



Evaporation System

for Thin-Film Solar

Evaporation System for Thin-Film Solar

Processing Systems for Evaporation of CIGS/CIS Thin-Film Solar Cells.



SINGULUS offers modern production systems for CIS/CIGS & CdTe thin-film solar panels made of glass and flexible substrates:

- *R&D tools for CIGS development*
- *Selenization/Sulfisation furnace for an optimized CIGS absorber formation*
- *PVD Sputtering machines*
- *Evaporation machines*
- > *Wet-chemical systems*
- *Systems for the manufacturing of cadmium-free buffer layers*
- *Equipment employing spray ion layer gas reaction processes*
- *Metal free glass washing machines*
- *Cleaning- and etching machines*

Evaporation System

Technical Data

Material	Copper, Indium, Gallium and Selenium deposition on glass substrates
Substrate Dimensions	max. 1200 x 600 mm ² (2 substrates/carrier; other substrate sizes on request)
Substrate Thickness	2-3 mm
Footprint	depending on requested throughput
Cycle Time	depending on requested throughput
Uptime	85 %
Main Voltage	400 V 3 AC/PE 50/60 Hz
Other Required Utilities	Cooling water, compressed air, process gases

Evaporation System for Thin-Film Solar

The inline co-evaporation tool is based on the thermal evaporation of all CIGS-related precursor materials. It is dedicated to the deposition of copper-indium-gallium-selenium layers for the purpose to form optimum precursor layers in the application of CIGS-thin-film solar cells.

The evaporation system consists of a handling station, multiple heating/cooling stations and deposition-chambers.

The inline evaporation system is offering proven thermal deposition technology, that delivers a high material utilization and excellent layer uniformity. In combination with a high uptime and mechanical yield, the system leads to a highly optimized and flexible production platform.

Main Features

- Inline evaporation tool with high throughput capability
- Modular chamber design supports a flexible layout conception to meet the production requests of the customer
- Optimized evaporation source utilization through unique chamber design (minimized wall deposition)
- High deposition speed and repeatability
- Excellent flux uniformity
- Easy and fast source refilling/replacement due to user-friendly source positioning
- Optimized maintenance concept for maximum machine availability/uptime

- High deposition speed
- Excellent temperature uniformity during process sequence
- Substrate pre-heating
- In-situ monitoring of flux and temperature
- Proven safety concept based on solid risk management and safety engineering

The evaporation system consists of the following key components:

- Handling section
Transport of the substrates between the FAB automatisaton and the evaporation system, including load-/unload of the process carriers
- Process section
Entrance load lock and pre-heating chamber provide the necessary vacuum level and apply an initial temperature profile for the consecutive process steps
- Deposition Chambers
Integrated multiple chamber system with heating – deposition – cooling capability. Chambers designed for excellent temperature uniformity and excellent deposition of different materials by optimized deposition-speed and geometry to achieve high repeatable precursor layers
- Cooling Chamber and Exit Chamber
Substrate cooling and exit on pre-defined temperature
- Periphery
Handling system
Vacuum system
Se Traps (in front TMP's)
Metrology

Headquarters



Subsidiaries
Offices



SINGULUS TECHNOLOGIES AG

Hanauer Landstrasse 103
D - 63796 Kahl, Germany
Tel. +49 6188 440-0
Fax +49 6188 440-110
sales@singulus.de
www.singulus.de

China

**SINGULUS TECHNOLOGIES
SHANGHAI**
Tel. +86 13918298537
greens.pan@singulus.com.cn

France

**SINGULUS TECHNOLOGIES
FRANCE S.A.R.L.**
Tel. +33 3 893111-29
singulus@club-internet.fr

Germany

**SINGULUS TECHNOLOGIES AG
Niederlassung Fürstenfeldbruck**
Tel. +49 8141 3600-0
sales@singulus.de

Latin America

**SINGULUS TECHNOLOGIES
LATIN AMERICA LTDA.**
Tel. +55 1121 6524-10
rodolfo.mignone@singulus.com.br

Singapore

**SINGULUS TECHNOLOGIES
ASIA PACIFIC PTE LTD.**
Tel. +65 674 119-12
sales@singulus.com.sg

Taiwan

**SINGULUS TECHNOLOGIES
TAIWAN LTD.**
Tel. +886 2 2748-3366
sales@singulus.com.tw

United States and Canada

SINGULUS TECHNOLOGIES INC.
Tel. +1 860 68380-00
sales@singulus.com

THIN FILM
DEPOSITION

SURFACE
ENGINEERING

THERMAL
PROCESSING

WET
CHEMICAL

SINGULUS TECHNOLOGIES – Innovations for New Technologies

SINGULUS TECHNOLOGIES develops innovative technologies for economic and resource-efficient production processes. SINGULUS TECHNOLOGIES' strategy targets the use and expansion of its existing core competencies. This includes process technology and scientific solutions combined with mechanical and plant engineering. The core competence of SINGULUS TECHNOLOGIES rests on vacuum thin-film and plasma technology, wet-chemical processing as well as thermal process technology.

SINGULUS TECHNOLOGIES is expanding this expertise in its core segments and is transferring the know-how to new application areas: consumer goods, entertainment, energy, mobility and semiconductors.

SINGULUS 