VISPIRON
SYSTEMS

SMART CHARGING

ENGINEERING & TESTING SOLUTIONS.

Functional Development

Complex System Specifications

Detailed Product & Systems Testing

Solutions for Smart Charging & Bidirectional Charging.

In the laboratories of VISPIRON SYSTEMS, we realistically simulate **use cases** in the field of **smart charging** and provide support in pre-development, specification, requirements management, as well as in integration & testing.

These **development and testing solutions** provide our customers with quick and reliable advantages in achieving market readiness for smart charging and connected energy systems.

Our customers benefit from our extensive experience, broad expertise, and highly specialised system knowledge.

We look forward to your enquiry.

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Smart and Bidirectional Charging is a Highly Interconnected Topic.

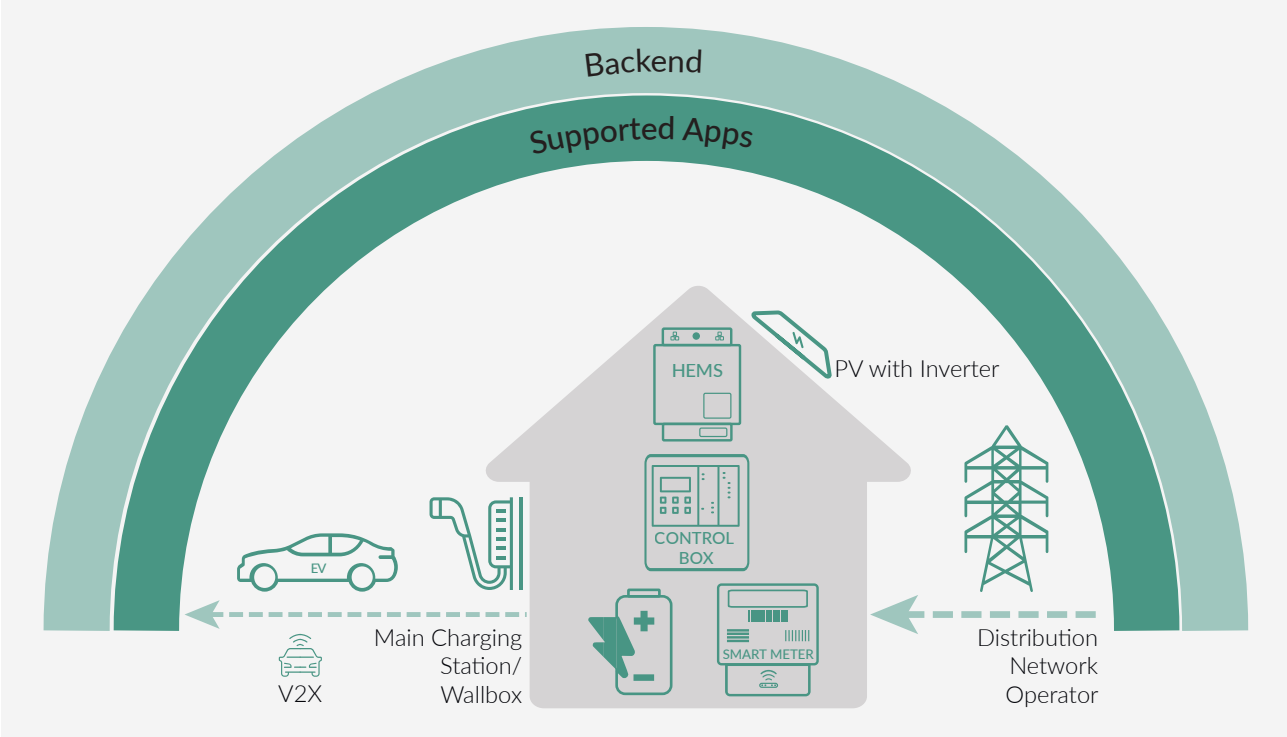


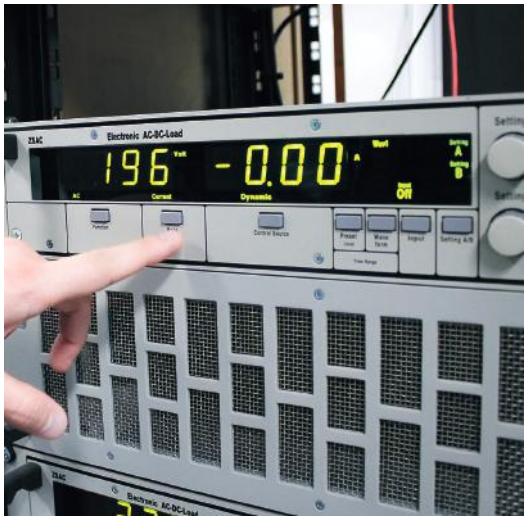
Illustration: System architecture showing the integration of a Home Energy Management System (HEMS), photovoltaic system (PV), smart meter, wallbox, electric vehicle (EV), and grid connection point for intelligent and efficient charging control.

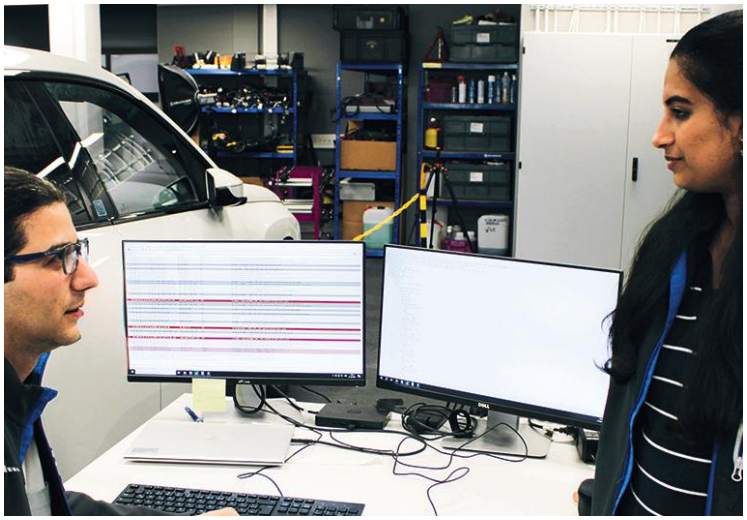
In the development and testing of complex systems, know-how, time, and experience are often limited resources.

We test interconnected systems with highly specialised knowledge and comprehensive development and testing expertise.

Business models based on smart charging and/or bidirectional charging are developed by us with a strong focus on verifiability – enabling rapid fault detection and ensuring robust operation.

Competent & Cooperative Collaboration.





Technical Implementation of the Process Chain, from the Electric Vehicle to the Distribution Network.

Pre-development

- Development of use cases/ conduction of use case analyses
- Development of models and implementation of simulations
- Establishment of potential assessments and architectural designs

System Specification

- Detailed use case descriptions
- Requirement sets derived from use cases
- Functional and system specifications
- State and sequence diagrams
- Standardisation & interfaces

Integration, Testing & Analysis

- Planning & development of test cases and test scenarios
- Integration testing of subsystems
- System-wide testing (including regression tests)
- Creation of failure reports with error analyses
- Development & implementation of test bench concepts
- Component analysis

Project Management

- Developmental support for research projects and series development
- Flexible adaptation to dynamic requirements
- Rapid responses to market and technology trends

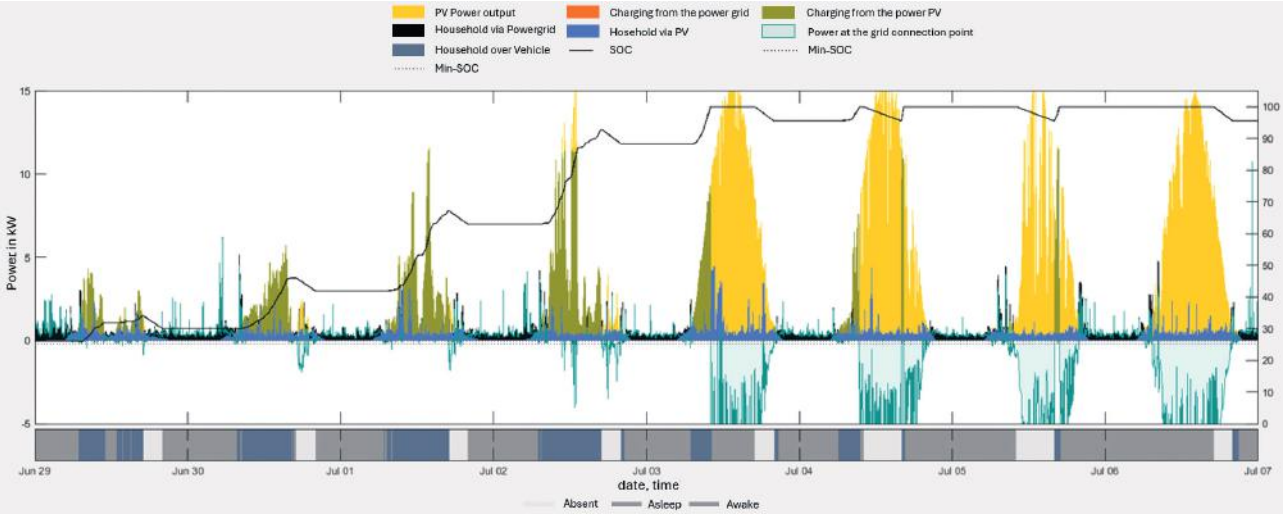
Pre-Development

The Foundation for the Next Generation.

In pre-development, we focus on emerging technologies that shape both unidirectional and bidirectional charging.

Our proprietary models and simulations reflect realistic application behaviour, enabling us to identify potential benefits and uncover possible risks at an early stage.

Based on these insights, we develop innovative solutions — such as integration with PV forecasts for bidirectional optimisation of solar self-consumption.



Graphical representation of simulation results showing the power profile over several days at various system points, as well as the SOC development of the high-voltage battery.

Developing Use Cases for Unidirectional & Bidirectional Charging.

Use cases from research and customer projects provide a comprehensive overview of the entire smart charging ecosystem, (including wallboxes, vehicle connectivity, backend systems, smart meters, the energy market, and more).

The adoption of relevant communication standards, such as ISO 15118-20 and OCPP, enables development at the highest level, independent of its customer groups.

Profit Center	Label	Customer Group	Control	Project Elaboration
Vehicle-to-Grid	Primary control reserve	🏠 🏭	Local	Lab
	Temporal arbitrage (Intraday)	🏠 🏭	Central	Customer Implementation
	Temporal arbitrage (Day-Ahead)	🏠 🏭	Central	Lab
	Local Network service	🏠 🏭	Central	Lab
	Redispatch	🏠 🏭	Central	Lab
	Reactive power supply	🏠 🏭	Central	Lab
Vehicle-to-Home	Increase in self-consumption	🏠	Local	Customer Implementation
	Tariff-optimised charging/ discharging	🏠	Local	Lab
	Emergency power supply	–	Local	Simulation/Concept
	Powerbox	–	Local	Simulation/Concept
Vehicle-to-Business	Peak load shaving	🏭	Local	Customer Implementation
	“Real“ Green power (with PPA)	🏭	Central	Lab
	“Real“ Green power (CO_2 Charging)	🏭	Central	Simulation/Concept
	Fleet Management	🏭	Local	Lab

Potential use cases in the context of smart charging

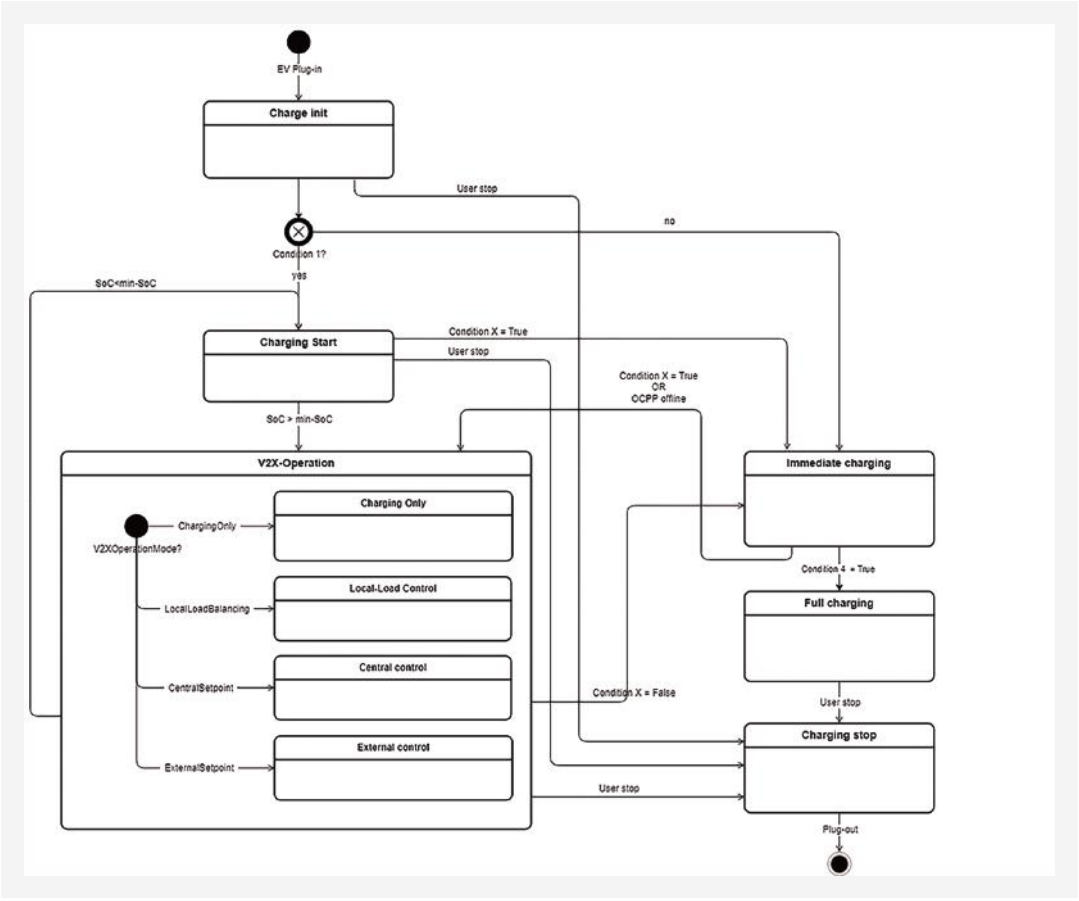
🏠 at home 🏭 commercial

System Specification

Functional Development of Use Cases in Highly Interconnected Systems.

The development of intelligent and complex functions, as well as the drafting of cross-system and detailed requirements, are part of our day-to-day business. We place particular emphasis on clear and comprehensive documentation, supported by appropriate illustrations and graphics to enable better and faster understanding.

The use of and expertise in relevant tools (such as Confluence and Jira) help us achieve qualitative and seamless collaboration. Our experience with standardised communication protocols (e.g. ISO 15118, OCPP, IEC 61851, EEBUS) – some of which we have co-developed – enables us to support interoperable and highly networked systems through to series production.



Illustrative state diagram of a smart charging system

Integration, Testing & Analysis

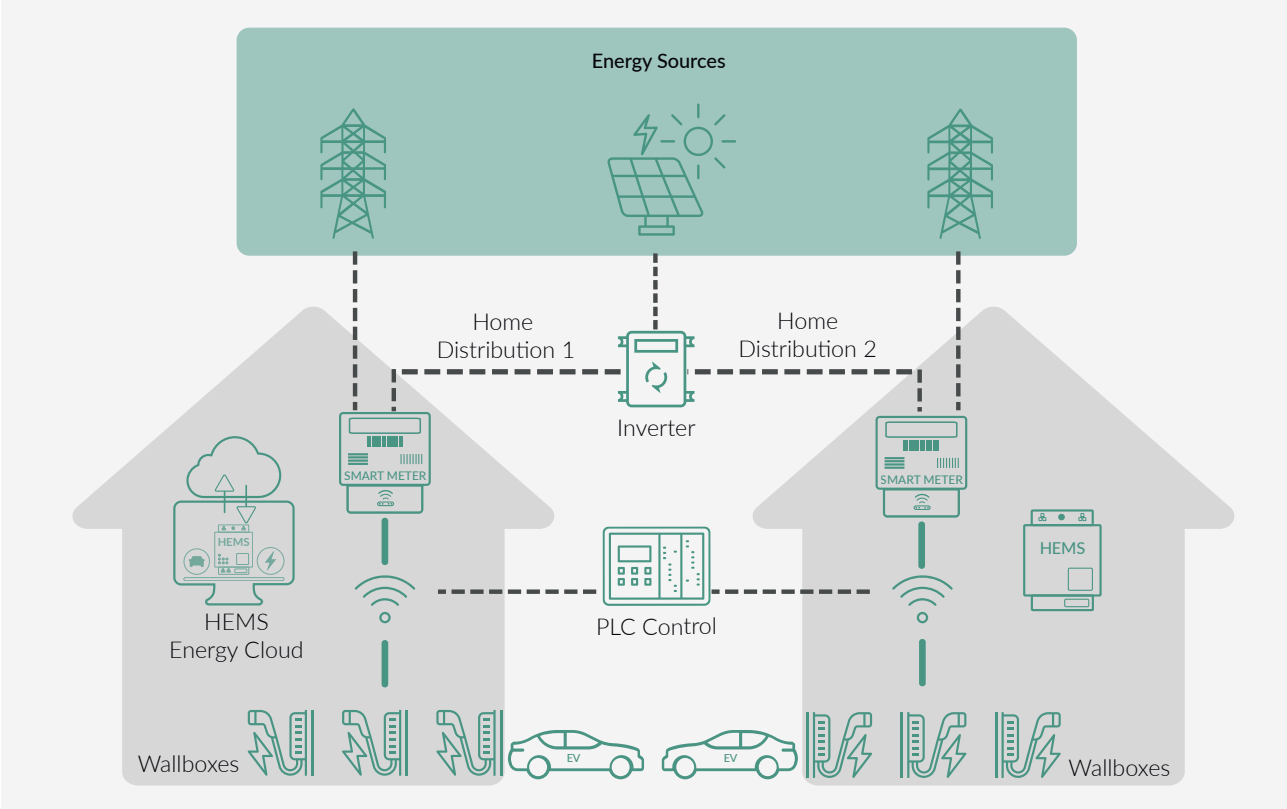
End-to-End Test Stations for Smart Charging Solutions.

Development and Testing Solutions	Product and system tests for detecting errors in functional processes.
Validation of AC and DC Wallboxes	Comprehensive tests and validations for essential components such as power pool, vehicle shadow, and smart meter gateway.
Integration of Standard Protocols	Extensive experience with protocols such as OCPP, ISO 15118-20 at the component level and in system integration.
Modular End-to-End Test Stations	Rapid integration of future requirements, automation, and integration of systems and interfaces such as HEMS or EEBUS.
Realistic Replication of Tests	Simulation of retests and regression tests for subsystems with comprehensive result evaluation.
Error Analysis and Management	Error documentation and reporting as well as in-depth error analysis and problem management.

Modular, Flexible & Powerful Test Stations for all Requirements.

Our in house test benches for smart charging facilitate the integration and testing of complex systems and components.

Thanks to their modular structure, we can quickly adapt to new requirements and ensure realistic simulation of use cases, as well as inter-operability of the systems.



Graphical Representation of Our Test Stations

Measurement Technology, Diagnostic Tools & Protocols.

XCP	Control unit calibration and data reading.
PLC	PLC communication monitoring and simulation of communication standards, e.g., ISO 15118.
CAN	Restbus simulation and CAN Bus recordings.
OCPP (2.X)	Backend integration, security, and simulation.
EEBUS	HEMS integration, heat pumps, etc.
MODBUS	Smart Meter simulation
OBC	Reading and evaluating vehicle diagnostic data.

Nominal Power	According to customer requirements, e.g., 22 kW per test station
Control	PLC
PV Simulation	Automated from 6 kW (expansion possible)
Household loads	Dynamic AC loads fully automated 3 kW/phase (expansion possible)

Measurement Technology, Diagnostic Tools & Protocols.

Simulation

	Power	Frequency	Voltage
Net Simulation	6 kVA	16 – 500 Hz	0 – 350 V
AC Laod	3 phase	16 – 500 Hz	0 – 350 V

	Power	Amount MPPT inputs	Control
PV	6 kW	2	CAN / Ethernet

HEMS	full Backend-Connections	Local Simulation (EEBUS)
SMGW	via Network Operator	Local Simulation
Backend	Simulated Cloud Backend (OCPP 2.X)	

Deep Dive Analysis for Hardware & Software as an Integral Part of the Overall Concept.

Project Management

The Guarantee for Your Project.

Our expertise in development and testing is complemented by proficient project management, which is deeply embedded in the DNA of VISPIRON SYSTEMS.

We combine proven classical methods with agile approaches, bringing the best of both worlds to our projects – always ensuring an optimum of dynamism and flexibility.

For many years, we have been working with OEMs across all areas of development and are particularly familiar with the required processes, milestones, and specifications.

The result: Efficient use of project resources and the achievement of project goals – on time, within budget, and perfectly tailored to your needs.

Key Aspects of Our Project Management:

Stakeholder-Management	Close collaboration with customers, suppliers, and authorities to ensure smooth project execution.
Time and Resource Planning	Optimisation of schedules and efficient utilisation of resources to ensure timely and cost-effective project deliveries.
Risk Management	Proactive identification and mitigation of risks to prevent project failures and delays.
Technology Integration	Coordination of hardware and software component integration, such as HEMS, EEBUS, and OCPP, into existing infrastructures.

Certifications & Standards

Throughout the entire project lifecycle, we ensure high-quality standards through continuous monitoring and improvements.

VISPIRON SYSTEMS is certified according to the industry-specific standards VDA-ISA TISAX, ISO 9001:2015, and ISO 27001:2013.

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Get in touch with us for personalised consultation and achieve success in your projects with our customised solutions.

Our team looks forward to setting new standards in Smart Charging & Connected Energy Systems together with you.