



INNOVATIONS FOR HIGH- PERFORMANCE SOLAR CELLS

Advanced Process Technology

SINGULUS TECHNOLOGIES – Innovative Technology for PV Technology

Energy produced by solar power is the major pillar for sustainable energy supply. Intelligent energy transition towards renewables represents both an opportunity and a challenge for power generation. Highly efficient photovoltaic cells will pave the road to this destination. Modern storage and battery technologies will sharply increase the use of environmentally friendly energy.

SINGULUS TECHNOLOGIES provides technology solutions for both crystalline and thin-film high-performance solar cell platforms including CIGS, CdTe and Perovskite Technology as well as PERC, HJT, IBC, HBC & TOPCon. SINGULUS TECHNOLOGIES partners with cell manufacturers worldwide and develops processes, which improve the efficiency of solar cells while reducing production costs.

SINGULUS TECHNOLOGIES' expertise includes vacuum thin-film coating (PECVD, sputtering, evaporation), surface engineering, wet-chemical processes and thermal processing.

With the production equipment for thin film technology SINGULUS TECHNOLOGIES is one of the few companies able to equip both efficiently running factories for the manufacturing of CIS/CIGS thin-film modules as well as single machines and turn-key lines for the production of next generation solar cells. For the manufacturing of CIGS solar modules, SINGULUS TECHNOLOGIES has delivered in 2017 and will continue to deliver in 2018 equipment for two different factory sites of CNBM in China with a first capacity step of 300 MW. The final production size of both factories is planned to build up to 1500 MW each. Two more manufacturing sites with the same capacity are in discussion.

In the market for crystalline cell technologies, SINGULUS TECHNOLOGIES is focusing clearly on the new high-efficiency cells like heterojunction solar cells. With the wet-chemical SILEX II etching and cleaning machine, the company is involved in numerous international investment projects and has established itself as the market leader in this segment. SINGULUS TECHNOLOGIES is currently using this position to launch new vacuum deposition machines (PVD & PECVD) in this market.



**Modern building producing energy with CIGS solar modules
(Modules provided by Avancis/CNBM)**

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THIN FILM
DEPOSITION

SURFACE
ENGINEERING

THERMAL
PROCESSING

WET
CHEMICAL

SINGULUS TECHNOLOGIES – Innovations for New Technologies

SINGULUS TECHNOLOGIES builds innovative machines and systems for efficient and resource-friendly production processes. SINGULUS TECHNOLOGIES' strategy is to take advantage of its existing core competencies and to expand these further.

The core competencies include vacuum coating, surface processing, wet-chemical and thermal production processes. The company offers machines, which are used worldwide in solar, semiconductor, medical technology, consumer goods and optical disc. For all of the machines, processes and applications SINGULUS TECHNOLOGIES harnesses its automation and process technology expertise.