

The VertiClean Advanced Photomask Processor is a modular wet bench for single substrate processing, i.e. photomasks of sizes 6" x 6" or larger.

The modular system architecture with immersion tanks, made of quartz or PVDF, and a flexible process flow with random access to the individual process tanks can be customized for all wet processes.



Applications

- Quartz etching with HF
- SC1 and SC2 cleaning
- IPA/N2 drying
- Custom applications
- SPM and SOM cleaning
- Megasonic cleaning
- VUV/ozone cleaning

The process tanks can be combined into a customized cluster configuration with SMIF input/output stations. Chemical supply and distribution systems with state-of-the-art technology in handling of XLSI chemicals are provided for all process media. A programmable tool controller together with time proven software and graphic user interface with high flexibility in parameter settings guarantee easy and reliable operation.

Tool Concept

The VertiClean® features an innovative design for flexible single substrate processing, i.e. photomasks, with customized immersion tanks guaranteeing ultimate process results.

- **Customized immersion tanks**, made of quartz or PVDF for single substrate processing
- **Overflow tanks** for continuous process media flow and subsequent DI-water rinsing
- **Diffuser pipes** for homogeneous distribution of process media across the substrate
- **Optimized processes** for SPM, SOM, SC1, SC2 and others with use of H2SO4, NH4OH, H2O2, HCl, HF, HNO3, ozone and future to be defined chemistries as well as dry cleaning with VUV/ozone.
- **High efficient megasonic transducer** with non-directive irradiation of 1MHz frequency
- **State-of-the-art technology in handling** of XLSI chemicals with ultra-pure components and point-of-use filtration of 0.05µm or better
- **All hoses and fittings made of PFA** (Flair or Pillar)
- **In-situ mixture of chemicals** for flexible process media preparation
- **Exact temperature control** of process media
- **Programmable concentration**, flow rates and temperature of process media with large process windows
- **Flexible process flow** with random access to the individual process stations
- **Expandability** for integration of future cleaning techniques
- **Chemical supply** and distribution system with ozone generation
- **Waste collection system** with separation of various chemicals, i.e. HF contaminated waste from general waste
- **Programmable tool controller**
- **User friendly software** and operator interface with SECS communication.



VertiClean

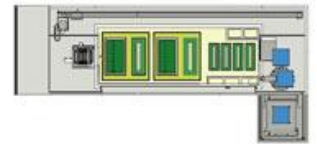
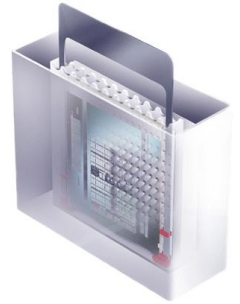
VertiClean Quartz Etcher

The VertiClean Quartz Etcher features a process tank made of PVDF with a unique pressurized diffuser plate overflow system resulting in uniform etch media flow onto the substrate surface, guaranteeing superior process results.

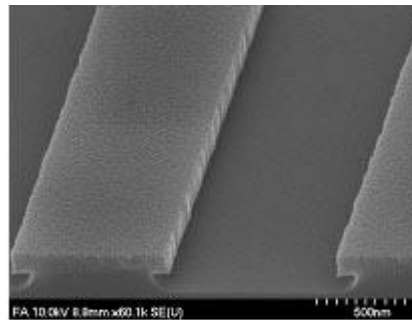
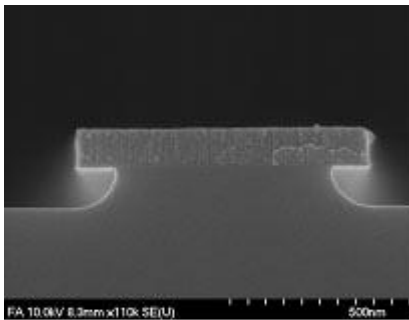
Additional process tanks such as for KOH face trimming, Glue Removal with SPM, and cleaning with SC1 and others can be incorporated

Performance

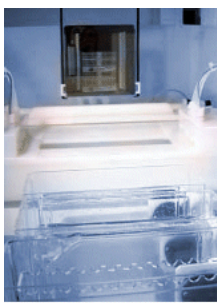
Etch uniformities with range of <1% can be achieved on plate and plate-to-plate for manufacturing of the most advanced alternate phase-shift photomasks.



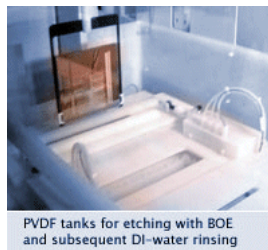
Layout VertiClean Etcher



Etch profile of 400nm structure with 100nm etch step, demonstrating isotropic quartz etching with no lift-off underneath of Cr-layer.



Quartz tanks for SPM, SC1 cleaning and subsequent DI-water rinsing



PVDF tanks for etching with BOE and subsequent DI-water rinsing

VertiClean Chemical Supply System

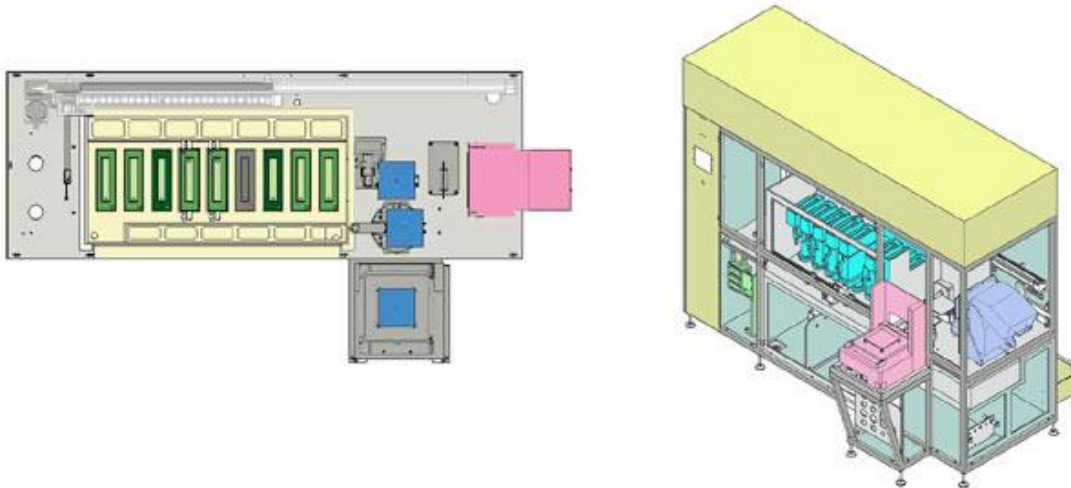
The remote chemical supply cabinet is made of fire retardant PVC-C Corzan material with a stainless steel basement and contains separate compartments for the different chemicals.

Each compartment contains separate spill pans with leakage sensors, drain and exhaust as well as a safety door with interlocks.



VertiClean Cleaning System

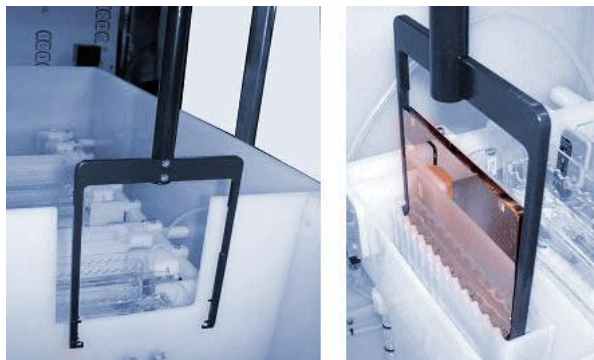
The VertiClean® Cleaning System is a modular tool for automatic immersion processing of single substrates, i.e. blanks and masks of standard sizes of 6" x 6" or larger.



Layout of VertiClean Cleaning System

All standard cleaning and etching processes as well as new to be developed cleaning techniques are possible

- **Substrate cleaning** of 248nm, 193nm and EUV substrate material
- **Post resist strip cleaning** on binary, a-PSM, e-PSM plates and EUV masks
- **Repair cleaning**, procedures maintaining repair integrity
- **Adhesive clean**, clean post pellicle removal intended at removing residual adhesive from pellicle frame
- **Final clean**, prior to pellicle mount on Cr-on-glass, e-PSM, and a-PSM masks and final clean before shipping of EUV masks
- **New cleaning** and surface preparation techniques for development and manufacturing of EUV photomasks



Process Area with mask handler and immersion tanks

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