INLINE SPUTTERING SYSTEMS
for Vertical & Horizontal Substrate Transport
Sputtering Systems for R&D and Production
Over 20 Years of Know-how in Physical Vapor Deposition

Sputtering Technology at a Glance

SINGULUS TECHNOLOGIES, founded in a classic buy-out from the former LEYBOLD in 1995, is a corporation since 20 years with worldwide operations headquartered in Germany’s Rhein-Main region. SINGULUS TECHNOLOGIES is solidly positioned as an innovator and active participant in different markets and has attained the world market leadership position for optical data storage replication lines.

The goals of the company are targeted on achieving a technological market leadership in relevant markets and to thus sustainably increase the business volumes and to generate stable, profitable results. SINGULUS TECHNOLOGIES develops innovative technologies for economic and resource-efficient production processes and the strategy is based on the use and expansion of its existing core competencies. SINGULUS TECHNOLOGIES offers a high level of expertise in a combination with process-technological and scientific know-how coupled with complex solutions for machines and plant engineering. The application areas include vacuum technology, surface coating and thermal processing as well as the related chemical and physical processing steps.

SINGULUS TECHNOLOGIES has delivered far more than 8,000 vacuum coating machines since its foundation in 1995. It ranges from compact systems for optical disc replication to ultra-high vacuum coating machines applying extremely thin layers of around 0,2 nm for the semiconductor industry as required for the manufacturing of MRAM chips. In addition, vacuum thin-film technology is used in modern sensory technology for medical uses and in vehicle technology as well as for piezoelectric materials in mobile phone technology.

HIGH THROUGHPUT
HIGH UPTIME
LOW BREAKAGE
OVER 20 YEARS SPUTTERING EXPERIENCE
OVER 8,000 SPUTTERING DEVICES
IN HOUSE CATHODE DESIGN
VISTARIS Sputtering Systems

The SINGULUS TECHNOLOGIES system with the brand name VISTARIS was developed for the requirements in the photovoltaic industry. Inline sputtering systems are important in today’s CIGS & CdTe thin-film solar cell production. The VISTARIS system was designed to enhance the efficiency of thin-film solar cells, while cutting production costs by using the state-of-the-art technologies. For photovoltaic technology, SINGULUS TECHNOLOGIES develops and manufactures coating systems which can apply special layers and layer systems on different substrates.

Examples are transparent front or metallic back contact layers as well as multilayered precursors with a broad range of different materials. The main advantage of the system is that it can be used for vertical vacuum-based coating of glass substrates in solar and display industry. In the market for thin-film photovoltaic SINGULUS TECHNOLOGIES adds another production stage to its range of processing systems for the manufacture of CIGS/CIS cells.

Typical Performance Characteristics

→ Integrated power supply design
→ No carrier return system necessary
→ Fully vertical substrate transport
→ Special designed carrier transport system
→ Load and unload of substrate from the same side of the machine
→ Usage of rotatable cylindrical magnetrons for highest utilization of target material
→ Temperature processing before and during deposition available
→ Gas separation by dynamic slit valves and/or by individual lock chambers
→ Smallest machine footprint thru turn chamber technology
→ Easy maintenance, low CoO
→ Fast target exchange, use any vendor target
→ Easy expansion possible
→ Vacuum base pressure: < $1 \times 10^{-6}$ mbar
→ Typical process pressure: $2–5 \times 10^{-3}$ mbar
Vertical Inline Sputtering
Sputtering Systems for Various Applications

VISTARIS Inline Sputtering Systems
with Vertical Transport Orientation

The SINGULUS TECHNOLOGIES system with the brand name VISTARIS respond to demand in the photovoltaic industry especially for CIGS/CIS thin-film solar cells. The VISTARIS system for development and production tools is designed to enhance the efficiency of thin-film solar cells, while cutting production costs by using the state-of-the-art technologies. For photovoltaic technology, SINGULUS TECHNOLOGIES develops and manufactures coating systems which can apply special layers and layer systems on different materials. Inline sputter systems are important in today’s thin-film solar cell production. Examples are transparent front or metallic back contact layers as well as multilayered precursors.
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**Example for System Configuration**

**CARRIER RETURN SYSTEM**

**AUTOMATIC LOADING AND UNLOADING OF SUBSTRATE**

LOAD BUFFER 1 EXTENSION 1 PROCESS EXTENSION 2 BUFFER 2 EXIT

**DECREASING OF PRESSURE**

**SPUTTER CHAMBER WITH MULTIPURPOSE PROCESS**

**INCREASING OF PRESSURE**

**Typical Target Materials for PV Application**

→ Sputtering materials like ITO, AZO, CuGa, Cu, In, AZO, i-Zn0 etc
HISTARIS Sputtering System

The HISTARIS is a horizontal inline sputter coating tool designed for special needs. The system can be configured for various substrate sizes and is ideally suited for challenging layer stacks and flexible product mixes. Typical applications include e.g. solar control, anti-reflection, barrier, buffer and precursor layers such as copper-gallium, indium, and i-ZnO, but also different metallic layers like Mo, Al, Cu, Ag, and NiV etc. as well as transparent conductive oxide layers like ITO, AZO which are necessary for new heterojunction cell technology. The systems use an inline process in which the substrates are transported on a special designed conveyor system on flat carriers through the system. The carriers can be configured flexibly for different substrate formats and materials e.g. solar wafers. Different automation options for loading and unloading are available.
Typical Performance Characteristics

- Modular configuration
- Ideally suited for wafers & large substrates
- Parallel processing of several substrates
- Possibility of carrier as well as carrier free transport system
- Low cost of ownership
- Top down and bottom up sputtering possible
- Temperature processing before and during deposition available
- Vacuum base pressure: < 1 x 10⁻⁶ mbar
- Typical process pressure: 2–5 x10⁻³ mbar
- Temperature range for deposition: up to 200 °C
- Usage of rotatable cylindrical magnetron for highest utilization of target material
- Sputtering material: ITO, AZO and metallic layers like Mo, Al, Cu, Ag, NiV etc.

Example for HISTARIS Lab Configurations
SINGULUS TECHNOLOGIES develops and builds machines for economical and resource-efficient production processes. The application areas include vacuum thin-film and plasma coating for wet-chemical processes as well as thermal process technologies.

For all machines, processes and applications SINGULUS TECHNOLOGIES utilizes its know-how in the areas of automation and process technology in order to develop additional, attractive work areas with innovative products next to the existing application areas of Solar, Semiconductors and Optical Disc.