



VACGEN

www.vacgen.com



PRODUCT OVERVIEW

Material Science
Surface Analysis

PRODUCT OVERVIEW

Material Science Surface Analysis

Engineered Solutions for Vacuum Technology.

Material science is an interdisciplinary subject, spanning the physics and chemistry of matter, engineering applications and industrial manufacturing processes. Vacuum technology is fundamental to the characterisation and qualification of new materials.

VACGEN are an ISO9001:2015 Certified Quality Management System supplier and have over 50 years experience in supplying ultra-high vacuum components, manipulation systems and vacuum chambers to the material science industry.



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X-Ray Photoemission Spectroscopy XPS

Analysis Equipment XPS/ARPES/PES

Secondary Ion Mass Spectroscopy SIMS

Electron Microscopy EM

Scanning Tunneling Microscopy STM

Atomic Force Microscopy AFM

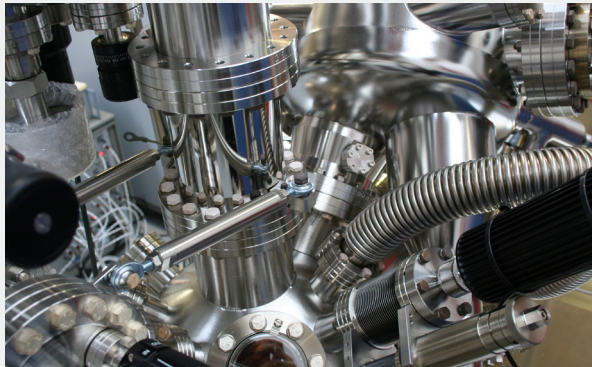
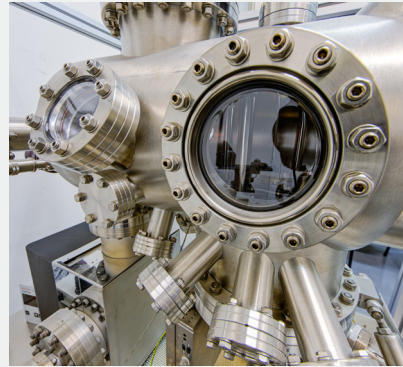
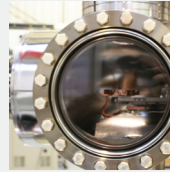
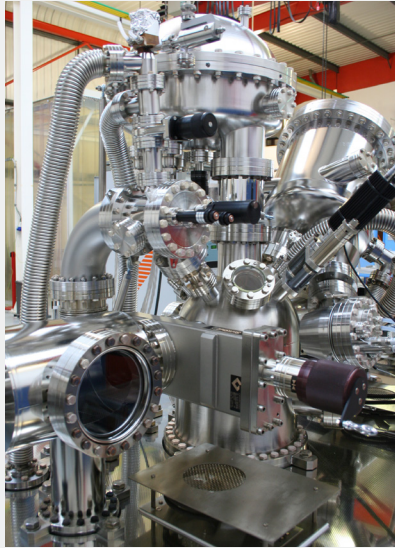
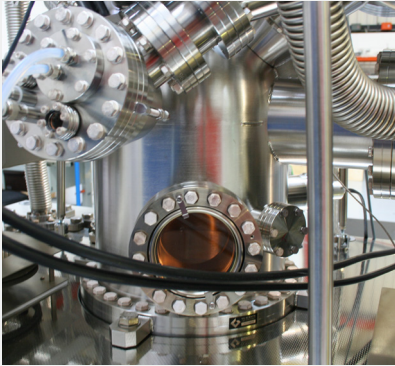
Synchrotron Components

Vacuum Chambers

Sample Manipulation

Transfer Devices

Valves





About Us

Since 1964, VACGEN (VG) has been the name synonymous with high quality ultra high vacuum products and services. From the manufacture of the first UHV valve to some of the most advanced vacuum research systems built, over 50 years in the research and scientific industry has given us an incredible grounding in the needs of our customers, how we can support new projects through the design phase, delivered product and ongoing support.

VACGEN remains the partner of choice for the next generation of researchers, innovators and builders. From our UK high tech manufacturing base, our focus is on delivering enabling technologies and supporting our customers across industry and academia.

UKAS and BSI ISO 9001:2015 Certified.

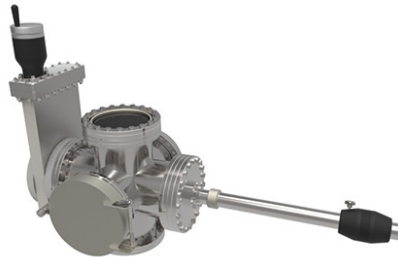
Applications

Surface Analysis

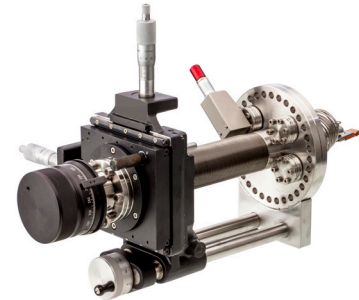
There are various applications which fit under the Surface Analysis umbrella, including Photoemission Spectroscopy, Mass Spectrometry and Electron Microscopy. These applications require different vacuum system components due to the nature of their set up.



Analysis Chambers



Load Lock & Transfer Systems



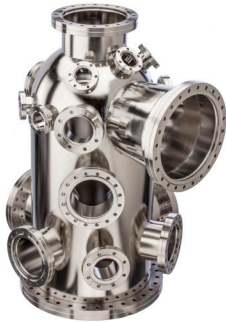
Sample Manipulation

Applications & Product Examples					
XPS X-Ray Photoemission Spectroscopy	SIMS Secondary Ion-Mass Spectrometry	EM Electron Microscopy	STM Scanning Tunnelling Microscopy	AFM Atomic Force Microscopy	Synchrotron
Analysis Chamber	Detector Chamber	Electron Gun	Analysis Chamber	Sample Stages	Beamline Adjuster
Preparation Chamber	Mass Analyser Assembly	Electron Lens Assembly	Preparation Chamber	Detector Assembly	Beamline End Stations
Monochromatic X-Ray Source	Ion Source & Detector Assembly	Detector Assemblies	Sample Manipulation	Analysis and Detector Chamber	Sample Manipulation
Electron Lens Assembly	Sample Stages	Sample Stages	Sample Stages	Transfer Devices	Beam Chopper Blades
Hemispherical Electron Energy Analyser	All-Metal Right Angle Valves	Sample Manipulation Systems	Wobble Sticks Transfer Devices Linear Drives	Sample Manipulation Systems	Analysis Chamber Lens Chamber
Sample Manipulation	Flight Tubes	Vacuum Chambers	Valves	Vibrational & Acoustical Isolation	Transfer Devices Rotary Drives

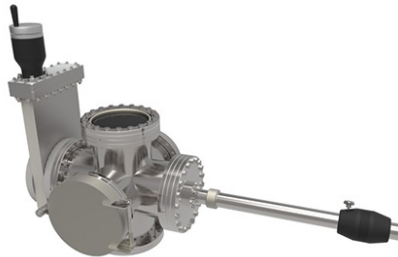
Product Overview

Surface Analysis

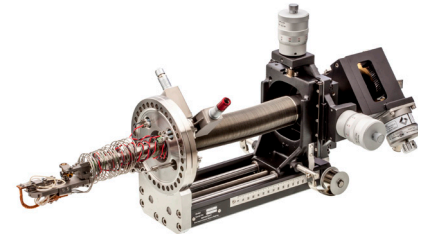
Surface analysis techniques provide valuable insights into the surface morphology, chemical composition, elemental distribution, and other surface-related properties. The development of new materials is key to an advancing world and vacuum systems are a core technology required for these advancements.



Vacuum Chambers



Load Lock & Transfer Systems

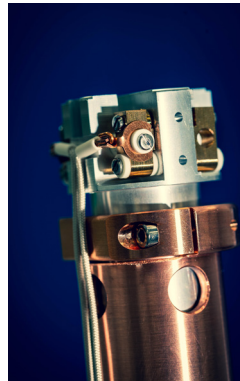


Sample Manipulation

Vacuum technology is fundamental to the characterisation and qualification of new materials. Vacuum systems comprise of multiple key components including vacuum chambers, sample manipulators, multiple transfer or transport devices, analysis equipment, valves and more.



Transfer Devices



Anode Assemblies



Valves

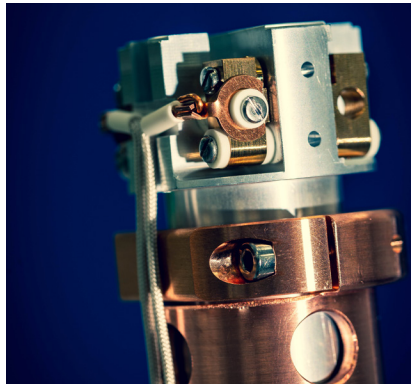
XPS

X-Ray Photoemission Spectroscopy

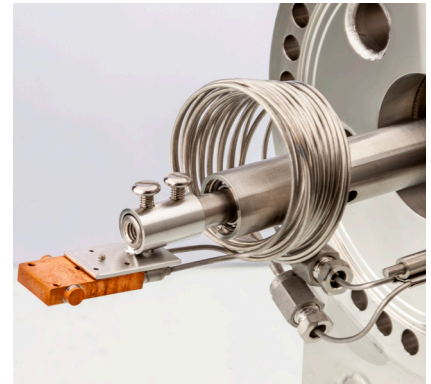
X-ray Photoelectron Spectroscopy (XPS), is a surface-sensitive analytical technique used to determine the elemental composition, chemical state, and electronic state of the elements present on the surface of a material. We manufacture and supply quality UHV components for OEM vacuum system builders.



Analysis Chamber



Anode Assemblies



Sample Manipulation

COMPONENT EXAMPLE

XPS

Analysis Chambers - Mu Metal or SS 316LN

Preparation Chambers

Fast Entry Load Locks

Valves

Anode Assemblies

Electron Lens Assembly

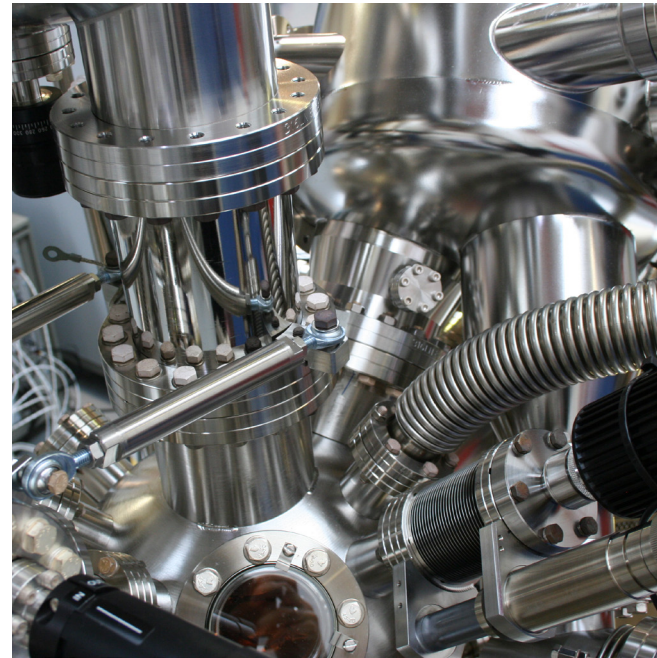
Sample Manipulation

Transfer Devices

Analytical Equipment

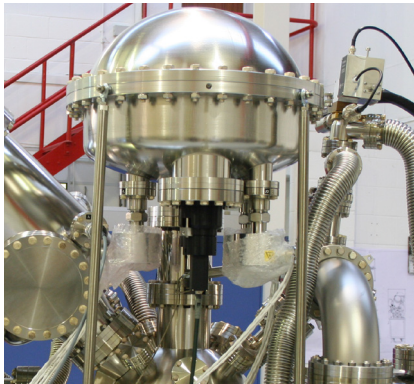
Monochromator Assembly

Crystal Rotation Assembly

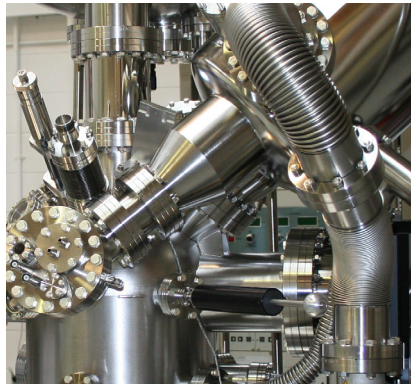


Analysis Equipment

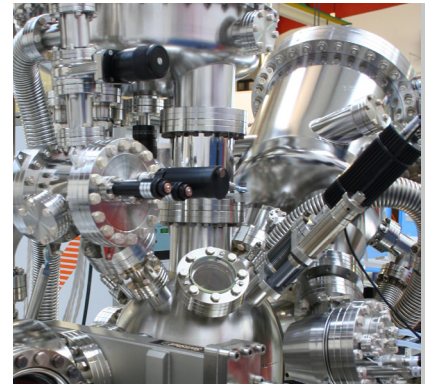
VACGEN have a rich history in manufacturing instrumentation for surface science applications including XPS and ARPES vacuum components and chambers. Our in-depth knowledge of analysis equipment ensures we manufacture your components to the highest standards.



Hemispheres and Tank Covers



Lens Chambers



Baseplate Assemblies

COMPONENT EXAMPLE

Analysis Equipment

Analysis Chamber with Liners

Monochromatic X-Ray Source

Electron Lens Assembly

Hemispherical Electron Energy Analyser

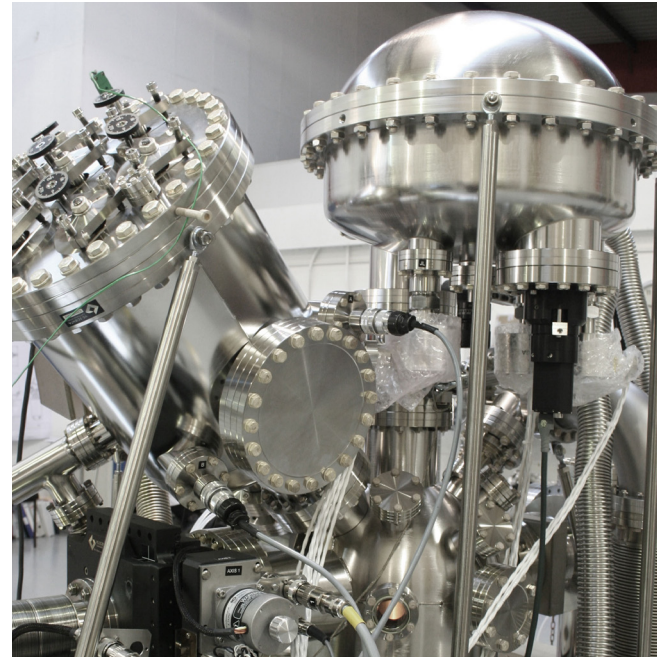
Tank Cover Assembly

Base Plate Assembly

Baseplate and Lens Chambers

Crystal Rotation Assembly

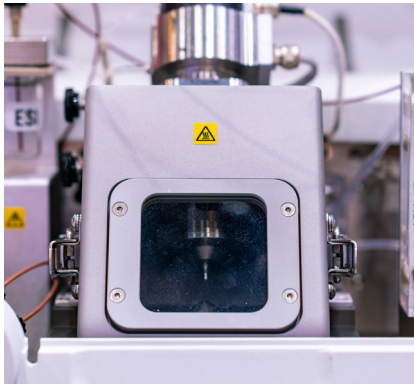
Monochromatic Source Chamber



SIMS

Secondary Ion Mass Spectrometry

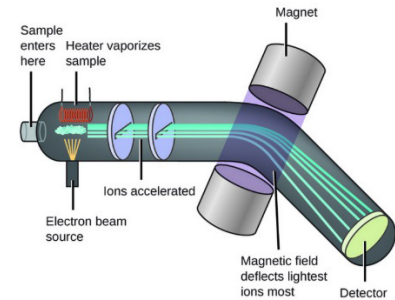
Mass spectrometers are essential tools within material analysis vacuum systems, enabling researchers to analyse the composition of materials at the molecular level. In a vacuum environment, these instruments can accurately determine the mass-to-charge ratio of ions generated from the sample, providing valuable insights into the elemental composition and molecular structure of materials.



Detector Chambers



All-Metal Right Angle Valves



Flight Tubes

COMPONENT EXAMPLE

SIMS

Detector Chamber

Ion Source

Source Chamber

Mass Analyser Assembly

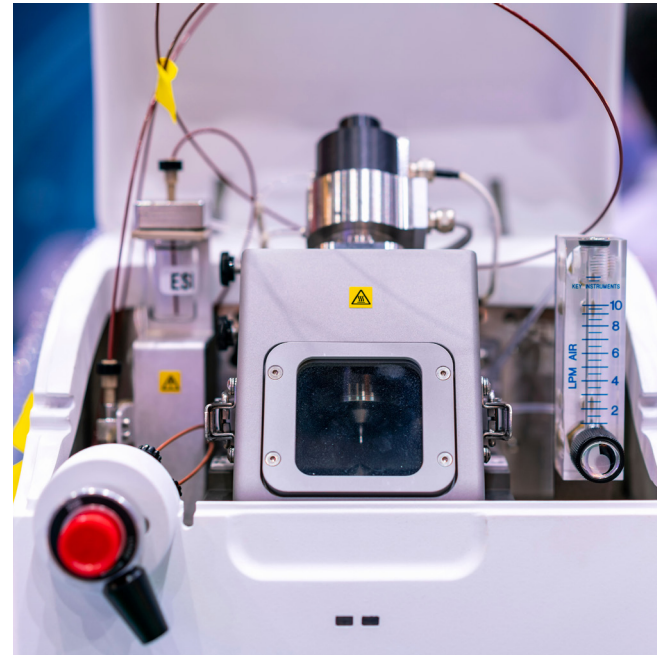
Ion Detector Assembly

Flight Tubes

Vacuum Gauges

Sample Stages

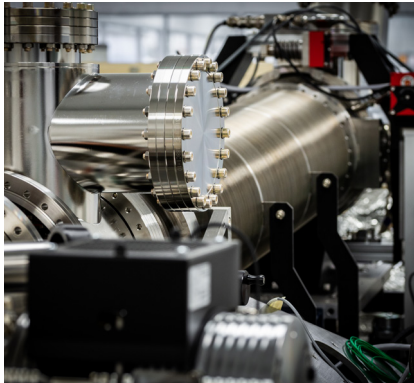
All-Metal Right Angle Valves



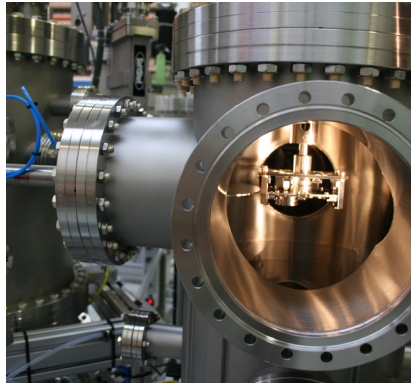
EM

Electron Microscopy

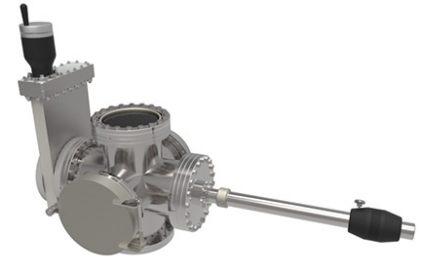
Electron microscopy is a powerful imaging technique that uses electron beams instead of light to magnify and resolve structures at the nanoscale. This technique has become indispensable in various scientific and industrial fields, including materials science, biology, and the semiconductor industry.



Manipulator to move an Electron Beam Column



Sample Stages



Load Lock Chamber

COMPONENT EXAMPLE

EM

Metrology Equipment for the Semiconductor Industry

Custom Bore Manipulator System for Moving an Electron Beam Column

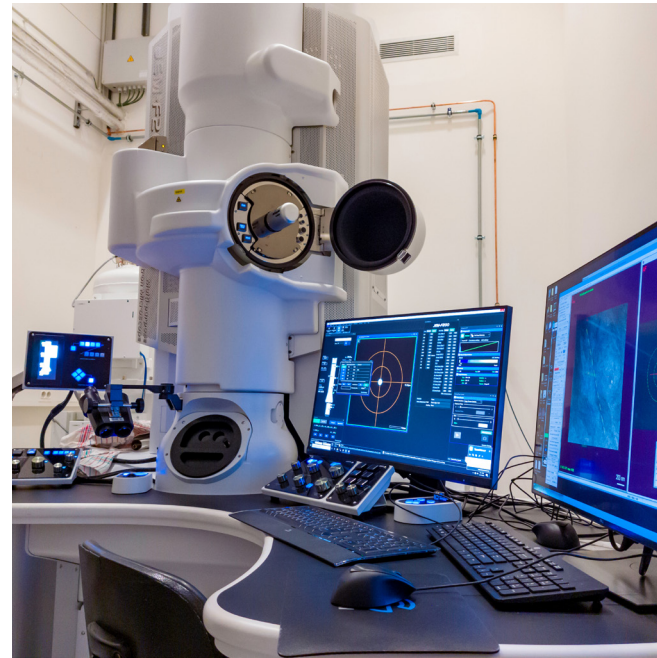
Electron Gun

Electron Lens Assemblies

Sample Stages

Vacuum Chambers

Detector Assemblies



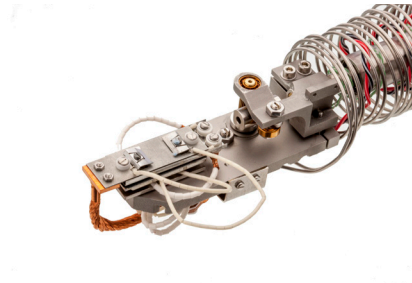
STM

Scanning Tunnelling Microscopy

Scanning tunnelling microscopy has been widely applied in research and manufacturing in fields spanning from biology to material science to microelectronics. It can be used to image topography, measure surface properties, manipulate surface structures, and to initiate surface reactions.



Analysis Chamber



Sample Stages



Wobble Sticks

COMPONENT EXAMPLE

STM

Analysis Chamber

Sample Manipulation

Sample Stages including Bias

Transfer Devices

Gate Valves

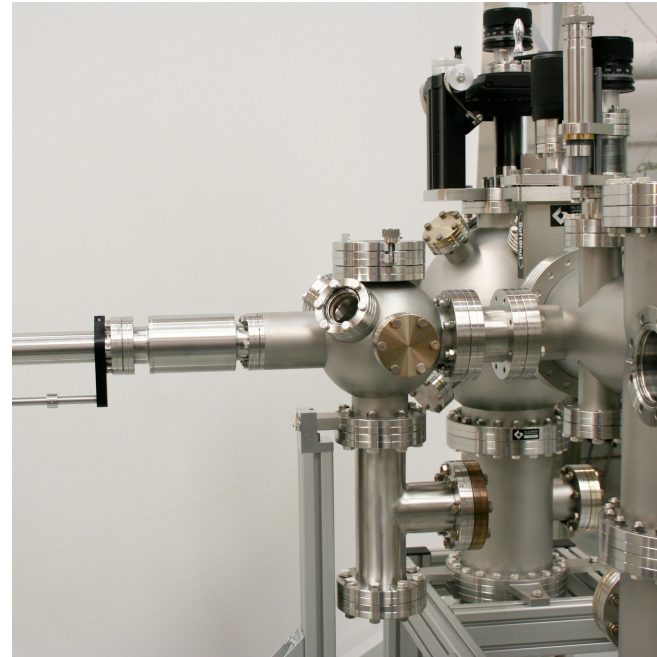
Wobble Sticks

Linear Drives

Rotary Drives

Viewports

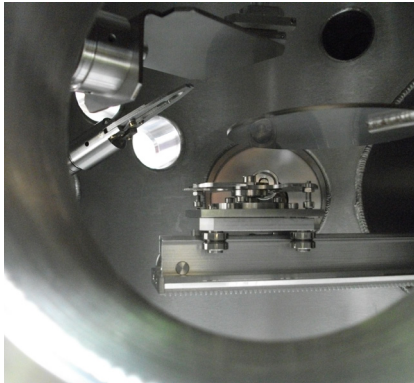
Valves



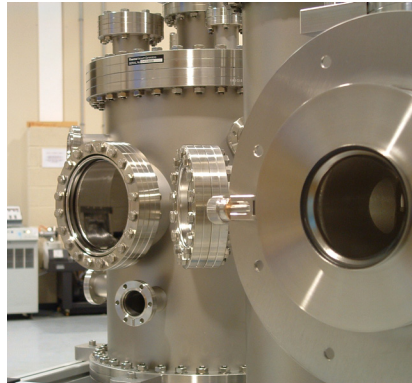
AFM

Atomic Force Microscopy

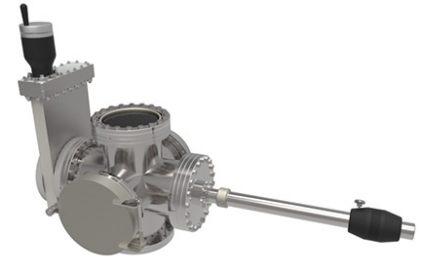
AFM is used for high-resolution imaging of surfaces at the atomic level. It measures forces between a probe tip and the sample surface, enabling the creation of detailed topographic maps. AFM provides magnification in 3D form, highlighting the height of features as well as width and depth.



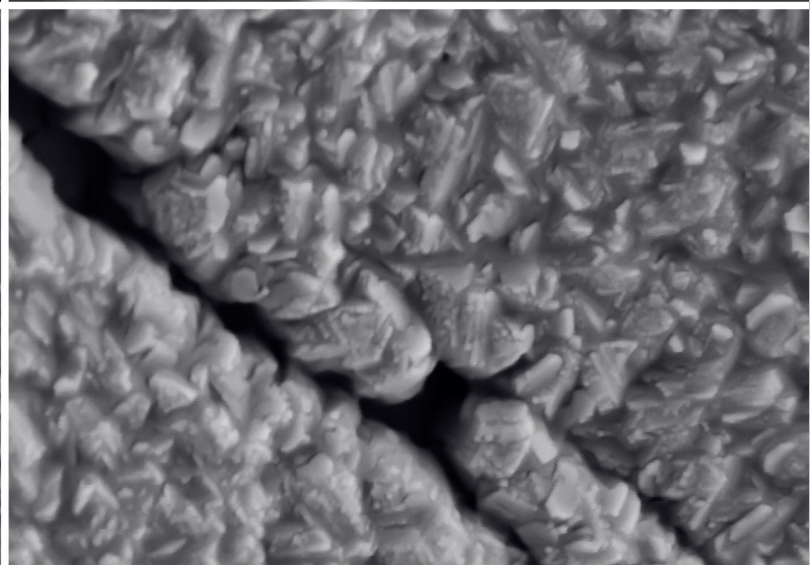
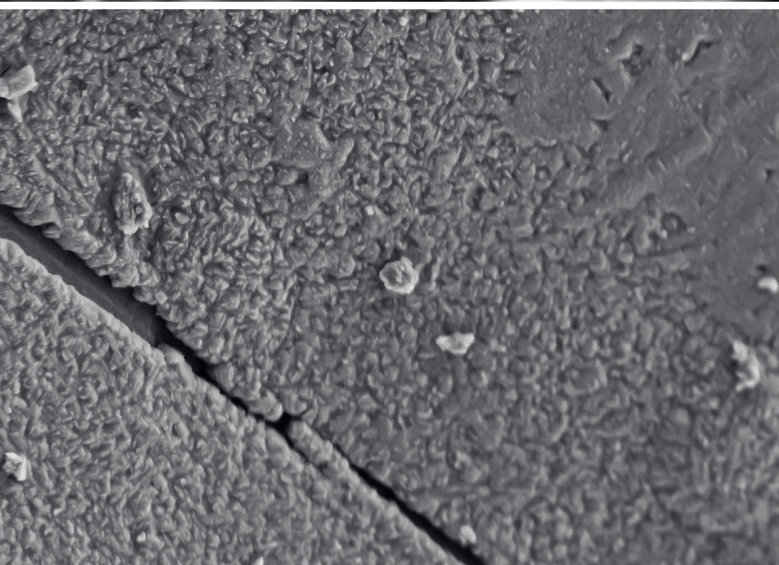
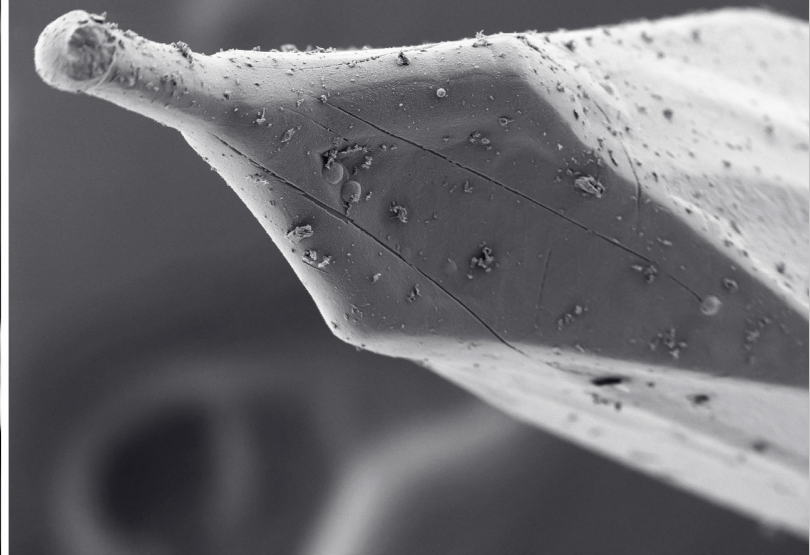
Sample Stages



Vacuum Chambers

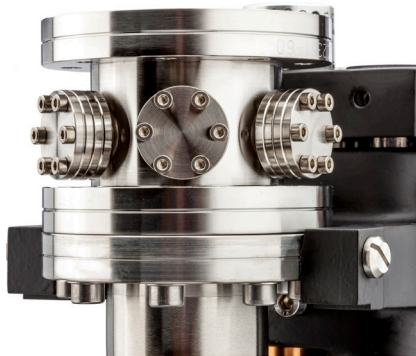


Load Lock & Transfer Systems

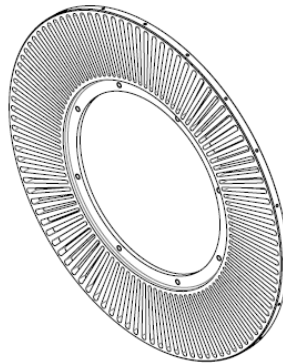


Synchrotron Components

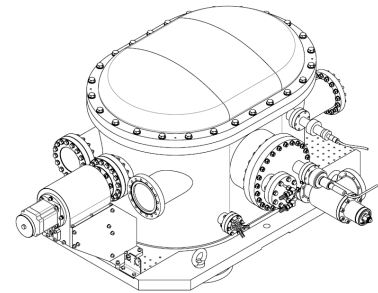
Synchrotron science involves the use of synchrotron radiation, which is produced when charged particles, typically electrons, are accelerated to nearly the speed of light in a circular or spiral path by strong magnetic fields. Vacuum technology is central to many of these experiments, ensuring the most accurate results for the beam line users and their applications.



Omniax Sample Manipulator



Beam Chopper Blades



Beam Chopper Chamber

MATERIAL SCIENCE EXAMPLES

Synchrotron

Beamline End Stations

Fast-Entry Load Lock Systems

Sample Manipulators

Beamline Adjuster

Beam Chopper Blades

Beam Chopper Chamber

Analysis Chambers

Lens Chambers

Ultra-High Vacuum Components

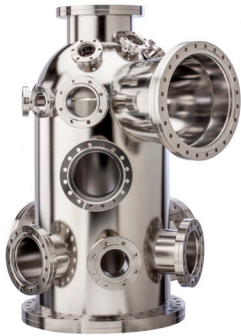
All-Metal Valves

Transfer Devices



Vacuum Chambers

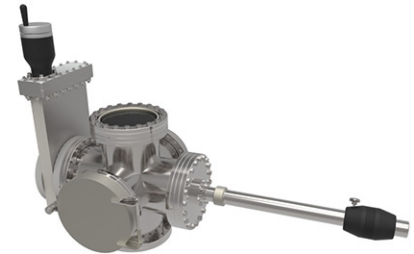
We supply bespoke ultra-high vacuum chamber manufactured to customer specifications. A project engineer will oversee the build, from design through to completion and will begin by discussing your chamber application. Typical applications include analysis chambers, preparation chambers, transfer and load lock.



Analysis Chamber



Preparation Chamber



Load Lock Chamber

GENERAL COMPETENCIES

Vacuum Chambers

Phi & Theta Angles $\pm 0.5^\circ$

Port Length, General $\pm 1\text{mm}$

Analyser Port Only $\pm 0.5\text{mm}$

General Tolerance R2.0mm

500Kg Mass Maximum

700x700x1000mm Maximum

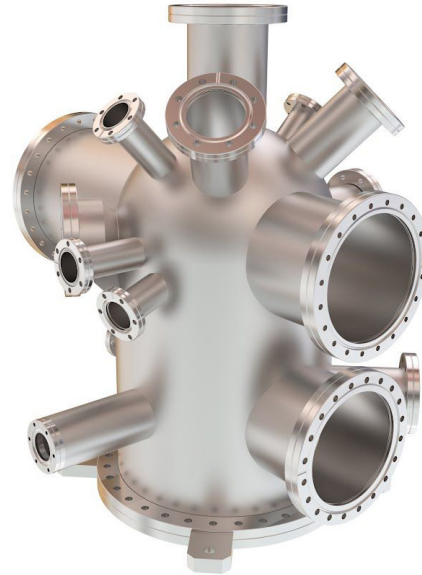
Stainless Steel 316L & 304L

Mu-Metal

Aluminium

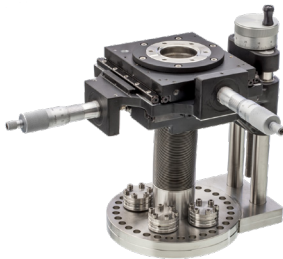
Leak Rate 2×10^{-10} mbar ls^{-1}

All tolerances can be improved dependant on customer drawing and machining methods used.



Sample Manipulation

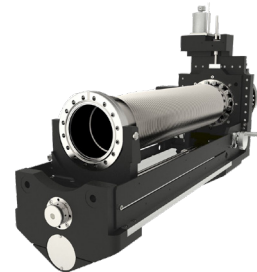
Our extensive range of customised Ultra High Vacuum (UHV) sample manipulators are designed specifically for vacuum systems. Precision movement and positioning of samples and substrates within a vacuum system is an essential process in material analysis. 5-axis complex manipulation manufactured and assembled to OEM requirements.



MiniMax - Sample Storage



Triax - Sample Analysis



OmniMax Widebore - Cryostat Applications

EXAMPLE SPECIFICATION

Sample Manipulation

1 μm Stability

$\pm 25\text{mm}$ X & Y Travel

100 - 1000mm Z Travel

32 or 54mm Support Tube

5 Axis Complex Manipulation

Any Mounting Orientation

Designed for Primary/Secondary Rotation

Compatible with Sample Holders

Liquid Nitrogen Cooling

EBH, PBN & HST Heating Modules

High Load Capacity >20Kg



Transfer Devices

UHV transfer devices are designed to transport a sample or instrumentation over long travel distances. Depending on application you may want to choose a magnetically coupled transfer device, a non-magnetic rack & pinion transfer device or a bi-directional transfer system. Custom transfer devices can be engineered and built to OEM specifications.



Magnetic Transfer



Non-Magnetic Transfer



Bi-Directional Transfer



Valves

We supply a comprehensive range of ultra-high vacuum (UHV) valves, from fully bakeable all-metal right angle valves for true UHV applications, to ultra-fine controllable leak valves, designed with fine pressure control for extremely low hysteresis.



All-Metal Right Angle Valves



All-Metal Leak Valves



Gate Valves

SPECIFICATION

Valves

All-Metal Right Angle Valves

All-Metal Leak Valves

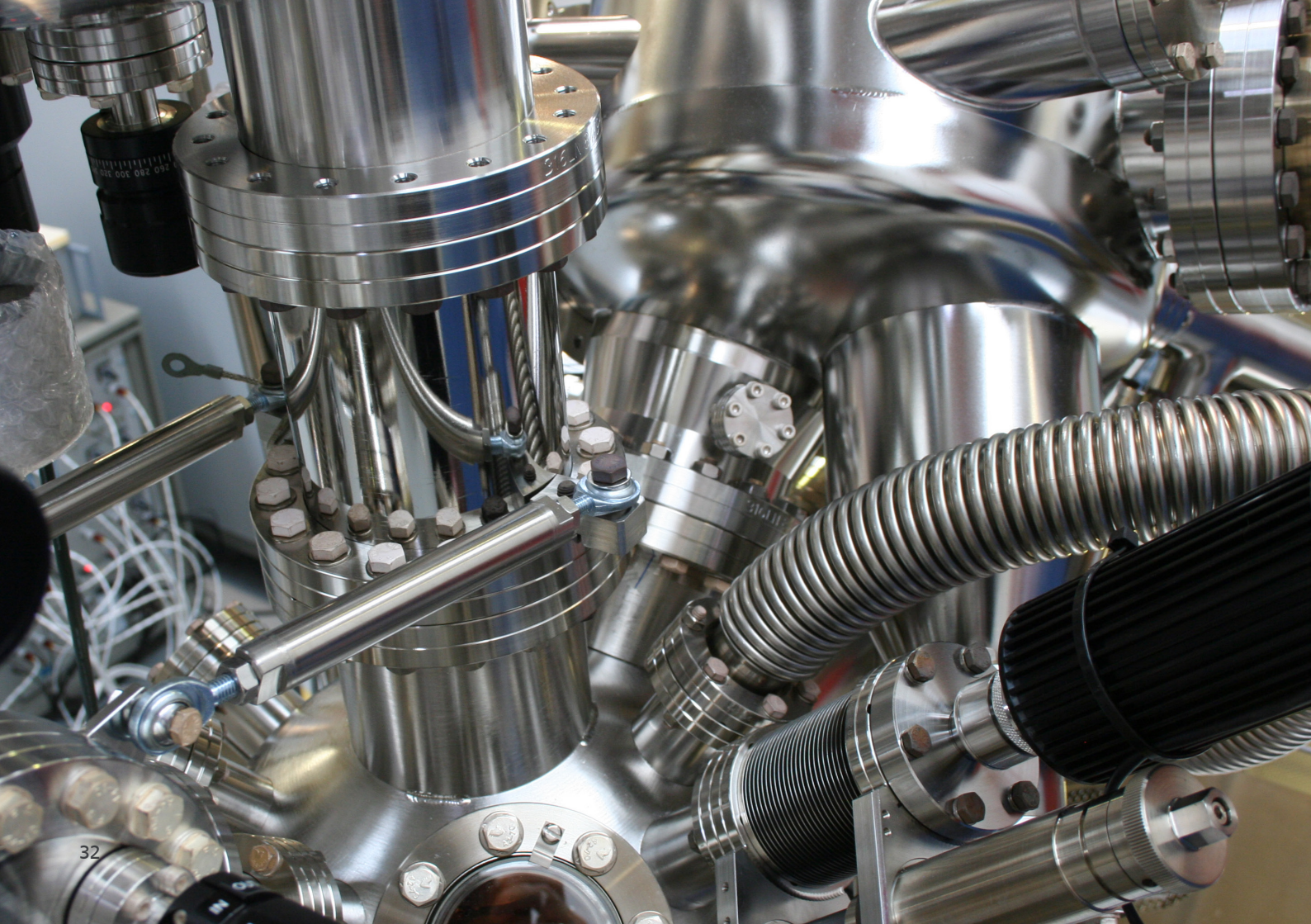
UHV Gate Valves with Internal Alignment
for Laser Alignment

Insertable Gate Valves Mechanisms for
Direct Integration with Vacuum Chamber

HV Gate Valves with Carriage End Baffle
Designed to Shield Internal Mechanism

Pressure Control Gate Valve with Gearbox
& Motor Assembly





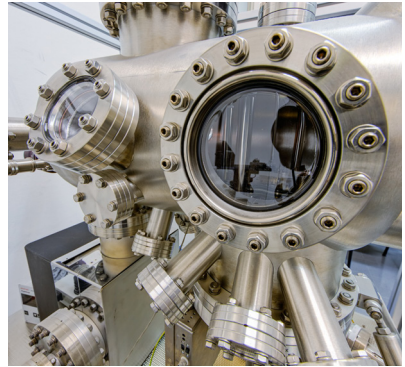
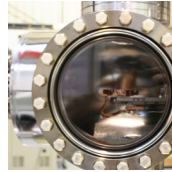
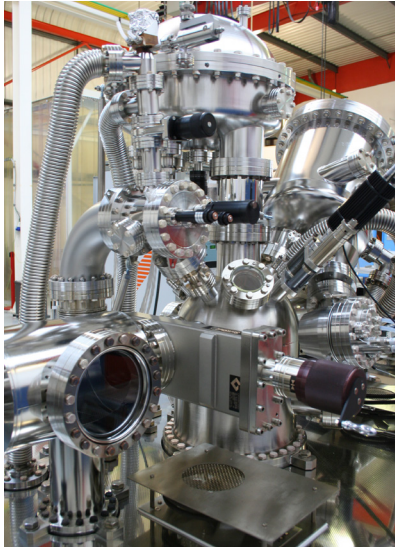
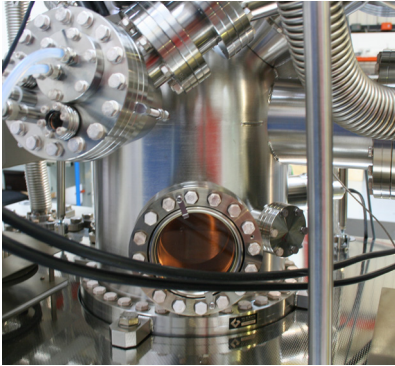
The Value of Partnership

In a high technology business, you have to be confident in the partners you choose to provide mission critical technology, equipment and services. You need to know that your partners can deliver and support what you need, when you need it. As your business grows and develops your need to work with partners that can support that growth. That's where we come in.

We're a fully-fledged UHV equipment manufacturer. At our factory in the UK we exploit extensive engineering resources to take raw materials right through the entire manufacturing workflow, producing finished UHV components, everything happens here.

Our in house design and development functions are world class, and production is supported by extensive CNC machining resources feeding a large clean room assembly area. We can react quickly with significant resources as needed. We take pride in being an agile responsive business. We've recently invested in new machining centers to improve our capacity and improve our lead times for OEMs.

Owning our product lifecycle ensures unparalleled control of quality, and gives us a deep understanding of each and every one of our products, from the simplest component through to the most complex assembly. We understand how they perform and interact across a host of applications and within numerous environments.



Contact Us

VACGEN LTD

Unit A, Swallow Business Park
Diamond Drive
Lower Dicker
Hailsham
East Sussex
BN27 4EL

Website: www.vacgen.com

General Enquiries: sales@vacgen.com



VACGEN

www.vacgen.com