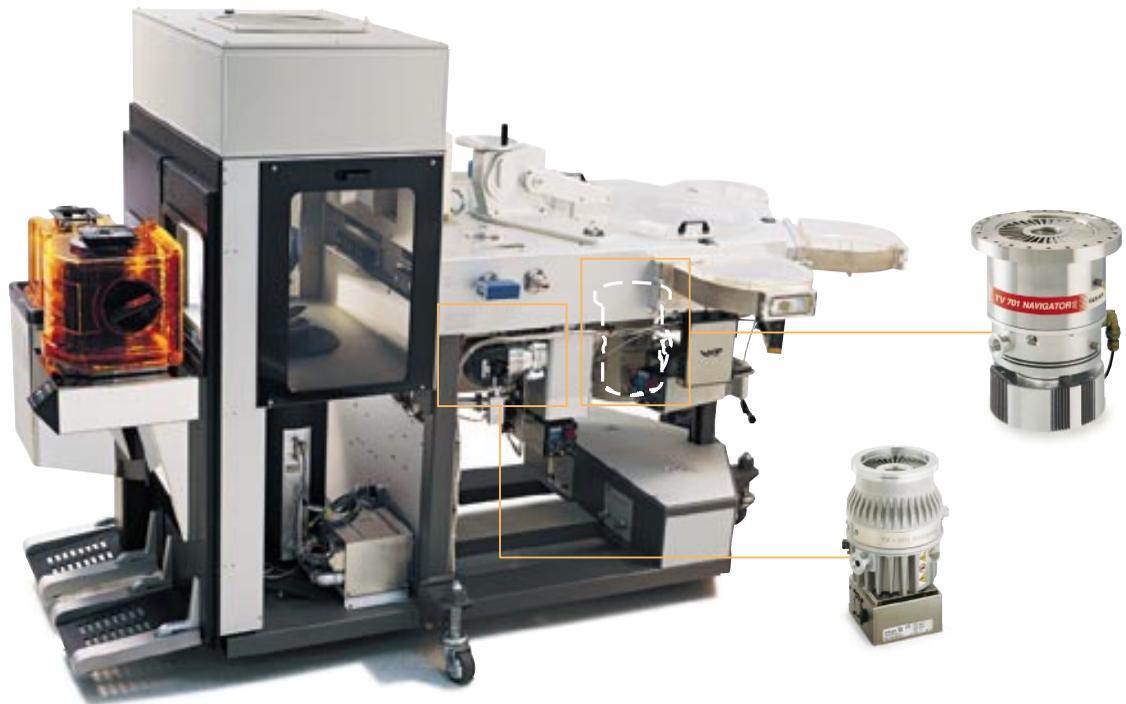


Turbo-V Pump Typical Applications



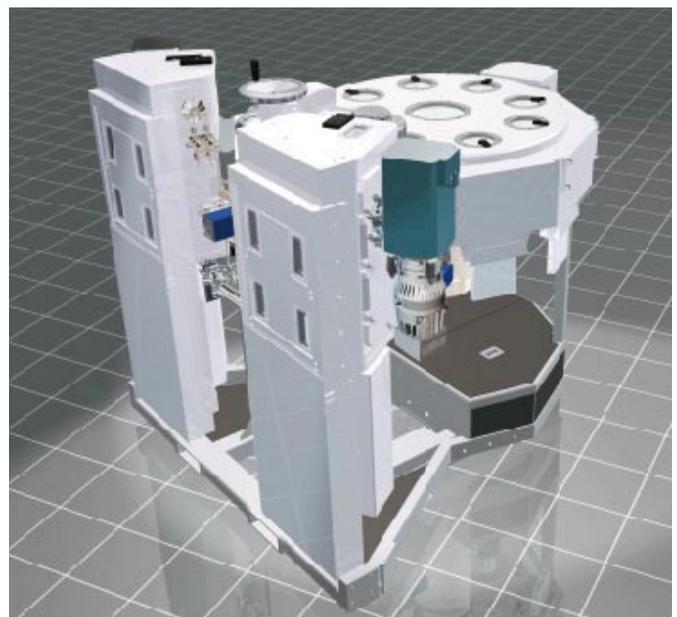
Semiconductors

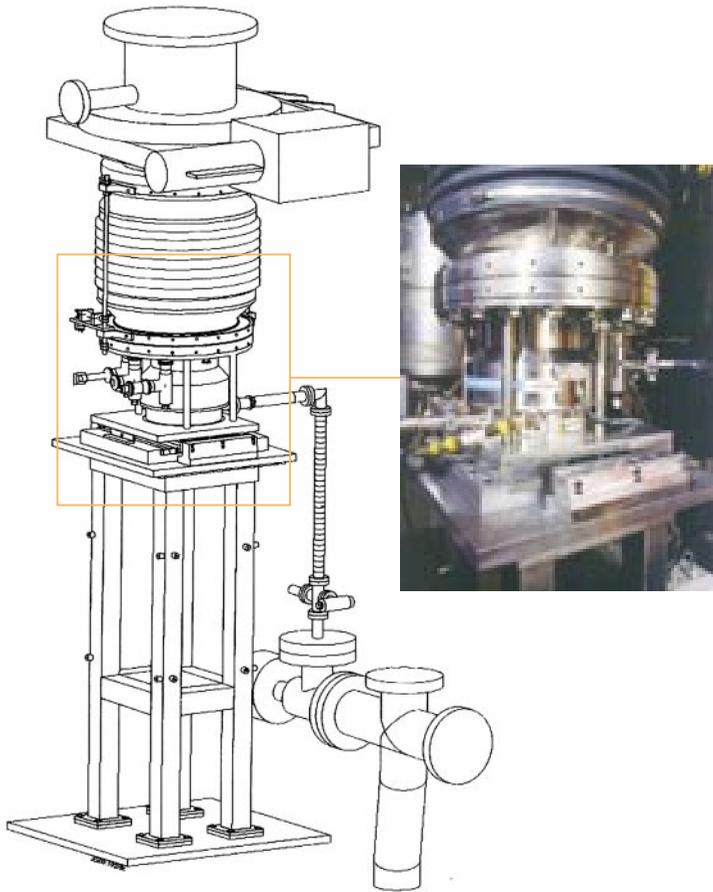
The turbo pump is the critical element in the creation of an appropriate environment in the world of semiconductor manufacturing. In fact, as semiconductor chip geometries continue to shrink, the reliance on turbo pump technology is the highest it has been in the history of semiconductor manufacturing. Varian's turbo pumps provide unique and critical advantages in the creation of vacuum for the manufacture of semiconductor devices. Varian's rich history of innovations includes the pioneering of thermally stable ceramic bearings in place of stainless steel bearings, and the development of MacroTorr® turbo stages, among others.

The use of ceramic bearing technology allows Varian to run its turbo pumps at the one of the highest rotational speeds in the industry, providing high pumping speed for light gases like helium and hydrogen, which are frequently liberated in the production of semiconductors. Since pumping speed is directly related to rotational speed, our turbo pumps provide improved pumping speed in a more compact package.

Another critical innovation by Varian in the world of turbo pumps has been the introduction of the monolithic rotor in conjunction with MacroTorr® turbo stages. These two additions provide the turbo pump with the ability to meet demanding rapid cycle applications, such as vacuum load locks, in which high gas-load cycling and

high tolerable foreline pressures are critical to the success of the process. Varian's turbo pump capabilities are unique, and the most advanced in the industry, allowing the user to share a single roughing pump across multiple turbo pumps, thus reducing costs and improving tool reliability by reducing the number of dynamic systems within the process tool.





High Energy Physics and Research Laboratories

Turbomolecular pumps are widely used in High Energy Physics, Fusion Technology and general UHV research. Synchrotron Light Sources, Particle Accelerator Rings, UHV Laboratory research, and Fusion reactors need extremely clean, reliable and cost effective HV and UHV.

Maintenance-free pumps are specifically required, because most pumps are not easily accessible.

Varian Turbo-V pumps are designed to offer unmatched reliability, performance and cleanliness for these applications. Ceramic bearing pumps, thanks to their reduced rolling friction, low stress and high thermal stability compared to conventional bearings, deliver longer operating life.

Ultra low vapor pressure solid lubricant eliminates the need for maintenance and assures clean operation under any operating conditions.

Furthermore, in contrast to most of the other pumps, all Varian Turbo-V pumps have both the upper and the lower bearing in the rough vacuum side and not exposed to UHV, further reducing the possibility of contamination - even in case of misuse.

The patented MacroTorr® stages provide the highest speed and compression ratio in the smallest footprint; furthermore all the Turbo-V pumps can truly be mounted in any orientation, from vertical to horizontal to upside down, aiding

system design in the most stringent space requirements. MacroTorr® Turbo Pumps can operate at higher foreline pressures, allowing the use of diaphragm roughing pumps, thus providing a completely clean, oil-free compact and cost effective pumping package.

Whenever a large amount of gas has to be pumped and higher throughput is needed, the combination of Turbo-V pumps and TriScroll® dry pumps is the state-of-the-art solution. All the Turbo-V Navigator pumps have the option of an on board controller, allowing easy plug and pump operation, or a rack-mounted controller for applications where the electronics need to be remotely placed (i.e. radioactive environments).

Analytical Instrumentation

Electron Microscopy (SEM, TEM), Focused Ion-beam Systems (FIB) and Surface Analysis

Modern focused-beam systems such as SEM's, TEM's and FIB's utilize columns that project electrons or ions onto microscopic samples for detailed analysis. End users analyze all types of substances from organic compounds to semiconductor wafers. In the Semiconductor industry, in particular, they require more sensitivity for better sample resolution. Another key requirement is high sample throughput in order to lower the cost of ownership of these instruments.

Based on these requirements, the demand for high performance vacuum pumps is greater than ever. Varian offers a full range of high and ultra-high vacuum pumps designed especially for the demanding requirements of SEM's, TEM's and surface analysis systems (Varian has a full range of ion pumps, which are key products for this application; please see ion pump section).

Turbo molecular pumps are also a key component in modern focused-beam systems because they offer fast, oil-free air evacuation of large sample chambers (oil-free operation is a key requirement of many modern analysis applications such as semiconductor manufacturing). From Varian's full range of turbo pumps, the focused-beam system designer can choose a pump size that offers the best chamber evacuation time with the best cost of ownership and compact size for use in limited space situations. Varian has a full line of customized, low vibration turbo pumps for the most sensitive microscopy applications. Finally, Varian has a full range of integrated pump controllers that offer the highest control flexibility with near zero electromagnetic noise generation.

Mass Spectrometry

Mass Spectrometry has become an important analytical tool in many industries including pharmaceuticals. Thanks to advances in electronics, instrument designers can implement cost-effective, high-performance analytical power in a cost-effective, easy-to-use system. These developments require advanced vacuum systems that are characterized by multi-chamber, high throughput designs on the high quality

Turbo-V Pump Typical Applications

instruments. These requirements, in turn, demand cost-effective, high performance vacuum pumps. Varian offers a full line of pumps and controllers that meet the most challenging vacuum requirements and are optimized for the specific requirements of modern mass spectrometry systems. Varian can further customize its pumps by providing multi-inlet pumping systems that are compact and reliable. A few common application examples for mass spectrometry are listed below:



- **GC-MS**

Gas Chromatograph Mass Spectrometers typically use one vacuum chamber in relatively low gas load environments and an intermediate vacuum interface to analyze inorganic samples.

The Varian Turbo-V 70 with printed circuit board controller (PCB) is a very cost-effective solution for this common analytical technique. The V 301 Navigator offers a compact, cost-effective solution for larger instrument designs.

- **LC-MS**

Liquid Chromatograph Mass Spectrometers typically include multi-chamber, high throughput vacuum systems. Varian's Turbo-V301 and V 551 pumps are designed for high throughput operation with air cooling – an important benefit for maintaining a compact system. The V 301 and V 551 pumps are also available in several split flow versions to increase their utility and performance in this application. The on board Navigator control system provides a high level of control function in a small package.

- **ICP-MS**

Inductively Coupled Plasma-MS systems have a wide range of vacuum requirements. Many systems can use heavy carrier gases such as argon, while collision cell designs use helium. The Turbo-V 301 Navigator has a high efficiency motor and MacroTorr® drag stages to reduce heat production under gas load. These features allow the V 301 to pump high levels of argon. The Navigator controller provides high controller function in a compact package.

- **TOF**

Time Of Flight systems are becoming very important analytical tools in drug discovery and proteomics. Vacuum requirements vary, although small size is often an important consideration. The Turbo V 301 Navigator pump and controller package provides the TOF designer with a high degree of flexibility with regard to high throughput, efficient heat dissipation and compact size.

Industrial Vacuum Processes

We can distinguish many applications in which vacuum technology is of fundamental importance. Examples of typical industrial applications are:

Thin Film Deposition:

- Glass coating equipment (architectural glass, automotive glass, flat panel display substrates)
- Thin film solar cells production (photo-voltaic)
- Optical data media (Compact Discs, Digital Versatile Discs, Magneto Optical Discs)
- Magnetic storage media (hard discs, read heads)
- Surface treatments (functional, decorative)
- Optical coating (ophthalmic, precision opto-electronics)
- Roll/Web coating on films or foils

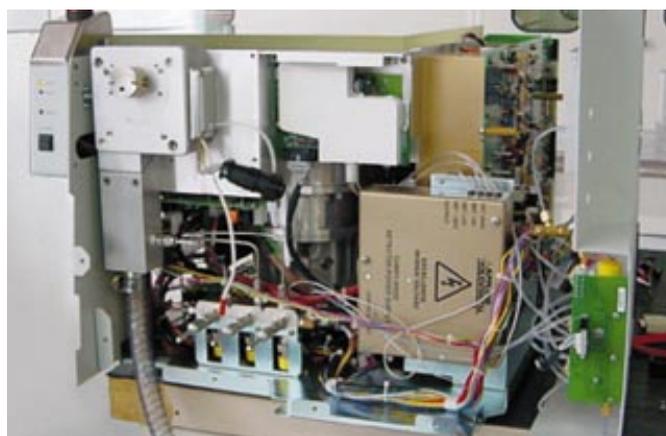
Device Processing:

- TV & Monitor picture tube manufacture
- Evacuation of lamps (motorway lighting, beamers)
- X-Ray tubes & electron devices
- Medical accelerator tubes
- Lasers

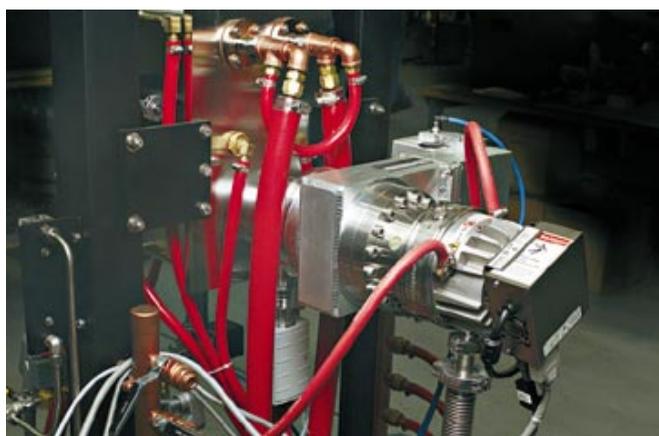
General Industrial Processes:

- Vacuum furnaces / metallurgy
- Others

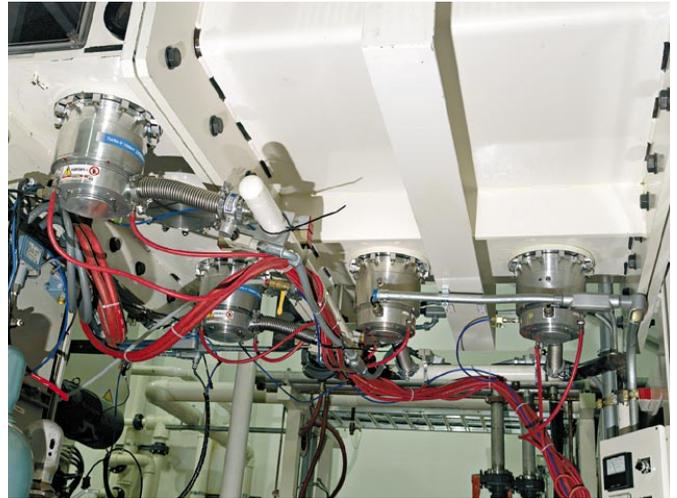
Varian provides complete solutions. We're experts at creating, maintaining, measuring and controlling high vacuum in diverse industrial processes. With innovative application design, responsive technical support, service, training,



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Varian, Inc. Vacuum Technologies



accessories, and a global network, Varian is your total vacuum solution provider.

Turbomolecular Pumps

The Turbo-V pumps are designed to meet the most demanding needs of the industrial market. They offer unmatched reliability, performance, and cleanliness. Designed to withstand heavy industrial use, Turbo-V pumps handle high gas loads and will recover quickly from accidental air in-rushes. With a complete range of turbo pumps from 70 to 6,000 l/s including the Navigator pumps with on board controllers, Varian has the right solution for your needs.

Industrial Thin Film Deposition Equipment

Our expertise with both OEMs and end users in the field of industrial vacuum equipment makes us the right partner for your Total Vacuum Solution. In single chamber batch systems, multiple chamber systems, with load locks, or large inline continuous systems, Varian Vacuum Technologies has the right turbo pump for your process requirements.

What really differentiates Varian is the expertise of its applications, support and custom system design staff to integrate these superior vacuum pumps into an optimized vacuum solution. Our experts will work with you to offer the right solutions to your particular vacuum requirements.