

# QPrep500

## Modular Deposition Systems



### Features

- Cylindrical, easy-access base chamber
- UHV-compatible CF ports
- Multiple deposition ports
- Analysis, load-lock and viewing ports
- Multiple sample-holder options including rotation, heating, cooling, RF bias, DC bias..
- Range of turbo or cryo-pumping options
- Deposition source options include high-rate e-beam, low-rate (high accuracy) e-beam, DC and RF sputtering, thermal, K-cell, nanoparticle deposition and oxide sources.

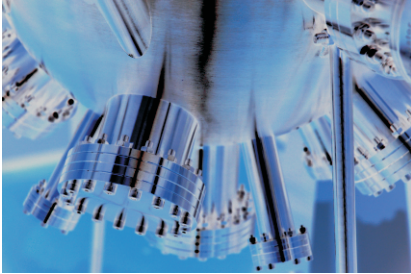
### Applications

- Semiconductor films
- Oxide (and other) dielectrics
- Nanostructured films
- Multilayers
- Compound semiconductors
- Device metallisation
- Ultra-thin films.

# Base Chamber



## Chamber configuration Overall Dimensions



The Qprep500 system is based on a UHV, conflat flange platform. This allows true UHV to be achieved while allowing excellent chamber access through the large top-flange.

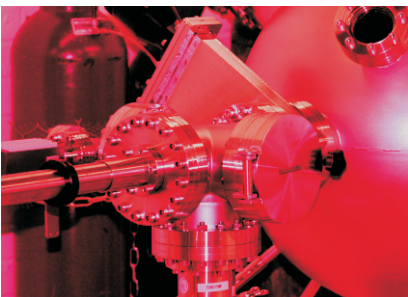
All joints are internally welded and polished on request to reduce to an absolute minimum any outgassing.

Base ports are confocal as standard allowing a wider variety of deposition sources to be employed than with non-confocal arrangements.

Two side-mounting ports for high-power e-beam sources can be specified while still leaving three confocal deposition ports in the base.

The system can be equipped with pumps ranging from 300 to 1500  $\text{ls}^{-1}$  turbo pumps but alternative pump types can be specified.

## Sample Loading



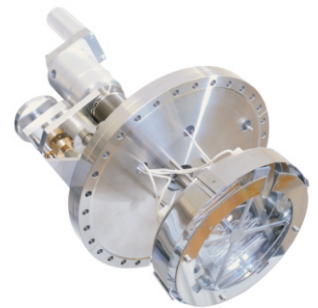
The base system is equipped with a side-entry door appropriately-sized for the sample platform chosen (1" to 6" as standard, 8" on request).

Optionally a load-lock can be mounted for clean sample transfer while leaving the main chamber under vacuum. Sample

transfer is actuated via a magnetically-coupled transfer arm. Sample hand-off is enabled via a z-shift lift-off on the sample table.

## Sample Manipulator

The sample table/manipulator can be configured as standard from 2 inch (52mm) to 6" (or multiple smaller) samples but can be modified for a number of custom configurations.



### Options

- Variable speed
- sample rotation.
- DC or RF sample table bias
- Sample heating up to 800°C
- Sample cooling
- Z-shift

The sample cradle in heated sample holders is manufactured of refractory

## Gauges, Analysis

The system is configured as standard with full-range gauges to allow seamless pumpdown monitoring.

Ports can be included for RHEED, ellipsometry, residual gas analysers or thin-film monitors.

A sample/source viewport is included.

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

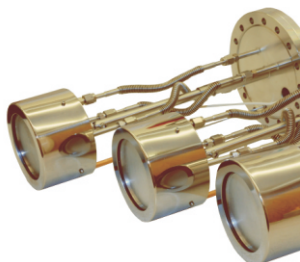
The base ports can accommodate up to four sputtering sources.

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 and additionally balanced or unbalanced magnet sets.

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



as from many compound materials (oxides, nitrides, carbides...) and alloys.

The size of the particles is highly controlled - mean between ~0.5nm and 20nm with a narrow size distribution of +/- 15%.

*See separate brochure*

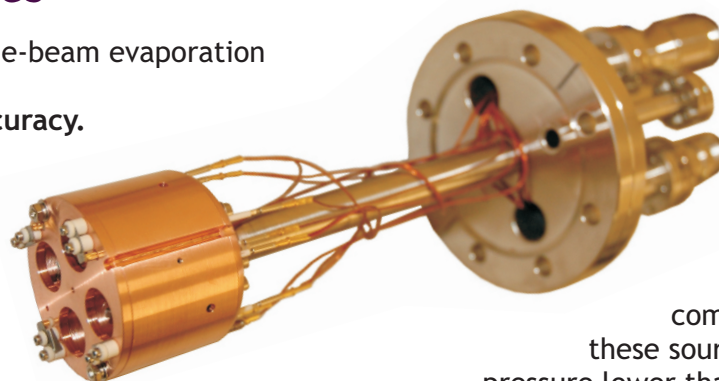
## Oxides/Nitrides

For the growth of oxides or nitrides at low pressure, it is often necessary to use a more reactive form of oxygen (and certainly nitrogen) to form oxides or nitride compounds. Mantis Deposition manufactures RF plasma sources which are used to

generate beams of highly reactive atomic oxygen or nitrogen. These can be incorporated to act alongside conventional metal deposition sources

to grow high-quality compound layers. Note,

these sources require a chamber pressure lower than  $2 \times 10^{-3}$  mbar to operate.



## E-beam Sources

We offer two types of e-beam evaporation sources:

### 1. Low dose, high accuracy.

These are intended for highly-controlled, ultra-thin film deposition of refractory materials into the system.

*See separate brochure*

### 2. Multi kW sources.

These offer high deposition rate and high capacity. Up to two larger sources (single or multi-pocket) may be installed.

## Nanoparticle Deposition



Our **Nanogen** nanoparticle source can be installed on the chamber to allow controlled nanoparticle deposition onto the sample. Nanoparticles can be generated from any metal as well

## Thermal Sources

Thermal sources of most types (knudsen cells, filament evaporators, boat-evaporators...) can be added.

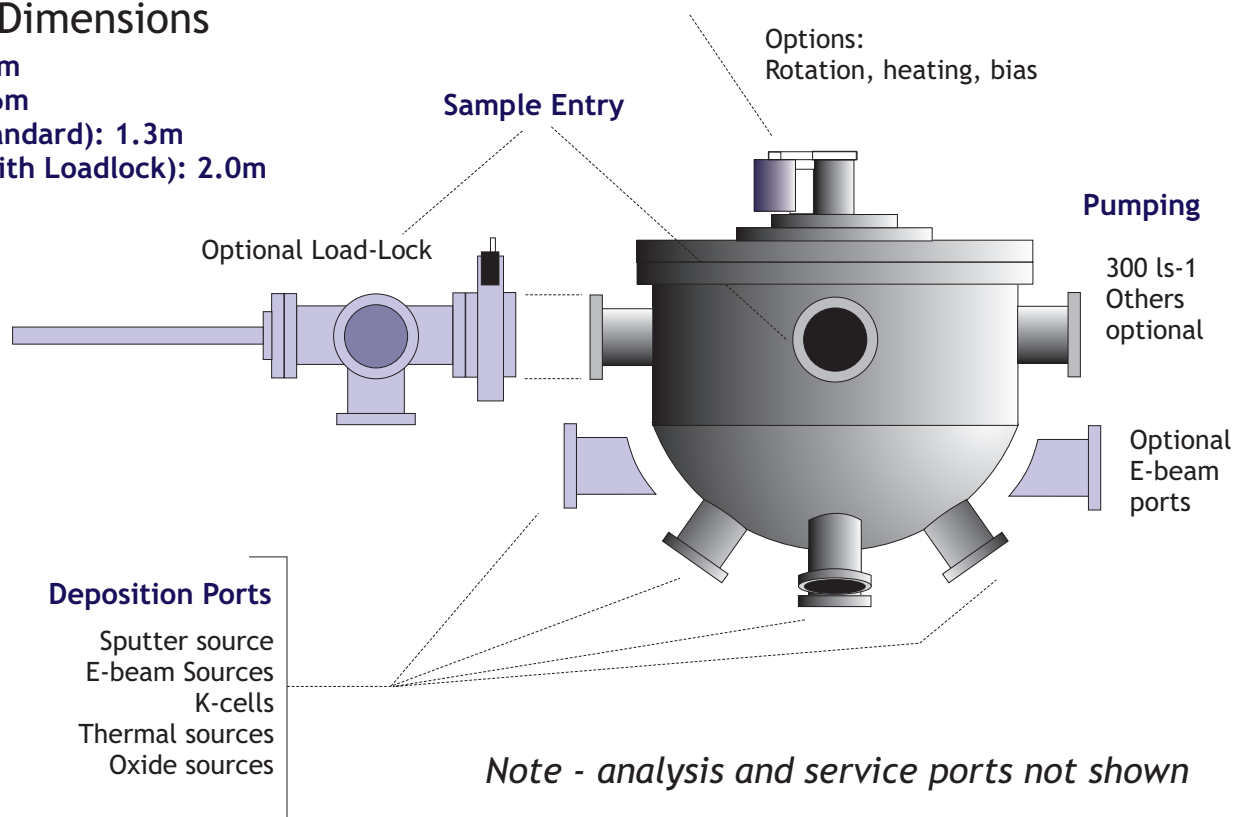
K-cells will fit through standard ports and optional, water-cooled cross-contamination shields can be added around K-cells to improve overall system purity.

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 a load-lock is used, by removing the adapter flange.

# Specification

## Overall Dimensions

Width: 1.5m  
Height: 1.6m  
Length (standard): 1.3m  
Length: (with Loadlock): 2.0m



## Standard Configuration

Top Flange	Double O-ring or metal
Radial ports	Size and quantity defined by sample size and application
Deposition ports	5 (or 7) x NW100CF, 4 x NW35CF
Pumping	300 to 1000 ls <sup>-1</sup> options
Sample loading	Load-lock or quick entry door
Base Pressure	<1 x 10 <sup>-10</sup> (see note below)
Frame	Low footprint frame on transport casters

## Options

Manipulator	Rotation, heating, bias, tilt
Sample Entry	Load-Lock
Sample size	1", 2", 3", 4", 6" options
Film monitoring	QCM, Ellipsometry, RHEED
Bakeout	Internal or jacket
Automation	Full process automation including recipe-driven programming and full data logging.

Note: To operate the system with a base pressure in the 10<sup>-10</sup> torr region in a practical manner, a load lock and bakeout should be employed. Ultimate base pressure depends on pumps and source configuration.



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