

VACUUBRAND® Vacuum Products

A Complete Range of Vacuum Solutions

VACUUBRAND has been a pioneer in laboratory vacuum for over 50 years, and brings convenience, performance, reliability, and economy to laboratory vacuum supply. VACUUBRAND® pump-control options also offer distinct productivity advantages compared with uncontrolled pumps, central vacuum system, and competitive vacuum products.

Being the only manufacturer that manufactures nothing but vacuum technology for laboratory applications gives VACUUBRAND a unique perspective on the market. It gives them the ability to make “no compromise” application-specific solutions, for rotary evaporators, vacuum ovens, gel dryers, biofluid aspiration and more.

- **Unsurpassed reliability:** Even with aggressive vapors. VACUUBRAND® chemistry diaphragm pumps have rugged diaphragms and valves made of corrosion resistant materials, and heads with a metallic stability core for long term reliability even in harsh chemical applications. 100% quality control testing after “run-in” ensures performance right out of the box.
- **Whisper quiet:** These are among the quietest diaphragm vacuum pumps available, operating at decibel levels comparable to a quiet conversation.
- **Lower lifetime cost:** The high flow rates, corrosion-resistant flow path materials, reliability (typical service intervals well in excess of 15,000 working hours) and durability of VACUUBRAND® pumps can save thousands of dollars per pump per year in operation and maintenance costs. Visit www.brandtech.com for details.
- **High performance:** Working vacuum flow rates of VACUUBRAND® pumps are up to 100% greater than competitive dry pumps for faster evaporative applications and higher productivity.



PC3001 VARIO^{PRO}
2mbar, 1.2cfm



Thick fluoropolymer molded over stability core provides chemical resistance and long term reliability.

Quiet...powerful...low
maintenance...unbeaten
economy

Become a Vacuum Expert: A Short Course in Lab Vacuum

How deep of a vacuum do I need?

Vacuum pump specifications are typically stated as ultimate vacuum and flow rate. The ultimate vacuum required is task dependant. Most laboratory applications operate best in the range of 1-100mbar. For filtration, liquid aspiration and other pressure-differential ("fluid movement") applications, 100mbar is sufficient, achieving 90% of the possible "force" i.e. potential pressure difference. An ultimate vacuum of 7mbar is effective for rotary evaporation of most solvents more volatile than water. For challenging applications, like rotary evaporation of very high temperature boiling point solvents or centrifugal concentration of high boilers like DMF, a 2mbar ultimate vacuum is needed. VACUUBRAND® oil-free diaphragm pumps can do the job for all the above applications. VACUUBRAND® oil-free pumps are whisper quiet, economical and environmentally friendly, requiring no costly oil changes, or cold traps to protect the pump. A good rule of thumb is "never use an oil pump when an oil-free pump will do the job." Freeze-drying requires deeper vacuum, typically referred to as "fine vacuum", in the range of 10^{-3} -1mbar. Rotary vane or hybrid pumps are required for these applications.

Control

Gauges and controllers enable you to monitor and manage your laboratory vacuum applications. Whether you simply need to monitor your application, provide on/off control, need flow rate control or require precise adaptive vacuum control, VACUUBRAND offers mercury-free gauges and controllers, as well as integrated systems to meet your requirements.

What about "flow rate?"

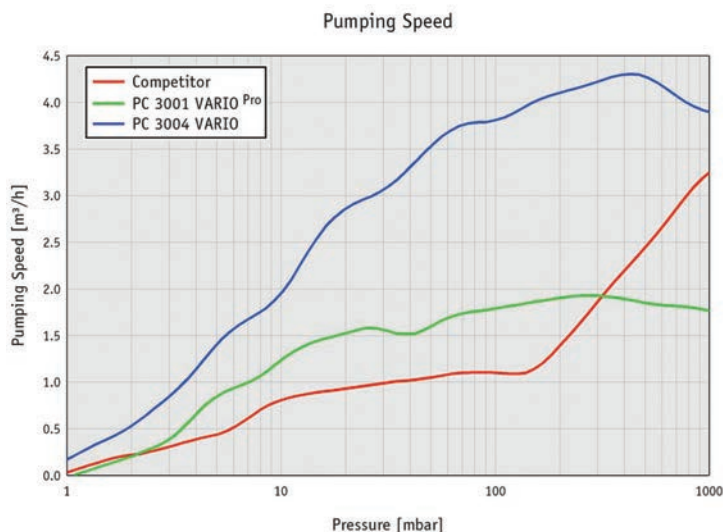
The flow rate required for an application is determined by the application, system leakage, and your time requirements. The "free air capacity" (also known as displacement) specification of a vacuum pump represents its peak ability to move vapor at atmospheric pressure. It is important to note that actual flow rate decreases from the displacement specification to zero as a pump reaches its ultimate vacuum. A pump's flow curve illustrates its working flow rate through its operating range and can be useful for the selection of the correct pump for an application (see figure to the right). If a pump can't provide enough flow under vacuum, the application will proceed more slowly or in some cases not at all. VACUUBRAND® pumps are designed to retain more flow rate throughout their working range, and only drop off sharply close to their ultimate vacuum.

Solvent recovery

Catchpots and condensers protect the pump and your lab atmosphere from application vapors. An inlet catchpot captures condensed vapors from the vacuum line before they degrade pump performance. The outlet condenser (cooled by external means) and catchpot provide near 100% recovery of vapors that pass harmlessly through the pump's corrosion-resistant fluoropolymer flowpath, typically eliminating the need for a cold trap to protect the pump or environment. Depending on the temperature of your application and the vapor pressure of your solvent, you may not even need a condenser, an outlet catchpot may be sufficient.

Corrosion resistance

Evaporative and other corrosive applications can be very destructive to ordinary vacuum pumps. Conventional rotary vane pumps require frequent oil changes and cold traps to minimize the damaging effects of corrosive chemical vapors. VACUUBRAND® oil-free chemistry-design pumps incorporate a fully chemistry resistant fluoropolymer flow path for excellent corrosion resistance and low maintenance. For non-corrosive, non-evaporative applications, VACUUBRAND also offers a comprehensive line of high-performance Aluminum-FKM diaphragm pumps.



The essential oil-free, corrosion-resistant vacuum pump

High performance VACUUBRAND® chemistry-design diaphragm pumps provide dry vacuum levels as deep as 0.6mbar, making them an excellent choice for most applications from benchtop research to pilot plant installations. Pumps without controls are well-suited to high flow applications like vacuum ovens, or for applications in which the control is provided by the vacuum application apparatus. Even operations that don't require solvent recovery or sophisticated control benefit from a pump designed with your applications in mind.

Continuous condensate purge

All chemistry-design multistage models feature an integrated gas ballast that permits continuous purging of condensed vapor from the pump

From simple pumps to fully integrated vacuum systems – VACUUBRAND has the right pump for your lab



MZ2C NT Vacuum Pump
7mbar, 1.4cfm

Small footprint

Compact pumps fit easily on benchtops or under hoods

The VACUUBRAND nameplate – the sign of a quality product

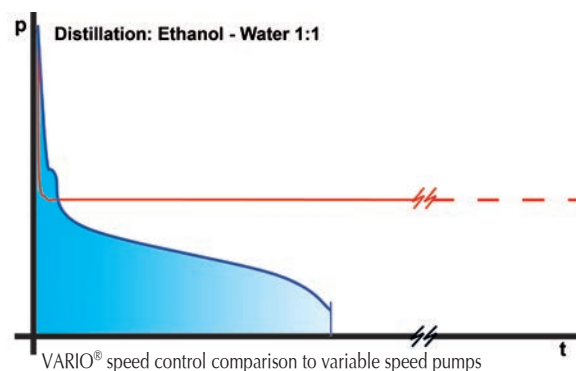
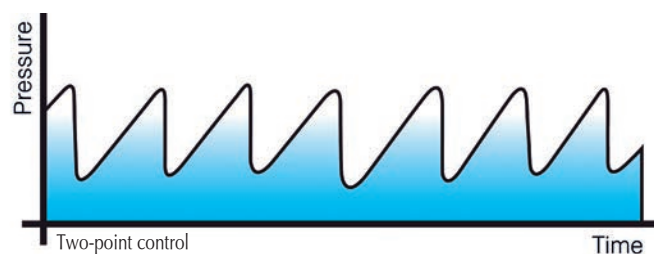
VACUUBRAND continuously works to perfect an integrated management system in all departments; conforming with ISO 9001 and ISO 14001. The standard of performance is quality, customer focus, employee involvement and environmental orientation. Each vacuum pump goes through a performance test of hours to days at the VACUUBRAND facility, measuring specifications and equipment reliability with computer-controlled measuring and test instruments, with

a fully automated final test. An interlock system prevents the manufacturing of a serialized nameplate until all test parameters are met. This ensures that every vacuum pump bearing the VACUUBRAND name is not only designed to an exceptionally high level engineering standard, but also offers extraordinary lifetime economy because of their low service costs and above-average lifetimes.

Vacuum Pumps with Control

Types of electronic vacuum control

- **Traditional two-point control:** Found in systems with single-speed pumps, i.e. the PC620 NT two-application system, or older design single application systems. Analogous to a home thermostat, the pump runs until the desired setpoint is reached, at which point, the vacuum supply is interrupted, via a solenoid valve, or, in cheaper systems, by turning off the pump. The vacuum level is allowed to rise to a set hysteresis above the setpoint, at which point vacuum supply is restored, maintaining the vacuum between two-points. In an evaporative application, the setpoint necessarily can not be below what would cause bumping and foaming. Every point above that - even within the hysteresis, is somewhat suboptimal for evaporation, lengthening the time of evaporation by some amount. As the solute concentration increases, the setpoint will need to be adjusted to maintain evaporation speed, either by programming, or manual intervention.
- **VARIO® speed control:** VACUUBRAND's proprietary control for variable speed vacuum pumps automatically adjusts the speed of the vacuum pump to find boiling points and continuously optimize vacuum levels for faster evaporation, reduced noise, maintenance, and electrical consumption as well as improved solvent recovery when an outlet condenser is used. Optional VACUUBRAND CONTROL™ software allows remote monitoring and control, from any web-enabled device. Increasing solute concentration or multiple solvents are not a problem for VARIO®.
- **Variable speed pumps:** (as supplied by other manufacturers) Less sophisticated software can only find the first boiling point, often overshooting, requiring frequent manual intervention.



- Competitive product in the automatic mode - First boiling pressure is determined, and then maintained. Evaporation dramatically slows because the vacuum is not continuously adapted to changing boiling pressures in mixtures
- VACUUBRAND VARIO® controlled vacuum adapts automatically to all boiling points in the mixture, continuously optimizing the process for fast run times without bumping.

Vacuum pumps with manual control

Popular VACUUBRAND® chemistry-design vacuum pumps are available with manual flow control to provide the most basic management of vacuum where electronic control is unnecessary to achieve good results.

Centrifugal concentration, gel drying, and even simple rotary evaporation applications can often be effectively managed with manual control systems.

Diaphragm valve

A manually controlled PTFE diaphragm valve

Bourdon analog gauge

Dial (Bourdon) relative pressure gauge

Inlet catchpot

An "AK" inlet catchpot helps protect the pump from any condensation



PC101 NT
Vacuum System
7mbar, 1.4cfm

Self-regulating electronic control – VARIO®

VACUUBRAND® VARIO® vacuum systems offer users unsurpassed control of critical vacuum applications. A low maintenance chemistry-design pump is integrated with a variable speed motor and a mercury-free, digital controller. The system automatically finds and follows boiling curves, continuously optimizing the vacuum level without having to program presets. It's the ultimate productivity tool!

- **Faster:** Because the vacuum level is continuously optimized, evaporation times are up to 30% faster when compared to other electronically-controlled pumps.
- **Easier:** Just press “Start” and the VARIO® pump begins pumping down, and finds the first boiling point. It maintains and continually optimizes vacuum levels to vapor flow — even for mixtures!
- **Sustainable:** VARIO® technology greatly reduces energy consumption by reducing pumping speed to only what is necessary for optimal process performance. This greatly extends service intervals. No dry ice cold traps required for pump protection, and no oil changes massively reduce the carbon footprint.
- **Less “babysitting”:** The VARIO® controller automatically adjusts vacuum levels, reducing the need for manual adjustment or complex pumping programs. The pump even shuts itself off at pre-set levels or when evaporation is complete.
- **Virtually no bumping:** The VARIO® controller automatically reduces the pumping speed as each boiling point is approached so “overpumping” is substantially reduced.
- **Less maintenance:** Because the pump only operates enough to maintain optimum vacuum, wear is reduced, extending the service interval greatly.
- **Computer interface:** An integrated bidirectional RS232 port allows control and monitoring of every parameter for process validation, and the execution of complex pumping programs. VACUU*CONTROL™ modules allow networking of pumps, allowing remote control and monitoring from any web-enabled device.



PC3001 VARIO^{PRO}
Vacuum System 2mbar, 1.2cfm

Low-profile outlet condenser reduces height requirements.

Dual application vacuum systems

Outlet condenser with catchpot

A condenser with an “EK” outlet catchpot captures vapors that pass through the pump, helping protect the lab atmosphere and environment

Electronic control

Solenoid valve, operated by a CVC3000 controller, provides precise two-point electronic control for critical applications

Manual control

PTFE diaphragm valve provides approximate control of vacuum levels for less demanding applications



PC511 NT
7mbar, 1.4cfm

Pumps with dual application control

VACUUBRAND® dual application vacuum systems harness the power of VACUUBRAND® oil-free pumps to increase lab efficiency and reduce the cost of vacuum generation. Operating two different applications from a single pump saves money and lab bench space.

These vacuum systems are available with manual control, electronic control, or both. Integrated check valves minimize interaction between applications.

All dual application systems include a high-performance 7mbar or 1.5mbar VACUUBRAND® NT series vacuum pump. Select a 7mbar system (MZ2C NT Synchro™, PC511 NT, or PC520 NT) for most lab applications and 1.5mbar systems (MD4C NT Synchro™, PC611 NT, PC620 NT) for larger applications or those with higher boiling point solvents.

Selecting the best pump for your application

Vacuum Pump Selection Guide—online!

Not sure which vacuum pump or system is best for your lab? Find out using the BrandTech® Scientific Vacuum Pump Selection Guide.

This free guide has been designed to recommend the best VACUUBRAND® vacuum pump or system for a wide variety of laboratory applications, including fluid aspiration, centrifugal concentration, rotary evaporation, and more.

Simply choose “Vacuum Pump Selection Guide” from the left hand navigation menu at www.brandtech.com to find the guide. Answer a few simple questions about your application. The software suggests the pump, controls, and solvent capture accessories that are right for your application. It even offers options for limited budgets or applications where control is critical.

VACUU•LAN® Mini-Network

The VACUU•LAN® Mini-Network is a great way to perform up to three applications from a single pump, increasing utility without eating up valuable lab space. It builds on VACUUBRAND's pioneering technology in vacuum local area networks for new laboratories and renovations, transferring the technology into a simple-to-install unit to add capability to existing labs. Three VACUU•LAN® vacuum ports with flow control are mounted onto a bar—each port has an integrated check valve to minimize

interference and the possibility of cross-contamination. Corrosion resistant materials are used throughout the vapor flowpath for long life in chemistry labs. The bar can be mounted to ring stands or laboratory framework with the pre-installed mounting support rods, or can be easily attached to walls. Vacuum can be supplied by any VACUUBRAND® chemistry-design pump, or even diaphragm pumps from other manufacturers.



VACUU•LAN Mini Network (for pricing see page 80)

VACUU•LAN vacuum port



VACUU•LAN® networks for new lab construction and renovation

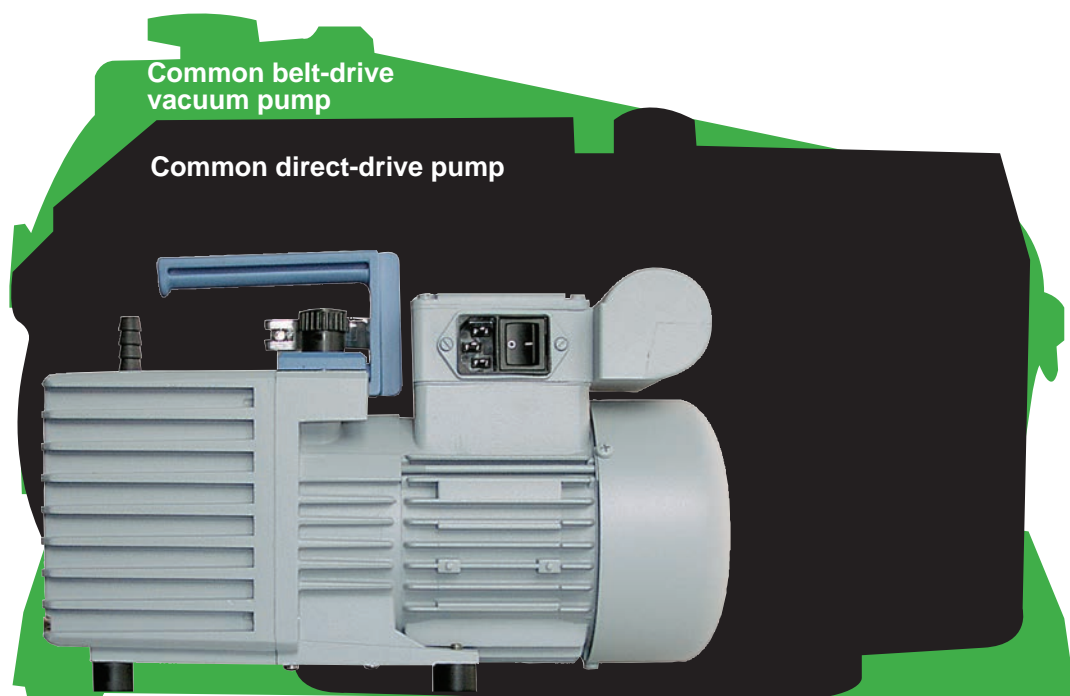
Fully-customized VACUU•LAN® vacuum local area networks can provide the vacuum for your laboratory construction or renovation project. The modular network can be integrated into laboratory furniture and fume hoods, and powered by a quiet, compact VACUUBRAND® chemistry design vacuum pump that fits under your lab bench. With a VACUU•LAN® vacuum local area network, you have high-performance vacuum (as deep as 2mbar/1.5Torr) at each bench or fume hood port, without the instability and user interference of a central vacuum system, and without the bench space required for individual pumps. Individual ports can even be configured for electronic control, for fully programmable vacuum supply directly from the network. This modular approach offers long-term flexibility; install the vacuum you need where you need it, only when you need it.

Two decades of global experience developing VACUU•LAN® laboratory vacuum local area networks, for small college labs and major research institutions, make this VACUUBRAND innovation the smart choice for your laboratory vacuum. For more information on this innovative technology, contact BrandTech® Scientific.

VACUUBRAND® Rotary Vane Pumps

VACUUBRAND XS-Series rotary vane vacuum pumps for fine vacuum applications

- **Quiet:** XS-pumps are extremely low-noise and low vibration, even compared to earlier VACUUBRAND® rotary vane models.
- **Rugged:** The XS series have been designed from the ground-up for service in chemistry labs. They provide exceptional water vapor tolerances with minimal impact on ultimate vacuum. Internal components have been redesigned to improve corrosion resistance, reduce wearing forces, enhance performance and simplify maintenance. Internal steel surfaces have even been nitrogen-plasma treated for chemical resistance and mechanical hardness.
- **Energy efficient:** Pumps have very low power consumption, and generate low levels of waste heat compared to competitive models.
- **Great value:** On top of all of these advantages, VACUUBRAND® XS-series rotary vane pumps are competitively priced with other popular pumps.



vacuubrand

Big vacuum in a small package!

VACUUBRAND® RZ2.5

Extremely compact compared to popular pump models

- **Compared with a belt-drive pump,** the RZ2.5 takes up 1/3 of the bench space, weighs half as much, and occupies less than 1/4 the volume, despite superior flowrates.
- **Compared with competitive direct drive pumps,** the RZ2.5 takes up half of the space and weighs half as much.

For a detailed comparison see: www.brandtech.com/rvpumpcompare

Don't forget...

Adding accessories to your rotary vane pump can extend the pump lifetime and make your workplace more pleasant.

- **Inlet hose barbs:** Match the pump to your vacuum hose. A 10mm (3/8") polypropylene hose barb is included with RZ2.5 and RZ6 pumps, inlet centering and clamping rings (and outlet, where applicable) are included with the pump.
- **Inlet catchpot:** Collects condensates and particles from the vacuum line, before they can contaminate pump oil and can reduce pump lifetime.
- **Oil mist filter:** Captures up to 99% of oil-mist from the outlet of your pump, keeping your lab atmosphere and bench top clean (included with RC6).
- **Pump oil B:** For best performance, and long life, use Pump Oil B (supplied with all new pumps). Its special viscosity formula is an excellent choice for VACUUBRAND® pumps.

Vacuum Applications

Vacuum for Filtration and SPE

Filtration, SPE and aspiration

Fluid movement applications, such as filtration, fluid aspiration and solid phase extraction, typically don't require deep vacuum levels or high flow rates. For fluid aspiration, the best choice is usually an integrated solution like our BVC *control* or *professional* (see page 62).

However, when using an unpowered collection system like the BVC *basic*, or for filtration or SPE, these types of applications are best served by the VACUUBRAND® ME1C and ME4C NT. Users seeking additional capability or users with special circumstances, may

want to consider the VACUUBRAND® MZ2C NT+2AK or MD1C+AK+EK pumps with integrated solvent recovery.

When choosing the pump for your filtration or solid phase extraction application, consider the following factors:

How much vacuum do I need?

Vacuum filtration and solid phase extraction typically require just enough vacuum depth to generate a pressure differential between atmospheric pressure and the receiving vessel. These applications do not usually require control unless the vacuum level is too deep and may cause filtrate boiling.

The ME1 vacuum pump is an excellent selection for most fluid movement applications. It is a simple, compact, stand alone pump with sufficient vacuum to perform effective vacuum filtration. For acidic vapors, choose the ME1C.

How much flow do I need?

Labs running multiple filtration applications may require a pump with higher flow rates to maintain sufficient vacuum at all workstations.

For 2-4 filtrations, choose the ME2C NT; for more than 4 filtrations, the ME4C NT vacuum pump is an excellent pump for these circumstances. The higher flow rate ensures better results and faster process times in large-scale filtration labs. For solid phase extraction (SPE), choose the ME2C NT for small applications, the ME4C NT for medium size, and the ME8C NT for larger scale extractions.

Do I need solvent recovery?

During normal filtration and solid phase extraction applications, solvent recovery is not typically needed. However, pumps with higher performance and solvent recovery can support a broader range of applications or may be suitable for teaching laboratories, where aspiration of liquids may be inevitable. They are an excellent choice for labs seeking to support several different applications with only one pump.



ME1C Vacuum Pump
100mbar, 0.5cfm



MZ2C NT+2AK
Vacuum Pump 7mbar, 1.4cfm

Rotary Evaporation Vacuum Solutions

Vacuum pumps provide the operational muscle for your rotary evaporator. Apart from the vacuum control, your evaporator is just rotating glassware! In fact, you can get better control of your application directly from your vacuum pump. As such VACUUBRAND offers a full range of pumps and systems with integrated control that help optimize your rotary evaporation application.

To find the vacuum pump or system that best meets your needs, answer the following questions:

How much vacuum do I need?

The vacuum capacity required from a pump to support a rotary evaporation application is determined by the typical application temperatures and the solvents being evaporated. Virtually all rotary evaporation applications can be accomplished with diaphragm vacuum pumps. The vacuum pump should have the ability to reach the vapor pressure of the solvent at the application temperature. For most common solvents and bath temperature, a two-stage (MZ-series) pump provides sufficient vacuum levels, whereas for high boiling point solvents, such as DMF, DMSO or NMP, a three-stage (MD-series) pump would be preferred.

How much control do I need?

Rotary evaporation applications often require significant oversight and control because the heat and high surface area increase evaporation rates. This sensitivity can lead to solvent "bumping" or boiling over if vacuum is poorly controlled.

VARIO® adaptive vacuum control

The best way to prevent bumping is with a self-regulating, hysteresis-free vacuum control. Adaptive control, an innovation exclusive to VACUUBRAND® VARIO® pumps and systems, combines an electronic controller and a speed-controlled motor. Fifteen years of proprietary software refinement allows our VARIO® pumps to automatically perform the following tasks:

- Find and follow boiling points, hysteresis-free, without programming even for solvent mixtures or changing conditions
- Evaporate up to 30 percent faster
- Shut the pump off when evaporation is completed

For most benchtop rotary evaporators, the PC3001 VARIO^{PRO} vacuum system is an excellent choice. The powerful integral pump provides a deep 2mbar ultimate vacuum – enough to evaporate DMSO at a bath temperature of 50°C. It's truly the ultimate system for the benchtop rotary evaporator.

Manual control

For applications that require only minimal control, select the economical PC101 NT vacuum system for basic evaporation and vapor capture. It includes a 7mbar MZ2C NT pump along with a stand, inlet catchpot and outlet condenser with a manual flow-control valve and dial gauge for economy. It's an excellent choice for basic evaporation. Or support two evaporators with an economical, space-saving Synchro system. See pages 68 & 80 for description and ordering information.

On a budget?

If you would like to harness the power of the PC3001 VARIO^{PRO}, but don't currently have the budget, consider the PC3001 basic. It features the same variable speed MD1C pump, and can easily be upgraded to full VARIO capability when your budget allows. Contact BrandTech® for more information.

Did you know?

Outlet condensers not only help collect solvent vapors, keeping the lab atmosphere clean, but they also make VACUUBRAND® pumps even quieter!



PC3001 VARIO^{PRO} Vacuum System
2mbar, 1.2cfm



PC101 NT
7mbar, 1.4cfm

Electronic control

Some rotary evaporation applications might benefit from control, but not require the precision of adaptive control. The PC510 NT system is an excellent choice for these applications. It is a great workhorse system for evaporation of many common solvents in rotary evaporators up to 5 liters in size. The integrated MZ2C NT pump evaporates all but the highest boiling point solvents at reasonable bath temperatures, and the system includes a controller that allows preset or semi-automatic setting of vacuum level, with appropriate hysteresis adjustment. Solvent recovery is provided by an inlet catchpot and outlet condenser.

Need to run two evaporators? Consider the PC520 NT. See pages 68 & 80 for description and ordering information. It will provide different conditions to two applications at once, saving bench space and the cost of an additional pump or system. If you have a limited budget and anticipate needing a second electronically controlled port in the future, consider a PC511 NT or PC611 NT. The second flow-controlled port adds minimal cost, but can easily be upgraded to full electronic control with the purchase of a CVC3000 *detect* (see page 78).



The CVC3000 *detect* vacuum controller can let you select a setpoint, run a complex program 'ramp' or even automatically find the first boiling point. It works with benchtop diaphragm pumps from all manufacturers.

Do I need solvent recovery?

Solvent vapor that makes it past the evaporator's condenser can condense in the vacuum line. For best pump performance, an inlet catchpot "AK" can keep these condensed vapors out of the pump. Solvent vapors that pass through the pump can be captured efficiently at atmospheric pressure at the diaphragm pump outlet with an outlet condenser "EK," minimizing pollution of the laboratory environment.

Consider the MD1C+AK+EK for labs that already have a stand-alone vacuum controller, or one integrated into their evaporator. It features the same chemistry-design pump and solvent recovery as the 2mbar PC3001 VARIO^{PRO} system, but without control.

For applications that do not require either control or solvent recovery, consider a stand alone pump such as the MZ1C or MD1C. They provide superior flow rates at working vacuum to competitive pumps, with a significantly lower price and very small footprint. Integrated gas ballast provides high condensate tolerance. The MD1C is also preferred by customers who address vacuum control and solvent recovery through other methods.



MZ1C
vacuum pump
12mbar, 0.5cfm

What about larger or multiple rotary evaporators?

BrandTech® and VACUUBRAND offer the most comprehensive line of chemistry-design diaphragm vacuum pumps, including models that can operate rotary evaporators up to 100 liters or larger, with or without integrated VARIO® adaptive control.

We also offer systems that will run two different evaporation applications simultaneously without interference! Still not sure? Contact BrandTech® Scientific for more information.

NOT SURE WHAT PUMP IS RIGHT FOR YOUR NEEDS?

See our Vacuum Pump Selection Guide at www.brandtech.com.



MD1C+AK+EK
vacuum pump
2mbar, 0.88cfm

Vacuum Oven/Gel Dryer Vacuum Solutions

Vacuum oven solutions

How much vacuum do I need?

Vacuum ovens typically require a pump with vacuum levels below 10 mbar because the evaporative effect of elevated temperature is often offset by the poor thermal transfer of the oven environment.

How much flow do I need?

Vacuum ovens often require higher vacuum pump flow rates than other lab applications due to the relatively large sample capacity of most vacuum ovens. A distinction should be made between residual drying of damp samples vs. drying of high moisture content “wet” samples, which require considerably more flowrate. For residual drying, some assumptions can be made based on oven size.

The MZ2C NT+2AK vacuum pump is an excellent selection for labs with smaller vacuum ovens (<1.0 cubic foot in capacity) and semi-dry samples. Its performance, small footprint, and integrated catchpots for solvents make it a popular choice for gels and residual drying. Evaporation of higher boiling point solvents, however, may require a more powerful pump, such as the MD1C+AK+EK.

Laboratories with larger ovens (>1.0 cubic feet in capacity) or with samples having a high moisture content do well with the PC201 NT. It can generate vacuum levels for evaporation of most solvents, and its high flow rate reduces process times. For truly wet samples, calculations should be made to determine the right pump size. Contact BrandTech® Scientific for assistance.

Why use a cold trap?

Using a cold trap for solvent recovery gives users greater flexibility when selecting a pump for vacuum ovens. The cold trap reduces vapor loads, and eliminates the need for solvent capture by the pump. These applications are typically best-served by a stand alone pump such as the compact, economical MD1C vacuum pump.



MD1C
vacuum pump
2mbar, 0.88cfm

Gel dryer vacuum solutions

How much vacuum do I need?

The vacuum level required for gel drying applications is usually determined by the concentration of SDS-PAGE. For standard-sized gels with SDS-PAGE concentrations up to 10%, select the MZ2C NT+2AK. It has the power to provide excellent results in most gel-drying applications and its two catchpots capture condensing vapors for clean operation.



MZ2C NT+2AK
vacuum pump
7mbar, 1.4cfm

For SDS-PAGE concentrations greater than 10%, choose the MD1C+AK+EK. Its integral pump achieves deeper vacuum levels for enhanced evaporative performance, and the catchpots and condenser protect the pump and the lab atmosphere without the cost and inconvenience of a cold trap.



PC201 NT
vacuum system,
1.5mbar, 2.2cfm

Centrifugal Concentration Vacuum Solutions

The high performance and convenience of VACUUBRAND® pumps and systems makes them an excellent choice for most centrifugal concentration applications. VACUUBRAND offers a wide variety of pumps for excellent, reproducible results. When selecting the best pump for your lab, consider the following issues:

How much vacuum do I need?

Centrifugal concentration generally requires greater ultimate vacuum than other evaporative applications because it is usually performed at room temperature. Fortunately, VACUUBRAND® diaphragm pumps are available with enough power for room temperature evaporation of solvents with boiling points as high as that of DMF.

The performance demands of most tabletop concentrators are often well served with one of VACUUBRAND's three-stage vacuum pumps, the MD1C or MD4C NT. Both of these pumps are powerful enough to evaporate DMF. Select the MD1C for supporting smaller concentrators and the MD4C NT with its higher flow rate for larger benchtop concentrators. For more volatile solvents, a pump like an MZ2C NT would be an excellent choice.

For very high boiling point solvents at room temperature such as DMSO or ethylene glycol, rotary vane technology may be required. We suggest the unique RC6 Chemisty-HYBRID pump for deeper vacuum with maximum convenience.

Do I need solvent recovery?

Large centrifugal concentrators often come with cold traps, reducing the need for integrated solvent recovery with the pump. Concentrators without cold traps should have solvent recovery integrated with the pump to prevent pump contamination and pollution of the laboratory environment.

When using a small concentrator without a cold trap, choose the MD1C+AK+EK. It provides excellent flow rates at working vacuum to effectively operate a smaller concentrator without a cold trap (something not possible with many competitive pumps) and captures solvent vapors itself.

Are my samples prone to bumping?

When samples often bump in a centrifugal concentrator, control may be necessary to prevent cross-contamination. For more volatile solvents, use our VARIO® systems that adjust vacuum levels automatically.

What about larger concentrators?

VACUUBRAND® pumps are available for "mega" sized concentrators used in combinatorial chemistry and the drug discovery marketplace. Please contact BrandTech® Scientific for assistance in selecting the best pump for these applications.



MD12C NT VARIO,
1.5mbar, 7.6cfm

Pump economy and sustainability

When comparing the costs of vacuum pumps, it is important to include accessories that are needed and lifetime repair and maintenance costs. Rotary vane pumps require mist filters, catchpots, cold traps (including dry ice, liquid nitrogen or electricity costs) plus frequent oil changes. Competitive diaphragm pumps have much shorter service intervals (3,000-4,000 hours) compared with VACUUBRAND® oil-free pumps (15,000+ hours), and competitive diaphragm pumps often recommend cold traps to enhance performance, adding substantially to operating costs and inconvenience.



MD4C NT vacuum pump
1.5mbar, 2.2cfm

Freeze Drying Vacuum Solutions

Lyophilization is a demanding vacuum application that requires a deeper vacuum than can be achieved with diaphragm technology alone. It is usually best-served by the innovative VACUUBRAND® RC6 Chemistry-HYBRID™ pump.

How much vacuum do I need?

Lyophilization applications typically require vacuum levels as deep as 10^{-3} mbar. Traditionally, this requirement has been provided by oil-sealed rotary vane pumps.

To help users combat the high costs and contamination of rotary vane pumps, VACUUBRAND developed the RC6 Chemistry-HYBRID™ pump. The RC6 combines a rotary vane pump for vacuum capacity with a chemistry-design diaphragm pump to maintain peak performance uncompromised by solvent contamination, by continuously cleaning the pump oil during operation. This design also reduces oil changes and maintenance costs by up to 90%. The RC6 Chemistry-HYBRID™ pump, like other oil-sealed pumps, should always be operated with a cold trap.

What about larger applications?

The RC6 Chemistry-Hybrid pump may be used with freeze dryers with condensers of 6, 12, or 18 liters. VACUUBRAND also offers a full line of rotary vane pumps with the power to easily meet the demands of larger applications and the innovative design and quality assurance of VACUUBRAND® pumps.

For applications larger than 18 liters, contact BrandTech® Scientific.

Rotary vane options?

BrandTech® Scientific recommends that you should “never use an oil pump when an oil-free pump will do the job.” However, certain applications require deeper vacuum levels than oil-free pumps can provide.

When these situations arise, consider the RC6 Chemistry HYBRID™ pump or a VACUUBRAND® rotary vane vacuum pump such as the RZ2.5, RZ6, or RZ9. These pumps feature the same high performance, innovative design, and quality assurance as VACUUBRAND® oil-free vacuum pumps and systems. See page 70 for more information.



RC6 Chemistry-HYBRID™
vacuum pump 2×10^{-3} mbar, 4.1 cfm

Save money with a VACUUBRAND® system!

Because VACUUBRAND® pumps provide high flow-rates at working vacuum levels, they can provide cost savings, both initially, and over the life of the pump.

- **Synchro™** multi-tasking systems harness the power of the VACUUBRAND® pump for two applications, reducing the cost per application. See page 69 for VACUU•LAN® systems.
- **No cold trap required** VACUUBRAND® chemistry diaphragm pumps require no cold trap to protect the pump in most applications; a huge cost saving in purchase and refrigerant costs.
- **Productivity savings** with the self-adjusting VARIO® systems, which free you up to perform other work with minimal pump oversight. Their continually optimized vacuum levels speed evaporation by up to 30%.

Find out more details on how to save money with VACUUBRAND® vacuum pumps at www.brandtech.com.

Non-Chemistry Diaphragm Vacuum Pumps

VACUUBRAND® Aluminum-FKM (e.g., Viton®) vacuum pumps are intended specifically for non-corrosive, non-evaporative applications. They are excellent for laboratory and process-plant applications including gas transfer, backing turbo pumps, and vacuum filtration. All wetted parts of these pumps are made of aluminum, FKM, and polyethylene. Aluminum-FKM pumps should not be used with organic solvents, corrosives, or other vapors inconsistent with the materials of construction.

- **Eliminates oil changes:** These pumps utilize diaphragm vacuum technology for totally dry operation. There is no oil to change or monitor!
- **Reduces maintenance:** Diaphragms typically withstand over 15,000 hours of use before replacement – that's years in most applications, minimizing downtime and service costs. When it is finally time for service, their unique design eliminates tedious, trial-and-error stroke length recalibration.
- **Improves productivity:** These pumps feature specially engineered pump heads for high flow rates at working vacuum. Higher flow rates mean reduced process times and higher throughput.
- **Ensures reliable use:** All VACUUBRAND® pumps and systems must pass rigorous product testing before leaving the factory. It's your assurance of a reliable pump.
- **Quiet operation:** Aluminum-FKM pumps operate very quietly, at about the same volume as a conversation.
- **FKM double diaphragm:** FKM double planar diaphragm for high performance and increased reliability.
- **Broad product range:** Vacuum as deep as 0.5mbar with flow rates as high as 307lpm.

ME1:

Features PTFE diaphragm and valves for enhanced corrosion resistance (not for use with acidic vapors). An excellent choice for filtration (see page 71).



ME1 vacuum pump
100mbar, 0.5cfm



ME8 NT vacuum pump
70mbar, 4.6cfm

ME8 NT:

A popular choice for plate washers, cell harvesters and other applications that require high flowrates with relatively shallow vacuum.



Vacuum Gauges & Controllers

VACUUBRAND® vacuum gauges and controllers enable you to monitor and control vacuum generation for most laboratory vacuum applications. Gauges are compatible with most laboratory vacuum pumps and house vacuum, and feature both analog and digital displays. They help to rid laboratories of toxic, harmful mercury by replacing McLeod gauges and other manometers.

- **Meets the requirements of most vacuum applications:** VACUUBRAND® vacuum gauges cover the range from atmospheric pressure to 5×10^{-3} mbar/Torr/hPa. They are easy to read and feature a digital readout and analog indicator to simplify both data recording and trend-monitoring.
- **Rugged operation:** Gauges and controllers are manufactured without fragile springs or glass tubes and feature corrosion-resistant transducers to ensure rugged, reliable operation.
- **Displays results in your units:** Vacuum gauges and controllers provide results in millibar, Torr, or hectoPascal.
- **Provides complete process control:** The CVC 3000 *detect* is an all-in-one controller with integrated valve, providing two-point vacuum control in the range from atmospheric pressure to 1 mbar/Torr/hPa (control range can be extended to 10^{-3} mbar with external Pirani vacuum sensor). It allows easy adjustment of vacuum setpoints as well as both automatic and manual hysteresis programming.
- **Integrated vacuum controller:** The CVC3000 *detect* pairs our sophisticated CVC3000 vacuum controller with a permanently mounted chemistry-design solenoid valve to provide a simple one-piece solution to single-application vacuum control.

DVR2 vacuum gauge

Eliminate fragile glass tubes and mercury and inaccurate, corrosion-prone dial gauges in your lab! Analog and digital display for easy monitoring of most lab applications. A transducer of corrosion-resistant ceramic for durability measures absolute pressures from atmosphere to 1 mbar/Torr/hPa with user-selectable units. Battery power with adjustable sleep timer for long battery life.

CVC3000 *detect*

The new CVC3000 *detect* combines the market leading CVC3000 vacuum controller and a solenoid valve, to provide advanced two-point control for any stand-alone diaphragm vacuum pump from VACUUBRAND®, competitive units, or central vacuum. An integrated check valve helps protect your application from vacuum line instability. The new “*detect*” feature allows the CVC3000 to automatically find the first boiling point with a rotary evaporator. The CVC3000 also allows the pre-programming of up to ten multi-step programs, bi-directional communication via RS232 serial port and too many other features to mention here. Available in two models – one with a benchtop stand; or one for mounting on lab frames or ring stands

CVC3000 + VSP3000 Pirani control packages for “High Vac” applications

These packages enable convenient two point vacuum control in the fine vacuum range down to 10^{-3} mbar. They consist of a CVC3000 vacuum controller, a VSP3000 external Pirani vacuum sensor, a VVB 15C high performance chemistry in-line solenoid valve and all necessary small flange components. Two versions of this package are available: one with KF16 small flange connections suitable for the RZ2.5, RZ6 rotary vane pumps and our RC6 Chemistry-HYBRID™ pump; the other with KF25 small flanges suitable for our RZ9 rotary vane pumps. Either package can also be used with pumps from other manufacturers with the corresponding flange set. Control is achieved by use of an in-line solenoid valve, minimizing noise and oil-mist generation. The controller and components are completely self-configuring and automatically checked via VACUU•BUS® communication protocol.

The versatile DCP3000 vacuum gauge system

The DCP3000 utilizes VACUUBRAND’s innovative VACUU•BUS® plug-and-play system to monitor a variety of different vacuum sensors including the new VACUU•VIEW models. The DCP3000 can monitor up to a total of four transducer sets. The DCP3000 also features a switching power supply.



DVR2

CVC3000 *detect*
benchtop standCVC3000
benchtop stand

DCP3000 with VSK

NEW! Remote control and monitoring VACUU•CONTROL®

Add remote control and monitoring to any vacuum pump – regardless of manufacturer with the VACUU•CONTROL® add-on for the CVC3000 controller, or any VACUUBRAND® system that incorporates the CVC3000. Unlike simple RF control that requires a dedicated controller, and limited control frequencies, VACUU•CONTROL® interfaces with your network, allowing control or monitoring from any web-enabled device, with multi-level security. LAN (Ethernet) and WLAN (WiFi) versions available.

NEW! VACUU•VIEW and VACUU•VIEW extended gauges

Vacuum gauges with corrosion-resistant transducers designed especially for the rigors of laboratory use. Both gauges are totally mercury-free, feature KF16 small flange vacuum connections, with screw-in hose barbs to allow fitting of 6-10mm ID vacuum hose. VACUU•BUS® connections allow interfacing with VACUUBRAND® DCP3000 and CVC3000. Universal power supplies are included.

The VACUU•VIEW gauge features a capacitive transducer made of alumina ceramic, and is suitable for absolute pressure readings in the rough vacuum range (atmosphere to 0.1mbar/hPa/Torr). The VACUU•VIEW extended features a dual technology gauge head — a capacitive transducer for absolute pressure readings in the rough vacuum range, paired with a Pirani transducer for measurements in the fine vacuum range. Both transducers have alumina ceramic wetted surfaces for corrosion and shock resistance.



Mercury-free,
digital/analog vacuum
instruments



Product comparison

Name	Battery-powered	Chemical resistant	Lower measuring limit in mbar	Diaphragm (Capactive)	Measuring principle			Measurement gas type independent
					Heat conduction (Pirani)	cold cathode		
VACUU•VIEW	–	✓	0.1	✓	–	–		✓
VACUU•VIEW Extended	–	✓	0.001	✓	✓	–		Yes (>5mbar)
DVR 2	✓	✓	1	✓	–	–		✓
Set DCP 3000 + VSK 3000	–	✓	0.1	✓	–	–		✓
Set DCP 3000 + VSP 3000	–	✓	1 x 10 ⁻³	–	✓	–		–
Set DCP 3000 + MPT	–	–	5 x 10 ⁻⁹	–	✓	✓		–

Vacuum Pump Ordering Information

Chemistry design pumps

					Free Air Capacity at 60Hz			2016
Model	Controller(s)	Solvent Recovery	Ultimate Vacuum mbar	Torr	cfm	lpm	Cat. No.	List Price
Oil-Free Chemistry design diaphragm vacuum pumps								
ME1C*	No	No	100	75	0.5	14	721103	\$1,091.00
ME2C NT	No	No	70	52	1.4	40	730103	1,995.00
ME4C NT	No	No	70	52	2.5	72	731203	2,948.00
ME4C NT +2AK 100-120V/200-230V, 50-60Hz***	No	Yes	70	52	2.5	72	2614080	4,035.00
ME8C NT*	No	No	70	52	4.6	130	734203	4,995.00
ME16C NT	No	No	70	52	10.8	307	741303	Inquire
MZ1C*	No	No	12	9	0.5	15	724103	1,936.00
MZ2C NT	No	No	7	~ 5	1.4	38	732303	2,949.00
MZ2C NT +2AK	No	Yes**	7	~ 5	1.4	38	732503	3,851.00
MD1C*	No	No	2	1.5	0.88	25	696613	3,560.00
MD1C +AK+EK	No	Yes	2	1.5	0.88	25	696633	5,651.00
MD4C NT	No	No	1.5	1.1	2.2	63	736403	6,629.00
MD12C NT	No	No	2	1.5	7.2	205	743303	Inquire
MV10C NT	No	No	9x10 ⁻¹	7x10 ⁻¹	6.3	178	744303	Inquire

Accessories for oil-free diaphragm vacuum pumps

VACUU•LAN® Mini-Network	2614455	1,360.00
ME1C vacuum regulation valve with manometer (suitable for use with the MZ1C and MD1C)	696843	351.56
Power cord, L-shaped 120V, US	637655	43.82

Oil-free Chemistry design single application vacuum system

MZ2C NT +AK+M+D	1 Manual	No	7	~ 5	1.4	38	732703	4,045.00
PC101 NT	1 Manual	Yes	7	~ 5	1.4	38	733003	3,753.00
MZ2C NT +AK+EK	1 Manual	Yes	7	~ 5	1.4	38	732603	3,953.00
MD4C NT +AK+EK	1 Manual	Yes	1.5	1.1	2.2	63	736703	7,813.00
PC510 NT	1 Electronic	Yes	7	~ 5	1.4	38	733103	7,069.00
PC3001 basic 100-120V/200-230V, 50-60Hz	1 Manual	No	2	1.5	1.2	33	696723	5,252.00
PC201 NT	1 Manual	Yes	1.5	1.1	2.2	63	737003	6,997.00
PC610 NT	1 Electronic	Yes	1.5	1.1	2.2	63	737103	11,009.00

Oil-free Chemistry design dual application vacuum systems

MZ2C NT Synchro™	2 Manual	Yes	7	~ 5	1.4	38	732803	4,987.00
PC511 NT	1 Electronic +1 Manual	Yes	7	~ 5	1.4	38	733203	7,669.00
PC520 NT	2 Electronic	Yes	7	~ 5	1.4	38	733303	10,403.00
MD4C NT Synchro™	2 Manual	Yes	1.5	1.1	2.2	63	736803	8,853.00
PC611 NT	1 Electronic +1 Manual	Yes	1.5	1.1	2.2	63	737203	11,534.00
PC620 NT	2 Electronic	Yes	1.5	1.1	2.2	63	737303	14,161.00

Oil-free Chemistry design VARIO® adaptive single application vacuum systems

ME16C NT VARIO	Adaptive	No	70	53	11.4	322	741703	Inquire
MZ2C NT VARIO	Adaptive	No	7	~ 5	1.6	47	732403	7,030.00
MD4C NT VARIO	Adaptive	No	1.5	1.1	2.7	77	736503	10,930.00
MV10C NT VARIO	Adaptive	No	6x10 ⁻¹	4.5x10 ⁻¹	6.8	193	744703	Inquire
MD12C NT VARIO	Adaptive	No	1.5	1.1	7.6	215	743703	Inquire
PC3001 VARIO ^{PRO}	Adaptive	Yes	2	1.5	1.2	33	696703	8,588.00
PC3002 VARIO	Adaptive	Yes	7	~ 5	1.6	47	733503	8,620.00
PC3003 VARIO	Adaptive	Yes	6x10 ⁻¹	4.5x10 ⁻¹	1.6	47	738403	12,895.00
PC3004 VARIO	Adaptive	Yes	1.5	1.1	2.7	77	737503	12,310.00
PC3010 NT VARIO	Adaptive	Yes	6x10 ⁻¹	4.5x10 ⁻¹	6.8	193	744803	Inquire
PC3012 NT VARIO	Adaptive	Yes	1.5	1.1	7.6	215	743803	Inquire
PC3016 NT VARIO	Adaptive	Yes	70	53	11.4	322	741803	Inquire

* Can be fitted with vacuum regulation valve 696843. **Outlet catchpot for solvent collection only. *** US power cord (#637655) not included.

Note: All pumps 120V, 60Hz unless noted.

Rotary vane pumps

Model	Solvent Recovery	Ultimate Vacuum		Free Air Capacity at 60Hz		Cat. No.	2016 List Price
		mbar	Torr	cfm	lpm		
RZ2.5 100-120V/200-230V, 50-60Hz, US plug	No	2x10 ⁻³	1.5x10 ⁻³	1.6	47	698126	\$2,495.00
RZ6 100-120V/200-230V, 50-60Hz, US plug	No	2x10 ⁻³	1.5x10 ⁻³	4.0	113	698136	3,427.00
RZ9, 120V, 60Hz, US plug	No	2x10 ⁻³	1.5x10 ⁻³	6.0	170	698143	4,395.00
RZ16, 230V, 50-60Hz, CEE plug	No	2x10 ⁻³	1.5x10 ⁻³	11.2	318	698050	5,368.00

Chemistry-HYBRID vacuum pumps

RC6, 100-120V, 50-60Hz, US plug	No	2x10 ⁻³	1.5x10 ⁻³	4.1	115	698563	7,375.00
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Accessories for your VACUUBRAND® rotary vane pump and RC6

KF16 to 10mm (3/8") hose barb, fits RZ2.5, RZ6, and RC6 inlet, aluminum	662511	41.78
KF25 to 19mm (3/4") hose nipple, fits RZ9 inlet and outlet, aluminum	662532	58.08
Inlet catchpot for RZ2.5	698000	405.56
Inlet catchpot for RZ6 and RC6	698006	594.08
Inlet catchpot for RZ9 and RZ16	698007	509.50
Oil mist filter for RZ2.5 and RZ6	698003	563.51
Oil mist filter for RZ9 and RZ16	698017	695.98
Pump Oil B, 1 liter bottle	687010	51.97
Pump Oil B, 5 liter can	687011	183.42

Other flanges, clamping rings and centering rings available, contact BrandTech® Scientific.

What's in a name?

A quick guide to VACUUBRAND diaphragm pump names

To get a better handle on the vacuum pump you are looking at, VACUUBRAND has a nomenclature that makes pump identification relatively easy:

M = "Membrane"/diaphragm pump

E, Z, D or V = From "eins," "zwei," "drei," and "vier" or 1, 2, 3 or 4 in German

Indicates the number of pump stages which gives vacuum depth. An "E" pump provides 70-100mbar, and is suitable for filtration, degassing, solid-phase extraction, aspiration, dessication and other pressure differential applications. Z, D or V pumps provide increasingly deeper vacuum levels typically used for evaporative applications.

C = Chemistry design

A full fluoropolymer flowpath suitable for use with aggressive chemicals. If selecting a "non-C" diaphragm pump, make sure that the vapors passing through the pump are compatible with the materials of construction of the flowpath - typically aluminum and FKM elastomer (aluminum and PTFE in the case of the ME1)

NT = "New Technology"

A series of pumps incorporating design changes for improved performance and easier service.

AK and EK = solvent recovery accessories

AK indicating a glass catchpot on the inlet (or in the case of 2AK, inlet and outlet), while EK represents an outlet condenser.

Synchro = A two-application vacuum system with flow control and check valves for each.

PC = Pumping unit, Chemistry

An integrated vacuum system with pump, solvent recovery and control accessories. They have a different, but equally descriptive nomenclature.

Vacuum Pump Ordering Information

Aluminum-FKM diaphragm vacuum pumps for non-corrosive applications

Model	Ultimate Vacuum		Free Air Capacity at 60Hz		Cat. No.*	2016
	mbar	Torr	cfm	lpm		List Price
ME1	100	75	0.5	14	721003	\$859.00
ME2 NT	70	52	1.3	37	730003	1,392.00
ME4 NT	70	52	2.6	73	731003	2,162.00
ME8 NT	70	52	4.8	135	734003	3,881.00
ME16 NT	70	53	10.8	307	741003	Inquire
MZ2 NT	7	5.2	1.4	40	732003	2,162.00
MD1, 100-120V/200-230V, 50-60Hz	1.5	1.1	0.82	23	696087**	2,570.00
MD4 NT	1	0.75	2.5	72	736005	4,079.00
MD12 NT	2	1.5	7.8	222	743003	6,400.00
MV2 NT	5x10 ⁻¹	4x10 ⁻¹	1.4	40	738003	4,610.00
MV10 NT	5x10 ⁻¹	3.8x10 ⁻¹	6.8	193	744003	Inquire

Accessory

Vacuum regulation valve with manometer for ME1	696842	175.27
Vacuum regulation valve with manometer for ME2 NT	696840	319.97
Power cord, 120V, 60Hz	612065	27.51

* All pumps 120V, 60Hz unless noted. **Dual voltage pumps require purchase of a power cord.

Vacuum gauges & controllers

Model	Cat. No.	2016 List Price
DVR2 Vacuum Gauge, battery operated (9V, Lithium)	682902	\$923.00
VACUU•VIEW, 100-230V, 50-60Hz	683220	1,242.00
VACUU•VIEW extended, 100-230V, 50-60Hz	683210	1,422.00
DCP 3000 + VSK 3000 vacuum gauge, 100-230V, 50-60Hz	683170	1,889.00
DCP 3000 + VSP 3000 vacuum gauge, 100-230V, 50-60Hz	683190	1,889.00
DCP 3000 + MPT 200 vacuum gauge, 100-230V, 50-60Hz	683175	3,569.00
CVC 3000 <i>detect</i> vacuum controller, frame rod version 100-230V, 50-60Hz (with integrated chemistry solenoid valve and check valve)	2614120	3,285.00
CVC 3000 <i>detect</i> , vacuum controller, benchtop version, 100-230V, 50-60Hz (with integrated chemistry solenoid valve and check valve)	2614860	3,285.00
CVC 3000 + VSP 3000 + VVB 15C KF16 (Pirani control package), all inclusive, for rotary vane pumps with KF16 small flange inlets (RZ2.5, RZ6, RC6)	635983	3,369.00
CVC 3000 + VSP 3000 + VVB 15C KF25 (Pirani control package), all inclusive, for rotary vane pumps with KF25 small flange inlets (RZ9, RZ16)	635982	3,969.00
VSK 3000 VACUU•BUS® gauge head	636657	648.00
VSP 3000 VACUU•BUS® Pirani gauge head	636163	643.00
VACUU•CONTROL® add-on, LAN*	683120	818.00
VACUU•CONTROL® add-on, WLAN*	683110	818.00
VVKWB solenoid coolant valve	674220	440.21
VMBB solenoid vent valve	674217	380.09
Liquid Level Sensor for 500mL catchpot, VACUU•BUS®	699908	614.46
VACUU•BUS® extension cable, 2m	612552	75.41
VACUU•BUS® Y-adapter with cable, 2m	683240	255.00

*Software version 2.0 or higher (2009)

