



EVAPORATOR

Inline High Rate Evaporator
for Metallization of High
Efficiency Solar Cells

SINGULUS TECHNOLOGIES

*Developer, Enabler and Supplier for the
PV Market*

SINGULUS TECHNOLOGIES is a supplier of manufacturing solutions and production equipment for the Markets Optical Disc, Semiconductor and Solar. With new machine concepts and manufacturing processes in the crystalline and thin-film solar technology SINGULUS TECHNOLOGIES establishes itself as development partner and equipment supplier for investments in new high-performance solar cell concepts. As market leader for Optical Disc production systems we have gained extensive know-how in vacuum coating, automation and process integration.

SINGULUS TECHNOLOGIES cooperates with cell manufacturers worldwide and develops processes, which improve the efficiency of solar cells and at the same time reduce production costs.

SINGULUS is the market leader for the wet-chemical cleaning applying CIS and CdTe processes. New plant concepts expand the value-added chain of the company in the area of thin-film solar technology.

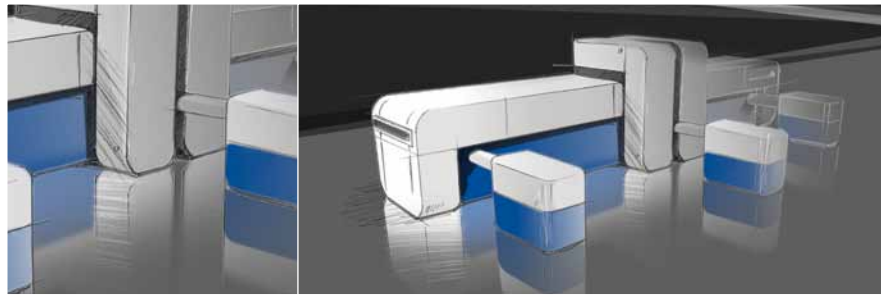
Inline High Rate Evaporator for Metallization of High Efficiency Solar Cells

*Until now in industrial photovoltaics,
screen-printing is the standard technique for
producing contacts. The use of a high rate
evaporator for the metallization of crystalline
solar cells offers new opportunities in order
to reduce complexity in crystalline solar cell
production.*

High rate thermal evaporation process is contact-free and aluminum as metal used for metallization is very cost-saving compared to screen-printing pastes. In addition, contacts formed between aluminum and silicon have a very high quality.

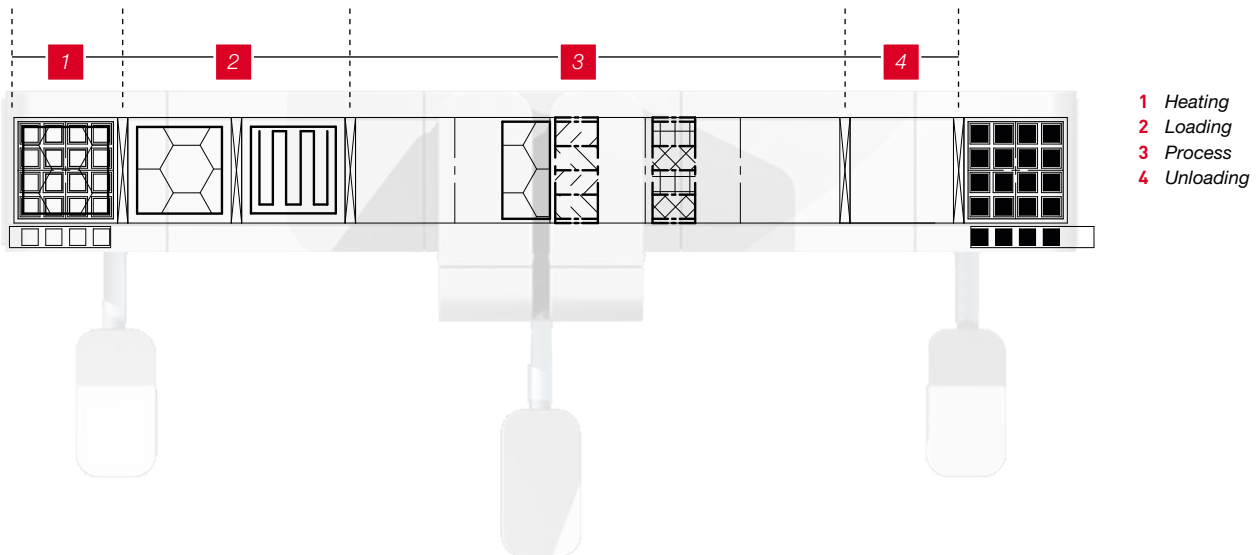
Main characteristics of the process

- Pure Al instead of printing paste
 - Cheaper (wire of quality 4N = 12 €/kg)
 - Higher electrical conductivity
 - Thin layer sufficient (≈ 2 µm with 0.14 g "lay-down")
- Contactless method → reduced wafer breakage
- Reduced wafer bowing due to thin layer allows also for thinner wafer
- No efficiency degrading solvents, no VOC
- Al layer acting as mirror at rear interface for NIR-photons → back-reflection of unconverted photons
- Al layer harmless to rear passivation layers (in case of rear passivated cells, PERC)
- Technology needed for cell generation beyond PERC e.g. IBC



We developed an evaporation process with unique features, i.e.:

- High material utilization
- Practically no parasitic deposition and therefore no chamber clean
- High uptime
- Static deposition
- Top - down deposition
- Process fits for upcoming generations of solar cells.



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