

## Accredited Laboratories

In addition to its R&D activities, Fraunhofer ISE offers independent testing and certification services to commercial enterprises and scientific institutions. Complementing its twelve Centers, the Institute has seven accredited laboratories for calibration and testing as follows:

- CalLab PV Cells
- CalLab PV Modules
- TestLab PV Modules
- TestLab Solar Façades
- TestLab Solar Thermal Systems
- TestLab Heat Pumps and Chillers
- TestLab Power Electronics



## R&D Infrastructure

A special feature of Fraunhofer ISE is its excellent technical infrastructure. Laboratories covering a floor area of 20900 m<sup>2</sup>, including clean room space of over 1000 m<sup>2</sup>, contain cutting-edge facilities and equipment and provide the basis for our R&D expertise. The R&D infrastructure of Fraunhofer ISE is divided into eight Laboratory Centers and four production-relevant Technological Evaluation Centers:

- Center for High Efficiency Solar Cells
- Center for Emerging PV-Technologies
- Center for Heating and Cooling Technology
- Center for Electrical Energy Storage
- Center for Material Characterization and Durability Analysis
- Center for Power Electronics and Sustainable Grids
- Center for Optics and Surface Science
- Center for Fuel Cells, Electrolysis and Synthetic Fuels
- SiM-TEC – Silicon Materials Technology Evaluation Center
- PV-TEC – Photovoltaic Technology Evaluation Center
- Module-TEC – Module Technology Evaluation Center
- Con-TEC – Concentrator Technology Evaluation Center



## External Branches and Cooperations

- Fraunhofer Center for Silicon Photovoltaics CSP, Halle/Saale, Germany
- Fraunhofer Chile Research – Centro para Tecnologías en Energía Solar (FCR-CSET), Santiago, Chile

Fraunhofer ISE contributes its expertise as a member institute in associations and alliances within the Fraunhofer-Gesellschaft.

- Fraunhofer Cluster of Excellence Integrated Energy Systems CINES
- Fraunhofer Alliances: Energy, Batteries, Building Innovation, Space and Water Systems (SysWasser)
- Fraunhofer Electromobility Systems Research
- Fraunhofer Group for Energy Technology and Climate Protection
- Fraunhofer Group MATERIALS
- Fraunhofer Networks for Intelligent Energy Grids, Sustainability and Hydrogen
- Fraunhofer Initiative “Morgenstadt – City of the Future”
- Sustainability Center Freiburg, a cooperation between the University of Freiburg and Freiburg’s five Fraunhofer Institutes

## Contact

Fraunhofer Institute for  
Solar Energy Systems ISE

Institute Directors  
Prof. Dr. Hans-Martin Henning  
Phone +49 761 4588-5547  
Prof. Dr. Andreas Bett  
Phone +49 761 4588-5210

Communications  
Christina Lotz  
Phone +49 761 4588-5150  
christina.lotz@ise.fraunhofer.de

Heidenhofstr. 2  
79110 Freiburg, Germany  
Phone +49 761 4588-0

# Fraunhofer Institute for Solar Energy Systems ISE

Founded in Freiburg, Germany, in 1981, the Fraunhofer Institute for Solar Energy Systems ISE is the largest solar energy research institute in Europe, with a staff of 1 400. It creates the technological foundations for supplying energy efficiently on an environmentally sound basis in industrialized, threshold and developing countries. With its research focusing on energy conversion, energy efficiency, energy distribution and energy storage, it contributes to the broad application of new technologies. In 2021 the Institute's budget (including investments) totalled 118.1 million euros (preliminary).

Together with clients and partners from industry, politics and society Fraunhofer ISE develops technical solutions for practical implementation. It investigates and develops materials, components, systems and processes in five business areas. In addition, Fraunhofer ISE offers testing and certification procedures and features an excellent laboratory infrastructure. The institute is certified according to the quality management standard, DIN EN ISO 9001:2015.



## Spectrum of Activities

Through its research, Fraunhofer ISE develops and optimizes new and existing products, processes and services. The Institute searches for promising technical solutions and transfers technology from science and research to industry and the society at large. As a partner for industry, the Institute orientates itself according to our clients' requirements and contributes toward their economic value generation.

The Institute carries out research and development projects at various phases in the life cycle of a given technology. Depending on the task and requirements of our clients and the technological readiness level, the Institute offers services in various forms:

- New material/process
- Prototype/pilot series
- Patent/licence
- Software/application
- Measurement analysis/quality control
- Consultations/planning/studies

## Business Areas

### Photovoltaics

#### Silicon Photovoltaics

- Feedstock, Crystallization and Wafering
- Epitaxy, Si-Foils and SiC Deposition
- Characterization of Processing Materials and Silicon Materials
- Doping and Diffusion
- Surfaces: Conditioning, Passivation, Light-Trapping
- Metallization and Structuring
- High-Efficiency Silicon Cell Fabrication and Analysis
- Pilot Processing of Industrial Silicon Solar Cells
- Technology Assessment
- Silicon Bottom Cells for Tandem Photovoltaics

#### III-V and Concentrator Photovoltaics

- III-V Epitaxy and Solar Cells
- Concentrator Assemblies
- Concentrator Optics
- High-Concentration Systems (HCPV)
- Low-Concentration Systems (LCPV)
- Silicon Concentrator Solar Cells
- Power-by-Light
- III-V-Silicon Tandem Photovoltaics
- Thermo Photovoltaics

#### Perovskite and Organic Photovoltaics

- Perovskite Solar Cells and Modules
- Organic Solar Cells and Modules
- Perovskite Silicon Tandem Photovoltaics



#### Photovoltaic Modules and Power Plants

- Module Technology
- Module Calibration
- Service Life and Failure Analysis
- Photovoltaic Power Plants
- Integrated Photovoltaics
- Solar Radiation and Performance Prediction

### Energy Technologies and Systems

#### Energy Efficient Buildings

- Building Envelopes
- Building Operations Management
- Building Systems Technology
- Low Temperature Solar Thermal
- Heat Pumps
- Heat and Cold Storage
- Ventilation and Air-Conditioning

#### Solar Thermal Power Plants and Industrial Processes

- Solar Thermal Power Plants
- Concentrating Solar Collectors
- Water Treatment and Materials Separation
- Thermal Storage for Power Plants and Industry
- Industrial Processes and Process Heat
- Efficient Heat Exchangers

#### Hydrogen Technologies and Electrical Energy Storage

- Thermochemical Processes
- Electrolysis and Power-to-Gas
- Fuel Cell Systems
- Battery Cell Technology
- Battery System Technology
- Applied Storage Systems

#### Power Electronics, Grids and Smart Systems

- Power Electronics and Grid Integration
- Smart Grids
- Energy System Analysis



Thanks to our breadth of expertise, we can help shape the energy transition in its entirety."

**Prof. Andreas Bett,**  
**Prof. Hans-Martin Henning**  
Institute Directors, Fraunhofer ISE