

## Detailed Meteorological Data Acquisition

Detailed meteorological data acquisition is available in real time via network interfaces in the newly constructed Solar TestField and at Fraunhofer ISE.

- different sensor types for solar irradiance (pyranometer, reference cells)
- separation by irradiance type (direct, diffuse)
- different orientations (horizontal, 20 degrees south, tracking)
- spectroradiometer, cloud camera
- air temperature, pressure, humidity
- wind speed, direction
- pollution levels on module or mirror surfaces

## Reduce Costs, Ensure Quality and Return on Investment

On our Solar TestField, we test solar components and systems for material and component manufacturers on the one hand, and for customers on the other. The actual yields of new module types, their reliability and aging behavior have a significant influence on the economic viability of solar power plants and the costs of the energy turnaround. Our independent test reports facilitate the selection of durable components for plant operators, investors, banks and insurance companies.

## Independent Outdoor Testing for Manufacturers, Operators, Investors, Banks and Insurance Companies



Website "Solar TestField"

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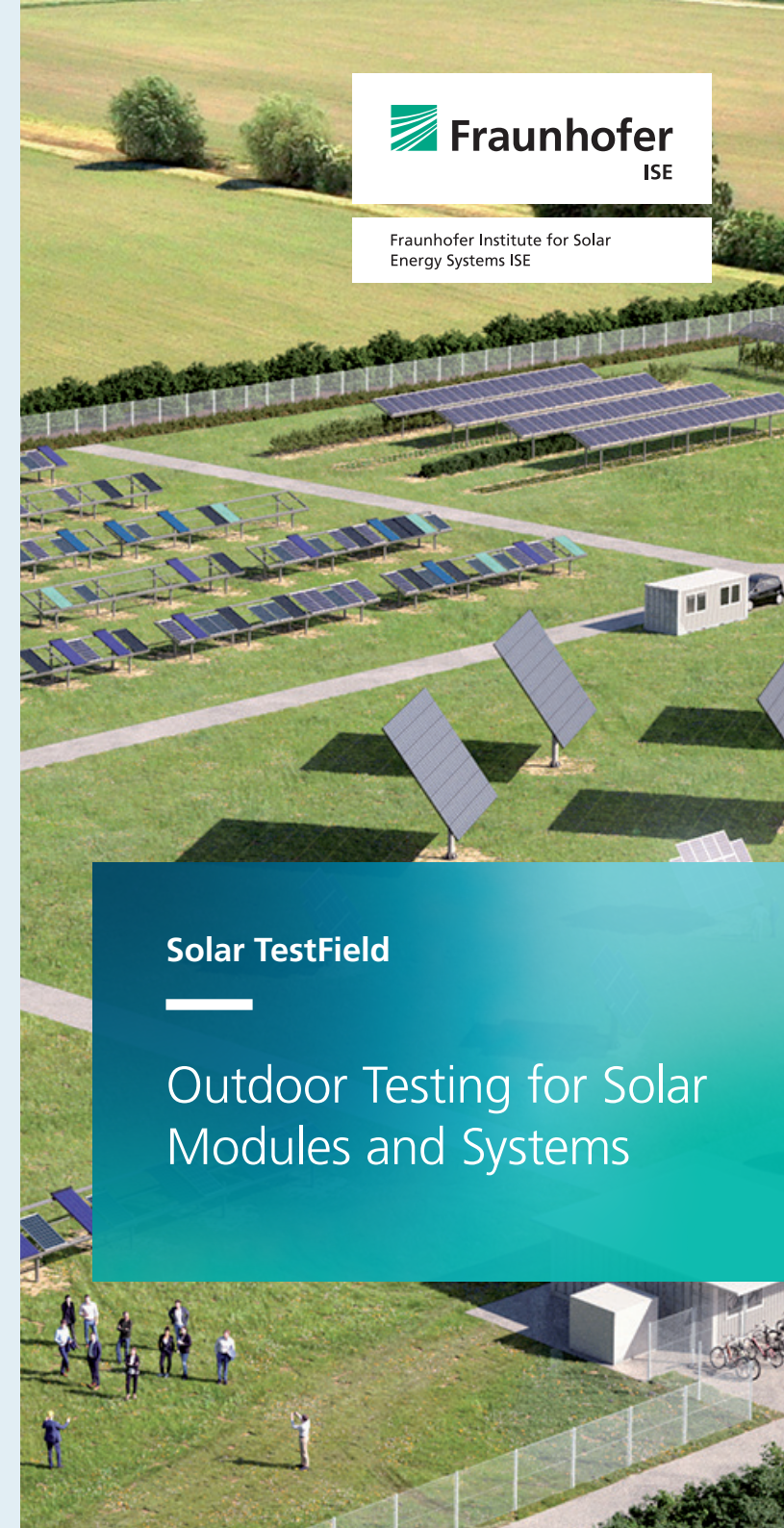


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## Solar TestField

## Outdoor Testing for Solar Modules and Systems



# Research and Quality Assurance

In Merdingen, 15 km west of Freiburg in Germany, one of the largest test fields for solar energy systems in Europe is being built. On an area of three hectares, Fraunhofer ISE will be testing the performance and reliability of components and systems in real-life operation.

Precise monitoring data from our Solar TestField will allow comprehensive analysis and comparative evaluation of performance. These data provide valuable information on

## Our Services for Manufacturers, Operators, Investors, Banks and Insurance Companies

- module installation fixed, single-axis or dual-axis tracking
- precise, high-frequency recording of IV characteristics, meteorological data, other operating parameters and degradation indicators
- data evaluation and informative, independent test reports
- benchmarking of different module types
- combination with laboratory measurements, accelerated aging, degradation analysis
- analyses of power and agricultural yield of agrivoltaic systems
- testing of Concentrating PV systems (CPV)
- testing of inverters and PV battery systems
- testing of solar thermal systems and their components



*Visualization of the Solar TestField with different solar system setups in Merdingen near Freiburg, Germany.*

the expected degradation and service life during operation. Innovative products and prototypes of a variety of different solar technologies will be tested:

- photovoltaic modules
- mounting and tracking systems
- agri-photovoltaic systems
- inverters and battery storage
- solar thermal collectors and heliostats

### Precise Benchmarking for Innovative PV Modules

The Solar TestField will be available for innovative technologies, including bifacial modules, heterojunction technology (HJT), perovskite PV, organic PV (OPV) and tandem PV. Comparative measurements with reference modules from Fraunhofer ISE and with competitor products will be carried out under practical outdoor conditions. Depending on the technology and application, different questions arise. We arrange customized test programs and accompanying analyses with our clients on demand.

### Comprehensive Performance Analysis

Monitoring at the Solar TestField can be combined with precision measurements in the accredited CalLab PV Modules, with accelerated aging tests in the accredited TestLab PV Modules and with the highly sensitive degradation analysis methods we have developed. Fraunhofer ISE offers a unique platform for comprehensive performance analysis:

- precision measurements in the laboratory under standard conditions and according to IEC 61853 (energy rating)
- accelerated pre-aging in the laboratory for early detection of aging effects in field operation
- monitoring on our test fields on Gran Canaria (maritime climate) and in Israel (arid climate)
- combination with parameter-based simulation calculations for module performance and energy rating for product optimization
- derivation of lifetime relevant parameters and development of a lifetime yield rating