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 systems, and competitive vacuum products.

- **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**—Flow rates at typical operating pressures of VACUUBRAND® pumps are up to 100% greater than competitive oil-free pumps for faster evaporative applications and higher productivity.

**Groundbreaking control for any vacuum application – VACUU-SELECT® electronic vacuum control**

The NEW VACUU-SELECT® vacuum controller is a quantum leap forward in harnessing vacuum to perform your labwork. A multilingual touch screen interface uses smart-phone style icons to quickly navigate to the desired procedure for simple automation of rotary evaporation, short path distillation, concentration, filtration, drying ovens and more. Want to modify an existing procedure, or create a new one? Dragging and dropping application building blocks is as easy as swiping a finger.

VACUU-SELECT® control is now incorporated in our pumping systems that have traditionally had electronic control. When paired with VARIO® speed controlled pumps, it delivers continuously optimized vacuum levels for faster evaporation without bumping. In the multitasking PC 520 select and PC 620 select vacuum system VACUU-SELECT® provides completely independent touch screen control for two applications.

VACUU-SELECT® control can also be brought to vacuum pumps from other manufacturers, or even central vacuum systems—subject to those systems performance specifications.
The Essential Vacuum Pump

The essential oil-free, corrosion-resistant vacuum pump

High performance VACUUBRAND® chemistry-design diaphragm pumps provide dry vacuum levels as deep as 0.6 mbar, 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. All chemistry-design multistage models feature an integrated gas ballast that permits continuous purging of condensed vapor from the pump.

Inset shows diaphragm head assembly, which incorporates thick fluoropolymer, molded over stability core, providing chemical resistance and long term reliability.

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.

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 70-100 mbar, 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 ME 1)
- **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 “accumulating” catchpot on the inlet (or in the case of 2AK, inlet and outlet), while EK represents an outlet "emission" condenser.
- **Synchro = Dual application system**
  - 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.
- **SELECT = Electronic Control**
  - Select models incorporate the innovative VACUU·SELECT® electronic controller.
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 1-100 mbar. For filtration, liquid aspiration and other pressure-differential (“fluid movement”) applications, 100 mbar is sufficient, achieving 90% of the possible “force” i.e. potential pressure difference. An ultimate vacuum of 7 mbar 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 2 mbar 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 $10^{-3}$—1 mbar. Rotary vane or hybrid pumps are required for these applications.

What about “flow rate?”

The flow rate required for an application is determined by the application, system leakage, and your time requirements. The maximum flow rate—sometimes called “free air capacity” or “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. 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.
Types of electronic vacuum control

• **Traditional two-point control**—Found in systems with single-speed pumps, i.e. the PC 620 select two-application system, or non-VARIO® 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 less sophisticated 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. This results in reduced noise, maintenance, and electrical consumption and improved solvent recovery when used with an outlet condenser. Increasing solute concentration or multiple solvents is easily handled with VARIO® speed control.

• **Variable speed pumps**—(as supplied by other manufacturers) Less sophisticated software can only find the first boiling point, often overshooting, requiring frequent manual intervention.

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

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Vacuum order information see pages 81-82
VACUUBRAND® VARIO® select vacuum systems offer users unsurpassed control of critical vacuum applications. A low maintenance chemistry-design pump is integrated with a variable speed motor and the NEW VACUU-SELECT® touch screen 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!

NEW VARIO® vacuum with the VACUU-SELECT® controller. Automatic control of all common lab applications with touch-screen control!

- **Intuitive**—The new VACUU-SELECT® controller offers smart-phone like intuitive operation of all aspects of vacuum control. Use or modify one of several different self-operating protocols for different applications, or assemble your own custom protocol using the easy drag and drop interface.

- **Faster**—VARIO® variable speed pumps continuously optimize the vacuum levels for up to 30% faster evaporations, even with solvent mixtures.

- **Less “babysitting”**—Protocols operate automatically, reducing the need for oversight, freeing you up to be a scientist rather than a machine operator.

- **Virtually no bumping**—VARIO® control gently approaches boiling points, minimizing bumping, foaming, or other artifacts of “overpumping” caused by lesser control options.

- **Nearly silent**—Standard VACUUBRAND® pumps are whisper-quiet, even when running at full speed. Typical VARIO® operation is a small fraction of that.

- **Extremely low maintenance**—Because the pump only runs as fast as necessary to maintain optimum vacuum, service intervals are greatly extended over the typical 15,000 working hours of full speed operation.

- **Sustainable**—VARIO® pumps not only eliminate the oil use and dry ice traps used for protective purposes of rotary vane pumps, they also have reduced use of wearing parts and electricity consumption compared with conventional diaphragm pumps. The most sustainable vacuum pumps ever!

- **Share protocols**—A USB port allows downloading and uploading of protocols on a flash drive.

Standard VACUUBRAND® two-point control (PC 510/610 select) and electronic multitasking systems (PC 511/520/611/620 select) also feature the VACUU-SELECT controller for intuitive operation, with the cost of a single speed pump.

**Already have a pump?** A VACUU-SELECT® complete vacuum controller can provide many of the convenience functions to your existing single speed diaphragm vacuum pump from any manufacturer. See page 78.
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 7 mbar or 1.5 mbar VACUUBRAND® NT series vacuum pump. Select a 7 mbar system (MZ 2C NT Synchro™, PC 511 select, or PC 520 select) for most lab applications and 1.5 mbar systems (MD 4C NT Synchro™, PC 611 select, PC 620 select) 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? Help is available through the VACUUBRAND® Vacuum Pump Selection Guide.

This free guide has been designed to suggest an appropriate 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. Because applications can vary, these suggestions are a great starting point to discuss with your BrandTech® representative.
Networked Vacuum

**VACUU-LAN® Mini-Network**

The VACUU-LAN® Mini-Network is a great way to serve 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](image)

**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 2 mbar/1.5 Torr) 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 XS-Series rotary vane vacuum pumps for fine vacuum applications

- **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 are designed to improve corrosion resistance, reduce wearing forces, enhance performance and simplify maintenance. Internal steel surfaces are nitrogen-plasma treated for chemical resistance and mechanical hardness.

- **Quiet**—XS-pumps are extremely low-noise and low vibration, even compared to earlier VACUUBRAND® rotary vane models.

- **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.

Big vacuum in a small package!
VACUUBRAND® RZ 2.5

**Extremely compact compared to popular pump models**

- **Compared with a belt-drive pump**, the RZ 2.5 takes up 1/3 of the bench space, weighs half as much, occupies less than 1/4 the volume, and delivers superior flowrates.

- **Compared with competitive direct drive pumps**, the RZ 2.5 takes up half the space and weighs half as much.

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 10 mm (3/8") polypropylene hose barb is included with RZ 2.5 and RZ 6 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 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 RC 6).

- **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 pumps provide the operational muscle for your rotary evaporator. 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 temperatures, 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 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. Over twenty 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 than two point control
- Shut the pump off when evaporation is completed

For most benchtop rotary evaporators, the PC 3001 VARIO® select vacuum system is an excellent choice. The powerful integral pump provides a deep 2 mbar 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 PC 101 NT vacuum system for basic evaporation and vapor capture. It includes a 7 mbar MZ 2C 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 69 & 81 for description and ordering 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!

PC 3001 VARIO® select Vacuum System
2 mbar, 1.2 cfm

PC 101 NT
7 mbar, 1.4 cfm
The VACUU-SELECT® complete vacuum controller lets 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 MD 1C + 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 2 mbar PC 3001 VARIO® select system, but without control.

For applications that do not require either control or solvent recovery, consider a stand-alone pump such as the MZ 1C or MD 1C. 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 MD 1C is also preferred by customers who address vacuum control and solvent recovery through other methods.

Electronic control
Some rotary evaporation applications might benefit from control, but might not require the precision of adaptive control. The PC 510 select 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 MZ 2C 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 PC 520 select. See pages 69 & 81 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 PC 511 select or PC 611 select. The second flow-controlled port adds minimal cost, but can easily be upgraded to full electronic control with the purchase of a VACUU-SELECT® complete (see page 78).

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?
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?**

Due to the highly variable solvent content and sample size, choosing an appropriate vacuum pump for an oven can be challenging. 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 MZ 2C 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 MD 1C +AK+EK.

Laboratories with larger ovens (>1.0 cubic feet in capacity) or with samples having a high moisture content do well with the PC 201 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 MD 1C vacuum pump.

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 MZ 2C 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.

For SDS-PAGE concentrations greater than 10%, choose the MD 1C +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.
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® ME 1C and ME 4C NT. Users seeking additional capability or users with special circumstances, may want to consider the VACUUBRAND® MZ 2C NT +2AK or MD 1C +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 ME 1 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 ME 1C.

**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 ME 2C NT; for more than 4 filtrations, the ME 4C NT vacuum pump is an excellent pump. The higher flow rate ensures better results and faster process times in large-scale filtration labs. For solid phase extraction (SPE), choose the ME 2C NT for small applications, the ME 4C NT for medium size, and the ME 8C 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.

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**Environmental Responsibility**

For decades, VACUUBRAND has looked at environmentalism from both a manufacturing and product side. They manufacture pumps designed to minimize their impact on the environment, through reduced energy and water consumption, solvent capture, and elimination of waste oil, all while conforming to the ISO 14001 standard. Recycling waste material and heat, collecting rainwater for non-potable applications and more has been the norm at VACUUBRAND long before it was fashionable. Find out more at vacuubrand.com
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 MD 1C or MD 4C NT. Both of these pumps are powerful enough to evaporate DMF. Select the MD 1C for supporting smaller concentrators and the MD 4C NT with its higher flow rate for larger benchtop concentrators. For more volatile solvents, a pump like an MZ 2C 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 RC 6 Chemistry-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 MD 1C +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). It also 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 the drug discovery marketplace. Please contact BrandTech® Scientific for assistance in selecting the best pump for these applications.

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**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, and 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.
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® RC 6 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 RC 6 Chemistry-HYBRID™ pump. The RC 6 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 RC 6 Chemistry-HYBRID™ pump, like other oil-sealed pumps, should always be operated with a cold trap.

What about larger applications?

The RC 6 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®.

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 RC 6 Chemistry HYBRID™ pump or a VACUUBRAND® rotary vane vacuum pump such as the RZ 2.5, RZ 6, or RZ 9. These pumps feature the same high performance, innovative design, and quality assurance as VACUUBRAND® oil-free vacuum pumps and systems. See page 71 for more information.

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.
- **No cold trap required** to protect VACUUBRAND® chemistry diaphragm pumps 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%.
- **Modular distributed vacuum systems** enable even greater saving by delivering vacuum where you need it. See page 70 for VACUU-LAN® systems.

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

VACUUBRAND® vacuum gauges and controllers enable you to monitor and control vacuum generation for most laboratory 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 1x10⁻³ 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.

### Improved! DVR 2pro vacuum gauge

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. Easily accessible battery power with adjustable sleep timer for long battery life.

### NEW! VACUU·SELECT® complete

Innovative touch screen display provides smart-phone like convenience to vacuum control. Includes routines for nearly all laboratory applications. Custom modify standard routine procedures, or use the drag-and-drop menu to assemble your own application. A revolution in vacuum technology!

### NEW! VACUU·SELECT® + VACUU·VIEW® Extended 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 VACUU·SELECT® vacuum controller, a VACUU·VIEW extended external combination capacitive-Pirani vacuum sensor, a VV-B 15C high performance chemistry in-line solenoid valve and all necessary small flange components. Control is achieved by use of an in-line solenoid valve, minimizing noise and oil-mist generation.

### VACUU·VIEW® and VACUU·VIEW® extended gauges

Vacuum gauges with corrosion-resistant transducers designed especially for the rigors of laboratory use. Both gauges are mercury-free, feature KF 16 small flange vacuum connections, with screw-in hose barbs to allow fitting of 6-10 mm ID vacuum hose.
**VACUUBRAND Transducer Technology**

Vacuum gauges and controller feature corrosion-resistant transducers designed especially for the rigors of laboratory use. All VACUUBRAND® transducers are mercury-free. VACUU-BUS® connections allow easy interfacing with VACUUBRAND® accessories, and universal power supplies are included (except DVR 2pro).

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 0.1 mbar/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.

<table>
<thead>
<tr>
<th>Product comparison</th>
<th>Measuring principle</th>
<th>Measurement gas type independent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Battery-powered</td>
<td>Chemical resistant</td>
</tr>
<tr>
<td>VACUU·VIEW</td>
<td>–</td>
<td>✓</td>
</tr>
<tr>
<td>VACUU·VIEW Extended</td>
<td>–</td>
<td>✓</td>
</tr>
<tr>
<td>DVR 2pro</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>VACUU·SELECT® complete</td>
<td>–</td>
<td>✓</td>
</tr>
</tbody>
</table>
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 diaphragms provide high performance and increased reliability.
- Broad product range—Pumps with vacuum as deep as 0.3 mbar and flow rates as high as 10.8 cfm (307 lpm).

ME 8 NT:
A popular choice for plate washers, cell harvesters and other applications that require high flowrates with relatively shallow vacuum.

ME 1:
Features PTFE diaphragm and valves for enhanced corrosion resistance (not for use with acidic vapors). An excellent choice for filtration (see page 75).
## Vacuum Pump Ordering Information

### Chemistry design pumps

<table>
<thead>
<tr>
<th>Model</th>
<th>Controller(s)</th>
<th>Solvent Recovery</th>
<th>Ultimate Vacuum</th>
<th>Free Air Capacity at 60 Hz</th>
<th>Cat. No.</th>
<th>2019 List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Oil-Free Chemistry design diaphragm vacuum pumps</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>ME 1C*</td>
<td>No</td>
<td>No</td>
<td>100</td>
<td>75</td>
<td>0.5 14</td>
<td>20721103</td>
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<tr>
<td>ME 2C NT</td>
<td>No</td>
<td>No</td>
<td>70</td>
<td>52</td>
<td>1.4 40</td>
<td>20730103</td>
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<tr>
<td>ME 4C NT</td>
<td>No</td>
<td>No</td>
<td>70</td>
<td>52</td>
<td>2.5 72</td>
<td>20731203</td>
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<tr>
<td>ME 4C NT +2AK</td>
<td>No</td>
<td>Yes**</td>
<td>70</td>
<td>52</td>
<td>2.5 72</td>
<td>22614080</td>
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<tr>
<td>100-120 V/200-230 V, 50-60 Hz***</td>
<td>No</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ME 8C NT*</td>
<td>No</td>
<td>No</td>
<td>70</td>
<td>52</td>
<td>4.6 130</td>
<td>20734203</td>
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<tr>
<td>ME 16C NT</td>
<td>No</td>
<td>Yes**</td>
<td>70</td>
<td>53</td>
<td>10.8 307</td>
<td>20741303</td>
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<tr>
<td>MZ 1C*</td>
<td>No</td>
<td>Yes**</td>
<td>70</td>
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<td>0.5 15</td>
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<tr>
<td>MZ 2C NT</td>
<td>No</td>
<td>Yes**</td>
<td>7</td>
<td>5</td>
<td>1.4 38</td>
<td>20732503</td>
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<tr>
<td>MZ 2C NT +2AK</td>
<td>No</td>
<td>Yes**</td>
<td>7</td>
<td>5</td>
<td>1.4 38</td>
<td>20732503</td>
</tr>
<tr>
<td>MD 1C*</td>
<td>No</td>
<td>Yes**</td>
<td>7</td>
<td>5</td>
<td>0.9 25</td>
<td>20696613</td>
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<tr>
<td>MD 1C +AK+EK</td>
<td>No</td>
<td>Yes**</td>
<td>7</td>
<td>5</td>
<td>2.2 52</td>
<td>20731603</td>
</tr>
<tr>
<td>MD 4C NT</td>
<td>No</td>
<td>Yes**</td>
<td>7</td>
<td>5</td>
<td>1.1 22</td>
<td>20734303</td>
</tr>
<tr>
<td>MD 12C NT</td>
<td>No</td>
<td>Yes**</td>
<td>7</td>
<td>5</td>
<td>1.1 22</td>
<td>20734303</td>
</tr>
<tr>
<td>MV 10C NT</td>
<td>No</td>
<td>Yes**</td>
<td>7</td>
<td>5</td>
<td>6.3 178</td>
<td>20744303</td>
</tr>
</tbody>
</table>

### Accessories for oil-Free diaphragm vacuum pumps

- **VACUULAN® Mini-Network**  
  22614455  1,427.40

- ME 1C vacuum regulation valve with manometer (suitable for use with the MZ 1C and MD 1C)  
  20696843  375.80

- Power cord, L-shaped 120 V, US  
  20637655  41.60

### Oil-free Chemistry design single application vacuum system

<table>
<thead>
<tr>
<th>Model</th>
<th>Controller(s)</th>
<th>Solvent Recovery</th>
<th>Ultimate Vacuum</th>
<th>Free Air Capacity at 60 Hz</th>
<th>Cat. No.</th>
<th>2019 List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC 101 NT</td>
<td>1 Manual</td>
<td>Yes</td>
<td>7</td>
<td>5</td>
<td>1.4 38</td>
<td>20713003</td>
</tr>
<tr>
<td>PC 201 NT</td>
<td>1 Manual</td>
<td>Yes</td>
<td>1.5</td>
<td>1.1</td>
<td>2.2 63</td>
<td>20737003</td>
</tr>
<tr>
<td>PC 610 select</td>
<td>1 Electronic</td>
<td>Yes</td>
<td>1.5</td>
<td>1.1</td>
<td>2.2 63</td>
<td>20737153</td>
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</tbody>
</table>

### Oil-free Chemistry design dual application vacuum systems

- **MZ 2C NT** Synchro™  
  2 Manual  
  20732803  5,185.60

- PC 511 select  
  1 Electronic  
  +1 Manual  
  20732553  8,234.00

- PC 520 select  
  2 Electronic  
  20733353  11,273.00

- **MD 4C NT** Synchro™  
  2 Manual  
  20736803  9,205.80

- **PC 3001** VARIO® select  
  1 Electronic  
  20737253  12,302.60

- **PC 3002** VARIO® select  
  2 Electronic  
  20737353  15,030.80

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

- **ME 1C VARIO® select**  
  Adaptive  
  20741753  Inquire

- **ME 2C VARIO® select**  
  Adaptive  
  20724253  7,559.60

- **MD 4C VARIO® select**  
  Adaptive  
  20746553  12,045.20

- **MV 10C VARIO® select**  
  Adaptive  
  20744753  Inquire

- **MD 12C VARIO® select**  
  Adaptive  
  20743753  Inquire

- **PC 3001 VARIO® select**  
  Adaptive  
  20700203  8,988.00

- **PC 3002 VARIO® select**  
  Adaptive  
  20733553  9,574.40

- **PC 3003 VARIO® select**  
  Adaptive  
  20738453  13,177.60

- **PC 3004 VARIO® select**  
  Adaptive  
  20731553  12,800.00

- **PC 3010 NT VARIO® select**  
  Adaptive  
  20744853  Inquire

- **PC 3012 NT VARIO® select**  
  Adaptive  
  20743853  Inquire

- **PC 3016 NT VARIO® select**  
  Adaptive  
  20741853  Inquire

* Can be fitted with vacuum regulation valve 20696843. **Outlet catchpot for solvent collection only. *** US power cord (#20637655) not included.

Note: All pumps 120 V, 60 Hz unless noted.
Vacuum Pump Ordering Information

Aluminum-FKM diaphragm vacuum pumps for non-corrosive applications

<table>
<thead>
<tr>
<th>Model</th>
<th>Ultimate Vacuum</th>
<th>Free Air Capacity at 60 Hz</th>
<th>Cat. No.*</th>
<th>2019 List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 1</td>
<td>100 Torr</td>
<td>0.5</td>
<td>14</td>
<td>20721003</td>
</tr>
<tr>
<td>ME 2 NT</td>
<td>200 Torr</td>
<td>1.3</td>
<td>37</td>
<td>20730003</td>
</tr>
<tr>
<td>ME 4 NT</td>
<td>200 Torr</td>
<td>2.6</td>
<td>73</td>
<td>20731003</td>
</tr>
<tr>
<td>ME 8 NT</td>
<td>200 Torr</td>
<td>4.8</td>
<td>135</td>
<td>20734003</td>
</tr>
<tr>
<td>ME 16 NT</td>
<td>200 Torr</td>
<td>10.8</td>
<td>307</td>
<td>20741003</td>
</tr>
<tr>
<td>MZ 2 NT</td>
<td>200 Torr</td>
<td>1.4</td>
<td>40</td>
<td>20732003</td>
</tr>
<tr>
<td>MD 1, 100-120 V/200-230 V, 50-60 Hz</td>
<td>200 Torr</td>
<td>0.82</td>
<td>23</td>
<td>20696687</td>
</tr>
<tr>
<td>MD 4 NT</td>
<td>200 Torr</td>
<td>2.5</td>
<td>72</td>
<td>20736005</td>
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<tr>
<td>MD 12 NT</td>
<td>200 Torr</td>
<td>7.8</td>
<td>222</td>
<td>20743003</td>
</tr>
<tr>
<td>MV 2 NT</td>
<td>200 Torr</td>
<td>1.4</td>
<td>40</td>
<td>20738003</td>
</tr>
<tr>
<td>MV 10 NT</td>
<td>200 Torr</td>
<td>6.8</td>
<td>193</td>
<td>20744003</td>
</tr>
</tbody>
</table>

Accessories

- Vacuum regulation valve with manometer for ME 1: 20696842, 167.40
- Vacuum regulation valve with manometer for ME 2 NT: 20696840, 345.20
- Power cord, 120 V, 60 Hz: 20612065, 29.80

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

Vacuum gauges & controllers

<table>
<thead>
<tr>
<th>Model</th>
<th>Cat. No.</th>
<th>2019 List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>DVR 2pro Vacuum Gauge, battery operated (9 V, alkaline)</td>
<td>20682906</td>
<td>$977.00</td>
</tr>
<tr>
<td>VACUU·VIEW, 100-230 V, 50-60 Hz</td>
<td>20683220</td>
<td>1,291.00</td>
</tr>
<tr>
<td>VACUU·VIEW extended, 100-230 V, 50-60 Hz</td>
<td>20683210</td>
<td>1,478.40</td>
</tr>
<tr>
<td>VACUU·SELECT® complete vacuum controller, frame rod version 100-230 V, 50-60 Hz (with integrated chemistry solenoid valve and check valve)</td>
<td>20700080</td>
<td>3,415.80</td>
</tr>
<tr>
<td>VACUU·SELECT® complete vacuum controller, benchtop version, 100-230 V, 50-60 Hz (with integrated chemistry solenoid valve and check valve)</td>
<td>20700070</td>
<td>3,318.00</td>
</tr>
<tr>
<td>VACUU·SELECT® + VACUU·VIEW® extended KF 16 (Pirani control package), all inclusive, for rotary vane pumps with KF 16 small flange inlets (RZ 2.5, RZ 6, RC 6)</td>
<td>20700100</td>
<td>4,528.80</td>
</tr>
<tr>
<td>VACUU·SELECT® + VACUU·VIEW® extended KF 25 (Pirani control package), all inclusive, for rotary vane pumps with KF 25 small flange inlets (RZ 9)</td>
<td>20700110</td>
<td>4,599.00</td>
</tr>
</tbody>
</table>

Rotary vane pumps

<table>
<thead>
<tr>
<th>Model</th>
<th>Ultimate Vacuum</th>
<th>Free Air Capacity at 60 Hz</th>
<th>Cat. No.</th>
<th>2019 List Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>RZ 2.5 100-120 V/200-230 V, 50-60 Hz, US plug</td>
<td>2x10⁻³</td>
<td>1.5x10⁻³</td>
<td>2069126</td>
<td>$2,594.40</td>
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<tr>
<td>RZ 6 100-120 V/200-230 V, 50-60 Hz, US plug</td>
<td>2x10⁻³</td>
<td>1.5x10⁻³</td>
<td>2069136</td>
<td>3,563.00</td>
</tr>
<tr>
<td>RZ 9,120 V, 60 Hz, US plug</td>
<td>2x10⁻³</td>
<td>1.5x10⁻³</td>
<td>2069143</td>
<td>4,570.00</td>
</tr>
<tr>
<td>Chemistry-HYBRID vacuum pumps</td>
<td>2x10⁻³</td>
<td>1.5x10⁻³</td>
<td>20695563</td>
<td>7,668.80</td>
</tr>
</tbody>
</table>

Accessories for your VACUUBRAND® rotary vane pump and RC 6

- KF 16 to 10 mm (3/8") hose barb, fits RZ 2.5, RZ 6, and RC 6 inlet, aluminum: 20662311, 45.20
- KF 25 to 19 mm (3/4") hose nipple, fits RZ 9 inlet and outlet, aluminum: 20662332, 62.80
- Inlet catchpot for RZ 2.5: 20680000, 433.40
- Inlet catchpot for RZ: 2068006, 635.40
- Inlet catchpot for RZ 9: 2068007, 545.00
- Oil mist filter for RZ 2.5: 2068003, 602.60
- Oil mist filter for RZ 9: 2068017, 744.40
- Pump Oil B, 1 liter bottle: 20687010, 55.60
- Pump Oil B, 5 liter can: 20687011, 195.60

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

BrandTech® Scientific, Inc. 888-522-2726 www.brandtech.com