

VISTARIS HISTARIS

Inline Sputtering for
Large Substrates with
Vertical & Horizontal
Substrate Transport

Sputtering Systems for R&D and Production

Over 20 Years of Know-how in Physical Vapor Deposition

SINGULUS TECHNOLOGIES Sputtering Competence

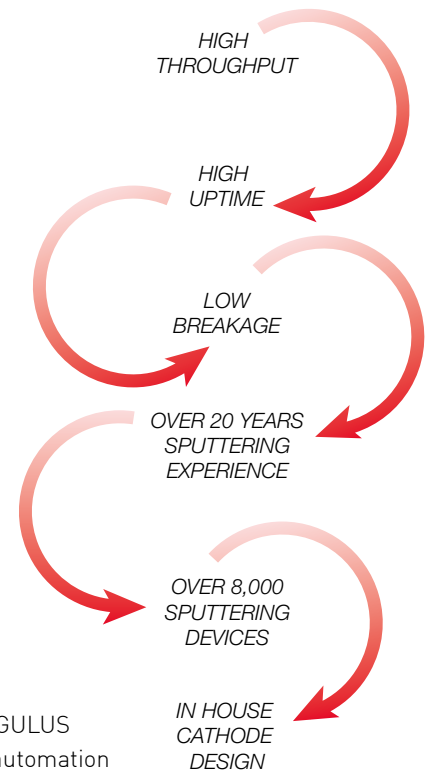
SINGULUS TECHNOLOGIES has delivered far more than 8000 vacuum sputtering machines since its foundation in 1995. The machines range from standard sputtering systems to ultra-high vacuum deposition machines applying extremely thin layers of around 0.2 nm for the semiconductor industry as well as photovoltaic, data storage, decorative coatings, medical technology and other applications.

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.

SINGULUS TECHNOLOGIES develops technologies for economical and resource-efficient production processes. The core competencies are vacuum thin-film technologies, wet-chemical processes, surface technologies and thermal processing technologies. SINGULUS TECHNOLOGIES taps new work areas with these competencies and develops innovative solutions.

For all processes and applications, SINGULUS TECHNOLOGIES uses its know-how in automation and process technologies as well as the integration of production steps and works on transferring these solutions to additional areas of application.

SINGULUS TECHNOLOGIES is a renowned manufacturer of advanced thin-film deposition equipment. It is the trusted partner in the respective industry and extends its leadership in the thin-film deposition technology for these applications. SINGULUS TECHNOLOGIES operates as a driver of innovation in technologic areas with high growth potential.



VISTARIS Sputtering System

Inline Production Equipment with Vertical Substrate Transport

VISTARIS Sputtering Systems

The SINGULUS TECHNOLOGIES VISTARIS system 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



VISTARIS Vertical Inline Sputtering

Modular Sputtering System for Different Applications

VISTARIS Inline Sputtering Systems with Vertical Transport Orientation

The SINGULUS TECHNOLOGIES VISTARIS system responds 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 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 Target Materials for PV Application

→ Sputtering materials like ITO, AZO, CuGa, Cu, In, AZO, i-ZnO etc





Example for System Configuration



AUTOMATIC LOADING AND UNLOADING OF SUBSTRATE

»»»»»»»»»»»»»»»»
DECREASING OF PRESSURE

SPUTTER CHAMBER WITH MULTIPURPOSE PROCESS

»»»»»»»»»»»»»»»»
INCREASING OF PRESSURE

HISTARIS

Inline Sputtering Systems with Horizontal Substrate Transport

Modular Sputtering System for Different Applications

HISTARIS Inline Sputtering System with Horizontal Substrate Transport

The SINGULUS TECHNOLOGIES HISTARIS system was developed for the requirements in the photovoltaic industry but also for applications in large area sputtering like architectural glazing, fuel cells and mobile devices. In photovoltaics the Inline sputtering systems are important in today's CIGS & CdTe thin-film solar cell production.

The HISTARIS system was designed to enhance the efficiency and cutting production costs by using the state-of-the-art technologies. The modular design includes process chambers equipped with rotatable magnetrons for the sputter deposition of high-performance TCO layers or several other materials,

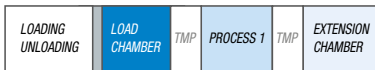
such as metals and metal oxides. Pre-treating modules for cleaning or etching can be added. With its unique modular design, the HISTARIS system is ideally suited for challenging layer stacks and flexible product mixes.

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 horizontal vacuum-based coating of glass substrates in solar and display industry. Typical applications include anti-reflection layers, barrier layers and precursor layers but also different metallic layers such as Al, Cu, NiV, etc.

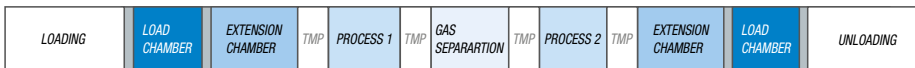


The Modularity of the HISTARIS System Allows a High Degree of Flexibility

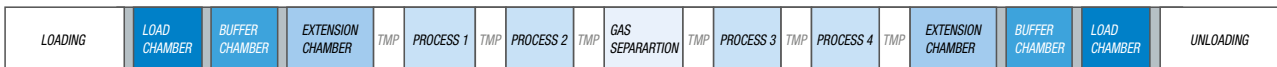
HISTARIS LAB



HISTARIS STANDARD



HISTARIS SPEED



Main Features HISTARIS

For photovoltaic technology, SINGULUS TECHNOLOGIES develops and manufactures thin film deposition systems which can apply special layers and layer systems on different substrates. In the market for thin-film photovoltaic SINGULUS TECHNOLOGIES adds another production stage to its range of processing systems for the manufacture of CIGS & CdTe thin-film solar cells.

The HISTARIS is using an inline process in which the substrates are transported on specially designed carriers or directly on a customized roller drive system. Different automation options for loading and unloading are available.

- Modular machine concept
- Integrated power supply design
- Horizontal substrate transport – with and without carrier
- Usage of rotatable cylindrical magnetron for highest utilization of target material
- Highest deposition rates
- Temperature processing before and during deposition available
- Gas separation by dynamic slit valves and/or by individual lock chambers
- Easy maintenance, low CoO
- Fast target exchange, use any vendor target
- Vacuum base pressure: $< 1 \times 10^{-6}$ mbar
- Typical process pressure: $2 - 5 \times 10^{-3}$ mbar





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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.