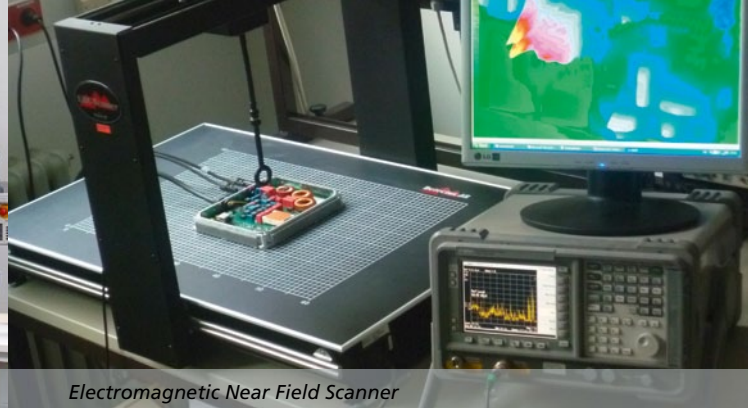
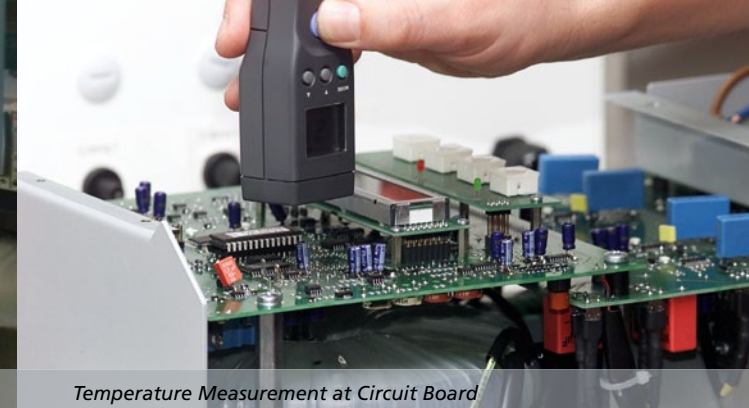




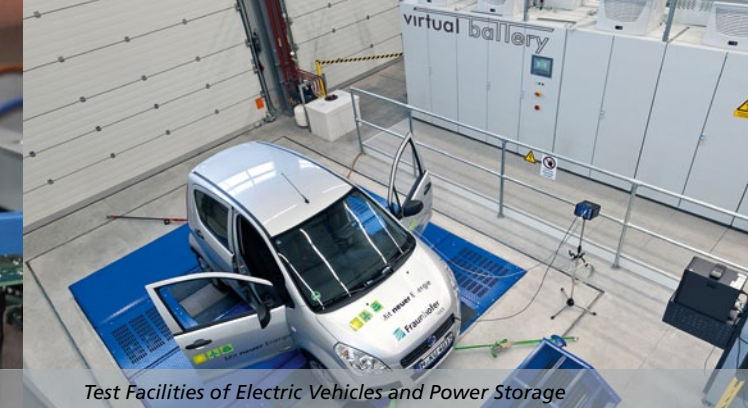
Laboratory for Inverter Tests



Electromagnetic Near Field Scanner



Temperature Measurement at Circuit Board



Test Facilities of Electric Vehicles and Power Storage

PERFORMANCE & RELIABILITY

Efficiency measurement of grid connected inverters

Within our accreditation scope we can conduct

- Overall efficiency measurements of grid connected photovoltaic inverters according to EN 50530
- Efficiency measurements of DC-DC converters
- Measurements of the conversion efficiency together with static and dynamic MPPT efficiency of PV inverters

Electromagnetic compatibility (EMC)

In our accredited EMC testing laboratory, we can carry out all necessary emission and immunity tests, according to the generic EN61000-6-1 to -6-4 standards. The laboratory is optimised for research on inverters, but also offers extensive possibilities to test other devices – from pre-compliance near field scans on circuit board level up to accredited tests in terms of Go/NoGo tests. Moreover, tests on electricity meters, in-situ EMC measurements on electrical installation, grid quality and and EMC appraisals are also possible.

PERFORMANCE & RELIABILITY

Outdoor measurement of power electronic components

Characterisation of power electronic components can be carried out under genuine operating conditions while simultaneously recording all relevant parameters on the DC and AC side. Furthermore, the operating temperature of critical components can be measured. In addition, we can provide detailed evaluation to characterise the quality of their products.

Additional activities

- EN 62109-1/ -2: Safety of power converters for use in photovoltaic power systems
- UL 1741: Inverters, converters, controllers and interconnection system equipment for use with distributed energy resources
- Reliability and life cycle assessment under specified environment conditions
- Noise emission test (sound pressure level (L_p) and sound power level (L_w))

OTHER SERVICES

In addition to the test procedures in accordance with current standards and application requirements, we are able to offer the following additional services for the characterization and development of power electronic components.

R&D electronics and converters

- Consulting, development and design of power electronics converters and control strategies, controller cards, measurement and communication interfaces according to system requirements and specifications
- Verification and performance testing of control algorithms using Software-in-the-Loop
- Analysis and inspection of prototypes in the laboratory together with in field monitoring campaigns

Additional measurement

- Investigations on novel network assets, e.g. voltage stabilizers, controllable MV/LV substations, charging stations for electric vehicles
- Test of devices and components in a system context (in combination with power hardware in the loop systems)
- In-situ measurements of components along with analyses of system performance

HYBRID-STORAGE SYSTEMS

We offer a multitude of laboratory services for PV systems to increase the local consumption of the generated energy in household, industrial and commercial applications:

Functionality and efficiency tests

Besides standardized tests for the functionality and efficiency of the system components, such as EN 62509 for the battery charge controller, we are qualified to carry out extensive tests in the household environment for your self-consumption system. Furthermore, we are developing test procedures to compare the overall system efficiencies in benchmark tests.

Tests with virtual battery

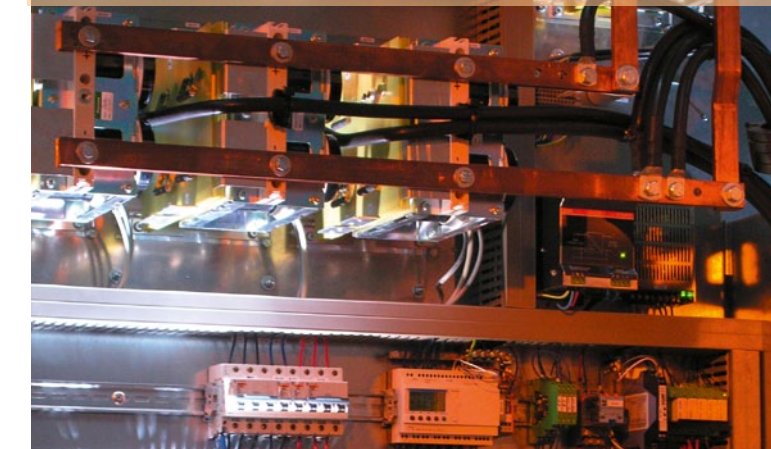
By means of our virtual battery we can conduct test services to support the development of battery charge controllers and the optimization of storage operation and charging strategies.

Battery tests

We carry out standardized efficiency and capacity tests according to EN 61427 as well as custom tests to determine battery state-of-health.

INVERTER AND DER TECHNOLOGY

TURNKEY SOLUTION SERVICES





DeMoTec Laboratory



Grid Integration Research and Test Laboratory (PNI)



Installation of a Protective Grounding Assembly on a Transformer



Control Room at PNI Laboratory

FRAUNHOFER IWES

Königstor 59

34119 Kassel / Germany

Phone: +49 (0) 561 7294-0

Fax: +49 (0) 561 7294-200

www.iwes.fraunhofer.de

TURNKEY SOLUTION

Testing of generation units, static converters and power electronics is an inherent part of the research activities at Fraunhofer IWES / Kassel. With accredited testing laboratories, we offer standard and customised tests and measurements together with characterisation and simulation of power electronics and system components, with a particular focus on:

- Grid integration
- Performance and reliability
- Electromagnetic compatibility
- Hybrid-storage systems

We develop and characterise inverters, module integrated and orientated inverters, DC/DC converters, unidirectional and bidirectional chargers from small to large scale for different applications; storage facilities, generator based renewable energies, combined heat and power generation plants, adjustable load appliances, electric vehicles and controllable transformers.

Our services cover concept design and control systems as well as tests and measurements of all power electronics devices from sub kW to multi MW systems.

TEST FACILITIES & LABORATORY EQUIPMENT

- PV simulator (750A@1000V) with MPP tracking
- 90 kVA bi-directional three phase AC grid simulator for the measurement of low-frequency network disturbances, voltage fluctuation and flicker
- 1MVA bi-directional three phase AC grid simulator
- Mobile low and medium voltage fault ride through test equipment (LV- & MV-FRT) up to 6 MVA
- Climate chambers
- Accredited EMC laboratory

Simulation and analysis software

- MATLAB / Simulink, PLECS
- Power Factory
- Ansys / Ansoft
- CST Studio Suite
- CONCEPT II
- COMSOL Multiphysics

We are able to offer more extensive tests in different power classes within the European network of excellence DERlab, an alliance of several independent laboratories in Europe that work on the integration of distributed energy resources (DER) in electric grids. Fraunhofer IWES is member and co-ordinator of this network.

➤ www.der-lab.net

GRID CONNECTION

The accredited testing laboratory for grid integration “Forschungs- und Prüflabor zur Netzintegration” (PNI) offers the determination of electrical characteristics of distributed energy resources according to relevant grid codes:

- Measurement of units and plant up to 6 MVA
- Laboratory measurements or on-site measurements.

Accredited measurements:

- VDE-AR-N 4105 (Low Voltage guideline)
- BDEW (Medium Voltage guideline)
- FGW TR3

Measurements for international grid codes (in cooperation with DERlab e.v.):

- Italy: CEI 0-16, CEI 0-21, CEI C.1058
- USA: ANSI C62.41; CEC Inverter Performance Protocol; FCC part 15 Class A; UL 1741
- Austria: OEVE/OENORM E 8001-4-712
- Belgium: C10/11
- Spain: RD 436/2004; RD 1663/2000; PVVC; P.O. 12.3

GRID CONNECTION

Modelling and certification services

Fraunhofer IWES offers extensive support for unit and plant certificates required for grid connection approval:

- Modelling of units and plants – by means of preparation and parameterisation of the simulation model
- FGW TR4: Validation of unit and plant models – based on measurement results
- FGW TR8: Certification of plants (in progress)

Network studies and expertise

Grid connection approval of units and plants bases on reliable grid integration studies. Fraunhofer IWES offers support for all relevant issues concerning grid connection and integration.

CONTACT

Fraunhofer IWES is the contact for all your energy system technology solutions, especially in the area of renewable energies.

Grid Integration

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Performance & Reliability

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Electromagnetic Compatibility & Multiphysics Modelling

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Research & Development Electronics and Converters

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Further Information:

<http://www.iwes.fraunhofer.de/de/labore.html>