

Custom Vacuum Technology for Analytical Instruments

Expert engineering, custom manufacturing and focused project management for precision machined components

Introduction

Analytical instruments are relied upon for leading edge research in high technology and life sciences fields where the ability to properly characterize complex samples is critical. Scientific instruments that quantify, qualify and analyze materials are becoming highly complex, requiring increased speed, precision, automation, and repeatability.

Technologies such as Mass Spectrometry and Atomic/Molecular Spectroscopy are the workhorse of the analytical world and today's instruments are much more robust, predominantly software-controlled and data intensive. Manufacturers of leading edge analytical instruments spend a significant amount of time on new designs and prototypes, requiring precision engineered components and vacuum chambers which are critical for correct operation and performance. Utmost care must be taken to ensure that various machining processes do not affect the final product performance. Any imperfections in machining could make the system susceptible to failure.

MKS Custom Vacuum Solutions provide superior, precision engineering and manufacture

of machined components and electro-mechanical assemblies.

- Rapid advances in analytical instrumentation require highly complex products and platforms for new scientific applications.
- Increasing demand challenges manufacturing to maintain production yield.

New Challenges in Precision Machining



The Analytical Instrumentation industry has become more competitive, with increased focus on product innovation and quality improvements while reducing costs and increasing throughput. This introduces unique challenges in instrument design and the manufacture of precision components and vacuum chambers.

Some of the key challenges include:

- Increased complexity of precision engineering and manufacturing
- Maintaining very high accuracy while machining: no vibrations or movements in the machining process
- Ensuring weld quality with no sharp edges, cracking, tearing or undercutting
- Ultraclean components with zero defect tolerance
- Extremely reliable pressure and vacuum measurement for Ultra-High Vacuum (UHV)

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MKS Solutions

MKS specializes in the manufacture of precision machined components and electromechanical assemblies to UHV standards. MKS collaborates with R&D scientists and engineers to ensure manufacturability and quality of the design. MKS works together with the customer to establish joint project teams to drive design of complex, high level assemblies. This close relationship provides on-time delivery, increased yield and cost savings to the manufacturer.



For example, when an industry leading manufacturer of research grade MALDI TOF/TOF mass spectrometers— one of the most powerful tools in mass spectrometry— found they were experiencing significant production delays and yield issues, they turned to MKS Custom Vacuum Solutions. MKS engineers

and technicians worked with the customer to design and manufacture the complex assembly, generating test requirements, installation of a designated assembly area and test rig for the high quality precision components. The project involved complex component manufacturing, supply chain management for parts sourcing, critical high level fabrication as well as tests to customer specification. MKS delivered the assemblies on-time and to plan resulting in immediate yield improvement of more than 10% and cost saving of 8%.



Rapid advances in Analytical Instrumentation require highly complex products and platforms for new scientific applications. MKS Custom Vacuum Solutions specializes in precision engineering and custom subcontract manufacture of machined components and electro-mechanical assemblies.

MKS provides the experience, engineering proficiency, manufacturing capability and capacity to successfully address these challenges to Ultra High Vacuum (UHV) standards.



Recent subcontract manufacturing projects include UHV vacuum chambers, vessel and housing fabrication, assembly of vacuum systems and vacuum subsystems, and building complete scientific and analytical instruments. MKS facilities support precision engineering, clean assembly

and testing, including a 3,200 square foot, Class 10000 (ISO7) clean room in a 42,000 square foot state-of-the-art factory. We are staffed by engineers experienced in the special demands of high vacuum manufacturing, clean room assembly and scientific/analytical instrumentation testing.

MKS Instruments, Inc. is a leading global provider of technologies and solutions that enable and improve the performance of analytical instruments. MKS also provides a broad range of analytical subsystems and instruments essential for research, development and quality control in a variety of laboratory and process applications. Our precision solutions include residual gas analyzers, FTIR gas analyzers, mass flow controllers, pressure and vacuum measurement and control, as well as custom engineered solutions such as vacuum chambers and effluent management systems. Our data analytics solutions include software for design of experiments, multivariate analysis, modeling and data visualization.