



SOLARE

Turn-key Production
System for Solar Cells

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Turn-key Production System Multi- or Mono-Cell Production

SINGULUS TECHNOLOGIES cooperates with cell manufacturers worldwide and develops processes which improve the efficiency of solar cells and at the same time reduce production costs. Evolutionary improvements in cell concepts like BSF, PERC (PERL/PERT) and also transitions to n-type material, heterojunction or IBC cells will drive the future of crystalline solar cells. SINGULUS TECHNOLOGIES proves the efficiency of the competencies centralized in the company for the delivery of all essential systems up to the complete manufacturing line.

SINGULUS TECHNOLOGIES offers all the services necessary to build a turn-key solar cell production line. This service includes the planning and technical design of the production building as well as all supplies and additional equipment. Depending on the planned manufacturing capacity, the technical plans including the investment needs are created. SINGULUS TECHNOLOGIES offers not only the cell production line but also the upstream ingot wafer production and the solar module line with the complete accessories.



GENERIS PECVD In-line Production System

SINGULUS TECHNOLOGIES Turn-Key Cell & Module Production

- Optimized building including facilities and utilities
- Complete ingot and wafer line
- Cell-line equipment and services
- On-site project engineering/management for complete equipment
- Ramp-up and process commissioning
- Efficiency guaranteed
- Module line for "standard" or "building integrated" modules
- Together with cell-line planning, installation and commissioning of complete solar plants possible
- "1/2/3 year(s) after FAT production support" for all equipment





GENERIS PVD Sputtering System



LINEX – Inline Wet Process Equipment for Cleaning, Texturing and PSG Removal



SILEX II – Modular Batch System for Wet-chemical Treatment of Standard and High-efficiency Solar Cells

Bifacial Solar Cells based on PERC Technology

Bifacial solar cells are light-sensitive on both sides. The incidence of diffuse light on the back of the module is optimized by a highly reflective background surface that should be in sufficient distance.

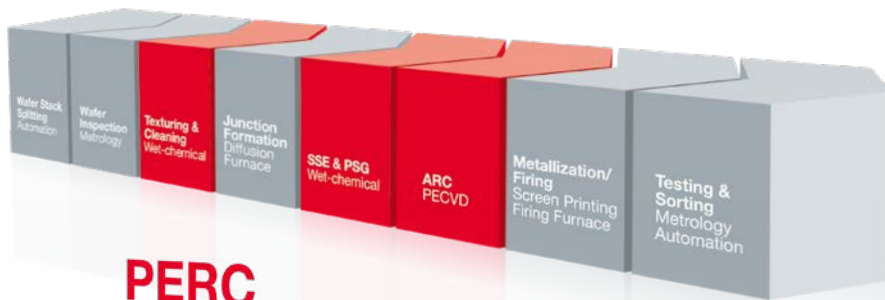
Bifacial solar cells based on PERC technology enable higher yield with a suitable alignment than conventional cells. A standard rear passivated solar cell on p-type mc Material ($AlO_x + SiN_y$) is used. Depending on mounting condition and albedo illumination of rear side (typically 20 % - 30 %), the module has a power equivalent of 330 W - 350 W.

SINGULUS TECHNOLOGIES offers proven production equipment for the manufacturing of bifacial solar cells based on PERC technology.

Advantages:

- No additional equipment needed (no Boron diffusion)
- Use of Al paste on rear side instead of Ag paste
- Also applicable for LID-free n-type material (Boron diffusion required)
- Module power front side $P_{max} = 300\text{ W}$
- Module power rear side $P_{max} = 160\text{ W}$

AI-BSF



PERC



HJT





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THIN FILM
DEPOSITION

SURFACE
ENGINEERING

THERMAL
PROCESSING

WET
CHEMICAL

SINGULUS TECHNOLOGIES – Innovations for New Technologies

SINGULUS TECHNOLOGIES develops and assembles innovative machines and systems for efficient and resource-saving production processes, which are used worldwide in the solar, semiconductor, medical technology, consumer goods and data storage.

The company's core competencies include various processes of coating technology, surface treatment and wet-chemical and thermal production processes.