

Thin-Film Coating and Surface Treatment

THIN FILM
DEPOSITION

SURFACE
ENGINEERING

THERMAL
PROCESSING

WET
CHEMICAL

**Innovative
Technologies**



Technologies for a Sustainable World

Responsible and sustainable corporate governance is very important to SINGULUS TECHNOLOGIES. SINGULUS TECHNOLOGIES develops and assembles innovative machines and systems for efficient and resource-saving production processes, which are used worldwide in the solar/hydrogen, semiconductor, medical technology, consumer goods and data storage sectors. SINGULUS TECHNOLOGIES regards sustainability as an opportunity to position itself with innovative products that follow this spirit. In the focus are:

- » environmental awareness
- » efficient use of resources
- » avoidance of unnecessary CO₂ pollution

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

KEY DATA

Two Decades of Innovation & Diversification

- » 1996: Foundation and start with **data storage**
- » 2002: Expansion into the **semiconductor** market
- » 2007: Diversification into **solar**
- » 2015: First production line for **decorative layers**
- » 2016: Market leader for **thin-film solar** production systems
- » 2017: First order in the field of **medical technology**
- » 2018: Delivery of **inline coating** systems for consumer goods
- » 2019: Launch of inline sputtering system for **heterojunction solar cells**
- » 2020: Inline metallization systems for **medical applications** available
- » 2021: New **PECVD** system for high efficiency solar cells **HJT, PERC, TopCon**
- » 2021: New **CISARIS X3** selenization system for **CIGS** application
- » 2022: New **CSS** system for **CdTe** application
- » 2022: Turn-Key Solutions for **HJT, PERC & TOPCon**
- » 2023: **GENERIS PET** system to improve efficiencies of half cut, multi cut and shingle cells
- » 2024: **GENERIS PVD** inline sputtering system for bipolar plates and fuel cells
- » 2024: **TIMARIS** sputtering system for micro-LED applications
- » 2024: Production system for solid state batteries
- » 2024: **EVARIS** production system for Perovskite tandem cells

SINGULUS TECHNOLOGIES – Innovations for New Technologies in the Energy Sector

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.

The expertise includes vacuum thin-film coating (PECVD, sputtering/PVD, evaporation), surface engineering, wet-chemical processes and thermal processing. SINGULUS TECHNOLOGIES also offers turn-key solutions for PERC, TOPCon and HJT Solar.



1

1: SILEX III
wet processing system



2

2: GENERIS PVD
inline sputtering system



3

3: PECVD inline system for
high-performance solar cells



SINGULUS TECHNOLOGIES – Nano-Coatings for the Semiconductor Industry

SINGULUS TECHNOLOGIES is a renowned manufacturer of advanced thin-film deposition equipment for semiconductor applications. Already established in the field, SINGULUS TECHNOLOGIES recently introduced the second generation of its TIMARIS PVD cluster tool platform, comprising a complete portfolio of process modules for different applications. These include the deposition of ultra-thin metallic and insulating films down to thickness of one nanometer and below, as well as stacks of such films with very precise material thickness and high uniformity specifications.

APPLICATIONS:

- » Integrated inductors
- » MRAM
- » Magnetic sensor
- » MEMS
- » Packaging
- » Compound semiconductor
- » Power electronics
- » LED
- » EMI shields



1: TIMARIS II
ultra-high vacuum deposition
system



2: TIMARIS III
production system for the
manufacturing of 300 mm wafer

SINGULUS TECHNOLOGIES – Wet Chemical and Vacuum Deposition for Medical Technology

For medical technology SINGULUS TECHNOLOGIES offers innovative wet chemical and vacuum deposition process solutions. The core competencies of SINGULUS TECHNOLOGIES include various processes of coating technology, surface treatment, wet chemical, and thermal production processes. Certain frequently used surfaces such as door handles, elevator buttons, shopping trolley handrails and light switches as well as masks pose a considerable risk of transmission of bacteria, viruses and fungal cultures. One way to reduce the risk of infection – for example by MRSA (methicillin-resistant Staphylococcus aureus, so-called „hospital bacteria“) and E. coli bacteria – lies in the use of specially coated products with a permanently antibacterial and antiviral surface. This method is available immediately and is especially helpful in times of the COVID-19 pandemic to prevent dangerous infections.



1: Coating of medical devices



2: Large inline sputtering with vertical substrate transport





Inline Production Systems for Green & Sustainable Metallizing of 3D Parts

Whether in the cosmetics or automotive sectors, metallic quality surfaces are needed more than ever for 3D coatings for decorative purposes. A wide range of enhanced metallic layers on 3D parts for cosmetics, automotive, bottle caps for the eco-friendly and chrome (VI)-free refining of 3D parts are available. SINGULUS TECHNOLOGIES offers the second generation of inline coating solutions for fully automated handling and coating of 3-dimensional parts. From loading to packaging, the process is fully automated and not one manual step is necessary – at a cycle time of only 0.4 seconds per component. In the shape of the new DECOLINE II SINGULUS TECHNOLOGIES is able to offer the industry an environmentally friendly process and significant benefits for simplifying their production processes.



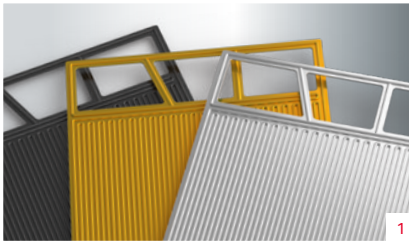
1: DECOLINE II
inline production system for 3D parts

GENERIS PVD

Reliable Production of Bipolar Plates & Electrolyzers

For manufacturers of fuel cell components and PEM electrolysis, SINGULUS TECHNOLOGIES offers ideal solutions for cost-effective and productive production. Steel bipolar plates stacked in so-called slacks are used. Since steel surfaces conduct electricity only moderately well, bipolar plates are often elaborately coated. For this purpose, cathode sputtering lends itself to the use of inexpensive and lightweight sheet metal plates coated with a suitable cheaper protective layer that meets the required properties. The SINGULUS TECHNOLOGIES machines of the GENERIS PVD family are modular designed and scalable for applications ranging from research to mass production.

Numerous SINGULUS TECHNOLOGIES vacuum sputtering machines are in operation in the solar industry, where SINGULUS TECHNOLOGIES provides the GENERIS PVD as a high throughput inline sputtering system platform with horizontal substrate transport.



1: Reliable Production of Bipolar Plates & Electrolyzers



2: GENERIS PVD Sputtering System – Production of Bipolar Plates and for PEM electrolysis



Innovative Technologies

SINGULUS TECHNOLOGIES –
Innovations for New Technologies



Photovoltaics



Medical
Technology



Glass/
Automotive



Semiconductor



Packaging
Industry



Battery/
Hydrogen

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