



# VITRUM II

Inline Wet Process  
Equipment, Etching,  
Cleaning & Single Side  
Coating for Thin-Film  
Solar Cells

## Inline Wet Process Equipment, Etching, Cleaning & Single Side Coating for Thin-Film Solar

*The VITRUM II Platform is a Modular Inline System for the Processing of Glass Substrates.*



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

- Cleaning and etching machines
- Metal free glass washing machines
- R & D tools for CIGS development
- Selenisation & sulphurisation furnaces
- Sputtering & evaporation systems
- Deposition systems for cadmium-free buffer layers



As part of the product family VITRUM the new processing machine, VITRUM II Cover, is dedicated to cleaning in a single working step wrap around coatings at rear sides and edges of thin-film solar panels. While the edges and the rear side are cleaned with brushes and chemicals the active layer is protected by means of a process hood. Therefore, the VITRUM II Cover is best suited for cleaning after dipping processes as well as the etching of undesirable coatings on rear side and edges, for example CdTe or CdS.

The modular design of the VITRUM II allows the easy integration of different process steps according to the requirements of CIS, a-Si or CdTe technology (etching, rear side and substrate edge etching, cleaning and single side coating).

### Main Features

- Modular design
- Up to 30 % cost reduction
- Better accessibility
- Smaller footprint
- Low cost of ownership
- High throughput
- High availability (uptime → 99 %\*)
- Standard and customer specific substrate sizes up to 2,600 mm
- Parallel carrier transport for higher throughput
- Reproducible process results

\*depends on application

The VITRUM II provides the platform for wet-chemical inline process steps: In a CdTe manufacturing line it performs several process steps, starting with glass washing, removal of rear side coating, CdCl<sub>2</sub> deposition using a roller, CdCl<sub>2</sub> salt removal as well as chemical NP etch.

When producing a thin-film silicon or CIS/CIGS cell, VITRUM is capable of glass washing as well as TCO etching, KCN etching or NH<sub>3</sub> treatment respectively. In addition, it also provides NP, DAE and EDTA etching for substrate width up to 2,200 mm. With our newly developed and unique soft shower process, a homogeneous, reliable, and reproducible etching is now reality. Furthermore, it features several advantages compared with inline dipping baths such as

reduced process volume, saving energy, and chemicals as well as a higher process speed of up to 5 m/min with minimized carryover.

The design of the VITRUM II features similar piping for all liquid circuits and generously dimensioned installation compartments for optimized maintenance work. It offers a high cycle rate and due to the modular concept it is easy to integrate into existing production lines. With the new VITRUM II process cost can be reduced substantially.

### VITRUM II Clean

- Inline cleaning equipment (2200/1400/600)
- Pre-rinse and single side brush off (acid/caustic)
- Inline final rinse (cascade cleaner), metal free
- Inline standard cleaning, polishing, and brushing machine (glass corrosion)
- Ultrasonic and megasonic support (particle removal)

### VITRUM II Etch

- Inline etching equipment (2200/1400/600)
- Inline TCO etcher (HCl/HF)
- Inline KCN etcher
- Inline NP etcher
- Inline CuCl<sub>2</sub> etcher
- Inline developer for photoresist
- Inline CdCl<sub>2</sub> salt removal

### VITRUM II Cover

- Inline etching equipment
- Removal of wrap around coating on edges and rear side
- Active layer protection (neither liquids nor vapors attack the active layer)

### VITRUM II Coat

- Inline wet deposition of thin salt films by means of a soft roller (e. g. CdCl<sub>2</sub>, CuCl<sub>2</sub> or NaCl)
- Automated process control
- Single side coating
- Very high material usage

### Facility Management

SINGULUS STANGL SOLAR also supplies:

- Chemical supply and mixing systems
- Waste water treatment
- Exhaust scrubber
- Water purification



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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.*