

QPrep250

Modular deposition systems



Features

- Flexible R&D benchtop deposition system
- UHV compatible CF ports
- Multiple deposition ports
- Integrated load-lock/glovebox combination
- Analysis and viewing ports
- Multiple sample-holder options including rotation, heating, cooling, RF/DC bias
- Cost effective solution for a limited budget

Applications

- Semiconductor films
- Oxide (and other) dielectrics
- Nanostructured films
- Sample metallisation
- Organic material deposition
- SEM sample coatings
- Lab scale teaching system

Base chamber

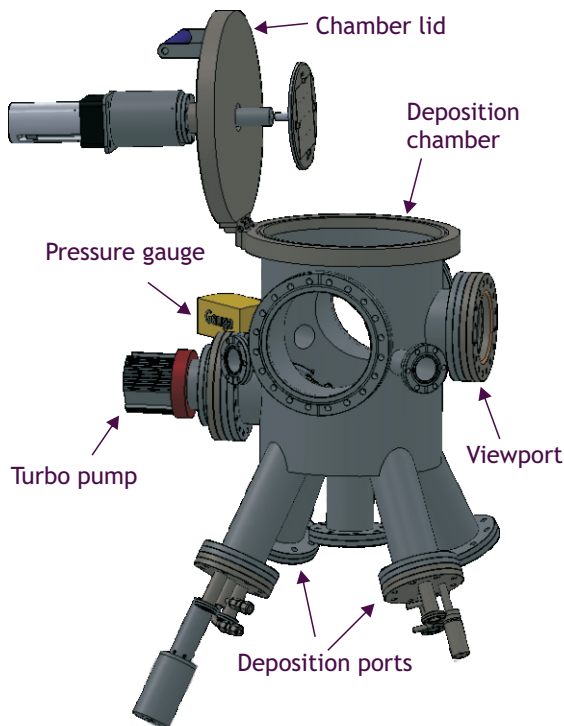
Chamber configuration

The QPrep250 system offers true UHV integrity combined with cost effective solution that allow the researchers to obtain a new deposition facility on a limited budget.

The main chamber is of a cylindrical construction (250mm ID) and is based on a UHV conflat flange platform. The chamber has internal welds and is polished to minimise outgassing. Base ports are confocal as standard allowing a wider variety of deposition sources to be employed than with non-confocal arrangement. Numerous ports are provided for gauges and analysis tools. The chamber can optionally be equipped with removable cross-contamination shielding in applications where high rates of deposition are required.

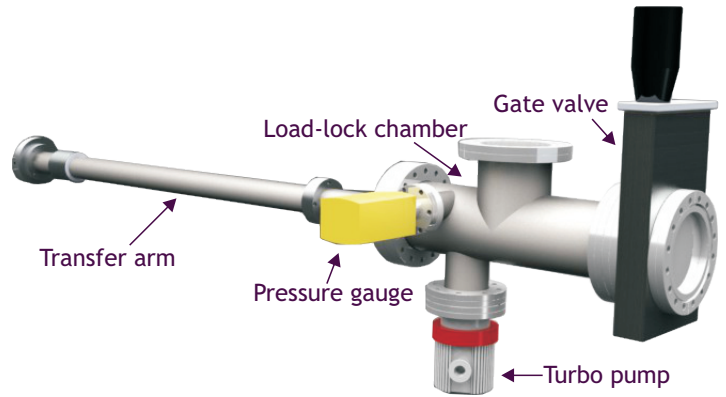
The system can be equipped with pumps ranging from 70 to 500ls⁻¹ turbo pumps but alternative pump types can be specified.

The main chamber design can be configured according to customer requirements.



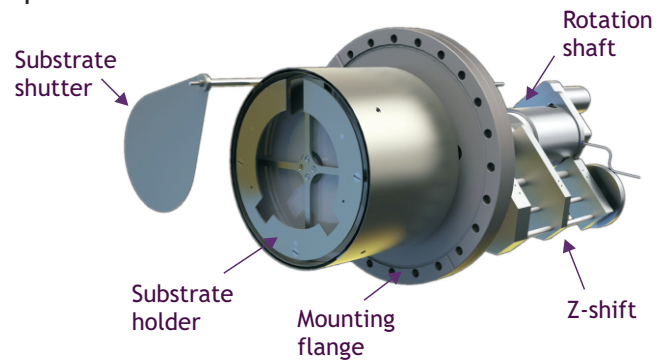
Sample loading

In the basic system, sample entry can be made through a quick-load hinged flange (o-ring sealed). For true UHV applications it is necessary to use a sample entry load-lock. Our load-lock uses a magnetically coupled linear/rotary transfer arm to transport samples to the main chamber. Optionally, an integrated glove box can be included to allow preparation of the samples before loading into the chamber.



Sample manipulator

Sample manipulator can be fitted with 1", 2" and 4" samples, it has 50rpm rotation speed, heating up to 800 degrees centigrade and linear movement in the port axis as standard. Additionally, sample bias and unique custom mounting arrangements can be incorporated at customer request.



Film monitoring

The system can be equipped with a retractable UHV quartz-crystal monitor to allow accurate determination of the film growth rate at the sample position. Optionally additional analysis equipment can be included at the user's request.

Automation

The system can be automated using touchscreen-based pumpdown and process automation.

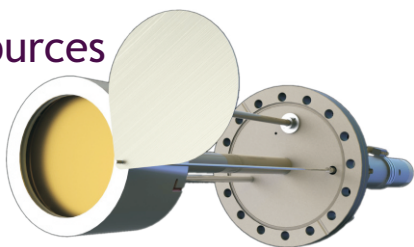


Components

Sputtering sources

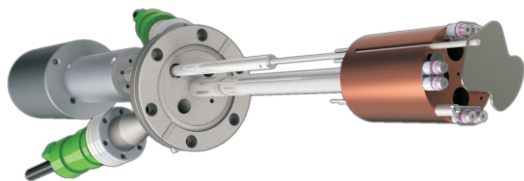
The base ports can accommodate several sputtering sources. We can supply 1", 2" or 3" magnetron sputtering sources for DC or RF operation. The sources can be equipped with standard or high-strength magnets in balanced or unbalanced configuration. Additionally, in-situ Z-shift and target tilt features could be incorporated.

Alternatively we are happy to fit in existing or third party guns into the system.



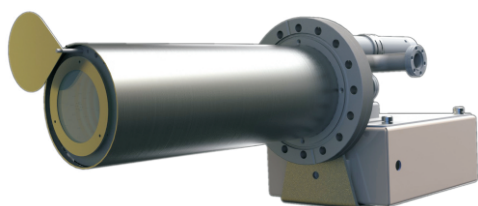
E-beam sources

Our e-beam evaporation sources are intended for highly-controlled, ultra-thin film deposition of refractory metals. They have 100% UHV construction and could be controlled through a software. All models incorporate integral flux monitoring for all evaporation pockets. The pockets are connected to independent high-voltage lines and co-evaporation of up to four materials could be achieved. The evaporation could be carried out from rods or crucibles.



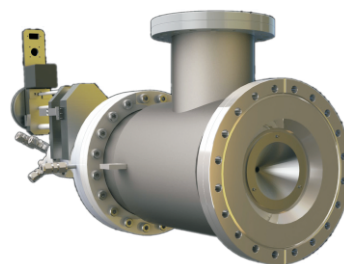
Plasma sources

For the growth of oxides or nitrides at low pressure it is often necessary to use a more reactive form of oxygen and nitrogen. Our RF plasma sources generate beams of highly reactive *atomic* oxygen or nitrogen and can be incorporated to act alongside conventional metal deposition sources to grow high quality compound layers. The coaxial RF coil design ensures very efficient power transfer into the plasma. The sources are compatible with a range of gases such as O₂, N₂, H₂ and CH₄. Note, the operating pressure inside the chamber should be lower than 2x10⁻³mbar.



Nanoparticle deposition

Our Nanogen50 nanoparticle source can be installed in the chamber to allow controlled nanoparticle deposition onto the sample. Nanoparticles can be generated from any metal as well as from many compound materials such as oxides, nitrides, carbides and alloys (with NanogenTrio). The size of particles is highly controlled - mean between ~0.5nm and 20nm with a narrow size distribution of +/- 15%. Deposition rate is 6A/s.

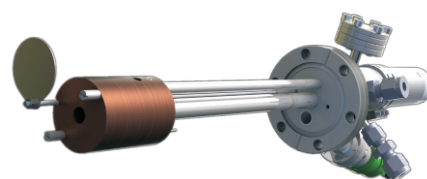


For more details see separate brochure Nanogen50.

Gas cracker

Our MGC75 gas cracker is 100% UHV compatible. It has e-beam heated iridium capillary which makes it very efficient in cracking various gases (60% oxygen and up to 90% hydrogen). In this configuration there is no electron impact ionisation and the emerging atomic beam is truly neutral. The MGC75 body is directly water-cooled to ensure minimal outgassing of the instrument. A dual filament design allows for continuous operation over long periods without maintenance. Because of excellent water cooling and need for low gas flow and power, MGC75 places very little heat and gas load into the chamber.

The source could be safely operated at pressures as high as 5x10⁻⁴Torr.



Thermal sources

Thermal sources of most types (knudsen cells, filament evaporators, boat evaporators) can be added. K-cells will fit through standard ports and optional water-cooled cross-contamination shields can be added around K-cells to improve overall system purity.

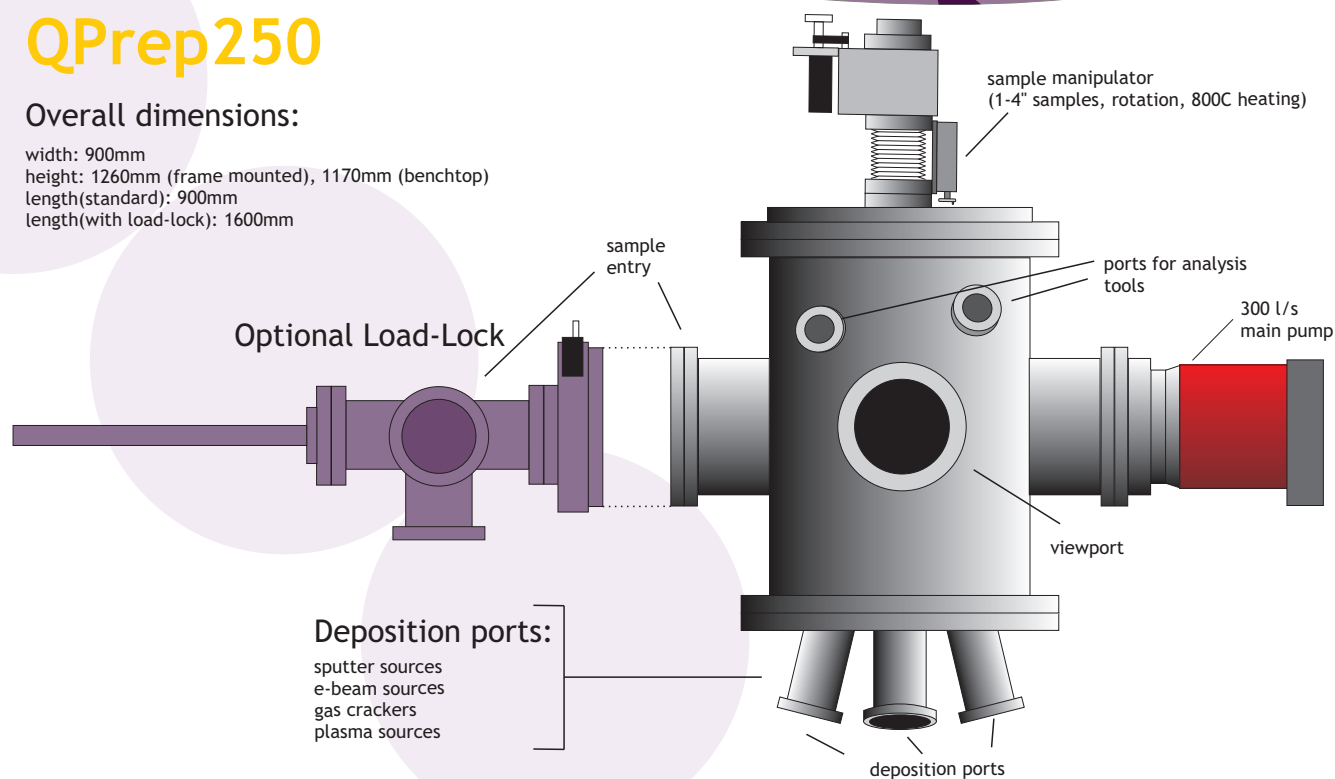
Thermal evaporation boats can be installed in the base with adapter flanges. These can be quickly replenished through access from the top lid or, if the load-lock is used, by removing adapter flange.

Specifications

QPrep250

Overall dimensions:

width: 900mm
height: 1260mm (frame mounted), 1170mm (benchtop)
length(standard): 900mm
length(with load-lock): 1600mm



QPrep250 (Standard)

Chamber	
Construction	Cylindrical, UHV
Top flange	12"
Radial ports	4 x NW100CF
Deposition ports	1 x NW63CF 4 x NW35CF
Pumping	
Main pump	70 ls ⁻¹ , 300 ls ⁻¹ , 500 ls ⁻¹ Turbodrag options
Backing pumps	Dry pumps (scroll)
Base pressure	<9x10 ⁻⁸ (without bakeout)
Manipulator	
Sample mount	Suitable for 1-4" samples
Sample loading	Quick-open top lid
Other	
Electronics	Cabinet-mounted
Gauging	Ion gauge/Pirani
Frame	Low footprint frame on transport casters or benchtop mounting

Options

Load-lock	
Pumping	70 ls ⁻¹ Turbo
Transfer	Magnetically-coupled transfer arm
Manipulator	
Rotation	To 50 rpm
Heating	To 800 °C
Z-Travel	100 mm
Bias	Optional power supply
Bakeout	Internal or jacket
Film Monitoring	
QCM	UHV-compatible, quartz-crystal monitor
Ellipsometry	
Automation	Please contact Mantis for full automation specification

Utilities

Gases: Argon, Oxygen (optional), Nitrogen (optional).
Cooling: Water (de-ionised *not* necessary), 0.5 l/min.
Power: Dependent on configuration.



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