

Electric Vehicle Charging Systems: Development and Testing

Applus IDIADA offers complete charging development and testing services to support manufacturers of both light- and heavy-duty electric vehicles, charging station manufacturers, and TIER 1's throughout the development and testing stages to ensure a safe, robust and user-friendly charging experience.



With more than 12 years' experience, IDIADA is a world leader in prototype development and charging test activities, performing tests to ensure the interoperability of the interfaces of electric vehicles and charging stations, as well as the compliance of both interfaces with charging standards.

More than 35 charging experts and workshops in Spain, Germany, the US, and China support our clients worldwide.

Charging specification definition and training

Thanks to acquired know-how, IDIADA's charging team can support in the definition electric vehicle charging architecture, prototyping and regulation compliance according to worldwide standards.

Additionally, customized training on the required charging topic can be given:

- IEC61851-1, IEC61851-23, DIN 70121, ISO15118-2, ISO15118-20, GB/T 27930, GB/T 18487, CHAdeMO 0.9-2.1
- Upcoming concepts such as ChaoJi, ISO ed.20, PnC, OCPP 2.0.1, etc.



IDIADA has developed a **CCS and NACS V2G decoder software** that decodes and analyses the **V2G Transport Protocol** during charging sessions or for post-analysis. It comes as a plug-in for the most commonly used and known packet sniffer 'WireShark', allowing to log and open pcap files.

You can find more information about our [CCS and NACS V2G decoder software](#) in our **e-commerce platform**, where you can purchase the tool by contacting our technical team to arrange a demo or request a quotation.

Certification and conformance testing

IDIADA was the first **European CHAdeMO certification** body and has increased the capability since then and is now an accredited laboratory by **ENAC** with the recognized International **Standard ISO 17025** for:

- **IEC 61851-1** – Requirements for conductive EV charging systems
- **IEC 61851-23** – DC EV Charging systems up to 500kW
- **IEC 61851-24** – Digital communications for EV charging systems

This accreditation demonstrates technical competence and a high-quality testing process, supporting the self-certification process of the CE Marking of our clients.

We have developed an [in-house Modular Charging Test System \(MCTS\)](#), capable of working as an EV and as an EVSE with over 800 test cases covering the different worldwide charging standards. The MCTS is used for conformance testing to ensure conformity of the EV or EVSE with the standards. Changes made:

- At vehicle or component level
- Test up to 500kW DC power
- More than 800 test cases
- Automatic test analysis for fast and easy test performance
- All standards available: **CCS1and2, GBT, CHAdeMO, NACS and OCPP**
- Charging tests for DC and AC such as: induction of failures: insulation, cut of control signals, misuse tests, emergency shutdowns' management, validations of the communication, power operation validation up to 500kW DC
- AC grid emulation with multiple grid conditions: harmonic disturbances, 50/60Hz, etc.

IDIADA's charging simulator (MCTS) is designed and used by our charging engineers. This brings a high flexibility during testing and allows the inclusion of all know-how into this tool. It is available at IDIADA's facilities, but it can also be purchased/rented for self-development.

Performance **tests at extreme temperatures** are also available for development or benchmarking activities. Charges up to 500kW can be done inside a climatic chamber (-30°C up to 50°C) for checking charging performance, efficiency, power distribution etc., and vehicles/chargers can be instrumented if needed.

Charging Market Study

IDIADA has performed an in-depth analysis of the **AC and DC charging stations** installed at public places worldwide, identifying the brand and model of each, as well as the provider/network. Data is regularly updated and provides market share figures of:

- Charger manufacturers
- Charger models
- Country and/or regions
- Used charging protocols

Discover comprehensive details regarding our [Charging Market Study](#) on our **e-commerce platform**, where you have the option to procure the tool. Feel free to reach out to our technical team to schedule a demonstration or request a price quote.

In-lab interoperability tests

The interoperability tests will be done against the most representative charging stations or electric vehicles. They consist of an in-depth analysis of the charge process when performing a high number of different tests cases in various stages of the charge process and checking in detail the communication and analogue signals:

- More than **20 DC and 30 AC charging stations constantly available** at IDIADA for this purpose
 - In our workshops, we cover more than 75% of the manufacturers present in our Market Study
 - We have **1,000V and 500V chargers for different battery architectures**
 - CCS1/2, GB/T, and CHAdeMO standards available
- New market vehicles available
- Exhaustive test list to ensure full interoperability
- Highly instrumented tests with non-invasive communication sniffers and specific interoperability test tools used for fast and safe data collection
- User abusive testing and error performance
- Experts and strong collaboration with EVSE manufacturers for root-cause analysis in case of incompatibilities

In-field interoperability tests



In-field tests or **FOT** consist of a final check to ensure compatibility with a wide range of charging station brands and models in real situations:

- Tailor-made routes in the target markets for maximizing coverage
- Technical data collection and analysis for all charge processes
- Test under different grid conditions
- Test performance by experts for in-field problem-solving

Break out Box

Our self-developed Break-out-Box (BoB) is a passive device designed to act as a man-in-the-middle between the charging station and the electric vehicle. It facilitates real-time monitoring of charging sessions without introducing any communication delays.

The BoB supports both AC and DC CCS charging modes and features advanced safety measures, including a locking system, fuse, and circuit breaker.

Equipped with specific measuring points for instrumentation, it offers detailed connections for AC (CP, PE, L1-2-3, N) and DC (CP, PE, DC+, DC-), plus communications (PLC).

Our Break-out-Box enables critical test cases, such as CP cuts, CP-PE shorts, and isolation failures. Additionally, it allows independent monitoring of EVSE and EV communication, ensuring a thorough and precise evaluation.

Charging facilities

Headquarters and Technical Centre - [Pol. Industrial L'Albornar, 43710 Santa Oliva, Tarragona, Spain](#)

- Slots for light vehicles and heavy-duty vehicles
- 5 pins sockets 32A – 250A
- 1MW AC Grid capability
- Battery simulator up to 500kW
- 40 kVA Grid emulator
- ACD Pantograph systems (up and down)
- High Power CCS connector for non-ACD buses
- Climatic chambers (from -30°C up to 50°C) with charging ability up to 500kW
- +50 DCandAC different charging stations for testing
- Charging test tools available:
 - PLC decoders



- CAN and INCA loggers
- Modular Charging Test System (MCTS) – CCS1and2, NACS, CHAdeMO and GB/T

Applus+ IDIADA China - Jucheng Pioneer Park, Building 23, 3999 Xiupu Road, Kangqiao Town, Pudong District, 201315 Shanghai, China

- Slots for light vehicles
- 5 pin sockets 16A – 400A
- 200kW AC Grid capability
- Battery simulator 150kW
- Climatic chamber (from -40°C to 60°C) with charging ability up to 160kW
- Charging stations for testing:
 - +40 GB/T DC and GB/T AC
 - CCS1 DC and Type 1 AC
 - CCS2 DC and Type 2 AC
- Charging test tools available:
 - PLC analysers
 - CAN and INCA loggers
- Modular Charging Test System (MCTS) – GB/T, CCS2 and CHAdeMO

IDIADA Automotive Technology USA – [LLC, 9121 Pulsar Ct., Corona, CA 92883, United States of America](#)

- Slots for light vehicles
- 5 pins sockets 480/277V 60 A – 400 A
- 3 pins sockets 208V 20 A – 60 A
- AC and DC charging stations available for testing
- Charging test tools available:
 - PLC analysers
 - CAN and INCA loggers
- Modular Charging Test System (MCTS) – CCS1, CCS2, SAE AC, IEC AC, and NACS coming soon

IDIADA Fahrzeugtechnik GmbH - [Manchingerstraße 97, 85053 Ingolstadt, Germany](#)

- Slots for light vehicles
- 5 pin sockets 16A – 32A

Arplus⁺

IDIADA

- Climatic chamber (from -30°C to 50°C)
- DC charging stations for testing up to 350kW
- Charging test tools available:
 - PLC analysers
 - CAN and INCA loggers
 - Modular Charging Test System (MCTS) – AC, CCS, CHAdeMO and GB/T