

TENUIS

Wet Process Equipment for Thin-Film Solar Cells on Glass

Economic Processing of CdS/Alternative Buffer Layers for CIS/CIGS/CIGSSe Solar Cells



STANGL & SINGULUS – Smart Solutions to Drive the Future

TENUIS

Wet Process Equipment for Thin-Film Solar Cells on Glass

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.

With STANGL continuing to experience strong growth rates, SINGULUS TECHNOLOGIES has made the decision to rapidly expand the solar segment.



Photovoltaic Thin-Film Technology

Thin-film solar cells gives you the chance to reduce manufacturing costs. This is based on the high costs of crystalline raw material and the better value chain for thin-film solar cells.

Product portfolio for thin film technology:

Thin Film Technology on Glass Substrates

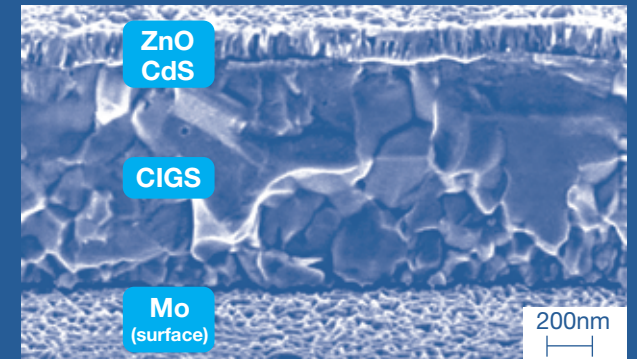
- _ Single Side Chemical Bath Deposition (CBD) of CdS/alternative buffer layers for CIS, CIGS, CIGSSe technologies
- _ Inline cleaning & etching equipment (TCO, HNO₃, H₃PO₄)
- _ Inline Glass washing & brush off unit

Thin Film Technology on Foils (metal/plastic)

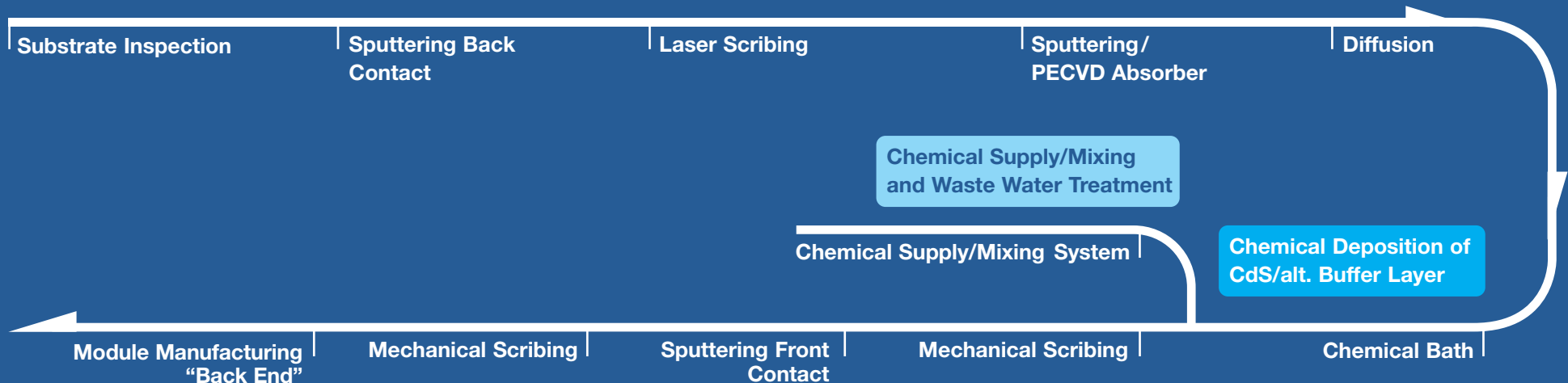
- _ Roll-to-Roll Chemical Bath Deposition (CBD) of CdS/alternative buffer layers for CIS, CIGS, CIGSSe technologies
- _ Roll-to-Roll cleaning & etching equipment

Facility Management

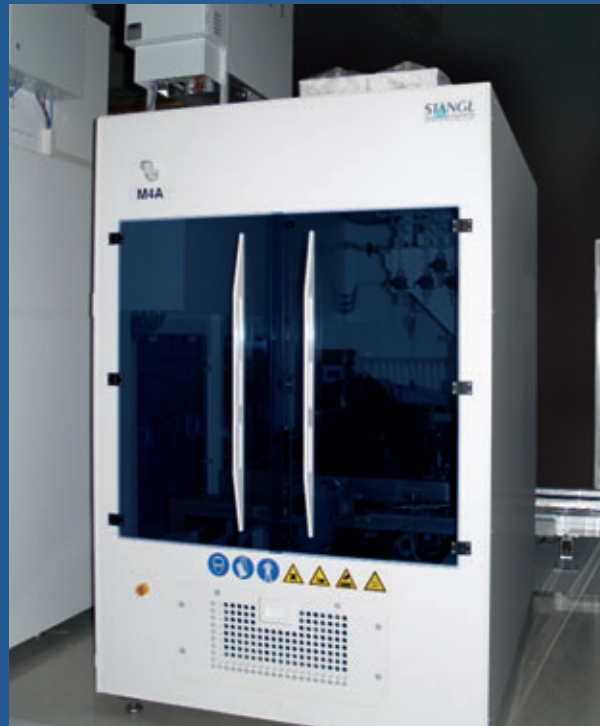
Additionally we are your partner for chemical supply/mixing systems and waste water treatment.



CIS Process Flow Step-by-Step with ■ STANGL - TENUIS ■ STANGL



Technical Features



STANGL wet process tools ensure economic and reliable production:

- _ Low cost of ownership
- _ High throughput (cycle time 60 s)
- _ Low process temperatures
- _ High availability (uptime > 98 %)
- _ Lowest possible chemical consumption

Per 30 MW line up to 2.5 Mio Euro economies by reduced chemical-consumption

- _ Single-side coating
- _ Modular system (easy upgrade for higher throughput)
- _ Reproducible process results

- _ Automatic dosage and mixing systems
- _ Lowest possible DI water consumption
- _ Uniform spot-free glass plate drying (dry-in/dry-out)
- _ Waste and exhaust management system
- _ Networked communication supported
- _ Compliant with European/U.S. safety regulations

Main Components

1 Input Transport Unit

Function:

With the help of an “Input Transport Unit” the substrate will be transported without touching the absorber to the Pre Rinsing (glass washing/brush off machine)

Consists of:

- _ conveyor belt or roll gears with adjustable speed
- _ rotary table (LEL/SEL) for direction change
- _ module housing in PP and
- _ PVC-clear cover to protect the substrate

2 Brush Off Machine

Function:

Backside brushing of the substrates

Consists of:

- _ Housing in PP with roller conveyor
- _ Single side brush module
 - _ Rotating brushes with spray units and recirculation tanks
- _ Coarse/fine/ultrafine cascade rinsing module
- _ Drying module

3 Linear Transport System

Function:

The linear handling system collects the substrate on the dispatch station of the Pre Rinsing station

Consists of:

- _ 3-axial articulated linear system
- _ Gripper to collect the substrate without touching the absorber

4 Process Module

Function:

Single side coating of the substrates with CdS or alt. buffer.

Consists of:

- _ Housing in PP white with drain drip pan
- _ Heating element for substrate heating
- _ Chemical mixing and dosage unit
- _ Pre Rinsing and Pre Drying unit

5 Final Rinse

Function:

Final cleaning of the substrates

Consists of:

- _ Housing in PP with roller conveyor
- _ Coarse/fine/ultrafine/fresh cascade rinsing module
- _ Drying module

6 Output Transport Unit

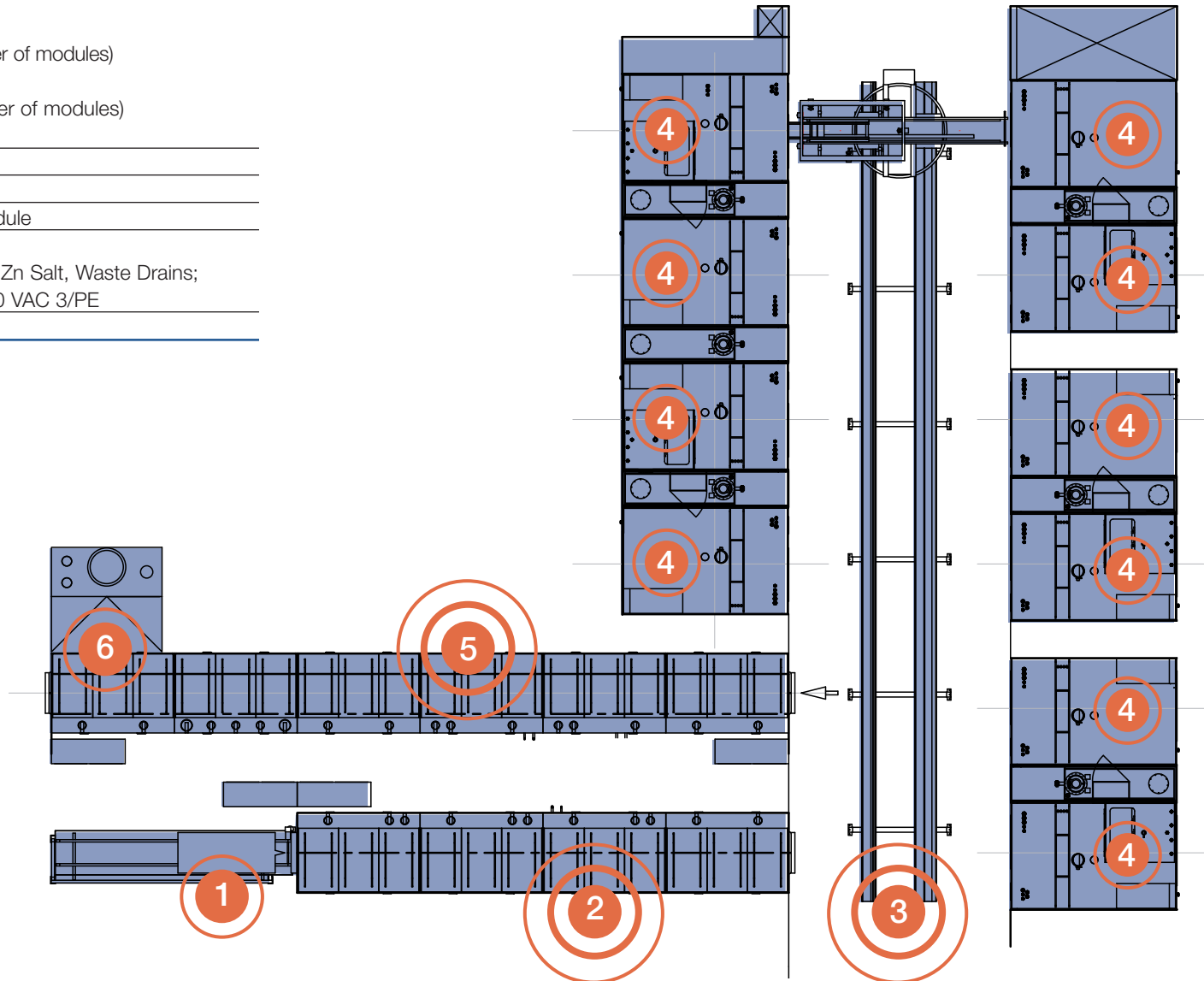
Function:

With the help of the “Output Transport Unit” the substrate will be transferred to the following process steps.

Consists of:

- _ Conveyor belt or roll gears with adjustable speed
 - _ Rotary table (LEL/SEL) for direction change
 - _ Module housing in PP and
 - _ PVC-clear cover to protect the substrate
-

Main Features	TENUIS 1200x600/1600x700/2600x2200 Other sizes on request
Dimension L/W/H	
Length	14,000-22,000 mm (according to number of modules)
Width	6,000-19,000 mm (according to number of modules)
Height	3,650 mm
Capacity max	30/60 MW
Substrate Material	Glass substrates
Batch Size	1 substrate per module
Utilities	N ₂ , CDA, DI Water, THS, NH ₃ , Cd Salt, Zn Salt, Waste Drains; Electrical power 400 VAC 3/PE
Typical Cycle Time	60 s





STANGL Semiconductor Equipment AG

Ringstrasse 17
D-82223 Eichenau, Germany
Tel. +49 8141 3600-0
Fax +49 8141 3600-30
stangl@stangl.de | www.stangl.de

STANGL
Semiconductor Equipment AG
A MEMBER OF THE SINGULUS GROUP

Headquarters

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

Affiliated Companies

Germany
STANGL Semiconductor
Equipment AG
Tel. +49 8141 3600-0
stangl@stangl.de

Netherlands
SINGULUS MASTERING B.V.
Tel. +31 407 5014-00
info@singulus.nl

Sales Subsidiaries

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

Great Britain
SINGULUS TECHNOLOGIES UK Ltd.
Tel. +44 1793 7842-00
brian.walsh@singulusuk.com

Italy
SINGULUS TECHNOLOGIES Italia s.r.l.
Tel. +39 0717 9303-12
singulus.italia@fastnet.it

Latin America
SINGULUS TECHNOLOGIES Ltda. Latin America
Tel. +55 1136 4301-13
latinamerica@singulus.com.br

Singapore
SINGULUS TECHNOLOGIES Asia Pacific
Tel. +65 674 119-12
singulus@singnet.com.sg

Spain
SINGULUS TECHNOLOGIES Iberica
Tel. +34 936 7500-25
singulus@singulusib.com

Taiwan
SINGULUS TECHNOLOGIES Taiwan Ltd.
Tel. +886 2 274833-66
sales@singulus.com.tw

United States and Canada
SINGULUS TECHNOLOGIES Inc.
Tel. +1 860 68380-00
sales@singulus.com