

# IMPEDIO

## Roll-to-Roll Wet Process Equipment for Thin Film Solar Cells on Foils

Economic Processes for Coating, Cleaning,  
Etching of Metal/Plastic Foils



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# IMPEDIO – Wet Process Equipment for Thin Film Solar Cells on Foils (Metal/Plastic)

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SINGULUS TECHNOLOGIES is the world market leader in manufacturing mass production equipment for Optical Discs CD/DVD/Blu-ray. With the acquisition of the solar company STANGL, the foundation was laid to establish SINGULUS in the photovoltaics market. Numerous new products were developed and made marketable at SINGULUS and SINGULUS STANGL SOLAR.

The company's target is to position itself at the forefront for the introduction of new technologies with respect to silicon and thin film solar technology. SINGULUS will offer a broad product range of new machines for the photovoltaics industry, which will offer manufacturers of silicon cells new production technologies and therefore particular cost advantages. Especially during

times of cost pressures in the photovoltaics market the interest regarding new cost efficient concepts increases.

## **Thin Film Solar Technology**

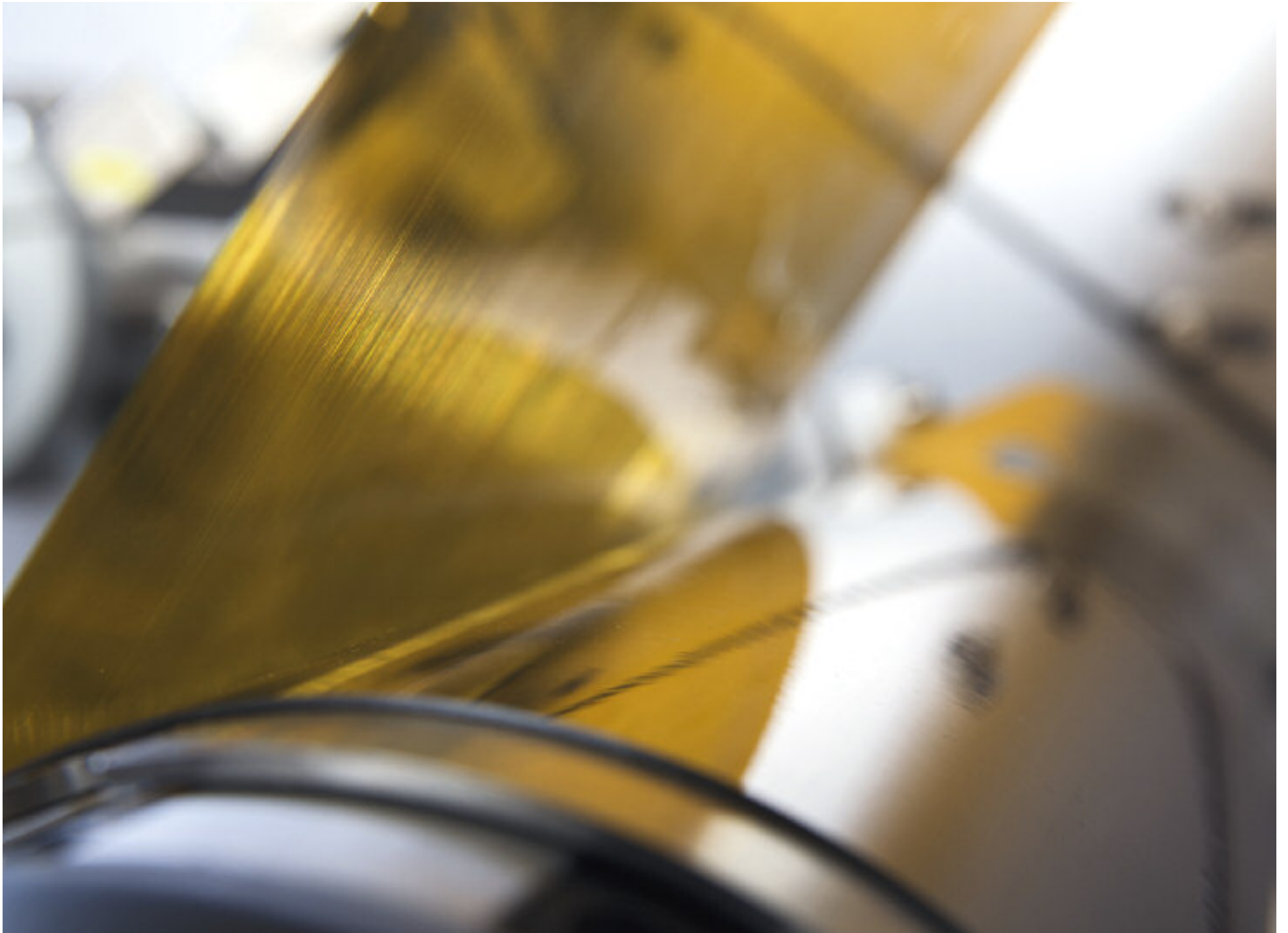
Thin film solar panels offer specific advantages compared to silicon solar technology. Amongst these are the retention of efficiency during periods of weak sun intensity and an easy integration into architectural design elements.

SINGULUS is the market leader for wet-chemical cleaning for CIS and CdTe processes. New production concepts as the spray ion layer gas reaction (ILGAR®) process expand the value-added chain in the area of thin film solar technology. The company's target is to position itself at the forefront for the introduction of new technologies

with respect to silicon as well as thin film solar technology. In addition SINGULUS will progress on the way to a system supplier in this solar segment as well.

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

- \_ Chemical supply systems with automatic dosage equipment
  - \_ Systems for the deposition of cadmium-free buffer layers
  - \_ Equipment designed for spray ion layer gas reaction (ILGAR®) processes (AACVD)
  - \_ Metal free inline glass cleaning machines
  - \_ Inline etching and coating machines
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# Photovoltaic Thin Film Technology on Foils

Thin film solar cells on flexible materials are on the advance due to their potential applications regarding low weight, high flexibility and low cost of manufacturing compared to silicon based solar cells.

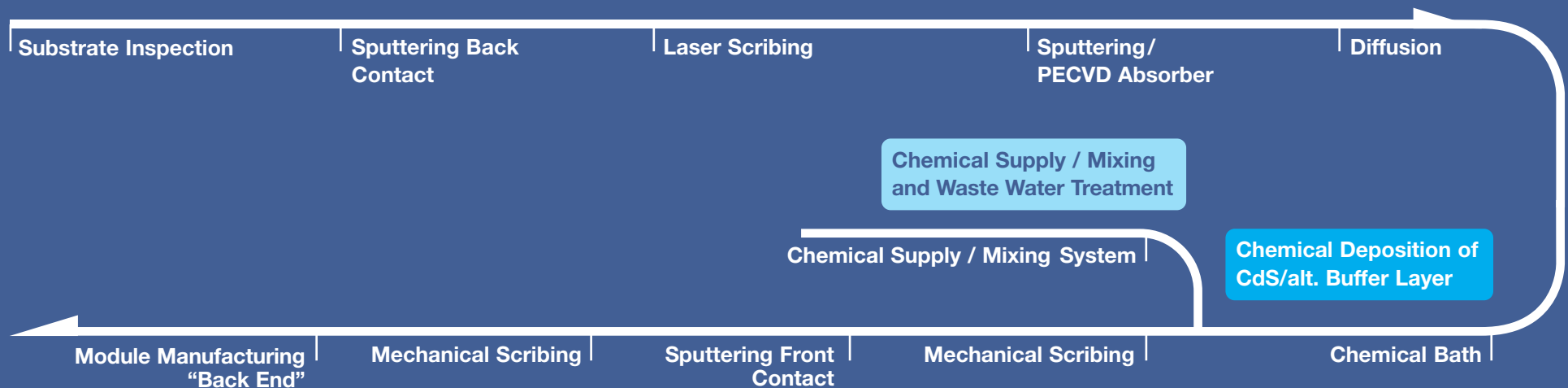
## Roll-to-roll – IMPEDIO Product Portfolio for Thin Film Technology:

- Thin film technology on foils (metal/plastic)*
- \_ Roll-to-roll chemical bath deposition (CBD) of CdS/alternative buffer layers for CIS, CIGS, CIGSSe and CdTe technologies
  - \_ Roll-to-roll inline cleaning (DI-water, tensides)
  - \_ Roll to roll inline etching (KCN, HCl, H<sub>3</sub>PO<sub>4</sub>)

## Facility Management

- STANGL also supplies the following facility management systems:
- \_ Chemical supply systems
  - \_ Chemical mixing systems
  - \_ Waste water treatment

## CIS Process Flow Step-by-Step with ■ STANGL - IMPEDIO ■ STANGL



# STANGL Wet Process Tools Ensure Economic and Reliable Production



## Technical Features

- \_ Low cost of ownership
- \_ Low process temperatures
- \_ High availability (uptime > 98 %)
- \_ Lowest chemical consumption possible
- \_ Single-side coating of CdS or alt. buffer layers
- \_ Both side etching with spray or dipping processes
- \_ Both side cleaning with spray process
- \_ Reproducible process results
- \_ Automatic dosage and mixing systems
- \_ Optimized DI water consumption
- \_ Uniform spot-free foil drying (dry-in/dry-out)
- \_ Waste and exhaust management system
- \_ Networked communication supported
- \_ Compliant with European/U.S. safety regulations

# Main Components



## 1 Input Web

Foil will be unwinded automatically from the roll and transported to the process station without touching the absorber

Consists of:

- \_ Housing PP
- \_ Unwinder for foil and winder for interleaf
- \_ Foil draft observation & regulation

## 2 Process Module

Single side coating/etching/cleaning of the foil

Consists of:

- \_ Housing in PP
- \_ Heating element, roll gears, spray bars
- \_ Chemical mixing and dosage unit

## 3 Rinsing and Drying Module

Coarse and final cleaning of the substrates

Consists of:

- \_ Housing in PP
- \_ Coarse/fine/ultrafine/fresh rinsing module
- \_ Drying module

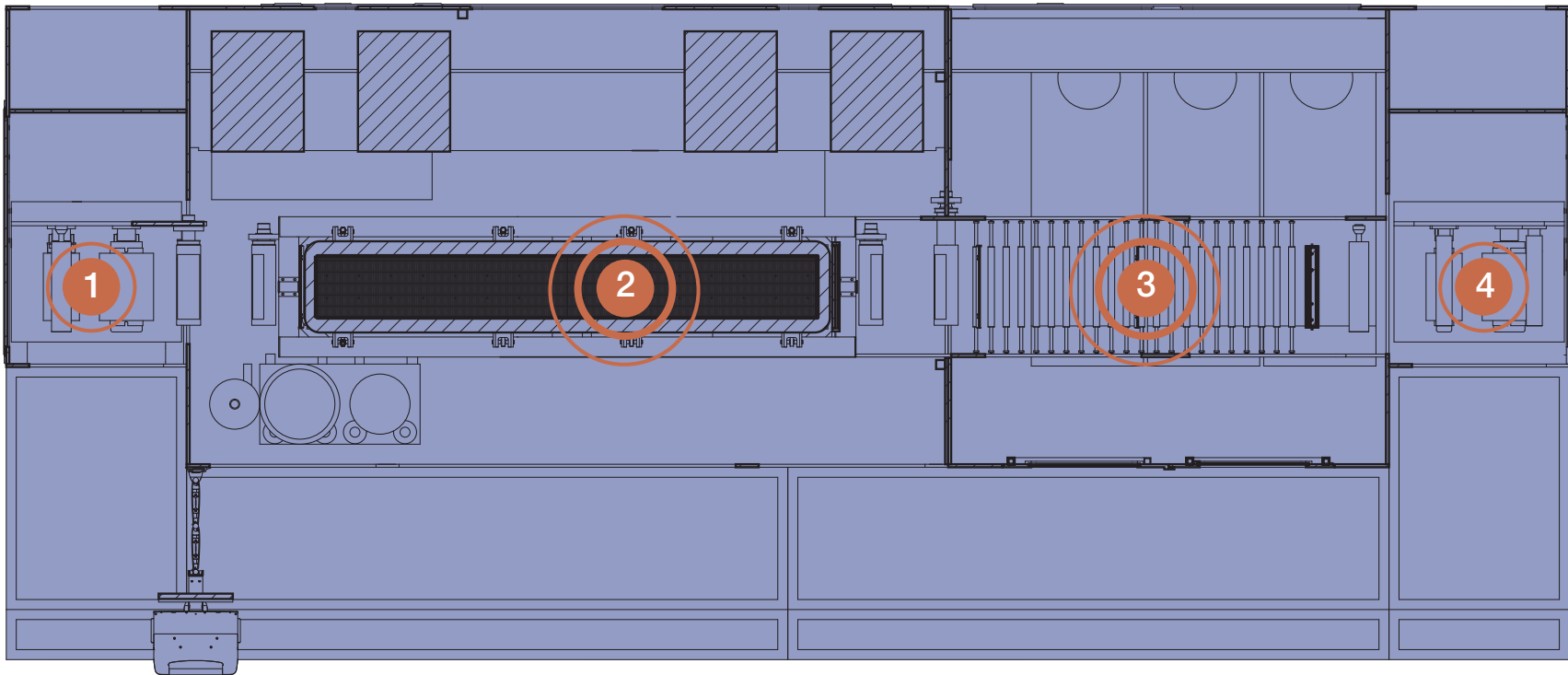
## 4 Output Web

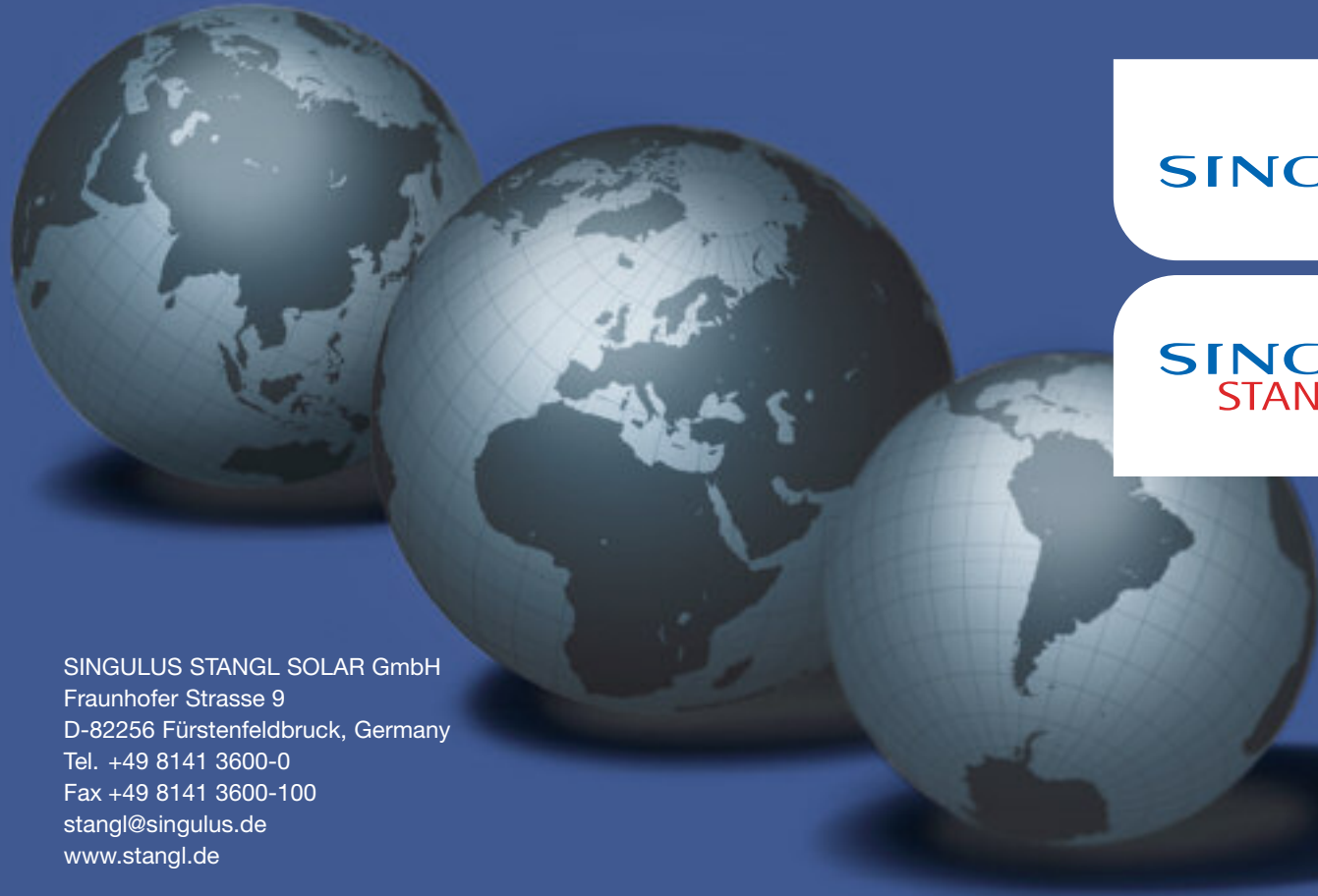
Foil will be wined automatically onto the roll, with or without Interleaf

Consists of:

- \_ Housing PP
- \_ Winder for processed foil and unwinder for interleaf
- \_ Foil draft observation & regulation

<b>Main Features</b>	<b>IMPEDIO</b> Width from 100 mm to 1000 mm Other sizes on request
<b>Dimension L/W/H</b>	
Length	7800 mm
Width	3300 mm (according to width of foil)
Height	3100 mm
<b>Substrate Material</b>	Polyimid foil, metal foil
<b>Utilities</b>	N <sub>2</sub> , CDA, DI-water, THS, NH <sub>3</sub> , Cd salt, Zn salt, waste drains; electrical power 400 VAC 3/PE
<b>Typical Cycle Time</b>	Up to 10 - 14 min/cycle (depending on process)





SINGULUS 

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STANGL SOLAR 

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