficient setups often include power recovery mechanisms to the grid. Advanced setups may use a common DC bus to minimize energy loss. The configurations vary significantly depending on the charger type and specific testing requirements.

There are numerous challenges when designing a test setup and choosing the right equipment. For instance, when using an AC source - a common requirement for many tests - it is crucial to ensure low distortion levels, particularly for Harmonic and Flicker testing. Distortions can compromise the accuracy and validity of your results.

To determine the ideal configuration for your specific requirements, I always recommend you contact our application team at AMETEK CTS. We have "real world" in this field and are dedicated to helping customers achieve compliance efficiently while optimizing every aspect of your testing process.

got a QUESTION?

Contact us to get answers to your EMC compliance questions.



sales.cts.eu@ametek.com

It's evident that navigating the testing requirements and standards can be complex, but with a partner like AMETEK CTS, the process becomes more predictable with less risks. With decades of experience and a proven track record, AMETEK CTS is uniquely positioned to help manufacturers achieve compliance and operational excellence.

To learn more about our solutions and how we can support your EMC testing needs, contact the AMETEK CTS team today.

sales.cts.eu@ametek.com



www.ametek-cts.com

AMETEK®
COMPLIANCE TEST SOLUTIONS