



Type VTS-1B

MKS VACUUM TRAINING SYSTEM

The MKS Vacuum Training System (VTS) is designed as a representative medium vacuum process system with provisions for manual or automatic pressure control. A Type 146 ClusterGauge™ Measurement and Control System in combination with the user's PC provides setup, control, and display of various aspects of system operation (e.g., pressure vs time, deviation from set point, etc.). A small transparent chamber is included with the VTS-1B and a variety of accessories may be used to demonstrate various physical properties of vacuum.

The system is supplied as a kit of components with a guide that describes setup and use. The guide includes a variety of demonstrations and learning exercises that have been proven in classroom use. These are designed to reinforce theory as well as to teach problem solving and troubleshooting techniques.

Because the vast majority of industrial vacuum processes take place in the medium vacuum range, the system only requires a two-stage mechanical pump for operation. Also, all of the system components are in the open and accessible making the VTS easy to work on and modify. These factors make the system very simple to use and forgiving of mishandling.

Features & Benefits

The VTS miniature process system is a cost-effective and robust tool for learning vacuum and instrumentation fundamentals. This apparatus will provide vivid, hands-on experience in:

- Vacuum theory
- Vacuum components
- Gauging practice
- Mass flow control
- Pressure control
- Calibration principles of flow and pressure devices
- Control systems



Applications

Here are some examples of where the basic VTS serves as a valuable instructional tool:

- Demonstrating adiabatic cooling
- Showing conductance and pressure drop effects
- Performing calculations of system time constant
- Showing how to reduce pumpdown turbulence
- Demonstrating, sizing and finding real and virtual leaks
- Permeation
- Outgassing
- Quantifying and applying the relationship between pumping speed, pressure and throughput
- Performing pressure control in three modes: manual, closed-loop upstream and downstream
- Setting and optimizing control system tuning parameters
- Ion gauge operation (using a sealed-off tube)
- Desorption
- Contrasting indirect and direct gauges: resolution, accuracy, time response characteristics, gas sensitivity, calibration principles
- The glow discharge, electron beams and mean free path
- Thermal mass flow controller (MFC) flow verification using the pressure rate-of-rise technique
- MFC problem solving and troubleshooting
- Developing system control software

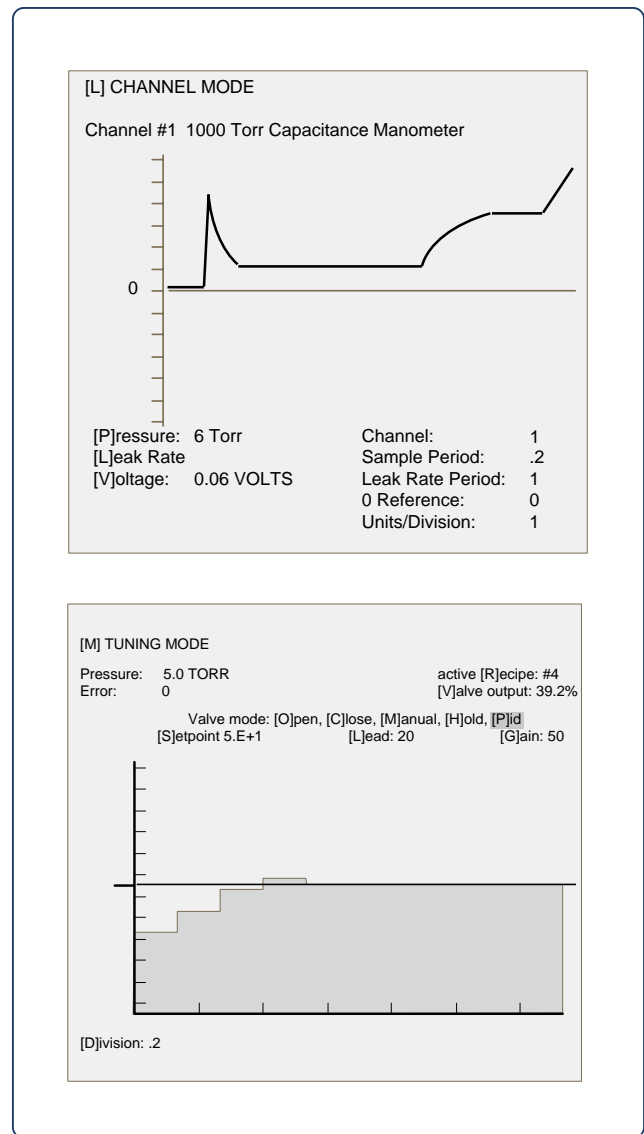


Figure 1 — Various screens permit adjustments to be made to the system parameters and allow the results of those parameters to be seen. The above figures show two display modes: (upper chart) pressure vs time profile under varying conditions of flow and (lower chart) deviation from set point vs time.



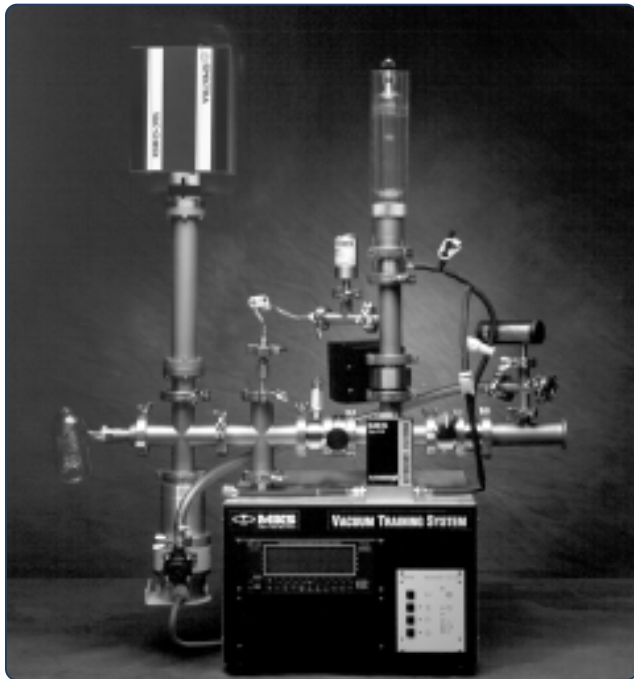


Figure 2 —
The MKS High Vacuum Modifications Package with an MKS— Spectra Products VAC-CHECK Residual Gas Analyzer with optional base cabinet.

High Vacuum Add-on Options

The capabilities of the Vacuum Training System may be expanded by adding the **High Vacuum Modification Package**. This component kit includes all of the necessary fittings, isolation and roughing valves, and gauging to permit a small turbo pump to be incorporated in any version of the VTS-1. The retrofit is easily installed and may be used in several modes. The most useful mode will have the chamber pressure controlled in the medium vacuum range with the high vacuum section connected by means of sampling orifice. This mode permits differential pumping and will be of particular value when combined with an **MKS — Spectra Products VAC-CHECK Residual Gas Analyzer**. The recommended RGA package includes a 100 amu Faraday cup detector head, Electronic Control Unit with RS-232 port, and RGA for Windows™ software. The necessary cabling, power source, orifice, and connecting hardware are detailed on the next page. Figures 2 and 3 show the complete system.

The VTS-1B manual includes a series of exercises for the RGA.

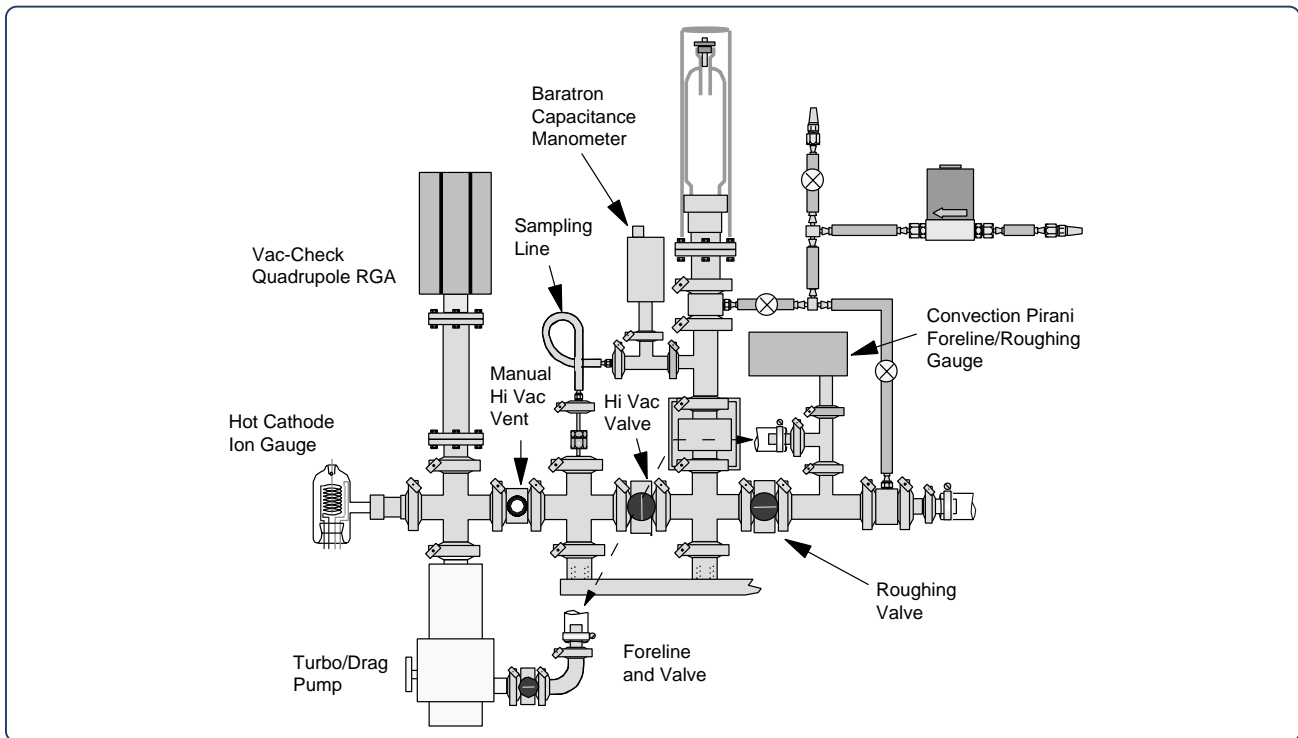


Figure 3 —
Duplicating the sampling method used on actual process tools, the differentially pumped mode permits the analysis of chamber gases with the chamber controlled at pressures up to 1 Torr.



Ordering Information

Ordering Code Example: VTS-1B

Type	Code	Configuration
VTS-1B MKS Vacuum Training System	VTS-1B	VTS-1B
Accessories		
Base cabinet		124467-P1
Mechanical Vacuum Pump		123970-G1
RF Chamber Kit		123971-G1
High Vacuum Modification Package		
Kit of components including foreline and high vacuum valves, hot cathode ion gauge, connecting tubing, vent, differential sampling port and connecting tubing.		VTS-HVMOD-A
High Vacuum pump kit		123972-G1
Quadropole RGA System		
MKS— Spectra Products VAC-CHECK RGA package with Windows™ software		128289-G1

The VTS-2A, featuring CE Compliant components, is also available.

Options and Accessories

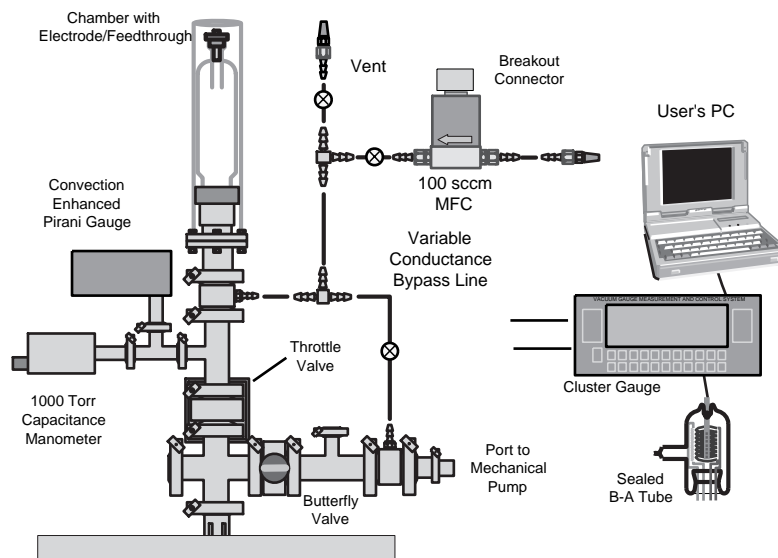
The adaptable MKS Vacuum Training System can grow with your program. Please inquire about the following options and enhancements:

10 Torr Type 722 for improved resolution at low pressures (for high vacuum system only)

Digital DeviceNet™ Instruments: Baratron® capacitance manometer, convection Pirani, Mass Flow Controller, Throttle Valve

Additional Mass Flow Controller and Channel Card for ratio control of gases

VACUUM SENTRY® for automatic protection against oil backup from the mechanical pump



Standard Configuration —

The above illustration shows the standard configuration of the VTS. For ease of set-up and modification, the majority of the fittings for the VTS are KF-40. Designed for flexibility, a variety of add-on accessory packages are available.



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