

# 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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# STANGL & SINGULUS – Smart Solutions to Drive the Future

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## IMPEDIO

Wet process equipment for thin-film solar cells on foils (metal/plastic)

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The Semiconductor industry has enjoyed more than 40 years of success since its sophisticated technology was enthusiastically embraced. Today, the commercial use of the photoelectrical effect for photovoltaic power generation is poised for similar success as it prepares for conversion to fully automated mass production.

STANGL Semiconductor Equipment AG – a German manufacturer of qualified wet process equipment – entered the booming semiconductor industry

in the late 1980's. Their expertise is based on 20 years of experience in the planning, design, assembly and implementation of wet process machines for semiconductor and solar cell manufacturing.

### **SINGULUS TECHNOLOGIES Vacuum Coating and Systems Integration Experts**

While STANGL focuses on wet-chemical processes, SINGULUS' core competence is physical coating technology; it is also the integration of different processing steps into turnkey, predominantly

automated production systems, as demonstrated by the highly successful automation of its CD and DVD production lines. This know-how is an optimal base for the development of highly profitable, fully-automated production lines for the photovoltaic industry. Working in complementary fashion, STANGL and SINGULUS will consistently expand their solar activities. Each company will focus on its particular areas of expertise so that together they will be positioned to offer a broad range of products to the photovoltaics industry over the next few years.

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ThyssenKrupp Steel building: Laminated solar foils on steel sheets

# 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:

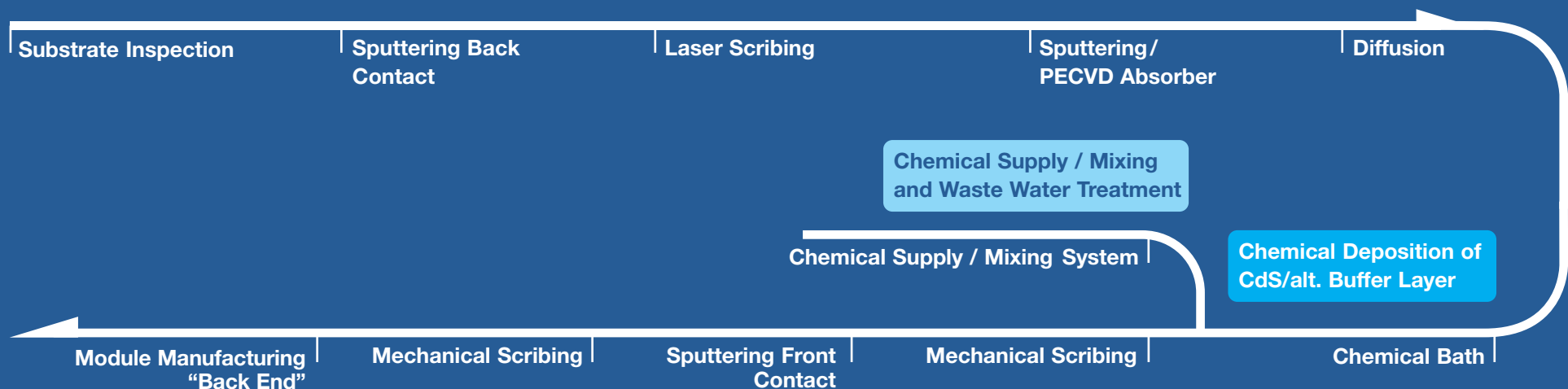
- Thin-film technology on foils (metal/plastic)*
- \_ Roll-to-Roll Chemical Bath Deposition (CBD) of CdS/alternative buffer layers for CIS, CIGS, CIGSSe technologies
  - \_ Roll-to-Roll Inline-cleaning (DI-Water, Tensides)
  - \_ Roll to Roll Inline-etching (KCN, HCl, H<sub>3</sub>PO<sub>4</sub>)

## Facility Management

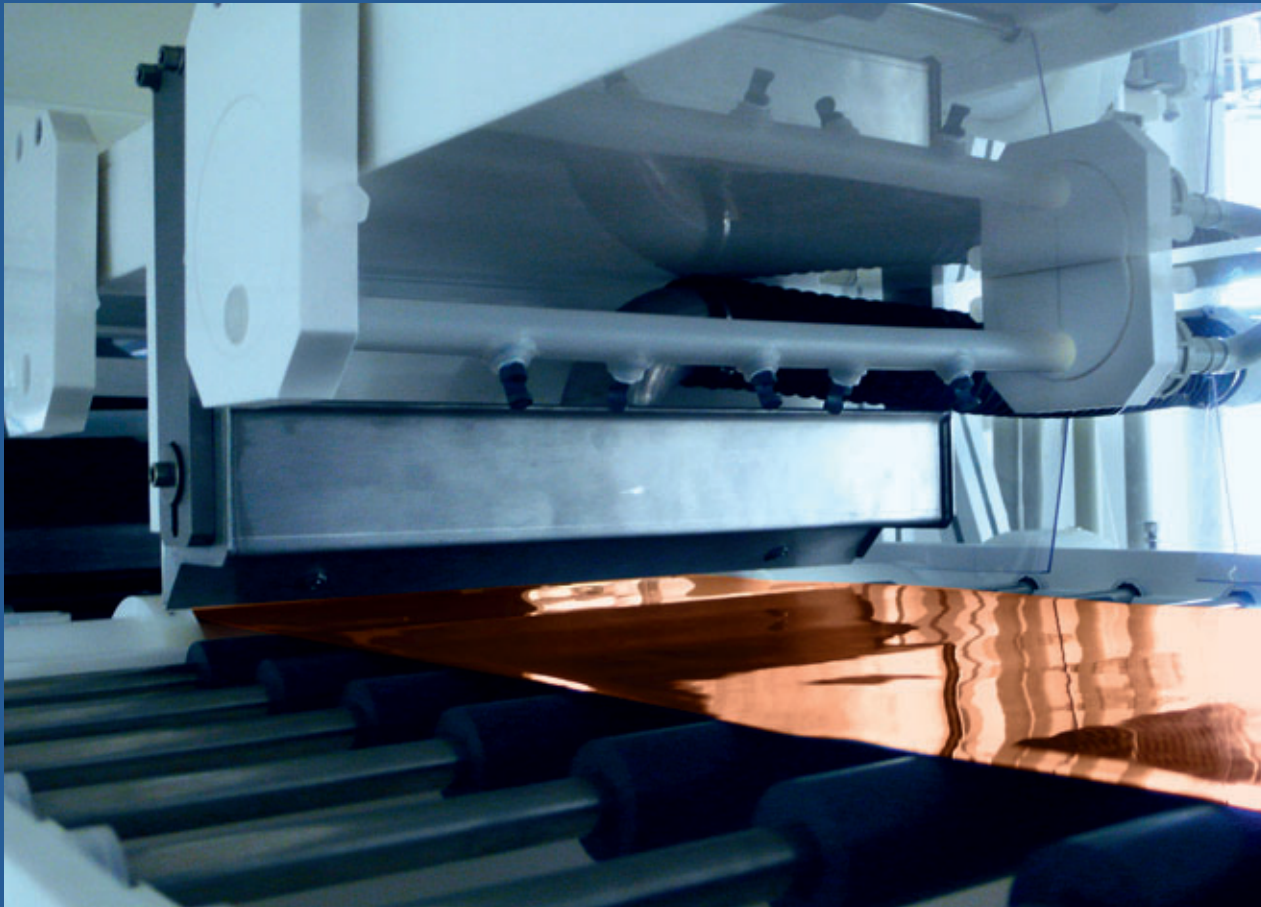
STANGL also supplies the following facility management systems:

- \_ 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



- \_ Low cost of ownership
- \_ Low process temperatures
- \_ High availability (uptime > 98 %)
- \_ Lowest possible chemical consumption
- \_ 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
- \_ Lowest possible 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 without touching the absorber to the process station

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

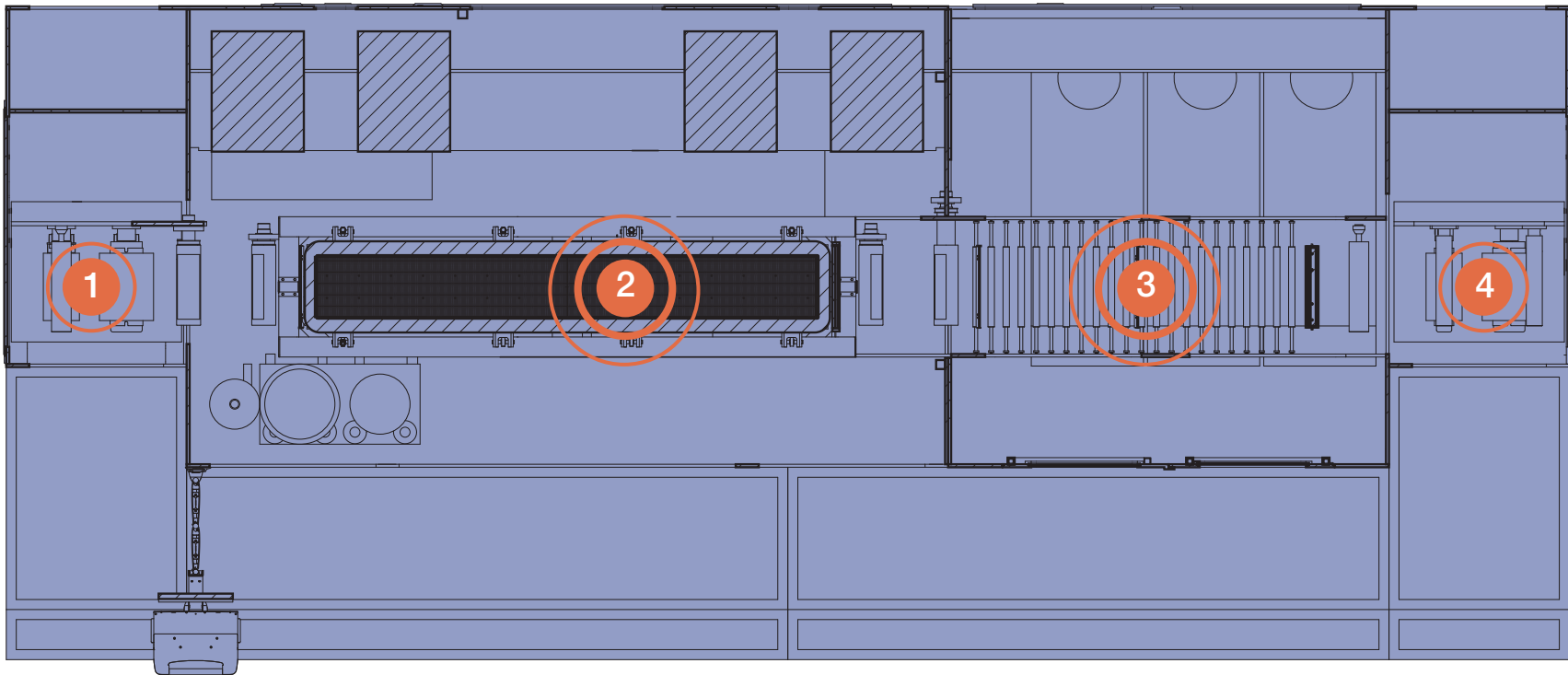
## 4 Output Web

Foil will be wound 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)





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