

Thin Film System TFS 500 for ALD Research and Batch Production

The TFS 500 is an ALD system designed for use in thin film coating applications. The unit incorporates leading edge design and technical solutions that enable superior quality coatings and results. In Beneq, we have approached ALD tool design with an open mind and innovative spirit. Our goal is to develop new applications and business opportunities by combining experience with invention. The TFS 500, our initial reactor model, has proven its case as a versatile tool adaptable to both in-depth thin film research and robust batch processing.

The TFS 500 can handle several types of substrates; wafers, planar objects, powders and porous bulk materials, as well as complex 3D objects with high aspect ratio features. It can further be equipped with a manually operated load lock for increased wafer processing capabilities. Different types of reaction chambers can easily be fitted inside the vacuum chamber, which in turn enables optimizing each reaction chamber for each customer application. The TFS 500 is an ideal tool for multi-project environments.

The TFS 500 meets both the stringent requirements of industrial reliability and the need for flexibility of R&D operations. It is built on a robust and modular structure and meets all necessary engineering and safety requirements. The process components are off-the-shelf articles, thus ensuring spare parts availability. All precursor containers can easily be changed, at short notice. The precursor readiness includes gases, liquids and solid materials. For full flexibility in precursor selection, we have additionally included a 500 °C hot source option. A customer's source configuration can therefore vary from a minimum of two, to a battery of 5 gases, 4 liquids and 4 hot sources.



Technical specifications

Process temperature range		25 - 500 °C
Reaction chamber types and dimensions	single wafer	ø 200 × 3 (mm) ø 300 × 25 (mm)
	single wafer plasma	ø 200 × 3 (mm) ø 300 × 3 (mm)
	3D/batch wafer	ø 200 × 170 (mm)
	3D/batch powder	450 × 300 × 250 (mm)
	solar cell batch	ø 80 × 50 (mm) 156 × 156 mm, 100 pcs
Gas lines		up to 5
Liquid sources (+5 °C to ambient)		up to 4
Hot source HS 300 (ambient to 300 °C)		up to 4
Hot source HS 500 (ambient to 500 °C)		up to 2
Optional		- plasma source - manual load lock
Control system		PLC control with PC user interface
Main dimensions, [L × W × H]		1600 × 900 × 1930 (mm)

Features

Performance that counts

- Process cycle time predominantly less than 2 seconds
In many cases, less than 1 second (with uniformity variation $< \pm 1\%$ for, *e.g.*, Al_2O_3).
- Hot source versatility, up to 500 °C hot source setups as standard options.
- Application-specific reaction chamber design with superior coating performance.
- Both direct and remote plasma ALD as standard options.



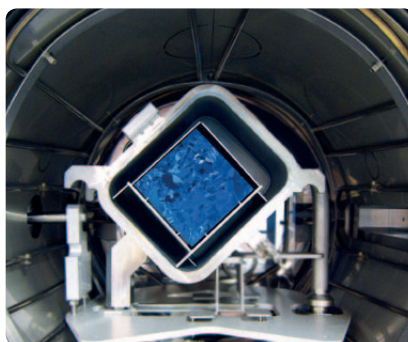
TFS 500 load lock

Unique design – ease of use

The TFS 500 incorporates a small footprint and user-friendly design. All coating and process control operations are conveniently situated above waistline, making the TFS 500 a pleasure to work with. Precursor source loading and changing is simple, fast and reliable. All functions are managed by programmable logic control (PLC), including PC user interface and data logging.



TFS 500 with single wafer reaction chamber.



TFS 500 with batch reaction chamber for 100 c-Si solar cell wafers.



TFS 500 with 3D/batch chamber.

Operational flexibility – modular and flexible

Whether you want to apply a thin film to one or several silicon wafers, or to a batch of two thousand silver coins, the TFS 500 is your best choice. Our accredited ALD team can accommodate your specific needs in equipment design, operation and support functions.

- Several different reaction chambers available for, *e.g.*, wafer, multiple wafer, 3D and powder substrates.
- Comprehensive modular design allows for easy change of reaction chambers, sources and tubing.
- High deposition pressures possible for large surface area substrates.
- Load lock with manual operation available for rapid substrate wafer change.
- Hot-wall reaction chamber for uniform substrate temperature and to prevent precursor condensation and secondary reactions.
- Cold-wall vacuum chamber for rapid heating and cooling.
- Auxiliary entry ports in vacuum chamber for plasma, in-situ diagnostics etc.
- Clean-room compatible, including clean room wall assembly.

Safety

Beneq takes pride in manufacturing equipment that gains the confidence and personal appreciation of scientists, operators and maintenance personnel. The location of the process components enables quick and accurate supervision. All precursor chemicals are located in a ventilated hood, which ensures chemical safety of a high level. The TFS 500 complies with the safety requirements of the CE, UL and CSA.

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