

## MINILAB 026 ETCH/ANNEAL STATION

Glovebox-compatible substrate/device etching and annealing tools

### Key Features:

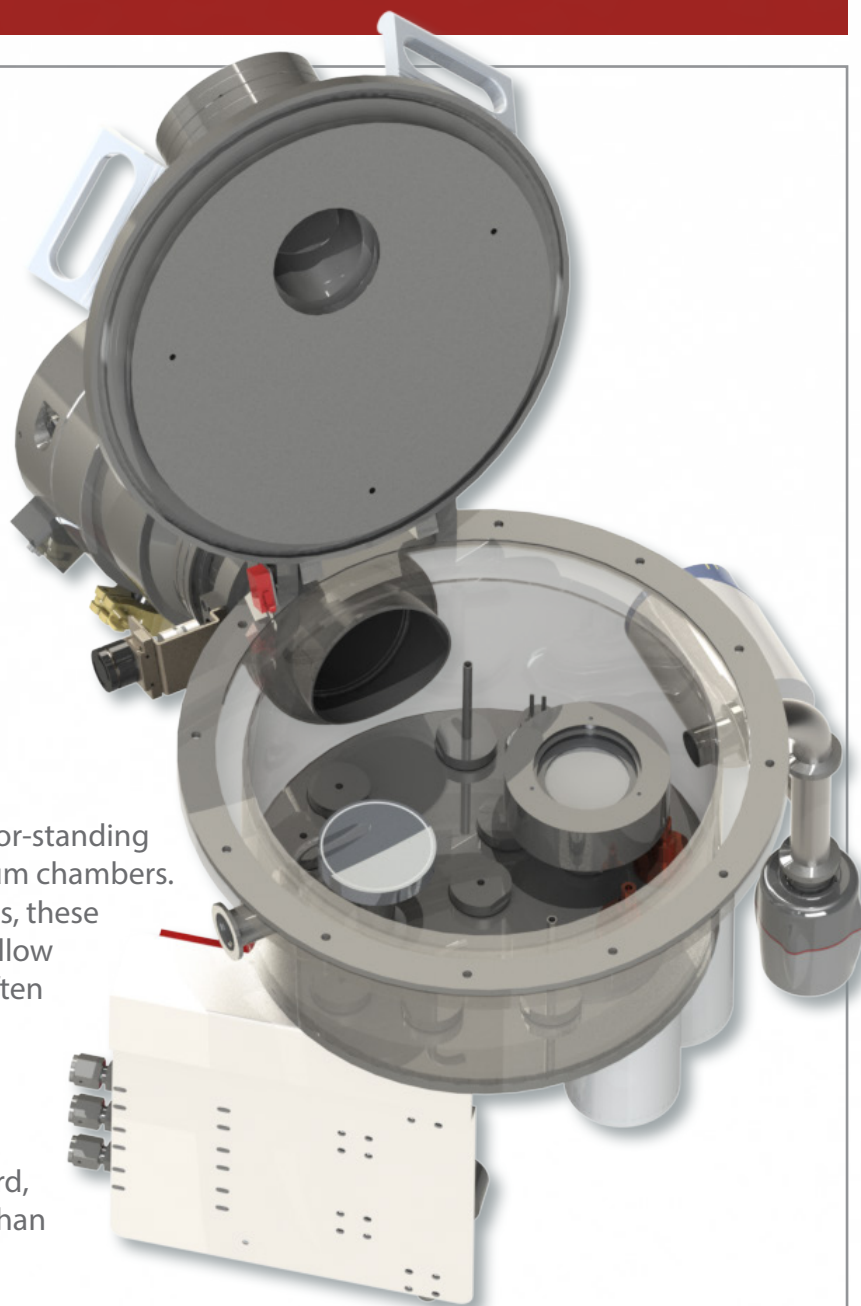
- 'Clam-shell' chamber
- Turbomolecular pumping systems
- Base pressures  $< 5 \times 10^{-7}$  mbar
- Plasma etching stages
- High-temperature annealing stages
- Controlled atmospheres
- Touchscreen HMI for system control
- Equipped for easy servicing
- Comprehensive safety features
- Cleanroom compatible
- Glovebox-compatible
- Proven performance

### Overview:

MiniLab 026 systems are ultra-compact floor-standing vacuum systems with 'clam-shell' type vacuum chambers. While originally designed for PVD processes, these systems have recently been converted to allow for etching and annealing techniques as often required for R&D applications. The MiniLab 026 is also glovebox-compatible and is the only system in the MiniLab range that can be easily retrofitted to an existing setup. A turbomolecular pumping system is standard, for high-vacuum base pressures of better than  $5 \times 10^{-7}$  mbar.

### Configuration and Options:

The MiniLab 026 base configuration includes a turbomolecular pump positioned on an ISO100 port at the rear of the vacuum chamber. The base of the vacuum chamber sits, as a well, into the supporting frame (or glovebox base). The chamber lid is stainless-steel and attached to the chamber body via a



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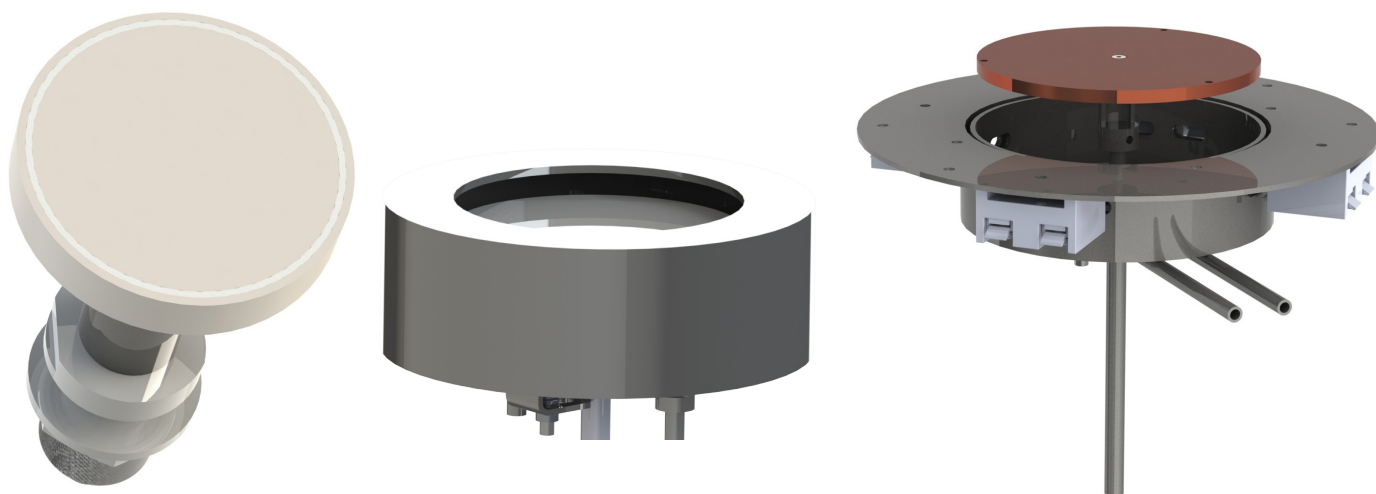
hinge mechanism. This system is ideal for configuration with components for substrate/device annealing and etching under controlled atmospheres. All in-chamber hardware is situated on the baseplate.

**Annealing:** Heater stages for controlled temperatures up to 1000 °C ( $\pm 1$  °C resolution). Resistive and quartz lamp heating modes available. For resistive heating, a variety of element materials can be provided, depending on required powers and atmospheric compatibility (e.g., SiC-coated elements for oxygen tolerance). Stage areas from 1" to 6" diameter. Water-cooled assemblies and shielding arrangements available for restricted IR transmission.

**Etching:** Biased stages and DC/RF power supplies for plasma generation for etching purposes. Multiple stage sizes available. Plasma generation compatible with multiple process gases (see below). Moorfield "soft-etching" technology for high-resolution, low-power plasma control ideal for use with 2D materials such as graphene and TMDCs (see also *nanoETCH* range brochure).

**Atmosphere control:** Manual or fully-automatic gas control packages, including for process pressure control to  $\pm 0.1$  mTorr. Multiple gas lines, with MFC-regulated and measured flow rates. Safety interlocks for preventing illegal co-flows.

**Multi-technique systems:** Various combinations of all of the above can be included in a single MiniLab 026 etch/anneal station, for creating a powerful R&D tool.



Above: Examples of etching and annealing hardware that can be fitted to MiniLab 026 etch/anneal stations. Left: Plasma etching stage. Centre: Resistive heater stage with water-cooled body, for substrate heating to 1000 °C. Right: Quartz lamp heating stage, for substrate heating to 600 °C.

## Control System:

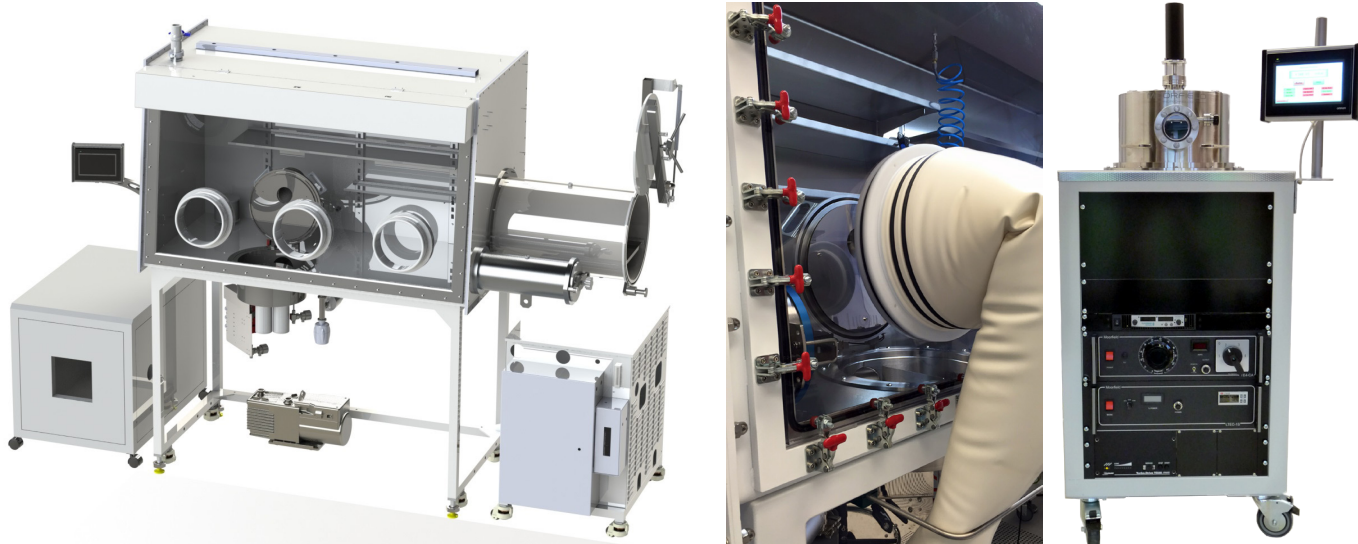
The unit is fitted with high-stability, industrial-grade PLC electronics. User operation is via a 7" touchscreen HMI mounted on the front panel. Powerful but easy-to-use software allows for system setup and operation via a menu-driven interface (note that manual control via electronics rack front panels is also possible, depending on exact system configuration). *IntelliNet* software allows for data-logging and diagnostics to a connected PC.

## Glovebox Compatibility:

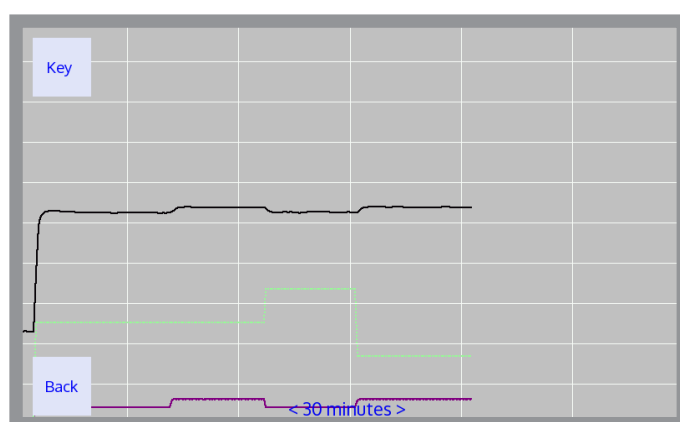
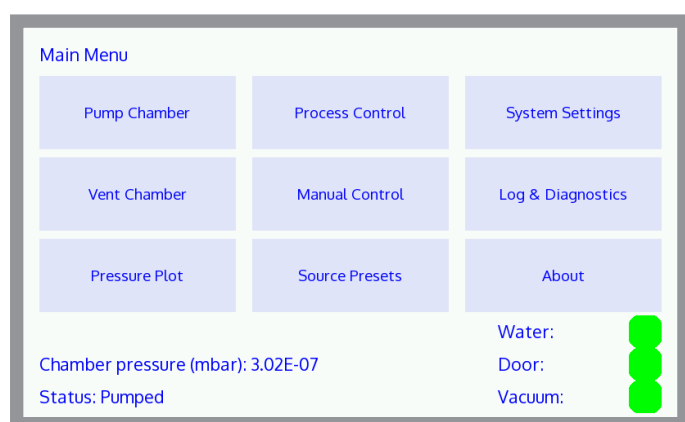
The MiniLab 026 is compatible with gloveboxes of various manufacturers, and can be easily retrofitted to existing setups. For this, a suitable hole is created in the glovebox floor for accepting the bottom part of the chamber. A hermetic seal is created. The chamber lid is fitted with easy-to-use, ergonomic handles

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for straightforward operation through gloveports. A microswitch ensures the chamber is fully closed before pumping routines are initiated. The system's touchscreen HMI is fitted to the glovebox frame. We also supply complete packages consisting of gloveboxes ready-integrated with MiniLab 026 tools; please contact us for details.



Above: Installation configurations for MiniLab 026 etch/anneal stations. Left and centre: Model and photograph of unit with etch and anneal stages interfaced with glovebox base for easy operation through gloveports. Right: MiniLab 026 tools are also available as standalone systems, where glovebox integration for sample handling in inert environments is not required.



Above: Screenshots from the touchscreen HMI software through which general control of MiniLab 026 etch/anneal stations is carried out.

## Technical Specification:

**Chamber:** 305 mm ID stainless-steel front-loading chamber. Hinged lid. Base-plate and lid fitted with ports for in-chamber hardware. Viton o-ring seals.

**Safety interlocks:** Water and vacuum levels. Door microswitch for glovebox-integrated units.

**Pumping group:** Water-cooled Edwards or Leybold turbomolecular pumps. Edwards rotary or dry scroll-type backing pumps.

**Pressure measurement:** Wide-range gauge (Edwards or Inficon) and optional capacitance manometers for high-resolution measurement.

**Substrate stages:** Stainless steel, aluminium or copper with threaded holes for substrate attachment. Up

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to 6" diameter substrates. Optional rotation, heating and z-shift modules.

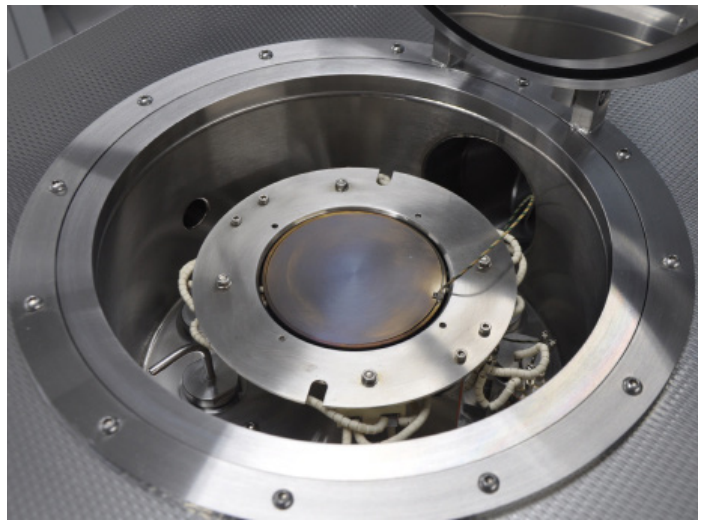
**Etching and annealing hardware:** Various types depending on requirements (see above). Separate brochures available.

**Power supplies:** Various types depending on integrated techniques. All power supplies fully integrated within system electronics rack.

**System control:** Industrial-grade, high-stability PLC electronics core. Designed for safe operation and reliable vacuum integrity.

**Weight:** Approximately 100–200 kg; dependant on configuration.

**Size:** Dependant on configuration. Please contact us for details.



Above: Typical in-chamber configurations for MiniLab 026 etch/anneal stations. Left: Tool configured with etching stage (chamber-left) and 1000 °C oxygen-compatible annealing stage (chamber-right). Right: System fitted with 600 °C quartz lamp water-cooled heating stage for 4" diameter substrates. The turbomolecular pump port is visible at the back of each chamber.

## System Requirements—Basic Configuration:

- Process gases: 25 psi supplies, 99.99% purity or better
- Service gas: Dry compressed air nitrogen or argon, 60–80 psi supply
- Vent gas: N<sub>2</sub>, 0.5 bar
- Power: Single-phase 230 V, 50 Hz, 13 A
- Chilled water: 18–20 °C, 3 L/min, pressure < 4 bar
- Exhaust extraction

## Applications:

- Fundamental research, e.g., on 2D materials
- Education
- Product R&D

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