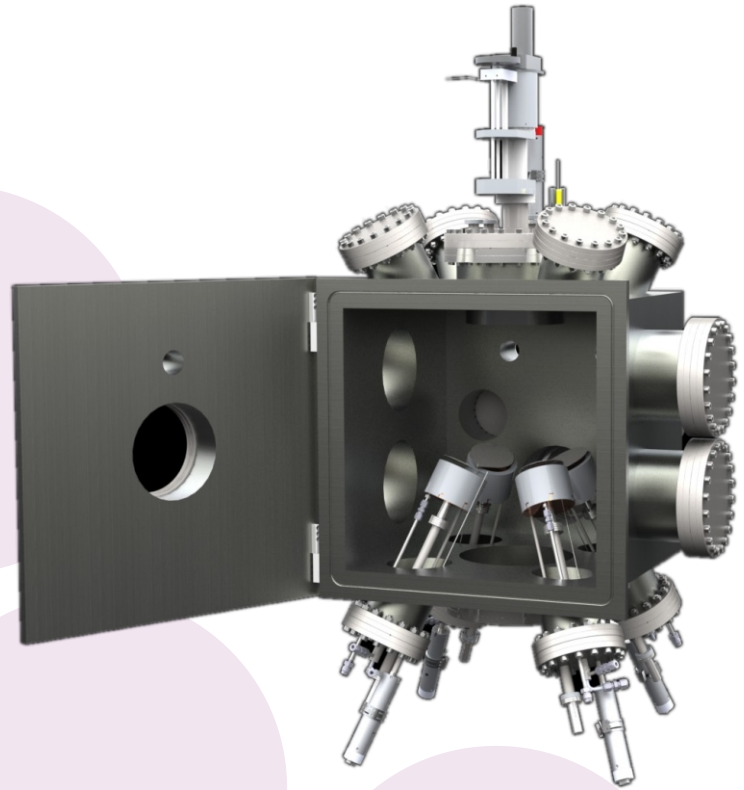


# Qbox400

## Modular Deposition System



### Features

- Front-loading box style chamber
- CF mounting ports for versatility
- Confocal port design for deposition sources
- Analysis, load-lock and view ports
- Multiple sample manipulation options including rotation, heating, cooling, RF bias, and DC bias
- Wide range of pump configurations available
- 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

- Anti-reflection coatings
- Oxide and dielectric materials deposition
- Nanostructured films
- Multilayer deposition processes
- Optical coatings
- Device Metalization
- Nanometer to micrometer film deposition

# Base chamber

## Chamber configuration



The QBox 400 is a high vacuum, front loading box style deposition chamber that is engineered for easy access to all components of the system to provide rapid maintenance and loading cycles. The chamber is outfitted with all conflat flanges for easy instrument integration. All deposition source ports are in a confocal arrangement to optimize deposition uniformity and coverage.

The chamber construction consists of all internal welds. The internal surfaces can be polished to minimize surface area and maximize vacuum performance.

## System evacuation

The QBox 400 is typically outfitted with a 300l/s turbo pump that is backed by a dry scroll pump. This combination allows for the system to maintain a base vacuum of  $2 \times 10^{-7}$  torr. Other pumping configurations are available on request.

A full range gauge is implemented to the deposition system to provide vacuum conditions feedback at all times.

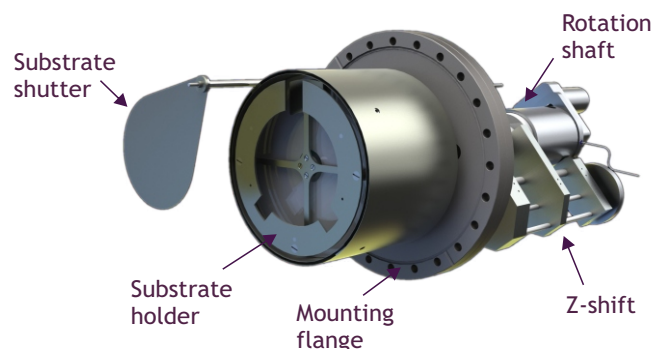
## Sample loading

The QBox400's large access door allows the user to quickly place the substrate on the stage by hand quickly and easily. This feature allows for substrates with abnormal features and shapes as well as multi-sample planetary configurations to be loaded.

An optional sample introduction load-lock can be configured to the deposition chamber. This allows for the base vacuum to be maintained in the growth chamber while a sample is loaded. The load-lock has an isolation gate valve that allows for the load-lock to be vented to atmosphere while the main chamber is still under vacuum. A quick access door allows the user to place the sample upon the magnetically coupled transfer arm. Once the load-lock is sealed and pumped to equal vacuum of the main chamber, the gate valve is opened and the transfer arm brings the sample into position to be mounted to the stage.

## Sample manipulator

The standard sample manipulator handles substrate sizes up to 6 inches in diameter. Options such as substrate heating, cooling, and rotation can be added for enhanced performance. Customized stages for planetary samples and larger sample are available on request.



## Process monitoring

The various analysis ports on the QBox 400 allow for in-situ process monitoring to be performed. A quartz crystal deposition monitor (QCM) is often integrated to the system for calibration purposes. When placed on a linear translator, the QCM can be placed directly below the substrate for calibration, then pulled out of the deposition path during the production process. This increases the life span of the crystal as well as ensuring they will not shadow the deposition.

Other process monitoring tools such as ellipsometry, reflectometry, pyrometry, and residual gas analysis can be utilized in the QBox 400.

## Automation

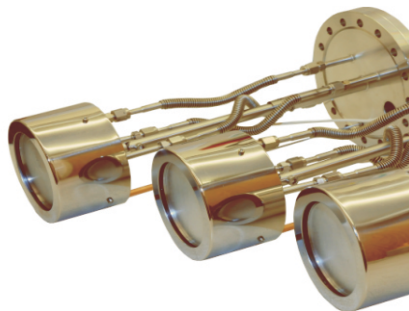
A comprehensive computer automation package is available for the QBox400 deposition system. The Windows based software controls all aspects of the system. The software is pre-programmed with automatic pump down and vent sequences. Recipe driven processes can be implemented for highly repeatable results. Logging features keep track of all process parameters that can be analyzed by the researcher following the process.

# Deposition Sources

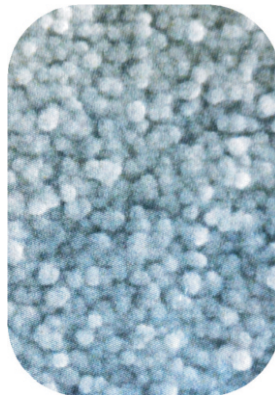
## Sputtering sources

The CUSP series magnetron sputter sources can be mounted to the standard DN100CF flanges located on the base of the QBox400.

Available in 1, 2, or 3 inch target configurations, the CUSP sources are engineered for high performance processing. The all metal construction allows for the sources to be baked as well as ensure the highest quality vacuum. The CUSP sources can be used with both RF and DC power and includes a titlable head option.



## Nanoparticle Deposition



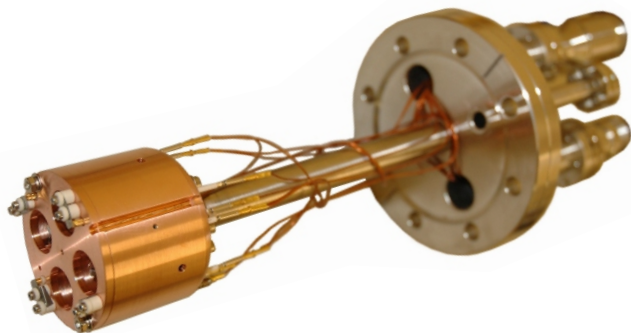
Our **Nanogen** nanoparticle source can be installed on the chamber to allow controlled nanoparticle deposition onto the sample. Nanoparticles can be generated from any metal as well as from many compound materials (oxides, nitrides, carbides...), alloys, and core-shell coated particles.

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

## E-beam Sources

The QUAD-EV series e-beam evaporators can be integrated on the QBox400 system to provide precision deposition of almost any material. Excellent for films with thicknesses of around 200nm or less, the QUAD-EV e-beams include integrate flux monitoring for precision control and real-time feedback control of the source. The QUAD-EV source can be integrated to almost any standard source port.

High power (multi kW) e-beam evaporators can be installed in the QBox400 for high deposition rate application. Single and multipocket sources with be utilized. Beam rastering, rate monitoring, and PID control are available to enhance operational functionality.



## 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.

## Thermal Sources

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

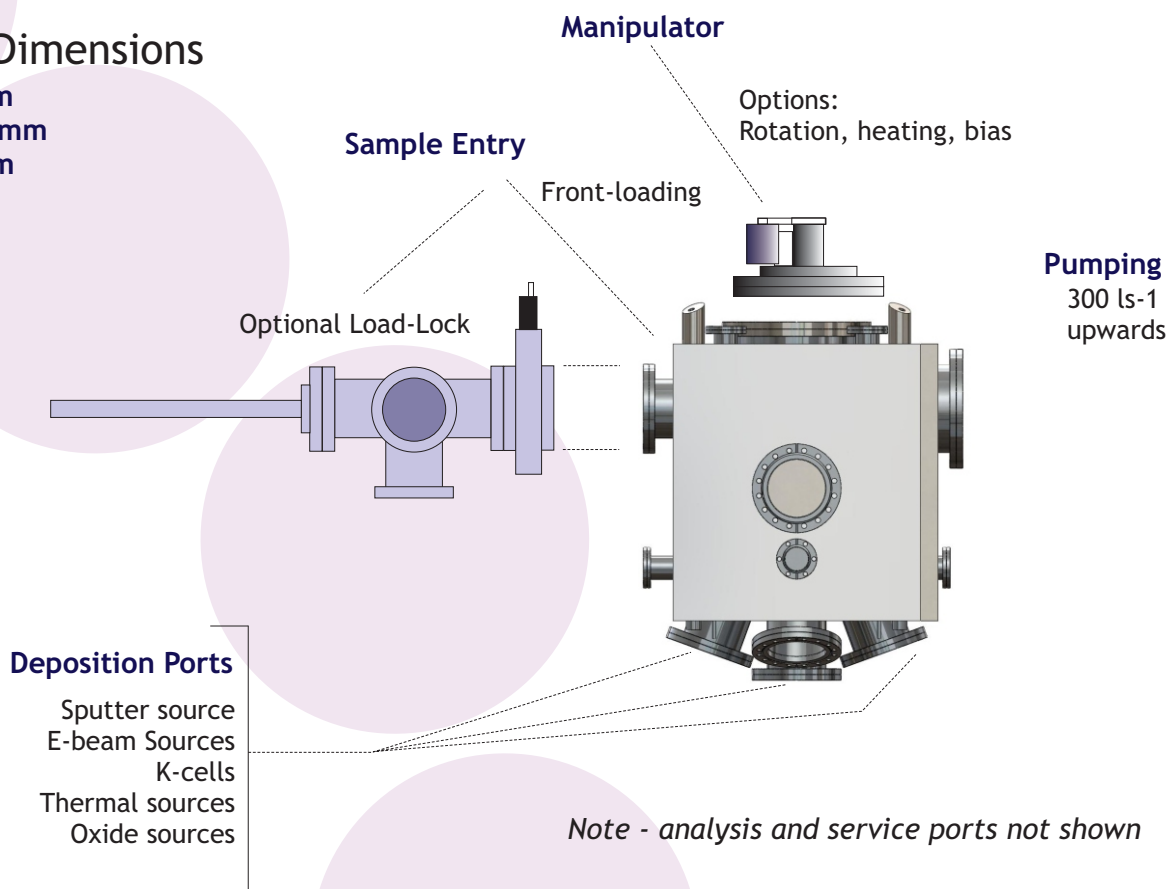
K-cells will fit through standard ports and optional, water-cooled cross-contamination shields can be added around K-cells to improve overall system purity.

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.

# Specifications

## Chamber Dimensions

Width: 400mm  
Height: 450mm  
Depth: 400mm



## Standard Configuration

Top Flange	NW200CF
Side ports	3 x NW100CF, 1 x NW150CF
Deposition ports	5 x NW100CF, 4 x NW35CF
Pumping	300ls <sup>-1</sup> to 1000 ls <sup>-1</sup> options
Sample loading	Front door.
Base Pressure	2 x 10 <sup>-7</sup> (standard)
Frame	Low footprint frame on transport casters

## Options

Manipulator	Rotation, heating, bias
Sample Entry	Load-Lock
Sample size	1", 2", 3", 4", 6"
Film monitoring	QCM, Ellipsometry
Pumping	Cryopump
Automation	Full recipe-driven process automation



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