



KENOSISTEC
UHV & Thin Film Equipment

Research and Industrial Vacuum Deposition Systems

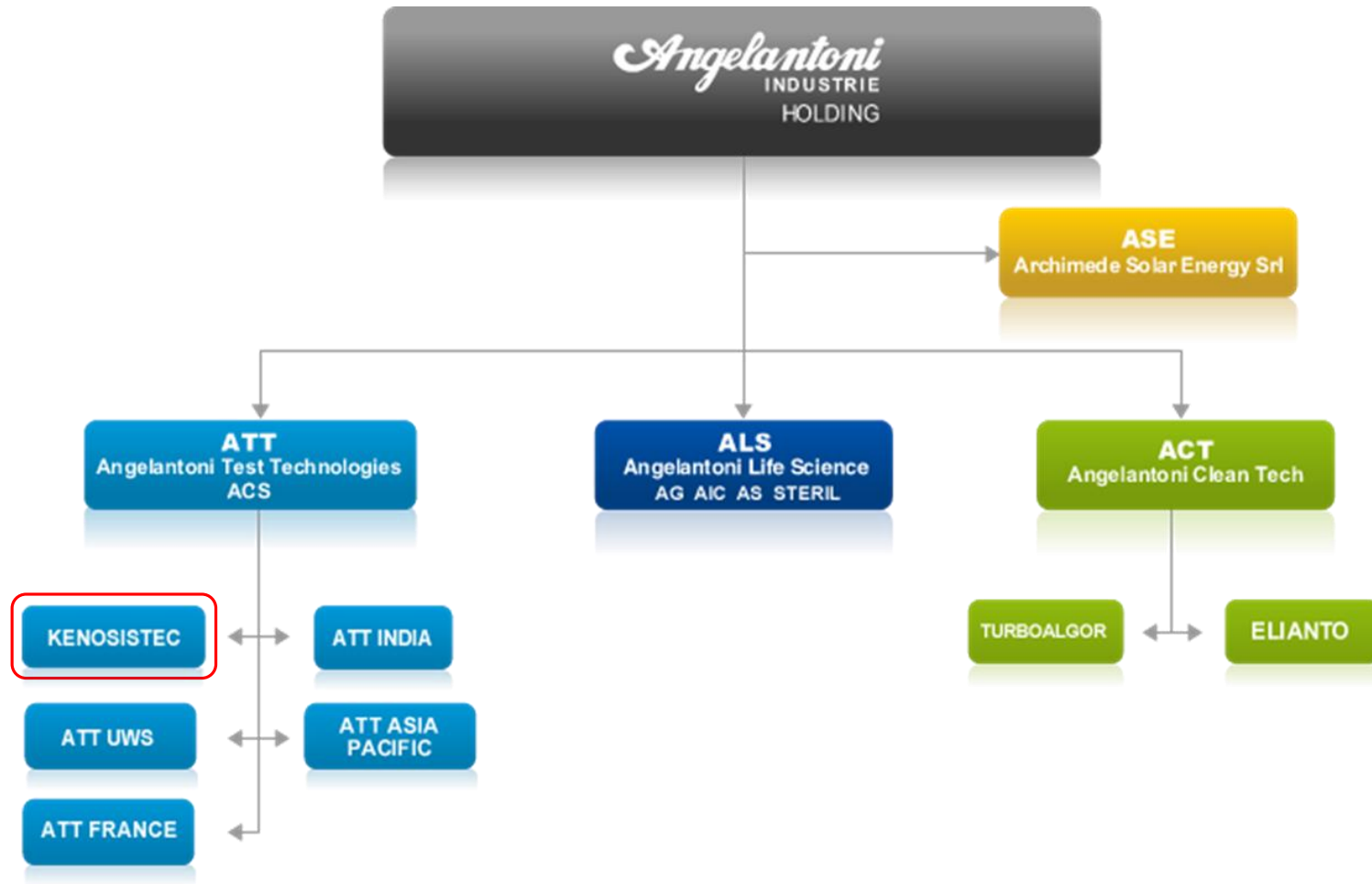
February 2018

Angelaantoni
MORE THAN YOU THINK

kenosistec.com

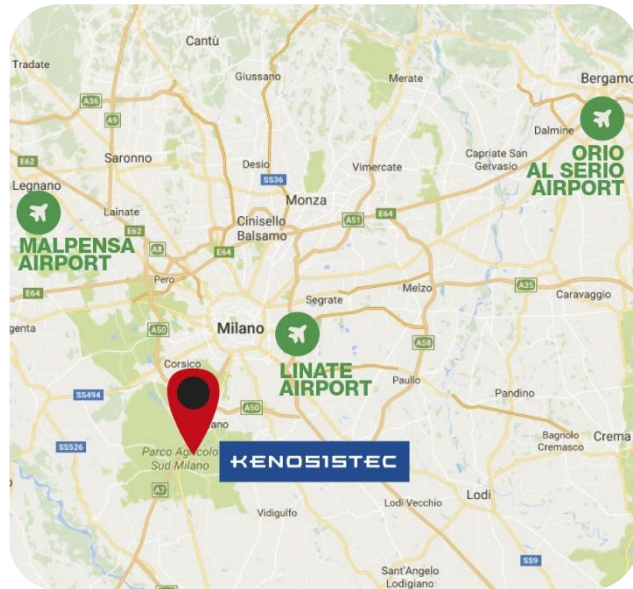
Angelantoni Group

Corporate Organization Details



Angelantoni Group Localization





Via delle Scienze, 23
20082 Binasco (MI) - Italy

- 30 km away from Airport of Linate
- 65 km away from Airport of Malpensa
- 75 km away from Airport of Orio al Serio

Equipment for thin film deposition system

To design and fabricate vacuum equipment for thin film deposition in nanotechnology, renewable energy, telecommunications, microelectronics, optical instrumentation and automotive, as well as for decorative and functional applications.

To develop innovative and competitive solutions for research and industrial large area/high throughput processes, involving our human resources who are fundamental contribute to our success.

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UHV & Thin Film Deposition



- 600 sq meters assembly
 - 400 sq meters workshop
 - 300 sq meters warehouse
 - 200 sq meters offices
 - 18 employees
- eventual expansion to 1600 sq meters area
(in the next 3 years)



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Customer Targets



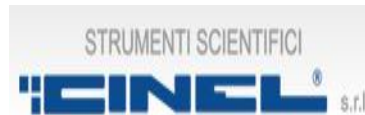
- R&D Institutions such as Universities and Government Research Centres
- Teaching Basic Material Science and Physics University Departments
- Companies involved in R&D, limited production and production
- Semiconductor companies requiring moderate production and cheap but reliable products.
- New customer with their own process to evaluate and to test for real production
- Companies interested in decorative and functional coatings, like: taps, fittings, handles, household, fashion, glasses, automotive, jewelry, cosmetics, lighting, ...

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Italian references

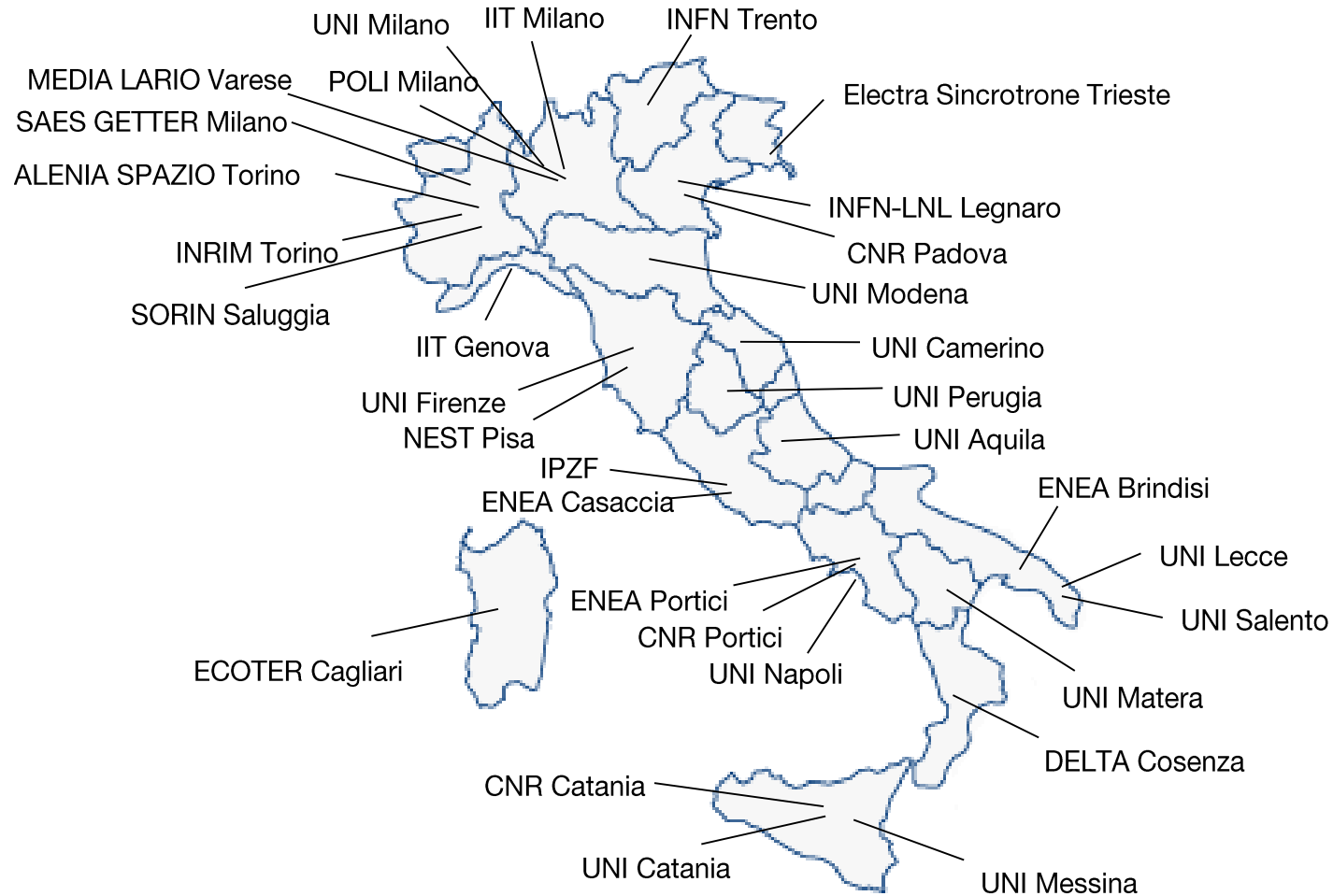


UNIVERSITÀ DEL SALENTO



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Italian key Customers



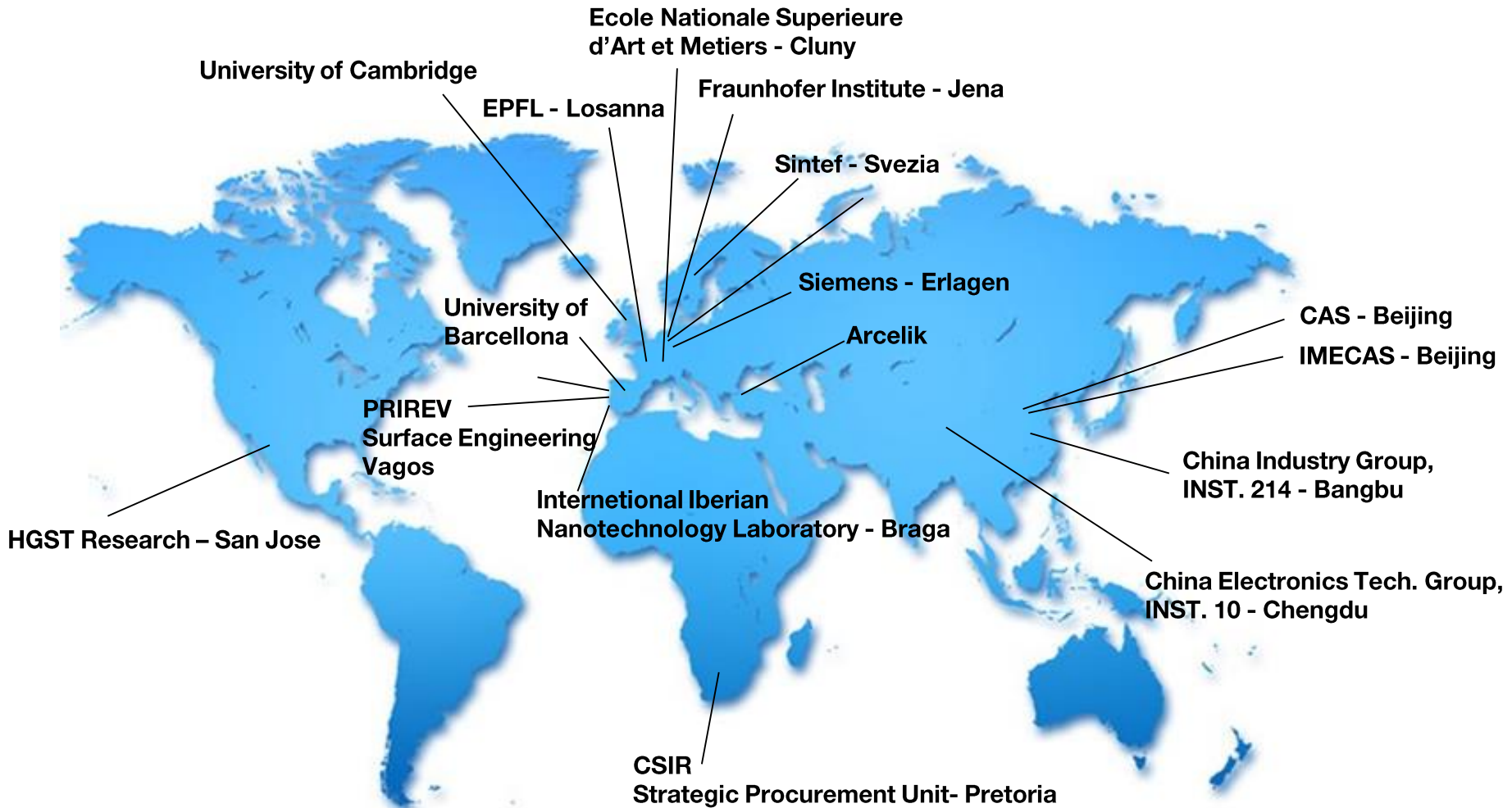
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Foreign References



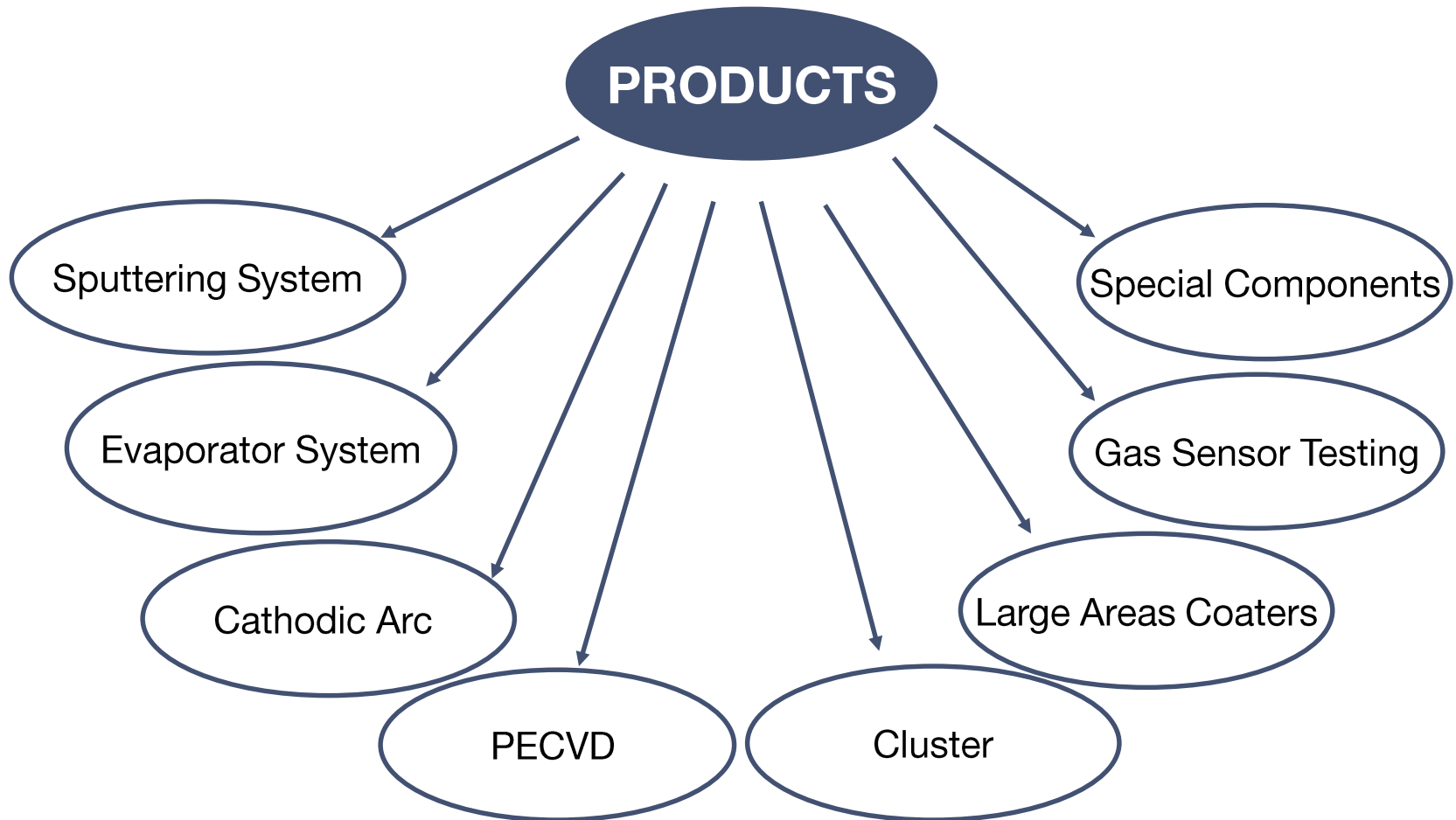
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Foreign key Costumers



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Main Products



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Main Products



1. Vertical Sputtering
(with single or double rotation carousel)
2. Horizontal Sputtering
3. Confocal Sputtering
4. Thermal, E-beam & Effusion Cell Evaporators
5. Cathodic Arc
6. Gas Sensor Test
7. PECVD System
8. Cluster
9. Large Area Coaters
10. Vacuum Components & Deposition Sources



9



10



7



8



1



2



3



4



5



6

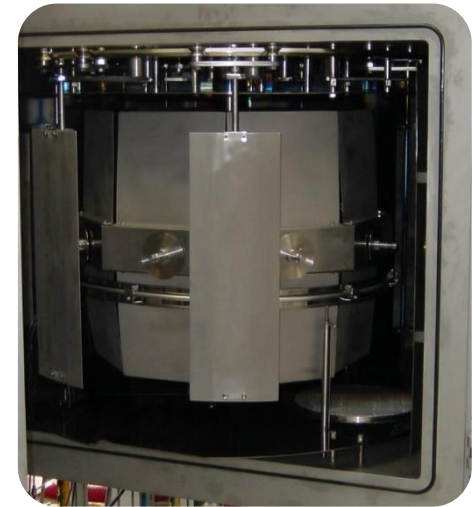
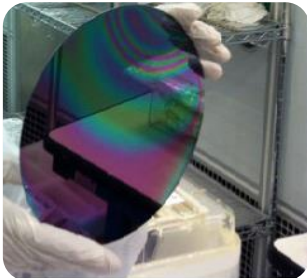
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Sputtering System KS 80 V



KS 80 V: System designed for deposition on 8" wafers

- 6 vertical cathodes
- 8" x 8" Wafers
- Fast entry chamber (load lock)
- Wafers are placed in a planetary holder rotating around a vertical axis
- While the holder rotates the wafers spin around their axis



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Sputtering and Cathodic Arc



KSA 75 V: Batch vertical Systems for combined techniques

- HiPIMS* Magnetron Sputtering source
- Dual Magnetron Sputtering source
- Cathodic Arc Evaporation sources
- Carrousel with double rotation for 3D samples
- DC pulsed for Bias** and Etching

Techniques for tribological*** applications



*HiPIMS High Power Impulse Magnetron Sputtering

** Bias: low voltage applied on substrate to accelerate ions on substrate

*** Tribological: Science of the mechanisms of friction, lubrication, and wear of interacting surfaces that are in relative motion

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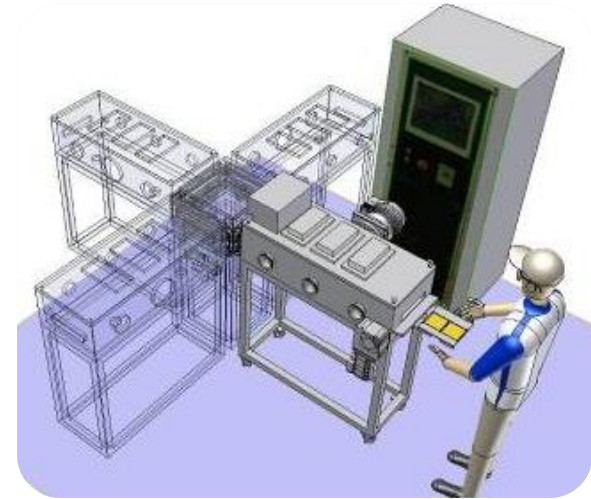
Horizontal Sputtering KS 300 In-Line



KS 300 In-Line

System used for research
in the thin film photovoltaic technology

- Nr. 3 cathodes with length up to 12”
- Heating station for substrate
- Configured as “cluster tool”
- RF and DC pulsed Power supply
- Substrate up to 200 mm



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Confocal Sputtering



Confocal Sputtering for a real co-sputtering and development of new complex processes

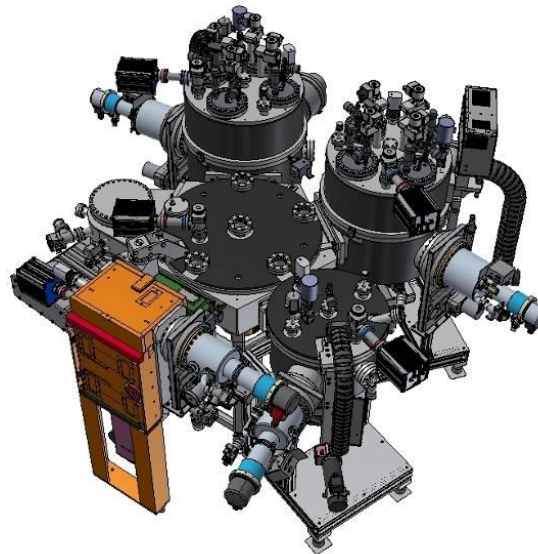
- R&D oriented
- Good uniformity with small targets
- Simple or very complex systems

Some Models:

KS 300 C

KS 800 C

KS 1000 C



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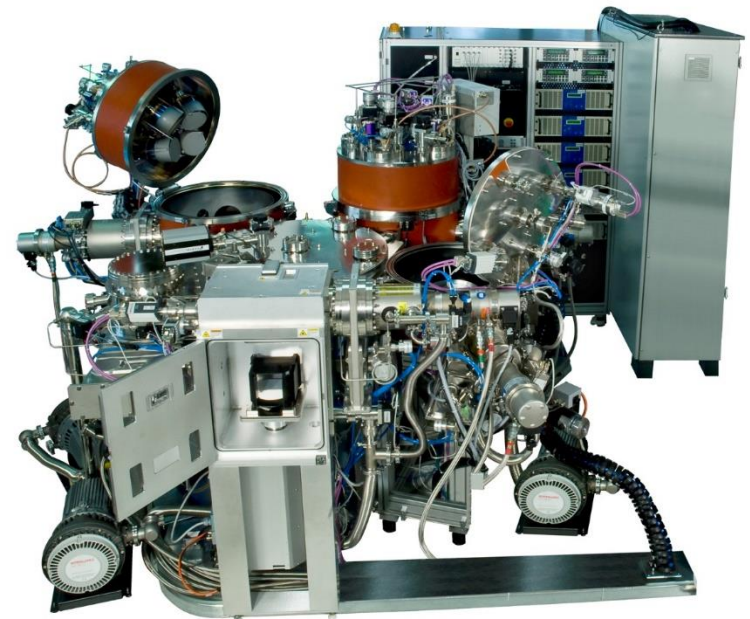
Multichamber KS 800 Cluster



KS 800 Cluster: R&D Cluster system in Confocal Configuration

System used for research and semi-industrial production in semiconductor field with an advanced software control to get a full automated managing of wafers recipe

- Automatic Load-Lock
- Transfer chamber
- Plasma cleaning module
- Oxide deposition module with 4 x 4" Cathodes
- Metal deposition module with 4 x 4" Cathodes



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Thermal, e-beam & ion-beam system



KE 1000 ETI

- E-gun power up to 15kW
- Up to 20 crucibles for E-beam
- Nr. 2 Thermal Evaporators sources
- Ion Assisted Deposition
- DC Plasma cleaning
- Substrate heating up to 500°
- Optical Monitoring of thickness



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Evaporator with special Load-Lock



KE 500 ET: Thermal and E-beam evaporator with special Load-Lock

Special Load Lock with separate carrier and Getter Pump



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Thermal Evaporator and Sputtering



KE 500 ST-SE-SET:

Thermal + e-beam + sputtering can be integrated in the same system

- Thermal evaporators and/or e-beam sources
- Insulated substrate for “bias” and “etching”
- Substrate holder heatable up to 500°C



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Decorative and functional equipment



KSA 1300 V: Batch vertical System for combined techniques one system, many possibilities



The system is designed and manufactured to produce coatings on **metal, ceramic and plastic substrates**, even **chromium or nickel plated**. It is equipped with: Many substrates can be accommodated into a carousel for high productivity purposes.

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Vertical Sputtering and Arc system



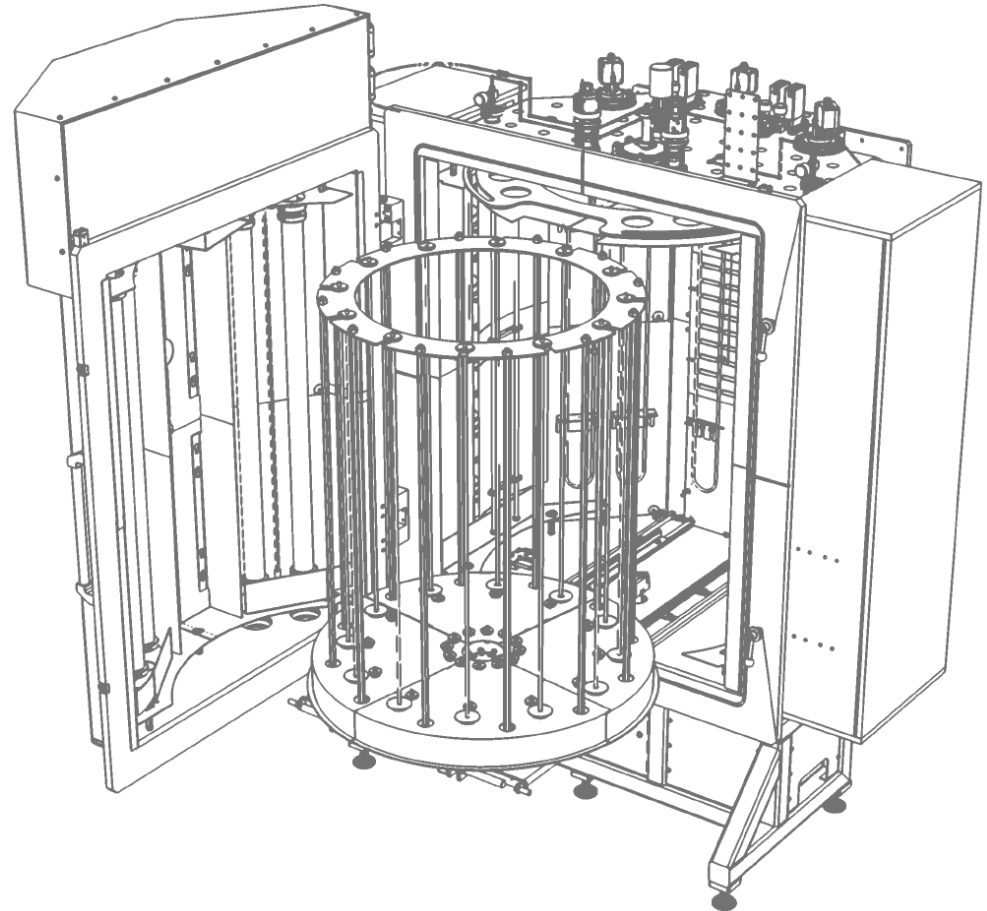
KSA 1300 V: Carousel with double rotation for 3D substrates

- Samples with different size and shape can be loaded
- Good uniformity of samples using carousel in continuous double rotation
- Carousel with Nr.13 shafts, useful height 1200 mm
- Special shield with easy mount / dismount for quick maintenance
- A special trolley for a quick load / unload of the carousel



KSA 1300 V

Sputtering, Cathodic Arc and PECVD



KSA 1600 V: General Configuration

- Two pairs of cylindrical sputtering sources for better use of the target, with fast maintenance and quickly mount/dismount of cathodes
- N.10 Cathodic Arc Evaporation sources for decorative and functional coatings
- PECVD source for SiO₂ transparent deposition (before and after PVD deposition)
- Carrousel with double rotation for 3D samples to have a better uniformity
- DC pulsed Power Supply for bias and plasma cleaning of the samples
- Heating elements for better adhesion of the coating
- Polycold for water fast pumping

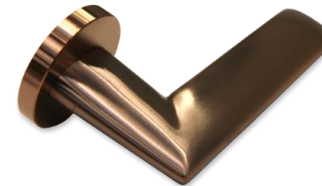


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Decorative coating applications



Our costumers use our systems to produce coatings for applications either in the **functional field** (moulds, end-mills, cutting tools, machinery components) and in the **decorative field** (cutlery, handles, taps, jewellery).



Taps
Fittings



Handles



Watches



Glasses



Jewelry



Automotive



Household



Lighting



Fashion



Cosmetics

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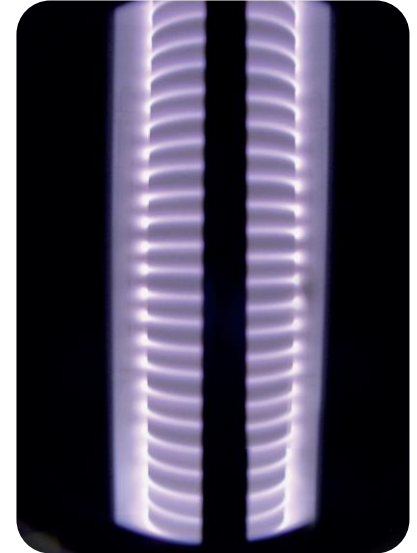
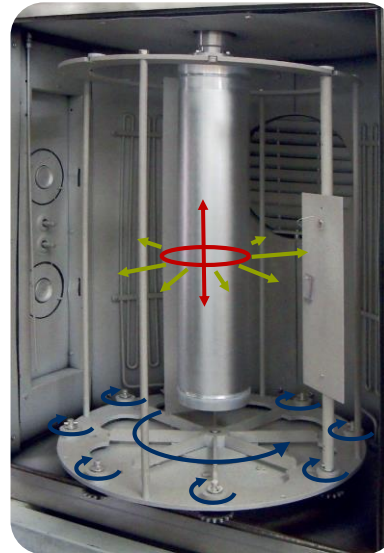
Hi.P.Po. sputtering cathode



Hi.P.Po. is a new generation sputtering source whose purpose is **large production**.

As it guarantees an high deposition rate, it is considered the perfect **alternative to the metallization**.

In addition, nitrides and carbides can be deposited as well, which means more colors and more possibilities.



The target (i.e. the material to be deposited) has cylindrical geometry to deposit in **all the directions simultaneously**.

In addition, thank to a motorized magnetic array, the target is consumed **uniformly** and **almost entirely**.

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Hi.P.Po. sputtering cathode



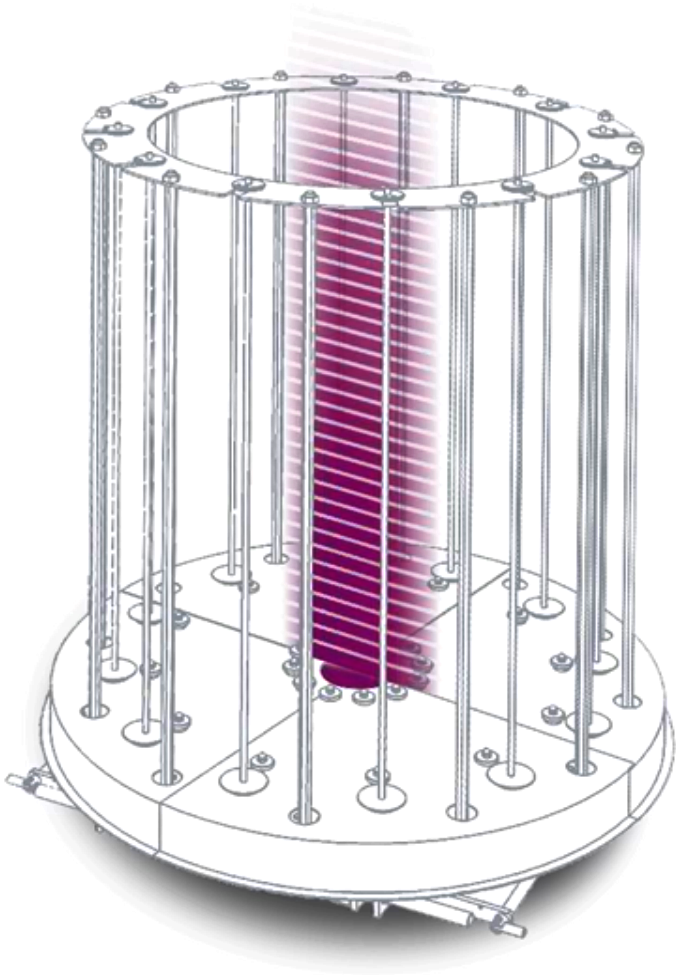
Deposition rate >10÷20 times higher than traditional planar cathodes. This makes Hi.P.Po. competitive against traditional metallization, more reproducible and tunable.

Energy consumption <1/3 compared to traditional sources for the same deposited thickness.

Savings on target material >65%, 2/3 of material cost savings. Thanks to material use optimization, the routine target exchange will occur **less frequently**, typically one out of seven compared to standard technologies.

Chamber volume reduction

(of about 40%), even with same carousel used in traditional batch coater with planar magnetron, is possible to reduce the pumping time per cycle.

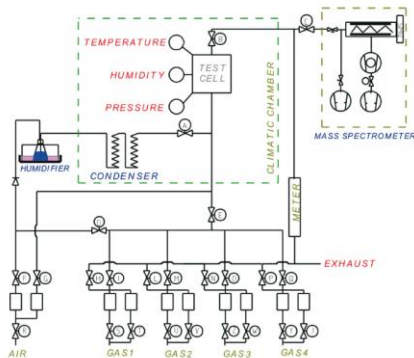


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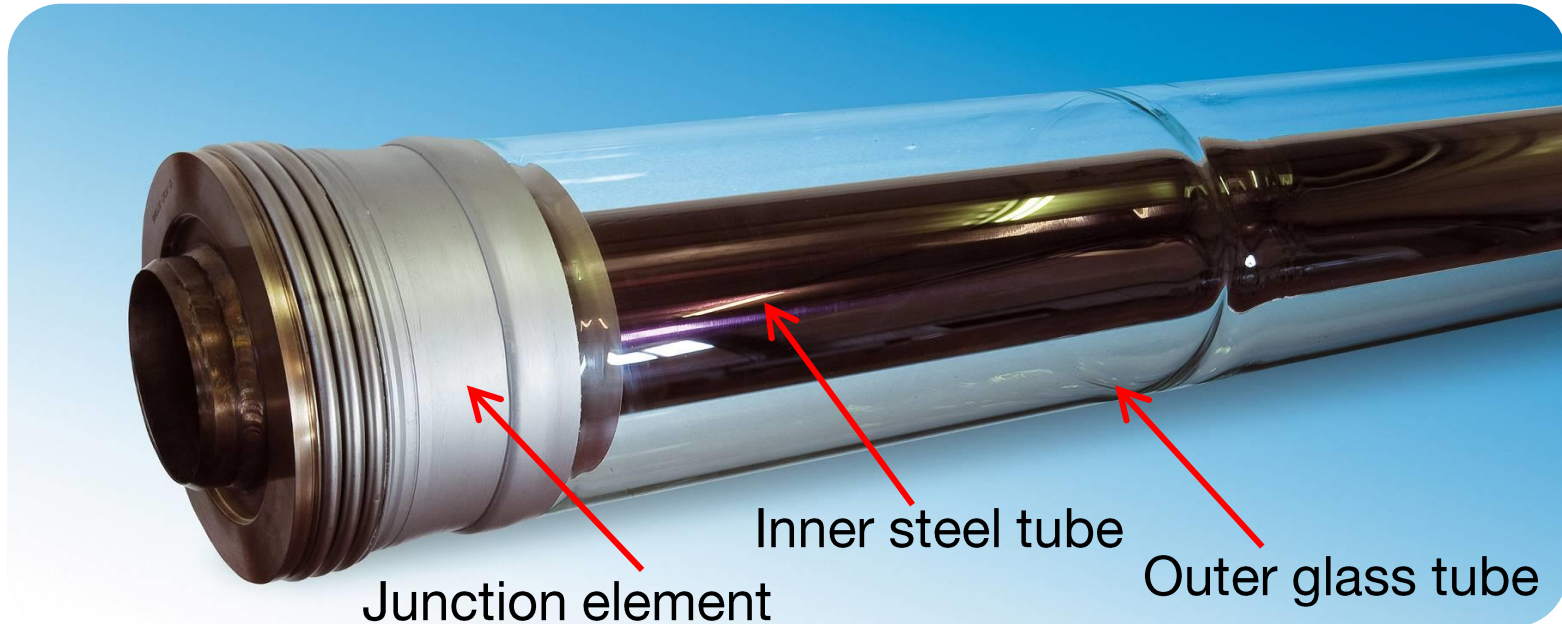
Gas sensor testing system



- A fundamental tool for Quality Control and to speed up R&D results
- High throughput. Up to 10 Gas Sensor Heads
- Ultra High Purity Gas compatibility
- Fully automatic process control



Inner tube cover by sputtering



The space between the inner and outer tubes is evacuated for:

- reduced convection losses (wind!)
- longer lifetime (possible oxidation of coating at high T)

KENOSISTEC – Large Area Coater

Solar Thermal Energy



In-Line Sputtering Coating System

for ASE Angelantoni Group

At site in Massa Martana



During mechanical assembly



Carrier with tubes

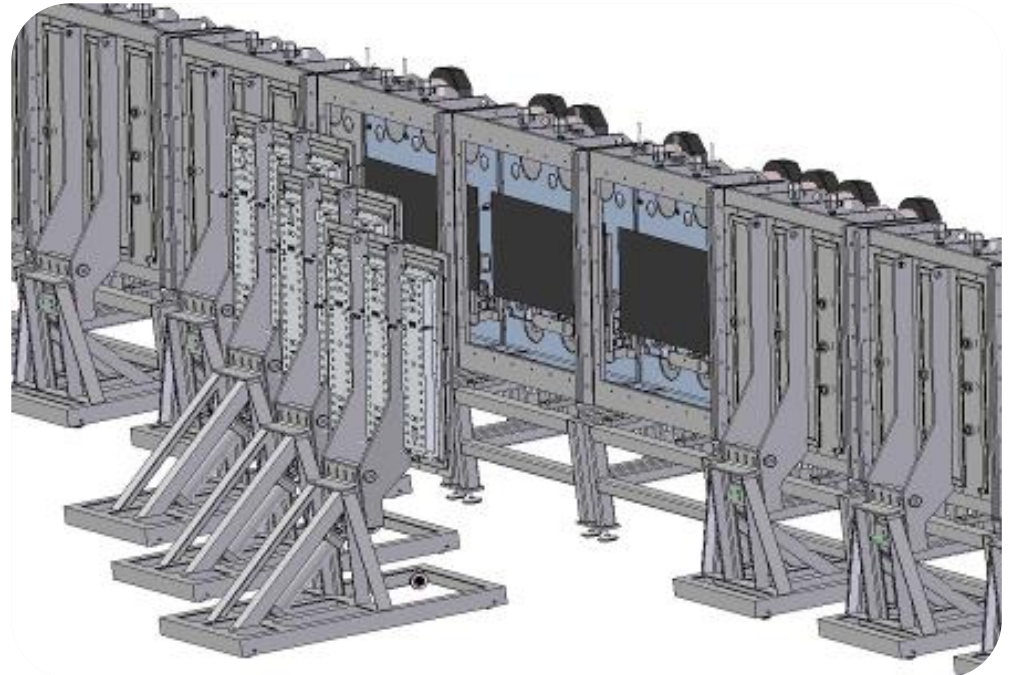
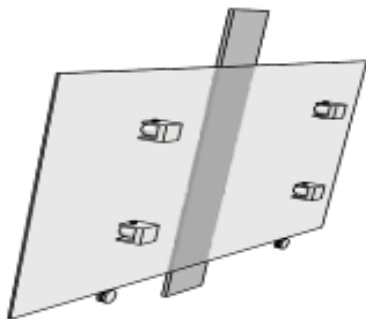
KENOSISTEC – Large Area Coater Photovoltaic Energy



In-Line System for Photovoltaic CdTe modules

Glass sheets move continuously through the different process chambers traveling either vertical or in horizontal

Vertical Line
(actually “subvertical” position
about 5°inclined)



KENOSISTEC – Large Area Coater Photovoltaic Energy



In-Line System for Photovoltaic CdTe modules

Horizontal Line



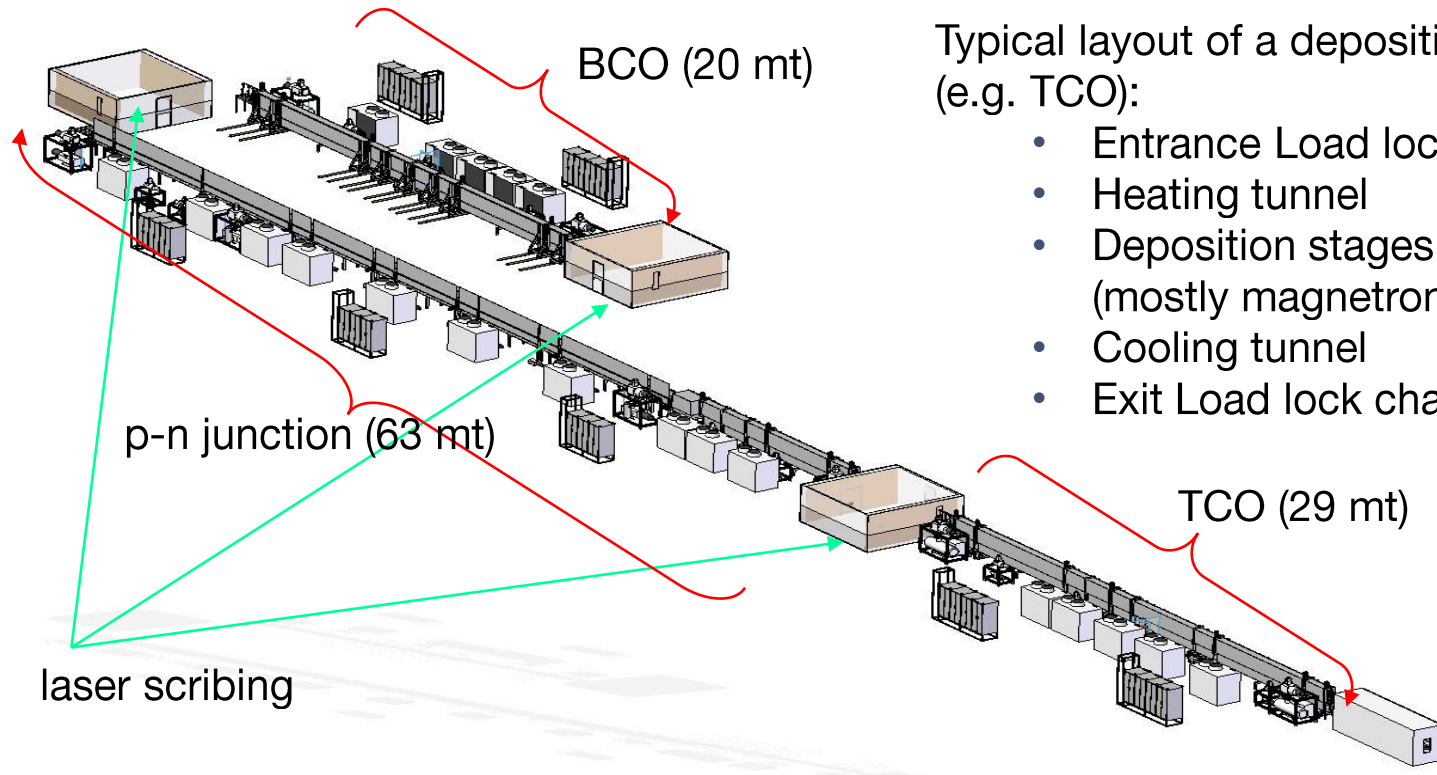
KENOSISTEC – Large Area Coater

Photovoltaic Energy



In-Line System for Photovoltaic CdTe modules

Production equipment: **2 modules per minute**



Typical layout of a deposition section
(e.g. TCO):

- Entrance Load lock chamber
- Heating tunnel
- Deposition stages (mostly magnetron)
- Cooling tunnel
- Exit Load lock chamber

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Vacuum components



A wide choice of manual and motor driven motion devices and manipulators



UHV Chamber

Accurately positioning of many flanges in a complex UHV chamber is our job

Rectangular and Circular Magnetron Sputtering Sources with different dimensions

- DC & RF Circular Magnetron Sputtering of 2", 3", 4" for standard materials and for ferromagnetic materials
- DC & RF Rectangular Magnetron Sputtering of 8" x 3", 12" x 3", 16" x 2", 16" x 5", 22" x 5"
- Rectangular Magnetron for HiPIMS Sputtering and Dual Magnetron Sputtering



KENOSISTEC
UHV & Thin Film Equipment



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Angelantoni
MORE THAN YOU THINK

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