



# Company Presentation



## Company

Solsol GmbH in Stuttgart, Germany, was founded in late 2008 with the mission to serve the global photovoltaic industry as a competent and reliable technology and engineering partner for solar cell manufacturers and equipment suppliers. We offer consulting, production line support, customized R&D, and process development. Our expertise comprises mono- and multicrystalline silicon solar cells and modules as well as thin film modules.

For us, photovoltaic engineering is not only a mere job but a philosophy and a great passion. We believe that success is defined through our customers to whom we are dedicated partners and consultants in business and technology.

Our Team consists of highly-skilled people with in-depth knowledge of solar cell device physics and engineering technology as well as experience in the photovoltaic business and related areas. All positions are held by well-educated and highly motivated professionals with doctoral or diploma (masters) degree in solar cell engineering or semiconductor physics.



## Services for Cell manufacturers

Solsol offers a wide range of technical services for the Photovoltaic Industry. Whether you are a manufacturer of solar cells, a supplier of solar cell production equipment, or a new company targeting business opportunities in the expanding Photovoltaic market, our team of outstanding experts in Solar cell physics and engineering will support you to achieve the most out of your solar enterprises. We work with dedication and devotion for our customers and target long-term partnerships.

### Ramp-up Support

Our experienced experts support your company during the ramp up of a new production line to the final output in terms of efficiency, throughput, and yield. We facilitate a smooth transition from the initial phase to regular and stable day-to-day operation conditions. We ensure that you achieve the best possible solar cell efficiency and yield with your production equipment and thereby guarantee sustainable success.

### Interims Management

Beyond technical support Solsol provides management expertise for solar cell manufacturers. Solsol professionals act as temporary technology and operations managers that assist you with the setup of efficient organization structures and help to build up qualified in-house management personnel.



## Training

Solsol offers a variety of trainings to qualify engineers and technicians for solar cell production, troubleshooting, and process improvements:

- Fundamentals of solar cell physics (theory)
- Solar cell characterization and analysis (theory and application)
- Specific device physics of c-Si (standard + high-efficiency) and Thin-Film (a-Si, a-Si/ $\mu$ c-Si, CIGS, CdTe) solar cells. (theory)

Depending on your preference, we are able to train and teach your engineers in our facility in Stuttgart, Germany or on site at your location.

## Business Development

Your company is looking for business opportunities in the rapidly growing PV market? Solsol experts command a wide variety of PV technologies, including mono- and multi-crystalline Silicon (standard + high-efficiency) as well as Thin-Film (a-Si, a-Si/ $\mu$ c-Si, CIGS) solar cells and modules.

In case you are an investor intending to invest in cell/module manufacturing the Solsol team will be glad to assist you with assessments of the right technology (thin film or crystalline Silicon). Our specialists will help you identify the most promising and reliable options. Once you have selected the technology, we are able to assist you in choosing the right equipment for your production line.

If you are a machine supplier without PV background, we point out potential applications of your machines in the photovoltaic industry. The combination of your machinery and process expertise with our solar cell engineering expertise ensures a fast time-to-market and a smooth integration into complete production lines.



## Research & Development

The great passion of Solsol GmbH is further solar cell development. Most of our team members have been involved in solar cell research throughout their professional career. Our ambition is to reduce the solar cell/module Wattpeak price to ensure the competitiveness of our customers in the future.

## Simulation

Solsol GmbH uses commercially available simulation tools as well as software that is custom written by our team to help interpreting measured solar cell data. The simulation professionals closely work together with the measuring team. Our goal is to use simulated results to thoroughly understand the limiting factors of the solar cell efficiency and to optimize single process steps.

## Sample Processing

With the help of the facility of the University of Stuttgart, we offer sample processing of mono- and multi-crystalline silicon solar cells to evaluate the quality of wafers and solar cell processes. We also fabricate lifetime samples to test wafers.



## Characterization

Solsol GmbH offers measuring and characterization services for crystalline solar cell as well as amorphous silicon and CIGS thin film solar cell technology. With the help of the measured data we derive the limiting factors in your solar cells. Together with your engineers, we subsequently evaluate your production process and assist in optimizing your production line.

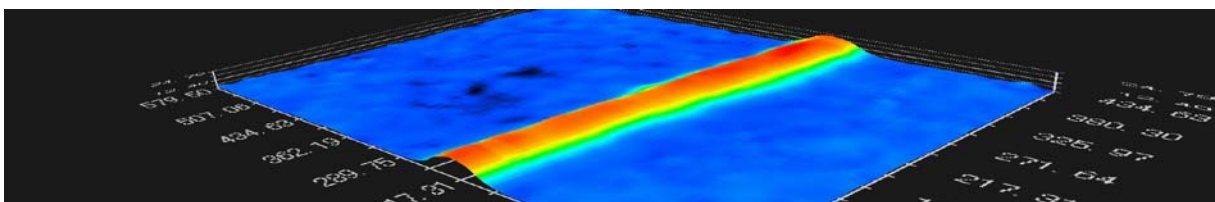
We perform the following measurements:

- Current/Voltage (I/V)
- External and Internal Quantum Efficiency
- LBIC (Light Beam Induced Current)
- Effective minority carrier lifetime (integrated and as function of position)
- Electroluminescence

For material characterization purposes we offer the following techniques:

- SEM (Scanning Electron Microscopy)
- EDX (Electron X-Ray Diffraction)
- SIMS (Secondary Ion Mass Spectroscopy)

We cooperate closely with the Institute of Physical Electronics (*ipe*) of the University of Stuttgart that is equipped with highly sophisticated custom build measuring stations and a state of the art solar cell characterization setup. Our well educated team that has long time experience in interpreting solar cell data carries out all measurements on its own, thereby guaranteeing a swift and reliable execution.



## Process Development

Solsol GmbH offers process development for machine manufacturers as well as solar cell producers. Together with the pilot production solar cell process line at the University of Stuttgart, we evaluate new process steps as well as perform the pre-commercial development of existing process steps for machine producers.

## New solar cell concepts

Solsol GmbH intends to develop additional solar cell production steps and new solar cell concepts. Our research and development program is focused on applicability of new technology in industrial mass production, which at the end of the day boils down to the reduction of the Wattpeak price. In contrast to fancy but complicated efficiency enhancements, our innovations are driven by the clear guidance of low cost of ownership, easy manufacturability, and short time-to-market.

