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Catalog 2014/2015 Technology for Vacuum Systems



Technology for Vacuum Systems



Vakuumentchnik im System

vacuubrand®

TRADEMARK-INDEX

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CATALOG 2014/2015
TECHNOLOGY FOR VACUUM SYSTEMS

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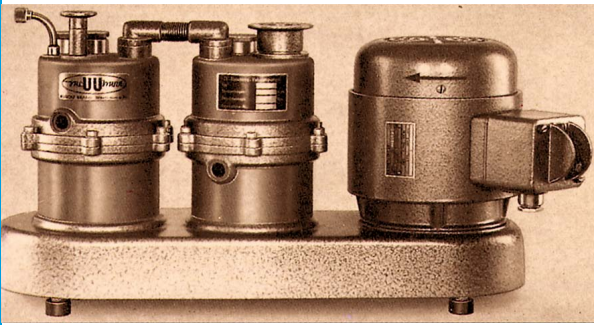
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Our technical literature is only intended to inform our customers. The validity of general empirical values and results obtained under test conditions for specific applications depends upon a number of factors beyond our control. It is, therefore, strictly the users responsibility to verify carefully the validity of values and suitability of products for their specific requirements. No claims arising from the information provided in this catalog will consequently be entertained. Technical data are subject to change without notice. Pictures may depict accessories which are not supplied as standard under the catalog number printed.

For reasons of corrosion and resistance, materials containing fluorine (such as PTFE) have to be used for chemical applications or the pumps are operated with PFPE (perfluoropolyether) fluid. We would like to point out that there are cleaning and disposal problems with these materials/fluids.

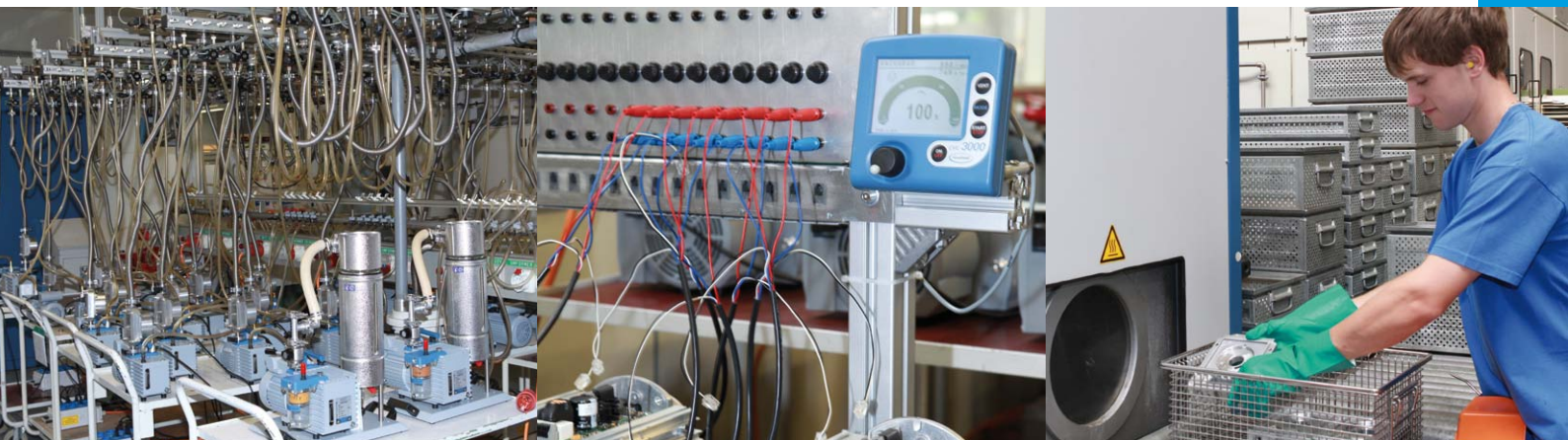
Protection class: According to standard IEC 60529

VACUUBRAND- YOUR NUMBER ONE FOR VACUUM!



RETROSPECTIVE

1961: The new vacuum technology department begins manufacturing their first vacuum pumps at RUDOLF BRAND in Wertheim, Germany. With innovative and high quality products, business expands so much in the following years that VACUUBRAND GMBH + CO KG is spun off on January 1, 1985 as an independent company. Today, more than 50 years after the first BRAND vacuum pump, VACUUBRAND offers the most comprehensive family of products for generating, measuring and regulating vacuum for rough and fine vacuum applications in the laboratory. The company has earned a place among the ranks of the leading vacuum suppliers in the world.



TECHNOLOGY

From the outset, we had one priority: offering laboratory users equipment that meets the highest quality standards. "Intelligent pumps" make work easier in laboratories, permitting chemists and technicians to concentrate on their real work. We engineer and produce nearly all pump and controller components in our own facility in Wertheim, Germany. That enables us to respond quickly to the special needs of our customers, and design and build the quality into our products by mastering the many disciplines that ensure that quality. Relying on state-of-the-art technology and machine tools, we produce rotary vane and diaphragm pumps, chemistry pumping units, chemistry vacuum systems, vacuum gauges and controllers, valves and components of the innovative VACUU-LAN® local vacuum network.

INDIVIDUALITY

Different laboratories make a wide variety of demands on vacuum systems. This is why we offer tailor-made solutions to our customers. We select the optimum vacuum pumps for the needed vacuum range, and encourage you to add capabilities and accessories to the basic equipment, depending upon your needs. But we can also meet very specific customer needs. With our in-house engineering and manufacturing, we can design and produce specialized equipment in short runs in our facilities in Wertheim.

QUALITY

What is the first thing customers have been associating with the VACUUBRAND name for decades? Quality! We maintain and work continuously to perfect an integrated management system in all departments in conformity with ISO 9001 and ISO 14001. Our 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 our facility, measuring specifications and equipment reliability with PC-controlled measuring and test machines and a fully automatic final test stand. That is how we guarantee that vacuum pumps from VACUUBRAND are not only designed to an exceptionally high level engineering standard, but also offer extraordinary economic advantages because of their low service costs and above-average lifetimes.

VACUUBRAND- WE DO MORE THAN YOU EXPECT



TRAINING

We offer special seminars and practical courses in VACUUBRAND's own training center to teach the basics of vacuum technology and vacuum generation. The hands-on and user-oriented seminar programme also teaches topics such as the correct application of vacuum pumps and systems in chemistry, pharmacy, physics and medicine. Service seminars are especially important for service and repair of vacuum pumps within the customer's workshops. Pumps, pumping units and measuring instruments can be tried out in a "mobile laboratory", the VACUUBRAND exhibition bus. Our application specialists would also be glad to come to your company to train your team in vacuum theory, technology and service.

SERVICE

Our vacuum pumps are very reliable but pending on the type and the application they need a bit of service occasionally. Our pumps are designed for easy service, so you can do it in your own workshops, or have us do it. Your workshop employees are welcome to take an intensive training course at our facility. And, if worse comes to worst, our service would be glad to help you do repair fast and at low cost. For all practical purposes, pumps we repair are like new and can be used all over your laboratory. We routinely repair VACUUBRAND pumps that have already been in use for 20 years or more. Quality pays!



CALIBRATION

VACUUBRAND is accredited according to DIN EN ISO/IEC 17025 by the Deutsche Akkreditierungsstelle GmbH (DAkkS) as a calibration laboratory within the German Calibration Service (Deutscher Kalibrierdienst, DKD). Its accreditation includes calibrating vacuum meters and other absolute pressure measuring instruments in the measuring range of 1300 to 10^{-3} mbar. We are authorised to issue DAkkS calibration certificates. VACUUBRAND's service offers DAkkS calibrations for own products and products of other manufacturers.

DISTRIBUTION

Our standard products are available from all leading laboratory dealers at home and abroad. The best advice is very important for us: Therefore, we support the dealers for years with our own staff who are specialists in technical consulting. Just call one of our local sales offices or ask our team in Wertheim. This team is the right partner for OEM products and custom designs. Please contact us using the contact details farther in the back of the catalog on page 180 and 181



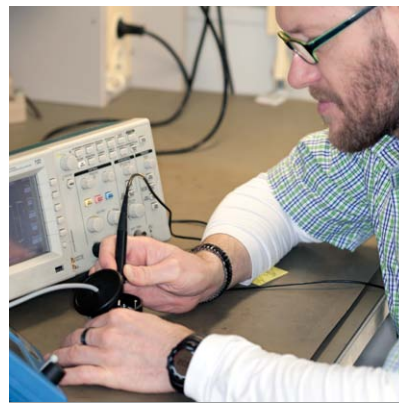
TECHNOLOGY

OUR PEOPLE MAKE THE DIFFERENCE



Maximum quality with regular checks

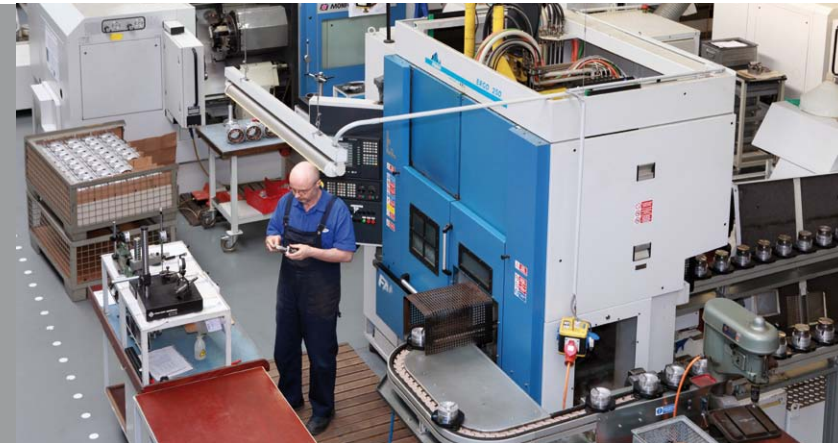
It is very easy to explain the secret of VACUUBRAND's success. We can only survive as a company in the heat of competition if we have the best team - right through the company. We set great store by individualised training and development for our employees. In more than 50 years in excess of 150 young people have successfully launched their professional careers in our company. We have an interdisciplinary exchange of knowledge with our very high degree of internal production in the various departments. That creates a high level of motivation and together it makes us efficient and productive.



Qualified personnel who make every motion count



Friendly and expert: Our ladies from the indoor sales service



Comprehensive review and testing of the specialized designs and prototypes in the product development



Shipping and packaging according to environmentally-friendly and economical criteria



VACUUBRAND cares about training and advanced education

CHEMISTRY DIAPHRAGM PUMPS - DIAPHRAGM PUMPS - ROTARY VANE PUMPS



Chemistry diaphragm pumps and ATEX pumps

Because they are oil-free, resistant to chemicals and able to recover solvents, diaphragm pumps are usually the best choice for generating vacuum in laboratory, and for equipment integration (OEM). They have a very wide range of application in evacuating and repumping gases in chemical and physical laboratories. Depending upon their designs, VACUUBRAND chemistry diaphragm pumps reach ultimate vacuums of 100 mbar to 0.6 mbar and volume flow rates of 1 - 19 m³/h. These are absolutely oil-free mechanical vacuum pumps. They are easy to handle, and diaphragm pumps neither use water nor generate waste water or contaminated oil. The components of VACUUBRAND chemistry diaphragm pumps in contact with process vapors and gases are made of fluorinated plastics that are resistant to chemicals. They are also very compatible with condensate. VACUUBRAND also features ATEX equipment category 2 chemistry diaphragm pumps (for instance for zone 1). Since there are no sliding surfaces and as the expansion chamber is hermetically sealed against the drive system, they are just right for use in environments in which it is important to eliminate ignition sources.



Diaphragm pumps for non corrosive gases

VACUUBRAND offers high-performance vacuum pumps made of aluminium and resilient materials for diaphragms and valves that are compatible with non-corrosive gases. Depending upon the design, these diaphragm pumps reach ultimate vacuums of 100 mbar to 0.3 mbar and volume flow rates of 1 - 18 m³/h. They have a wide range of applications in laboratories and industrial operations. Highly flexible, quiet-running diaphragms made of FKM materials with fabric reinforcement provide long diaphragm lifetimes that make these pumps ideal for OEM equipment and instrument applications. A typical use is as a fore-vacuum pump for state-of-the-art wide-range turbo pumps or as a source of vacuum in an analytical apparatus. The new NT series pump models have a patented drive system for low vibration and noise, and feature an innovative connection system for high gas tightness.



"XS" Rotary vane pumps

Rotary vane pumps are used whenever it is necessary to have a process vacuum of up to 10⁻³ mbar. VACUUBRAND rotary vane pumps are high-performance, yet compact, and can be equipped with an extensive line of VACUUBRAND accessories. They have an innovative lubrication system with a built-in oil pump and have a large oil volume. This extends oil change and service intervals and protects the pump at start-up. The effective gas ballast feature, with its high-flow gas ballast, provides high vapor pumping capability for water and solvents. VACUUBRAND rotary vane pumps' volume flow rate is specified at atmospheric pressure, as is customary with PNEUROP®. For process efficiency, however, the high volume flow rate of VACUUBRAND pumps under process conditions, as well as a consistently high volume flow rate over a wide pressure range, is the key to your satisfaction in real-world application. After switch-off the aggregate is vacuum-sealed to protect your application from undesired venting and oil back flow.

CHEMISTRY PUMPING UNITS - VACUUM GAUGES AND CONTROLLERS - COMPONENTS



■ Chemistry pumping units

VACUUBRAND vacuum pumping units cover the entire range of rough and fine vacuum, and all the way into the high vacuum range. We select the vacuum pumps at the heart of our pumping units to deliver the flow rate needed throughout the operating vacuum range, and that provide the best protection for the likely exposure to corrosive vapors and condensates. Our pumping units offer a full range of control options. The most advanced is VARIO® control for chemistry diaphragm pumps, in which vacuum is precisely controlled by continuously adapting the pumping speed to the system demands. VARIO® chemistry pumping units from VACUUBRAND make it possible to automatically find the vapor pressure and adapt the vacuum to the process without keying in any parameters. VARIO® control instantaneously and precisely adjusts the volume flow rate to the changing process conditions, resulting in high evaporation rates and shorter process times. This unique control approaches boiling points gently to prevent overpumping and foaming, for sample protection and optimum solvent recovery. In comparison with pumps operating at a fixed speed, VARIO® vacuum control significantly reduces total pumping time, conserving energy and boosting wear-part lifetimes.



■ Vacuum gauges and vacuum controllers

Besides our pumps, VACUUBRAND also manufactures an innovative line of electronic measuring and control instruments for vacuum work. You can select the measuring instruments that are the best - technically and economically - for virtually any vacuum application. High precision chemically resistant, long lived gauge heads with ceramic diaphragm vacuum sensors are used with instruments that operate in a range to 0.1 mbar. Pirani vacuum sensors are preferably used for applications in the area of the lower rough vacuum and fine vacuum below 10 mbar to 10^{-3} mbar. The new Pirani vacuum sensor VSP 3000 thanks to its structure of plastics and ceramics is characterized by an extraordinary chemical stability and robustness. Our ATEX-approved measuring instruments are ideal for vacuum monitoring in process engineering applications. Beyond the CVC 3000 vacuum controller for regulating for a wide range of vacuum applications, our line includes equipment designed especially for control of vacuum and cooling water (for condensation of application vapors) in local area networks. In addition to the performance and versatility of our instruments themselves, VACUUBRAND is accredited by the Deutsche Akkreditierungsstelle GmbH (DAkkS) as a calibration laboratory. Our laboratory is certified to calibrate vacuum measuring instruments and controllers in a pressure range of 1300 to 10^{-3} mbar with confirmation of tracing back to the national standards.



■ Vacuum valves, small flange components KF, and VACUU·LAN®-components

VACUUBRAND's range of valves and small flange components offer versatility for special situations, as well as the convenience of standardization of dimensions in conformity with DIN 28403 (ISO 2861-1). This range of products is based on the pipe, T- and cross pieces, elbows, flexible lines, connecting elements and sealing/clamping rings in the sizes of KF DN 10, KF DN 16, KF DN 25 and KF DN 40 listed by PNEUROP®. Our wide range of designs and material options includes the right solution for virtually any application. VACUUBRAND valve product lines satisfy most lab vacuum requirements for constant gas flow-through, service with aggressive gases and even products that combine excellent sealing with limited gas regulation. We offer ball valves, diaphragm valves, butterfly in-line valves and high-vacuum bellows-sealed corner valves. Our electromagnetic valves are actuated with vacuum controllers to achieve electronic control of vacuum processes. And specialized valves make it possible to connect several laboratory workstations to a single vacuum pump via our unique VACUU·LAN® local vacuum networks.

"GREEN" VACUUBRAND

Environmental protection has been a major priority at VACUUBRAND for decades. We continuously streamline our processes to prevent waste and minimize energy use. The result of our efforts is a healthy working environment for our employees and a minimum impact on our surroundings. We are proud of what we have achieved so far and we would welcome you to inspect our facilities!

■ Our manufacturing operations have had an environmental management system for years in conformity with ISO 14001. But VACUUBRAND innovations have also contributed to environmental improvements in your operations with products that:

- lower your energy use and costs
- reduce waste of resources and emissions of pollutants
- improve laboratory working conditions.

■ All our products are designed to combine high-performance with long product lives, low service demands and low energy use.

Efficiency in vacuum supply and control of vacuum applications reduces resource utilization, keeps expenses low and enhances lab productivity. Efficient operation and low service costs not only save resources but ultimately offset purchase costs. Add to these contributions the fact that our diaphragm pumps have for years been replacing the old water jet pumps that formerly wasted and contaminated millions of tons of water per year, and we are proud of all that our vacuum pumps have contributed to a greener world.

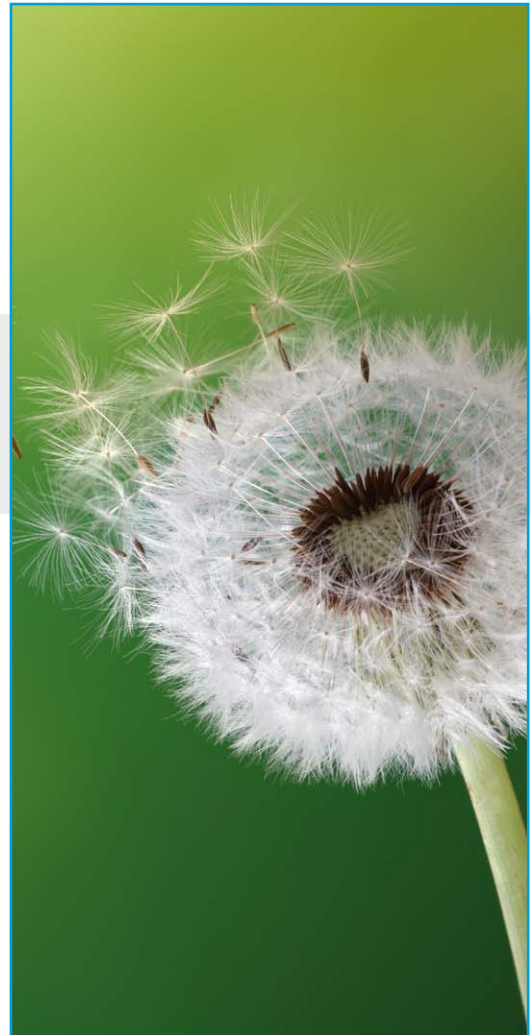


Environmental protection is important to everybody - let's all act responsibly !

CO₂MMITTED TO CHANGE®

Finding new ways to improve the environmental performance of products starts with a commitment to do so. We search continuously for ways to reduce energy use and resource consumption in both the manufacture and the use of our products.

- VACUUBRAND has promoted the use of oil-free pumps to replace classical rotary vane pumps in many applications, reducing contaminated oil disposal. You can be sure that our pumps, gauges and controllers are free of cadmium and mercury.
- Innovative design improvements increase the pumping speed of our NT-series 8-cylinder pumps by 30%, permitting them to replace even larger rotary vane pumps.
- The Peltronic® emission condenser developed by VACUUBRAND and introduced in 2007 collects solvent vapors and is operating completely without cooling water conserving the valuable resource water
- VACUU·LAN® local vacuum networks save energy and equipment costs by using small, in-lab pumps to supply on-demand vacuum for many users. This eliminates the need for central vacuum supply systems, with often over-sized pumps, and high maintenance and energy costs.
- VACUUBRAND VARIO® control technology continuously optimizes pumping speed automatically, perfectly adapting the flow rate to the actual process demand of the vacuum application. The process runs faster and energy consumption is up to 90% less than with conventional pumps.
- VACUUBRAND has recently introduced new pump designs that use less material in production, reducing their carbon footprint and contributing in yet another way to environmental protection.














THE RIGHT SOLUTION FOR YOUR APPLICATION

- For over 50 years, VACUUBRAND has had broad, hands-on experience helping our customers select and configure excellent applications-oriented solutions. Our focus is always reliable technology, economic efficiency and environmental protection. Our "Choosing vacuum equipment" manual helps you select the right equipment for your special vacuum application. The following pages will give you tips that bring our experience to bear on your solutions, with information on the considerations related to your needs and budget.



CHOOSING VACUUM EQUIPMENT

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CHOOSING VACUUM EQUIPMENT FOR ROTARY EVAPORATORS / PARALLEL EVAPORATORS

- Vacuum requirements for rotary evaporators can vary greatly depending upon the solvent and evaporating temperature. This is the reason why a modern vacuum system includes built-in vacuum regulation to help you reach optimum evaporating rates. This significantly shortens the process duration and minimizes environmental and laboratory air pollution.



Process requirements

- medium to high vacuum requirements
- fast and highly sensitive vacuum control with samples that tend to super heat or foam
- vacuum control for short process times and high reproducibility
- optimum condensation in the cooler of the rotary evaporator
- recovery of residual solvent vapors after the pump

Pump requirements

- excellent chemical and condensate compatibility
- effective gas ballast system to prevent condensation in the pump
- very good ultimate vacuum even with gas ballast operation for continuous evaporation
- low ultimate vacuum required for low evaporation temperatures or high boiling solvents
- emission condenser for solvent recovery and to minimize environmental and laboratory air pollution
- for applications with large amounts of inflammable solvents: pumps and gauges with ATEX approval

PRODUCT RECOMMENDATIONS

Overview Chemistry diaphragm pumps pg. 33

High boilers, fully automatic with speed control, time savings due to shorter process times



PC 3001 VARIO^{PRO} pg. 62

Classic two-point vacuum control with two controllers for two applications at one pump



PC 520 NT pg. 55

Full vacuum without control. With protection for pump and environment. Available with ATEX conformity (category 2)



MZ 2C NT +AK+EK pg. 49

CHOOSING VACUUM EQUIPMENT FOR VACUUM CONCENTRATORS

■ Vacuum concentration makes many demands on the supporting vacuum system, both in terms of the ultimate vacuum and in the selection of accessories. The pump needs high resistance to chemicals, as well as good tolerance of condensates. The type of solvents in use and the nature of the samples both have a strong influence on the ultimate vacuum needed and the appropriate type of process controls. Determining the optimum heat transfer into the sample material is also vital to avoid the need to upgrade your pump later.



Process requirements

- optimum heat transmission to the sample vessels
- medium to high vacuum requirements
- fast and highly sensitive vacuum control with samples that tend to foam
- control of condensate and droplet precipitation between the pump and concentrator

Pump requirements

- great resistance to chemicals
- ultimate vacuum as much as 7 mbar or 1.5 mbar
- sufficient volume flow rate (2 m³/h and more)
- good tolerance of condensate
- inclusion of a vacuum inlet separator (AK) made of glass to protect the pump from particles and droplets of liquid
- emission condenser for solvent recovery and to minimize environmental and laboratory air pollution

PRODUCT RECOMMENDATIONS

Overview Chemistry diaphragm pumps pg. 33

An ultimate vacuum of as much as 7 mbar is sufficient for organic solvents and/or small amounts of H₂O



MZ 2C NT +AK+EK pg. 49

Deeper vacuum for high boiling solvents or low temperature; good residual drying



MD 4C NT +AK+EK pg. 67

VARIO® controller for fully automatic concentration without need for parameter input



PC 3001 VARIO^{pro} pg. 62

CHOOSING VACUUM EQUIPMENT FOR DRYING CHAMBERS

- Vacuum drying chambers are used for drying very sensitive substances and when it is necessary to guarantee excellent residual drying. They generally need a very good ultimate vacuum depending upon the degree of drying, maximum acceptable temperature and the solvents used. At certain process parameters, there are large quantities of vapors that can only be handled with pump systems of a sufficiently large volume flow rate.



Process requirements

- medium to high vacuum requirements
- optimum heat transfer to the sample for time-saving drying
- depending on the sample material large amounts of vapor must be pumped off
- Condensate and droplet separation needed between pump and oven

Pump requirements

- for aqueous samples: oil-free diaphragm vacuum pumps (not necessarily chemical-resistant type) or for deep ultimate vacuum oil sealed rotary vane pumps
- outstanding chemical resistance and condensate tolerance for drying solvent-based samples
- ultimate vacuum down to 7 mbar, to improve performance compared with water-jet pumps or house vacuum
- vacuum inlet separator (AK) to protect the pump from particles and liquid droplets
- emission condenser for solvent recovery and to minimize environmental and laboratory air pollution
- for applications with large amounts of inflammable solvents: pumps and gauges with ATEX approval

PRODUCT RECOMMENDATIONS

Overview Chemistry diaphragm pumps pg. 33

Better than "water-jet vacuum". With protection for the pump and the environment



MZ 2C NT +AK+EK pg. 49

Deeper vacuum for high boiling solvents or low temperature; good residual drying



MD 4C NT +AK+EK pg. 67

Fully automatic vacuum control down to 0.6 mbar; suitable for high boiling solvents at low temperatures



PC 3003 VARIO pg. 84

CHOOSING VACUUM EQUIPMENT FOR GEL DRYERS

■ Gel electrophoresis is a very common method in life science laboratories for separation and determination of DNA fragments or proteins. Depending on the nature of the samples, these gels have to be produced with specific separation properties. Vacuum is typically used to gently dry the gels so that they are available for gel electrophoresis, or storage for later usage. Gel dryers make more limited demands on vacuum system than many lab applications. The ultimate vacuum requirement depends on the gels used and the degree of drying needed. In most cases two-stage diaphragm pumps with 7 mbar ultimate vacuum are ideal.



Process requirements

- medium vacuum requirements
- relatively high flow rates. There may be high leakage rates in gel drying, so the flow rate should be determined at the operating pressure
- condensate and droplet separation between the gel dryer and pump
- vacuum regulation is beneficial to keep the gels from tearing

Pump requirements

- excellent chemical and condensate compatibility
- ultimate vacuum as much as 7 mbar or 1.5 mbar
- sufficient volume flow rate: 2 m³/h or higher
- vacuum inlet separator (AK) to protect the pump from particles and liquid droplets
- for major condensate accumulation it is helpful to have a vacuum inlet separator (AK) and if necessary one at the outlet, too. An exhaust emission condenser (EK) ideally electronically operated (Peltronic®, without coolant) can minimize environmental and laboratory air pollution with solvent vapors
- vacuum regulation, such as with a manual flow-control valve

PRODUCT RECOMMENDATIONS

Overview Chemistry diaphragm pumps pg. 33

Better vacuum than water-jet vacuum, and without the waste of water; suited for SDS-PAGE up to 10%



MZ 2C NT +2AK pg. 48

Better vacuum than water-jet vacuum; suited for SDS-PAGE up to 10%, with manual flow-control valve



MZ 2C NT +AK+M+D pg. 51

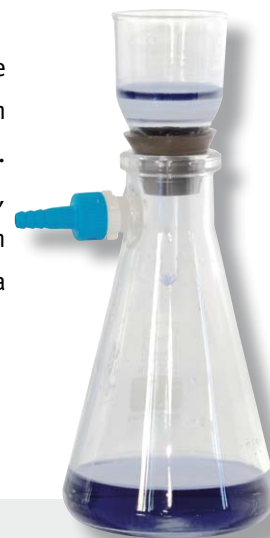
At 1.5 mbar, significantly better vacuum than water-jet aspirators; for high boilers, SDS-PAGE >10%



PC 201 NT pg. 69

CHOOSING VACUUM EQUIPMENT FOR FILTRATION AND SOLID PHASE EXTRACTION

■ Filtration is accelerated either with the aid of pressure or vacuum. For vacuum filtration the regulation and ultimate vacuum requirements are generally modest. With vacuum filtration at 100 mbar, 90% of the atmospheric pressure is available as the driving force for filtration. Improving the vacuum level even further has only a minor impact on the process. However, in some cases two-stage pumps with their high pumping speed may accelerate the filtration process. In these cases control of the vacuum, e.g., by a manual vacuum controller with a vacuum gauge is recommended to avoid evaporation of solvents from the filtration bottle.



Process requirements

- modest vacuum, at best medium requirements
- depending on filter size and leakage rate, the pumping speed of the pump is an important parameter
- the speed of filtration is partly influenced by the consistency of the filter cake
- limited need for vacuum control for filtration
- for solid-phase extraction, a defined flow or drip rate is needed that may require control

Pump requirements

- single-stage diaphragm pump with up to 70 mbar ultimate vacuum is ideal
- outstanding chemical resistance and superior vapor tolerance for solid phase extraction or filtration samples containing solvents
- for a defined flow or drip rate, a manual control valve and a vacuum gauge is helpful
- vacuum inlet separator (AK) to protect the pump from particles and liquid droplets
- emission condenser for solvent recovery to minimize the impact of solvent vapors on environmental and laboratory air
- the automation of a filtration process is possible with chemistry pumping units that are equipped with electronic vacuum controllers

PRODUCT RECOMMENDATIONS

Overview Chemistry diaphragm pumps pg. 33

Perfect for single filtrations down to 100mbar, extraordinary chemical resistance (ME 1C)



ME 1C pg. 34

Higher pumping speed for single and multiple filtrations, high chemical resistance



ME 2C NT pg. 36

Multiple filtration down to 70 mbar, with pump protection and condensate collection



ME 4C NT +2AK pg. 36

CHOOSING VACUUM EQUIPMENT FOR LYOPHILIZATION, DRYING WITH MINIMAL RESIDUES, AND MOLECULAR DISTILLATION

■ These applications are beyond the vacuum range of diaphragm pumps. They call for vacuum systems with ultimate vacuums of 10^{-1} to 10^{-3} mbar; single- and two-stage rotary vane pumps provide these pressures at various volume flow rates. A convenient option especially for chemical applications is our chemistry-HYBRID™ pump RC 6, a combination of a rotary vane and a chemistry diaphragm pump. The special design often allows operation without an additional cold trap. The integrated diaphragm pump enhances condensate compatibility, reduces service needs by as much as 90% and results in a longer pump life. The lower service demands greatly reduce lifetime costs of the RC 6 pump compared with a conventional rotary vane pump.



Process requirements

- low ultimate vacuum, depending upon the process conditions
- volume flow rate appropriate to system size (laboratory, pilot or production plant)
- regulation of shelf temperature and vacuum level, depending upon material to be dried (in freeze drying processes)

Pump requirements

- ultimate vacuum to 10^{-3} mbar
- depending upon process conditions, excellent pump condensate compatibility may be important for extended service life of the pump
- low ultimate vacuum even with open gas ballast for continuous condensate purge
- chemical resistance is an important consideration when drying substances containing solvents
- chemistry-HYBRID™ pump RC 6 is recommended for maximum vapor tolerance and low service demands

PRODUCT RECOMMENDATIONS

Overview Rotary vane pumps pg. 129

Freeze-drying, residual drying, ultimate vacuum 10^{-3} mbar, packages with oil mist filter and valve available



RZ 2.5 pg. 130

Improved chemical compatibility and less waste oil, for more aggressive and condensable vapors



RC 6 pg. 138

Diffusion pumping system with ultimate vacuum of 10^{-6} mbar, provides sufficient vacuum for molecular distillation



HP 40 B2 / RZ 6 pg. 144

CHOOSING VACUUM EQUIPMENT

LOCAL AREA VACUUM NETWORKS FOR LABORATORIES

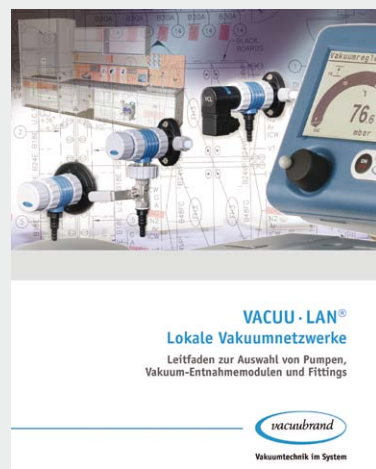
VACUU·LAN® vacuum networks make it possible to supply several different applications with one vacuum pump. This is a money- and space-saving solution when a lot of users are working with vacuum in one laboratory and avoids the numerous drawbacks of a central ("house") vacuum supply. For the vacuum outlets at workplaces very versatile modules are obtainable which can be easily upgraded. All of the components are available for new laboratory furnishings or for installation in existing or renovated laboratories. The modules are very resistant to chemicals and have built-in check valves to ensure that adjacent applications do not contaminate or interfere with one another.



There is a broad choice of vacuum pumping units, workplace modules and accessories available well-proven in daily laboratory use. Thanks to a very modular system and simple connections between the components planning is easy and can be done in a timely manner. A few steps only and some application parameters are guiding us to an optimal configuration of a productive vacuum network.

For further information ask for our detailed VACUU·LAN® manual, please. Get the benefits of a personal project consultation with our experienced sales staff.

Overview VACUU·LAN® pg. 165



PRODUCT RECOMMENDATIONS

VACUU·LAN® pg. 165

Adaptive, demand-driven pumping speed, 20% more flow, lowest energy demand



PC 3004 VARIO pg. 74

Versions available with coolant-free Peltronic® condenser



EK Peltronic pg. 91

Large selection of modular fittings for vacuum workstations, also for benchtops and fume hoods



pg. 165

CHOOSING VACUUM EQUIPMENT

FORE-VACUUM GENERATION FOR TURBO MOLECULAR PUMPS

■ Many analytical applications such as mass spectrometry, electron microscopy or surface analysis are carried out in high vacuum. Turbomolecular pumps are typically used to generate the needed vacuum. Such turbo pumps need an auxiliary backing pump, or "roughing pump", as they cannot compress to atmospheric pressure. Using oil-free diaphragm pumps for fore-vacuum generation in connection with state-of-the-art turbo pumps (with "molecular drag" stage) decisively improves the cleanliness of the vacuum generation, and often reduces service requirements as well. In many cases, such an oil-free high vacuum is absolutely mandatory.



Process requirements

- If the high vacuum system is operated without any gas load, the ultimate vacuum of the diaphragm pump may be assumed as the available backing vacuum. The volume flow rate of the diaphragm pump then only has an impact on the pump-down time.
- Under gas load (process-related gas inlet or gas release), the roughing pump has to be sized so that the maximum permissible backing pressure of the high vacuum pump is safely reached. This requires a diaphragm pump with high pumping speed close to its ultimate vacuum. All VACUUBRAND diaphragm pumps are excellent in this regard because of their planar diaphragm designs.

Pump requirements

- ultimate vacuum of the diaphragm pump sufficient to meet the backing pressure requirements of the high vacuum pump – down to 0.3 mbar, with VARIO® diaphragm pumps
- high pumping speed even at pressures close to ultimate vacuum
- low power consumption
- low anti-suckback leakage rate, no venting during a power failure
- high reliability, designed for continuous operation (24/7)
- good tolerance of condensate
- high ultimate vacuum stability and service intervals comparable to turbo pumps
- reliable starting even under vacuum
- small size, low weight and low vibration

PRODUKTEMPFEHLUNGEN

Übersicht Membranpumpen S. 99

Bis 4 mbar



MZ 2D NT S. 108

Bis 1 mbar; MD 4 NT und MD 12 NT für kürzere Auspumpzeiten, MD 4 NT VARIO für stets optimale Drehzahl



MD 1 S. 110

Endvakuum < 1 mbar, MV 10 NT für kürzere Auspumpzeiten, VARIO® für niedrigstes Endvakuum (0.3 mbar)



MV 2 NT S. 116

CHOOSING VACUUM EQUIPMENT

OIL-FREE VACUUM FOR KILO LABS

■ In kilo labs and pilot plants, materials are produced in quantities of a few hundred grams to several kilograms for pharmaceutical development, safety studies and early clinical trials for new drugs. Based on their extraordinary chemical resistance, our high performance chemistry diaphragm vacuum pumps are perfectly suitable for these applications. The pumps operate without fluids such as water or oil, and thus reduce operating and maintenance costs. Variable-speed pumping systems offer unique control advantages in these applications, and are easily integrated into process control via PC or programmable logic controller.

**Process requirements**

- a wide range of chemicals are used and many different process parameters are required
- high reliability of technical plant components for days of continuous duty operation
- medium to high vacuum requirements, both in vacuum depth and pumping speed
- frequent use of large amounts of volatile solvents that can create hazardous atmospheres
- controlled and reproducible process parameters

Pump requirements

- high resistance against aggressive chemicals
- high pumping speed over a wide pressure range
- low ultimate vacuum even with open gas ballast for continuous condensate purge
- precise vacuum control via speed controlled pumps and ease of integration into process control systems
- compatibility with vapors of inflammable solvents, and/or ATEX compatibility in potentially explosive atmospheres

PRODUCT RECOMMENDATIONS

Overview Chemistry diaphragm pumps pg. 33

Adaptive, demand-driven pumping speed, precise control, 20% more flow, lowest energy demand



PC 3004 VARIO pg. 74

Vacuum down to 0.9 mbar, with high pumping speed for large volumes of vapors. VARIO® for optimum process control



MV 10C NT pg. 86

Vacuum down to 2 mbar, with high pumping speed and ATEX conformity



MV 10C EX pg. 95

CHOOSING VACUUM EQUIPMENT

LIQUID ASPIRATION

■ Liquids can be sucked into a collection bottle which is kept at low pressure by a vacuum pump. The vacuum should be controlled automatically. There should be sufficient vacuum provided in the collection bottle to support aspiration, but not so deep to risk evaporation of solvents. The suction power (and hence the vacuum level) should be adjustable for sensitive or powerful aspirations as needed. For optimum operational safety and convenience self-closing quick couplings and a liquid level detector at the bottle are helpful. All components should have a high chemical resistance and should be autoclavable, or be out of contact with the media. Depending on aspiration safety protocols a collection flask made either of polypropylene or glass may be preferred.



Process requirements

- adjustable suction force, with modest vacuum at most
- delicate aspiration of sensitive samples; rapid aspiration of large volumes of liquids
- vacuum available automatically on demand to keep users hands free for working
- very limited need for high-precision vacuum control
- minimal distraction by vacuum control while handling biological materials

Pump requirements

- single stage chemistry diaphragm pump with good suction power
- extraordinary chemical resistance of the complete system for samples containing solvents, as well as for aspirated and pre-loaded disinfectants
- conveniently adjustable vacuum level for adaption to application requirements
- collection flask with protection filter to protect pump and workplace from biologically hazardous material
- high operational comfort to minimize fatigue and operator errors

VACUUBRAND manufactures numerous vacuum technology solutions for life science laboratories. In addition to the BVC aspiration systems below, we offer a large selection of pumps and systems for other common applications:

- filtration - vacuum concentration (centrifuges) - gel drying - vacuum blotting - freeze drying - microplate washing - DNA purification on a vacuum manifold

PRODUCT RECOMMENDATIONS

Fluid aspiration systems pg. 146

Advanced aspiration system, with pump, adjustable vacuum, liquid level detector, self-locking quick couplings and hand-set



BVC professional pg. 149

Aspiration of supernatants with adjustable and controlled vacuum. With collection bottle and aspiration hand-set



BVC control pg. 148

Integrated aspiration unit with autoclavable bottle and hand-set, for use with vacuum networks or existing pumps

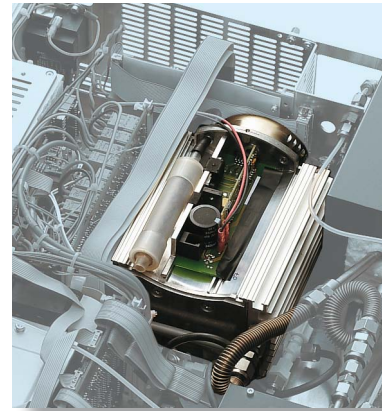


BVC basic pg. 147

CHOOSING VACUUM EQUIPMENT

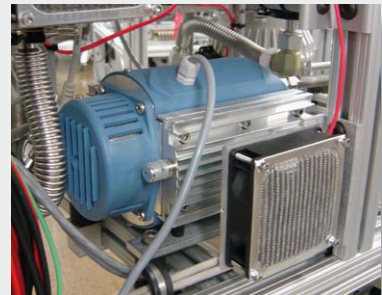
OEM PRODUCTS: ACCORDING TO INDIVIDUAL REQUIREMENTS

■ For more than 50 years, VACUUBRAND has been a proven business partner for OEM solutions in laboratories, analysis and industry. Our products meet customers' highest technical, economic and environmental standards. Our company has maintained a ISO 9001-certified management system for years. Production facilities and product development are located in Germany. A formidable development team and our integrated production, along with state-of-the-art machinery and automatic testing equipment, give us a high level of flexibility.



Your success is the measure of our work

■ We understand that in many cases the vacuum source is the heart of your application. There are many different demands placed on the vacuum source in OEM applications. To meet your needs, we look at the challenge comprehensively: What are the technology parameters? How does the design need to be adapted to the installation situation? What external certifications (e.g., according to UL and CSA standards) or special test specifications are needed? Of course, the product must also satisfy your cost objectives; ready-to-install vacuum components should boost your economic efficiency by saving you the need to purchase and store add-on components. Finally, our standard procedures include full documentation for OEM products, and we make provision for you to verify their technical parameters and call up test findings. Contact VACUUBRAND to discuss your needs with our engineers.



PRODUCT RECOMMENDATIONS

OEM or built-in pumps pg. 121

Space-saving, built-in solution with 1 mbar ultimate vacuum and demand-responsive, adaptive motor speed



MD 1 VARIO-SP pg. 122

Wide range motors for many pump models available - wide choice of pumps



MD 4 NT pg. 112

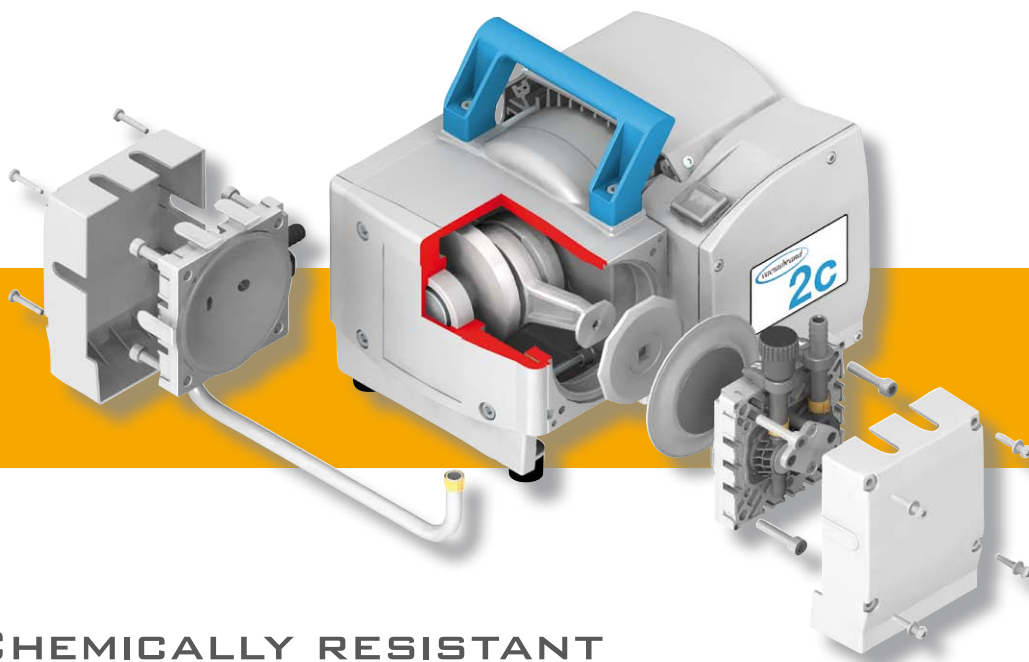
Rotary vane OEM pumps, also available with PFPE oil



RZ 6 pg. 132

CHEMISTRY DIAPHRAGM PUMPS

- Typical applications for chemistry diaphragm pumps include evacuating chemically aggressive gases and vapors from such equipment as rotary evaporators, vacuum drying cabinets and centrifugal concentrators. Chemistry diaphragm pumps from VACUUBRAND feature uncompromising chemistry designs. Their construction with fluoropolymers makes them very resistant to chemical vapors from inlet to exhaust and very tolerant to condensates. Our two-, three- and four-stage pumps also have a gas ballast valve that provides continuous purge with minimal impact on ultimate vacuum when working with condensable vapors. Pumping chambers are hermetically separated from the drive system ensuring long lifetimes of mechanical parts. Most importantly, diaphragm pumps are oil-free, for vastly reduced service demands compared with oil-sealed pumps. They eliminate the cost of water and its contamination well-known from water-jet aspirators, and the waste-oil disposal of rotary vane pumps.



CHEMICALLY RESISTANT

- PTFE sandwich diaphragms and valves made of perfluoro elastomer (FFKM) or PTFE
- internal tubing and fittings made of PTFE/ETFE/ECTFE compounds
- exceptional diaphragm lifetimes with ultra-durable PTFE sandwich design

DURABLE

- head cover and clamping disc made of fluoro compounds with stability core for unsurpassed long-term performance
- very long service intervals for low lifetime cost-of-ownership
- patented new drive system for extra quiet, ultra-low-vibration operation

PRACTICAL

- patented new valve mounting system to simplify service access (NT)
- smooth surfaces for easy cleaning (NT)
- new sealing system provides reduced leakage rates for improved ultimate vacuum (NT)

OPTIMIZED LABORATORY PROCESSES

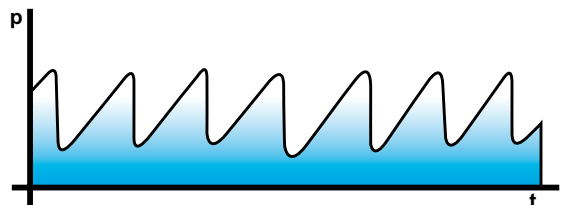
VACUUM CONTROL

Vacuum applications in the laboratory and in industrial operations require versatile vacuum control to:

- prevent sample loss by foaming or boiling over
- reduce process times for distillation and evaporation processes
- ensure reproducible results in drying processes
- reduce time committed to process oversight through automation
- protect the environment by recovering waste solvent vapors

Two-point regulation by ON/OFF vacuum pump switching

- A two point-vacuum controller switches a pump on and off as required. The actual vacuum level inevitably fluctuates around the target pressure. This system is well suitable for vacuum networks.



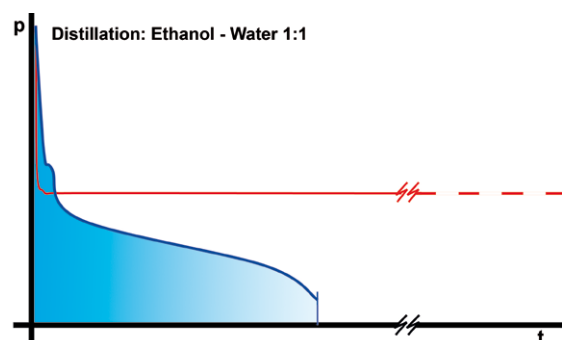
Two-point vacuum control via in-line solenoid valve

- For pumps without a variable speed motor, the CVC 3000 controller manages the vacuum with an in-line solenoid valve. The actual vacuum level fluctuates around the target pressure, too, but much less than with pump on/off-switching. This makes the system better suitable for process control.

VARIO® controller for fully automatic evaporation without test runs or programming

VARIO®-diaphragm pumps and chemistry pumping units control the vacuum automatically and accurately by adjusting the speed of the diaphragm pump. The vacuum controller CVC 3000 in the VARIO®-pumping units detects the boiling pressure automatically and adjusts the vacuum continuously and optimally to the vapor pressure by an adaptive control algorithm.

- eliminates manual re-adjustment, which saves oversight time
- optimized pressures reduce foaming, avoiding sample loss
- waste vapor recovery rates near 100% keep the lab air clean and protect the environment
- continuous optimization of boiling pressures results in shortest process times, even with complex solvent mixtures
- pump runs only as fast as needed - minimizing energy consumption, extending service intervals and reducing noise



- Competitive product in the automatic mode - First boiling pressure is determined, and then maintained. Evaporation stops 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.

LEADING DIAPHRAGM PUMP TECHNOLOGY

TECHNICAL HIGHLIGHTS

Nearly all VACUUBRAND diaphragm pumps and measuring instruments have been approved for ATEX equipment category 3 in the vapor path

Following a very intensive and comprehensive testing process – according to ATEX Directive 94/9/EC – VACUUBRAND has now verified that most of its diaphragm pumps and pumping units do not have ignition sources in the internal, wetted parts area, and so meet the requirements of ATEX equipment category 3. This includes capacitive vacuum sensors, measuring devices and solenoid operated valves.

- applicable for pumping of Ex-mixtures “infrequently” or “for a short period”
- during normal operation there is no ignition source in the internal, wetted parts area
- at gas temperatures up to 40°C the maximum surface and gas temperatures in the internal, wetted parts area remain below the limits specified in ATEX temperature class T3
- for areas with hazardous atmosphere around the pump and for “occasional” pumping of Ex-mixtures the special ATEX pumps for category 2 (inside and around the pump, for example, for Zone 1) continue to be recommended



■ Environment, no Ex-zone
 ■ Wetted parts Zone 2

The VACUUBRAND stability core principle: for unprecedented long-term performance

VACUUBRAND chemistry diaphragm pumps provide optimum performance and unsurpassed service intervals even in harsh chemical applications. We achieve this unmatched reliability by manufacturing the most highly stressed components – the head cover and clamping disk – in a sophisticated multi-step process.

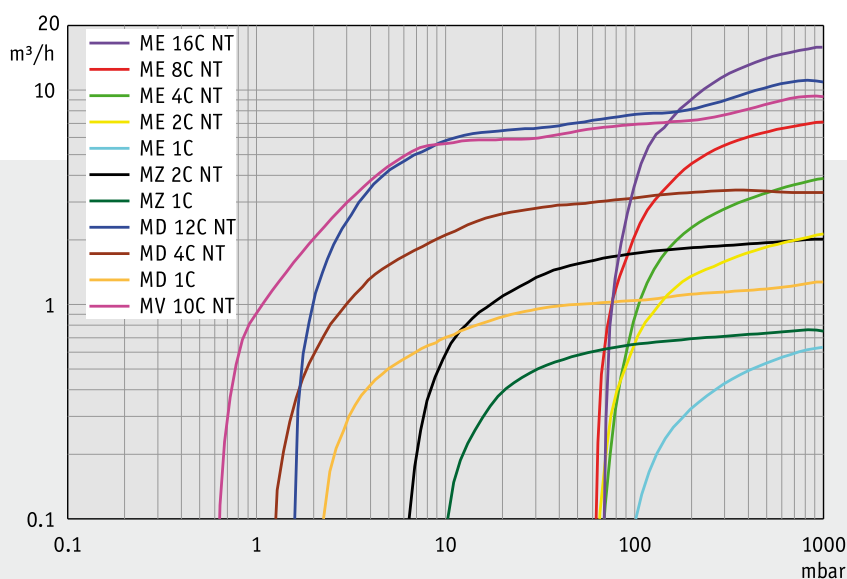
- high quality carbon-fiber-reinforced fluoroplastics provide long term chemical resistance
- this thick-walled, diffusion resistant, molded fluoroplastic is supported by a stable metallic core for durability
- mechanical precision finishing ensures reproducible VACUUBRAND quality
- 100% quality control testing after "run-in" at destination-market electrical voltage



OIL-FREE VACUUM FOR CORROSIVE GASES AND VAPORS

CHEMISTRY DIAPHRAGM PUMPS, CHEMISTRY VACUUM SYSTEMS AND CHEMISTRY PUMPING UNITS

■ Our chemistry diaphragm pumps are available in a full range of volume flow rates and ultimate vacuum options. Single-stage models reach as much as 70 mbar (absolute) vacuum. Connecting pump heads in series as two-, three- or four-stage pumps improves the ultimate vacuum to as much as 0.6 mbar. Connecting heads in parallel provides higher flow rates. Our line offers combinations that satisfy virtually any laboratory need.



The pumping speed of all pumps is measured according to ISO 21360

Nomenclature for VACUUBRAND pumps is built from the following codes designating specific features or components:

M = diaphragm (membrane) pump

E, Z, D, V = number of pump stages

E = single stage, up to 70 mbar

Z = two stages, up to 7 mbar

D = three stages, up to 1.5 mbar

V = four stage, up to 0.6 mbar

C = chemistry design, with fluoropolymer flowpath

NT = labels the new series of pumps comprising the New Technology

AK = separator catchpot for inlet or outlet condensates, collects particles and droplets, keeps condensate in vacuum line from

flowing into the pump, protecting pump performance and providing additional noise reduction on the pressure side
EK = exhaust vapor (emission) condenser for nearly 100% solvent recovery in compact design, protecting environment and lab air

TE = dry ice or water ice cooled emission condenser for solvent recovery

PC = "Pumping Unit, Chemistry" - a chemistry pump with vacuum control and solvent recovery





Chemistry vacuum system = a chemistry pump with accessories like inlet catchpot and/or solvent recovery

Chemistry pumping unit = a chemistry vacuum system with vacuum control and solvent recovery

SYNCHRO = pumping unit for simultaneous operation of two independent vacuum applications by a single pump

CHEMISTRY DIAPHRAGM PUMPS

SERIES OVERVIEW

				
	Chemistry diaphragm pumps	Chemistry vacuum systems	Chemistry pumping units	
	Basic pump	with solvent recovery	vacuum control and solvent recovery	with two vacuum ports to operate two applications simultaneously
Examples of use				
down to 70 mbar · Pumping of aggressive gases and vapors · For low-boiling solvents · Vacuum filtration	ME 1C 0.7 m ³ /h pg. 34	ME 4C NT +2AK 3.9 m ³ /h pg. 36	PC 3016 NT VARIO 19.3 m ³ /h pg. 42	
	ME 2C NT 2.1 m ³ /h pg. 36	ME 8C NT +2AK 7.1 m ³ /h pg. 38		
	ME 4C NT 3.9 m ³ /h pg. 36	ME 16C NT +EK 16.3 m ³ /h pg. 40		
	ME 8C NT 7.1 m ³ /h pg. 38			
	ME 16C NT 16.3 m ³ /h pg. 40			
	ME 16C NT VARIO 19.3 m ³ /h pg. 42			
down to 7 mbar · Concentration, drying · For high-boiling solvents · Rotary evaporator · Vacuum concentrators	MZ 1C 0.75 m ³ /h pg. 44	MZ 2C NT +2AK 2.0 m ³ /h pg. 48	PC 101 NT 2.0 m ³ /h pg. 52	MZ 2C NT +AK SYNCHRO+EK 2.0 m ³ /h pg. 50
	MZ 2C NT 2.0 m ³ /h pg. 46	MZ 2C NT +AK+EK 2.0 m ³ /h pg. 49	PC 510 NT 2.0 m ³ /h pg. 53	PC 511 NT 2.0 m ³ /h pg. 54
	MZ 2C NT VARIO 2.8 m ³ /h pg. 56	MZ 2C NT +AK+M+D 2.0 m ³ /h pg. 51	PC 3002 VARIO 2.8 m ³ /h pg. 56	PC 520 NT 2.0 m ³ /h pg. 55
down to 1.5 mbar · Concentration, drying · For high-boiling solvents · Rotary evaporator · Vacuum concentrators	MD 1C 1.3 m ³ /h pg. 58	MD 1C +AK+EK 1.3 m ³ /h pg. 60	PC 3001 VARIO^{pro} 2.0 m ³ /h pg. 62	MD 4C NT +AK SYNCHRO+EK 3.4 m ³ /h pg. 68
	MD 4C NT 3.4 m ³ /h pg. 64	PC 3001 basic 2.0 m ³ /h pg. 61	PC 201 NT 3.4 m ³ /h pg. 69	PC 611 NT 3.4 m ³ /h pg. 72
	MD 4CRL NT 3.4 m ³ /h pg. 64	MD 4C NT +2AK 3.4 m ³ /h pg. 66	PC 600 LAN NT 3.4 m ³ /h pg. 70	PC 620 NT 3.4 m ³ /h pg. 73
	MD 4C NT VARIO 4.6 m ³ /h pg. 74	MD 4C NT +AK+EK 3.4 m ³ /h pg. 67	PC 610 NT 3.4 m ³ /h pg. 71	
	MD 12C NT 11.1 m ³ /h pg. 76	MD 12C NT +EK 11.1 m ³ /h pg. 78	PC 3004 VARIO 4.6 m ³ /h pg. 74	
	MD 12C NT VARIO 12.9 m ³ /h pg. 80	MD 12C NT +AK+EK 11.1 m ³ /h pg. 78	PC 3012 NT VARIO 12.9 m ³ /h pg. 80	
			PC 3012 NT VARIO DUO 25 m ³ /h pg. 82	
down to 0.6 mbar · Concentration, drying · For high-boiling solvents, evaporation at low temperatures · Rotary evaporator · Vacuum concentrators	MV 10C NT 9.5 m ³ /h pg. 86	MV 10C NT +EK 9.5 m ³ /h pg. 86	PC 3003 VARIO 2.8 m ³ /h pg. 84	
	MV 10C NT VARIO 11.6 m ³ /h pg. 88		PC 3010 NT VARIO 11.6 m ³ /h pg. 88	

All mentioned pumping speeds are for 50 Hz (if applicable)

CHEMISTRY DIAPHRAGM PUMP

ME 1C

■ Vacuum filtration is one of the most common applications used for sample preparation in chemistry, microbiology, waste water control and other analytical processes. The new ME 1C diaphragm pump offers a compact, high performance and easy-to-use solution which is perfect for single filtrations. This new development, based on the highly successful technology of the oil-free diaphragm pump MD 1C, provides a well-proven and extraordinarily long diaphragm life time. The functional, space saving and innovative design with easily accessible, top-mounted power switch ensures convenient and quick operation for day-to-day lab work. Robust PTFE diaphragms and valves provide optimal chemical resistance. A manual vacuum regulator valve with dial gauge for adjustment of pumping speed and ultimate vacuum is available as accessory.

PERFORMANCE FEATURES

- convenient, quick and simple to use due to the new top-mounted power switch
- whisper quiet and very low vibration
- requires minimal benchtop space
- maintenance-free drive system and proven long diaphragm life
- high chemical resistance



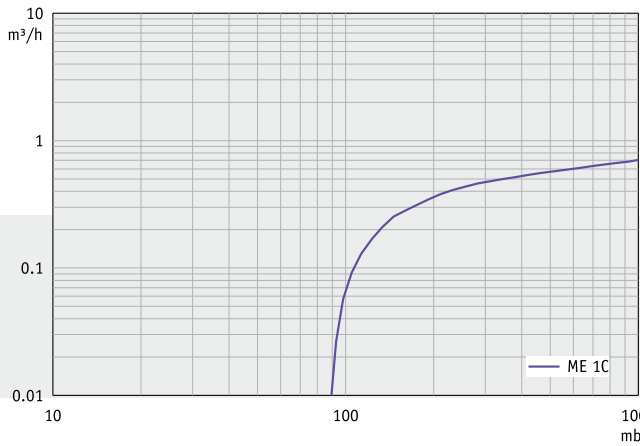
ME 1C
0.7 m³/h
100 mbar

Chemistry vacuum re-
gulator valve unit
ME 1C

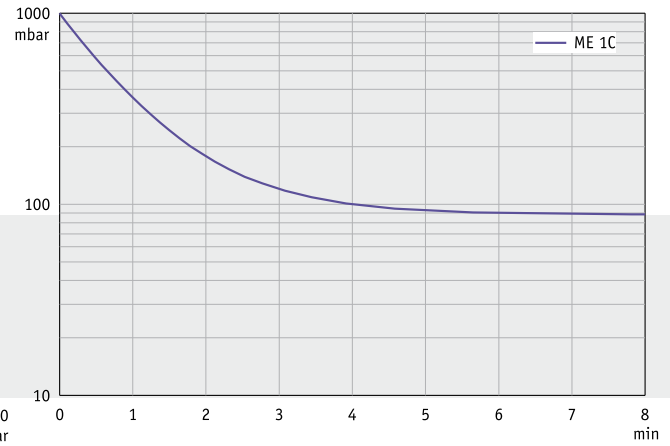


APPLICATIONS

One-stage diaphragm pumps are an excellent solution for continuous, oil-free pumping of gases and vapors with a modest vacuum requirement. In contrast to water-jet pumps they do not consume water and therefore do not produce any contaminated waste water in daily use. Typical applications for the ME 1C are filtrations and solid phase extractions with solvents. At a process vacuum of 100 mbar, 90% of the atmospheric pressure is available as the driving force for the application. If a certain pressure difference must not be exceeded, the pump can be equipped with an optional manual vacuum regulator valve with dial gauge. It enables continuous adjustment of pumping speed and ultimate vacuum.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		ME 1C
Number of heads / stages		1 / 1
Max. pumping speed 50/60 Hz	m ³ /h	0.7 / 0.85
Ultimate vacuum (abs.)	mbar	100
Max. back pressure (abs.)	bar	1.1
Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Rated motor power	kW	0.04
Dimensions (L x W x H), approx.	mm	247 x 121 x 145
Weight, approx.	kg	5.0

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	721100
230 V ~ 50-60 Hz	CH, CN	Ex*	721101
230 V ~ 50-60 Hz	UK	Ex*	721102
100-120 V ~ 50-60 Hz	US		721103
100-120 V ~ 50-60 Hz /			
200-230 V ~ 50-60 Hz	IEC plug EN 60320	Ex*	721105**

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately

▶ S. 185

ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)

Chemistry vacuum regulator valve unit for ME/MZ 1C (696843)

Silencer DN 8 - 10 mm (636588)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

CHEMISTRY DIAPHRAGM PUMP

ME 2C NT, ME 4C NT AND ME 4C NT +2AK

Chemistry-design diaphragm pumps are an excellent solution for continuous, oil-free pumping of corrosive gases and vapors. The one-stage construction provides the advantageous combination of high pumping speed and low ultimate vacuum down to 70 mbar. All major parts in contact with pumped media are made of chemically resistant fluoroplastics. Well-proven PTFE sandwich diaphragms increase reliability and extend operating life. The new NT-series features further improved performance data, higher tolerance for condensates and simplified maintenance. The ME 4C NT is also available as chemistry vacuum system ME 4C NT +2AK with inlet separator to protect the pump against particles and liquid droplets, plus outlet separator to collect condensate.

PERFORMANCE FEATURES

- outstanding chemical resistance
- high performance even at low vacuum levels
- whisper quiet
- low vibration
- long diaphragm life, maintenance-free drive system



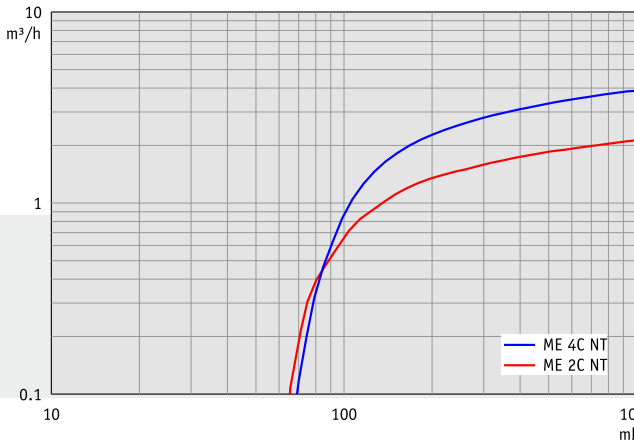
ME 2C NT
2.1 m³/h
70 mbar



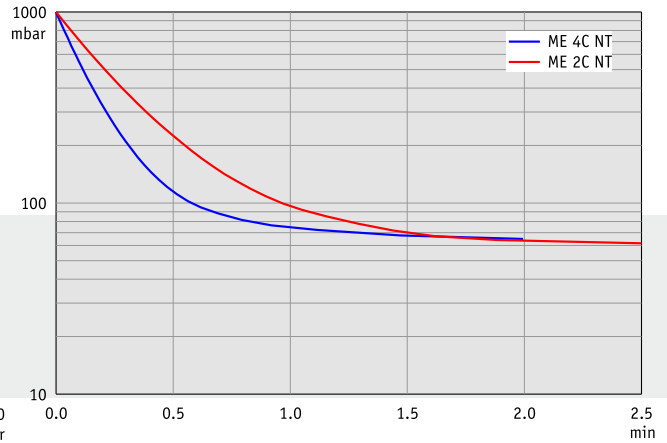
ME 4C NT
3.9 m³/h
70 mbar

APPLICATIONS

One-stage chemistry-design diaphragm pumps are an excellent choice for applications with corrosive gases and vapors which do not require very deep vacuum levels. They do not consume water and therefore do not produce any contaminated waste water. Typical applications are filtration as well as concentration of solvents with low boiling points. The ME 4C NT is recommended for processes which require higher flow rates. The chemistry vacuum system ME 4C NT +2AK with inlet separator and condensate catchpot is an excellent choice for rugged applications and for collecting condensates at the exhaust of the pump.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		ME 2C NT	ME 4C NT
Number of heads / stages		1 / 1	2 / 1
Max. pumping speed 50/60 Hz	m ³ /h	2.1 / 2.4	3.9 / 4.3
Ultimate vacuum (abs.)	mbar	70	70
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Rated motor power	kW	0.18	0.18
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	243 x 211 x 198	254 x 243 x 198
Weight, approx.	kg	10.2	11.1

ORDERING INFORMATION ME 2C NT

230 V ~ 50-60 Hz	CEE	Ex*	730100
230 V ~ 50-60 Hz	UK	Ex*	730102
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		730103
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz			
200-230 V ~ 50-60 Hz	IEC plug EN 60320	Ex*	730105**

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately

pg. 185

ORDERING INFORMATION ME 4C NT

230 V ~ 50-60 Hz	CEE	Ex*	731200
230 V ~ 50-60 Hz	CH, CN	Ex*	731201
230 V ~ 50-60 Hz	UK	Ex*	731202
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		731203

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION ME 4C NT +2AK

100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz			
200-230 V ~ 50-60 Hz	IEC plug EN 60320	Ex*	2614080**

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately pg. 185

ACCESSORIES

VACUU·LAN® Mini-Network (2614455)

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

CHEMISTRY DIAPHRAGM PUMP

ME 8C NT, ME 8C NT +2AK

■ Chemistry-design diaphragm pumps are an excellent solution for continuous, oil-free pumping of corrosive gases and vapors. The one-stage construction provides the advantageous combination of high pumping speed and low ultimate vacuum down to 70 mbar. All major parts in contact with pumped media are made of chemically resistant fluoroplastics. Well-proven PTFE sandwich diaphragms for increased reliability and extended operating life. These large pumps have an exceptionally high pumping speed. The new NT-series features further improved performance data and superior vapor tolerance.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- compact design
- whisper quiet and very low vibration
- long diaphragm life, maintenance-free drive system



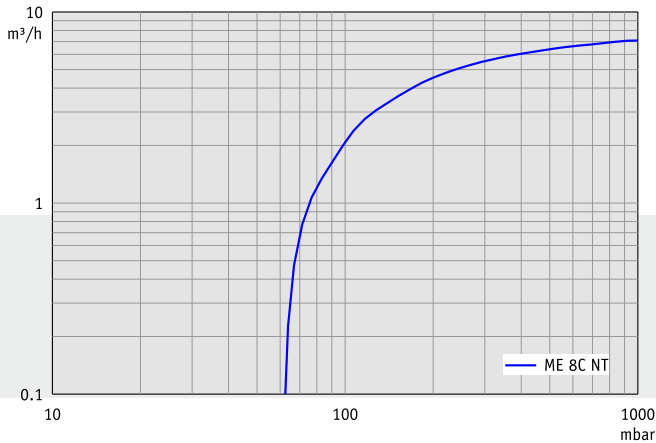
ME 8C NT
7.1 m³/h
70 mbar



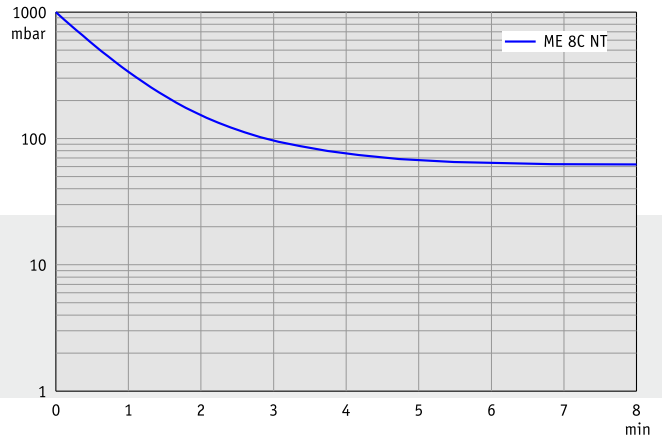
ME 8C NT +2AK
7.1 m³/h
70 mbar

APPLICATIONS

Large one-stage chemistry-design diaphragm pumps are an excellent choice for pumping large amounts of gases and vapors. They do not consume water and therefore do not produce any contaminated waste water. Typical applications are degassing of liquids, multipoint filtrations e. g. on vacuum networks and in general evaporation of low boiling solvents. We recommend these pumps especially for processes with large gas flow at high process pressures.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA		ME 8C NT	ME 8C NT +2AK
Number of heads / stages		4 / 1	4 / 1
Max. pumping speed 50/60 Hz	m ³ /h	7.1 / 7.8	7.1 / 7.8
Ultimate vacuum (abs.)	mbar	70	70
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Rated motor power	kW	0.25	0.25
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	325 x 243 x 198	319 x 243 x 374
Weight, approx.	kg	14.3	16.7

ORDERING INFORMATION ME 8C NT

230 V ~ 50-60 Hz	CEE	Ex*	734200
230 V ~ 50-60 Hz	CH, CN	Ex*	734201
230 V ~ 50-60 Hz	UK	Ex*	734202
120 V ~ 60 Hz	US		734203
100 V ~ 50-60 Hz	US		734206

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION ME 8C NT +2AK

100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz			
200-230 V ~ 50-60 Hz	IEC plug EN 60320	Ex*	734405**

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately

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ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)

CHEMISTRY VACUUM SYSTEM

ME 16C NT AND ME 16C NT +EK

■ Chemistry diaphragm pumps of the NT design are an excellent solution for continuous, oil-free pumping of corrosive gases and vapors. The one-stage construction provides the advantageous combination of high pumping speed and low ultimate vacuum down to 70 mbar. All major parts in contact with pumped media are made of chemically resistant fluoroplastics. Well-proven PTFE sandwich diaphragms for increased reliability and extended operating life. The eight cylinders pump ME 16C NT provides a particularly high performance together with a compact design. Upgraded with an outlet exhaust vapor condenser (EK) the ME 16C NT +EK provides an environmental friendly system with efficient solvent recovery. Eight-cylinder NT pumps feature quiet operation, smooth and easy to clean surfaces.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- very high pumping speed even at low vacuum levels
- compact design
- whisper quiet and very low vibration
- excellent environmental friendliness due to efficient solvent recovery



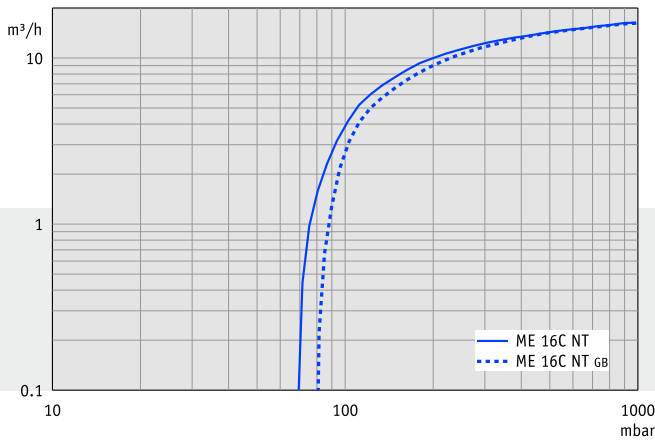
ME 16C NT
16.3 m³/h
70 mbar



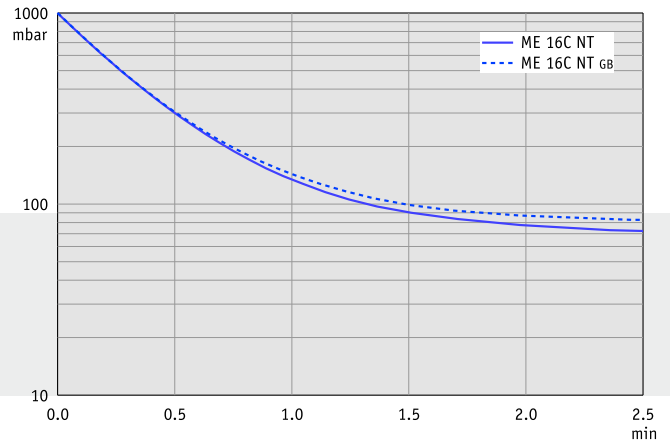
ME 16C NT +EK
16.3 m³/h
70 mbar

APPLICATIONS

Large one-stage chemistry diaphragm pumps are an excellent choice for pumping large amounts of gases and vapors. They do not consume water and therefore do not produce any contaminated waste water. Typical applications are filtration networks and in general evaporation of low boiling solvents. The ME 16C NT is an excellent choice for processes with large gas flow at high process pressures. It can easily be upgraded with accessories like inlet separator (AK) for challenging applications and an exhaust vapor condenser (EK) for solvent recovery.



Pumping speed graph at 50 Hz with/without gas ballast



Pump down graph at 50 Hz with/without gas ballast (100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		ME 16C NT	ME 16C NT +EK
Number of heads / stages		8 / 1	8 / 1
Max. pumping speed 50/60 Hz	m ³ /h	16.3 / 18.4	16.3
Ultimate vacuum (abs.)	mbar	70	70
Ultim. vac. (abs.) with gas ballast	mbar	100	100
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Small flange KF DN 25	Small flange KF DN 25
Outlet connection		Hose nozzle DN 15 mm	Hose nozzle DN 8-10 mm
Rated motor power	kW	0.44	0.44
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	533 x 260 x 359	528 x 387 x 395
Weight, approx.	kg	28.1	29.1

ORDERING INFORMATION ME 16C NT

230 V ~ 50-60 Hz	CEE	Ex*	741300
230 V ~ 50-60 Hz	UK	Ex*	741302
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		741303

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION ME 16C NT +EK

230 V ~ 50-60 Hz	CEE	Ex*	741500
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		741503

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES ME 16C NT

PTFE tubing KF DN 25 (1000 mm: 686033)
 Inlet separator KF DN 25 (699979)
 Emission condenser kit for NT pump models (699948)
 Centering and sealing ring KF DN 25 C AL/FEP (635722)

ACCESSORIES ME 16C NT +EK

PTFE tubing KF DN 25 (1000 mm: 686033)
 Inlet separator KF DN 25 (699979)
 Centering and sealing ring KF DN 25 C AL/FEP (635722)
 Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

VARIO® CHEMISTRY PUMPING UNIT

ME 16C NT VARIO, PC 3016 NT VARIO

■ These powerful pumps feature exceptionally high pumping speed. VARIO® pumping units provide precise vacuum control by adjusting the diaphragm pump's motor speed. They feature fully automatic evaporation control at the push of a button. The PC 3016 NT VARIO pumping unit is a proven concept for evaporations with large amounts of solvents. The inlet separator (AK) retains particles and liquid droplets, the waste vapor condenser at the outlet (EK) is highly efficient and compact. The condenser enables near-100-percent solvent recovery, efficient recycling, and active protection of the environment. Eight-cylinder NT pumps features quiet operation with smooth, easy-to-clean surfaces.



PERFORMANCE FEATURES

- VARIO®: Automatic adjustment of the vacuum level throughout the process for high process reproducibility and unattended operation
- very high pumping speed even at low vacuum levels
- systems +EK and PC 3016 NT VARIO: excellent environmental friendliness due to efficient solvent recovery
- VARIO®: short process times due to zero-fluctuation (hysteresis-free) vacuum control, even for large amounts of vapor
- VARIO®: easily operated CVC 3000 vacuum controller with clear text menus and integrated venting valve



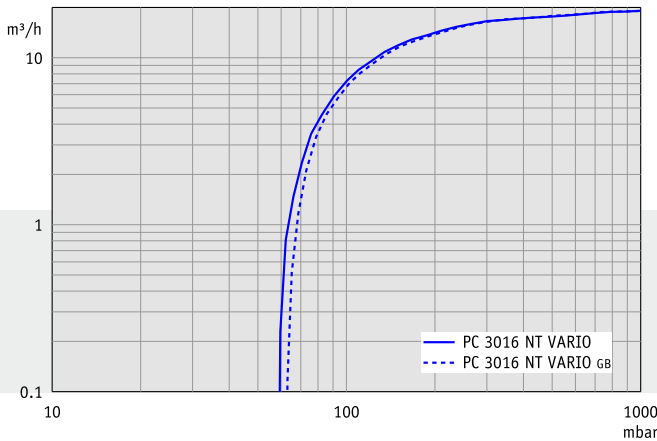
ME 16C NT VARIO
19.3 m³/h
70 mbar

PC 3016 NT VARIO
19.3 m³/h
70 mbar

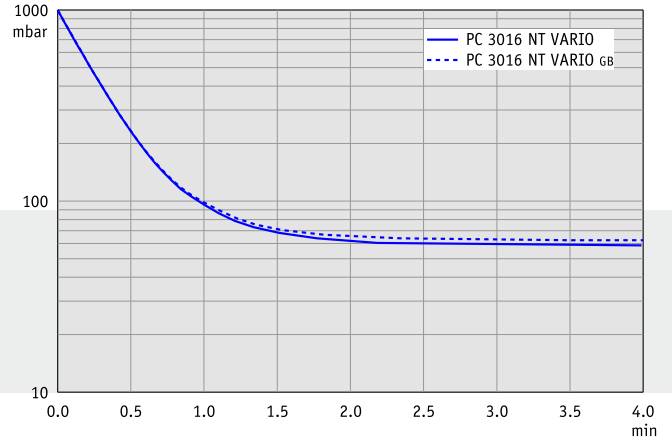


APPLICATIONS

The extraordinarily high pumping speed reduces the process time significantly and permits the usage of these pumps to support large vacuum networks, or in life science labs where high gas throughput is needed, but only a modest vacuum level. VARIO® provides hysteresis-free vacuum control. Typical applications with such characteristics include evaporation processes with low boiling solvents. Evaporation processes can be run fully automatically and with short process times and high sensitivity at the same time. The VARIO® control ensures high process reliability by preventing superheating and foaming. The inlet separator of the PC 3016 NT VARIO® makes this pump well-suited to rough operating conditions and enables efficient solvent recovery. These accessories such as the optional separator at the inlet (AK) for pump protection and the exhaust waste vapor condenser (EK), can be mounted to the pumps later, if the need arises.



Pumping speed graph with/without gas ballast



Pump down graph with/without gas ballast (100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA		ME 16C NT VARIO	PC 3016 NT VARIO
Vacuum controller		CVC 3000	CVC 3000
Number of heads / stages		8 / 1	8 / 1
Max. pumping speed 50/60 Hz	m ³ /h	19.3	19.3
Ultimate vacuum (abs.)	mbar	70	70
Ultim. vac. (abs.) with gas ballast	mbar	100	100
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Small flange KF DN 25	Small flange KF DN 25 / hose nozzle DN 15 mm
Outlet connection		Hose nozzle DN 15 mm	Hose nozzle DN 8-10 mm
Vacuum sensor connection		PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm (KF DN 16 optional)	PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm (KF DN 16 optional)
Rated motor power	kW	0.53	0.53
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	533 x 260 x 420	616 x 387 x 420
Weight, approx.	kg	28.1	29.7

ORDERING INFORMATION ME 16C NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	741700
100-120 V ~ 50-60 Hz	US		741703

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION PC 3016 NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	741800
100-120 V ~ 50-60 Hz	US		741803

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

VACUU·BUS®-compatible accessories

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Additional accessories

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ACCESSORIES ME 16C NT VARIO

- PTFE tubing KF DN 25 (1000 mm: 686033)
- Inlet separator KF DN 25 (699979)
- Emission condenser kit for NT pump models (699948)
- Rubber vacuum tubing DN 15 mm (686003)
- Vent valve VBM-B (674217)
- Centering and sealing ring KF DN 25 C Al/FEP (635722)

ACCESSORIES PC 3016 NT VARIO

- PTFE tubing KF DN 25 (1000 mm: 686033)
- Vent valve VBM-B (674217)
- Centering and sealing ring KF DN 25 C Al/FEP (635722)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

CHEMISTRY DIAPHRAGM PUMP

MZ 1C

■ Chemistry-design diaphragm pumps are an excellent solution for continuous, oil-free pumping of corrosive gases and vapors. The two-stage construction provides the advantageous combination of high pumping speed and low ultimate vacuum. All major parts in contact with pumped media are made of chemically resistant fluoroplastics. Well-proven PTFE-sandwich diaphragms increase reliability and extend operating life. The MZ 1C pump is equipped with a gas ballast valve for continuous condensate purge increasing the pumping capability of condensable vapors. It features slim design for space-saving installation and good vacuum performance. A manual vacuum regulator valve with dial gauge for adjustment of pumping speed and ultimate vacuum is available as accessory.

PERFORMANCE FEATURES

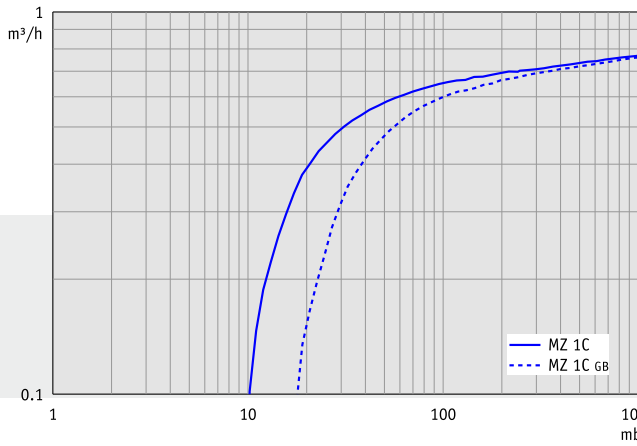
- outstanding chemical resistance and superior vapor tolerance
- convenient, quick and simple to use due to the new top mounted power switch
- optimized vacuum even with gas ballast for continuous purge
- whisper quiet and very low vibration
- maintenance-free drive system and proven long diaphragm life



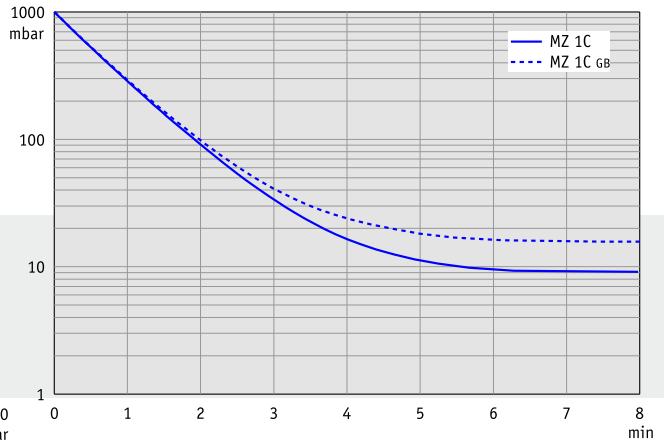
MZ 1C
0.75 m³/h
12 mbar

APPLICATIONS

Two-stage chemistry-design diaphragm pumps are an excellent choice for continuous, oil-free pumping of gases at medium vacuum requirements. In contrast to water jet pumps, they do not consume water and therefore do not produce any contaminated waste water. Typical applications are rotary evaporators, gel dryers, filtrations and many other lab applications. The MZ 1C is a powerful pump for smaller vacuum apparatus enabling continuous pumping of solvent vapors. It's a compact, stand alone pump with low ultimate vacuum. If the process requires atmospheric condensation of pumped vapors or electronic vacuum control, we recommend the pump families based on the MZ 2C NT or MD 1C.



Pumping speed graph at 50 Hz
with/without gas ballast



Pump down graph at 50 Hz
with/without gas ballast
(10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MZ 1C
Number of heads / stages		2 / 2
Max. pumping speed 50/60 Hz	m ³ /h	0.75 / 0.9
Ultimate vacuum (abs.)	mbar	12
Ultim. vac. (abs.) with gas ballast	mbar	20
Max. back pressure (abs.)	bar	1.1
Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Rated motor power	kW	0.06
Degree of protection		IP 40
Dimensions (L x W x H), approx.	mm	312 x 121 x 170
Weight, approx.	kg	6.7

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	724100
230 V ~ 50-60 Hz	UK	Ex*	724102
230 V ~ 50-60 Hz	CN	Ex*	724106
100-120 V ~ 50-60 Hz	US		724103
100-120 V ~ 50-60 Hz / 200-230 V ~ 50-60 Hz	IEC plug EN 60320	Ex*	724105**

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately ▶ pg. 185

ACCESSORIES

Chemistry vacuum regulator valve unit for ME/MZ 1C (696843)

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

CHEMISTRY DIAPHRAGM PUMP

MZ 2C NT

■ Chemistry-design diaphragm pumps are an excellent solution for continuous, oil-free pumping of corrosive gases and vapors. The two-stage construction provides the advantageous combination of high pumping speed and low ultimate vacuum. All parts in contact with pumped media are made of chemically resistant fluoroplastics. Well-proven PTFE sandwich diaphragms increase reliability and extend operating life. The MZ 2C NT pump is equipped with a gas ballast valve for continuous condensate purge increasing the pumping capability of condensable vapors. This pump is our most popular chemistry diaphragm pump, and is the heart of a family of VACUUBRAND pumping systems. The new NT-series features further improved performance data and superior vapor tolerance.

PERFORMANCE FEATURES

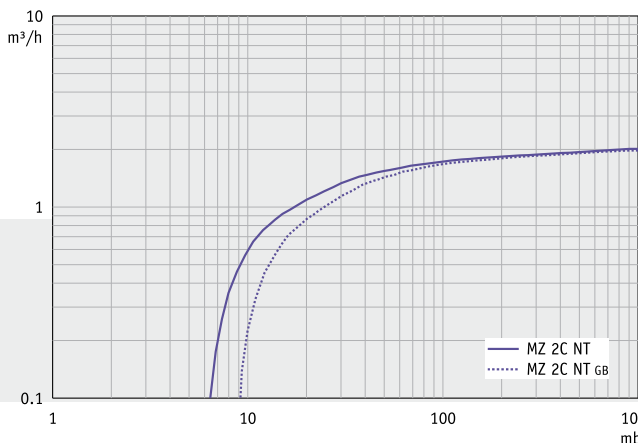
- outstanding chemical resistance and superior vapor tolerance
- high performance even at low vacuum levels
- optimized vacuum even with gas ballast for condensate purge
- whisper quiet and low vibration
- long diaphragm life, maintenance-free drive system



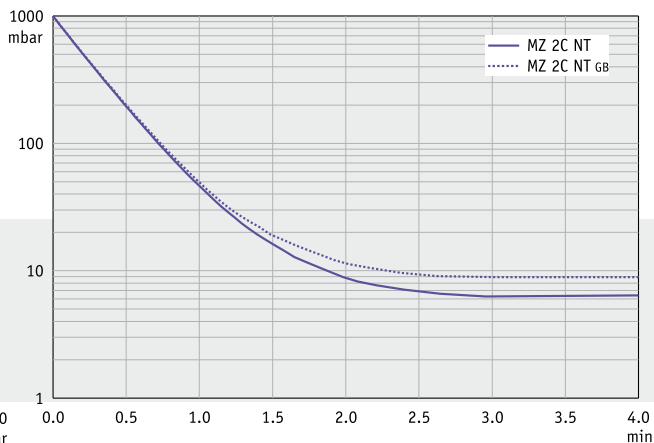
MZ 2C NT
2.0 m³/h
7 mbar

APPLICATIONS

Two-stage chemistry-design diaphragm pumps are an excellent choice for applications with corrosive gases and vapors with medium vacuum requirements. They do not consume water and therefore do not produce any contaminated waste water. The media contacted materials made of chemically resistant fluoroplastics open a wide range of applications in chemistry and pharmaceuticals. The robust design provides very good durability and long service intervals even in demanding chemistry applications. Typical usages are vacuum generation for rotary evaporators, vacuum concentrators, gel dryers, vacuum ovens and many other laboratory applications. The MZ 2C NT is the powerful basic pump for a complete family of well established and reliable chemistry vacuum systems and pumping units.



Pumping speed graph at 50 Hz with/without gas ballast



Pump down graph at 50 Hz with/without gas ballast (10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MZ 2C NT
Number of heads / stages		2 / 2
Max. pumping speed 50/60 Hz	m ³ /h	2.0 / 2.3
Ultimate vacuum (abs.)	mbar	7
Ultim. vac. (abs.) with gas ballast	mbar	12
Max. back pressure (abs.)	bar	1.1
Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Rated motor power	kW	0.18
Degree of protection		IP 40
Dimensions (L x W x H), approx.	mm	243 x 243 x 198
Weight, approx.	kg	11.1

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	732300
230 V ~ 50-60 Hz	CH, CN	Ex*	732301
230 V ~ 50-60 Hz	UK	Ex*	732302
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz			
200-230 V ~ 50-60 Hz	Inlet: Small flange KF DN 16	IEC plug EN 60320	Ex* 732345**
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz		US	732303

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately

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ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual, 732345 with clamping ring and sealing ring KF DN 16.

CHEMISTRY VACUUM SYSTEM

MZ 2C NT +2AK

■ MZ 2C NT chemistry diaphragm pump, with inlet separator and outlet catchpot

This chemistry vacuum system has a wide range of applications like evacuation, evaporation and pumping of gases and vapors in chemical, biological and pharmaceutical laboratories where there are no requirements for condensation of solvent vapors at the outlet. Typical applications are vacuum concentrators, gel dryers and filtration. The separator at the inlet (AK), made of glass with protective coating, retains particles and liquid droplets. The separator at the outlet collects condensate, avoids condensate backflow towards the pump, and reinforces the whisper-quiet operation of the pump.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- high performance even at low vacuum levels
- optimized vacuum even with gas ballast for condensate purge
- whisper quiet and very low vibration
- separators at inlet and outlet to collect condensates



MZ 2C NT +2AK
2.0 m³/h
7 mbar

TECHNICAL DATA same as MZ 2C NT, except

Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Dimensions (L x W x H), approx.	mm	319 x 243 x 309
Weight, approx.	kg	13.6

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	732500
230 V ~ 50-60 Hz	CH, CN	Ex*	732501
230 V ~ 50-60 Hz	UK	Ex*	732502
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		732503

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

- Rubber vacuum tubing DN 8 mm (686001)
- Upgrade kit manometer with valve (699906)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY VACUUM SYSTEM

MZ 2C NT +AK+EK

MZ 2C NT pump with pump protection and vapor capture components

This chemistry vacuum system has a wide range of applications like evacuation, evaporation and pumping of gases and vapors in chemical, biological and pharmaceutical laboratories. Typical applications are rotary evaporators, vacuum concentrators and vacuum drying ovens. The separator at the inlet (AK), made of glass with protective coating, retains particles and liquid droplets. The waste vapor condenser at the outlet (EK) is highly efficient and compact. The condenser enables near-100-percent solvent recovery, efficient recycling, and active protection of the environment.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- high performance even at low vacuum levels
- optimized vacuum even with gas ballast for condensate purge
- whisper quiet and very low vibration
- excellent environmental friendliness due to efficient solvent recovery



MZ 2C NT +AK+EK
2.0 m³/h
7 mbar

TECHNICAL DATA same as MZ 2C NT, except

Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	326 x 243 x 402
Weight, approx.	kg	14.2

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	732600
230 V ~ 50-60 Hz	CH, CN	Ex*	732601
230 V ~ 50-60 Hz	UK	Ex*	732602
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz			
200-230 V ~ 50-60 Hz	Inlet: Small flange KF DN 16	IEC plug EN 60320	Ex* 732615**
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz		US	732603

With NRTL certification for Canada and the USA

ORDERING INFORMATION MZ 2C NT +AK+EK Peltronic

230 V ~ 50-60 Hz	IEC plug EN 60320	Ex*	2613944**
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Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately

▶ pg. 185

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)

Upgrade kit manometer with valve (699906)

CHEMISTRY VACUUM SYSTEM

MZ 2C NT +AK SYNCHRO+EK

■ MZ 2C NT pump with full vapor capture and ports to operate two applications

This chemistry vacuum system provides the simultaneous operation of two processes with only one pump. Typical applications are rotary evaporators, vacuum concentrators and vacuum drying ovens. Each vacuum connection is provided with a manual flow control valve to regulate the effective pumping speed. The separator at the inlet (AK), made of glass with a protective coating, retains particles and liquid droplets. The waste vapor condenser at the outlet (EK) is highly efficient and compact. The condenser enables near-100-percent solvent recovery, efficient recycling and active protection of the environment.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- high performance even at low vacuum levels
- optimized vacuum even with gas ballast for condensate purge
- simultaneous operation of two independent vacuum applications, with reliable check valves to prevent interference between applications
- excellent environmental friendliness due to efficient solvent recovery



MZ 2C NT +AK SYNCHRO+EK
2.0 m³/h
7 mbar

TECHNICAL DATA same as MZ 2C NT, except

Inlet connection		2 x hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	326 x 248 x 402
Weight, approx.	kg	14.5

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	732800
230 V ~ 50-60 Hz	CH, CN	Ex*	732801
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		732803

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

Kit analog gauge for NT SYNCHRO (699907)

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY VACUUM SYSTEM

MZ 2C NT +AK+M+D

■ MZ 2C NT chemistry-diaphragm pump with pump protection and manual control

This chemistry vacuum system has a wide range of applications like evacuation, evaporation and pumping of gases and vapors in chemical, biological and pharmaceutical laboratories where there are no requirements for condensation of solvent vapors at the outlet. The manual flow control valve regulates the effective pumping speed at the vacuum connection, the vacuum manometer offers an analog vacuum display. This system is well proven for filtration. The separator at the inlet (AK), made of glass with a protective coating, retains particles and liquid droplets.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- high performance even at low vacuum levels
- optimized vacuum even with gas ballast for condensate purge
- whisper quiet and very low vibration
- manual vacuum control, analog vacuum display



MZ 2C NT +AK+M+D
2.0 m³/h
7 mbar

TECHNICAL DATA same as MZ 2C NT, except

Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Dimensions (L x W x H), approx.	mm	310 x 243 x 313
Weight, approx.	kg	13.4

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	732700
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		732703

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY PUMPING UNIT

PC 101 NT

Chemistry pumping unit with vacuum dial gauge, manual flow control and vapor capture

This chemistry pumping unit has a wide range of applications like evacuation, evaporation and pumping of gases and vapors in chemical, biological and pharmaceutical laboratories. Typical applications are rotary evaporators and vacuum drying ovens. The manual flow control valve regulates the effective pumping speed at the vacuum connection, the vacuum manometer offers an analog vacuum display. The waste vapor condenser at the outlet (EK) is highly efficient and compact. The condenser enables near-100-percent solvent recovery, efficient recycling and active protection of the environment.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- high performance even at low vacuum levels
- optimized vacuum even with gas ballast for condensate purge
- excellent environmental friendliness due to efficient solvent recovery
- manual vacuum control, analog vacuum display



PC 101 NT
2.0 m³/h
7 mbar

TECHNICAL DATA same as MZ 2C NT, except

Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	326 x 243 x 402
Weight, approx.	kg	14.5

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	733000
230 V ~ 50-60 Hz	UK	Ex*	733002
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		733003

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY PUMPING UNIT

PC 510 NT

■ Chemistry pumping units with electronic vacuum control

Chemistry pumping units of these series are well-proven for vacuum generation and control for many evaporation processes. The popular two-stage MZ 2C NT chemistry diaphragm pump is the heart of these pumping units, frequently used for medium-sized vacuum applications involving "common" solvents. The pumping units are equipped with a CVC 3000 vacuum controller with a solenoid valve for electronic vacuum control. The exhaust vapor condenser is outstandingly efficient and compact. It provides near-100-percent recovery of solvents, for economical recycling and environmental protection.

optional
remote control
pg.162



PERFORMANCE FEATURES

- optimized vacuum even with gas ballast
- easily operated vacuum controller CVC 3000 with clear text menus, with integrated venting valve
- chemistry design flow control valve with large cross section for unrestricted performance
- whisper quiet and very low vibration
- excellent environmental friendliness due to efficient solvent recovery



PC 510 NT
2.0 m³/h
7 mbar

TECHNICAL DATA same as MZ 2C NT, except

Vacuum controller		CVC 3000
Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	419 x 243 x 444
Weight, approx.	kg	16.7

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	733100
230 V ~ 50-60 Hz	CH, CN	Ex*	733101
230 V ~ 50-60 Hz	UK	Ex*	733102
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		733103

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

- Coolant valve VKW-B (674220)
- Vent valve VBM-B (674217)
- Liquid level sensor (699908)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY PUMPING UNIT

PC 511 NT

■ Chemistry pumping units with two inlet ports with vacuum control

Chemistry pumping units of these series are well-proven for vacuum generation and control for many evaporation processes. The popular two-stage MZ 2C NT chemistry diaphragm pump is the heart of these pumping units, frequently used for medium-sized vacuum applications involving "common" solvents. The pumping units are equipped with a CVC 3000 vacuum controller with a solenoid valve for electronic vacuum control. The exhaust vapor condenser is outstandingly efficient and compact. It provides near-100-percent recovery of solvents, for economical recycling and environmental protection. The PC 511 NT is equipped with an additional manually controlled vacuum port. Check valves help to protect against cross-contamination and interference, permitting simultaneous operation of two vacuum applications with one pump.

PERFORMANCE FEATURES

- optimized vacuum even with gas ballast
- easily operated vacuum controller CVC 3000 with clear text menus, with integrated venting valve
- chemistry design flow control valve with large cross section for unrestricted performance
- PC 511 NT allows simultaneous operation of two independent vacuum applications, with reliable check valves to prevent interference between systems
- excellent environmental friendliness due to efficient solvent recovery



PC 511 NT
2.0 m³/h
7 mbar

TECHNICAL DATA same as MZ 2C NT, except

Vacuum controller		CVC 3000
Inlet connection		2 x hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	435 x 243 x 444
Weight, approx.	kg	16.9

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	733200
230 V ~ 50-60 Hz	CH, CN	Ex*	733201
230 V ~ 50-60 Hz	UK	Ex*	733202
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		733203

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

- Coolant valve VKW-B (674220)
- Vent valve VBM-B (674217)
- Liquid level sensor (699908)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.



CHEMISTRY PUMPING UNIT

PC 520 NT

optional
remote control
pg.162



Chemistry pumping unit with two electronically controlled inlet ports

This chemistry vacuum pumping unit is an economic space-saving solution for simultaneous operation of two independent vacuum applications with one single pump. Each vacuum port is equipped with a CVC 3000 vacuum controller with solenoid valve for electronic vacuum control. Both vacuum ports have integrated check valves against cross contamination and interference. The popular MZ 2C NT two-stage chemistry diaphragm pump is the heart of this pumping unit. It is frequently used for medium-sized vacuum applications involving "common" solvents. The exhaust waste vapor condenser is outstandingly efficient and compact. It provides near-100-percent recovery of solvents, for economical recycling and environmental protection.

PERFORMANCE FEATURES

- optimized vacuum even with gas ballast
- two intuitive CVC 3000 vacuum controllers with clear text menus, with integrated venting valve
- two chemistry-design solenoid valves with large cross section for unrestricted performance
- simultaneous operation of two independent vacuum applications
- excellent environmental friendliness due to efficient solvent recovery



PC 520 NT
2.0 m³/h
7 mbar

TECHNICAL DATA same as MZ 2C NT, except

Vacuum controller		2 x CVC 3000
Inlet connection		2 x hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	435 x 361 x 444
Weight, approx.	kg	17.7

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	733300
230 V ~ 50-60 Hz	CH, CN	Ex*	733301
230 V ~ 50-60 Hz	UK	Ex*	733302
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		733303

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

- Coolant valve VKW-B (674220)
- Vent valve VBM-B (674217)
- Liquid level sensor (699908)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit largely mounted, ready for use, with manual.

VARIO® CHEMISTRY PUMPING UNIT

MZ 2C NT VARIO AND PC 3002 VARIO

■ VARIO® pumps and pumping units provide precise vacuum control by adaptation of the diaphragm pump's motor speed. They feature fully automatic evaporation control on the push of a button. The basic pump is the MZ 2C NT VARIO two-stage chemistry diaphragm pump which meets medium vacuum requirements for most solvents. The pumping unit PC 3002 VARIO is a well proven choice for evaporation of large amounts of solvents. The separator at the inlet collects particles and liquid droplets. The waste vapor condenser at the outlet enables near-100-percent solvent recovery, efficient recycling and active environmental protection. The on-demand motor speed control results in unparalleled length of service intervals for wearing parts such as diaphragms.



PERFORMANCE FEATURES

- automatic adaptation of the vacuum level throughout the process for high process reliability and unattended operation
- short process times due to zero-fluctuation (hysteresis-free) vacuum control
- easily operated CVC 3000 vacuum controller with clear text menus, with integrated venting valve
- extraordinary diaphragm life for minimum operational and servicing costs
- PC 3002 VARIO: excellent environmental friendliness due to efficient solvent recovery



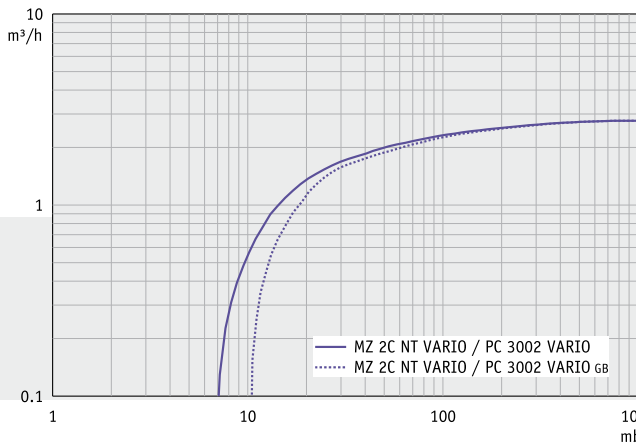
PC 3002 VARIO
2.8 m³/h
7 mbar

MZ 2C NT VARIO
2.8 m³/h
7 mbar

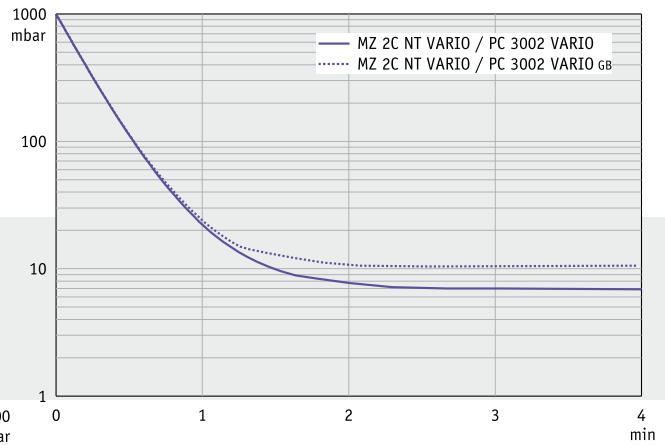


APPLICATIONS

Typical applications are all evaporation processes. Evaporation processes can be run fully automatically and with short process times and high sensitivity at the same time. The VARIO® control ensures high process reliability through prevention of superheating or foaming. The control allows for automatic vacuum level adaptation and is self-adapting to changing process parameters at any time. The VACUU·BUS® interface facilitates a user-friendly configuration of even complex vacuum installations.



Pumping speed graph with/without gas ballast



Pump down graph with/without gas ballast (10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MZ 2C NT VARIO	PC 3002 VARIO
Vacuum controller		CVC 3000	CVC 3000
Max. pumping speed	m ³ /h	2.8	2.8
Ultimate vacuum (abs.)	mbar	7	7
Ultim. vac. (abs.) with gas ballast	mbar	12	12
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Coolant connection		-	2 x hose nozzle DN 6-8 mm
Vacuum sensor connection		PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm (KF DN 16 optional)	Internally connected
Rated motor power	kW	0.53	0.53
Degree of protection		IP 20	IP 40
Dimensions (L x W x H), approx.	mm	243 x 243 x 245	419 x 243 x 444
Weight, approx.	kg	13.8	17.4

ORDERING INFORMATION MZ 2C NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	732400
200-230 V ~ 50-60 Hz	CH, CN	Ex*	732401
200-230 V ~ 50-60 Hz	UK	Ex*	732402
100-120 V ~ 50-60 Hz	US		732403

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

 VACUUBUS®-compatible accessories pg. 164
 Additional accessories pg. 169

ORDERING INFORMATION PC 3002 VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	733500
200-230 V ~ 50-60 Hz	CH, CN	Ex*	733501
200-230 V ~ 50-60 Hz	UK	Ex*	733502
100-120 V ~ 50-60 Hz	US		733503

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

PC 3002 VARIO EK Peltronic

on request

ACCESSORIES

- Coolant valve VKW-B (674220)
- Vent valve VBM-B (674217)
- Liquid level sensor (699908)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

ITEMS SUPPLIED PC 3002 VARIO EK Peltronic

Pumping unit completely mounted with Peltronic® emission condenser, with manual.

CHEMISTRY DIAPHRAGM PUMP

MD 1C

■ Three-stage chemistry-design diaphragm pumps are an excellent solution for continuous, oil-free pumping of corrosive gases and vapors and meet high requirements regarding ultimate vacuum. The three-stage construction provides the advantageous combination of high pumping speed and deep ultimate vacuum in a pump with a very small footprint. All parts in contact with pumped media are made of chemically resistant fluoroplastics. Well-proven PTFE sandwich diaphragms increase reliability and extend operating life. The MD 1C with gas ballast valve is optimally prepared for pumping easily condensable vapors (high boiling solvents).

PERFORMANCE FEATURES

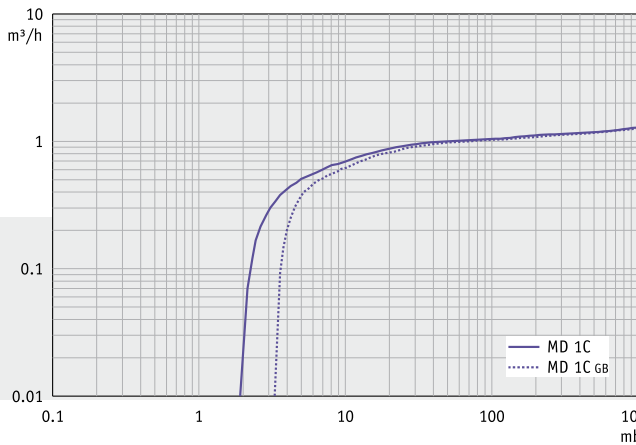
- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum even with gas ballast
- whisper quiet and ultra low vibration
- proven long diaphragm life, maintenance-free drive system



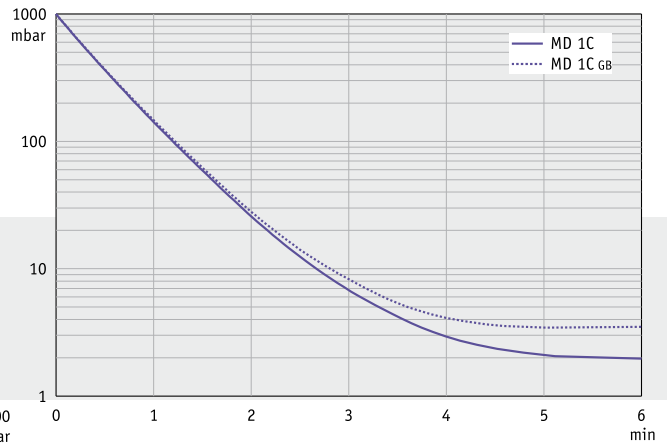
MD 1C
1.3 m³/h
2 mbar

APPLICATIONS

Three-stage chemistry diaphragm pumps are an excellent solution for applications involving corrosive gases and vapors at high vacuum requirements. Typical applications are vacuum generation at rotary evaporators, vacuum concentrators and many other laboratory applications. Due to their excellent ultimate vacuum they are the ideal solution for evaporation of high boiling solvents even with gas ballast. The MD 1C pump is the heart of a whole line of reliable chemistry pumping units.



Pumping speed graph at 50 Hz with/without gas ballast



Pump down graph at 50 Hz with/without gas ballast (10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MD 1C
Number of heads / stages		4 / 3
Max. pumping speed 50/60 Hz	m ³ /h	1.3 / 1.5
Ultimate vacuum (abs.)	mbar	2
Ultim. vac. (abs.) with gas ballast	mbar	4
Max. back pressure (abs.)	bar	1.1
Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8 mm
Rated motor power	kW	0.08
Degree of protection		IP 42
Dimensions (L x W x H), approx.	mm	316 x 143 x 175
Weight, approx.	kg	6.9

ORDERING INFORMATION

200-230 V ~ 50-60 Hz	CEE	Ex*	696600
200-230 V ~ 50-60 Hz	CH, CN	Ex*	696601
200-230 V ~ 50-60 Hz	UK	Ex*	696602
100-120 V ~ 50-60 Hz	US		696603
120 V ~ 60 Hz*	US		696613

*With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

CHEMISTRY VACUUM SYSTEM

MD 1C +AK+EK

■ MD 1C chemistry diaphragm pump with separator at the inlet and exhaust vapor condenser

This chemistry vacuum system has a wide range of applications like evacuation, evaporation and pumping of gases and vapors. This system is usable for increased vacuum requirements with high boiling solvents and often replaces rotary vane pumps. Typical applications are rotary evaporators and vacuum drying ovens. The separator at the inlet (AK), made of glass with a protective coating, retains particles and liquid droplets. The waste vapor condenser at the outlet (EK) is highly efficient and compact. The condenser enables near-100-percent solvent recovery, efficient recycling and active protection of the environment.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum even with gas ballast
- whisper quiet and ultra low vibration
- excellent environmental friendliness due to efficient solvent recovery



MD 1C +AK+EK
1.3 m³/h
2 mbar

TECHNICAL DATA same as MD 1C, except

Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	316 x 239 x 405
Weight, approx.	kg	10.2

ORDERING INFORMATION

200-230 V ~ 50-60 Hz	CEE	Ex*	696620
200-230 V ~ 50-60 Hz	CH, CN	Ex*	696621
200-230 V ~ 50-60 Hz	UK	Ex*	696622
100-120 V ~ 50-60 Hz	US		696623
120 V ~ 60 Hz*	US		696633

*With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)

Flow control valve (677137)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY PUMPING UNIT

PC 3001 BASIC

■ Chemistry pumping unit with manual speed control

This very compact chemistry pumping unit is an excellent solution when working with high boiling solvents. Typical applications are vacuum generation for rotary evaporators, vacuum concentrators and filtrations. With the continuously variable jog wheel, the pumping speed is manually adjustable to the process requirements. There are two optional kits available to easily upgrade the PC 3001 basic to the fully functional PC 3001 VARIO^{pro} complete with CVC 3000 vacuum controller, inlet separator and vapor condenser at the outlet.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- high flow rate even at low vacuum
- excellent ultimate vacuum even with gas ballast
- continuously adjustable manual adaptation of pumping speed via jog wheel
- upgradable to PC 3001 VARIO^{pro} system with two accessory packages: Kit 1, with CVC 3000 and inlet separator; Kit 2, with emission condenser and catch-pot



PC 3001 basic
2.0 m³/h
2 mbar

TECHNICAL DATA same as PC 3001 VARIO^{pro}, without CVC 3000, EK, AK

Inlet connection		Hose nozzle DN 6-10 mm
Outlet connection		Hose nozzle DN 8-10 mm / silencer
Dimensions (L x W x H), approx.	mm	251 x 256 x 400
Weight, approx.	kg	6.4

ORDERING INFORMATION

100-120 V/200-230 V ~ 50-60 Hz	CEE	Ex*	696720
100-120 V/200-230 V ~ 50-60 Hz	UK	Ex*	696722
100-120 V/200-230 V ~ 50-60 Hz	US	Ex*	696723

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

- Rubber vacuum tubing DN 6 mm (686000)
- Upgrade kit CVC 3000 with inlet separator (699921)
- Upgrade kit emission condenser (699922)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

VARIO® CHEMISTRY PUMPING UNIT

PC 3001 VARIO^{PRO}

■ Continuously optimized electronic vacuum control on a chemistry-design pumping unit

This VARIO® chemistry pumping unit optimizes vacuum conditions automatically by precisely and continuously adjusting the diaphragm pump's motor speed. Thanks to the motor speed control the pump operates only when vacuum is needed, saving energy and reducing maintenance. The integrated vacuum controller enables fully automatic evaporation at a push of a button. Low space requirements, light weight and low operational noise contribute further to this unit's flexibility and popularity for laboratory use. The PC 3001 VARIO^{PRO} is ideal for vacuum applications with high boiling point solvents. This new 'pro' version builds on the worldwide popular PC 3001 VARIO unit, boosting the pumping speed and thereby extending its range to larger applications. The inlet separator, made of glass with a protective coating, prevents droplets and particles from entering the pump. The highly efficient insulated exhaust vapor condenser has a very compact design and provides near-100-percent recovery of solvents.



PERFORMANCE FEATURES

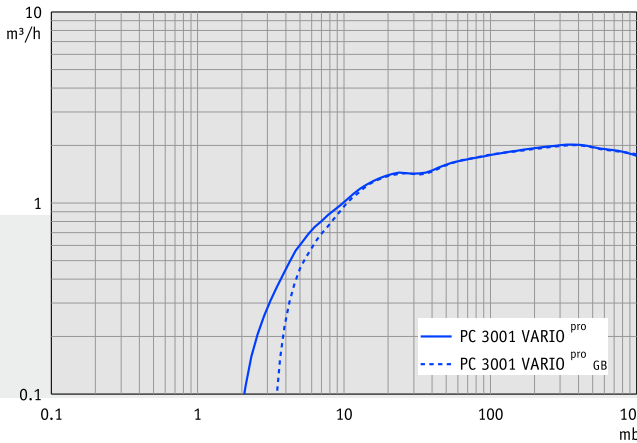
- easily operated CVC 3000 vacuum controller with clear text menus and integrated venting valve
- automatic optimization of the vacuum level throughout the process for high process reproducibility and unattended operation, short process times due to zero-fluctuation (hysteresis-free) vacuum control - even for large amounts of vapor
- compact and powerful; excellent ultimate vacuum, even with continuous condensate purge
- whisper quiet and ultra low vibration
- excellent environmental friendliness due to low power consumption and efficient solvent recovery



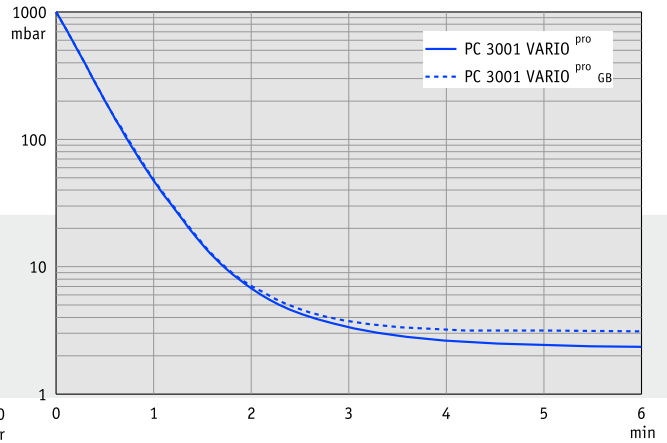
PC 3001 VARIO^{PRO}
2.0 m³/h
2 mbar

APPLICATIONS

This pumping unit is ideal for vacuum applications with high boiling solvents. The hysteresis-free vacuum control prevents superheating and foaming to protect valuable process samples. The controller enables automatic detection of vapor pressure and automatic adjustment of the vacuum level to the process requirements. The new 'pro' version with improved pumping speed extends the range of use. Evacuation of larger vessels and process steps with high vapor volumes can be completed more quickly. Programmed vacuum processes can be controlled by the integrated CVC 3000 controller or using the RS232C interface to your computer. The 'TE' version of the PC 3001 VARIO^{PRO} uses a dry ice condenser to provide a cooling-water-free option for vapor capture if no cooling water connection is available or water conservation is critical. The PC 3001 VARIO^{PRO} with the Peltronic® emission condenser works without any cooling media. For exceptionally large amounts of vapor - like from parallel evaporators without condenser - the PC 3001 VARIO^{PRO} +IK with its condenser on the vacuum side is an excellent choice.



Pumping speed graph with/without gas ballast



Pump down graph with/without gas ballast (10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		PC 3001 VARIO^{pro}	PC 3001 VARIO^{pro} TE
Vacuum controller		CVC 3000	CVC 3000
Number of heads / stages		4 / 3	4 / 3
Max. pumping speed	m ³ /h	2.0	2.0
Ultimate vacuum (abs.)	mbar	2	2
Ultim. vac. (abs.) with gas ballast	mbar	4	4
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Hose nozzle DN 6-10 mm	Hose nozzle DN 6-10 mm
Outlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm	-
Max. power	kW	0.16	0.16
Degree of protection		IP 20	IP 20
Dimensions (L x W x H), approx.	mm	300 x 306 x 400	300 x 341 x 493
Weight, approx.	kg	7.7	8.2

ORDERING INFORMATION PC 3001 VARIO^{pro}

100-120 V/200-230 V ~ 50-60 Hz	Ex*	CEE	696700
100-120 V/200-230 V ~ 50-60 Hz	Ex*	CH, CN	696701
100-120 V/200-230 V ~ 50-60 Hz	Ex*	UK	696702
100-120 V/200-230 V ~ 50-60 Hz	Ex*	US	696703

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION PC 3001 VARIO^{pro} TE

100-120 V/200-230 V ~ 50-60 Hz	Ex*	CEE	696710
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With NRTL certification for Canada and the USA

ORDERING INFORMATION PC 3001 VARIO^{pro} EK Peltronic

100-120 V/200-230 V ~ 50-60 Hz	Ex*	696735**
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ORDERING INFORMATION PC 3001 VARIO^{pro} +IK

100-120 V/200-230 V ~ 50-60 Hz	Ex*	696745**
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With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately ▶ pg. 185

ACCESSORIES

- Rubber vacuum tubing DN 6 mm (686000)
- Coolant valve VKW-B (674220)
- Vent valve VBM-B (674217)
- Liquid level sensor (699908)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY DIAPHRAGM PUMP

MD 4C NT AND MD 4CRL NT

- Three-stage chemistry-design diaphragm pumps are an excellent solution for continuous, oil-free pumping of corrosive gases and vapors and meet even challenging requirements. The three-stage design provides the advantageous combination of high pumping speed and very low ultimate vacuum. All parts of the MD 4C NT in contact with pumped media are made of chemically resistant fluoroplastics. Well-proven PTFE sandwich diaphragms provide increased reliability and extended operating life. Due to the gas ballast valve and its very good ultimate vacuum (even with gas ballast) the MD 4C NT is also suitable for pumping condensable vapors of high-boiling solvents. The new NT-series features further improved performance data, easy service and superior vapor tolerance.
- For applications requiring an especially high leak tightness of the pump, we recommend the MD 4CRL NT. The wetted parts of the pump are made of fluoroplastics and a special, highly corrosion-resistant stainless steel. Every single pump is tested for an integral leakage rate of 0.001 mbar l/s.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum even with gas ballast
- whisper quiet and very low vibration
- long diaphragm life, maintenance-free drive system



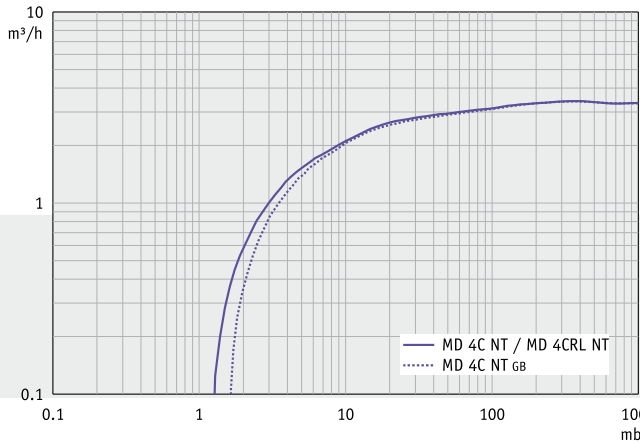
MD 4C NT
3.4 m³/h
1.5 mbar

MD 4CRL NT
3.4 m³/h
1.5 mbar

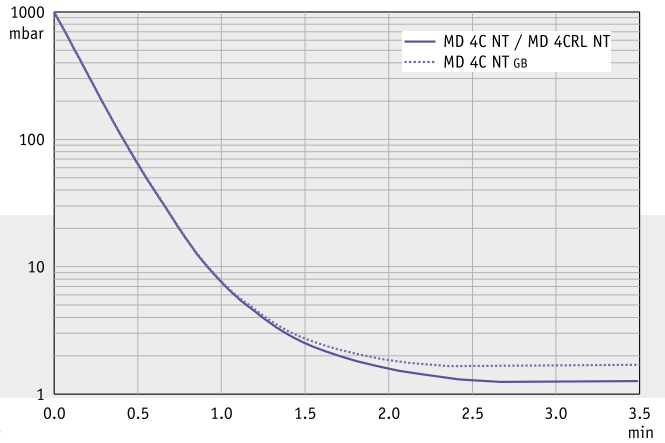


APPLICATIONS

Three-stage chemistry-design diaphragm pumps are an excellent choice for applications with corrosive gases and vapors with high vacuum requirements. Typical applications are parallel and rotary evaporators, concentrators, drying ovens and many other laboratory applications. The MD 4C NT has an outstanding performance for pumping large amounts of vapor, e.g., out of drying ovens and gel dryers. This powerful pump is at the heart of a complete family of well-proven and reliable vacuum systems and pumping units for larger lab applications.



Pumping speed graph at 50 Hz with/without gas ballast



Pump down graph at 50 Hz with/without gas ballast (10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MD 4C NT	MD 4CRL NT
Number of heads / stages		4 / 3	4 / 3
Max. pumping speed at 50/60 Hz	m ³ /h	3.4 / 3.8	3.4 / 3.8
Ultimate vacuum (abs.)	mbar	1.5	1.5
Ultim. vac. (abs.) with gas ballast	mbar	3	-
Integral leakage rate	mbar l/s	typ. 0.02	0.001
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Hose nozzle DN 8-10 mm	Small flange KF DN 16
Outlet connection		Hose nozzle DN 8-10 mm	Small flange KF DN 16
Rated motor power	kW	0.25	0.25
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	325 x 243 x 198	325 x 243 x 198
Weight, approx.	kg	14.3	19.8

ORDERING INFORMATION MD 4C NT

230 V ~ 50-60 Hz	Ex*	CEE	736400
230 V ~ 50-60 Hz	Ex*	CH, CN	736401
230 V ~ 50-60 Hz	Ex*	UK	736402
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz		US	736403

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES MD 4C NT

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

ORDERING INFORMATION MD 4CRL NT

100-115 V ~ 50-60 Hz / 120 V ~ 50-60 Hz		
200-230 V ~ 50-60 Hz	Ex*	736445**

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately ▶ pg. 185

ACCESSORIES MD 4CRL NT

PTFE tubing KF DN 16 (1000 mm: 686031)

Stainless steel tubing KF DN 16 (1000 mm: 673336)

CHEMISTRY VACUUM SYSTEM

MD 4C NT +2AK

■ MD 4C NT chemistry diaphragm pump with inlet separator and outlet catchpot

This chemistry vacuum system has a wide range of applications like evacuation, evaporation and pumping of gases and vapors in chemical, biological and pharmaceutical laboratories that do not require condensation of solvent vapors at the outlet. This system is well proven for high vacuum requirements with high boiling solvents. Typical applications are vacuum concentrators, rotary evaporators and drying ovens. The separator at the inlet (AK), made of glass with a protective coating, retains particles and liquid droplets. The catchpot at the outlet collects condensate, avoids condensate backflow towards the pump and reinforces the whisper-quiet operation of the pump.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum even with gas ballast
- whisper quiet and very low vibration
- separators at inlet and outlet to collect condensates



MD 4C NT +2AK
3.4 m³/h
1.5 mbar

TECHNICAL DATA same as MD 4C NT, except

Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Dimensions (L x W x H), approx.	mm	319 x 243 x 374
Weight, approx.	kg	16.7

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	736600
100-115 V ~ 50-60 Hz/120 V ~ 60 Hz	US		736603

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

- Rubber vacuum tubing DN 8 mm (686001)
- Upgrade kit manometer with valve (699906)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY VACUUM SYSTEM

MD 4C NT +AK+EK

■ MD 4C NT pump with separator at the inlet and exhaust vapor condenser

This chemistry vacuum system has a wide range of applications like evacuation, evaporation and pumping of gases and vapors in chemical, biological and pharmaceutical laboratories. This system is ideal for high vacuum requirements with high boiling solvents. Typical applications are rotary evaporators and drying ovens. The separator at the inlet (AK), made of glass with a protective coating, retains particles and liquid droplets. The waste vapor condenser at the outlet (EK) is highly efficient and compact. The condenser enables near-100-percent solvent recovery, efficient recycling of solvents and active protection of the environment.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum even with gas ballast
- whisper quiet and very low vibration
- excellent environmental friendliness due to efficient solvent recovery



MD 4C NT +AK+EK
3.4 m³/h
1.5 mbar

TECHNICAL DATA same as MD 4C NT, except

Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	326 x 243 x 402
Weight, approx.	kg	17.3

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	736700
230 V ~ 50-60 Hz	CH, CN	Ex*	736701
230 V ~ 50-60 Hz	UK	Ex*	736702
100-115 V ~ 50-60 Hz/120 V ~ 60 Hz	US		736703

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

MD 4C NT +AK+EK-Peltronic

230 V ~ 50-60 Hz	IEC plug EN 60320	2613972**
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**Please order power cable separately

▶ pg. 185

ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)

Upgrade kit manometer with valve (699906)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY VACUUM SYSTEM

MD 4C NT +AK SYNCHRO+EK

■ MD 4C NT pump with full vapor capture and ports to operate two applications

This chemistry vacuum system provides the simultaneous operation of two processes with only one pump. Typical applications are rotary evaporators, vacuum concentrators and vacuum drying ovens. Each vacuum connection is provided with a manual valve to regulate the effective flow at each port. The MD 4C NT pump offers more than sufficient pumping speed also for the parallel operation of two challenging applications. The separator at the inlet (AK), made of glass with a protective coating, retains particles and liquid droplets. The waste vapor condenser at the outlet (EK) is highly efficient and compact. The condenser enables near-100-percent solvent recovery, efficient recycling and active protection of the environment.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum even with gas ballast
- simultaneous operation of two independent vacuum applications, with reliable check valves to prevent interference between systems
- excellent environmental friendliness due to efficient solvent recovery



MD 4C NT +AK SYNCHRO+EK
3.4 m³/h
1.5 mbar

TECHNICAL DATA same as MD 4C NT, except

Inlet connection		2 x hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	326 x 248 x 402
Weight, approx.	kg	17.6

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	736800
230 V ~ 50-60 Hz	CH, CN	Ex*	736801
100-115 V ~ 50-60 Hz/120 V ~ 60 Hz	US		736803

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

- Kit analog gauge for NT SYNCHRO (699907)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY PUMPING UNIT

PC 201 NT

■ **Chemistry pumping unit with vacuum dial gauge, manual flow control and vapor capture**

This chemistry pumping unit has a wide range of applications like evacuation, evaporation and pumping of gases and vapors in chemical, biological and pharmaceutical laboratories. Typical applications are rotary evaporators, vacuum concentrators and vacuum drying ovens with high boiling solvents. The manual flow control valve regulates the effective pumping speed at the vacuum connection; the vacuum manometer offers an analog vacuum display. The separator at the inlet (AK), made of glass with a protective coating, retains particles and liquid droplets. The exhaust waste vapor condenser enables near-100-percent solvent recovery.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum even with gas ballast
- manual vacuum control, analog vacuum display
- excellent environmental friendliness due to efficient solvent recovery



PC 201 NT
3.4 m³/h
1.5 mbar

TECHNICAL DATA same as MD 4C NT, except

Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	326 x 243 x 402
Weight, approx.	kg	17.5

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	737000
100-115 V ~ 50-60 Hz/120 V ~ 60 Hz	US		737003

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY PUMPING UNIT

PC 600 LAN NT

■ This ready-to-connect chemistry vacuum pumping unit is optimized for automatic on-demand vacuum generation in local area vacuum networks, e.g., VACUU·LAN®. The pump turns on and off automatically, according to the actual vacuum demand. The on/off switch points can be set independently. Based on the MD 4C NT pump, the PC 600 LAN NT meets high vacuum requirements at multiple workstations in laboratories. The pumping unit includes a vacuum controller (VNC 2) with digital vacuum display. The VNC 2 also contains connections for a cooling water valve and a readout for an optional liquid level sensor for the catchpot at the exhaust waste vapor condenser.

PERFORMANCE FEATURES

- excellent ultimate vacuum even with gas ballast
- energy-efficient and low maintenance costs
- optional coolant valve to minimize cooling water consumption
- optional liquid level sensor for catchpot
- excellent environmental friendliness due to efficient solvent recovery



PC 600 LAN NT
3.4 m³/h
1.5 mbar

TECHNICAL DATA same as MD 4C NT, except

Vacuum controller		VNC 2
Inlet connection		PTFE tubing connection 10/8 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	408 x 264 x 470
Weight, approx.	kg	18.4

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	737400
230 V ~ 50-60 Hz	CH, CN	Ex*	737401
100-120 V ~ 50-60 Hz	US		737403

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

- PTFE tubing DN 10/8 mm (638644)
- Coolant valve VKW-B (674220)
- Vent valve VBM-B (674217)
- Liquid level sensor (699908)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY PUMPING UNIT

PC 610 NT

■ Chemistry pumping unit with electronic vacuum control

Chemistry pumping units of the PC 600 series are well-proven for vacuum generation and control for many evaporation processes. The basic pump is the three-stage chemistry diaphragm pump MD 4C NT which meets high vacuum requirements for most high boiling solvents. Typical applications are rotary evaporators and vacuum drying ovens. The pumping unit is equipped with a vacuum controller CVC 3000 with solenoid valve for electronic vacuum control. The exhaust vapor condenser is outstandingly efficient and compact. It provides near-100-percent recovery of solvents, for economical recycling and environmental protection.

optional
remote control
pg.162



PERFORMANCE FEATURES

- easily operated vacuum controller CVC 3000 with clear text menus, with integrated venting valve
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum even with gas ballast
- chemistry design flow control valve with large cross section for unrestricted performance
- excellent environmental friendliness due to efficient solvent recovery



PC 610 NT
3.4 m³/h
1.5 mbar

TECHNICAL DATA same as MD 4C NT, except

Vacuum controller		CVC 3000
Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	419 x 243 x 444
Weight, approx.	kg	19.9

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	737100
230 V ~ 50-60 Hz	CH, CN	Ex*	737101
230 V ~ 50-60 Hz	UK	Ex*	737102
100-115 V ~ 50-60 Hz/120 V ~ 60 Hz	US		737103

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

- Coolant valve VKW-B (674220)
- Vent valve VBM-B (674217)
- Liquid level sensor (699908)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY PUMPING UNIT

PC 611 NT

■ **Chemistry pumping unit with two ports - one electronic and one manual - for high boiling solvents**

Chemistry pumping units of these series are well-proven for vacuum generation and control for many evaporation processes. This pumping unit makes it possible to operate two vacuum systems simultaneously with just one pump. The basic pump is the three-stage MD 4C NT chemistry diaphragm pump which meets high vacuum requirements for most high boiling solvents. This pump offers more than sufficient pumping speed also for the parallel operation of two challenging applications. The pumping unit is equipped with a CVC 3000 vacuum controller with solenoid valve for electronic vacuum control. At the second vacuum connection a manual flow control valve allows to regulate the effective pumping speed at this port. Both vacuum ports have integrated check valves to protect against cross contamination.



PERFORMANCE FEATURES

- easily operated vacuum controller CVC 3000 with clear text menus, with integrated venting valve
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum even with gas ballast
- high pumping speed for unrestricted simultaneous operation of two independent vacuum applications; check valves against cross contamination
- excellent environmental friendliness due to efficient solvent recovery



PC 611 NT
3.4 m³/h
1.5 mbar

TECHNICAL DATA same as MD 4C NT, except

Vacuum controller		CVC 3000
Inlet connection		2 x hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	435 x 243 x 444
Weight, approx.	kg	20.1

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	737200
230 V ~ 50-60 Hz	CH, CN	Ex*	737201
100-115 V ~ 50-60 Hz/120 V ~ 60 Hz	US		737203

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

- Coolant valve VKW-B (674220)
- Vent valve VBM-B (674217)
- Liquid level sensor (699908)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY PUMPING UNIT

PC 620 NT

■ Chemistry pumping unit with two electronically controlled inlet ports for high boiling solvents

This chemistry vacuum pumping unit is an economic space-saving solution for simultaneous operation of two independent vacuum applications with one single pump. Each vacuum port is equipped with a vacuum controller CVC 3000 with a solenoid valve for electronic vacuum control. The basic pump is the three-stage MD 4C NT chemistry diaphragm pump which meets high vacuum requirements for most high boiling solvents. This pump offers more than sufficient pumping speed also for the parallel operation of two challenging applications. Both vacuum ports have integrated check valves against cross contamination and interference. The exhaust vapor condenser is outstandingly efficient and compact. It provides near-100-percent recovery of solvents, for economical recycling and environmental protection.



PERFORMANCE FEATURES

- easily operated vacuum controller CVC 3000 with clear text menus, with integrated venting valve
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum even with gas ballast
- high pumping speed for unrestricted simultaneous operation of two independent vacuum applications; check valves against cross contamination
- excellent environmental friendliness due to efficient solvent recovery



PC 620 NT
3.4 m³/h
1.5 mbar

TECHNICAL DATA same as MD 4C NT, except

Vacuum controller		2 x CVC 3000
Inlet connection		2 x hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H), approx.	mm	435 x 361 x 444
Weight, approx.	kg	20.9

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	Ex*	737300
230 V ~ 50-60 Hz	CH, CN	Ex*	737301
100-115 V ~ 50-60 Hz/120 V ~ 60 Hz	US		737303

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

- Coolant valve VKW-B (674220)
- Vent valve VBM-B (674217)
- Liquid level sensor (699908)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit largely mounted, ready for use, with manual.

VARIO® CHEMISTRY PUMPING UNIT

MD 4C NT VARIO AND PC 3004 VARIO

■ VARIO® pumps and pumping units provide precise vacuum control by adaptation of the diaphragm pump's motor speed. They feature fully automatic evaporation control on the push of a button. The basic pump is the three-stage MD 4C NT VARIO chemistry diaphragm pump which meets high vacuum requirements for most high boiling solvents. The PC 3004 VARIO offers a well proven choice for evaporation of large amounts of solvents. The separator at the inlet, made of glass with protective coating, retains particles and liquid droplets. The waste vapor condenser at the outlet enables near-100-percent solvent recovery, efficient recycling and active environmental protection. The on-demand motor speed control results in unsurpassed lifetimes of service parts, such as diaphragms.



PERFORMANCE FEATURES

- automatic adaptation of the vacuum level throughout the process for high process reliability and unattended operation
- short process times due to high pumping speed and zero-fluctuation (hysteresis-free) vacuum control
- easily operated CVC 3000 vacuum controller with clear text menus, with integrated venting valve
- extraordinary diaphragm life, therefore minimum operational and servicing costs
- PC 3004 VARIO: Excellent environmental friendliness due to efficient solvent recovery

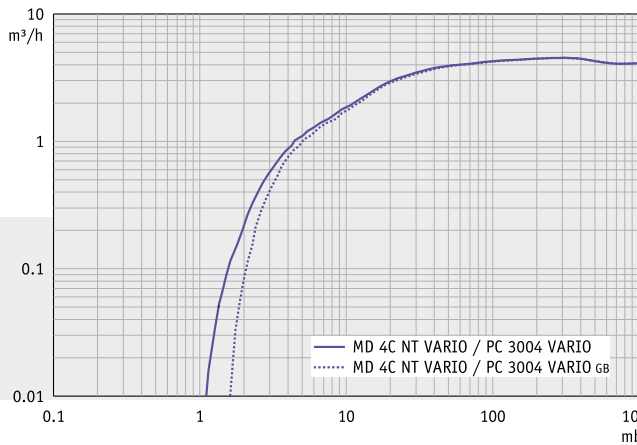


PC 3004 VARIO
4.6 m³/h
1.5 mbar

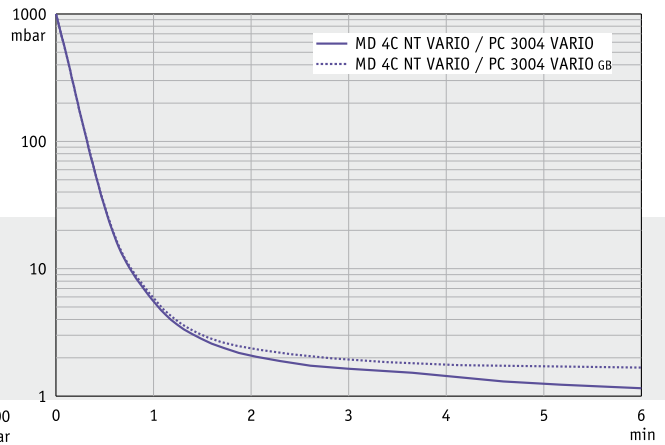


APPLICATIONS

Typical applications are all evaporation processes. They can be run fully automatically and with shorter process times and extra sensitivity even for challenging mixtures at the same time. The VARIO® control ensures high process reliability through prevention of boiling retardation or foaming. It detects boiling pressures automatically and self-adapts to changing process parameters at any time. This all without any need of parameter input or the use of a solvent library. Also in many other applications and in laboratory vacuum networks the VARIO® control brings significant advantages as it provides always the appropriate pumping speed. The VACUU·BUS® interface facilitates a user-friendly configuration of even complex vacuum installations.



Pumping speed graph with/without gas ballast



Pump down graph with/without gas ballast (10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MD 4C NT VARIO	PC 3004 VARIO
Vacuum controller		CVC 3000	CVC 3000
Number of heads / stages		4 / 3	4 / 3
Max. pumping speed	m³/h	4.6	4.6
Ultimate vacuum (abs.)	mbar	1.5	1.5
Ultim. vac. (abs.) with gas ballast	mbar	3	3
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Coolant connection		-	2 x hose nozzle DN 6-8 mm
Vacuum sensor connection		PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm (KF DN 16 optional)	Internally connected
Rated motor power	kW	0.53	0.53
Degree of protection		IP 20	IP 40
Dimensions (L x W x H), approx.	mm	325 x 243 x 245	419 x 243 x 444
Weight, approx.	kg	16.3	20.6

ORDERING INFORMATION MD 4C NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	736500
200-230 V ~ 50-60 Hz	CH, CN	Ex*	736501
100-120 V ~ 50-60 Hz	US		736503

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION PC 3004 VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	737500
200-230 V ~ 50-60 Hz	CH, CN	Ex*	737501
200-230 V ~ 50-60 Hz	UK	Ex*	737502
100-120 V ~ 50-60 Hz	US		737503

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

VACUUBUS®-compatible accessories ▶ pg. 164

Additional accessories ▶ pg. 169

ORDERING INFORMATION PC 3004 VARIO EK Peltronic

200-230 V ~ 50-60 Hz	IEC plug EN 60320	Ex*	2614327**
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Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately ▶ pg. 185

ACCESSORIES

Coolant valve VKW-B (674220)

Vent valve VBM-B (674217)

Liquid level sensor (699908)

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY DIAPHRAGM PUMP

MD 12C NT

■ Three-stage chemistry diaphragm pumps are an excellent solution for continuous, oil-free pumping of corrosive gases and vapors and meet the highest requirements. The three-stage design of the eight-cylinder MD 12C NT pump provides the advantageous combination of high pumping speed and very low ultimate vacuum. All internal parts in contact with pumped media are made of chemically resistant fluoroplastics. Well-proven PTFE sandwich diaphragms provide increased reliability and extended operating life. With its gas ballast valve the MD 12C NT is optimally prepared for pumping easily condensable vapors, thanks to the very good ultimate vacuum even with open gas ballast valve also for high boiling solvents. Upgrade kits such as inlet separator (AK) and exhaust vapor condenser (EK) enable a later adaptation to changed process requirements. Eight-cylinder NT pumps features quiet operation with smooth, easy-to-clean surfaces.

PERFORMANCE FEATURES

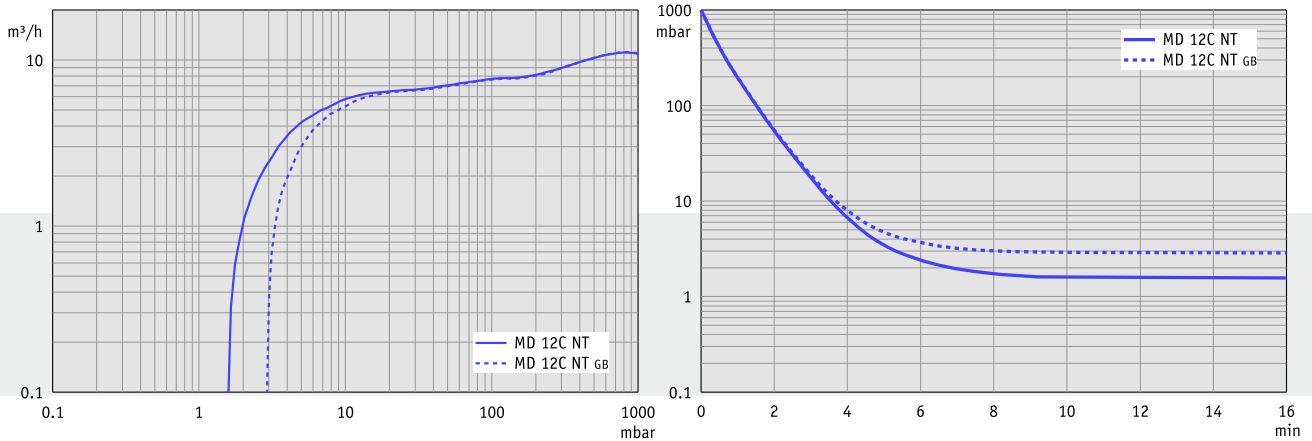
- outstanding chemical resistance and superior vapor tolerance
- reduced process time due to particularly high pumping speed even near ultimate vacuum
- whisper quiet and very low vibration
- very good ultimate vacuum even with open gas ballast valve for condensate purge
- long diaphragm lifetime, maintenance-free drive system



MD 12C NT
11.1 m³/h
2 mbar

APPLICATIONS

The high pumping speed of the MD 12C NT reduces the process time and meets the high vacuum requirements, e.g., of parallel processes in vacuum networks. Typical applications are large vacuum ovens and rotary evaporators, for example at pilot plants, mini-plants and kilo laboratories. The MD 12C NT is the particularly powerful base pump for vacuum systems and pumping units with vacuum control. Upgraded with a separator at the inlet the MD 12C NT is well prepared also for rough operating conditions. With a waste vapor emission condenser (available as accessory) at the outlet the pump offers excellent environmental friendliness due to efficient solvent recovery.


 Pumping speed graph at 50 Hz
with/without gas ballast

 Pump down graph at 50 Hz
with/without gas ballast
(100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MD 12C NT
Number of heads / stages		8 / 3
Max. pumping speed at 50/60 Hz	m ³ /h	11.1 / 12.3
Ultimate vacuum (abs.)	mbar	2
Ultim. vac. (abs.) with gas ballast	mbar	4
Max. back pressure (abs.)	bar	1.1
Inlet connection		Small flange KF DN 25
Outlet connection		Hose nozzle DN 15 mm
Rated motor power	kW	0.44
Degree of protection		IP 40
Dimensions (L x W x H), approx.	mm	533 x 260 x 359
Weight, approx.	kg	28.1

ORDERING INFORMATION MD 12C NT

230 V ~ 50-60 Hz	CEE	Ex*	743300
230 V ~ 50-60 Hz	CH, CN	Ex*	743301
230 V ~ 50-60 Hz	UK	Ex*	743302
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		743303

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES MD 12C NT

- PTFE tubing KF DN 25 (1000 mm: 686033)
- Inlet separator KF DN 25 (699979)
- Emission condenser kit for NT pump models (699948)
- Centering and sealing ring KF DN 25 C AL/FEP (635722)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

CHEMISTRY VACUUM SYSTEM

MD 12C NT +EK, MD 12C NT +AK+EK

■ These chemistry vacuum systems have a wide range of applications like evacuation, evaporation and pumping of gases and vapors. They provide particularly high pumping speed and are ideal for higher vacuum requirements, e.g., with high boiling solvents. The base MD 12C NT pump obtains a very good ultimate vacuum even with open gas ballast valve for condensate purge and delivers high pumping speed in a compact design. The pump design offers exceptionally high chemical resistance supporting almost universal usage in chemistry and pharmaceuticals. The inlet separator (AK) retains particles and liquid droplets, the waste vapor condenser at the outlet (EK) is highly efficient and compact. The condenser enables near-100-percent solvent recovery, efficient recycling, and active protection of the environment.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- reduced process time due to particularly high pumping speed even near ultimate vacuum
- whisper quiet and very low vibration
- very good ultimate vacuum even with open gas ballast valve for condensate purge
- efficient solvent recovery and inlet separator equip the MD 12C NT +AK+EK system for rough operating conditions



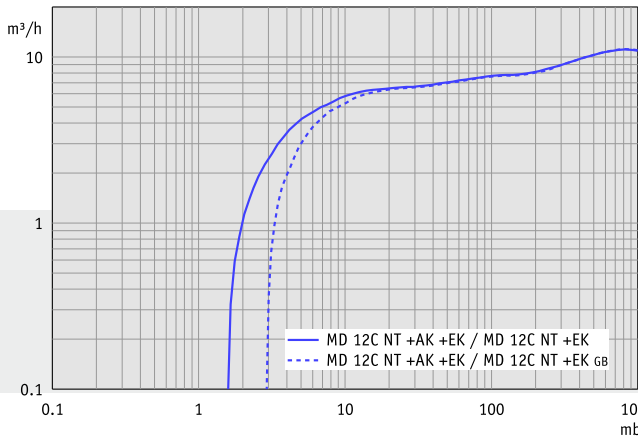
MD 12C NT +AK+EK
11.1 m³/h
2 mbar

MD 12C NT +EK
11.1 m³/h
2 mbar

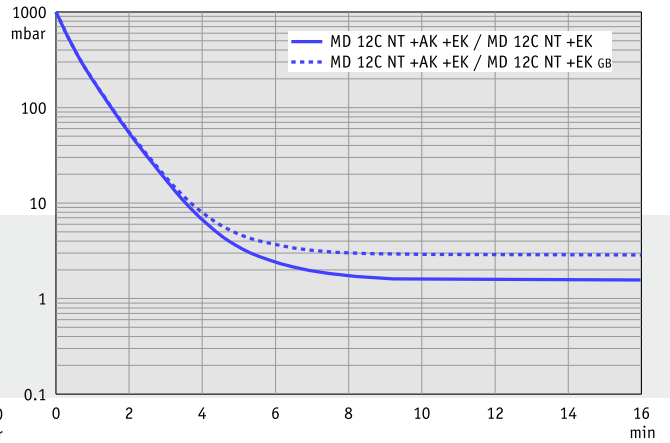


APPLICATIONS

The very high pumping speed of the MD 12C NT reduces the process time and meets the high vacuum requirements, e.g., of parallel processes in vacuum networks. Typical applications are vacuum ovens and large rotary evaporators as well as pilot plants and mini-plants. These vacuum systems will also quickly prove their advantages in kilo labs, with the high volumes of solvents processed there. The MD 12C NT serves as the powerful heart of several environmentally friendly VACUUBRAND models with efficient solvent recovery accessories. The MD 12C NT +AK+EK, for example, includes a separator at the inlet that is particularly useful for rough operating conditions.



Pumping speed graph at 50 Hz with/without gas ballast



Pump down graph at 50 Hz with/without gas ballast (100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MD 12C NT +EK	MD 12C NT +AK+EK
Number of heads / stages		8 / 3	8 / 3
Max. pumping speed 50/60 Hz	m ³ /h	11.1 / 12.3	11.1 / 12.3
Ultimate vacuum (abs.)	mbar	2	2
Ultim. vac. (abs.) with gas ballast	mbar	4	4
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Small flange KF DN 25	Small flange KF DN 25 / hose nozzle DN 15 mm
Outlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm	2 x hose nozzle DN 6-8 mm
Rated motor power	kW	0.44	0.44
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	528 x 387 x 395	616 x 387 x 395
Weight, approx.	kg	29.1	29.7

ORDERING INFORMATION MD 12C NT +EK

230 V ~ 50-60 Hz	CEE	Ex*	743500
230 V ~ 50-60 Hz	CH, CN	Ex*	743501
230 V ~ 50-60 Hz	UK	Ex*	743502
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		743503

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION MD 12C NT +AK+EK

230 V ~ 50-60 Hz	CEE	Ex*	743600
230 V ~ 50-60 Hz	CH, CN	Ex*	743601
230 V ~ 50-60 Hz	UK	Ex*	743602
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		743603

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

MD 12C NT +AK+EK Peltronic

on request

ACCESSORIES MD 12C NT +EK

- PTFE tubing KF DN 25 (1000 mm: 686033)
- Inlet separator KF DN 25 (699979)
- Centering and sealing ring KF DN 25 C Al/FEP (635722)

ACCESSORIES MD 12C NT +AK+EK

- PTFE tubing KF DN 25 (1000 mm: 686033)
- Centering and sealing ring KF DN 25 C Al/FEP (635722)

ITEMS SUPPLIED MD 12C NT +EK

Pumping unit completely mounted, ready for use, with manual.

ITEMS SUPPLIED MD 12C NT +AK+EK

Pumping unit completely mounted, ready for use, with manual.

VARIO® CHEMISTRY PUMPING UNIT

MD 12C NT VARIO AND PC 3012 NT VARIO

■ These VARIO® pumping units feature a very high pumping speed even close to the outstanding ultimate vacuum and are ideal for high vacuum requirements with most high boiling solvents. They provide precise vacuum control by continuously adjusting the pump's motor speed. The controller provides fully automatic evaporations without any need for parameter input. The pump design offers exceptionally high chemical resistance supporting almost universal usage in chemistry and pharmaceuticals. The PC 3012 NT VARIO pumping unit relies on a well-proven operating concept for evaporations with large amounts of solvents. The inlet separator (AK) retains particles and liquid droplets, the waste vapor condenser at the outlet (EK) is highly efficient and compact. The condenser enables near-100-percent solvent recovery, efficient recycling, and active protection of the environment. The MD 12C NT VARIO can be equipped with these accessories later.



PERFORMANCE FEATURES

- automatic adjustment of the vacuum level throughout the process for high process reproducibility and unattended operation
- short process times due to zero-fluctuation (hysteresis-free) vacuum control, even for large amounts of vapor
- removable CVC 3000 vacuum controller, can be arranged flexibly, easily operated with clear text menus
- extraordinary diaphragm life for minimum operational and servicing costs
- PC 3012 NT VARIO: excellent environmental friendliness due to efficient solvent recovery, inlet separator for demanding applications



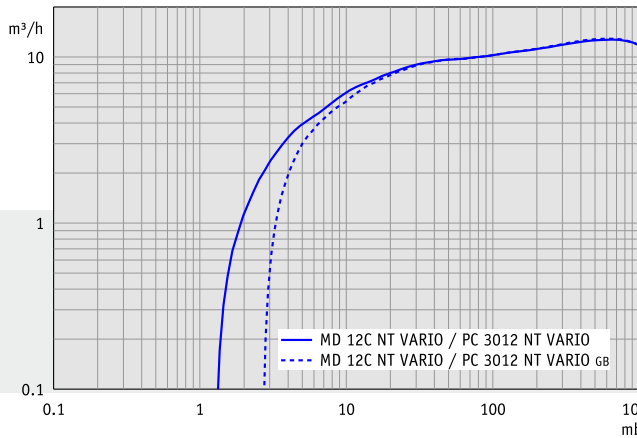
PC 3012 NT VARIO
12.9 m³/h
1.5 mbar

MD 12C NT VARIO
12.9 m³/h
1.5 mbar

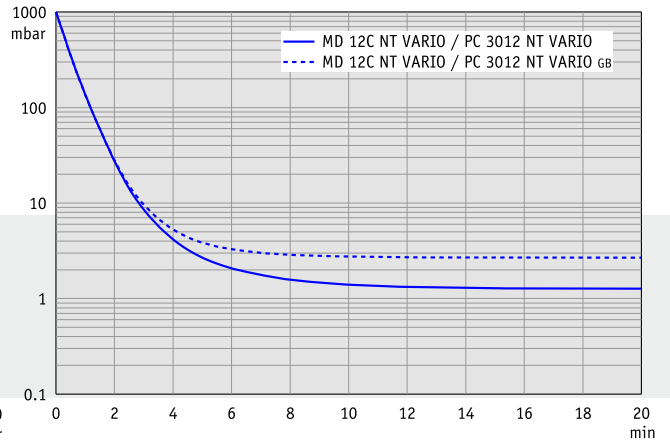


APPLICATIONS

The high pumping speed reduces the process time and meets the high vacuum requirements, for example, of parallel operations in vacuum networks. Evaporation processes can be run fully automatically and with short process time without sacrificing sensitivity. The VARIO® control minimizes the danger of superheating and foaming and therefore ensures consistent process safety and protection of samples. With its inlet separator and efficient solvent recovery system, the PC 3012 NT VARIO is ideal for rough operating conditions. The model with Peltronic® emission condenser enables environmentally friendly solvent condensation at the outlet without external coolant.



Pumping speed graph with/without gas ballast



Pump down graph with/without gas ballast (100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MD 12C NT VARIO	PC 3012 NT VARIO
Vacuum controller		CVC 3000	CVC 3000
Number of heads / stages		8 / 3	8 / 3
Max. pumping speed	m ³ /h	12.9	12.9
Ultimate vacuum (abs.)	mbar	1.5	1.5
Ultim. vac. (abs.) with gas ballast	mbar	3	3
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Small flange KF DN 25	Small flange KF DN 25 / hose nozzle DN 15 mm
Outlet connection		Hose nozzle DN 15 mm	Hose nozzle DN 8-10 mm
Coolant connection		-	2 x hose nozzle DN 6-8 mm
Vacuum sensor connection		PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm (KF DN 16 optional)	PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm (KF DN 16 optional)
Rated motor power	kW	0.53	0.53
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	533 x 260 x 420	616 x 387 x 420
Weight, approx.	kg	28.1	29.7

ORDERING INFORMATION MD 12C NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	743700
100-120 V ~ 50-60 Hz	US		743703

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

VACUU · BUS®-compatible accessories ▶ pg. 164

Additional accessories ▶ pg. 169

ORDERING INFORMATION PC 3012 NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	743800
200-230 V ~ 50-60 Hz	CH, CN	Ex*	743801
100-120 V ~ 50-60 Hz	US		743803

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION PC 3012 NT VARIO EK Peltronic

200-230 V ~ 50-60 Hz	IEC plug EN 60320	Ex*	743814**
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Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately ▶ pg. 185

ACCESSORIES MD 12C NT VARIO

PTFE tubing KF DN 25 (1000 mm: 686033)

Inlet separator KF DN 25 (699979)

Emission condenser kit for NT pump models (699948)

Centering and sealing ring KF DN 25 C Al/FEP (635722)

ACCESSORIES PC 3012 NT VARIO, PC 3012 NT VARIO EK Peltronic

PTFE tubing KF DN 25 (1000 mm: 686033)

Centering and sealing ring KF DN 25 C Al/FEP (635722)

ITEMS SUPPLIED MD 12C NT VARIO, PC 3012 NT VARIO, PC 3012 NT VARIO EK Peltronic

Pumping unit completely mounted, ready for use, with manual.

VARIO® CHEMISTRY PUMPING UNIT

PC 3012 NT VARIO DUO

- The VARIO® DUO pumping units are consisting of a combination of two individual VARIO® pumping units, connected in parallel on the suction side and driven synchronously by one vacuum controller CVC 3000. The vacuum is controlled accurately. The speed of the two individual pumps is exactly adjusted to the vacuum needs. The controller allows both fully automatic distillations without any user pre-settings as well as specific and reproducible program sequences. The integration into existing control systems via digital and analog interfaces is also possible. The consequent design to highest chemical resistance provides the ideal prerequisite for universal use in chemistry and pharmacy - without any operating fluid such as water or oil.



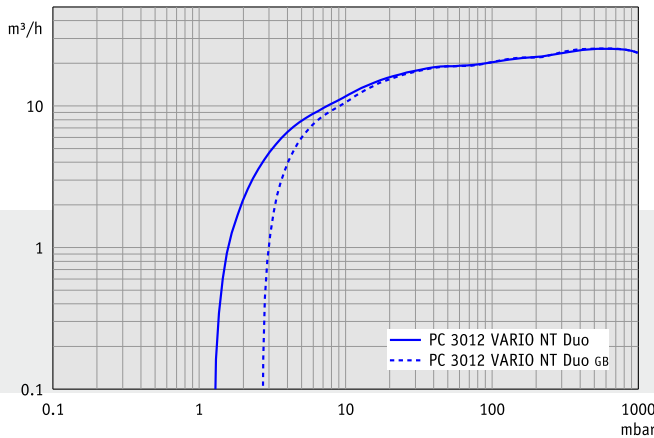
PC 3012 NT VARIO DUO
25 m³/h
1.5 mbar

PERFORMANCE FEATURES

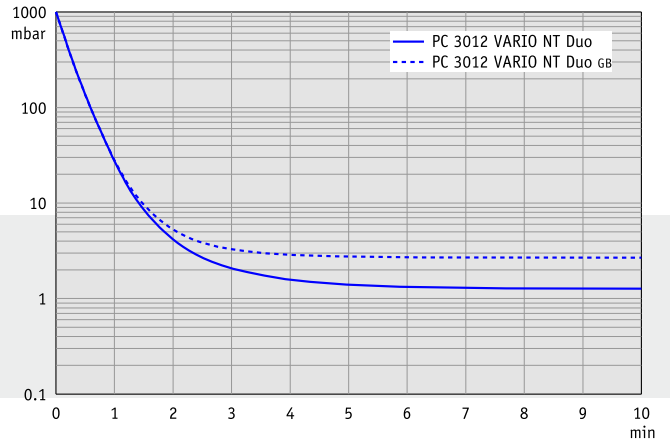
- automatic adaptation of the vacuum level throughout the process for high process reliability and unattended operation
- short process times due to powerful vacuum pump and accurate (hysteresis-free) vacuum control, even for large amounts of steam
- removable vacuum controller CVC 3000, variable to arrange, easy to use with multilingual full-text menus, simply integratable by digital or analog interfaces
- unmatched diaphragm life with minimal operating and maintenance costs
- excellent environmental friendliness due minimized energy consumption, no operating fluid needs (oil, water) and efficient solvent recovery

APPLICATIONS

The unique combination of high chemical resistance, very good ultimate vacuum and high pumping speed with low energy consumption and without any operating fluid makes the new VARIO® DUO pumping units the contemporary vacuum source for many applications in the range of kilo-lab, pilot and small productions. They are also used as network pumping units for larger VACUU·LAN® - installations or as an environmentally friendly alternative to existing central vacuum systems. The VARIO® control provides the required vacuum all the time and automatically adjusts the speed of the two pumps to the needs. This results in prolonged maintenance intervals in addition. The low noise level allows placement within the workspace.



Pumping speed graph with/without gas ballast



Pump down graph with/without gas ballast (100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

TECHNICAL DATA		PC 3012 NT VARIO DUO
Vacuum controller		CVC 3000
Number of heads / stages		16 / 3
Max. pumping speed	m ³ /h	25
Ultimate vacuum (abs.)	mbar	1.5
Ultim. vac. (abs.) with gas ballast	mbar	3
Max. back pressure (abs.)	bar	1.1
Inlet connection		Small flange KF DN 25 / hose nozzle DN 15 mm
Outlet connection		2 x hose nozzle DN 10 mm
Coolant connection		4 x hose nozzle DN 6-8 mm
Vacuum sensor connection		PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm (KF DN 16 optional)
Rated motor power	kW	1.06
Degree of protection		IP 40
Dimensions (L x W x H), approx.	mm	611 x 925 x 560
Weight, approx.	kg	65

ORDERING INFORMATION

200-230 V ~ 50-60 Hz IEC plug EN 60320 Ex* 2614930**

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately ▶ pg. 185

VACUU·BUS®-compatible accessories ▶ pg. 164

Additional accessories ▶ pg. 169

ACCESSORIES

PTFE tubing KF DN 25 (1000 mm: 686033)

Centering and sealing ring KF DN 25 C Al/FEP (635722)

ITEMS SUPPLIED

Pumping unit consisting of two PC 3012 NT VARIO pumps mounted in parallel on common base plate, controlled by one CVC 3000 vacuum controller, ready for use, with manual.

VARIO® CHEMISTRY PUMPING UNIT

PC 3003 VARIO

■ This VARIO® pumping unit provides precise vacuum control by adjusting the diaphragm pump's motor speed. It features fully automatic evaporation control at the push of a button. The PC 3003 VARIO provides an excellent ultimate vacuum and is therefore the best solution for evaporations of high boiling solvents even at low temperatures. It combines extraordinary performance with a compact design and very low noise. The separator at the inlet, made of glass with protective coating, retains particles and liquid droplets to protect pump performance. The exhaust vapor condenser at the outlet enables near-100-percent solvent recovery. The on-demand motor speed control results in unsurpassed lifetimes for service parts, such as diaphragms.



PERFORMANCE FEATURES

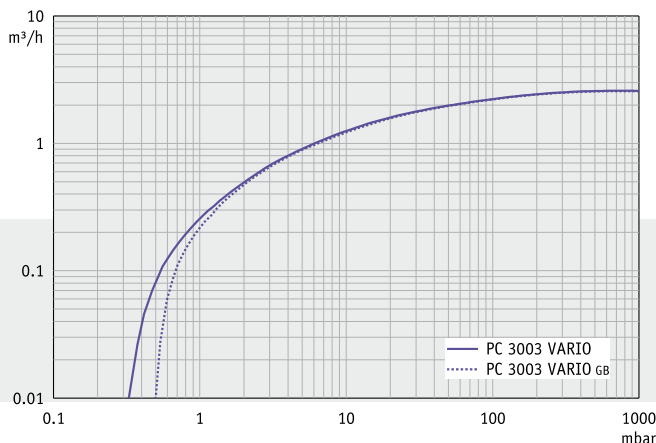
- automatic optimization of vacuum levels throughout the process for high process reliability and unattended operation
- short process times due to powerful pump and zero-fluctuation (hysteresis-free) vacuum control
- ideal for high-boiling solvents and evaporation at low temperatures
- easily operated CVC 3000 vacuum controller with clear text menus and integrated venting valve
- excellent environmental friendliness due to efficient solvent recovery



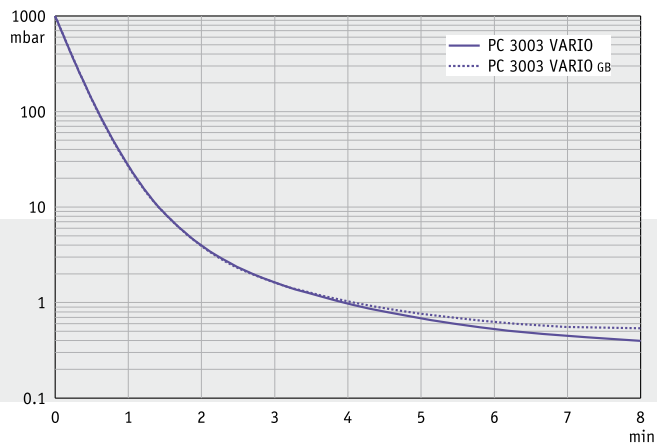
PC 3003 VARIO
2.8 m³/h
0.6 mbar

APPLICATIONS

Typical applications are all evaporation processes. They can be run fully automatically by the integrated vacuum controller CVC 3000 resulting in both shorter process times and extra sensitivity at the same time. The excellent ultimate vacuum allows even high boiling solvents to evaporate at low temperatures. The VARIO® control ensures high process reliability through prevention of superheating or foaming. It detects boiling pressures of solvents fully automatically and adapts continuously the vacuum conditions to changing process parameters. All this without any need of parameter input or the use of a solvent library. In many other applications - like in local vacuum networks - the VARIO® control offers a significant advantage by supplying always the appropriate pumping speed. The VACUU·BUS® interface facilitates a user-friendly configuration of even complex vacuum installations.



Pumping speed graph with/without gas ballast



Pump down graph with/without gas ballast (10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		PC 3003 VARIO
Vacuum controller		CVC 3000
Number of heads / stages		4 / 4
Max. pumping speed	m ³ /h	2.8
Ultimate vacuum (abs.)	mbar	0.6
Ultim. vac. (abs.) with gas ballast	mbar	2
Max. back pressure (abs.)	bar	1.1
Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Rated motor power	kW	0.53
Degree of protection		IP 40
Dimensions (L x W x H), approx.	mm	419 x 243 x 444
Weight, approx.	kg	20.6

ORDERING INFORMATION PC 3003 VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	738400
200-230 V ~ 50-60 Hz	CH, CN	Ex*	738401
200-230 V ~ 50-60 Hz	UK	Ex*	738402
100-120 V ~ 50-60 Hz	US		738403

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

PC 3003 VARIO EK Peltronic

on request

ACCESSORIES PC 3003 VARIO

- Coolant valve VKW-B (674220)
- Vent valve VBM-B (674217)
- Liquid level sensor (699908)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

CHEMISTRY VACUUM SYSTEM

MV 10C NT AND MV 10C NT +EK

- Four-stage chemistry-design diaphragm pumps are an excellent solution for continuous, oil-free pumping of corrosive gases and vapors and meet highest requirements. The four-stage design of the eight-cylinder pump MV 10C NT provides the advantageous combination of high pumping speed and very low ultimate vacuum of 0.9 mbar in a very compact design. All internal parts in contact with pumped media are made of chemically resistant fluoroplastics. Well-proven PTFE sandwich diaphragms increase reliability and extend operating life. Upgraded with an exhaust waste vapor condenser (EK) the MV 10C NT +EK provides an excellent, environmentally friendly system with efficient solvent recovery. A separator for the inlet (AK) made of glass (with protective coating) against particles and liquid droplets is available as an optional accessory.

PERFORMANCE FEATURES

- outstanding chemical resistance and superior vapor tolerance
- reduced process time due to very high flow rates even close to ultimate vacuum
- very low vibration and quiet
- excellent ultimate vacuum even with gas ballast
- on models with EK: excellent environmental friendliness due to efficient solvent recovery



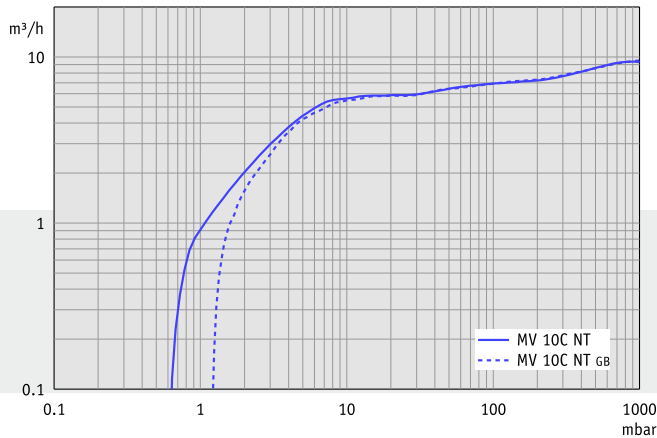
MV 10C NT
9.5 m³/h
0.9 mbar



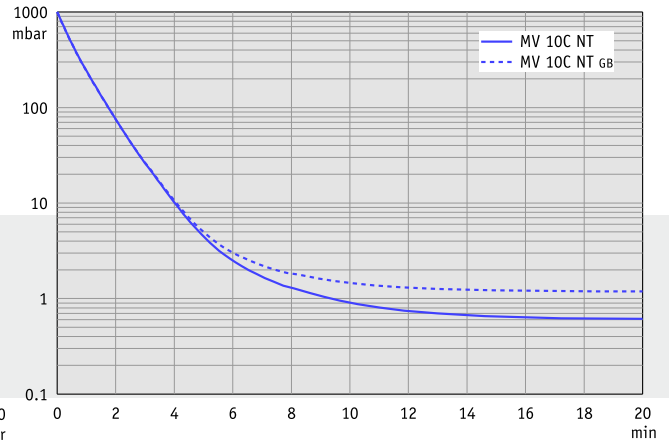
MV 10C NT +EK
9.5 m³/h
0.9 mbar

APPLICATIONS

The high pumping speed and excellent ultimate vacuum of the MV 10C NT reduce the process time significantly. The pump meets the high vacuum requirements, e.g., of parallel processes in vacuum networks. Further typical applications are vacuum ovens, large rotary evaporators, pilot plants and mini-plants as well as kilo laboratories. For rough operating conditions we recommend an inlet separator (AK) to protect the pump from particles and liquid droplets. The exhaust waste vapor condenser on the MV 10C NT +EK (also available as accessory) enables near-100-percent solvent recovery, efficient recycling and active protection of the environment.



Pumping speed graph at 50 Hz with/without gas ballast



Pump down graph at 50 Hz with/without gas ballast (100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MV 10C NT	MV 10C NT +EK
Number of heads / stages		8 / 4	8 / 4
Max. pumping speed at 50/60 Hz	m ³ /h	9.5 / 10.7	9.5 / 10.7
Ultimate vacuum (abs.)	mbar	0.9	0.9
Ultim. vac. (abs.) with gas ballast	mbar	1.5	1.5
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Small flange KF DN 25	Small flange KF DN 25
Outlet connection		Hose nozzle DN 15 mm	Hose nozzle DN 8-10 mm
Coolant connection		-	2 x hose nozzle DN 6-8 mm
Rated motor power	kW	0.44	0.44
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	533 x 260 x 359	528 x 387 x 395
Weight, approx.	kg	28.1	29.1

ORDERING INFORMATION MV 10C NT

230 V ~ 50-60 Hz	CEE	Ex*	744300
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		744303

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION MV 10C NT +EK

230 V ~ 50-60 Hz	CEE	Ex*	744500
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		744503

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES MV 10C NT

- PTFE tubing KF DN 25 (1000 mm: 686033)
- Inlet separator KF DN 25 (699979)
- Emission condenser kit for NT pump models (699948)
- Centering and sealing ring KF DN 25 C AL/FEP (635722)

ACCESSORIES MV 10C NT +EK

- PTFE tubing KF DN 25 (1000 mm: 686033)
- Inlet separator KF DN 25 (699979)
- Centering and sealing ring KF DN 25 C AL/FEP (635722)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

VARIO® CHEMISTRY PUMPING UNIT

MV 10C NT VARIO AND PC 3010 NT VARIO

■ These VARIO® pumps and pumping units feature a very high pumping speed and attain an outstanding ultimate vacuum. They are ideal for high vacuum requirements, e.g., for evaporation of most high boiling solvents even at low temperatures. They provide precise vacuum control by adjusting the diaphragm pump's motor speed. The controller provides fully automatic evaporations without any need of parameter input. The pump design offers exceptionally high chemical resistance supporting almost universal usage in chemistry and pharmaceuticals. The PC 3010 NT VARIO pumping unit relies on a well-proven operating concept for example for evaporation of large amounts of solvents. The inlet separator (AK) retains particles and liquid droplets, the waste vapor condenser at the outlet (EK) is highly efficient and compact. The condenser enables near-100-percent solvent recovery, efficient recycling, and active protection of the environment. For the MV 10C NT VARIO these accessories are optionally available and can be mounted later.



PERFORMANCE FEATURES

- automatic optimization of the vacuum level throughout the process for high process reproducibility and unattended operation
- short process times due to zero-fluctuation (hysteresis-free) vacuum control, even for large amounts of vapor
- removable CVC 3000 vacuum controller, can be arranged flexibly, easily operated with clear text menus
- extraordinary diaphragm life for minimum operational and servicing costs
- PC 3010 NT VARIO: excellent environmental friendliness due to efficient solvent recovery



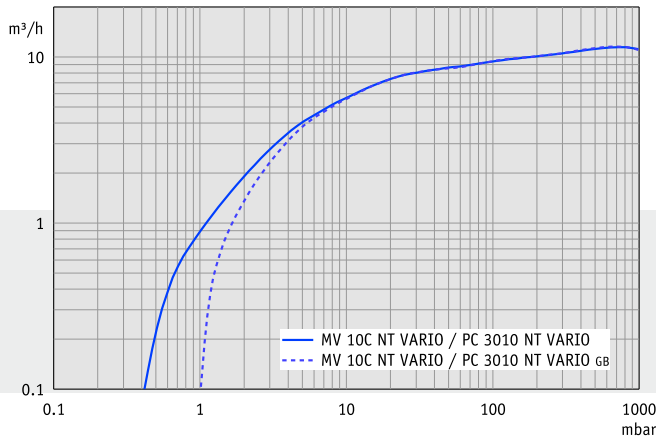
PC 3010 NT VARIO
11.6 m³/h
0.6 mbar

MV 10C NT VARIO
11.6 m³/h
0.6 mbar

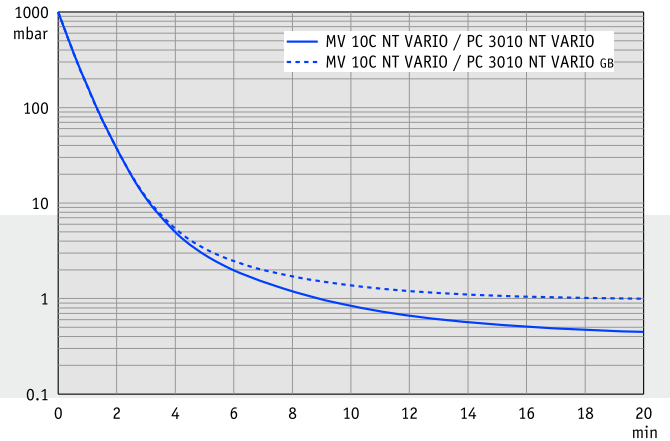


APPLICATIONS

The high pumping speed and the very good ultimate vacuum reduce the process time significantly, e.g., of evaporation of high boiling solvents. Typical applications are all drying and evaporation processes like in vacuum ovens, large rotary evaporators, at pilot plants, mini-plants or kilo laboratories. Evaporation processes can be run fully automatically with short process times and high sensitivity at the same time. The VARIO® control minimizes the danger of superheating and foaming and therefore ensures a constantly high process safety. With its inlet separator and efficient solvent recovery system, the PC 3010 NT VARIO is ideal for challenging operating conditions.



Pumping speed graph with/without gas ballast



Pump down graph with/without gas ballast (100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MV 10C NT VARIO	PC 3010 NT VARIO
Vacuum controller		CVC 3000	CVC 3000
Number of heads / stages		8 / 4	8 / 4
Max. pumping speed	m³/h	11.6	11.6
Ultimate vacuum (abs.)	mbar	0.6	0.6
Ultim. vac. (abs.) with gas ballast	mbar	1.2	1.2
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Small flange KF DN 25	Small flange KF DN 25 / hose nozzle DN 15 mm
Outlet connection		Hose nozzle DN 15 mm	Hose nozzle DN 8-10 mm
Coolant connection		-	2 x hose nozzle DN 6-8 mm
Vacuum sensor connection		PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm (KF DN 16 optional)	PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm (KF DN 16 optional)
Rated motor power	kW	0.53	0.53
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	533 x 260 x 420	616 x 387 x 420
Weight, approx.	kg	28.1	29.7

ORDERING INFORMATION MV 10C NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	744700
100-120 V ~ 50-60 Hz	US		744703

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

VACUU·BUS®-compatible accessories ▶ pg. 164

Additional accessories ▶ pg. 169

ORDERING INFORMATION PC 3010 NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	744800
200-230 V ~ 50-60 Hz	CH, CN	Ex*	744801
100-120 V ~ 50-60 Hz	US		744803

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES MV 10C NT VARIO

PTFE tubing KF DN 25 (1000 mm: 686033)

Inlet separator KF DN 25 (699979)

Emission condenser kit for NT pump models (699948)

Centering and sealing ring KF DN 25 C Al/FEP (635722)

ACCESSORIES PC 3010 NT VARIO

PTFE tubing KF DN 25 (1000 mm: 686033)

Centering and sealing ring KF DN 25 C Al/FEP (635722)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

SUPPLEMENTARY MODULES FOR CHEMISTRY PUMPING UNITS

■ Upgrade kit for chemistry pumping units for a second inlet port

The upgrade kit SYNCHRO for a second vacuum connection can be equipped, depending on the application, with a manual flow control valve (677137) or an in-line solenoid valve (636668) for electronic vacuum control with CVC 3000 or VNC 2. These functional elements for individual vacuum control are necessary to operate the vacuum ports. Order this essential accessory separately, please.



Upgrade kits for PC 3001 basic

■ Upgrade kit I: Inlet separator and CVC 3000 controller for PC 3001 basic

Inlet separator, vacuum controller CVC 3000 and assembling accessory to upgrade the PC 3001 basic to a pumping unit with electronic vacuum control. The separator protects the pump effectively and extends diaphragm lifetime considerably.



■ Upgrade kit II: Complete exhaust vapor condenser assembly for PC 3001 basic

Exhaust waste vapor condenser with catchpot for efficient solvent recovery.



■ Conversion kit for remote pump control with the CVC 3000

This upgrade kit enables the remote operation of all vacuum pumping units with the CVC 3000. The kit consists of a stand, a 2 m cable, and parts for assembly (including a cover plate for the controller mounting space of PC 3001 VARIO^{PRO} and pumping units with plastic housing).

■ VACUU · CONTROL™ - Remote controlling, monitoring or recording of vacuum systems

Remote monitoring and controlling of pumping units or vacuum systems with CVC 3000 or 3000 DCP through easy integration with computer networks



ORDERING INFORMATION

Upgrade kit for chemistry pumping units for a second inlet port	699920
Upgrade kit for chemistry pumping units with plastic housing (PC 510 NT, PC 610 NT) for a second inlet port	699942
Add-on manual flow control valve C2	677137
Add-on in-line solenoid valve C3-B	636668
Vacuum controller CVC 3000	683160
Upgrade kit I: Inlet separator and CVC 3000 controller for PC 3001 basic	699921
Upgrade kit II: Complete exhaust vapor condenser assembly for PC 3001 basic	699922
Conversion kit for remote pump control with the CVC 3000	699923
Small flange KF DN 16 / G1/2" as outlet for diaphragm pumps ME 16(C) NT, MD 12(C) NT, MV 10(C) NT	672101
VACUU · CONTROL™ LAN	683120
VACUU · CONTROL™ WLAN	683110

EMISSION CONDENSER

ACCESSORIES FOR CHEMISTRY PUMPING UNITS

■ Peltronic® emission condenser

The Peltronic® emission condenser performs condensation of solvent vapors without external coolant such as water or dry ice. It works electronically and uses Peltier elements as cooling system. All wetted parts are highly chemically resistant. The condenser is especially designed to be added to existing pumping units and allows the replacement of common condensers working with external coolant. The condenser is ideally suited for applications where cooling water is not available or desired, or in case of cost and productivity concerns associated with dry ice condensers. It is often used to reduce cooling water usage for environmental reasons or to prevent the risk of flooding from cooling water plumbing leakage. This frequently is requested for vacuum networks built into lab furniture. If the Peltronic® is connected to a CVC 3000 vacuum controller it is switched on/off automatically on demand. The complete pumping units PC 3001 VARIO^{pro} EK Peltronic and PC 3012 EK Peltronic are available serially, most other pumping units are available with Peltronic® on request.

TECHNICAL DATA

Cooling capacity at 21°C ambient temp.	50 W
Ambient temperature range	10-40°C
Condensation set-point temperature	10°C
Inlet connection	PTFE tubing connection 10/8 mm
Outlet connection	PTFE tubing connection 10/8 mm, hose nozzle DN 10 mm
Volume of condensate catchpot	500 ml
Power draw	7 - 160 W (controlled)
Heat dissipation	7 - 200 W
Dimensions (L x W x H) in mm	175 x 179 x 392
Weight, approx.	4.3 kg

ORDERING INFORMATION

Peltronic® emission condenser 100-120 V / 200-230 V ~ 50-60 Hz Ex* 699905

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ITEMS SUPPLIED

Condenser ready for use with electronic control, status indicator, temperature control, switch, PTFE tubing ready to connect to many VACUUBRAND pumping units, catchpot 500ml, catchpot clamp. Universal power supply; please order power cable separately.

■ Dry ice exhaust vapor condenser

The dry ice exhaust vapor condenser is designed to hold dry ice or water ice and functions without circulating coolant. The coolant tank can be easily removed. The VACUUBRAND PC 3001 VARIO^{pro} TE pumping unit is equipped with a dry ice condenser in place of the standard circulating condenser. Other pumping units with dry ice condenser are available on request.



ACCESSORIES FOR CHEMISTRY PUMPING UNITS

■ Liquid level sensor for VACUUBRAND catchpot 500 ml

The liquid level sensor is designed to be mounted at the neck of a VACUUBRAND 500 ml catchpot and works with the CVC 3000 or VNC 2 controllers. It monitors the liquid level in catchpots of emissions condensers and inlet separators. The process is halted and an alarm sounded if the catchpots are close to overflowing. The sensor detects all common solvents without any contact to the solvents.



■ Solvent drain for exhaust vapor condenser

Suitable for all VACUUBRAND exhaust vapor condensers and catch pots with glass joint connections

■ Inlet separator AK with round bottom flask 500 ml, with connections KF DN 25 and hose nozzle DN 15 mm

For all NT diaphragm pumps with flange KF DN 25 (all types ME 16(C) NT, MD 12(C) NT, MV 10(C) NT and their pumping units). Inlet with small flange KF DN 25 and hose nozzle DN 15 mm.



■ Mini-Network VACUU·LAN® with 3 vacuum connections (manual valves)

The VACUU·LAN® Mini-Network is a space saving VACUU·LAN® network assembly with three VACUU·LAN® valve modules pre-plumbed on a channel that can be attached to a wall or lab frame. The Mini-Network tubing is to be connected to a new VACUUBRAND diaphragm vacuum pump, or an oil-free vacuum pump that you already own, with vacuum tubing, and your one pump now supports three applications. Each VACUU·LAN® Mini-Network includes three manual flow control valves for continuously variable pumping speed adjustment. Ball Valve control and electronically controlled ports are optionally available. Each port is check-valve controlled to minimize interference among applications.



ORDERING INFORMATION

Liquid level sensor for VACUUBRAND catchpot 500 ml	699908
Inlet separator AK with connections KF DN 25 (ME 16C NT, MD 12C NT, MV 10C NT)	699979
Upgrade kit exhaust vapor condenser for NT series (ME 16C NT, MD 12C NT, MV 10C NT)	699948
Upgrade kit manometer for vacuum ports at pumping units NT SYNCHRO and PC 511 / 611 NT	699907
Mini-Network VACUU·LAN® with 3 vacuum connections (manual valves)	2614455
Solvent drain for exhaust vapor condenser, Adapter from KS 35 to hose nozzle DN 6/10mm	2618398
Cooling water valve VKW 230 V UK	676012
Cooling water valve VKW 230 V CEE	676014
Silencer with hose*	636588
VACUU·BUS®-compatible accessories Page 164	

* Attention: Dust-laden gases, deposits and condensed vapors can restrict the gas flow out of the silencer. The resultant back pressure can lead to damage of pump bearings, diaphragms and valves. Under those conditions, a silencer must not be used.

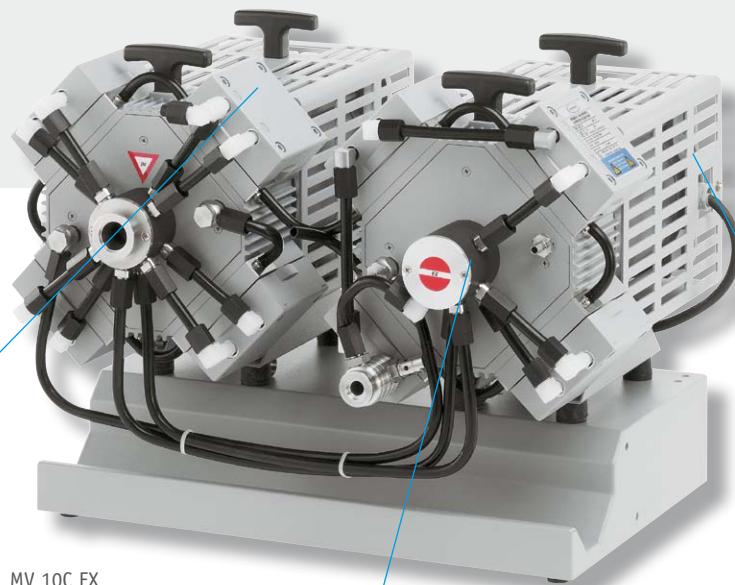
SPARE PARTS

Exhaust vapor condenser EK PC 8	699975
Catchpot 1 liter for exhaust vapor condenser EK PC 8	699976
500 ml round bottom flask made of borosilicate glass with spherical ground joint KS25/25, coated	638497
Catchpot clip for KS 35/25 suitable for all VACUUBRAND glass catchpots	637627



ATEX CHEMISTRY DIAPHRAGM PUMPS AND ATEX CHEMISTRY VACUUM SYSTEMS

■ When intended for use in areas with potentially explosive atmospheres, European Community Directive 94/9/EC (ATEX) requires equipment in conformity with ATEX standards. VACUUBRAND offers Category 2 chemistry diaphragm pumps and vacuum systems in conformity with ATEX (for use in zones where an explosive atmosphere is likely to occur). These chemistry diaphragm pumps are appropriate for such locations because they are highly resistant to chemicals, oil-free, have no sliding surfaces, and the expansion chamber is hermetically sealed against the drive zone. ATEX chemistry vacuum systems with solvent recovery provide safe, convenient vacuum while protecting the environment. The VACUUBRAND range of ATEX chemistry diaphragm pumps is supplemented by an ATEX vacuum gauge with excellent corrosion resistance and long-term stability. (Note: Compliance with EC Directive 94/9/EC does not ensure compliance with similar codes in countries outside of the EC. These pumps are not available in every location. Contact your local VACUUBRAND representative for availability.)



MV 10C EX
Four stage ATEX chemistry diaphragm pump

Powerful

Ultimate vacuum 12 to 2 mbar
Pumping speed 1.9 to 8.1 m³/h

Chemically resistant materials

Wetted materials: Fluoroplastics (PTFE, ETFE, FFKM)
and stainless steel

Explosion proof

ATEX conformity:
pumping chamber (pumped gas):
II 2G IIC T3 X
environment (around the pump):
II 2G IIB T4 X (with inert gas purge)
II 3G IIB T4 X (without inert gas purge)



ATEX CHEMISTRY DIAPHRAGM PUMPS AND ATEX CHEMISTRY VACUUM SYSTEMS

EXPLOSION PROOF

OIL-FREE

CHEMICALLY RESISTANT MATERIALS

■ Flame-proof motor

with built-in and self-retaining overcurrent and excess temperature protection for direct 230 V/50 Hz single-phase connection; the customer does not need any additional overcurrent protection system

■ Antistatic materials

diaphragm pump heads made of antistatic carbon-reinforced fluoroplastics, heavily loaded parts with metallic stability core; connecting elements and other parts made of antistatic materials

■ Chemically resistant

wetted materials: Fluoroplastics (PTFE, ETFE, FFKM) and stainless steel

■ Gas ballast

included as separate inert gas connection

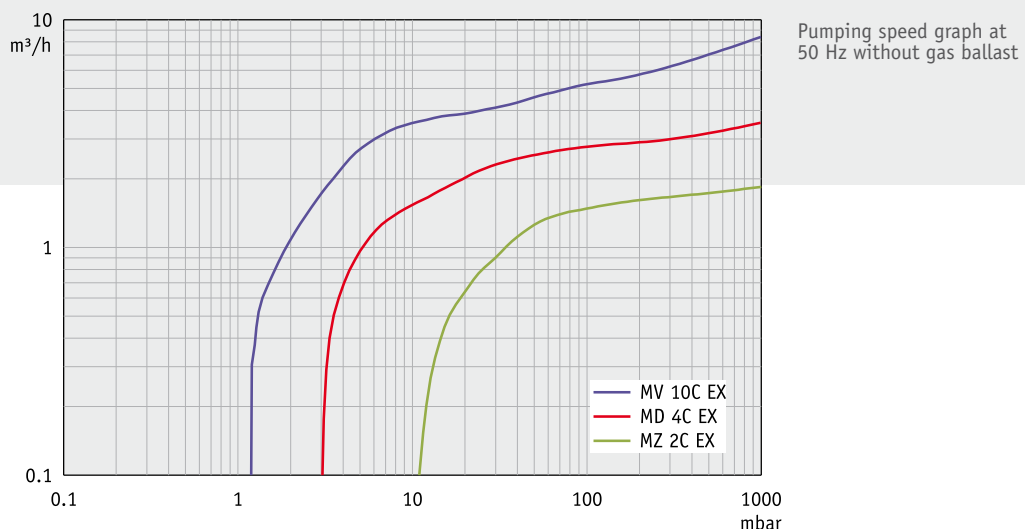
■ Overpressure safety relief valve

internal and at the outlet

■ Safety diaphragm design

with inert gas purge feature to permit optional installation of a diaphragm crack-detection system

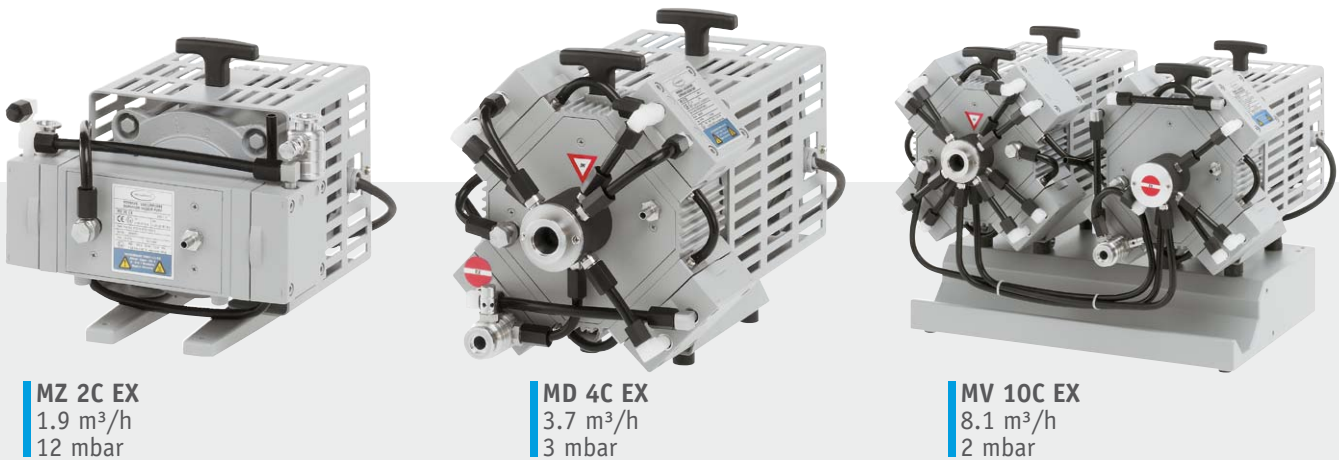
The ATEX range of products is supplemented by the DVR 3 ATEX vacuum gauge (ATEX Cat. 2) with excellent corrosion resistance and long-term stability



CHEMISTRY DIAPHRAGM PUMP

ATEX CHEMISTRY DIAPHRAGM PUMP

ATEX chemistry diaphragm pumps offer all advantages of oil-free chemistry diaphragm pumps. Typical applications are rotary evaporators and drying ovens with potentially explosive atmospheres. The ATEX approval includes the interior of the pump (in contact with pumped gases) as well as the surrounding area of the pump. All wetted parts of the pumps have excellent chemical resistance and are mainly made of antistatic materials. Included in delivery is a separate gas ballast connection part for use of inert gas.



MZ 2C EX
1.9 m³/h
12 mbar

MD 4C EX
3.7 m³/h
3 mbar

MV 10C EX
8.1 m³/h
2 mbar

TECHNICAL DATA	MZ 2C EX	MD 4C EX	MV 10C EX
ATEX conformity	Pumping chamber (pumped gases): II 2G IIC T3 X Environment with inert purge gas: II 2G IIB T4 X Environment without inert purge gas: II 3G IIB T4 X Motor: II 2G Ex d IIB T4		
Number of heads / stages	2/2	4/3	8/4
Max. pumping speed at 50 Hz	m ³ /h 1.9	3.7	8.1
Ultimate vacuum (abs.)	mbar 12	3	2
Ultim. vac. (abs.) with gas ballast	mbar 18	10	10
Max. back pressure (abs.)	bar 1.1	1.1	1.1
Max. gas inlet temperature	°C 40	40	40
Inlet connection	Small flange KF DN 16	Small flange KF DN 25	Small flange KF DN 25
Outlet connection	Small flange KF DN 16	Small flange KF DN 16	Small flange KF DN 16
Rated motor power	kW 0.15	0.25	0.5
Degree of protection	IP 54	IP 54	IP 54
Dimensions (L x W x H), approx.	mm 337 x 287 x 251	440 x 265 x 305	560 x 430 x 410
Weight, approx.	kg 21.6	29.3	63.2

ORDERING INFORMATION MZ 2C EX

230 V ~ 50 Hz Open wires 696920

ORDERING INFORMATION MD 4C EX

230 V ~ 50 Hz Open wires 696930

ORDERING INFORMATION MV 10C EX

230 V ~ 50 Hz Open wires 696945

ACCESSORIES MZ 2C EX

PTFE tubing KF DN 16 (1000 mm: 686031)

ACCESSORIES MD 4C EX / MV 10C EX

PTFE tubing KF DN 16 (1000 mm: 686031)

PTFE tubing KF DN 25 (1000 mm: 686033)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual, 2 m cable without plug. Pump MV 10C EX with two cables (two motors).

CHEMISTRY VACUUM SYSTEM

MZ 2C EX +AK+EK AND MD 4C EX +AK+EK

- ATEX chemistry vacuum systems are ready for use for applications with large amounts of condensable vapors due to optimally configured accessories. Typical applications are rotary evaporators and drying ovens with potentially explosive atmospheres. The separator at the inlet (AK) retains particles and liquid droplets. The waste vapor condenser at the outlet (EK) is highly efficient and compact. The condenser enables near-100-percent solvent recovery. Included in delivery is a separate gas ballast connection part for use with inert gas.



MZ 2C EX +AK+EK
1.9 m³/h
12 mbar



MD 4C EX +AK+EK
3.7 m³/h
3 mbar

TECHNICAL DATA

	MZ 2C EX +AK+EK	MD 4C EX +AK+EK
ATEX conformity	Pumping chamber (pumped gases): II 2G IIC T3 X Environment with inert purge gas: II 2G IIB T4 X Environment without inert purge gas: II 3G IIB T4 X Motor: II 2G Ex d IIB T4	Pumping chamber (pumped gases): II 2G IIC T3 X Environment with inert purge gas: II 2G IIB T4 X Environment without inert purge gas: II 3G IIB T4 X Motor: II 2G Ex d IIB T4
Basic pump	MZ 2C EX	MD 4C EX
Inlet connection	Small flange KF DN 16	Small flange KF DN 25
Outlet connection	Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Max. gas inlet temperature °C	40	40
Degree of protection	IP 52	IP 54
Dimensions (L x W x H), approx.mm	357 x 308 x 470	600 x 365 x 420
Weight, approx. kg	25.4	37.4

ORDERING INFORMATION MZ 2C EX +AK+EK

230 V ~ 50 Hz Open wires 696921

ORDERING INFORMATION MD 4C EX +AK+EK

230 V ~ 50 Hz Open wires 696931

ACCESSORIES MZ 2C EX +AK+EK

PTFE tubing KF DN 16 (1000 mm: 686031)

ACCESSORIES MD 4C EX +AK+EK

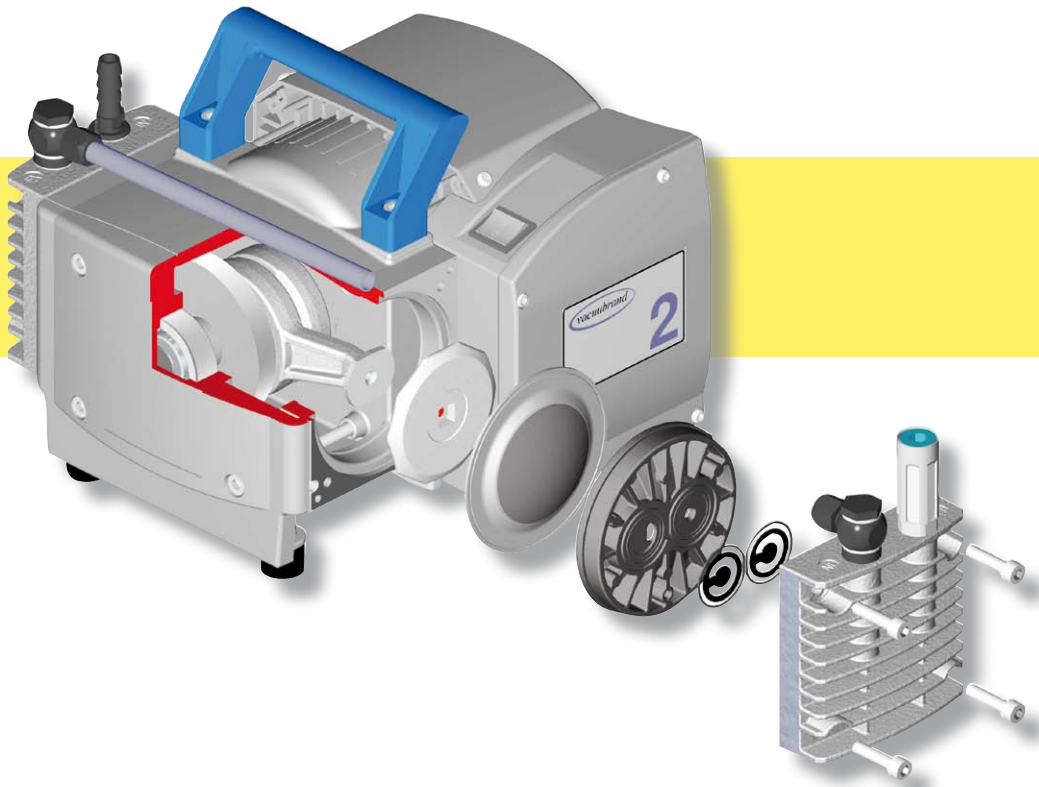
PTFE tubing KF DN 25 (1000 mm: 686033)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual, 2 m cable without plug. The user must provide an external protection against glass damage and breakage.

DIAPHRAGM PUMPS

VACUUBRAND's aluminum design diaphragm pump is a perfect match for many applications in the laboratory and operations because it is oil-free and whisper quiet, and because it requires so little service. Diaphragms have especially long lives and hermetically seal the drive space from the pumping chamber to protect mechanical parts from corrosion. The pumps achieve their distinctively high performance from high pumping chamber volume relative to the minimal dead space. Highly flexible FKM double diaphragms with fabric reinforcement ensure an extremely long diaphragm lifetime. The pumps operate absolutely oil free and do not have any sliding components in the gas path. In normal operation they are completely free of abrasion. Besides contributing to the long service intervals the lack of abrasion also eliminates most of the particulate impurities frequently generated inside of scroll or piston pumps. This makes VACUUBRAND diaphragm pumps the right choice for clean applications.

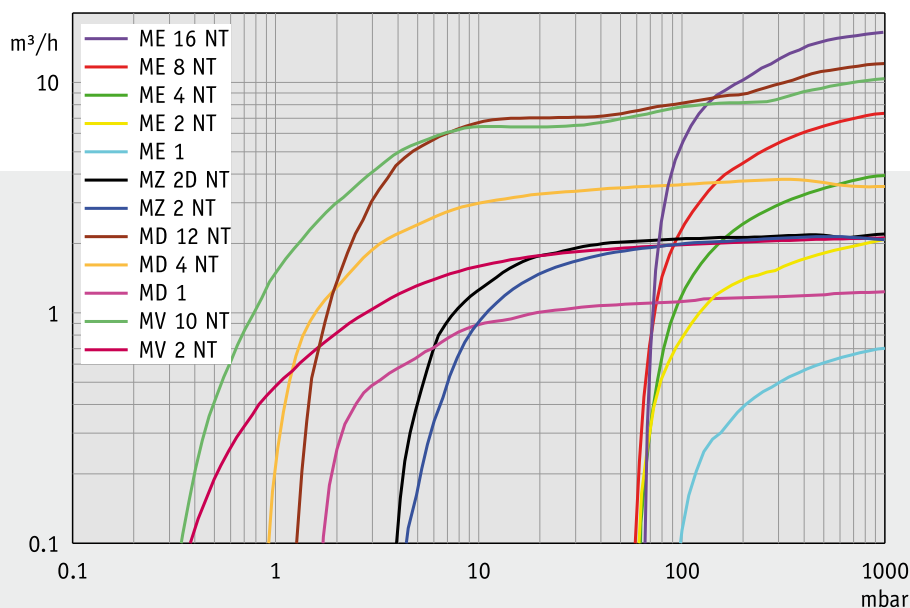


- new internal connection technology for a very low leakage rate and reliable performance. Stable ultimate vacuum, even after a very long operating time
- no abrasion - therefore dust and contamination-free
- long diaphragm life due to highly flexible FKM double diaphragms, fabric-reinforced
- FKM valves with excellent durability and vacuum performance
- with innovative, patented drive system for quiet and vibration-free running

OIL-FREE VACUUM FOR NON-CHEMISTRY APPLICATIONS

DIAPHRAGM PUMPS

■ The VACUUBRAND diaphragm pump line includes pumps with a wide range of flow rate and ultimate vacuum. Single-stage diaphragm pumps reach as much as 70 mbar (absolute) vacuum. By connecting pump heads in series of two, three or four stages, we can create pumps with ultimate vacuum reaching 0.3 mbar on some models. Connecting the heads in parallel produces higher flow rates. VACUUBRAND pumps combine these options to create pumps with the capabilities you need for most applications.



The pumping speed of all pumps is measured according to ISO 21360

Nomenclature for VACUUBRAND pumps is built from the following codes designating specific features or components:

M = diaphragm (membrane) pump

E, Z, D, V = number of pump stages from single (E) to four (V) stage design




NT = labels the new series of pumps comprising the New Technology

VARIO® = speed controlled pump with vacuum controller CVC 3000

- Many vacuum applications in laboratories and industrial operations require electronic vacuum control. VACUUBRAND's unique VARIO® control system offers the distinctive advantages and convenience of the CVC 3000 vacuum controller
 - precise vacuum control by continuously adjusting the motor speed of the diaphragm pump from 0-100%
 - when used as a backing pump for turbomolecular drag pumps (with backing pressure in the mbar range): Patented turbo mode with automatic speed adjustment for even better forevacuum
 - this results in lower heating and better residual gas performance of the turbo pump
 - unrivaled long diaphragm and valve lifetime by reducing the number of diaphragm strokes
 - very quiet, extremely low-vibration operation and significantly reduced energy consumption

DIAPHRAGM PUMPS

SERIES OVERVIEW

					
Ultimate vacuum Examples of use	Diaphragm pumps without vacuum control		Diaphragm pumps with manual vacuum and pressure control		Diaphragm pumps with electronic vacuum control
down to 70 mbar <ul style="list-style-type: none"> · Aqueous vacuum filtration · Drying chamber · Pressure filtration 	ME 1 0.7 m ³ /h	pg. 100	ME 4R NT 3.8 m ³ /h	pg. 104	
	ME 2 NT 2.0 m ³ /h	pg. 102			
	ME 4 NT 4.0 m ³ /h	pg. 102			
	ME 8 NT 7.3 m ³ /h	pg. 106			
	ME 16 NT 16.4 m ³ /h	pg. 106			
down to 4 mbar <ul style="list-style-type: none"> · Drying chamber · Aqueous vacuum filtration · Backing of wide-range Turbo pumps 	MZ 2 NT 2.2 m ³ /h	pg. 108			
	MZ 2D NT 2.3 m ³ /h	pg. 108			
down to 1 mbar <ul style="list-style-type: none"> · Drying chamber · Degassing of viscous media · Backing of wide-range turbo pumps 	MD 1 1.2 m ³ /h	pg. 110			
	MD 4 NT 3.8 m ³ /h	pg. 112			MD 4 NT VARIO 5.7 m ³ /h pg. 112
	MD 12 NT 12.1 m ³ /h	pg. 114			MD 12 NT VARIO 13.4 m ³ /h pg. 114
down to 0.3 mbar <ul style="list-style-type: none"> · Drying chamber · Fast evacuation of larger volumina · Backing of wide-range turbo pumps 	MV 2 NT 2.2 m ³ /h	pg. 116			MV 2 NT VARIO 3.3 m ³ /h pg. 116
	MV 10 NT 10.4 m ³ /h	pg. 118			MV 10 NT VARIO 12.1 m ³ /h pg. 118

All mentioned pumping speeds are for 50 Hz (if applicable)

DIAPHRAGM PUMP

ME 1

- Vacuum filtration is one of the most common applications used for sample preparation in chemistry, microbiology, waste water control and other analytical processes. The new ME 1 diaphragm pump offers a compact, high performance and easy-to-use solution which is perfect for single port filtrations. This new development, based on the highly successful technology of the oil-free diaphragm pump MD 1, provides a well-proven and extraordinarily long diaphragm life time. The functional, space saving and innovative design with visible top mounted power switch ensures convenient and quick operation for day to day lab work. The PTFE diaphragm and valves are rugged and provide high chemical resistance. An optional manual regulator valve with dial gauge enables variable fine adjustment of the pumping speed and ultimate vacuum.

PERFORMANCE FEATURES

- convenient, quick and simple to use due to the new top mounted power switch
- whisper quiet and very low vibration
- requires minimal benchtop space
- maintenance-free drive system and proven long diaphragm life
- wetted materials: PTFE, aluminum



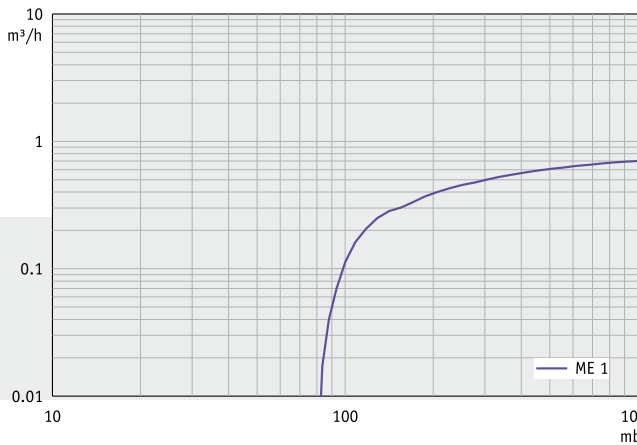
ME 1
0.7 m³/h
100 mbar

ME 1
Vacuum regulator valve unit

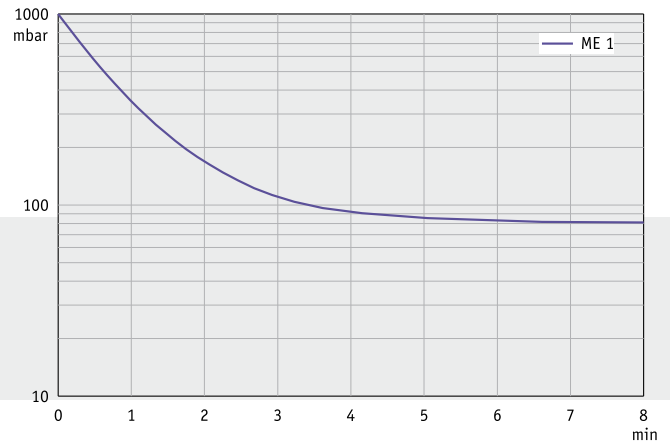


APPLICATIONS

One-stage diaphragm pumps are an excellent solution for continuous, oil-free pumping of gases and vapors for modest vacuum requirements. In contrast to water-jet pumps, they do not consume water and therefore do not produce any contaminated waste water in daily use. Typical applications for the ME 1 are aqueous filtrations. With filtration at 100 mbar, 90% of atmospheric pressure is available as a driving force. If a certain pressure difference must not be exceeded, an optional manual regulator valve with dial gauge enables variable fine adjustment of the pumping speed and ultimate vacuum. For working with aggressive solvents a chemistry version (ME 1C) is available.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		ME 1
Number of heads / stages		1 / 1
Max. pumping speed at 50/60 Hz	m ³ /h	0.7/0.85
Ultimate vacuum (abs.)	mbar	100
Max. back pressure (abs.)	bar	1.1
Inlet connection		Hose nozzle DN 6-10 mm
Outlet connection		Silencer / G1/8"
Rated motor power	kW	0.04
Degree of protection		IP 40
Dimensions (L x W x H), approx.	mm	247 x 121 x 145
Weight, approx.	kg	5.0

ORDERING INFORMATION ME 1

230 V ~ 50-60 Hz	CEE	Ex*	721000
230 V ~ 50-60 Hz	CH, CN	Ex*	721001
230 V ~ 50-60 Hz	UK	Ex*	721002
100-120 V ~ 50-60 Hz	US		721003
100-120 V ~ 50-60 Hz /			
200-230 V ~ 50-60 Hz	IEC plug EN 60320	Ex*	721005**

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately

▶ pg. 185

ACCESSORIES ME 1

Rubber vacuum tubing DN 6 mm (686000)

Rubber vacuum tubing DN 8 mm (686001)

Vacuum regulator valve unit for ME 1 (696842)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

DIAPHRAGM PUMP

ME 2 NT AND ME 4 NT

■ Diaphragm pumps are an excellent solution for continuous, oil-free evacuation and pumping of gases. All parts in contact with pumped media are made of aluminum and selected plastics, allowing a wide range of applications for non-corrosive gases. The one-stage construction provides the advantageous combination of high pumping speed and an ultimate vacuum down to 70 mbar. The highly flexible fabric-reinforced double diaphragm made of FKM is ideal for extended operating life. The new NT-series features further improved performance data.

PERFORMANCE FEATURES

- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- whisper quiet
- ME 4 NT with low vibration and higher pumping speed
- exceptionally long diaphragm life and maintenance-free drive system for low lifetime costs



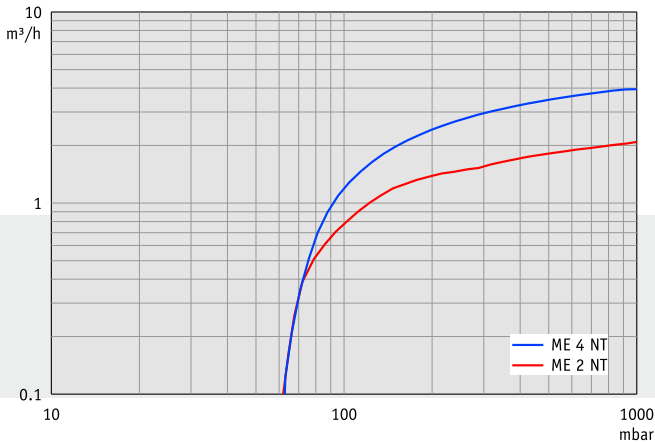
ME 4 NT
4.0 m³/h
70 mbar



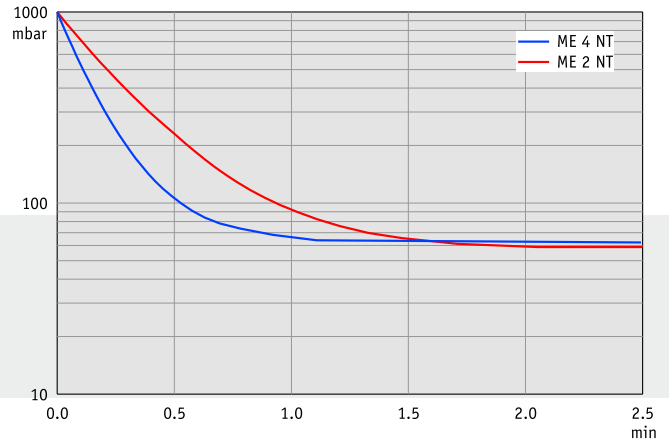
ME 2 NT
2.0 m³/h
70 mbar

APPLICATIONS

One-stage diaphragm pumps are an excellent choice for continuous, oil-free pumping at modest vacuum requirements. In contrast to water jet pumps, they do not consume water and therefore do not produce any contaminated waste water. Typical applications are vacuum ovens, aqueous filtrations and pumping and evacuation of non-aggressive gases in general. The ME 4 NT offers shorter evacuation times and higher gas throughput.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		ME 2 NT	ME 4 NT
Number of heads / stages		1 / 1	2 / 1
Max. pumping speed 50/60 Hz	m ³ /h	2.0 / 2.2	4.0 / 4.4
Ultimate vacuum (abs.)	mbar	70	70
Max. back pressure at outlet (abs.)	bar	2	2
Inlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Outlet connection		Silencer / G1/4"	2 x silencer / G1/4"
Rated motor power	kW	0.18	0.18
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	243 x 211 x 198	243 x 239 x 198
Weight, approx.	kg	10.2	11.0

ORDERING INFORMATION ME 2 NT

230 V ~ 50-60 Hz	CEE	Ex*	730000
230 V ~ 50-60 Hz	UK	Ex*	730002
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		730003

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION ME 4 NT

230 V ~ 50-60 Hz	CEE	Ex*	731000
230 V ~ 50-60 Hz	CH, CN	Ex*	731001
230 V ~ 50-60 Hz	UK	Ex*	731002
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		731003
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz		Ex*	
200-230 V ~ 50-60 Hz	IEC plug EN 60320		731005**

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately

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ACCESSORIES

Vacuum regulator valve with manometer (696840)

VACUU-LAN® Mini-Network (2614455)

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

DIAPHRAGM PUMP

ME 4R NT

■ This one-stage diaphragm pump works as a vacuum generator and as well as a compressor. All parts in contact with pumped media are made of aluminum and selected plastics (PTFE diaphragms and valves). They enable a wide range of applications for non-corrosive gases. The inlet and outlet connections of the ME 4R NT are equipped with regulator valves for vacuum and overpressure, respectively. Both the compression pressure and vacuum level can be adjusted. Inlet vacuum level and outlet pressure are indicated by manometers.

PERFORMANCE FEATURES

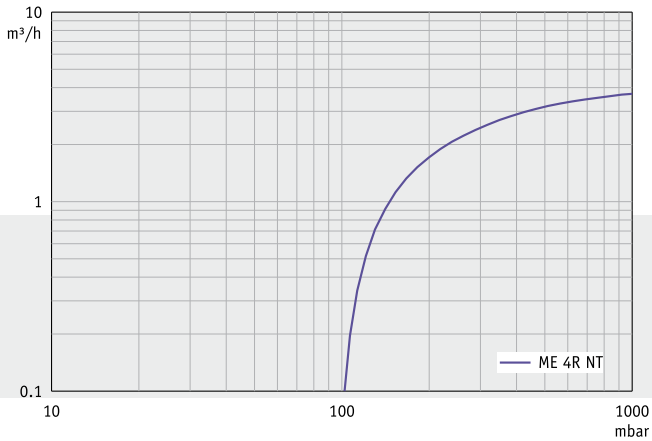
- contamination-free pumping, evacuation and compression
- high flow rate even near ultimate vacuum
- adjustment of outlet pressure and vacuum level with regulator-valves
- very low vibration
- exceptionally long diaphragm life and maintenance-free drive system for low lifetime costs



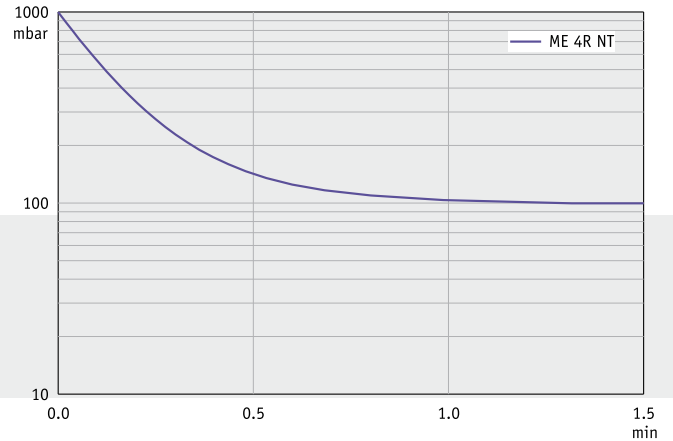
ME 4R NT
3.8 m³/h
100 mbar

APPLICATIONS

This one-stage diaphragm pump is an excellent choice for continuous, oil-free pumping and evacuation of non-corrosive gases and also for compression. Typical applications are vacuum ovens, pressure and vacuum filtrations and generation of compressed, absolutely oil-free air. Inlet- and outlet pressure can be adjusted continuously using the regulator valves. The manometers on inlet- and outlet side enable easy setting of the desired vacuum and pressure levels.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		ME 4R NT
Number of heads / stages		2 / 1
Max. pumping speed 50/60 Hz	m ³ /h	3.8 / 4.2
Ultimate vacuum (abs.)	mbar	100
Max. back pressure (abs.)	bar	4
Inlet connection		Hose nozzle DN 8-10 mm
Outlet connection		Hose nozzle DN 8-10 mm
Rated motor power	kW	0.18
Degree of protection		IP 40
Dimensions (L x W x H), approx.	mm	243 x 239 x 290
Weight, approx.	kg	11.5

ORDERING INFORMATION ME 4R NT

230 V ~ 50-60 Hz	CEE	731100
230 V ~ 50-60 Hz	UK	731102
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US	731103

With NRTL certification for Canada and the USA

ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

DIAPHRAGM PUMP

ME 8 NT AND ME 16 NT

■ Diaphragm pumps are an excellent solution for continuous, oil-free evacuation and pumping of gases. The one-stage design provides the advantageous combination of high pumping speed and low ultimate vacuum down to 70 mbar. All parts in contact with pumped media are made of aluminum and selected plastics allowing a wide range of applications for non-corrosive gases. The highly flexible, fabric-reinforced double diaphragms made of FKM are ideal for extended operating life. These pumps are particularly powerful and offer large volume flow. The eight-cylinder pump ME 16 NT features exceptionally high pumping speed, low vibration and a very compact design with smooth and easy-to-clean surfaces.

PERFORMANCE FEATURES

- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- whisper quiet
- very low vibration
- exceptionally long diaphragm life and maintenance-free drive system for low lifetime costs



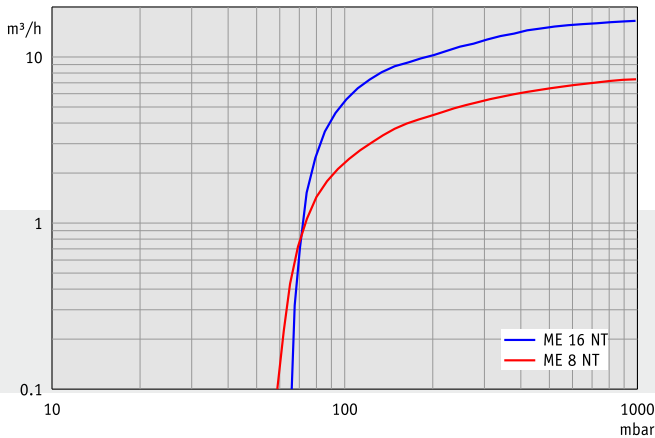
ME 16 NT
16.4 m³/h
70 mbar



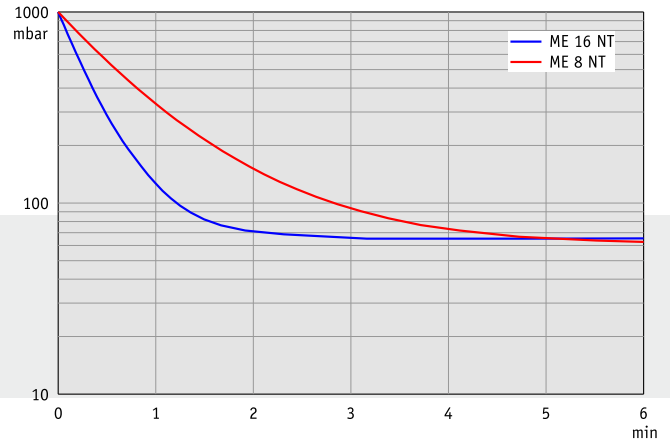
ME 8 NT
7.3 m³/h
70 mbar

APPLICATIONS

Large one-stage diaphragm pumps are an excellent choice for continuous, oil-free pumping of large amounts of gases. Typical applications are vacuum ovens and in general evacuation and pumping of non-corrosive gases. We recommend these pumps especially for processes with high inlet and process pressures. They are also excellent for very fast evacuations down to modest vacuum levels.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		ME 8 NT	ME 16 NT
Number of heads / stages		4 / 1	8 / 1
Max. pumping speed 50/60 Hz	m ³ /h	7.3 / 8.1	16.4 / 18.4
Ultimate vacuum (abs.)	mbar	70	70
Max. back pressure at outlet (abs.)	bar	2	1.1
Inlet connection		Hose nozzle DN 8-10 mm	Small flange KF DN 25
Outlet connection		2 x silencer / G1/4"	Silencer / G1/2"
Rated motor power	kW	0.25	0.44
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	325 x 239 x 198	554 x 260 x 359
Weight, approx.	kg	16.4	30.6

ORDERING INFORMATION ME 8 NT

230 V ~ 50-60 Hz	CEE	Ex*	734000
230 V ~ 50-60 Hz	UK	Ex*	734002
230 V ~ 50-60 Hz	CH, CN	Ex*	734001
120 V ~ 60 Hz	US		734003
100 V ~ 50-60 Hz	US		734006

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES ME 8 NT

Rubber vacuum tubing DN 8 mm (686001)

ORDERING INFORMATION ME 16 NT

230 V ~ 50-60 Hz	CEE	Ex*	741000
230 V ~ 50-60 Hz	UK	Ex*	741002
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		741003

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES ME 16 NT

Stainless steel tubing KF DN 25 (1000 mm: 673337)

Hose nozzle DN 15 mm / G1/2" (642472)

Small flange KF DN 16 / G1/2" (672101)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

DIAPHRAGM PUMP

MZ 2 NT AND MZ 2D NT

■ Diaphragm pumps are an excellent solution for continuous, oil-free evacuation and pumping of gases. All parts in these MZ 2 series pumps that are in contact with pumped media are made of aluminum, stainless steel and selected plastics, allowing a wide range of applications for non-corrosive gases. The two-stage construction provides the advantageous combination of high pumping speed and an ultimate vacuum down to 4 mbar. The highly flexible fabric-reinforced double diaphragms made of FKM provide high reliability and extended operating life. The new NT-series features further improved performance data and compact design.

PERFORMANCE FEATURES

- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- good ultimate vacuum
- whisper quiet and very low vibration
- exceptionally long diaphragm life and maintenance-free drive system for low lifetime costs



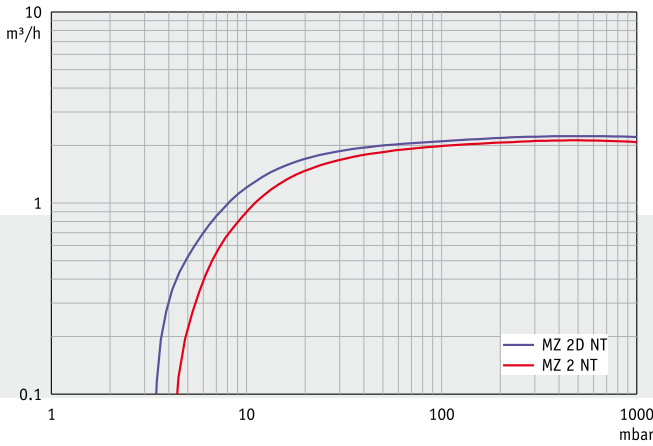
MZ 2D NT
2.3 m³/h
4 mbar



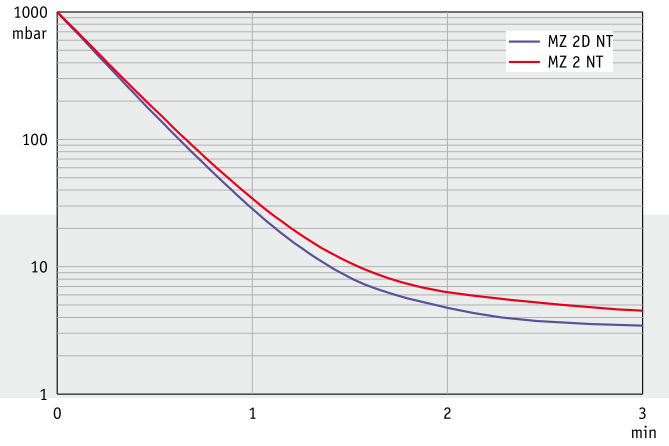
MZ 2 NT
2.2 m³/h
7 mbar

APPLICATIONS

Two-stage diaphragm pumps are an excellent choice for continuous, oil-free pumping at medium vacuum requirements. In contrast to water jet pumps, they do not consume water and therefore do not produce any contaminated waste water. Typical applications are vacuum ovens and aqueous filtrations. The MZ 2D NT is ideal as backing pump for turbomolecular drag pumps and for pumping down in helium cryostats due to its better ultimate vacuum.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MZ 2 NT	MZ 2D NT
Number of heads / stages		2 / 2	2 / 2
Max. pumping speed at 50/60 Hz	m ³ /h	2.2 / 2.4	2.3 / 2.5
Ultimate vacuum (abs.)	mbar	7	4
Max. back pressure (abs.)	bar	2	1.1
Inlet connection		Hose nozzle DN 8-10 mm	Small flange KF DN 16
Outlet connection		Silencer / G1/4"	Silencer / G1/4"
Rated motor power	kW	0.18	0.18
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	243 x 239 x 198	243 x 242 x 198
Weight, approx.	kg	11.0	11.4

ORDERING INFORMATION MZ 2 NT

230 V ~ 50-60 Hz	CEE	Ex*	732000
230 V ~ 50-60 Hz	CH, CN	Ex*	732001
230 V ~ 50-60 Hz	UK	Ex*	732002
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		732003
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz		Ex*	
200-230 V ~ 50-60 Hz	IEC plug EN 60320		732005**

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately

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ORDERING INFORMATION MZ 2D NT

230 V ~ 50-60 Hz	CEE	Ex*	732200
230 V ~ 50-60 Hz	UK	Ex*	732202
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		732203
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz		Ex*	
200-230 V ~ 50-60 Hz	IEC plug EN 60320		732205**

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately

▶ pg. 185

ACCESSORIES MZ 2 NT

Small flange KF DN 16 / G1/4" (662590)

Rubber vacuum tubing DN 8 mm (686001)

ACCESSORIES MZ 2D NT

Stainless steel tubing KF DN 16 (1000 mm: 673336)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

DIAPHRAGM PUMP

MD 1

■ The MD 1 diaphragm pump is an excellent choice for oil-free evacuation and pumping of non-corrosive gases down to 1.5 mbar ultimate vacuum. The three-stage design with precisely guided flat diaphragms provides outstanding pumping speed even close to the ultimate vacuum, especially when compared with similarly rated two-stage diaphragm pumps. The MD 1 is an ultra-low vibration pump with very long diaphragm lifetimes and stable ultimate vacuum documented with years of testing. With a flow path consisting of aluminum and selected plastics (diaphragms and valves made of PTFE/FKM and FKM, respectively) the pumps are suitable for a wide range of applications with non-corrosive gases.

PERFORMANCE FEATURES

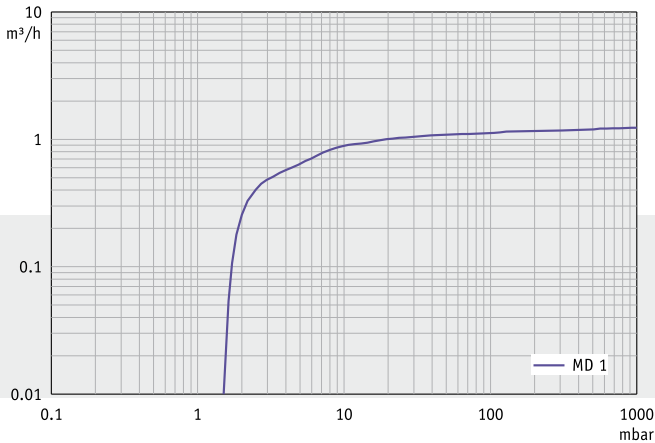
- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- excellent ultimate vacuum
- whisper quiet and ultra-low vibration
- proven long diaphragm life, maintenance-free drive system



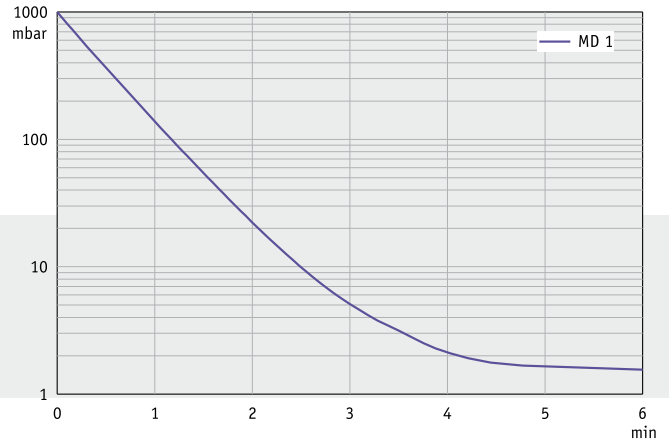
MD 1
1.2 m³/h
1.5 mbar

APPLICATIONS

The MD 1 is an excellent choice for continuous, oil-free evacuation and pumping of non-aggressive gases. It is suitable for high vacuum requirements at modest gas flow as often needed in physics and analytics. The pump is exceptionally quiet and reliable with long diaphragm and valve lifetimes. With its low ultimate vacuum and compact dimensions the MD 1 is widely used as replacement of rotary vane pumps. Typical applications are exhaust gas analysis, for degassing of small amounts of viscous media and in particular as backing pump for compact turbomolecular drag pumps. Back diffusion of oil or even oil back flow, e.g., into a high vacuum chamber is excluded due to its oil-free operation. For equipment manufacturers customized versions are available.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

Number of heads / stages		MD 1
Max. pumping speed at 50/60 Hz	m ³ /h	4 / 3 1.2 / 1.4
Ultimate vacuum (abs.)	mbar	1.5
Max. back pressure (abs.)	bar	1.1
Inlet connection		Hose nozzle DN 6 mm
Outlet connection		Silencer / G1/8"
Rated motor power	kW	0.08
Degree of protection		IP 42
Dimensions (L x W x H), approx.	mm	303 x 143 x 163
Weight, approx.	kg	6.5

ORDERING INFORMATION MD 1

200-230 V ~ 50-60 Hz	CEE	Ex*	696080
200-230 V ~ 50-60 Hz	CH, CN	Ex*	696081
200-230 V ~ 50-60 Hz	UK	Ex*	696082
100-120 V ~ 50-60 Hz	US		696083
120 V ~ 60 Hz*	US		696073
100-120 V ~ 50-60 Hz		Ex*	
200-230 V ~ 50-60 Hz	IEC plug EN 60320		696087**

*With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately [▶ pg. 185](#)

ACCESSORIES MD 1

Rubber vacuum tubing DN 6 mm (686000)

Small flange KF DN 16 / G1/8" (637425)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

DIAPHRAGM PUMP

MD 4 NT AND MD 4 NT VARIO

■ These three-stage diaphragm pumps are an excellent solution for continuous, oil-free pumping of non-corrosive gases. They reach an excellent ultimate vacuum of 1 mbar. All parts in contact with pumped gases and vapors are made of aluminum, stainless steel and carefully selected plastics suitable for a wide range of applications with non-corrosive gases. The new NT series provides whisper quiet and ultra-low vibration operation, high leak tightness and improved performance. The highly flexible fabric-reinforced double diaphragm made of FKM is ideal for extended operating life. The VARIO® design includes the VARIO® pump and the CVC 3000 vacuum controller with external gauge head. The demand-responsive motor speed control on VARIO® models further extends the already long lifetimes of diaphragms and valves.



PERFORMANCE FEATURES

- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- VARIO® option for self-regulating vacuum optimization throughout the process
- excellent ultimate vacuum, VARIO® version with higher pumping speed and TURBO·MODE™ for use as backing pump for turbo pumps
- CVC 3000 controller on VARIO® version offers easy operation with clear text menus



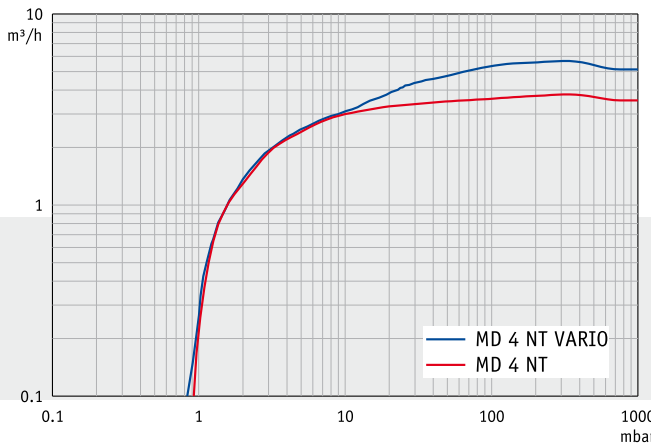
MD 4 NT
3.8 m³/h
1 mbar



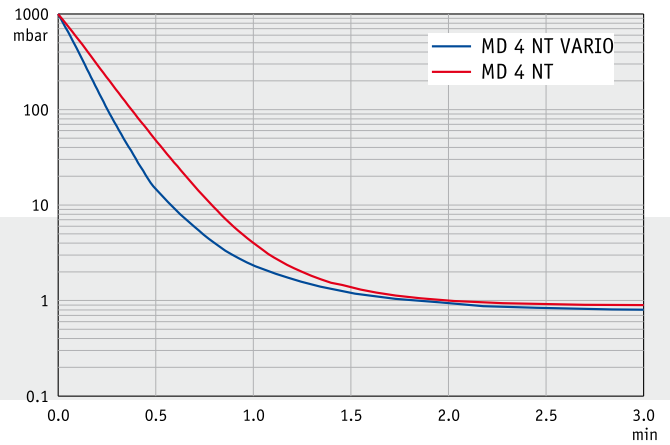
MD 4 NT VARIO
5.7 m³/h
1 mbar

APPLICATIONS

These three-stage diaphragm pumps are an excellent choice for continuous, contamination-free evacuation and pumping of non-aggressive gases at demanding vacuum conditions. They are especially suitable for applications requiring high volume flow in physics and analytics. The low ultimate vacuum makes these an attractive alternative to rotary vane pumps. Typical uses are as backing (roughing) pumps for turbomolecular drag pumps, for degassing of viscous media, as well as for exhaust gas analytics. Additionally, the VARIO® model provides vacuum control by precise adjustment of the diaphragm pump's motor speed to process requirements. Back diffusion of oil or even oil back flow, e.g., into a high vacuum chamber is excluded due to its oil-free operation. For equipment manufacturers customized versions are available. Depending on the application the demand-responsive motor speed control of VARIO® models further extends the long diaphragm life for which VACUUBRAND pumps are well-known. In addition it provides an even higher pumping speed and enables precise vacuum control.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA		MD 4 NT	MD 4 NT VARIO
Vacuum controller		-	CVC 3000
Number of heads / stages		4 / 3	4 / 3
Max. pumping speed at 50/60 Hz	m ³ /h	3.8 / 4.3	5.7
Ultimate vacuum (abs.)	mbar	1	1
Max. back pressure at outlet (abs.)	bar	1.1	1.1
Inlet connection		Small flange KF DN 16	Small flange KF DN 16
Outlet connection		Silencer / G1/4"	Silencer / G1/4"
Vacuum sensor connection		-	Small flange KF DN 16, PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm
Rated motor power	kW	0.25	0.53
Degree of protection		IP 40	IP 20
Dimensions (L x W x H), approx.	mm	325 x 239 x 198	325 x 235 x 245
Weight, approx.	kg	16.4	18.6

ORDERING INFORMATION MD 4 NT

230 V ~ 50-60 Hz	CEE	Ex*	736000
230 V ~ 50-60 Hz	CH, CN	Ex*	736001
230 V ~ 50-60 Hz	UK	Ex*	736002
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		736003
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz		Ex*	
200-230 V ~ 50-60 Hz	IEC plug EN 60320		736005**

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

**Please order power cable separately ▶ pg. 185

ORDERING INFORMATION MD 4 NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	736300
200-230 V ~ 50-60 Hz	CH, CN	Ex*	736301
100-120 V ~ 50-60 Hz	US		736303

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

VACUU-BUS®-compatible accessories ▶ pg. 164

Additional accessories ▶ pg. 169

ACCESSORIES MD 4 NT

Stainless steel tubing KF DN 16 (1000 mm: 673336)

ACCESSORIES MD 4 NT VARIO

Stainless steel tubing KF DN 16 (1000 mm: 673336)

Vent valve VBM-B (674217)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

VARIO® MEMBRANPUMPE

MD 12 NT UND MD 12 NT VARIO



■ These oil-free diaphragm pumps are especially powerful pumps for evacuation and pumping of non aggressive gases. The three-stage design combines especially high pumping speed with excellent ultimate vacuum down to 2 mbar, and down to 1.5 mbar with the VARIO® version. It provides precise vacuum control and consists always of the pump and the CVC 3000 vacuum controller with external gauge head. For the use as backing pump it features continuous adaptation of running speed for optimized forevacuum. The highly flexible, fabric-reinforced double diaphragm made of FKM offers extended operating life that increases significantly in motor speed controlled operation. Like all VACUUBRAND diaphragm pumps they generate an absolutely oil-free and clean vacuum as they work without any sliding seals. Hence generation of dust that might creep back into the high vacuum application, as often found with Scroll or piston pumps, is excluded.

PERFORMANCE FEATURES

- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- VARIO® model includes the easily operated CVC 3000 vacuum controller with clear text menus, removable
- VARIO® version offers self-regulating vacuum optimization throughout the process
- TURBO·MODE™ in VARIO® version with even better ultimate vacuum especially for backing of turbo pumps

MD 12 NT
12.1 m³/h
2 mbar

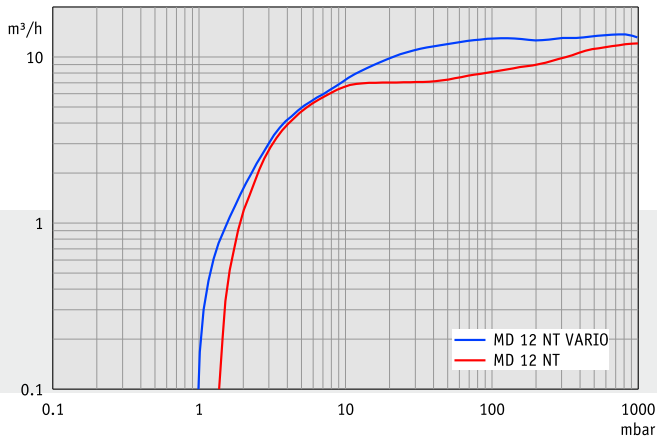


MD 12 NT VARIO
13.4 m³/h
1.5 mbar

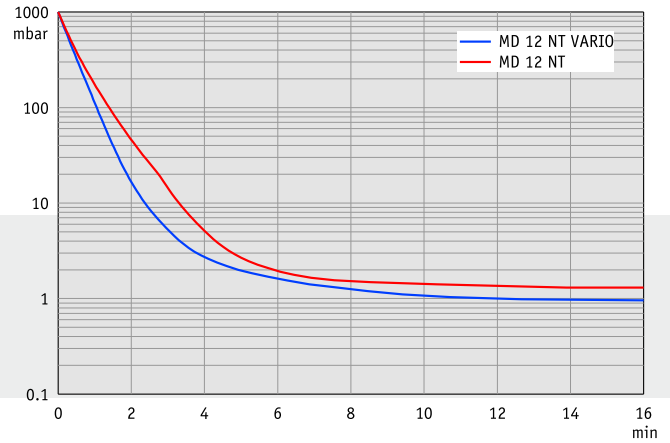


APPLICATIONS

These diaphragm pumps are an excellent choice for continuous, contamination-free evacuation and pumping of non-aggressive gases especially in physics and analytics. The flow path consists of aluminum, stainless steel and carefully selected plastics to permit a wide range of applications. Due to the outstanding ultimate vacuum these pumps are often used as an alternative to rotary vane pumps, for example for vacuum ovens, for very quick and efficient degassing of viscous media, exhaust gas analytics and especially as backing (roughing) pump for large turbomolecular drag pumps. The particularly high pumping speed enables the usage at bigger apparatus and with high gas throughput. The pumps are extraordinarily silent and exhibit very low vibration making them an excellent match for sensitive equipment such as electron microscopes. Back diffusion of oil or even oil back flow, e.g., into a high vacuum chamber is excluded due to its oil-free operation. Additionally, the VARIO® version provides precise (hysteris-free) vacuum control. Depending on the application the demand-responsive motor speed control results in unsurpassed lifetimes of service parts like diaphragms as well as optimal performance for backing of turbo pumps.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MD 12 NT	MD 12 NT VARIO
Vacuum controller		-	CVC 3000
Number of heads / stages		8 / 3	8 / 3
Max. pumping speed at 50/60 Hz	m ³ /h	12.1 / 13.3	13.4
Ultimate vacuum (abs.)	mbar	2	1.5
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Small flange KF DN 25	Small flange KF DN 25
Outlet connection		Silencer / G1/2"	Silencer / G1/2"
Vacuum sensor connection		-	Small flange KF DN 16, PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm
Rated motor power	kW	0.44	0.53
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	554 x 260 x 359	554 x 260 x 420
Weight, approx.	kg	30.6	31.2

ORDERING INFORMATION MD 12 NT

230 V ~ 50-60 Hz	CEE	Ex*	743000
230 V ~ 50-60 Hz	CH, CN	Ex*	743001
230 V ~ 50-60 Hz	UK	Ex*	743002
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		743003

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES MD 12 NT

Stainless steel tubing KF DN 25 (1000 mm: 673337)
 Hose nozzle DN 15 mm / G1/2" (642472)
 Small flange KF DN 16 / G1/2" (672101)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

ORDERING INFORMATION MD 12 NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	743100
100-120 V ~ 50-60 Hz	US		743103

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

VACUU·BUS®-compatible accessories ▶ pg. 164

Additional accessories ▶ pg. 169

ACCESSORIES MD 12 NT VARIO

Stainless steel tubing KF DN 25 (1000 mm: 673337)
 Hose nozzle DN 15 mm / G1/2" (642472)
 Small flange KF DN 16 / G1/2" (672101)
 Vent valve VBM-B (674217)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

DIAPHRAGM PUMP

MV 2 NT AND MV 2 NT VARIO

■ Four-stage diaphragm pumps are an excellent solution for continuous, oil-free pumping of gases when the need is to reach fractional millibar ultimate vacuum. All parts in contact with pumped vapors or gases are made of aluminum, stainless steel and carefully selected plastics suitable for a wide range of non-corrosive applications. The new NT series pumps provide whisper quiet and ultra-low vibration operation, high leak-tightness and improved vacuum. The highly flexible, fabric-reinforced double diaphragm made of FKM offers extended operating life. The VARIO® version automatically adjusts the vacuum level to optimize the process conditions by continuously adapting the motor speed. The VARIO® system includes the VARIO® pump and the CVC 3000 vacuum controller with external gauge head. The demand-responsive motor speed control results in unsurpassed vacuum performance as well as extended lifetimes for service parts like diaphragms.



PERFORMANCE FEATURES

- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- VARIO® version for self-regulating vacuum optimization throughout the process
- excellent ultimate vacuum, and even better ultimate vacuum with VARIO® version in TURBO·MODE™ for use as backing pump for turbo pumps
- CVC 3000 controller on VARIO® version offers easy operation with clear text menus



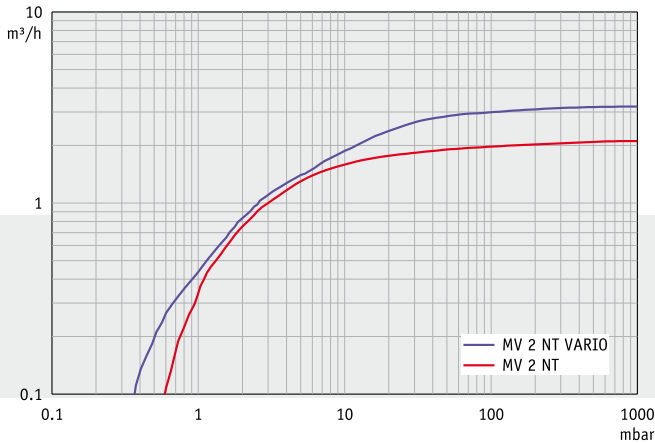
MV 2 NT
2.2 m³/h
0.5 mbar



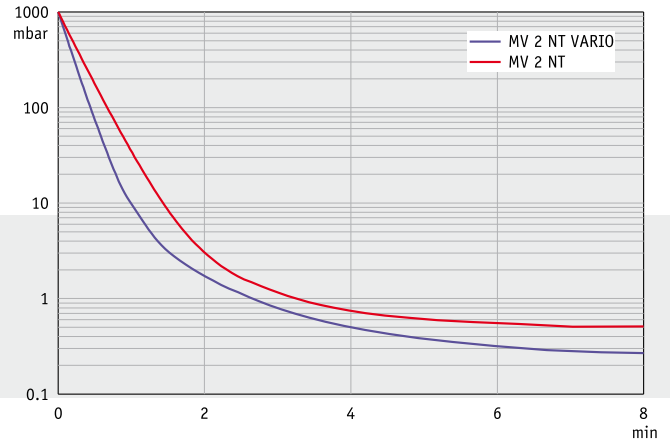
MV 2 NT VARIO
3.3 m³/h
0.3 mbar

APPLICATIONS

Four-stage diaphragm pumps are an excellent choice for continuous, contamination-free evacuation and pumping of non-aggressive gases under the very high vacuum demands of applications in physics and analytics. They generate a clean vacuum as they are designed without any sliding seals. Hence abrasion or dust are excluded that might creep back into the application. Due to the outstanding ultimate vacuum these pumps are often used as an alternative to rotary vane pumps. A typical application is the use as backing pump for turbomolecular drag pumps. Additionally, the VARIO® version provides vacuum control by precise adjustment of the diaphragm pump's motor speed. Depending on the application the demand-responsive motor speed control results in unsurpassed lifetimes of service parts like diaphragms as well as optimal performance for backing of turbo pumps.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MV 2 NT	MV 2 NT VARIO
Vacuum controller		-	CVC 3000
Number of heads / stages		4 / 4	4 / 4
Max. pumping speed at 50/60 Hz	m ³ /h	2.2 / 2.4	3.3
Ultimate vacuum (abs.)	mbar	0.5	0.3
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Small flange KF DN 16	Small flange KF DN 16
Outlet connection		Silencer / G1/4"	Silencer / G1/4"
Vacuum sensor connection		-	Small flange KF DN 16, PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm
Rated motor power	kW	0.25	0.53
Degree of protection		IP 40	IP 20
Dimensions (L x W x H), approx.	mm	325 x 239 x 198	325 x 235 x 245
Weight, approx.	kg	16.4	18.9

ORDERING INFORMATION MV 2 NT

230 V ~ 50-60 Hz	CEE	Ex*	738000
230 V ~ 50-60 Hz	CH, CN	Ex*	738001
230 V ~ 50-60 Hz	UK	Ex*	738002
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US		738003

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION MV 2 NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	738100
200-230 V ~ 50-60 Hz	CH, CN	Ex*	738101
100-120 V ~ 50-60 Hz	US		738103

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

VACUU·BUS®-compatible accessories ▶ pg. 164

Additional accessories ▶ pg. 169

ACCESSORIES MV 2 NT

Stainless steel tubing KF DN 16 (1000 mm: 673336)

ACCESSORIES MV 2 NT VARIO

Stainless steel tubing KF DN 16 (1000 mm: 673336)

Vent valve VBM-B (674217)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

DIAPHRAGM PUMP

MV 10 NT AND MV 10 NT VARIO

■ Four-stage diaphragm pumps are an excellent solution for continuous, oil-free pumping of gases when the need is to reach fractional millibar ultimate vacuum. All parts in contact with pumped vapors or gases are made of aluminum, stainless steel and carefully selected plastics suitable for a wide range of non-corrosive applications. These pumps provide the advantageous combination of high pumping speed with an extraordinarily good ultimate vacuum down to 0.5 mbar, and down to 0.3 mbar with the VARIO® version with self-adapting motor speed control. The highly flexible, fabric-reinforced double diaphragm made of FKM offers extended operating life. The VARIO® system consists of the VARIO® pump and the CVC 3000 vacuum controller with external gauge head. It provides precise vacuum control, higher pumping speed and improved ultimate vacuum. Eight-cylinder NT pumps feature quiet operation, with smooth and easy-to-clean surfaces.



PERFORMANCE FEATURES

- contamination-free pumping and evacuation
- high performance even close to the excellent ultimate vacuum
- VARIO® with removable CVC 3000 vacuum controller, can be arranged flexibly, easily operated with clear text menus
- VARIO® version offers self-regulating vacuum optimization throughout the process
- TURBO·MODE™ in VARIO® version with even better ultimate vacuum especially for backing of turbo pumps



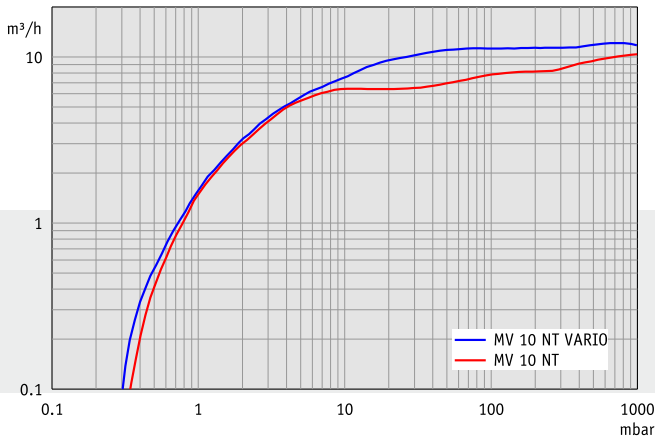
MV 10 NT
10.4 m³/h
0.5 mbar

MV 10 NT VARIO
12.1 m³/h
0.3 mbar

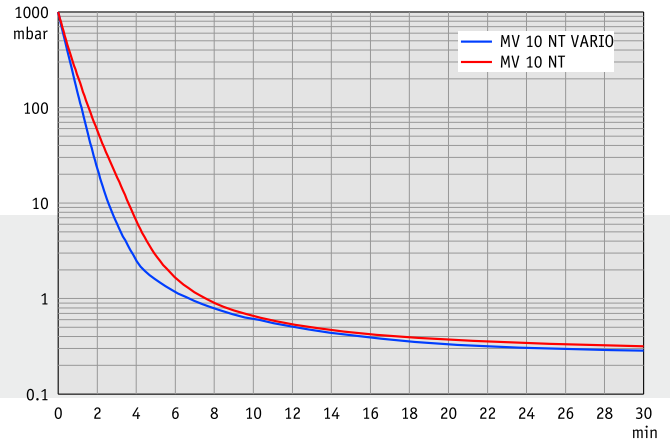


APPLICATIONS

Four-stage diaphragm pumps are an excellent choice for continuous, contamination-free evacuation and pumping of non-aggressive gases under the very high vacuum demands of applications in physics and analytics. Due to the outstanding ultimate vacuum these pumps are often used as an alternative to rotary vane pumps. Typical applications are for vacuum ovens, for very quick and efficient degassing of viscous media, exhaust gas analytics and especially as backing pump for large turbomolecular drag pumps. The pumps are extraordinarily silent and exhibit very low vibration making them an excellent match for sensitive equipment such as electron microscopes. Back diffusion of oil or even oil back flow, e.g., into a high vacuum chamber is excluded due to its oil-free operation. Additionally, the VARIO® version provides precise (hysteresis-free) vacuum control. Depending on the application the demand-responsive motor speed control results in unsurpassed lifetimes of service parts like diaphragms as well as optimal performance for backing of turbo pumps.



Pumping speed graph at 50 Hz


 Pump down graph at 50 Hz
(100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MV 10 NT	MV 10 NT VARIO
Vacuum controller		-	CVC 3000
Number of heads / stages		8 / 4	8 / 4
Max. pumping speed at 50/60 Hz	m ³ /h	10.4 / 11.6	12.1
Ultimate vacuum (abs.)	mbar	0.5	0.3
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Small flange KF DN 25	Small flange KF DN 25
Outlet connection		Silencer / G1/2"	Silencer / G1/2"
Vacuum sensor connection		-	Small flange KF DN 16, PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm
Rated motor power	kW	0.44	0.53
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	554 x 260 x 359	554 x 260 x 420
Weight, approx.	kg	30.6	31.2

ORDERING INFORMATION MV 10 NT

230 V ~ 50-60 Hz	CEE	Ex*	744000
100-115 V ~ 50-60 Hz /			
120 V ~ 60 Hz	US		744003

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

VACUU·BUS®-compatible accessories ▶ pg. 164

Additional accessories ▶ pg. 169

ACCESSORIES MV 10 NT

Stainless steel tubing KF DN 25 (1000 mm: 673337)

Hose nozzle DN 15 mm / G1/2" (642472)

Small flange KF DN 16 / G1/2" (672101)

ACCESSORIES MV 10 NT VARIO

Stainless steel tubing KF DN 25 (1000 mm: 673337)

Hose nozzle DN 15 mm / G1/2" (642472)

Small flange KF DN 16 / G1/2" (672101)

Vent valve VBM-B (674217)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual.

ORDERING INFORMATION MV 10 NT VARIO

200-230 V ~ 50-60 Hz	CEE	Ex*	744100
200-230 V ~ 50-60 Hz	CH, CN	Ex*	744101
200-230 V ~ 50-60 Hz	UK	Ex*	744102
100-120 V ~ 50-60 Hz	US		744103

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES FOR DIAPHRAGM PUMPS

■ Vacuum systems with small flanges require appropriate components for a consistent cross section of the connection from the system to the vacuum pump. Our small flange connections for diaphragm pumps, as well as elastic connection components, allow the integration of the pump into the vacuum distribution system.

■ Upgrading to small flange connection KF DN 16 for the following diaphragm pumps

at inlet:

ME 4 NT	662591
ME 8 NT, MZ 2 NT	662590
MD 1	637425

at outlet:

MZ 2 NT, MZ 2D NT	662590
MD 1	636553
ME 8 NT, MD 4 NT, MV 2 NT	662512
ME 16 NT, MD 12 NT, MV 10 NT	672101



■ Flexible connections:

Metal vacuum tubing with small flanges KF DN 16

Length 250 mm	673306
Length 500 mm	673316
Length 750 mm	673326
Length 1000 mm	673336

PVC-hose with small flange KF DN 16

Length 500 mm	686010
Length 1000 mm	686020

Additional flexible connections

▶ pg. 184

Small flange components

▶ pg. 179

Manually operated valves, e.g., VS 16 / Electrically operated (solenoid) valves

▶ pg. 169

DIAPHRAGM PUMPS WITH 24V DC DRIVE PARTICULARLY FOR INTEGRATION INTO OEM PRODUCTS

■ VARIO-SP™ diaphragm pumps from VACUUBRAND combine our proven diaphragm and cylinder head technology with state-of-the-art drive and control technology. This system component (SP = SystemPump) is frequently used in equipment or systems where it is beneficial and necessary to regulate vacuum parameters. The electronically commutated (brushless) 24 V direct current drive is service-free and features unparalleled compact dimensions. The high-quality and flexible electronic drive system built into the pump makes it easy to integrate the vacuum pump into your overall system. Varying the motor speed makes maximum efficiency possible, including the option of controlling vacuum processes by changing the pump's volume flow rate. Motor speed control also enhances performance features such as pumping speed, ultimate vacuum, diaphragm and valve life, vibration and sound levels and energy consumption. The motor speed may be set internally (fixed speed) or controlled via an external digital or analog signal.



MD 1C VARIO-SP diaphragm pump



MZ 2 VARIO-SP diaphragm pump



MD 4 VARIO-SP diaphragm pump

- possible variable speed 200-2400 min⁻¹, allowing a quicker pumping down with high speed
- improved ultimate vacuum at low speed
- significantly longer diaphragm and valve service life
- extremely compact, flexible mounting positions feasible
- much quieter and less vibration
- less energy consumption, less heat dissipation
- speed can be set manually or controlled externally by various analog and digital signals
- supply with 24 V DC for worldwide use

VARIO-SP™ DIAPHRAGM PUMP

MD 1 VARIO-SP AND MD 1C VARIO-SP

■ The three-stage MD 1 VARIO-SP diaphragm pump with its variable speed drive system attains significantly higher pumping speed and a better ultimate vacuum than the corresponding fixed speed pump. The brushless 24V DC motor (maintenance-free) enables easy integration of the pump into other equipment and operation independent of line voltage. The pump is particularly silent and vibration-free, and has an outstanding lifetime of its diaphragms and valves. For exceptional chemical resistance of the pump's internal flowpath it is also available as a chemistry design version (MD 1C VARIO-SP).

PERFORMANCE FEATURES

- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- variable speed: Fast pump down at high motor speed, maintain vacuum with reduced motor speed
- very powerful and extremely compact; whisper quiet and ultra-low vibration, especially at low speed
- MD 1C VARIO-SP in chemistry design, with gas ballast valve and outstanding chemical resistance and superior vapor tolerance



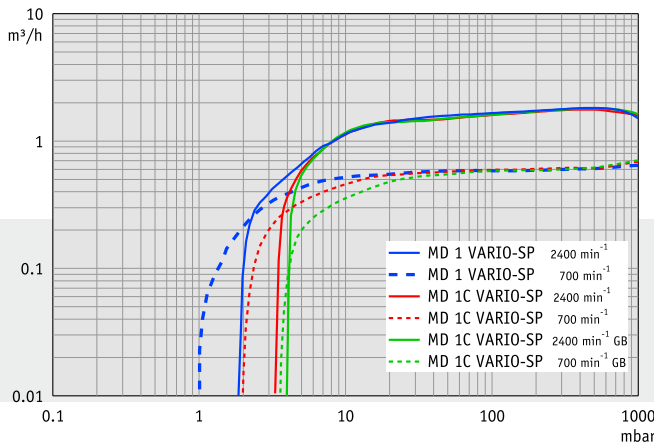
MD 1 VARIO-SP
1.8 m³/h
1 mbar



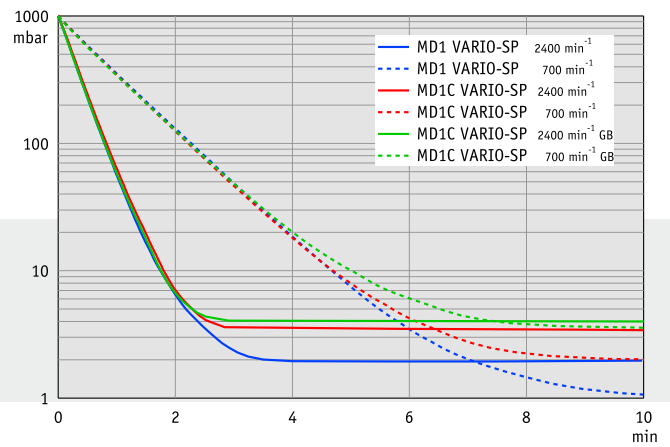
MD 1C VARIO-SP
1.8 m³/h
2 mbar

APPLICATIONS

The MD 1 VARIO-SP is an excellent choice for continuous, contamination-free evacuation and pumping of non-aggressive gases. The motor speed is either fixed or can be adjusted externally via electronic control signals for adaption to process requirements. For chemistry applications all major parts of the chemistry design pump MD 1C VARIO-SP in contact with pumped media are made of chemically resistant fluoroplastics. Both pump types are extremely compact and mountable in any position and are therefore the ideal built-in or system pump. Customized versions of these pump types are available on request.



Pumping speed graph with/without gas ballast



Pump down graph with/without gas ballast (10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MD 1 VARIO-SP	MD 1C VARIO-SP
Number of heads / stages		4 / 3	4 / 3
Max. pumping speed (2400 min ⁻¹)	m ³ /h	1.8	1.8
Ultimate vacuum (abs.)	mbar	1 (700 min ⁻¹)	2 (1500 min ⁻¹)
Ultim. vac. (abs.) with gas ballast	mbar	-	4 (1500 min ⁻¹)
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Hose nozzle DN 6 mm	Hose nozzle DN 8-10 mm
Outlet connection		Silencer / G1/8"	Hose nozzle DN 8 mm
Rated motor power	kW	0.064	0.064
Max. current	A	7	7
Typ. current (<10 mbar, 1500 min ⁻¹)	A	1.5	1.5
Motor speed range	min ⁻¹	200 - 2400	200 - 2400
Dimensions (L x W x H), approx.	mm	223 x 143 x 163	235 x 143 x 175
Weight, approx.	kg	4.1	4.2

ORDERING INFORMATION MD 1 VARIO-SP

24 V DC	Open wires	Ex*	696101
With NRTL certification for Canada and the USA			
Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only			

ORDERING INFORMATION MD 1C VARIO-SP

24 V DC	Open wires	Ex*	696110
With NRTL certification for Canada and the USA			
Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only			

ACCESSORIES MD 1 VARIO-SP

- Rubber vacuum tubing DN 6 mm (686000)
- Small flange KF DN 16 / G1/8" (637425)

ACCESSORIES MD 1C VARIO-SP

- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with 2 m cable without plug and with manual.

VARIO-SP™ DIAPHRAGM PUMP

MZ 2 VARIO-SP AND MD 4 VARIO-SP

■ VARIO-SP™ diaphragm pumps are extremely compact and ideal for continuous, oil-free pumping of non-aggressive gases at good ultimate vacuum. Due to their variable speed drive system they are much more flexible to use than the corresponding fixed speed pumps. The brushless 24V DC motor (maintenance-free) enables easy integration of the pump into other equipment and operation independent of line voltage. The pump design is distinguished by particularly silent operation and long diaphragm lifetime. The three-stage MD 4 VARIO-SP diaphragm pump offers higher flow rate and excellent ultimate vacuum.

PERFORMANCE FEATURES

- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- variable speed: Fast pump down at high motor speed, maintain vacuum with reduced motor speed
- very powerful and extremely compact; whisper quiet and ultra-low-vibration, especially at low speed
- choose the MZ 2 VARIO-SP for reliable, variable pumping, or the MD 4 VARIO-SP for greater vacuum capacity and higher flow rates



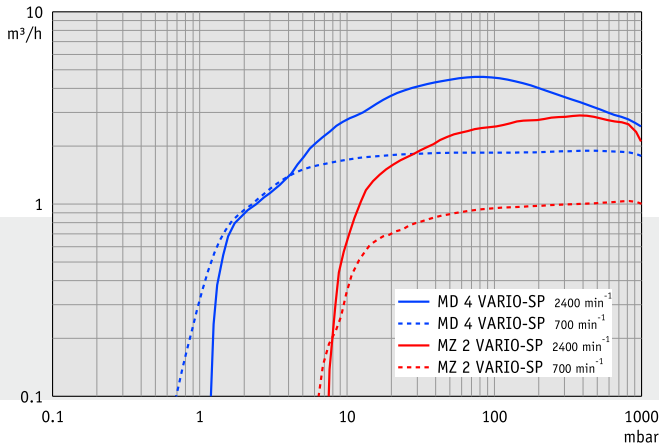
MZ 2 VARIO-SP
2.9 m³/h
7 mbar



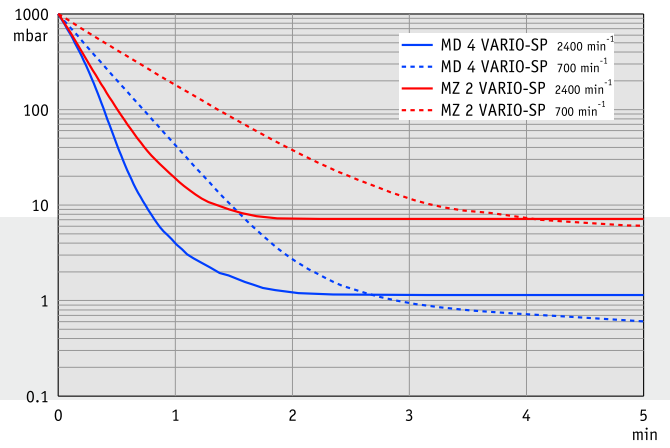
MD 4 VARIO-SP
4.5 m³/h
1 mbar

APPLICATIONS

The MZ 2 VARIO-SP and MD 4 VARIO-SP are excellent choices for continuous, oil-free evacuation and pumping of non-aggressive gases especially for applications in physics and analytics. The motor speed is either fixed or can be adjusted externally via electronic control signals for adaption to process requirements. The pumps are suited for medium to high gas loads, even close to their ultimate vacuum. The VARIO-SP™ pumps are extremely compact and mountable in any position; that are ideal built-in or system pumps. In view of special built-in situations these pumps can be adapted to meet customer's requirements. For pumping aggressive gases and vapors these pumps are available in chemistry design on request.



Pumping speed graph


 Pump down graph
(10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		MZ 2 VARIO-SP	MD 4 VARIO-SP
Number of heads / stages		2 / 2	4 / 3
Max. pumping speed (2400 min ⁻¹)	m ³ /h	2.9	4.5
Ultimate vacuum (abs.)	mbar	7 (1500 min ⁻¹)	1 (700 min ⁻¹)
Max. back pressure (abs.)	bar	1.1	1.1
Inlet connection		Hose nozzle DN 8-10 mm	Small flange KF DN 16
Outlet connection		Silencer / G1/4"	Silencer / G1/4"
Rated motor power	kW	0.16	0.16
Max. current	A	7	7
Typ. current (<10 mbar, 1500 min ⁻¹)	A	2.0	2.5
Motor speed range	min ⁻¹	400 - 2400	400 - 2400
Dimensions (L x W x H), approx.	mm	165 x 234 x 177	259 x 234 x 179
Weight, approx.	kg	6.3	12.2

ORDERING INFORMATION MZ 2 VARIO-SP

24 V DC Open wires Ex* 720000
 Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ORDERING INFORMATION MD 4 VARIO-SP

24 V DC Open wires Ex* 720100
 Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES MZ 2 VARIO-SP

Small flange KF DN 16 / G1/4" (662590)
 Rubber vacuum tubing DN 8 mm (686001)

ACCESSORIES MD 4 VARIO-SP

Stainless steel tubing KF DN 16 (1000 mm: 673336)

ITEMS SUPPLIED

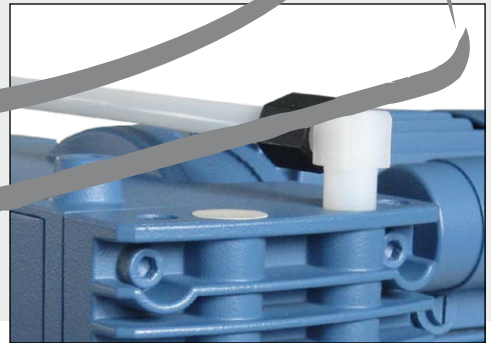
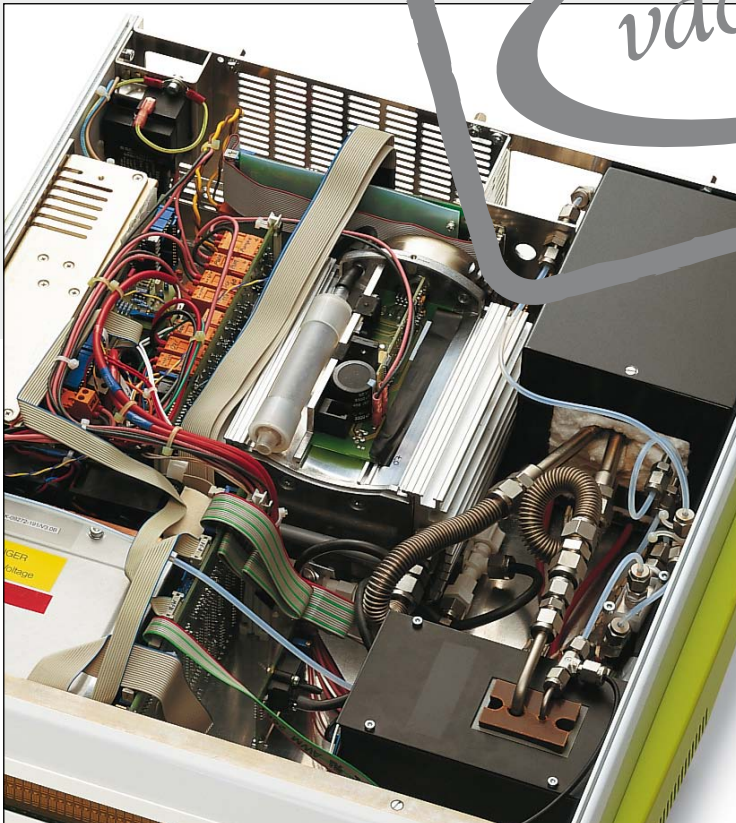
Pump completely mounted, ready for use, with 2 m cable without plug and with manual.

OEM OR BUILT-IN PUMPS

- In OEM applications, we adapt our pumps to your installation requirements: Color, motors, electrical interfaces, fastening and a whole lot more can be adapted to your design requirements. VACUUBRAND VARIO-SP™ pumps with 24 V DC drive are designed for integration into your equipment control wiring. For decades, VACUUBRAND pumps have been selected by leading equipment and instrument manufacturers world-wide for their most critical designs.

VACUUM BY...

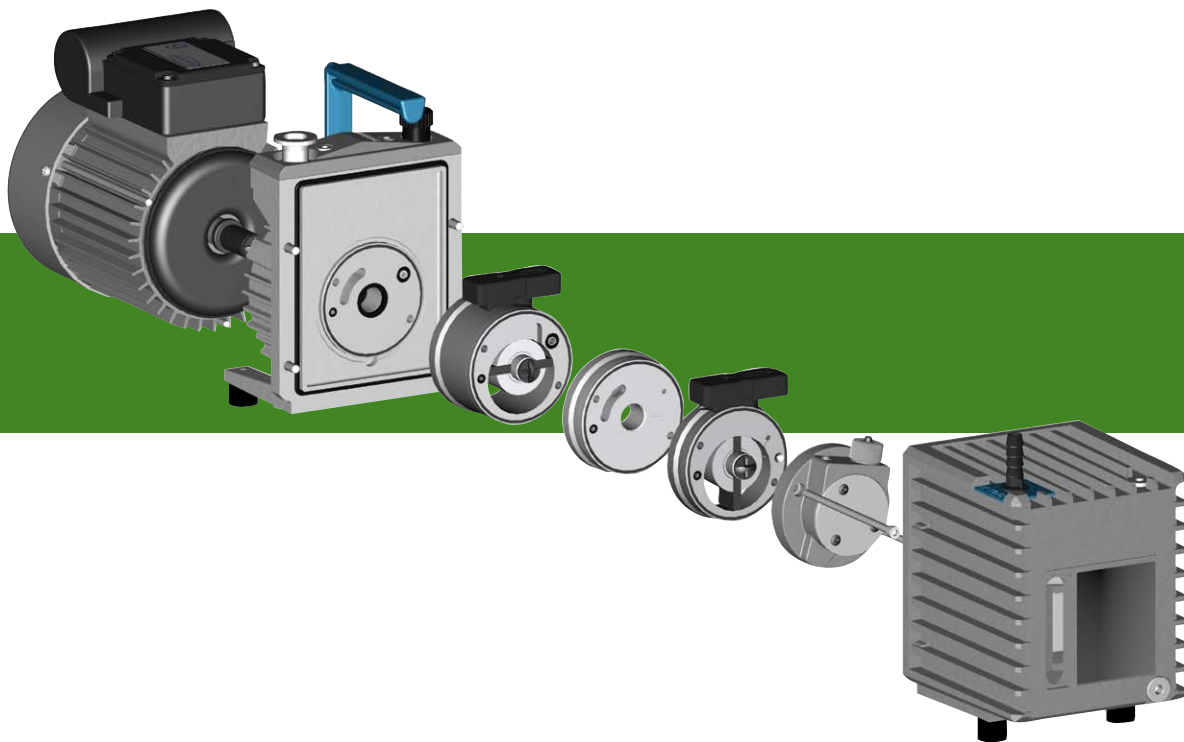
vacuubrand



ROTARY VANE PUMPS AND PUMPING UNITS, CHEMISTRY-HYBRID™ PUMPS

■ "XS" Rotary vane pumps

Rotary vane pumps are used whenever it is necessary to have a process vacuum of up to 10^{-3} mbar. VACUUBRAND rotary vane pumps are high-performance, yet compact, and can be equipped with an extensive line of VACUUBRAND accessories. They have an innovative lubrication system with a built-in oil pump and have a large oil volume. This extends oil change and service intervals and protects the pump at start-up. The effective gas ballast feature, with its high-flow gas ballast, provides high vapor pumping capability for water and solvents. VACUUBRAND rotary vane pumps' volume flow rate is specified at atmospheric pressure, as is customary with PNEUROP®. For process efficiency, however, the high volume flow rate of VACUUBRAND pumps under process conditions, as well as a consistently high volume flow rate over a wide pressure range, is the key to your satisfaction in real-world application. After switch-off the aggregate is vacuum-sealed to protect your application from undesired venting and oil back flow.



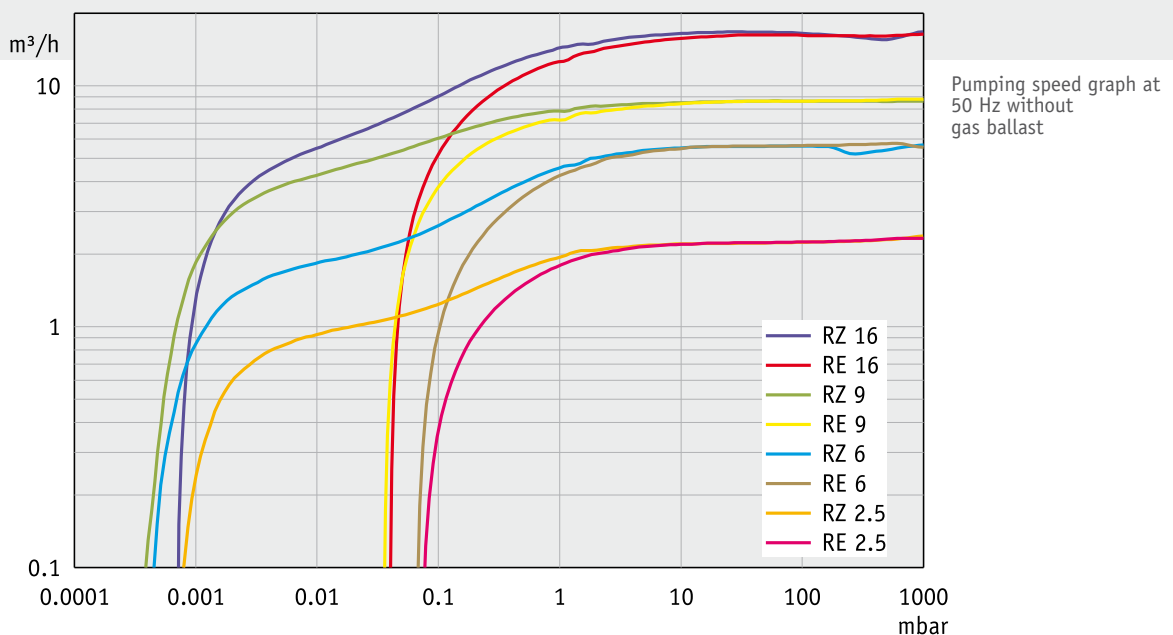
- constriction-free vapor pathway allows high volume flow rates, even when close to the ultimate vacuum
- high tolerance for water and solvent vapors, because of the high-volume gas ballast
- quiet running and excellent ultimate vacuum, even with gas ballast
- active corrosion protection: Oil cycle closes vacuum-tight against the intake of corrosive gases and oil impurities into the reservoir when shut down
- new design lubrication circuit, and large usable oil volume provides extended oil change and service intervals
- compact design, low weight and easy service due to telescopic design

ROTARY VANE PUMPS AND PUMPING UNITS, CHEMISTRY-HYBRID™ PUMPS

■ The rotary vane pumps from VACUUBRAND are especially designed for use in chemistry and physics. The powerful gas ballast system helps to prevent condensation inside the pump. Simultaneously the pumps are reaching outstanding ultimate vacuum even with open gas ballast valve. Rotary vane pumping systems from VACUUBRAND are suggested for applications in the fine vacuum range that demand special precautions to protect the pump and environment. The PC 3 pumping units with two-stage rotary vane pump (RZ 2.5 through RZ 16) have an inlet-side glass cold trap, exhaust oil mist filter and the accessories needed to handle larger amounts of condensable vapors. The RC 6 chemistry-HYBRID™ pump is the combination of a two-stage rotary vane pump and a chemistry diaphragm pump made of corrosion-resistant materials. By reducing solvent condensation and continuously distilling trapped solvents out of the pump oil the RC 6 offers the service advantages of an oil-free chemistry pump with the low ultimate vacuum of a two-stage rotary vane pump.

■ 7 GOLDEN RULES WHEN USING OIL-SEALED ROTARY VANE PUMPS


















- Before use, warm up pump with inlet blocked to reduce condensation in pump
- Avoid particles to protect mechanical parts
- Never block pump outlet
- Use gas ballast to purge condensable vapors
- Use a cold trap to protect pump from corrosive and condensable vapors
- After application is complete, run pump a few minutes with inlet blocked and gas ballast open to purge solvents from pump
- Check oil and maintain regularly





■ There are expedient hands-on packages available as a system solution with an exhaust oil mist filter (with built-in safety overpressure valve) and a manual in-line valve, e.g. to warm up the pump. There is also a package available with an additional DCP 3000 with VSP 3000 fine vacuum gauge.

ROTARY VANE PUMPS








SERIES OVERVIEW

Design	Max. pumping speed at 50 Hz in m³/h	Attainable ultimate vacuum			
		down to 2x10 ⁻¹ mbar	down to 2x10 ⁻³ mbar	Pumping unit PC 3 down to 2x10 ⁻³ mbar	Package solutions down to 2x10 ⁻³ mbar
RE 2.5	2.3	 ▶ pg. 130	 ▶ pg. 130	 ▶ pg. 130	
RZ 2.5	2.3				 ▶ pg. 130
RZ 2.5 +FO +VS 16	2.3				
RE 6	5.7	 ▶ pg. 132	 ▶ pg. 132	 ▶ pg. 132	
RZ 6	5.7				 ▶ pg. 132
RZ 6 +FO +VS 16	5.7				
RZ 6 +FO +VS 16 +Set DCP+VSP 3000	5.7				 ▶ pg. 132
RE 9	8.9	 ▶ pg. 134	 ▶ pg. 134	 ▶ pg. 134	
RZ 9	8.9				 ▶ pg. 134
RE 16	16.6	 ▶ pg. 136	 ▶ pg. 136	 ▶ pg. 136	
RZ 16	16.6				 ▶ pg. 136

CHEMISTRY-HYBRID™ PUMPS

Design	Max. pumping speed at 50 Hz in m³/h	Attainable ultimate vacuum	
		down to 2x10 ⁻³ mbar	Pumping unit PC 8 down to 2x10 ⁻³ mbar
RC 6, PC 8 / RC 6	5.9	 ▶ pg. 138	 ▶ pg. 138

ACCESSORIES

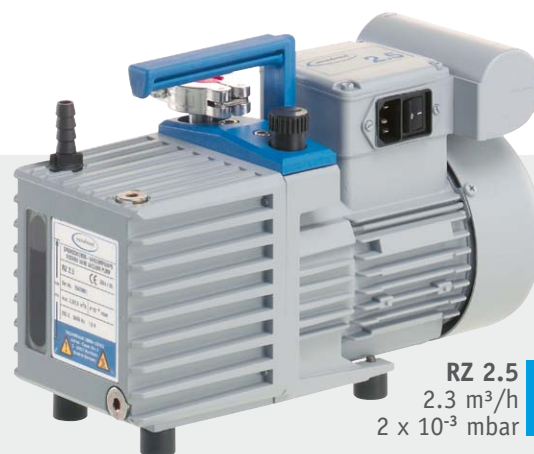
Components	Further information	Components	Further information
Oils for rotary vane pumps	 ▶ pg. 140	Cold traps and inline oil filter	 ▶ pg. 143
Oil mist filters FO	 ▶ pg. 142	Manually operated valves, e.g., VS 16	 ▶ pg. 172
Separator at inlet AK	 ▶ pg. 142	Electrically operated (solenoid) valves	 ▶ pg. 177
Package fine vacuum control	 ▶ pg. 159		

ROTARY VANE PUMP RE 2.5, RZ 2.5 AND PUMPING UNIT PC 3 WITH RZ 2.5

■ The one-stage RE 2.5 and two-stage RZ 2.5 are high-performance rotary vane pumps with extra compact design and low weight. They are the ideal solution for a wide range of laboratory and process applications that require low ultimate vacuum at medium gas flow rate. The rotary vane pumping unit PC 3 with cold trap (GKF 1000i) at the inlet helps the pump to handle larger volumes of condensable vapors. The pumping unit is compact, user-friendly, and well-arranged, with oil mist filter at the outlet, a valve, and a T-connection for a gauge. The RZ 2.5 is also available combined with the oil mist filter (FO) and the VS 16 valve as a package.

PERFORMANCE FEATURES

- high flow rates even at vacuum levels approaching ultimate vacuum
- high water vapor tolerance due to efficient gas ballast; very good ultimate vacuum even with gas ballast
- vacuum-tight at switch-off; external anti-suckback valve not needed
- large oil volume: Long intervals between oil changes
- ease of maintenance due to telescopic design



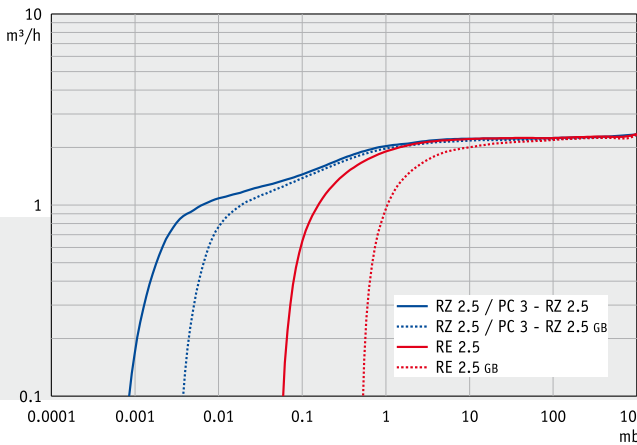
RZ 2.5
2.3 m³/h
2 x 10⁻³ mbar

PC 3 / RZ 2.5
2.3 m³/h
2 x 10⁻³ mbar

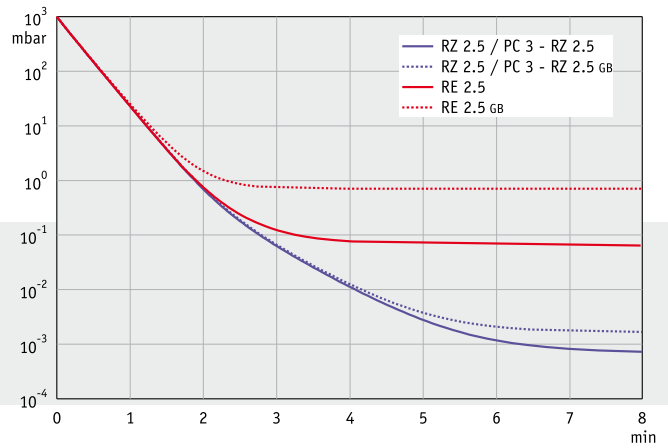


APPLICATIONS

Typical applications are lyophilization, fine vacuum distillation and evacuation of small volumes, e.g., for utilization of μ -focus x-ray tubes or filling with pure gases. The pumping unit PC 3 is the perfect choice for applications requiring special protection of pump and environment. Designed for the use in chemical laboratories the cold trap helps the pumps to handle large volumes of condensable vapors. The cold trap is metalized for extended coolant life and is protected against implosion.



Pumping speed graph at 50 Hz with/without gas ballast



Pump down graph at 50 Hz with/without gas ballast (10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		RE 2.5	RZ 2.5
Number of stages		1	2
Max. pumping speed at 50/60 Hz	m ³ /h	2.3/2.8	2.3/2.8
Ultimate partial vacuum (abs.)	mbar	3 × 10 ⁻¹	4 × 10 ⁻⁴
Ultimate vacuum (abs.)	mbar	3 × 10 ⁻¹	2 × 10 ⁻³
Ultim. vac. (abs.) with gas ballast	mbar	8 × 10 ⁻¹	1 × 10 ⁻²
Water vapor tolerance with gas ballast	mbar	40	40
Oil capacity (B-Oil) min./max.	l	0.18/0.51	0.1/0.28
Inlet connection		Small flange KF DN 16	Small flange KF DN 16
Outlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Rated motor power	kW	0.18	0.18
Rated motor speed at 50/60 Hz	min ⁻¹	1500/1800	1500/1800
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	316 x 125 x 190	316 x 125 x 190
Weight, approx.	kg	10.2	11.4

ORDERING INFORMATION RE 2.5

230 V ~ 50-60 Hz	CEE	697150
230 V ~ 50-60 Hz	CH, CN	697151
230 V ~ 50-60 Hz	UK	697152
120 V ~ 60 Hz	US	697153
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz		
200-230 V ~ 50-60 Hz*	US	697156**

*With NRTL certification for Canada and the USA

ORDERING INFORMATION RZ 2.5

230 V ~ 50-60 Hz	CEE	698120
230 V ~ 50-60 Hz	CH, CN	698121
230 V ~ 50-60 Hz	UK	698122
120 V ~ 60 Hz	US	698123
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz		
200-230 V ~ 50-60 Hz*	US	698126**

*With NRTL certification for Canada and the USA

RE 2.5, RZ 2.5 + Perfluoropolyether Oil

 on request ▶ pg. 140

 **Country specific power cable, please order separately if needed ▶ pg. 185
ORDERING INFORMATION PC 3 / RZ 2.5

230 V ~ 50-60 Hz	CEE	699890
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ORDERING INFORMATION RZ 2.5 +FO +VS 16

230 V ~ 50-60 Hz	CEE	698029
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ACCESSORIES

- Stainless steel tubing KF DN 16 (1000 mm: 673336)
- Separator inlet side AK R 2/2.5 (698000)
- Oil mist filter FO R 2/2.5/5/6 (698003)
- Package fine vacuum control KF DN 16 (635983)
- Rubber vacuum tubing DN 8 mm (686001)
- Small flange KF DN 16 with hose nozzle DN 8-10 mm (662806)

ITEMS SUPPLIED

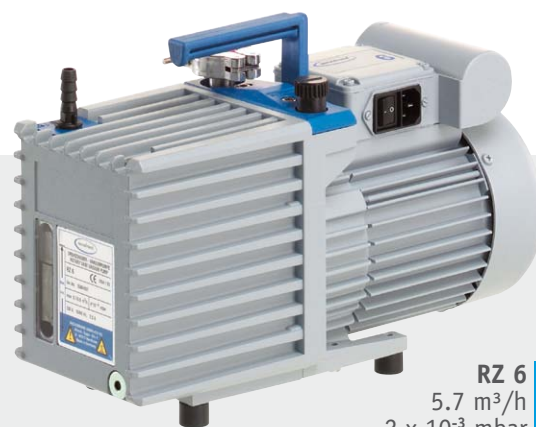
Pump oil filled and completely mounted, ready for use, with manual.

ROTARY VANE PUMP RE 6, RZ 6 AND PUMPING UNIT PC 3 WITH RZ 6

These powerful rotary vane pumps feature a particularly compact design and low weight for pumps of this capacity. They are the ideal solution for a wide range of laboratory and process applications that require low ultimate vacuum at medium to increased gas flow rate. The PC 3 rotary vane pumping unit, with GKF 1000i cold trap at the inlet, helps the pump to handle large amounts of condensable vapors. The PC 3 pumping unit is compact, user-friendly and well-arranged, with an oil mist filter at the outlet, a valve and a T-connection for a gauge. Various packages including pump, oil mist filter, etc. are available.

PERFORMANCE FEATURES

- high flow rates even at vacuum levels approaching ultimate vacuum
- high water vapor tolerance due to efficient gas ballast; very good ultimate vacuum even with gas ballast
- vacuum-tight at switch-off; external anti-suckback valve not needed
- large oil volume: Long intervals between oil changes
- ease of maintenance due to telescopic design



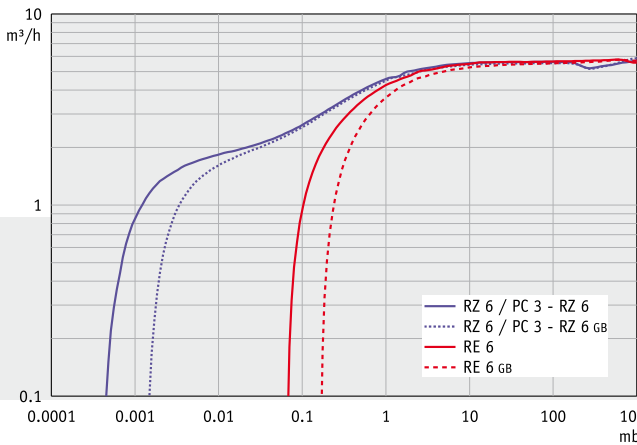
RZ 6
5.7 m³/h
2 x 10⁻³ mbar

PC 3 / RZ 6
5.7 m³/h
2 x 10⁻³ mbar

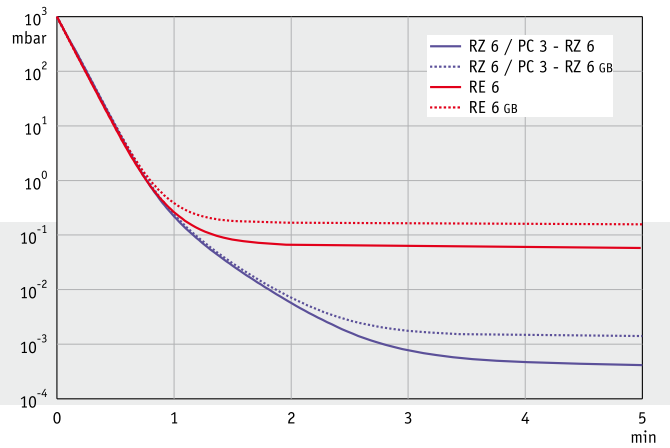


APPLICATIONS

Rotary vane pumps are used when an ultimate vacuum between a few mbar and down to 10⁻³ mbar has to be attained. Typical applications are degassing, lyophilization, fine vacuum distillation and drying chambers. The pumping unit PC 3 is the perfect choice for applications requiring special protection of pump and environment. Designed for the use in chemical laboratories the cold trap helps the pumps to handle large volumes of condensable vapors. The cold trap is metalized for extended coolant life and protected against implosion.



Pumping speed graph at 50 Hz with/without gas ballast



Pump down graph at 50 Hz with/without gas ballast (10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		RE 6	RZ 6
Number of stages		1	2
Max. pumping speed at 50/60 Hz	m ³ /h	5.7/6.8	5.7/6.8
Ultimate partial vacuum (abs.)	mbar	1 × 10 ⁻¹	4 × 10 ⁻⁴
Ultimate vacuum (abs.)	mbar	1 × 10 ⁻¹	2 × 10 ⁻³
Ultim. vac. (abs.) with gas ballast	mbar	6 × 10 ⁻¹	1 × 10 ⁻²
Water vapor tolerance with gas ballast	mbar	40	40
Oil capacity (B-Oil) min./max.	l	0.36/0.93	0.34/0.73
Inlet connection		Small flange KF DN 16	Small flange KF DN 16
Outlet connection		Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Rated motor power	kW	0.3	0.3
Rated motor speed at 50/60 Hz	min ⁻¹	1500/1800	1500/1800
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	370 x 142 x 207	370 x 142 x 207
Weight, approx.	kg	15.4	16.4

ORDERING INFORMATION RE 6

230 V ~ 50-60 Hz	CEE	697160
230 V ~ 50-60 Hz	CH, CN	697161
230 V ~ 50-60 Hz	UK	697162
120 V ~ 60 Hz	US	697163
100-120 V ~ 50-60 Hz		
200-230 V ~ 50-60 Hz*	US	697166**

*With NRTL certification for Canada and the USA

RE 6, RZ 6 + Perfluoropolyether Oil

on request

▶ pg. 140

**Country specific power cable, please order separately if needed ▶ pg. 185

ACCESSORIES

- Stainless steel tubing KF DN 16 (1000 mm: 673336)
- Separator inlet side AK R 5/6 (698006)
- Oil mist filter FO R 2/2.5/5/6 (698003)
- Package fine vacuum control KF DN 16 (635983)
- Rubber vacuum tubing DN 8 mm (686001)
- Small flange KF DN 16 with hose nozzle DN 8-10 mm (662806)

ITEMS SUPPLIED

Pump oil filled and completely mounted, ready for use, with manual.

ORDERING INFORMATION RZ 6

230 V ~ 50-60 Hz	CEE	698130
230 V ~ 50-60 Hz	CH, CN	698131
230 V ~ 50-60 Hz	UK	698132
120 V ~ 60 Hz	US	698133
400 V ~ 50 Hz 3 Ph.	CEE	698135
100-120 V ~ 50-60 Hz		
200-230 V ~ 50-60 Hz*	US	698136**

*With NRTL certification for Canada and the USA

ORDERING INFORMATION PC 3 / RZ 6

230 V ~ 50-60 Hz	CEE	699893
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RZ 6 +FO +VS 16

230 V ~ 50-60 Hz	CEE	698039
230 V ~ 50-60 Hz	CH, CN	698009

RZ 6 +FO +VS 16 +Set DCP+VSP 3000

230 V ~ 50-60 Hz	CEE	698150
230 V ~ 50-60 Hz	CH, CN	698151

ROTARY VANE PUMP RE 9, RZ 9 AND PUMPING UNIT PC 3 WITH RZ 9

■ The powerful mid-size one-stage RE 9 and two-stage RZ 9 rotary vane pumps are the ideal solution for a wide range of laboratory and process applications that require high pumping speed. The PC 3 rotary vane pumping unit, with the GKF 1000i cold trap at the inlet, helps the pump to handle large amounts of condensable vapors. The PC 3 pumping unit is compact, user-friendly, and well-arranged, with an oil mist filter at the outlet, a valve, and a T-connection for a vacuum gauge.

PERFORMANCE FEATURES

- very high flow rates even at vacuum levels approaching ultimate vacuum
- high water vapor tolerance due to efficient gas ballast; very good ultimate vacuum even with gas ballast
- vacuum-tight at switch-off; external anti-suckback valve not needed
- large oil volume: Long intervals between oil changes
- ease of maintenance due to telescopic design



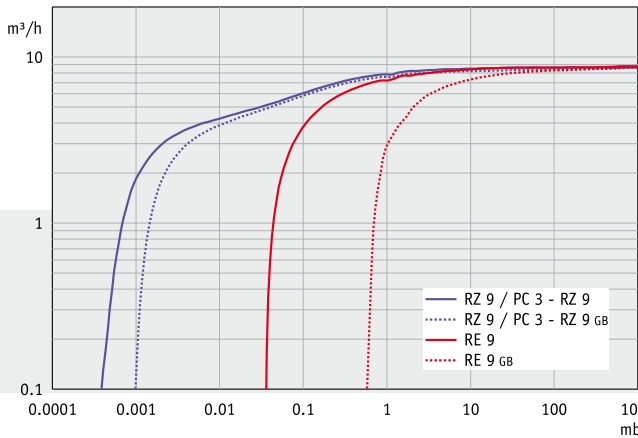
RZ 9
8.9 m³/h
2 x 10⁻³ mbar



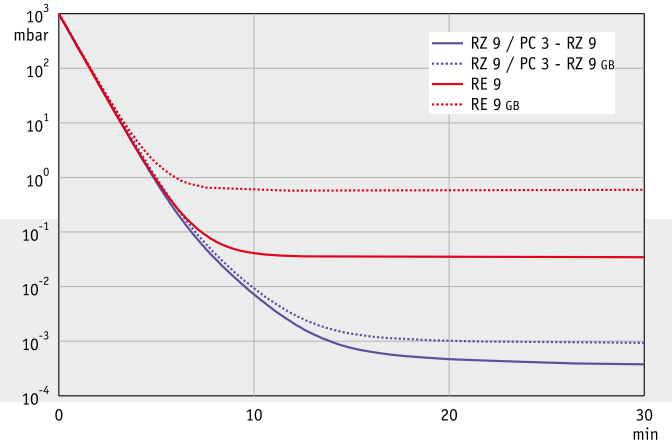
PC 3 / RZ 9
8.9 m³/h
2 x 10⁻³ mbar

APPLICATIONS

Typical applications are lyophilization, fine vacuum distillation, drying chambers, fast evacuation of vessels, and the pumping of large amounts of vapor. The PC 3 pumping unit is the perfect choice for applications requiring special protection of pump and environment. Designed for the use in chemical laboratories the cold trap helps the pump to handle large amounts of condensable vapors. The cold trap is metalized for extended coolant life and protected against implosion.



Pumping speed graph at 50 Hz with/without gas ballast



Pump down graph at 50 Hz with/without gas ballast (100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		RE 9	RZ 9
Number of stages		1	2
Max. pumping speed at 50/60 Hz	m ³ /h	8.9/10.2	8.9/10.2
Ultimate partial vacuum (abs.)	mbar	1 × 10 ⁻¹	4 × 10 ⁻⁴
Ultimate vacuum (abs.)	mbar	1 × 10 ⁻¹	2 × 10 ⁻³
Ultim. vac. (abs.) with gas ballast	mbar	6 × 10 ⁻¹	1 × 10 ⁻²
Water vapor tolerance with gas ballast	mbar	40	40
Oil capacity (B-Oil) min./max.	l	0.4/1.4	0.2/0.8
Inlet connection		Small flange KF DN 25	Small flange KF DN 25
Outlet connection		Small flange KF DN 25	Small flange KF DN 25
Rated motor power	kW	0.37	0.37
Rated motor speed at 50/60 Hz	min ⁻¹	1500/1800	1500/1800
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	460 x 152 x 232	460 x 152 x 232
Weight, approx.	kg	21.4	24.2

ORDERING INFORMATION RE 9

230 V ~ 50-60 Hz	CEE	697170
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ORDERING INFORMATION RZ 9

230 V ~ 50-60 Hz	CEE	698140
230 V ~ 50-60 Hz	CH, CN	698141
230 V ~ 50-60 Hz	UK	698142
120 V ~ 60 Hz	US	698143
400 V ~ 50 Hz 3 Ph.	CEE	698145

ORDERING INFORMATION PC 3 / RZ 9

230 V ~ 50-60 Hz	CEE	699895
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ACCESSORIES

- Stainless steel tubing KF DN 25 (1000 mm: 673337)
- Separator inlet side AK R 8/9/16 (698007)
- Oil mist filter FO R 8/9/16 (698017)
- Inline oil filter HF R 8/9/16 (698010)
- Package fine vacuum control KF DN 25 (635982)

ITEMS SUPPLIED

Pump oil filled and completely mounted, ready for use, with manual.

ROTARY VANE PUMP RE 16, RZ 16 AND PUMPING UNIT PC 3 WITH RZ 16

■ These powerful rotary vane pumps are the largest of the VACUUBRAND family and are designed for pumping large volumes of gases or evacuation of vessels. The PC 3 rotary vane pumping unit, with the GKF 1000i cold trap at the inlet, helps the pump to handle large amounts of condensable vapors. The PC 3 pumping unit is compact, user-friendly, and well arranged with oil mist filter at the outlet, a valve, and a T-connection for a vacuum gauge.

PERFORMANCE FEATURES

- very high flow rates even at vacuum levels approaching ultimate vacuum
- high water vapor tolerance due to efficient gas ballast; very good ultimate vacuum even with gas ballast
- vacuum-tight at switch-off; external anti-suckback valve not needed
- large oil volume: Long intervals between oil changes
- ease of maintenance due to telescopic design



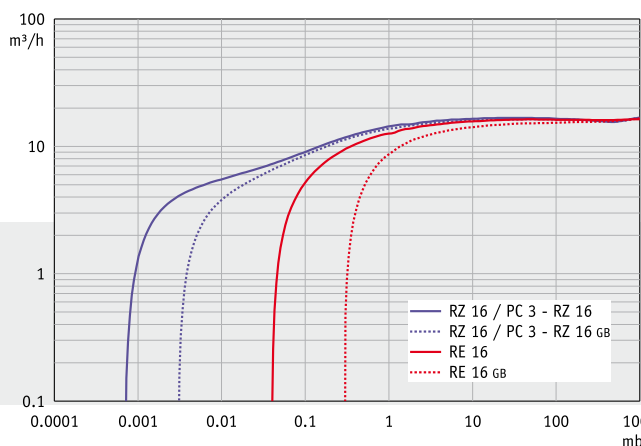
RZ 16
16.6 m³/h
2 x 10⁻³ mbar

PC 3 / RZ 16
16.6 m³/h
2 x 10⁻³ mbar

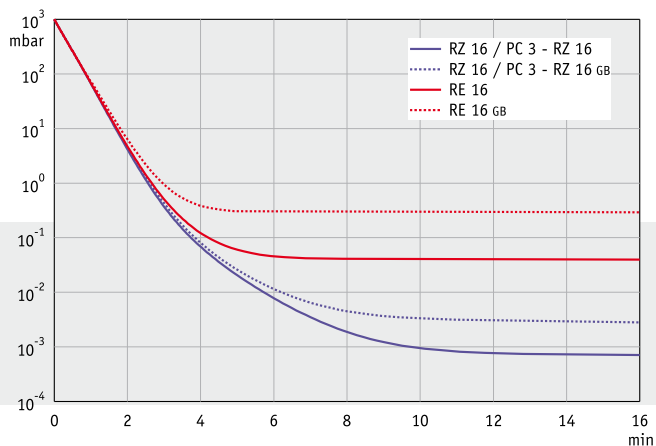


APPLICATIONS

Typical applications are lyophilization up to pilot plants or small-scale production, fine vacuum distillation, and fast evacuation of larger vessels. The PC 3 pumping unit is the perfect choice for applications requiring special protection of pump and environment. Designed for the use in chemical laboratories the cold trap helps the pumps to handle large volumes of condensable vapors. The cold trap is metalized for extended coolant life and protected against implosion.



Pumping speed graph at 50 Hz with/without gas ballast



Pump down graph at 50 Hz with/without gas ballast (100 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		RE 16	RZ 16
Number of stages		1	2
Max. pumping speed at 50/60 Hz	m ³ /h	16.6/19.1	16.6/19.1
Ultimate partial vacuum (abs.)	mbar	1 × 10 ⁻¹	4 × 10 ⁻⁴
Ultimate vacuum (abs.)	mbar	1 × 10 ⁻¹	2 × 10 ⁻³
Ultim. vac. (abs.) with gas ballast	mbar	6 × 10 ⁻¹	1 × 10 ⁻²
Water vapor tolerance with gas ballast	mbar	40	40
Oil capacity (B-Oil) min./max.	l	0.3/1.0	0.5/1.0
Inlet connection		Small flange KF DN 25	Small flange KF DN 25
Outlet connection		Small flange KF DN 25	Small flange KF DN 25
Rated motor power	kW	0.55	0.55
Rated motor speed at 50/60 Hz	min ⁻¹	1500/1800	1500/1800
Degree of protection		IP 40	IP 40
Dimensions (L x W x H), approx.	mm	505 x 152 x 232	545 x 152 x 232
Weight, approx.	kg	25.2	29

ORDERING INFORMATION RE 16

230 V ~ 50-60 Hz	CEE	697080
230 V ~ 50-60 Hz	CH, CN	697086
230 V ~ 50-60 Hz	UK	697087

ORDERING INFORMATION RZ 16

230 V ~ 50-60 Hz	CEE	698050
230 V ~ 50-60 Hz	CH, CN	698056
230 V ~ 50-60 Hz	UK	698057
400 V ~ 50 Hz 3 Ph.	CEE	698052

ORDERING INFORMATION PC 3 / RZ 16

230 V ~ 50-60 Hz	CEE	699897
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ACCESSORIES

- Stainless steel tubing KF DN 25 (1000 mm: 673337)
- Separator inlet side AK R 8/9/16 (698007)
- Oil mist filter FO R 8/9/16 (698017)
- Inline oil filter HF R 8/9/16 (698010)
- Package fine vacuum control KF DN 25 (635982)

ITEMS SUPPLIED

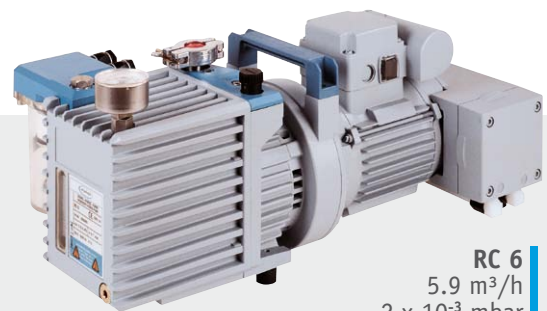
Pump oil filled and completely mounted, ready for use, with manual.

CHEMISTRY-HYBRID™ PUMP RC 6 AND PC 8 WITH RC 6

■ The RC 6 chemistry-HYBRID™ pump is a combination of a two-stage rotary vane pump and a two-stage chemistry diaphragm pump for optimized corrosion resistance. The diaphragm pump maintains the oil reservoir under vacuum in order to keep the partial pressures of solvent vapors at levels below their condensation points and to reduce largely the concentration of oxygen and corrosive gases. Therefore the RC 6 chemistry-HYBRID™ pump has a much higher solvent vapor pumping capability and resistance to aggressive gases than conventional rotary vane pumps. The pumping unit version PC 8 with RC 6 offers excellent environmental friendliness due to efficient solvent recovery.

PERFORMANCE FEATURES

- reduced internal corrosion, even when working with corrosive vapors
- oil changes typically reduced 90% or more compared with rotary vane pumps alone
- excellent environmental friendliness due to efficient solvent recovery (accessory kit PC 8 with emission condenser; or as pumping unit PC 8)
- most economical solution: In practical operation a cold trap is often no longer necessary. For large amounts of vapors a pumping unit PC 3 / RC 6 with cold trap at the inlet is available
- ease of maintenance due to telescopic design

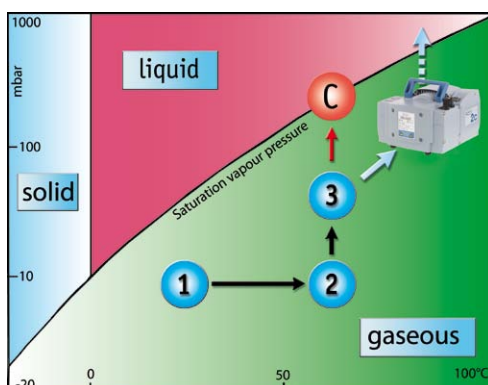


RC 6
5.9 m³/h
2 x 10⁻³ mbar



PC 8 / RC 6
5.9 m³/h
2 x 10⁻³ mbar

THERMODYNAMIC FUNCTIONAL PRINCIPLE OF THE CHEMISTRY-HYBRID™ PUMP

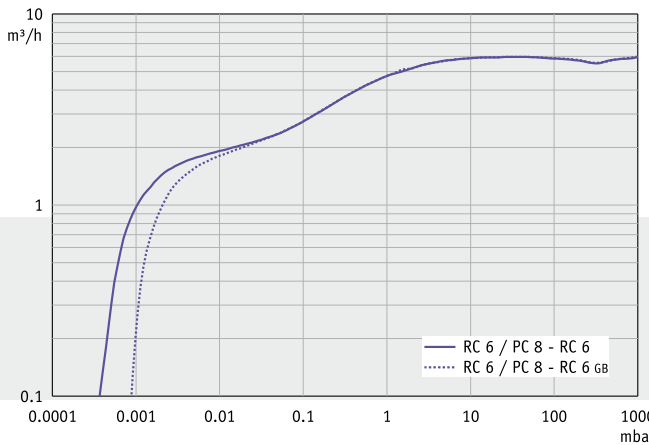


1 - Vapor is aspirated at low pressure and ambient temperature.

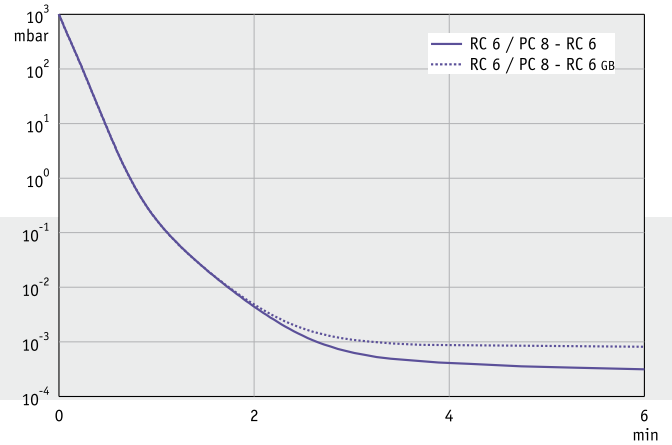
2 - Vapor is heated to approx. 60°C by heat exchange and compression within pump.

C - Condensation problem with "normal" rotary-vane pumps: On the way to atmospheric pressure, the saturation vapor pressure (transition to liquid state) is reached **inside** the oil-filled section. Result: **Condensation** and **corrosion** inside the pump; **contamination** of the oil.

3 - Chemistry-HYBRID™ Pump: The chemistry diaphragm pump evacuates the vapors from the oil reservoir of the rotary-vane pump. Under intended operating conditions, **no condensation** takes place inside the oil-filled part and, in particular, within the oil reservoir. (Any condensation taking place inside the oil-free diaphragm pump is much less problematic.) Less condensation means **less corrosion** and **cleaner oil for longer life**. For example, in the case of acid vapors, the evacuation of the oil reservoir to 20 mbar reduces corrosion by a factor of about 50!



Pumping speed graph at 50 Hz with/without gas ballast



Pump down graph at 50 Hz with/without gas ballast (10 l volume)

Pumping speeds and pump down times are only for information. Ultimate vacuum specification: See "Technical Data"

TECHNICAL DATA

		RC 6
Number of stages		2 + 2
Max. pumping speed at 50/60 Hz	m³/h	5.9/6.9
Ultimate partial vacuum (abs.)	mbar	4×10^{-4}
Ultimate vacuum (abs.)	mbar	2×10^{-3}
Ultim. vac. (abs.) with gas ballast	mbar	1×10^{-2}
Water vapor tolerance with gas ballast	mbar	>> 40 mbar
Oil capacity (B-Oil) min./max.	l	0.34/0.53
Inlet connection		Small flange KF DN 16
Outlet connection		Hose nozzle DN 8-10 mm
Rated motor power	kW	0.37
Rated motor speed at 50/60 Hz	min ⁻¹	1500/1800
Degree of protection		IP 40
Dimensions (L x W x H), approx.	mm	510 x 305 x 230
Weight, approx.	kg	24.2

ORDERING INFORMATION RC 6

230 V ~ 50-60 Hz	CEE	698560
230 V ~ 50-60 Hz	CH, CN	698561
230 V ~ 50-60 Hz	UK	698562
100-120 V ~ 50-60 Hz	US	698563

ORDERING INFORMATION PC 3 / RC 6

230 V ~ 50-60 Hz	IEC plug EN 60320	2613307*
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*Please order power cable separately

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ORDERING INFORMATION PC 8 / RC 6

230 V ~ 50-60 Hz	CEE	698570
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ACCESSORIES

- PTFE tubing KF DN 16 (1000 mm: 686031)
- Stainless steel tubing KF DN 16 (1000 mm: 673336)
- Kit PC 8 with emission condenser (699949)
- Filter element oil mist filter RC (640187)
- Package fine vacuum control KF DN 16 (635983)
- Rubber vacuum tubing DN 8 mm (686001)
- Small flange KF DN 16 with hose nozzle DN 8-10 mm (662806)

ITEMS SUPPLIED

Pump completely mounted, ready for use after oil filling (bottle 0.5 l enclosed), with manual.

OILS FOR ROTARY VANE PUMPS

■ Oils for rotary vane pumps have to meet high requirements, especially in circumstances of continuous operation:

- low vapor pressure even at high temperatures
- excellent lubricating properties
- low oil back streaming
- excellent resistance to aging
- resistant to break-down
- minimum oxidation



■ Rotary-vane Pump Oil B

This vacuum pump oil has excellent viscosity characteristics. Its good chemical resistance, low vapor pressure as well as its better stability when pumping oxidants such as acid and alkaline vapors, makes it superior compared to standard mineral oils. This oil is used for the first filling of RE / RZ / RC series pumps.

Many pumped substances can cause deterioration of common pump oil, leading to mechanical problems. **Special oils** should be used as a prevention. **Special oils may maintain lubricating properties but provide only limited protection against corrosion. The start of the pumps at low temperatures can be impeded.**

■ Rotary-vane Pump Oil K 8

This oil is especially designed for pumping acid vapors but is very hygroscopic and has limited capacity for water vapor. The alkaline additive is consumed during operation making it necessary to change the fluid regularly - even if the pump is not used for several days. Pump oil K 8 does not have the low vapor pressure and the viscosity characteristics of pump oil type B. Pumps will therefore not reach the specified ultimate vacuum and may not start up well at temperatures < 18°C.

■ Perfluoropolyether Oil

This synthetic oil has excellent chemical resistance. Therefore it is often used for pumping strong oxidants (halogenides, nitrogen oxides, etc.). As this oil type must not be mixed with mineral oils, a pump intended for this oil should be built with it from the outset. All VACUUBRAND rotary vane pumps are available with this oil on request. For changeover of an existing pump to this oil the pump has to be completely disassembled, cleaned and refilled with perfluoropolyether oil at VACUUBRAND (on request).

- PFPE oil type I for VACUUBRAND rotary vane pumps RE 2.5, RZ 2.5, RE 6, RZ 6.
- PFPE oil type II for all VACUUBRAND rotary vane pumps.

TECHNICAL DATA	Vapor pressure (mbar) at operating temperature of pump		Flashpoint °C	Viscosity at 40°C mm ² /sec	Density at 20°C g/cm ³
	0.5l bottle	1l bottle			
Rotary-vane Pump Oil B	< 1 × 10 ⁻³		264	94	0.87
Rotary-vane Pump Oil K 8	< 5 × 10 ⁻³		249	128	0.89
Perfluoropolyether Oil TYP I	< 3 × 10 ⁻⁵		-	60	1.90
Perfluoropolyether Oil TYP II	< 3 × 10 ⁻⁵		-	60	1.89
ORDERING INFORMATION	0.5l bottle	1l bottle	5l canister	20l canister	200l barrel
Rotary-vane Pump Oil B	-	687010	687011	687012	687013
Rotary-vane Pump Oil K 8	-	687100	687101	687102	-
Perfluoropolyether Oil TYP I	687610 (0.3 l)	-	-	-	-
Perfluoropolyether Oil TYP II	687600	-	-	-	-

Further information at www.vacuubrand.com

PROTECT YOUR PUMP AND THE ENVIRONMENT...

...at the inlet

■ Cold traps (models SKF and GKF)

At inlet pressures below 1 mbar cold traps using dry ice or liquid nitrogen as coolant provide important protection for your pump by separating condensates and aggressive media. Cold traps using liquid nitrogen may be essential with very volatile solvents and reduce the back streaming of oil molecules into the vacuum system. Furthermore a cold trap will considerably increase the effective pumping speed for vapors.

■ Separator (AK)

Separators at the inlet protect pumps from particulates and droplets which may shorten service intervals and even reduce the lifetime and the operating performance of oil-sealed rotary vane pumps.

- direct mounting at the inlet, compact and leak-tight
- high conductance
- direct visibility of condensate through the transparent catchpot
- easy draining of condensate

...at the outlet

■ Oil mist filter (FO)

Exhaust gases from oil-sealed rotary vane pumps always carry a certain quantity of oil mist. This is extremely unpleasant, and even harmful, for those working nearby. VACUUBRAND oil mist filters separate nearly 100% of oil mist at the ultimate vacuum of the pump.

- very high degree of separation
- optimal control by transparent catchpot
- easy draining of oil
- direct mounting on the oil reservoir outlet
- integrated pressure relief valve for burst protection in case of blocked filter

... inside the pump

■ Oil return upgrade kit for R 2.5/6/9 (R 16 on request), for installation on existing oil mist filter FO

The oil return kit puts the oil collected in the oil mist filter back into the oil circuit of the vacuum pump.

- for operation at relatively high vacuum pressure or frequently aerating of the vacuum chamber
- recommended for applications with low oil contamination

■ Full-flow oil filter (HF, only for R 8/9/16)

Particles reduce the lifetime of the oil and increase service demands. The full-flow oil filters efficiently filter micro particles out of the oil. The service indicator helps to avoid unnecessary filter changes.

■ Tips to obtain the best vacuum

- use a suction line with maximum cross-section (corresponding to the pump inlet). With a smaller cross section than the pump inlet the pumping speed especially at low pressures might be severely limited.
- design the suction line between the application and the pump as short as possible. The hose length and type has a major influence on the effective pumping speed at the application.
- for high demands on chemical resistance we recommend corrugated PTFE hoses

AK AND FO

- Separators (AK) protect the vacuum pump at the inlet from particles and liquid droplets. Oil mist filters (FO) protect air, both inside and outside the laboratory, from contaminated oil mist. Both have catchpots made of plastic (PMP) with good chemical resistance.



AK R 8/9/16



FO R 2/2.5/5/6

TECHNICAL DATA		AK R 2/2.5	AK R 5/6	AK R 8/9/16
Inlet		Small flange KF DN 16	Small flange KF DN 16	Small flange KF DN 25
Outlet		directly mountable	directly mountable	directly mountable
Wetted materials		Aluminum, PMP	Aluminum, PMP	Aluminum, PMP
Volume catchpot	ml	250	250	500
Dimensions (L x W x H), approx.	mm	200 x 80 x 161	223 x 80 x 161	163 x 110 x 161
Weight, approx.	kg	0.65	0.7	1.1
For VACUUBRAND pumps		RE 2, RZ 2, RE 2.5, RZ 2.5	RE 5, RZ 5, RE 6, RZ 6	RE 8, RZ 8, RE 9, RZ 9, RE 16, RZ 16

TECHNICAL DATA		FO R 2/2.5/5/6	FO R 8/9/16
Inlet		directly mountable	directly mountable
Outlet		Hose nozzle DN 10 mm	Small flange KF DN 25
Permissible volume flow rate	m ³ /h	6	20
Wetted materials		Aluminum, PMP, fiberglass epoxy	Aluminum, PMP, fiberglass epoxy
Max. collecting volume	ml	180	195
Dimensions (L x W x H), approx.	mm	119 x 80 x 181	163 x 110 x 196
Weight, approx.	kg	0.8	1.3
For VACUUBRAND pumps		RE 2, RZ 2, RE 2.5, RZ 2.5, RE 5, RZ 5, RE 6, RZ 6	RE 8, RZ 8, RE 9, RZ 9, RE 16, RZ 16

ORDERING INFORMATION	
AK R 2/2.5	698000
AK R 5/6	698006
AK R 8/9/16	698007

ORDERING INFORMATION	
FO R 2/2.5/5/6	698003
FO R 8/9/16	698017

COLD TRAPS (MODELS SKF AND GKF)

At inlet pressures below 1 mbar cold traps using dry ice or liquid nitrogen as coolant provide important protection for your pump by separating condensates and aggressive media. Cold traps using liquid nitrogen may be essential with very volatile solvents and reduce the back streaming of oil molecules into the vacuum system. Furthermore a cold trap will considerably increase the effective pumping speed for vapors.

Particles reduce the lifetime of the oil and increase service demands. The full-flow oil filters efficiently filter micro particles out of the oil. The service indicator helps to avoid unnecessary filter changes.



SKF H 25

PERFORMANCE FEATURES COLD TRAP SKF

- sturdy, easy to clean
- easy to disassemble
- two-wall design with good conductance
- long operating time per coolant filling
- easy condensate drainage without disassembling



GKF 1000i

Cold trap GKF

- highly reflective insulation jacket for extended coolant life
- vertical window: Direct observation of condensate and coolant levels
- PTFE stopcock: Drain condensate without disassembly
- sheet metal shield for protection against external damage and implosion

Inline oil filter HF

- extended oil lifetime
- reduced service demands
- easy space-saving mounting
- simple filter change, service indicator

TECHNICAL DATA	SKF H 25	SKF H 40	GKF 1000i
Inlet	Small flange KF DN 25	Small flange KF DN 40	NS 29/32 female ground joint
Outlet	Small flange KF DN 25	Small flange KF DN 40	Glass tube 22 mm
Materials	Stainless steel, FKM, NBR	Stainless steel, FKM, NBR	Borosilicate glass, PTFE, FKM
Volume catchpot	ml 500	500	250
Coolant capacity	ml 1000	1000	1000
Typ. coolant life *	h 12 h	12 h	14 h
Dimensions (L x W x H), approx.	mm 166 x 140 x 303	166 x 140 x 319	D 148 x 580

* typical coolant change intervall for liquid N₂ at pressure < 10⁻² mbar and 20°C ambient temperature

TECHNICAL DATA	HF R 8/9/16	ORDERING INFORMATION
Nominal flow	l/h 700	SKF H 25 667051
Opening pressure service indicator	bar 1	SKF H 40 667053
Additional oil amount	l 0.35	GKF 1000i 667056
For VACUUBRAND pumps	RE 8, RZ 8, RE 9, RZ 9, RE 16, RZ 16	HF R 8/9/16 698010
		Spare filter element HF R 8/9/16 698011
		Adapter KF DN 16 / tube OD 22 mm (for GKF 1000i) 637708

Further information at www.vacuubrand.com

HIGH-VACUUM PUMPING UNIT

HP 40 B2

- High-performance, reliable vacuum equipment is essential for successful and time-saving work in many science laboratories. The VACUUBRAND high-vacuum pumping units satisfy these needs and fulfil practical requirements, while providing high vacuum to 10^{-6} mbar. These pumping units consist of an air-cooled diffusion pump, a two-stage rotary vane pump as a backing pump (either RZ 2.5 or RZ 6) and all connecting parts, including high-vacuum valve, ventilation valve and a bypass line. The pumping unit HP 40B2 with RZ 6 provides higher pumping speed in the pump down phase and is additionally equipped with an oil mist filter FO.

HP 40 B2
 1×10^{-6} mbar



PERFORMANCE FEATURES

- efficient - The powerful rotary vane backing pumps generate the necessary backing pressure so that the diffusion pump can always attain its full pumping speed and an ultimate vacuum of approx. 10^{-6} mbar (measured with pump fluid DC 704 and cold trap with liquid nitrogen).
- fast - The pumping unit has a high-vacuum valve at the inlet and a rough vacuum line (bypass). This makes it particularly efficient for rapid evacuation cycles.
- clear directions - Smaller experimental set-ups can be mounted directly on the pumping unit. A clearly visible, condensed operating diagram on the housing of the diffusion pump guides your use and helps prevent operating errors. The diffusion pump can only be switched on if the rotary vane pump is running. All valves and switches are operated from the front.
- compact, sturdy and portable - Pumps, valves and tubing are compactly mounted on a pillar stand. Due to its small overall dimensions, light weight and air cooling, the pumping unit can easily be transported to the systems to be evacuated. The high vacuum pumping units are often used as table-top pumps on laboratory benches so that short vacuum lines can be used.
- economical - The high vacuum pumping units offer outstanding energy savings due to their low power consumption.

ORDERING INFORMATION HP 40 B2

230 V ~ 50-60 Hz CEE/CH/UK 699029

ACCESSORIES HP 40 B2

Stainless steel tubing KF DN 40 (1000 mm: 673338)
 Diffusion pump oil DC 704 (0.1 l : 687300)
 Oil mist filter FO R 2/2.5/5/6 (698003)
 Vacuum gauge DCP 3000 with MPT (683175)
 Rubber vacuum tubing DN 8 mm (686001)

ORDERING INFORMATION HP 40 B2 / RZ 6

230 V ~ 50-60 Hz CEE 2612089*

*Country specific power cable, please order separately if needed ▶ pg. 185

ACCESSORIES HP 40 B2 / RZ 6

Stainless steel tubing KF DN 40 (1000 mm: 673338)
 Diffusion pump oil DC 704 (0.1 l : 687300)
 Vacuum gauge DCP 3000 with MPT (683175)
 Rubber vacuum tubing DN 8 mm (686001)

HP 40 B2 / RZ 6
 1 x 10⁻⁶ mbar

TECHNICAL DATA

	HP 40 B2	HP 40 B2 / RZ 6
Backing pump	RZ 2.5	RZ 6 + FO
Max. pumping speed of pumping unit	l/s	22
Ultimate vacuum (abs.)	mbar	1 x 10 ⁻⁶
Inlet connection	Small flange KF DN 40	Small flange KF DN 40
Outlet connection	Hose nozzle DN 8-10 mm	Hose nozzle DN 8-10 mm
Connection of vacuum gauge	2 x small flange KF DN 10	2 x small flange KF DN 10
Diffusion pump fluid (DC 704)	ml	30
Heating power	kW	0.2
Heat-up time	min	7
Dimensions (L x W x H), approx.	mm	445 x 385 x 435
Weight, approx.	kg	25.4

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual.

FLUID ASPIRATION SYSTEMS

- The compact BioChem-VacuuCenter offers the perfect solution for safe, sensitive and efficient aspiration of supernatants in all application areas. The BVC basic is intended for connection to an external vacuum source. The BVC control and the BVC professional are equipped with a high performance, chemically resistant diaphragm pump. The vacuum level and thus the suction force at the hand control can be sensitively adjusted via a touch panel. In addition, the BVC professional features a non-contact liquid level sensor and self-closing quick couplings (4l PP bottle version). All systems are available either with a vacuum-resistant, autoclavable 4l PP bottle or with a 2l borosilicate glass bottle, e.g., for working with aggressive disinfectants such as chlorine bleach. All versions are ready for connection of a second hand control.
- VHC^{pro} - Ergonomic aspiration hand set with tip holder and adapter to accept a variety of common pipettes and tips, level for manual suction control, rotary knob for permanent aspiration, with 2.5 m tubing.



FLEXIBILITY AND COMFORT

- 4l PP or 2l glass bottle - for a perfect fit with process protocols (glass version, e.g., for chlorine bleach)
- compact size with control handle - for flexible, space-saving setup with perfect ergonomics
- very low noise levels in operation - to work comfortably in daily routine
- sensitive suction power adjustment via touch panel - for sample protection and reproducible results
- vacuum pump that responds automatically to demand - no foot pedal switch needed

ECONOMIC EFFICIENCY

- powerful chemical-resistant diaphragm vacuum pump with a very long service life even when working with aggressive disinfectants - minimal costs for maintenance and spare parts
- ready to accept a second hand controller - double use for lower cost per user
- high-quality components for trouble-free operation in continuous professional use

SAFETY

- 0.2 micron protection filter - high protection against contamination of the environment
- hand controller with flow-through suction tube - no contamination of handle with aspirated media
- collection flask made of PP or coated borosilicate glass - completely autoclavable, with 0.2 micron protection filter
- 2l borosilicate glass flask for high chemical resistance, with splinter-proof coating for safety and leakage protection
- BVC professional includes liquid-level sensor to prevent aspiration of liquids into pump. Self-closing couplings (4l PP bottle version) for safe removal of bottle for change and transport

FLUID ASPIRATION SYSTEM

BIOCHEM-VACUUCENTER BVC BASIC

■ The BioChem-VacuuCenter BVC basic is designed for connection to an existing external vacuum source like a diaphragm pump or a vacuum network (e.g., VACUU·LAN®) and does not require electric power. The chemical-resistant mechanical vacuum controller always ensures an optimal operating vacuum. The controller opens only when needed thus limiting the gas load on the vacuum source. The evaporation of collected liquid is minimized. The inlet tubing integrated in the bottle head reduces aerosol and foam formation and ensures a long service life of the hydrophobic protection filter. The aspiration system is available either as BVC basic with 4l PP bottle or as BVC basic G with 2l coated borosilicate glass bottle.

PERFORMANCE FEATURES

- mechanical vacuum regulator to provide optimum working vacuum and minimize the vapor load on the vacuum network
- stable base and electricity-free operation for convenience
- autoclavable collection bottle designed to reduce aerosol and foam formation; autoclavable quick-couplings available as accessory
- aspiration hand set VacuuHandControl (VHC^{PRO}) with flow-through suction tube - no contamination of handle by aspirated media
- hydrophobic 0.2 micron sterilizable filter - contamination risks for the vacuum pumping system are greatly reduced; autoclavable as complete unit together with the collection bottle



BVC basic

BVC basic

With 4l PP collection bottle for general aspiration tasks, completely autoclavable together with a 0.2 micron protection filter

BVC basic G

With 2l borosilicate glass collection flask with splinter-proof coating and leakage protection, with high chemical resistance for aggressive disinfectants like chlorine bleach; completely autoclavable together with 0.2 micron protection filter.

TECHNICAL DATA

Vacuum pump		-
Dimensions (L x W x H), approx.	mm	250 x 200 x 490
Weight, approx.	kg	2.8

ORDERING INFORMATION	BVC basic	BVC basic G
	727000	727100

ITEMS SUPPLIED

Complete fluid aspiration system for existing vacuum source, with automatic vacuum control, hose nozzle DN 6/10 mm for connection to a vacuum supply, aspiration hand set VacuuHandControl VHC^{PRO}, collection bottle, protection filter and manual.

FLUID ASPIRATION SYSTEM

BIOCHEM-VACUUCENTER BVC CONTROL

■ The BioChem-VacuCenter BVC control serves for efficient and convenient aspiration of supernatants. The vacuum level - and thus the suction force - is exactly adjustable by the electronic touch panel and allows a sensitive and reproducible operation. The chemically resistant diaphragm vacuum pump is automatically turned on and off as needed, which reduces the low noise level even further. The BVC control is available in two complete equipment options with different collection flasks. The 2l borosilicate glass bottle with a protective coating has a very high chemical resistance. For larger amounts of liquids the 4l bottle of unbreakable polypropylene (PP) is used. The smooth surfaces allow an easy cleaning of the systems.

PERFORMANCE FEATURES

- powerful and long-lasting chemistry diaphragm pump for universal economical use
- extremely compact, space saving and low noise and thus the ideal tool in the workplace
- easy operation due to electronically adjustable suction power via touch panel, for strong or sensitive suction
- autoclavable collection bottle designed to reduce aerosol and foam formation; with hydrophobic protection filter 0.2 µm, autoclavable quick-couplings available as accessory
- ready to accept a second aspiration hand controller (VHC^{pro}) to support two users



BVC control

BVC control

With 4l PP collection bottle for general aspiration tasks, completely autoclavable together with a 0.2 micron protection filter

BVC control G

With 2l borosilicate glass collection flask with splinter-proof coating and leakage protection, with high chemical resistance for aggressive disinfectants like chlorine bleach; completely autoclavable together with 0.2 micron protection filter

TECHNICAL DATA

Vacuum pump		ME 1C
Ultimate vacuum (abs.)	mbar	150
Dimensions (L x W x H), approx.	mm	408 x 194 x 500
Weight, approx.	kg	7.3

ORDERING INFORMATION BVC control

230 V ~ 50-60 Hz	CEE	727200
230 V ~ 50-60 Hz	CH, CN	727201
230 V ~ 50-60 Hz	UK	727202
100-120 V ~ 50-60 Hz	US	727203

ORDERING INFORMATION BVC control G

230 V ~ 50-60 Hz	CEE	727300
230 V ~ 50-60 Hz	CH, CN	727301
230 V ~ 50-60 Hz	UK	727302
100-120 V ~ 50-60 Hz	US	727303

ITEMS SUPPLIED

Fluid aspiration system complete with powerful chemistry diaphragm pump, collection bottle, adjustable suction power control via touch panel, aspiration hand set VHC^{pro} and protection filter, ready for use with manual.

FLUID ASPIRATION SYSTEM

BIOCHEM-VACUUCENTER BVC PROFESSIONAL

■ The BioChem-VacuuCenter BVC professional serves for aspiration and disposal of biological fluids, providing outstanding levels of comfort and safety for working with biological and biohazardous materials. A non-contact sensor monitors the liquid level in the collection bottle electronically and prevents overfilling. A disinfection routine allows the suction of disinfectants through aspiration hand set and tubing after switching off the pump, and so supports demanding safety protocols. The BVC professional with 4l PP bottle with self-closing quick couplings minimizes risk in transporting hazardous waste and of contamination in the workplace. The version with coated 2l borosilicate glass bottle allows you to work with aggressive disinfectants like chlorine bleach.

PERFORMANCE FEATURES

- with all the advantages of the BVC control
- non-contact sensor for electronic monitoring of the liquid level in the collection bottle
- disinfection routine for the suction tubing for drawing in disinfectant after switching off the pump
- self-closing quick couplings (as accessory to the BVC professional G) for convenient and safe bottle change, e.g., for work with biohazards
- for professional work and a perfect fit for required safety protocols



BVC professional

BVC professional

4l PP collection flask, with self-closing quick couplings made of PVDF, completely autoclavable together with protection filter 0.2 micron

BVC professional G

With 2l borosilicate glass collection flask with splinter-proof coating and leakage protection, with high chemical resistance for aggressive disinfectants like chlorine bleach; completely autoclavable together with 0.2 micron protection filter.

TECHNICAL DATA

Vacuum pump		ME 1C
Ultimate vacuum (abs.)	mbar	150
Dimensions (L x W x H), approx.	mm	408 x 194 x 500
Weight, approx.	kg	7.3

ORDERING INFORMATION BVC professional

230 V ~ 50-60 Hz	CEE	727400
230 V ~ 50-60 Hz	CH, CN	727401
230 V ~ 50-60 Hz	UK	727402
100-120 V ~ 50-60 Hz	US	727403

ORDERING INFORMATION BVC professional G

230 V ~ 50-60 Hz	CEE	727500
230 V ~ 50-60 Hz	CH, CN	727501
230 V ~ 50-60 Hz	UK	727502
100-120 V ~ 50-60 Hz	US	727503

ITEMS SUPPLIED

Fluid aspiration system complete with powerful chemistry diaphragm pump, collection bottle, adjustable suction power control via touch panel, non-contact liquid level sensor, quick couplings (4l PP version), aspiration hand set VHC^{PRO} and protection filter, ready for use with manual.

ACCESSORIES

VacuHandControl VHC^{pro}

688061



Ergonomic aspiration hand set with tip holder and adapter to accept a variety of common pipettes and tips, level for manual suction control, rotary knob for permanent aspiration, with 2.5 m tubing

Stand for VHC^{pro} suction handset

635680



The stainless steel stand for the VHC^{pro} enables to place the tipped suction handset conveniently and stable during work with cell cultures

Spare tubing for VHC / VHC^{pro}

636156



Silicone tubing (minimum order quantity 2m)

Adapter for pipette tips with tip ejector

635638



This adapter is designed for pipette tips 2 - 200 µl and has got a tip ejector to remove the used pipette tip

Adapter for eight pipette tips

635679



This adapter allows parallel operation of eight pipette tips (size 2 - 200 µl or 3-500 µl). It is designed to match the dimensions of microplates with tip ejector to remove the used pipette tips

Protection filter 0.2 micron

638266



Hydrophobic 0.2 micron protection filter, to protect pump system and work environment; autoclavable up to 20 times

Extension kit second VHC / VHC^{pro} connection

699943



Hose nozzle and inlet tube for minimized foam and aerosol formation (VHC / VHC^{pro} not included)

Quick coupling VHC / VHC^{pro} - bottle

635807



Quick coupling made of PVDF, with adapter to connect a VHC / VHC^{pro} to a collection bottle, very good chemical resistance, complete with inlet tube for minimized foam and aerosol formation, autoclavable

Quick coupling set connection bottle - pump

635808



Quick coupling made of PVDF, to connect a collection bottle to a pump unit BVC or to a BVC basic, very good chemical resistance, autoclavable. When disconnected, the collection bottle closes vacuum tight

BVC 4l bottle PP

635810



4l heavy-walled, vacuum-proof collection bottle with high chemical resistance (PP), special bottle head for minimized foam and aerosol formation, with hose nozzle for VacuuHandControl VHC / VHC^{pro}

BVC 2l bottle glass

635809



2l borosilicate glass collection bottle with high chemical resistance, with splinter-proof coating, special bottle head for minimized foam and aerosol formation

Adapter for 2l glass bottle

635839



Holder for 2 liter glass bottle for BVC control or BVC professional (included in BVC control G and BVC professional G)

BVC shuttle

696880




The BVC shuttle is a mobile underframe for all models BVC control and BVC professional. It serves to pull out the BVC easily from under the safety cabinet for cleaning and removal of bottle for change

VACUUM GAUGES AND VACUUM CONTROLLERS

■ The DCP 3000 gauges (as CVC 3000, CVC 3000 detect and VNC 2 controllers) as well as the recommended accessories use VACUU·BUS® as their communication system. Uniform plug and socket connections make the system flexible and allow extension of the lines up to 30 m. The measuring instruments and components are completely self-configuring. Components connected to the gauges and controllers are automatically recognized, configured and supervised. At the DCP 3000 up to eight external vacuum sensors (four VSK 3000 and four VSP 3000) can be connected for simultaneous monitoring on the spot. Additionally the DCP 3000 can be used for relative pressure measurements (using VSK 3000 vacuum sensors as a reference) and as a data logger for up to 32,000 measurement values. For high vacuum measurements the DCP 3000 allows the connection with the combined Penning/Pirani gauge head MPT.



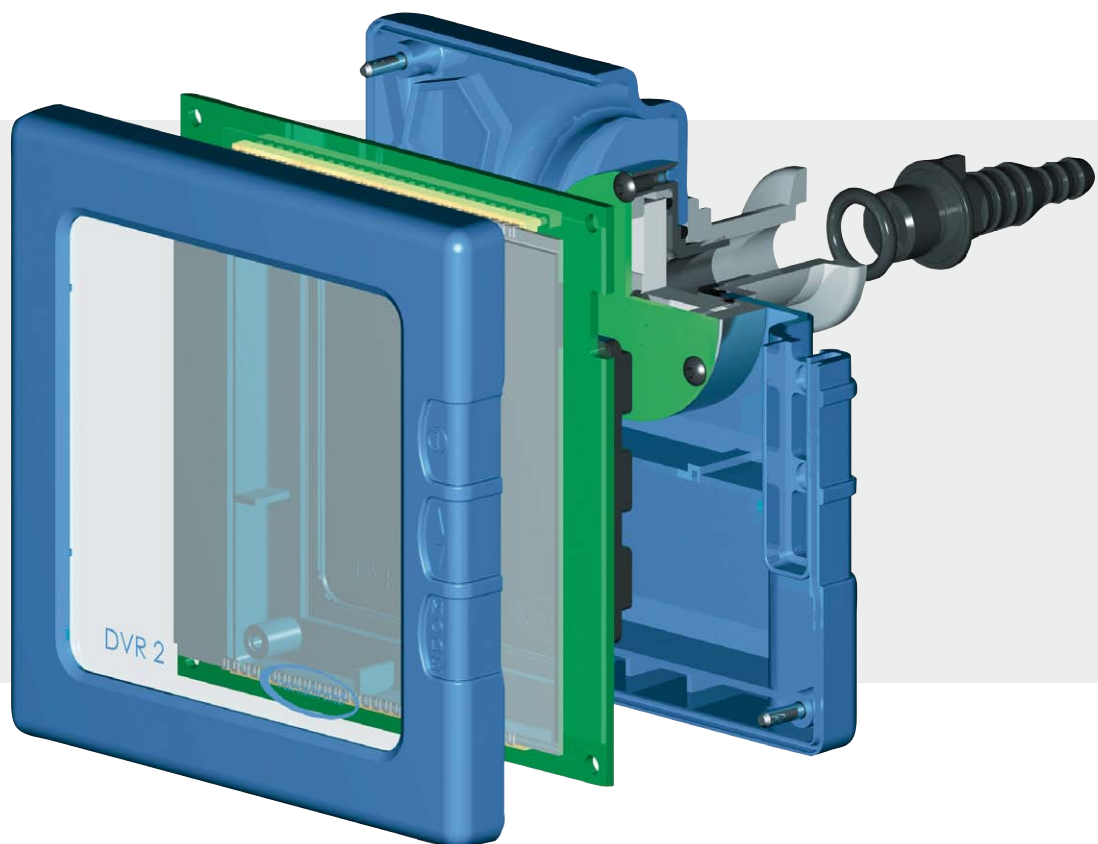
■ The final touch is put on this range of products with an ATEX-approved measuring instrument for use in locations with and measuring of potentially explosive atmospheres per ATEX category 2.

Vacuum gauges	Measurement principle	Measuring range	
DVR 2	Ceramic diaphragm	1080 - 1 mbar (hPa), 810 - 1 torr	▶ pg. 153
DVR 3	Ceramic diaphragm 	1080 - 1 mbar (hPa), 810 - 1 torr	▶ pg. 154
Set DCP 3000 + VSK 3000	Ceramic diaphragm	1080 - 0.1 mbar (hPa), 810 - 0.1 torr	▶ pg. 155
Set DCP 3000 + VSP 3000	Thermal conductivity (Pirani), chemically resistant plastics / ceramics	$1 \times 10^3 - 1 \times 10^{-3}$ mbar (hPa), $7.5 \times 10^2 - 1 \times 10^{-3}$ torr	▶ pg. 156
Set DCP 3000 + MPT	Combined thermal conductivity (Pirani) / cold cathode (Penning)	1000 - 5×10^{-9} mbar (hPa), 750 - 3.7×10^{-9} torr	▶ pg. 156

Vacuum controller			
CVC 3000	Ceramic diaphragm	1080 - 0.1 mbar (hPa), 810 - 0.1 torr	▶ pg. 158
CVC 3000 detect	Ceramic diaphragm	1080 - 0.1 mbar (hPa), 810 - 0.1 torr	▶ pg. 160
VNC 2	Ceramic diaphragm	1100 - 1 mbar (hPa), 825 - 1 torr	▶ pg. 161

VACUUM GAUGES

- State-of-the-art vacuum gauges for laboratory and industrial operation have to meet high standards in terms of gauge head resistance to chemicals, reliability in rugged applications and operator-friendly interfaces. VACUUBRAND has a comprehensive range of electronic measuring instruments for the range of atmospheric pressure to 5×10^{-9} mbar.
- We use a capacitive ceramic diaphragm gauge head in the rough vacuum range from atmospheric pressure to 0.1 mbar that measures independently of the type of gas and is exceptionally resistant to chemicals. It also has outstanding measuring accuracy, very low temperature dependence and excellent long-term stability.



- Pirani vacuum sensors are preferably used in the lower rough and fine vacuum ranges from below 10 to 10^{-3} mbar. They measure the heat conductivity of a gas that depends on the gas density and, therefore, pressure. The accuracy of this measuring process is best in the range of 10 to 10^{-2} mbar. The indicated pressure depends on the type of gas and deviates from the air adjustment (at the factory) depending upon the heat conductivity of the specific gas being measured. The new Pirani vacuum sensor VSP 3000 features an exceptional chemical resistance and robustness compared with conventional Pirani sensors (with metallic filament) as its wetted parts are made of special plastics and ceramics.
- Cold cathode vacuum gauges ("Penning") are ionization gauges for the range 10^{-2} mbar to 5×10^{-9} mbar. They measure the gas density via a discharge current and therefore gas type dependent. They are advantageously combined with a Pirani gauge with automatic switching to it in the range above 10^{-2} mbar to atmospheric pressure. Due to their limited chemical resistance they are preferably used in clean high vacuum applications. VACUUBRAND offers for such applications the vacuum gauge DCP 3000 with the combined Pirani and cold cathode gauge head MPT.

VACUUM GAUGE

DVR 2

■ The DVR 2 is a fully electronic, versatile vacuum gauge for the measuring range from atmospheric pressure to 1 mbar. It has an integrated ceramic diaphragm vacuum sensor with capacitive readout. The sensor measures independently of the type of gas and is exceptionally resistant to chemicals. It features outstanding measuring accuracy, very low temperature dependence and excellent long-term stability. A particular advantage of the DVR 2 gauge is its cordless, battery-powered operation. Its simple operation and the combined digital / analog vacuum reading for precise readout and quick trend detection, respectively, make the DVR 2 very versatile.

PERFORMANCE FEATURES

- enhanced battery life due to choosable shutdown time and sampling rate, typical battery life one year continuous operation
- large analog and digital vacuum display: Quick trend detection, precise readout
- user-selectable pressure units (mbar, hPa, Torr)
- with adjustable support rod for stand mounting operation
- capacitive alumina ceramic diaphragm vacuum sensor with excellent chemical resistance, accuracy and long term stability



TECHNICAL DATA

Upper measuring limit	mbar/hPa / torr	1080 / 810
Lower measuring limit	mbar/hPa / torr	1 / 1
Measurement principle		Ceramic diaphragm (alumina), capacitive, gas indep., absolute pressure
Measurement uncertainty		< +/- 1 mbar/hPa/torr / +/- 1 digit (after adjustment, constant temp.)
Temperature coefficient		< 0.07 mbar/hPa/0.05 torr /K
Vacuum connection		Small flange KF DN 16 and hose nozzle DN 6/10 mm
Permissible ambient temp. range storage / operation	°C	-10 - 60 / 10 - 40
Max. media temp. for continuous operation / short times	°C	40 / 80
Automatic switch-off		User-selectable: 1-1000 min (default 15 min) or continuous operation
Measurement cycle		User-selectable: Automatic or 1 x per 3s, 1 x per 1s, 3 x per 1s
Material of outer housing		Robust plastic housing with good chemical resistance
Degree of protection		IP 40
Power supply		9 V Lithium battery, 1.2 Ah Ultralife U9VL
Dimensions (L x W x H), approx.	mm	115 x 115 x 66
Weight, approx.	kg	0.375

ORDERING INFORMATION

DVR 2	682902
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ITEMS SUPPLIED

Vacuum gauge complete with integrated vacuum sensor and battery, ready for use, with support rod and manual.

ACCESSORIES

- PTFE tubing KF DN 16 (1000 mm: 686031)
- Battery 9V Lithium 1.2 Ah (612220)
- DAkKS calibration with first delivery (900214)
- DAkKS recalibration (900215)
- Rubber vacuum tubing DN 6 mm (686000)

VACUUM GAUGE

DVR 3



■ The DVR 3 is a fully electronic vacuum gauge with ATEX category 2 approval for use in areas with potentially explosive atmospheres (measured gas and environment of gauge). The DVR 3 has an integrated ceramic diaphragm vacuum sensor for the range from atmospheric pressure to 1 mbar with capacitive readout. The sensor measures independently of the type of gas and is exceptionally resistant to chemicals. It features outstanding measuring accuracy, very low temperature dependence and excellent long-term stability. A particular advantage of the DVR 3 is its cordless, battery-powered operation. Its simple operation and the combined digital / analog vacuum reading for precise readout and quick trend detection, respectively, make the DVR 3 very versatile.

PERFORMANCE FEATURES

- large analog and digital vacuum display
- mains independent power supply unit BVE 9V, with ATEX approval, mercury and cadmium free
- enhanced battery life due to automatic shutdown and variable sampling rate
- high reliability, low EMI emission level near detection limit, high degree of immunity to electromagnetic interference for use in industrial environments
- capacitive alumina ceramic diaphragm vacuum sensor with excellent chemical resistance, accuracy and long term stability



TECHNICAL DATA

ATEX-approval		II 2G Ex ia IIC T4
Upper measuring limit	mbar/hPa / torr	1080 / 810
Lower measuring limit	mbar/hPa / torr	1 / 1
Measurement principle		Ceramic diaphragm (alumina), capacitive, gas indep., absolute pressure
Measurement uncertainty		< +- 1 mbar/hPa/torr / +- 1 digit (after adjustment, constant temp.)
Temperature coefficient		< 0.07 mbar/hPa/0.05 torr /K
Vacuum connection		Small flange KF DN 16 and hose nozzle DN 6/10 mm
Permissible ambient temp. range storage / operation	°C	-10 - 60 / 10 - 40
Max. media temp. for continuous operation / short times	°C	40 / 80
Automatic switch-off		User-selectable: 1-1000 min (default 15 min) or continuous operation
Measurement cycle		User-selectable: Automatic or 1 x per 3s, 1 x per 1s, 3 x per 1s
Material of outer housing		Robust plastic housing (conductive) with good chemical resistance
Degree of protection		IP 40
Power supply		Power supply unit BVE 9 V, ATEX - certification II 2G Ex ia IIC T5
Dimensions (L x W x H), approx.	mm	116 x 116 x 66
Weight, approx.	kg	0.43

ORDERING INFORMATION

DVR 3 682903

ITEMS SUPPLIED

Vacuum gauge complete with integrated vacuum sensor and power supply unit, ready for use, with manual.

ACCESSORIES

- PTFE tubing KF DN 16 (1000 mm: 686031)
- Stainless steel tubing KF DN 16 (1000 mm: 673336)
- Power supply unit BVE 9 V (637986)
- DAkKS calibration with first delivery (900214)
- DAkKS recalibration (900215)

VACUUM GAUGE

DCP 3000 WITH VSK 3000

■ The DCP 3000 is an outstanding vacuum gauge for rough and fine vacuum. A large illuminated display shows the measured values of all sensors by a simple turn of a button. The VSK 3000 vacuum sensor with ceramic diaphragm measures from atmospheric pressure down to 0.1 mbar. It displays absolute pressure independent of gas type, is very corrosion resistant and has an outstanding accuracy and long term stability. Simultaneous connection of up to eight vacuum sensors allows flexible measuring on the spot. The DCP 3000 communicates with external components via the VACUU·BUS® digital bus system. It is characterized by fully automatic configuration, unified plug connections and cable lengths of up to 30 m. In addition the DCP 3000 offers relative pressure measurements (VSK 3000 as reference) and a data logger feature for up to 32,000 data values.



PERFORMANCE FEATURES

- up to four gauge heads VSK 3000 (Atm. - 0.1 mbar) and four VSP 3000 (Atm. - 10^{-3} mbar) can be simultaneously connected
- VSK 3000 capacitive alumina ceramic diaphragm vacuum sensor with very high chemical resistance, offers gas-type independent absolute pressure measurement
- outstanding measuring accuracy, temperature and long term stability
- rugged, splash-water proof vacuum sensor, also for rough operating conditions
- relative pressure measurement option (VSK 3000) and data logger feature (up to 32,000 values, readout via RS 232C)



TECHNICAL DATA

Vacuum sensor		VSK 3000
Cable length of vacuum sensor	m	2
Upper measuring limit	mbar/hPa / torr	1080 / 810
Lower measuring limit	mbar/hPa / torr	0.1 / 0.1
Measurement principle		Ceramic diaphragm (alumina), capacitive, gas indep., absolute pressure
Measurement uncertainty		< +/- 1 mbar/hPa/torr / +/- 1 digit (after adjustment, constant temp.)
Temperature coefficient		< 0.07 mbar/hPa/0.05 torr /K
Vacuum connection		Small flange KF DN 16, PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm
Permissible ambient temp. range storage / operation	°C	-10 - 60 / 10 - 40
Max. media temp. for continuous operation / short times	°C	40 / 80
Material of outer housing		Robust plastic housing with good chemical resistance
Degree of protection, front side of display unit		IP 42
Dimensions of display unit (L x W x H)	mm	144 x 124 x 114
Weight of display unit	kg	0.44

ORDERING INFORMATION Set DCP 3000 + VSK 3000

100-230 V ~ 50-60 Hz CEE/CH/UK/US/AUS/CN Ex* 683170

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ITEMS SUPPLIED

Vacuum gauge with external vacuum sensor VSK 3000, ready for operation, with kit hose nozzle DN 6/10 mm, wall-plug power supply and manual.

ACCESSORIES

- PTFE tubing KF DN 16 (1000 mm: 686031)
- DAkKS calibration with first delivery (900214)
- DAkKS recalibration (900215)
- Vent valve VBM-B (674217)
- Vacuum sensor VSK 3000 (636657)
- Vacuum sensor VSP 3000 (636163)
- Rubber vacuum tubing DN 6 mm (686000)
- Rubber vacuum tubing DN 8 mm (686001)

VACUUM GAUGE

DCP 3000 WITH VSP 3000

- The DCP 3000 is an outstanding vacuum gauge with large illuminated display. The VSP 3000 vacuum sensor is based on thermal conductivity (Pirani) and offers a wide measurement range from atmospheric pressure down to 10^{-3} mbar. The wetted parts are made of chemically resistant plastics (PBT, PUR) and alumina ceramics. It features a much better chemical resistance and ruggedness than conventional Pirani sensors with their fragile metallic spiral-wound filament. Simultaneous connection of up to eight vacuum sensors allows flexible measuring on the spot. The DCP 3000 communicates with external components via the VACUU·BUS® digital bus system. It is characterized by fully automatic configuration, unified plug connections and cable lengths of up to 30 m. In addition the DCP 3000 offers relative pressure measurements (VSK 3000 as reference) and a data logger feature for up to 32,000 data values.
- For the range from atmospheric pressure down to high vacuum (5×10^{-3} mbar) the DCP 3000 is also available with the combined thermal conductivity / cold cathode (Pirani / Penning) vacuum sensor MPT.



PERFORMANCE FEATURES

- up to four gauge heads VSK 3000 (Atm. - 0.1 mbar) and four VSP 3000 (Atm. - 10^{-3} mbar) can be simultaneously connected
- brand new rugged VSP 3000 vacuum sensor made of plastics and ceramics with high chemical resistance
- rugged, splash-water proof VSP 3000 vacuum sensor, also for rough operating conditions
- VSP 3000 with wide measurement range from atmospheric pressure to fine vacuum
- for vacuum control from atmospheric pressure down to 10^{-3} mbar combine the CVC 3000 vacuum controller with gauge head VSP 3000 and vacuum solenoid valves of type VV-B. Suitable complete packages for fine vacuum control are available.



TECHNICAL DATA Set DCP 3000 + VSP 3000

Vacuum sensor		VSP 3000
Cable length of vacuum sensor	m	2
Upper measuring limit	mbar/hPa / torr	1×10^3 / 7.5×10^2
Lower measuring limit	mbar/hPa / torr	1×10^{-3} / 1×10^{-3}
Measurement principle		Thermal conductivity (Pirani), chemically resistant plastics / ceramics
Measurement uncertainty		+/- 15% of indicated value in the range 0.01-10 mbar/hPa/torr
Vacuum connection		Small flange KF DN 16 and hose nozzle DN 6/10 mm
Wetted materials		Alumina ceramics, PBT, PUR
Permissible ambient temp. range storage / operation	°C	-10 - 60 / 10 - 40
Degree of protection, front side of display unit		IP 42
Dimensions of display unit (L x W x H)	mm	144 x 124 x 114
Weight of display unit	kg	0.44

ORDERING INFORMATION Set DCP 3000 + VSP 3000

100-230 V ~ 50-60 Hz CEE/CH/UK/US/AUS/CN 683190

ITEMS SUPPLIED Set DCP 3000 + VSP 3000

Vacuum gauge with external vacuum sensor VSP 3000, ready for operation, with wall-plug power supply and manual.

ORDERING INFORMATION Set DCP 3000 + MPT

100-230 V ~ 50-60 Hz CEE/CH/UK/US/AUS/CN 683175

ITEMS SUPPLIED Set DCP 3000 + MPT

Vacuum gauge with external vacuum sensor MPT, ready for operation, with wall-plug power supply and manual.

ACCESSORIES

- Stainless steel tubing KF DN 16 (1000 mm: 673336)
- DAkkS calibration with first delivery (900214)
- DAkkS recalibration (900215)
- Vent valve VBM-B (674217)
- Vacuum sensor VSK 3000 (636657)
- Vacuum sensor VSP 3000 (636163)
- Vacuum sensor MPT 200 (683177)
- Rubber vacuum tubing DN 6 mm (686000)
- Rubber vacuum tubing DN 8 mm (686001)

VACUUM CONTROLLER

- A lot of applications in the laboratory call for electronic vacuum control, that is, constantly adapting the pump's volume flow rate to process requirements. The maximum volume flow rate of the unregulated pump can be changed in various ways:
 - by cyclically turning the pump on/off (with vacuum controller VNC 2 or vacuum controller CVC 3000 in conjunction with vacuum management module VMS-B)
 - by cyclically opening/closing an in-line solenoid valve (CVC 3000, CVC 3000 detect or VNC 2) or
 - by continuously adjusting the pump speed (VARIO® - pumps with CVC 3000 or VNC 2 VARIO)
- The controller can be used both in vacuum networking solutions where parameters are set once for controlling the vacuum or as a stand-alone controller. The CVC 3000 with its large display, the user-friendly full-text menus and the stable stand is also perfect for use on the lab bench.



- Many accessories can be easily connected to both controllers: A coolant valve, an external venting valve or a liquid level sensor for catchpots are often required. Communication with sensors, VARIO® - pumps, the Peltronic® and all other connected components takes place via the VACUU·BUS® control system. It is self-configuring, meaning that connected components will be automatically detected, configured and monitored by the vacuum controller. The self-configuration of the vacuum controllers due to the VACUU·BUS® system makes them especially user-friendly and rules out any mix-up of components. Chemically resistant IP 67 connectors allow the connection of many components.
- VACUU·BUS®
 - self-configuring "plug and play"
 - tight, chemically highly resistant connector plugs
 - no danger of confusion of the plugs
 - automatic connection to all VACUU·BUS® components including sensors, valves and pumps

VACUUM CONTROLLER

CVC 3000

■ Vacuum controller CVC 3000

The CVC 3000 manages vacuum processes by controlling vacuum pumps, vacuum and coolant valves and accessories. The illuminated graphical display with clear text menus (14 languages) and the jog wheel make its handling nearly self-explanatory. Depending on the model, a ceramic diaphragm vacuum sensor and venting valve are already integrated (or externally connectable). The ceramic vacuum sensor is chemically highly resistant, measures gas-type independent and accurately. This controller offers a two-point vacuum control mode via in-line solenoid valve. Ten fully configurable programs (with up to ten time and pressure steps each, and control functions such as venting and pumping) can be easily edited and stored. External valves and sensors for liquid level and vacuum down to the fine vacuum range are easy to connect and recognized automatically via the VACUU·BUS® control system. Besides the CVC 3000 enables the measurement of relative pressure with regard to a reference sensor (VSK 3000).



PERFORMANCE FEATURES

- controls vacuum, cooling water and venting to demand
- intuitive operation with turn-and-tap jog wheel and clear text menus, with integrated venting valve
- interactive communication (PC) through RS 232C serial interface
- self-configuring due to VACUU·BUS® system: valves (vacuum, venting, coolant), sensors (vacuum, liquid level), Peltronic® condenser



CVC 3000

APPLICATIONS

The vacuum controller CVC 3000 is optimized for laboratory tasks. Together with a solenoid valve it controls vacuum processes gentle and at the same time as quickly as possible. The control is carried out by switching the vacuum valve (available as accessory or straight away in a package with CVC 3000 + VV-B6C). At the CVC 3000 operating parameters can be easily adapted to the several requirements. Pressure and time settings, as well as purge times for pump and valves after application is completed, can be adjusted.

ORDERING INFORMATION CVC 3000

100-230 V ~ 50-60 Hz CEE/CH/UK/US/AUS/CN Ex* 683160
 Built-in versions upon request

ORDERING INFORMATION Paket CVC 3000 + VV-B6C

Package vacuum controller CVC 3000
 with in-line isolation valve VV-B 6C,
 VACUU·BUS, PVDF/fluoroplastics,
 100-230 V/50-60 Hz,
 plug CEE/CH/UK/US/AUS Ex* 683169
 Built-in versions upon request

With NRTL certification for Canada and the USA (with integrated sensor or VSK 3000)

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only (with integrated sensor or VSK 3000)

ACCESSORIES

- Rubber vacuum tubing DN 6 mm (686000)
- PTFE tubing DN 10/8 mm (638644)
- DAkKS calibration with first delivery (900214)
- DAkKS recalibration (900215)
- VACUU·BUS® accessories
- Vacuum sensor VSK 3000 (636657)
- In-line solenoid vacuum valve VV-B 6C (674291)
- Vacuum sensor VSP 3000 (636163)
- Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED CVC 3000

Vacuum controller complete with integrated ceramic vacuum sensor and venting valve. With wall-plug power supply, ready for use, with manual.

VACUUM CONTROL FOR ROTARY VANE PUMPS



■ CVC 3000 + VSP 3000, KF DN 16 / CVC 3000 + VSP 3000, KF DN 25

The packages enable convenient vacuum control in the fine vacuum range down to 10^{-3} mbar and consist of a CVC 3000 vacuum controller, a VSP 3000 external Pirani vacuum sensor, a VV-B 15C in-line solenoid valve and all necessary small flange components. VACUUBRAND offers two packages, one with small flanges KF DN 16, suitable, e.g., for the VACUUBRAND RE/RZ 2.5 to RE/RZ 6 rotary vane pumps or our RC 6 Chemistry-HYBRID pump; or select the small flange KF DN 25 version suitable for our RE/RZ 9 to RE/RZ 16 rotary vane pumps. The CVC 3000 runs vacuum processes by control of vacuum, venting and cooling water valves. In these packages the vacuum control is performed by opening and closing the in-line solenoid valve VV-B 15C. The controller and components are completely self-configuring and automatically checked via VACUU·BUS® communication protocol.

ORDERING INFORMATION CVC 3000 + VSP 3000, KF DN 16

100-230 V ~ 50-60 Hz CEE/CH/UK/US/AUS/CN 635983

ITEMS SUPPLIED CVC 3000 + VSP 3000, KF DN 16

- Package for fine vacuum control, consisting of:
- vacuum controller CVC 3000 (without internal vacuum sensor) with VSP 3000 and power supply
 - in-line solenoid valve VV-B 15C KF DN 16
 - T-piece KF DN 16, hose nozzle DN 10 mm (PP), clamping and sealing rings, ready for use, with manual.

ORDERING INFORMATION CVC 3000 + VSP 3000, KF DN 25

100-230 V ~ 50-60 Hz CEE/CH/UK/US/AUS/CN 635982

ITEMS SUPPLIED CVC 3000 + VSP 3000, KF DN 25

- Package for fine vacuum control, consisting of:
- vacuum controller CVC 3000 (without internal vacuum sensor) with VSP 3000 and power supply
 - in-line solenoid valve VV-B 15C KF DN 25
 - T-piece KF DN 25, hose nozzle DN 15 mm (PP), clamping and sealing rings, ready for use, with manual.



CVC 3000 + VSP 3000, KF DN 25 (+RZ 9)

TECHNICAL DATA Package fine vacuum control KF DN 16 / KF DN 25

Control range	mbar/hPa / torr	1000 / 750 - 1×10^{-3} / 1×10^{-3}
Vacuum sensor / Cable length		VSP 3000 / 2 m
Measurement principle		Thermal conductivity (Pirani), chemically resistant plastics / ceramics
Measurement uncertainty		+/- 15% of indicated value in the range 0.01-10 mbar/hPa/torr
Vacuum connection		Small flange KF DN 16 / hose nozzle DN 10 mm / Small flange KF DN 25 / hose nozzle DN 15 mm

TECHNICAL DATA CVC 3000 (Order no. 683160, with integrated vacuum sensor)

Control range	mbar/hPa / torr	1080 / 810 - 0.1 / 0.1
Measurement principle		Ceramic diaphragm (alumina), capacitive, gas indep., absolute pressure
Measurement uncertainty		< +/- 1 mbar/hPa/torr / +/- 1 digit (after adjustment, constant temp.)
Temperature coefficient		< 0.07 mbar/hPa/0.05 torr /K
Vacuum connection		PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm (KF DN 16 optional)
Venting valve, connection		Integrated, hose nozzle DN 4-5 mm
Ambient temperature range (storage)	°C	-10 - 60
Ambient temperature range (operation)	°C	10 - 40
Max. media temp. continuous operation	°C	40
Max. media temperature for short times	°C	80
Material of outer housing		Robust plastic housing with good chemical resistance
Degree of protection		IP 20
Degree of protection, front side of display unit		IP 42
Dimensions (L x W x H), approx.	mm	144 x 124 x 115
Weight, approx.	kg	0.44

VACUUM CONTROLLER

CVC 3000

■ Vacuum-Controller CVC 3000 detect, bench-top device

The CVC 3000 detect is a ready to use two-set-point vacuum controller - available both as bench-top device and as a unit designed for attaching to a lab scaffold. It consists of the vacuum controller CVC 3000 with integrated ceramic vacuum sensor and vent valve that forms together with a non-return valve and the chemically resistant solenoid valve a very compact and easy to install unit for vacuum control. For available vacuum sources such as oil-free vacuum pumps that you already own and efficient vacuum network supplies, the electronic control increases the process efficiency and decisively elevates the solvent recovery. In the "detect" mode the controller does approach and detect independently the boiling pressure and switch to the two-point vacuum control mode. Manual settings are possible at any time during current operation.



CVC 3000 detect



PERFORMANCE FEATURES

- detect function for independent vapor pressure detection - time saving for other tasks
- compact unit with chemically resistant vacuum valve and common laboratory hose connections - immediately ready for use
- the vacuum measuring is integrated within the valve block - direct connection of the CVC 3000 detect between pump and vacuum application
- integrated venting valve - simple pressure balance or ventilation with inert gas at the end of the process
- non-return valve - no interference of parallel applications at a common vacuum source

APPLICATIONS

Many vacuum processes are carried out uncontrolled and thus often inefficient, and burdensome for environment and material. Controlled vacuum increases the solvent recovery rate with a rotary evaporator and so protects the environment. The vacuum pump is less loaded by the solvents, therefore the service intervals for valves and diaphragms are extended. The independent boiling point recognition also with solvent mixtures saves the user's time and in addition avoids boiling retardation. With a CVC 3000 detect processes become reproducible which is particularly necessary in fields such as production and quality assurance.

Vacuum-Controller CVC 3000 detect, bench-top device

100-230 V ~ 50-60 Hz CEE/CH/UK/US/AUS/CN Ex* 2614860

Vacuum controller CVC 3000 detect for attaching to a lab scaffold

100-230 V ~ 50-60 Hz CEE/CH/UK/US/AUS/CN Ex* 2614120

With NRTL certification for Canada and the USA

Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ACCESSORIES

DAkKS calibration with first delivery (900214)

DAkKS recalibration (900215)

VACUU · BUS® accessories

Rubber vacuum tubing DN 6 mm (686000)

Rubber vacuum tubing DN 8 mm (686001)

ITEMS SUPPLIED Vacuum-Controller CVC 3000 detect, bench-top device

Vacuum controller CVC 3000 detect bench-top device, complete with vacuum solenoid valve, non-return valve, integrated ceramic diaphragm vacuum sensor and venting valve. With power supply, ready to use, with manual

ITEMS SUPPLIED Vacuum controller CVC 3000 detect for attaching to a lab scaffold

Vacuum controller CVC 3000 detect for lab scaffold, complete with vacuum solenoid valve, non-return valve, integrated ceramic diaphragm vacuum sensor and venting valve. With mounting bracket for lab scaffold, power supply, ready to use, with manual

VACUUM CONTROLLER

VACUUM CONTROLLER VNC 2

■ The vacuum controller VNC 2 makes automatic, on-demand vacuum control possible either via two-point valve control or by switching the pump on/off. The version VNC 2 VARIO offers continuous vacuum control with VARIO® pumps. The integrated alumina ceramic diaphragm vacuum sensor is chemically resistant and offers outstanding measuring accuracy independent of gas type. The VNC 2 vacuum controller is designed for precise and reliable control of recurrent routine jobs that do not require regular adjustment. It works with components compatible with the VACUU·BUS® system. Special versions of the controller, e.g., for mounting into laboratory furniture are available. Further information on request.

PERFORMANCE FEATURES

- on-demand control of process vacuum, cooling water and venting; special program for operating vacuum networks like VACUU·LAN®
- easy changing of vacuum set points also during operation
- automatic or manual setting of the pressure switching interval (hysteresis)
- integrated relay for switching pumps on/off (except VNC 2 VARIO)
- selectable acoustic alert signals



VNC 2

TECHNICAL DATA

Control range	mbar/hPa / torr	1100 / 825 - 1 / 1
Measurement principle		Ceramic diaphragm (alumina), capacitive, gas indep., absolute pressure
Measurement uncertainty		< +/- 1 mbar/hPa/torr / +/- 1 digit (after adjustment, constant temp.)
Temperature coefficient		< 0.07 mbar/hPa/0.05 torr / K
Vacuum connection		PTFE tubing connection 10/8 mm, hose nozzle DN 6/10 mm (KF DN 16 optional)
Ambient temperature range (storage)	°C	-10 - 60
Ambient temperature range (operation)	°C	10 - 40
Max. media temp. continuous operation	°C	40
Max. media temperature for short times	°C	80
Material of outer housing		Coated metal housing
Degree of protection		IP 20
Degree of protection of front side of built-in versions		IP 54
Rated mains voltage / mains frequency		100-230 V / 50-60 Hz
Max. power for VACUU·BUS® (24V DC)		400 mA (line voltage: 110-230 V) / 340 mA (line voltage: 100-110 V)
Max. AC breaking capacity for ohmic (inductive) load up to 30°C		7.2(4) A at 250V~ / 7.2(7.2) A at 125 V~
Max. AC breaking capacity for ohmic (inductive) load for 30-40°C		6(4) A at 250 V~ / 6(6) A at 125 V~
Dimensions (L x W x H)	mm	163 x 90 x 68
Weight	kg	0.8

ORDERING INFORMATION

100-230 V ~ 50-60 Hz	IEC plug EN 60320	Ex*	683070
VNC 2 VARIO		Ex*	on request

Please order power cable separately ▶ pg. 185
Ex*: ATEX: II 3G IIC T3 X, Internal Atm. only

ITEMS SUPPLIED

Vacuum controller complete with integrated vacuum sensor, ready for use, with manual.

ACCESSORIES

- PTFE tubing DN 10/8 mm (638644)
- DAkKS calibration with first delivery (900214)
- DAkKS recalibration (900215)
- VACUU·BUS® accessories
- Rubber vacuum tubing DN 6 mm (686000)
- Rubber vacuum tubing DN 8 mm (686001)

REMOTE CONTROL

VACUU·CONTROL™

■ Remote controlling, monitoring or recording of vacuum systems

The new web-based remote control VACUU·CONTROL™ enables the monitoring and control of vacuum pumping units via computers or mobile devices such as Smartphones. With the new LAN or WLAN adapter all pumping units and vacuum systems equipped with the CVC 3000 vacuum controller or a DCP 3000 vacuum gauge can be integrated into a computer network. In this way it is possible for multiple pumping units to be controlled or monitored from a single PC on the one hand or alternatively an individual pumping unit can be observed from several devices. The vacuum system can be operated fully and simultaneously at any time directly at the pumping unit. With the built-in datalogger function, processes are automatically documented. Notification of the end of the process automatically appears when a selective pressure is reached or after a set time.

PERFORMANCE FEATURES

- Remote monitoring and controlling of pumping units or vacuum systems with CVC 3000 or 3000 DCP through easy integration with computer networks
- full simultaneous operation via the CVC 3000 / DCP 3000 or by remote control
- LAN and WLAN-adapter enables the control with fixed or mobile devices (PCs, smartphones, tablets, notebooks,...)
- available as an add-on for all CVC 3000 and DCP 3000 from software version 2.0 onwards (2009)
- process documentation via integrated datalogger and notification signal at the end of the process



APPLICATIONS

With VACUU·CONTROL™ the user can control and monitor his application at any time, for example from the office, using a LAN or WLAN - enabled device. So at the same time users can focus on and carry out other work whilst monitoring the process remotely. The vacuum process is automatically documented with the datalogger function and is fully traceable. The remote VACUU·CONTROL™ can be used as a flexible alternative to building in a CVC 3000 controller into the laboratory furniture. The monitoring of multiple vacuum systems via a central control station is also possible.

ORDERING INFORMATION

VACUU·CONTROL™ WLAN	Sub-D 9-pol	683110
VACUU·CONTROL™ LAN	Sub-D 9-pol / RJ45	683120

ITEMS SUPPLIED VACUU·CONTROL™ WLAN

Remote control adapter WLAN for integration into WLAN PC networks, with web based, graphical user interface, delivered completely with cable for connection to RS 232C interface of controller CVC 3000 or vacuum gauge DCP 3000.

ITEMS SUPPLIED VACUU·CONTROL™ LAN

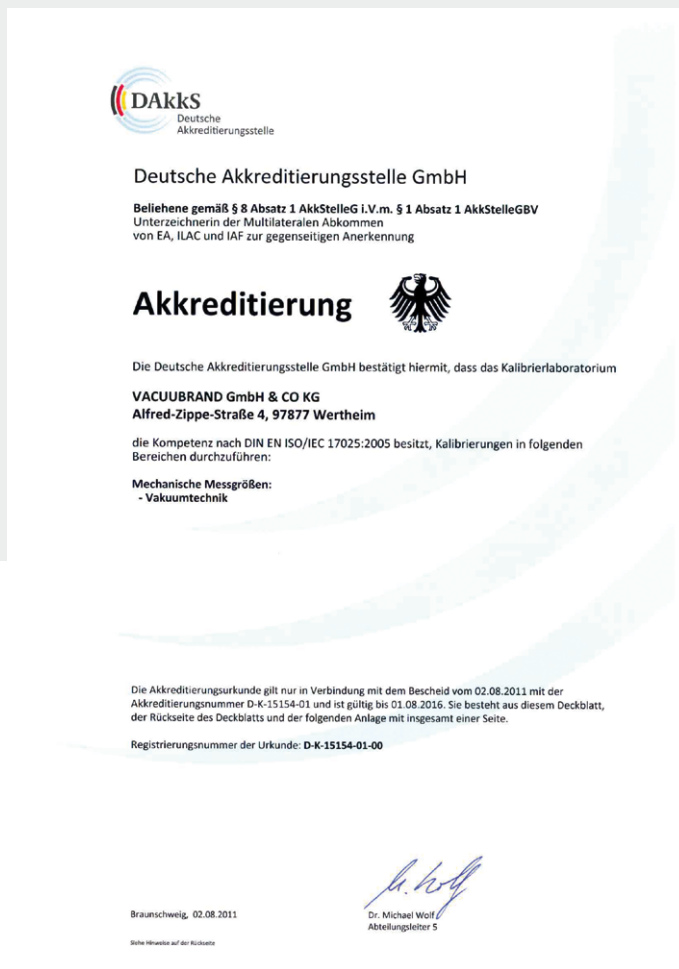
Remote control adapter LAN with RJ45 socket for integration into LAN PC network, with web based, graphical user interface, delivered completely with cable for connection to RS 232C interface of controller CVC 3000 or vacuum gauge DCP 3000.

Further information at www.vacuubrand.com

DAKKS CALIBRATION FOR VACUUM GAUGES AND CONTROLLERS

■ Calibration of vacuum measuring instruments in the VACUUBRAND DAkKS calibration laboratory

The monitoring and calibration of measurement instruments is an important requirement of quality management systems (e.g., ISO 9001, QS 9000). In particular, the traceability to nationally recognized standards must be ensured. VACUUBRAND is accredited by the national accreditation body for the Federal Republic of Germany (DAkKS) as a calibration laboratory for vacuum measuring instruments. VACUUBRAND's DAkKS laboratory is approved to calibrate and certify vacuum gauges in the range from 1300 to 10⁻³ mbar (abs.) and to issue the corresponding DAkKS Calibration Certificates. VACUUBRAND also offers DAkKS calibration as a service for vacuum gauges from other manufacturers.



ORDERING INFORMATION

DAkKS calibration with first delivery

DVR 2, DVR 3, CVC 3000, VNC 2, DCP 3000 with VSK 3000, DCP 3000 with VSP 3000

900214

DAkKS recalibration

DVR 2, DVR 3, DVR 4, DVR 4S, CVC 2^{II}, CVC 2000^{II}, CVC 3000, VNC 1, VNC 2, DVR 5, VSK 3000, VAP 5, VSP 3000

900215

VACUU·BUS®-COMPATIBLE ACCESSORIES

- For the CVC 3000 and VNC 2 vacuum controllers and the DCP 3000 gauges we feature a unique range of accessories including valves (for vacuum, coolant and venting), external sensors (for vacuum and liquid level) and modules (for communication or switching). These accessory components are plug-and-play and self-configuring due to the new VACUU·BUS® digital bus system for read-out or control and communication with VARIO® pumps. Uniform plug-and-socket connections prevent confusion and make it possible to arbitrarily connect nearly any required number of components, even over distances of up to 30 m. The plugs are liquid-tight and highly resistant to chemicals.
- The Vacuum-Management-System module VMS-B switches a vacuum pump according to actual demand from one or two applications. It is operated by one or two vacuum controllers CVC 3000. If two CVC 3000 are connected to the VMS-B it switches off the pump only if both applications do not need a vacuum supply anymore.
- The Digital-I/O-Module is a digital interface for VACUU·BUS® compatible vacuum gauges and controllers. There is a galvanically isolated input gate and a potential-free semiconductor relay for output switching. By default the Digital-I/O-Module is configured as bidirectional fault indicator module to communicate malfunctions in a vacuum system to the process control system, or in case of external malfunction to interrupt the process. When configured as Start/Stop module a process can be started and stopped from a PLC. In addition the Digital-I/O-Module can be configured for control of valves not compatible with VACUU·BUS®. In combination with the vacuum gauge DCP 3000 set points can be defined for the control of, e.g., high vacuum pumping units, load locks, etc.
- The Analog-I/O-Module is an analog interface for the VACUU·BUS® system of vacuum measuring gauges and controllers. The input and output signal follows the industry standard of 0-10 V. In the default configuration of the module the actual vacuum value is indicated as a 0-10V output. Therefore the controller CVC 3000 and the measuring gauge DCP 3000 can be easily connected to a plotter and used for GMP documentation. Other module configurations allow input and output of vacuum level and motor speed as 0-10V signals.



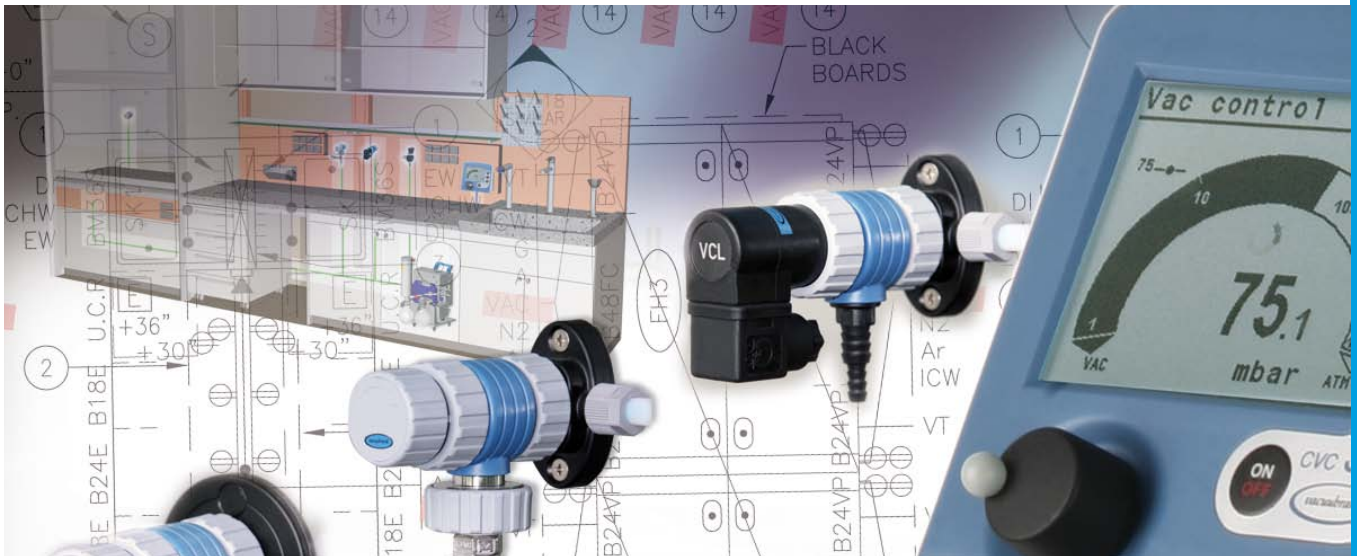
Bus plug at CVC 3000

ORDERING INFORMATION

Vacuum sensor VSK 3000	636657
Vacuum sensor VSP 3000	636163
Vacuum sensor MPT	683176
In-line valve VV-B 6 with KF DN 16 or hose nozzle DN 6/10	674290
In-line valve VV-B 6C with KF DN 16 or hose nozzle DN 6/10	674291
In-line valve VV-B 15C with KF DN 16	674210
In-line valve VV-B 15C with KF DN 25	674215
Coolant valve VKW-B, G3/4" / G1/2", with hose nozzle DN 6	674220
Air admittance valve VB M-B with KF DN 16 and hose nozzle DN 6/10	674217
Liquid level sensor for VACUUBRAND catchpot 500 ml	699908
VACUU·BUS® extension cable, 2 m	612552
VACUU·BUS® extension cable, 10 m	2618493
Y-Adapter VACUU·BUS®	636656
VACUU·BUS® wall feedthrough (plug-socket), for wall thickness of 1 - 10 mm	636153
Digital-I/O-Module VACUU·BUS®	636228
Analog-I/O-Module VACUU·BUS®	636229
VMS-B module for vacuum controller CVC 3000 to switch a vacuum pump	676030

LOCAL AREA VACUUM NETWORK

VACUU·LAN® - VACUUM FOR MANY USERS



- For new and existing laboratories
- One laboratory, one vacuum pump, several applications and workstations
- Individual configuration with chemical resistant PTFE tubing
- Space-saving installation with small investment
- Demand controlled energy saving vacuum
- Independent work without reciprocal influence - via integrated non-return valves
- Flexibility - easy upgrade and quick replacement of components
- Environmentally friendly - solvent recovery near 100%
- Higher safety for the laboratory - additional components (e.g., emission condenser Peltronic®, flask with liquid level sensor, solvent drain)
- Minimal energy consumption and maximum maintenance intervals by pump on demand control with VARIO® technology

Ask for
VACUU·LAN® information material

LABORATORY WORKPLACE

VACUU·LAN® THE DETAILS



Manual flow control module for hoods VCL AR



Shut-off/manual flow control module VCL 02



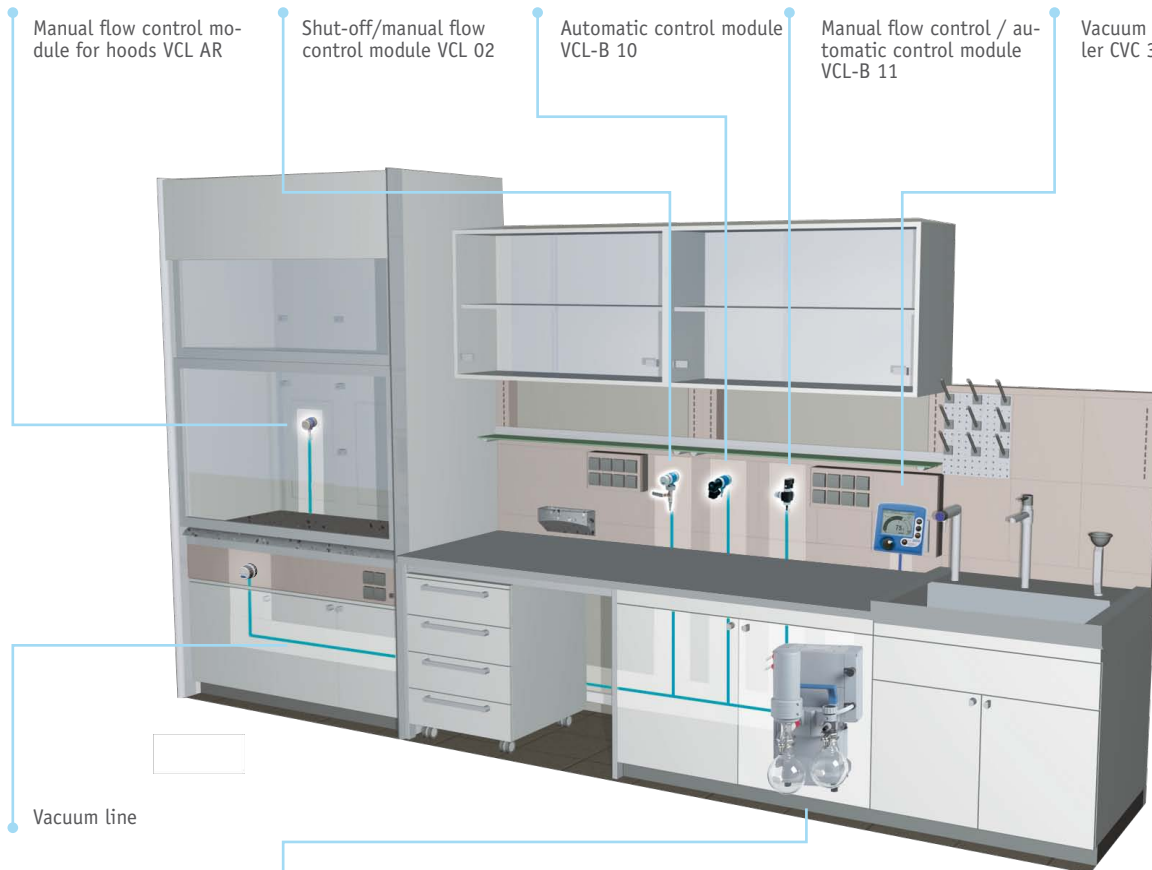
Automatic control module VCL-B 10



Manual flow control / automatic control module VCL-B 11



Vacuum controller CVC 3000



Vacuum line



Network vacuum pumping unit PC 3004 VARIO



VARIO® chemistry pumping unit, optional with emission condenser EK Peltronic®

■ Vacuum ports are connected with a network vacuum pump via easy-to-install PTFE tubes. The vacuum pump is typically integrated into a chemistry vacuum pumping unit with separator, emission condenser and a vacuum controller for vacuum network control.

MODULAR CONCEPT - VACUU·LAN® IN FOUR STEPS

1. STEP - PUMP SELECTION

Examples of use	Vacuum ports*	Vacuum pump
70 mbar Vacuum filtration, Liquid aspiration	6-8 10-12	ME 4C NT +2AK PC 3016 NT VARIO (with pump on demand control)
7 mbar Rotary evaporation, Concentration. For many common solvents	4-6 6-8	MZ 2C NT +AK+EK PC 3002 VARIO (with pump on demand control)
2 mbar Drying of small quantities, Rotary evaporation. For high-boiling solvents.	6-8 6-10	MD 4C NT +AK+EK PC 3004 VARIO (with pump on demand control)

*In case of low simultaneous usage larger networks with more connections per pump are possible. Talk to our experts!

2. STEP - CHOOSING THE VACUU·LAN® (VCL) MOUNTING BASES

Mounting bases are the connecting parts between pipeline network and vacuum port. On the mounting base the complete VCL module will be placed later. The mounting bases are used for the assembly of the VCL module on the wall or integrated in the furniture.

Mounting base A1



- for the subsequent refurbishment of laboratories
- the network tubing will be laid visibly on the wall or on the furniture

Mounting base A5



- for integrated installation
- the vacuum lines run hidden, the connection elements are mounted on the front side

3. STEP - SELECT VACUU·LAN® (VCL) MODULES AND THE OPERATING FUNCTIONS

Select the required operation functions for each work place.

Manual control

Manual flow control module VCL 01

with flow control diaphragm valve to open and close the vacuum port, and to fine-tune the pumping speed.

Shut-off / manual flow control module VCL 02

with flow control diaphragm to fine-tune the pumping speed, combined with a ball valve for quick opening or closing of the vacuum line - the fine adjustment is retained when the ball valve is closed and reopened.

Shut-off module VCL K

with ball valve for quick opening or closing of the vacuum line

Manual flow control module for hoods VCL AR

consisting of a flow control diaphragm valve unit and a separate vacuum port for installation in laboratory exhaust hoods.

Manual flow control / gauge module VCL RMS

similar to module VCL 01, but with additional mechanical bourdon vacuum gauge for quick reading, RMS for lateral wall mounting.

Electromagnetic control

Automatic control module VCL-B 10

electromagnetic (solenoid) valve for automatic vacuum control in conjunction with vacuum controllers CVC 3000 or VNC 2. All components with convenient VACUU·BUS® control connections. Valve seal made of fluoroelastomer with excellent chemical resistance for continuous use.

Manual flow control / automatic control VCL-B 11

with flow control diaphragm to fine-tune the pumping speed and electromagnetic valve for automatic vacuum control. With advantageous bus control VACUU·BUS®.

Controller module

CVC 3000E with in-line valve for integrated installation + vacuum connection VCL A/A5.

4. STEP - PTFE NETWORK AND CONNECTION ELEMENTS

For detailed planning or design of the connection elements and PTFE tube as well as control options, contact our product specialists. Ask us!

LOCAL AREA VACUUM NETWORK

VACUU·LAN®

VCL MOUNTING BASES

Supplied with VCL modules (A1 - for retrofitting; A5 - for built-in installation)

VCL MODULES

ORDERING INFORMATION - mounting base A1 - manually

Manual flow control module	VCL 01	A1	677106
Shut off / manual flow control module	VCL 02	A1	677107
Control and measuring module	VCL RMS	A1	2612120+677131
Control and measuring module	VCL RM	A1	2612991+677131

ORDERING INFORMATION - mounting base A1 - electromagnetic

Automatic control module	VCL-B 10	A1	677208
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ORDERING INFORMATION PTFE pipe and connection elements

PTFE tubing DN 10/8 mm	638644
VCL connector angle	638434
VCL connector T-piece	638435

ORDERING INFORMATION - mounting base A5 - manually

Manual flow control module	VCL 01	A5*	677190
Shut off / manual flow control module	VCL 02	A5*	677191
Manual control module for hoods	VCL AR	A5*	677195
Control and measuring module	VCL RMS	A5*	2612120+677135
Control and measuring module	VCL RM	A5*	2612991+677135

ORDERING INFORMATION - mounting base A5 - electromagnetic

Automatic control module	VCL-B 10	A5*	677292
Automatic / manual flow control module	VCL-B 11	A5*	677293
Controller for VCL B 10/11, see page 158			

ORDERING INFORMATION - Controller module

CVC 3000E	683180
Vacuum connection (CVC 3000E) VCL A/A5*	677167

*Additional T-piece (638435) or angle connector (638434) required

VACUU·LAN®

IN THE LABORATORY



VACUU·LAN® - network with separate controller CVC 3000 E for vacuum network control. Space-saving integration in the laboratory furniture.



ATEX approved vacuum pumps integrated in laboratory furniture. VACUU·LAN® for several fume hoods.



Vacuum network installation for the laboratory of a university, equipped with emission condenser Peltronic®, without additional cooling water connections inside the floor cupboard.



Laboratory with space-saving vacuum supply in the cabinet. Convenient pump control with integrated CVC 3000 E.

VACUUM VALVES AND SMALL FLANGE COMPONENTS

■ At VACUUBRAND, we make our own valves and components and inspect them carefully before shipment to ensure integrity. Our wide range of vacuum valves and small-flange components can be used alone or in combination, in the most simple or complex vacuum systems. Our components are appropriate both for connections to VACUUBRAND pumps and for all valves and components with DIN 28403 (ISO 2861-1) small flange (KF) dimensions. Many components and subassemblies are available in stainless steel, aluminum, brass or plastic. We offer elastomer seals made of NBR and FKM as well as metallic seals made of aluminum or indium. We round out the line with a great variety of resilient connecting elements and small-flange components that serve most vacuum system needs.



Clamping rings and centering rings



Vacuum valve VS



Stainless steel components

VACUUBRAND offers the following lines of vacuum valves:

■ Ball valves

They are the simplest type of shut-off device. They open up the entire cross-section. Therefore they can be used with load lock chambers.

■ Diaphragm valves

VM diaphragm valves are engineered for applications with corrosive and aggressive gases and vapors. Stainless steel housings and PTFE diaphragms offer excellent resistance for use in chemistry laboratories.

■ High-vacuum bellows valves

Stainless steel bellows-sealed angle valves with valve body made of aluminum or stainless steel (WIG). The VE WIG series valves with tungsten inert gas-welded valve body meet the toughest standards in terms of leak rate, outgassing and baking-out for the high vacuum range.

■ In-line valves

VS series valves are space-saving butterfly-type in-line valves with good conductance.

VACUUM VALVES AND SMALL FLANGE COMPONENTS

■ Connection elements for small flange components

The sealing ring for the seal between two components is held in place by the centering ring. The clamping ring is used to hold and mechanically compress the sealing ring.

■ Clamping rings

Aluminum clamping rings with a wing nut are a rapid connection that can be mounted without any tools for soft (primarily rubber-elastic) seals and indium seals.

■ Centering rings

Centering rings made of stainless steel are self-centering with sealing ring at the outside



High-vacuum right angle bellow valve VE



Gas inlet valve VGL



Ball valve VKE

■ VACUUBRAND trapped O-ring centering ring

The trapped O-ring centering ring is externally centered on the outside diameter of the small flange. The seal is pressed into a radius on the inside of the centering ring so that there are no gaps on the vacuum side. External centering allows the same ring to be used for two consecutive standard-rated widths (such as KF DN 10/16). This also makes transitional centering rings unnecessary.

■ Small flange components

VACUUBRAND small flange components have particularly reliable sealing properties because the sealing surfaces are lathed for optimum surface roughness. Application range: Up to high vacuum at approximately 10^{-6} mbar. Aluminum components are tested to a leakage rate of $< 10^{-6}$ mbar l/s, stainless steel components are tested to $< 10^{-9}$ mbar l/s.

■ Flexible connection elements

Flexible hoses made of natural rubber or PVC are enjoying great popularity in laboratories. For more demanding applications VACUUBRAND offers special hoses made of antistatic PTFE with small flanges made of 1.4305 stainless steel. The PTFE tubing is virtually smooth-walled on the inside with high conductance and minimal surface area, which keeps condensate from accumulating like in corrugated hoses. The antistatic PTFE has excellent resistance to chemicals and antistatic properties ($< 10^7$ Ohm resistance between the inside and flanges) to prevent electrostatic charging. Stainless steel bellows and corrugated hoses with TIG-welded small flanges meet high requirements in terms of outgassing and cleanliness. These metallic hoses are made of 1.4541 stainless steel and are vacuum annealed.

BALL VALVE

BALL VALVES VK

Valves of the VK series are sturdy isolation devices for the rough and fine vacuum range. A precisely machined ball with a hole through the middle is rotated by means of shaft and lever. When the valve is open, the hole provides unimpeded passage of media over the entire nominal cross section. Ball valves are therefore also used for load locks, e.g., for sample holders, thermocouples or helium supply lines. The VKE series uses stainless steel for the metal parts and fiberglass reinforced PTFE seatings.



VK 16



VKE 16

TECHNICAL DATA		VK 16	VK 25	VK 40
Nominal width of flange	mm	16	25	40
Wetted materials		SS, PTFE, brass (partly hard chromium plated)	SS, PTFE, brass (partly hard chromium plated)	SS, PTFE, brass (partly hard chromium plated)
Leakage rate	mbar l/s	1×10^{-6}	1×10^{-6}	1×10^{-6}
Fitting length between flanges	mm	80	100	130
Weight	kg	0.4	1.0	1.6

TECHNICAL DATA		VKE 16	VKE 25	VKE 40
Nominal width of flange	mm	16	25	40
Wetted materials		SS, PTFE	SS, PTFE	SS, PTFE
Leakage rate	mbar l/s	1×10^{-6}	1×10^{-6}	1×10^{-6}
Fitting length between flanges	mm	80	100	130
Weight	kg	0.7	1.7	3.1

ORDERING INFORMATION - VK valves made of brass, hard-chrome plated brass ball with reinforced PTFE seal seat

VK 16	Small flange KF DN 16	665504
VK 25	Small flange KF DN 25	665505
VK 40	Small flange KF DN 40	665506

ORDERING INFORMATION - VKE valves made of stainless steel with reinforced PTFE seal seat

VKE 16	Small flange KF DN 16	675504
VKE 25	Small flange KF DN 25	675505
VKE 40	Small flange KF DN 40	675506

BUTTERFLY VALVE

BUTTERFLY VALVES VS

■ The VS, VS C and VS B series valves are butterfly-type valves. A circular valve plate with a sealing ring on the circumference rotates around an axis at right angle to the valve axis. As a result, the valves leave virtually the entire cross section free, offering very good conductance. The valve bodies are made of one piece, machined from solid material, and require (in addition to the valve head seal) only one elastic shaft seal for rotational movement of the shaft. The valves provide low leakage and minimal degassing rate. The VS C series features a valve seal made of perfluorelastomer material (FFKM).

PERFORMANCE FEATURES

- compact, economic design
- high conductance, low leakage rate
- gas-tight against atmosphere in both positions
- helium leak-tested
- easy to grip, lever-operated, with position indicator



TECHNICAL DATA		VS 16	VS 25	VS 40
Nominal width of flange	mm	16	25	40
Wetted materials		SS, FKM, NBR	SS, FKM, NBR	SS, FKM, NBR
Leakage rate	mbar l/s	1 x 10 ⁻⁶	1 x 10 ⁻⁶	1 x 10 ⁻⁶
Fitting length between flanges	mm	65	65	65
Weight	kg	0.6	0.8	0.9

TECHNICAL DATA		VS 16C	VS 25C	VS 40C
Nominal width of flange	mm	16	25	40
Wetted materials		SS, FFKM, NBR	SS, FFKM, NBR	SS, FFKM, NBR
Leakage rate	mbar l/s	1 x 10 ⁻⁶	1 x 10 ⁻⁶	1 x 10 ⁻⁶
Fitting length between flanges	mm	65	65	65
Weight	kg	0.6	0.8	0.9

ORDERING INFORMATION - VS valves made of stainless steel

VS 16	Small flange KF DN 16	665004
VS 16C	Small flange KF DN 16	665007
VS 25	Small flange KF DN 25	665005
VS 25C	Small flange KF DN 25	665008
VS 40	Small flange KF DN 40	665006
VS 40C	Small flange KF DN 40	665009

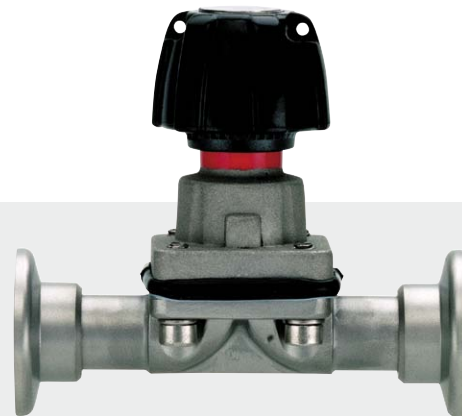
DIAPHRAGM VALVE

DIAPHRAGM VALVES VM

■ VM series valves are hand-operated diaphragm valves. They are used, e.g., as isolation valves, air-admittance valves or manual-control valves. By rotation of the wheel a flexible PTFE diaphragm is moved and pressed against the stainless steel seating or removed from it, opening and closing the valve, respectively. The gas-contacting parts are made of stainless steel and PTFE offering a good resistance to corrosive gases and vapors.

PERFORMANCE FEATURES

- materials with high chemical resistance
- high conductance, low leakage rate
- flow control possible
- gas-tight against atmosphere in both directions



VM 16



VM 25

TECHNICAL DATA

		VM 16	VM 25
Nominal width of flange	mm	16	25
Wetted materials		SS, PTFE	SS, PTFE
Leakage rate	mbar l/s	1×10^{-4}	1×10^{-4}
Fitting length between flanges	mm	80	100
Weight	kg	0.21	0.42

ORDERING INFORMATION

VM 16	Small flange KF DN 16	664010
VM 25	Small flange KF DN 25	664011

HIGH VACUUM BELLOW VALVE

HIGH VACUUM BELLOW VALVES VE

High vacuum, helium leak-tested right angle valves VE have stainless steel bellows which seals the drive mechanism without any gap on the vacuum side. Due to the screw-thread mechanism, these valves offer a certain control of conductance. They are mountable in any position because of their air tightness in both positions. The body is either made of solid aluminum or stainless steel (VE WIG). The stainless steel valves are tungsten inert gas welded from the inside for maximum gas tightness and minimum degassing rates.

PERFORMANCE FEATURES

- high conductance due to large stroke length
- excellent gas tightness, minimum degassing
- stainless steel version VE WIG bakeable to +150 °C
- simple dismantling and easy changing of seal
- dimensions of the VE valve are the same as elbow with corresponding nominal width



VE 16 WIG

TECHNICAL DATA		VE 16	VE 25	VE 40
Nominal width of flange	mm	16	25	40
Wetted materials		Aluminum, SS, FKM	Aluminum, SS, FKM	Aluminum, SS, FKM
Leakage rate of housing	mbar l/s	1×10^{-9}	1×10^{-9}	1×10^{-9}
Leakage rate of seat	mbar l/s	1×10^{-7}	1×10^{-7}	1×10^{-7}
Fitting dimension (flanges to center)	mm	40	50	65
Weight	kg	0.5	0.7	1.3

TECHNICAL DATA		VE 16 WIG	VE 25 WIG	VE 40 WIG
Nominal width of flange	mm	16	25	40
Wetted materials		SS, FKM	SS, FKM	SS, FKM
Leakage rate of housing	mbar l/s	1×10^{-9}	1×10^{-9}	1×10^{-9}
Leakage rate of seat	mbar l/s	1×10^{-7}	1×10^{-7}	1×10^{-7}
Fitting dimension (flanges to center)	mm	40	50	65
Weight	kg	1.0	1.1	2.9

ORDERING INFORMATION - Valves VE made of aluminum

VE 16	Small flange KF DN 16	664004
VE 25	Small flange KF DN 25	664005
VE 40	Small flange KF DN 40	664006

ORDERING INFORMATION - Valves VE WIG made of stainless steel

VE 16 WIG	Small flange KF DN 16	674020
VE 25 WIG	Small flange KF DN 25	674021
VE 40 WIG	Small flange KF DN 40	674022

AIR ADMITTANCE VALVE

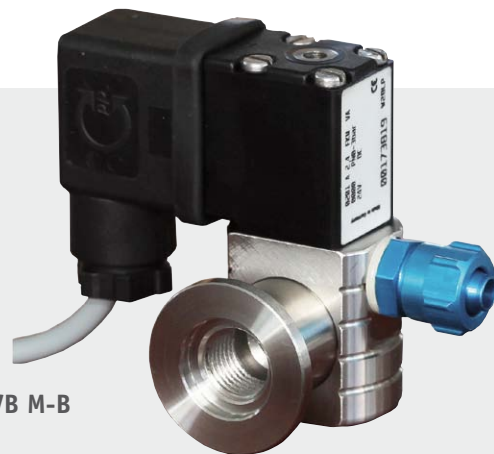
AIR ADMITTANCE VALVES VB AND VB M-B

■ Air admittance valve VB M-B with KF DN 16 and hose nozzle DN 6/10

These valves are compact air admittance valves with small flange. The VB valve is manually operated. On rotating the knurled screw cap the valve disc is lifted off the seating and air enters through the holes. The valve disc is rotatable. Therefore the valve seat seal is prevented against wear during opening and closing. The electromagnetic solenoid valve VB M-B with valve orifice diameter 2.4 mm and VACUU·BUS® control connection operates in conjunction with vacuum controllers CVC 3000, VNC 2 or the vacuum gauge DCP 3000. It is frequently used for remote-controlled systems like interlocking systems and inert gas flushing. The gas inlet has a tubing connection, e.g., for inert gas. Larger venting valves are available on request.



VB 10



VB M-B

TECHNICAL DATA		VB 10	VB M-B
Flange connection		Small flange KF DN 10	Small flange KF DN 16 or hose nozzle DN 6/10 mm
Gas inlet connection		-	Tubing connection DN 8/6 mm
Wetted materials		SS, NBR	SS, FKM
Leakage rate	mbar l/s	1×10^{-6}	1×10^{-3}
Operation		Manual	VACUU·BUS®
Weight	kg	0.1	0.25

ORDERING INFORMATION

VB 10	Small flange KF DN 10	666800
VB M-B	Small flange KF DN 16 or hose nozzle DN 6/10 mm	674217

GAS INLET VALVE

GAS INLET VALVES VGS AND VGL

- Gas inlet valves are small hand operated valves for admitting gases into a vacuum system. By rotating a knurled screw cap the valve stem is raised from the valve seat. Thus gas enters at a controlled flow rate from the line connected to the gas inlet. The gas inlet valve VGS 10 is mounted with a small flange to the vacuum system and has a hose nozzle DN 8 mm for connection to, e.g., gas cylinders, air driers or for admitting air directly. The vacuum and atmospheric sides of the valve VGL are provided with hard-soldering brass connections, facilitating the valve to be used as a fixed, permanent fitting.



TECHNICAL DATA		VGS 10	VGL
Flange connection		Small flange KF DN 10	Brass sleeve 5.1 mm
Gas inlet connection		Hose nozzle DN 8 mm	Brass sleeve 5.1 mm
Wetted materials		SS, FKM, NBR	SS, FKM, NBR, brass
Leakage rate of housing	mbar l/s	1×10^{-9}	1×10^{-9}
Leakage rate of seat	mbar l/s	1×10^{-6}	1×10^{-6}
Weight	kg	0.15	0.12

ORDERING INFORMATION

VGS 10	Small flange KF DN 10	666000
VGL	Brass sleeve 5.1 mm	666400

SOLENOID-OPERATED VALVES

SOLENOID-OPERATED VALVES VV AND VV C

■ These straight-through valves with electromagnetic (solenoid) drive are used for operating cycles with short intervals and, therefore, are often used as vacuum control valves. The straightforward design provides a valve with low leakage rate. The valves in version VV C are made of materials with excellent chemical resistance. The valve sealing of the VV-B 6C is made of a special fluoroelastomer with better form stability than common PTFE, much higher chemical resistance than FKM and excellent long-term leak tightness characteristics.

PERFORMANCE FEATURES

- version C with excellent chemical resistance
- high operating cycles
- significantly better long term tightness even after long operating time
- easy to clean
- versatile connection alternatives via small flange or hose nozzle



VV 6C



VV 15C

SOLENOID-OPERATED VALVES

SOLENOID-OPERATED VALVES VV AND VV G

TECHNICAL DATA		VV-B 6	VV 6
Flange connection		Small flange KF DN 16 or hose nozzle DN 6/10 mm	Small flange KF DN 16 or hose nozzle DN 6/10 mm
Wetted materials		SS, PP, FKM, PPS	SS, PP, FKM, PPS
Leakage rate	mbar l/s	1 x 10 ⁻⁵	1 x 10 ⁻⁵
Ambient temperature range	°C	0 - 50	0 - 50
Maximum gas temperature	°C	80	80
Max. switching frequency	/min	120	120
Supply voltage / Plug		VACUU·BUS®	Solenoid 230 V/~ 50-60 Hz IEC plug EN 60320
Cable length	m	2	2.5
Fitting length between flanges	mm	100	100
Weight, approx.	kg	0.53	0.53

TECHNICAL DATA		VV-B 6C	VV-B 15C
Flange connection		Small flange KF DN 16 or hose nozzle DN 6/10 mm	Small flange KF DN 16
Wetted materials		SS, PVDF, PTFE, fluoroelastomer, PPS	SS, PVDF, PTFE
Leakage rate	mbar l/s	1 x 10 ⁻²	1 x 10 ⁻⁴
Ambient temperature range	°C	0 - 40	0 - 40
Maximum gas temperature	°C	100	100
Max. switching frequency	/min	50	50
Supply voltage / Plug		VACUU·BUS®	VACUU·BUS®
Cable length	m	2	2
Fitting length between flanges	mm	80	109
Weight, approx.	kg	0.35	1.2

TECHNICAL DATA		VV-B 15C	VV 25
Flange connection		Small flange KF DN 25	Small flange KF DN 25
Wetted materials		SS, PVDF, PTFE	SS, FKM, brass (Nickel plated)
Leakage rate	mbar l/s	1 x 10 ⁻⁴	1 x 10 ⁻⁴
Ambient temperature range	°C	0 - 40	0 - 50
Maximum gas temperature	°C	100	80
Max. switching frequency	/min	50	120
Supply voltage / Plug		VACUU·BUS®	Solenoid 230 V/~ 50 Hz IEC plug EN 60320
Cable length	m	2	2.5
Fitting length between flanges	mm	117	100
Weight, approx.	kg	1.2	1.4

ORDERING INFORMATION VACUU·BUS® valves

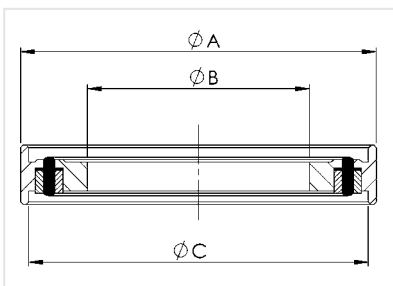
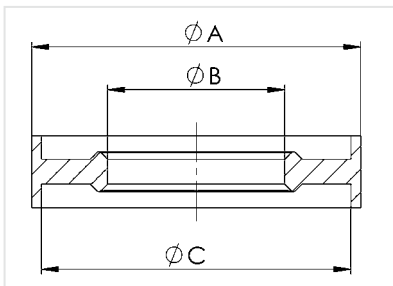
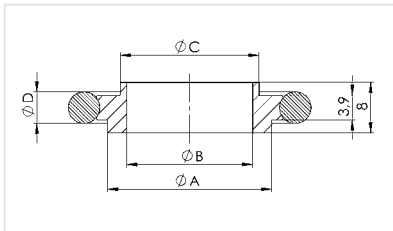
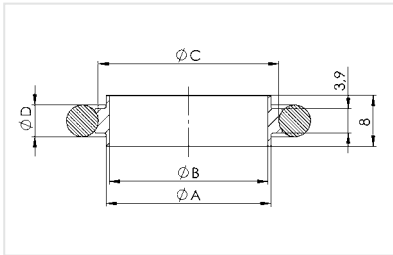
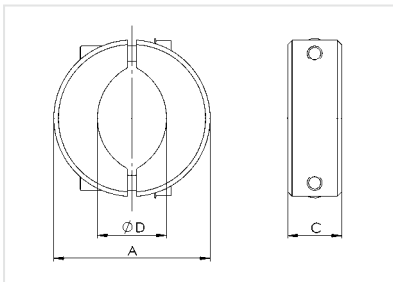
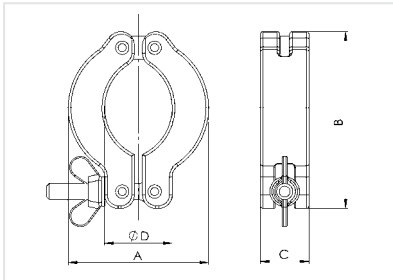
VV-B 6	Small flange KF DN 16 or hose nozzle DN 6/10 mm	674290
VV-B 6C	Small flange KF DN 16 or hose nozzle DN 6/10 mm	674291
VV-B 15C	Small flange KF DN 16	674210
VV-B 15C	Small flange KF DN 25	674215

ORDERING INFORMATION (24 V/= valves with plug 3-pole EN 60130-9, for controllers CVC 2^{II} and VNC 1, only)

VV 6	Small flange KF DN 16 or hose nozzle DN 6/10 mm Solenoid 24 V/=	674090
VV 6	Small flange KF DN 16 or hose nozzle DN 6/10 mm Solenoid 230 V/~ 50-60 Hz	674094
VV 6C	Small flange KF DN 16 or hose nozzle DN 6/10 mm Solenoid 24 V/=	674091
VV 15C	Small flange KF DN 16 Solenoid 24 V/=	674110
VV 15C	Small flange KF DN 25 Solenoid 24 V/=	674115
VV 25	Small flange KF DN 25 Solenoid 230 V/~ 50 Hz	674105

SMALL-FLANGE COMPONENTS

Dimensions in millimeters



CLAMPING RINGS FOR SMALL FLANGE KF

Size	A	B	C	D	Order-no.
made of aluminum					
KF DN 10/16	45	62	16	22	660000
KF DN 20/25	55	73	16	32	660001
KF DN 32/40	70	90	16	47	660002
KF DN 50	95	120	25	63	660003
made of stainless steel					
KF DN 10/16	52		18	23	660010
KF DN 20/25	62		18	32	660011
KF DN 32/40	80		18	47	660012
KF DN 50	112		20	62	660013

CENTERING RINGS FOR SMALL FLANGE KF made of stainless steel

Size	A	B	C	D	Order-no.
with sealing ring made of FKM					
KF DN 10	12	10	15.3	15 x 5	660120
KF DN 16	17	16	18.5	18 x 5	660124
KF DN 20	22	20	25.5	25 x 5	660121
KF DN 25	26	25	28.5	28 x 5	660125
KF DN 32	34	32	40.5	40 x 5	660122
KF DN 40	41	39	43	42 x 5	660126
KF DN 50	52	50	55.5	55 x 5	660123

ADAPTING CENTERING RINGS FOR SMALL FLANGE KF made of stainless steel

Size	A	B	C	D	Order-no.
with sealing ring made of FKM					
KF DN 10/16	17	10	12	18 x 5	660127
KF DN 20/25	26	20	22	28 x 5	660128
KF DN 32/40	41	32	34	42 x 5	660129

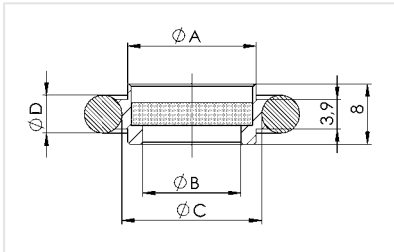
CENTERING AND SEALING RINGS FOR SMALL FLANGE KF (for stainless steel flanges only)

Size	A	B	C	Order-no.
with aluminum sealing ring				
KF DN 10/16	32	17.2	30.1	660140
KF DN 20/25	42	26.2	40.1	660141
KF DN 32/40	57	41.2	55.1	660142
KF DN 50	77	52.2	75.1	660143

INDIUM SEALING FOR KF - with stainless steel/aluminum centering rings (inside/outside)

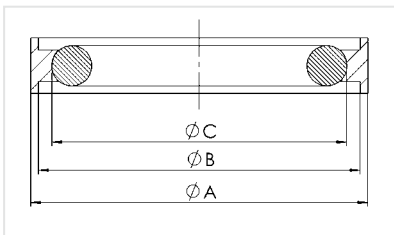
Size	A	B	C	Order-no.
KF DN 10/16	32	17.2	30.1	660150
KF DN 20/25	42	26.2	40.1	660151
KF DN 32/40	57	41.2	55.1	660152

SMALL-FLANGE COMPONENTS



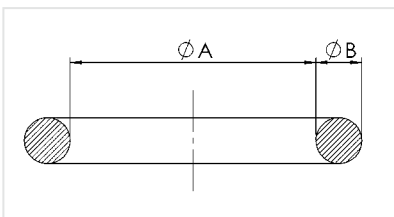
FILTER CENTERING RINGS FOR SMALL FLANGE KF made of stainless steel

Size	A	B	C	D	Order-no.
with sealing ring made of NBR					
KF DN 10	12	8	15.5	15 x 5	660160
KF DN 16	17	13	18.5	18 x 5	660161
KF DN 25	26	22	28.5	28 x 5	660162
KF DN 40	41	36	43	42 x 5	660163



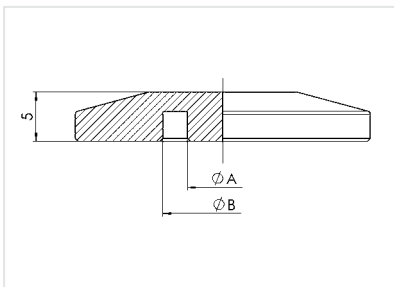
TRAPPED O-RING CENTERING RINGS FOR SMALL FLANGE KF made of PBT (non-wetted)

Size	A	B	C	Order-no.
with sealing ring made of NBR				
KF DN 10/16	32	30.1	27.7	660190
KF DN 20/25	42	40.1	36.7	660191
KF DN 32/40	57	55.1	51	660192
KF DN 50	77	75.1	61	660193
with sealing ring made of FKM				
KF DN 10/16	32	30.1	27.7	660195
KF DN 20/25	42	40.1	36.7	660196
KF DN 32/40	57	55.1	51	660197
KF DN 50	77	75.1	61	660198



SPARE SEAL RINGS FOR SMALL FLANGE KF

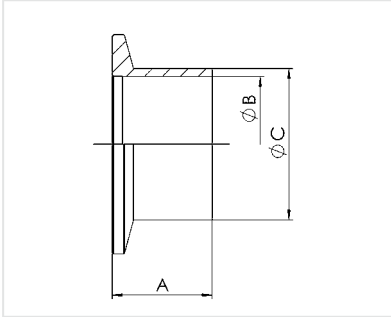
Size	A	B	Order-no.
made of NBR			
KF DN 10	15	5	660110
KF DN 16	18	5	660115
KF DN 20	25	5	660111
KF DN 25	28	5	660116
KF DN 50	55	5	660113
made of FKM			
KF DN 10	15	5	660130
KF DN 16	18	5	660135
KF DN 20	25	5	660131
KF DN 25	28	5	660136
KF DN 32	40	5	660132
KF DN 40	42	5	660137
KF DN 50	55	5	660133



BLIND SMALL FLANGES KF

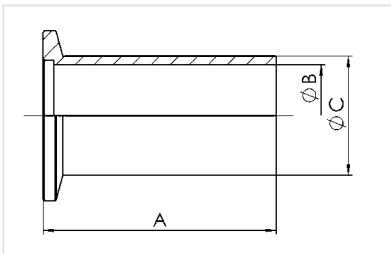
Size	A	B	Order-no.
made of aluminum			
KF DN 10	7.2	12.2	669000
KF DN 16	9.8	17.2	669004
KF DN 25	19.8	26.2	669005
KF DN 40	31.7	41.2	669006
KF DN 50	47.2	52.2	669003
made of stainless steel			
KF DN 10	7.2	12.2	671000
KF DN 16	9.8	17.2	671004
KF DN 25	19.8	26.2	671005
KF DN 40	31.7	41.2	671006
KF DN 50	47.2	52.2	671003

SMALL-FLANGE COMPONENTS



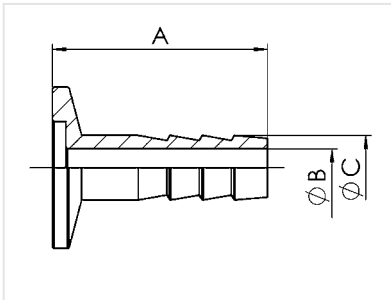
SMALL FLANGES KF WITH WELD STUB short

Size	A	B	C	Order-no.
made of stainless steel (1.4541)				
KF DN 10	16	10	14	661300
KF DN 16	16	16	20	661304
KF DN 20	20	21	25	661301
KF DN 25	20	24	28	661305
KF DN 32	25	34	38	661302
KF DN 40	25	40.5	44.5	661306
KF DN 50	25	50.6	57	661303



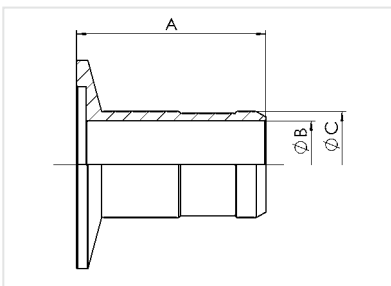
SMALL FLANGES KF WITH WELD STUB long

Size	A	B	C	Order-no.
made of stainless steel (1.4541)				
KF DN 10	52	10	14	662100
KF DN 16	52	16	20	662104
KF DN 20	55	21	25	662101
KF DN 25	55	24	28	662105
KF DN 32	58	34	38	662102
KF DN 40	58	40.5	44.5	662106
KF DN 50	58	50.6	57	662103



SMALL FLANGES KF WITH HOSE NOZZLE

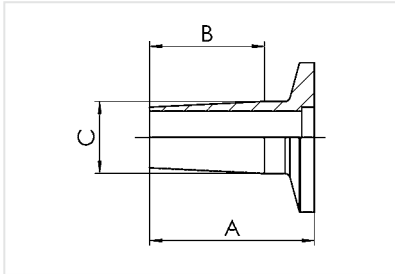
Size	A	B	C	Tubing ID	Order-no.
made of aluminum					
KF DN 10 / DN 6 mm	40	4	8	6	662500
KF DN 16 / DN 6 mm	40	4	8	6	662510
KF DN 16 / DN 10 mm	40	7	12	10	662511
KF DN 25 / DN 8 mm	40	6	10	8	662516
KF DN 25 / DN 10 mm	40	7	12	10	662517
KF DN 25 / DN 12 mm	40	10	15	12	662518
KF DN 25 / DN 15 mm	40	15	19	15	662519
KF DN 40 / DN 8 mm	40	6	10	8	662521
KF DN 40 / DN 10 mm	40	7	12	10	662522
KF DN 40 / DN 15 mm	40	15	19	15	662523
made of plastic PP (polypropylene)					
KF DN 16 / DN 10 mm	40	7	12	10	662806
KF DN 25 / DN 10 mm	43	7	12	10	662807
KF DN 25 / DN 15 mm	43	14	19	15	662808



SMALL FLANGES KF WITH HOSE NIPPLE

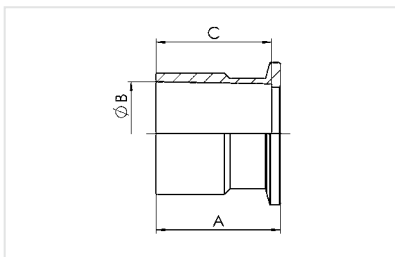
Size	A	B	C	Tubing ID	Order-no.
made of aluminum					
KF DN 10 / DN 12 mm	50	9	14	12	662530
KF DN 16 / DN 19 mm	50	15	20	19	662531
KF DN 25 / DN 20 mm	50	15	22	20	662532
KF DN 25 / DN 25 mm	50	23	28	25	662533
KF DN 40 / DN 25 mm	50	23	28	25	662534
KF DN 40 / DN 40 mm	50	37	41	40	662535

SMALL-FLANGE COMPONENTS



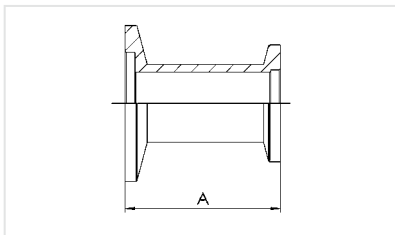
SMALL FLANGES KF WITH MALE GROUND JOINT

Size and grinding type made of stainless steel	A	B	C	Order-no..
KF DN 10 / NS 14/23	33	23	14.2	662701
KF DN 10 / NS 19/38	47.5	38	18.8	662700
KF DN 25 / NS 19/38	49	38	18.8	662704
KF DN 25 / NS 29/32	41.5	32	29.2	662705
KF DN 40 / NS 29/32	43.5	32	29.2	662706
KF DN 40 / NS 45/40	49.5	40	45	662707



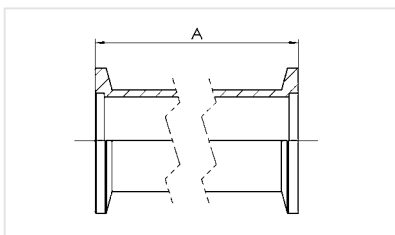
SMALL FLANGES KF WITH FEMALE GROUND JOINT

Size and grinding type made of stainless steel	A	B	C	Order-no.
KF DN 10 / NS 14/35	38	14.5	35	662800
KF DN 10 / NS 19/38	41	18.8	38	662801
KF DN 25 / NS 19/38	41	18.8	38	662802
KF DN 25 / NS 29/32	35	29.2	32	662803
KF DN 40 / NS 29/32	35	29.2	32	662804
KF DN 40 / NS 45/40	43	45	40	662805



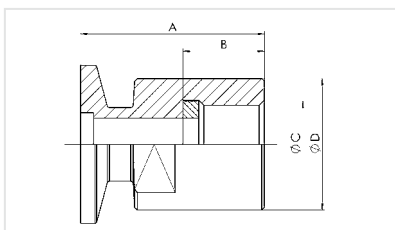
REDUCING PIECES WITH SMALL FLANGES KF

Size made of aluminum	A	Order-no.
KF DN 25/10	40	669040
KF DN 25/16	40	669041
KF DN 40/10	40	669042
KF DN 40/16	40	669043
KF DN 40/25	40	669044
Size made of stainless steel	A	Order-no.
KF DN 25/10	40	672910
KF DN 25/16	40	672911
KF DN 40/10	40	672912
KF DN 40/16	40	672913
KF DN 40/25	40	672914



VACUUM TUBING WITH SMALL FLANGES KF

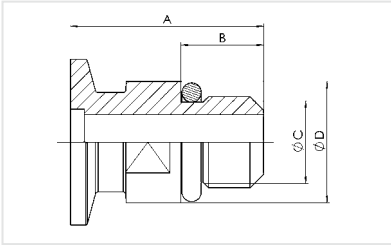
Size made of aluminum	A	Order-no.
KF DN 10	60	669010
KF DN 16	80	669014
KF DN 25	100	669015
KF DN 40	130	669016
Size made of stainless steel (flange and tube TIG welded)	A	Order-no.
KF DN 10	60	673000
KF DN 16	80	673014
KF DN 25	100	673015
KF DN 40	130	673016



SCREW-ON SMALL FLANGE KF made of stainless steel (internal thread)

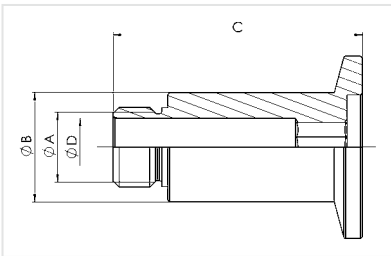
Size with sealing ring made of NBR	A	B	C	D	Order-no.
KF DN 10 / G3/8"	35	15.5	G3/8"	20	672000
KF DN 16 / G1/2"	35	16	G1/2"	25	672001
KF DN 25 / G1"	45	22	G1"	38	672002

SMALL-FLANGE COMPONENTS



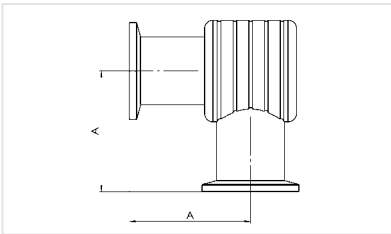
SCREW-IN SMALL FLANGES KF made of stainless steel (male thread)

Size	A	B	C	D	Order-no.
with sealing ring made of NBR					
KF DN 10 / G3/8"	35	15	G3/8"	22	672100
KF DN 16 / G1/2"	35	16	G1/2"	26	672101
KF DN 25 / G1"	45	24	G1"	39	672102



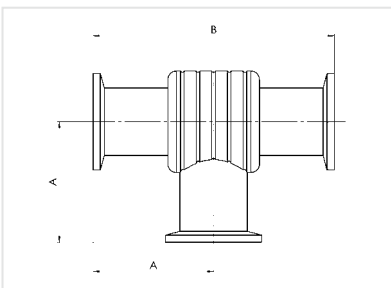
SMALL FLANGES KF WITH THREAD

Size	A	B	C	D	Order-no.
made of stainless steel					
KF DN 16 / G1/4"	G1/4"	18	41	9.5	662590
KF DN 10 / G1/8"	G1/8"	20	49	6	662600



ELBOW PIECES WITH SMALL FLANGES KF

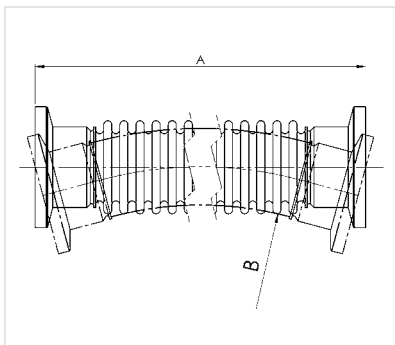
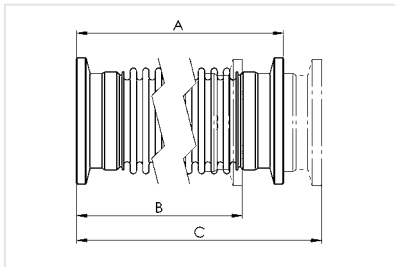
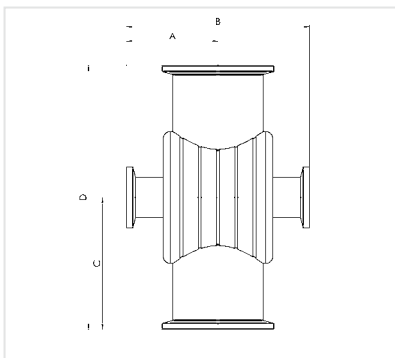
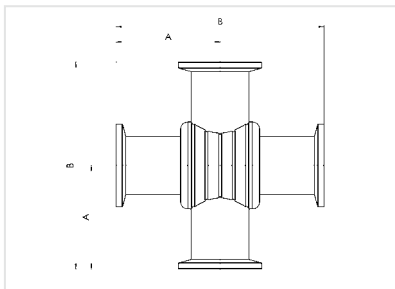
Size	A	Order-no.
made of aluminum		
KF DN 10/10	30	669400
KF DN 16/16	40	669404
KF DN 25/25	50	669405
KF DN 40/40	65	669406
made of stainless steel		
KF DN 10/10	30	673400
KF DN 16/16	40	673414
KF DN 25/25	50	673415
KF DN 40/40	65	673416



T-PIECES WITH SMALL FLANGES KF

Size	A	B	Order-no.
made of aluminum			
KF DN 10/10/10	30	60	669500
KF DN 16/16/16	40	80	669504
KF DN 25/25/25	50	100	669505
KF DN 40/40/40	65	130	669506
made of stainless steel			
KF DN 10/10/10	30	60	673500
KF DN 16/16/16	40	80	673514
KF DN 25/25/25	50	100	673515
KF DN 40/40/40	65	130	673516

SMALL-FLANGE COMPONENTS



CROSS PIECES WITH SMALL FLANGES KF

Size	A	B	Order-no.
made of aluminum			
KF DN 10/10/10/10	30	60	669600
KF DN 16/16/16/16	40	80	669604
KF DN 25/25/25/25	50	100	669605
KF DN 40/40/40/40	65	130	669606
made of stainless steel			
KF DN 10/10/10/10	30	60	673600
KF DN 16/16/16/16	40	80	673614
KF DN 25/25/25/25	50	100	673615
KF DN 40/40/40/40	65	130	673616

REDUCING CROSS PIECES WITH SMALL FLANGES KF

Size	A	B	C	D	Order-no.
made of aluminum					
KF DN 25/25/16/16	35	70	35	70	669608
KF DN 40/40/16/16	45	90	65	130	669609
made of stainless steel					
KF DN 25/25/10/10	35	70	50	100	673617
KF DN 40/40/10/10	45	90	65	130	673619

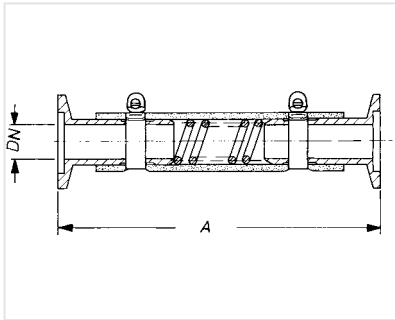
METAL BELLOWS WITH SMALL FLANGES KF

Size	A	B	C	Order-no.
made of stainless steel (1.4541)				
KF DN 10	74	62	86	673210
KF DN 16	74	62	86	673220
KF DN 25	88	72	104	673221
KF DN 40	113	88	138	673222

METAL VACUUM TUBINGS WITH SMALL FLANGES KF

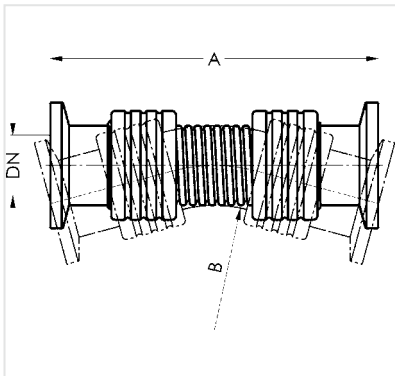
Size	A	B: minimum bend radius for		Order-no.
		single bending	repeated bending	
made of stainless steel (1.4541)				
KF DN 10	250	19	90	673305
KF DN 10	500	19	90	673315
KF DN 10	750	19	90	673325
KF DN 10	1000	19	90	673335
KF DN 16	250	29	120	673306
KF DN 16	500	29	120	673316
KF DN 16	750	29	120	673326
KF DN 16	1000	29	120	673336
KF DN 25	250	43	155	673307
KF DN 25	500	43	155	673317
KF DN 25	750	43	155	673327
KF DN 25	1000	43	155	673337
KF DN 40	250	65	200	673308
KF DN 40	500	65	200	673318
KF DN 40	750	65	200	673328
KF DN 40	1000	65	200	673338

SMALL-FLANGE COMPONENTS / POWER CABLES



PVC vacuum tubings with internal spiral with small flanges KF

Size	A	Order-no.
small flanges made of aluminum, with internal stainless steel spiral		
KF DN 16	500	686010
KF DN 16	1000	686020
KF DN 25	500	686011
KF DN 25	1000	686021
KF DN 40	500	686012
KF DN 40	1000	686022

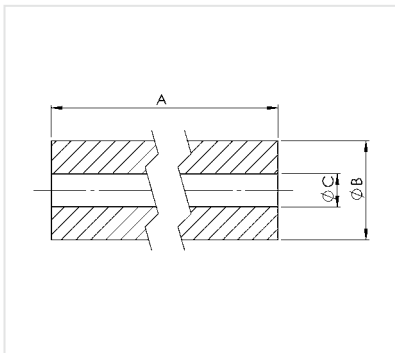


PTFE VACUUM TUBINGS with small flanges KF

made of antistatic PTFE, flanges made of stainless steel (1.4305)
Special features:

- hose ribbed only on the outside, almost smooth walls on the inside. Therefore no accumulation of liquids or particles like in corrugated hoses and high gas conductivity due to reduced turbulence.
- PTFE material with excellent chemical resistance
- PTFE material is antistatic according to BS 5958:1991 / EN ISO 8031, 10^7 Ohm resistivity between hose and flanges to prevent electrostatic charging on the inside or outside. However, the tubing must not be used for grounding of equipment.

Size	A	B: minimum bend radius for		Order-no..
		single bending	repeated bending	
KF DN 16	500	150	300	686030
KF DN 16	1000	150	300	686031
KF DN 25	500	200	400	686032
KF DN 25	1000	200	400	686033



RUBBER VACUUM TUBINGS available per meter

Size	B	C	Order-no.
DN 6 mm	12	6	686000
DN 8 mm	18	8	686001
DN 10 mm	30	10	686002
DN 15 mm	35	15	686003
DN 20 mm	45	19	686005

PTFE TUBING available per meter

PTFE tubing	DN 10/8 mm	638644
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POWER CABLES (e.g., for Peltronic® exhaust vapor condenser and VNC 2)

Power cable KG CEE	612058	Power cable LKG CEE	637652
Power cable KG CH	676021	Power cable LKG CH	637653
Power cable KG UK	676020	Power cable LKG UK	637654
Power cable KG US	612065	Power cable LKG US	637655
Power cable KG CN	635997	Power cable LKG CN	635770
Power cable KG IL	637353	Power cable CEE, Y-shaped with 1 x KG and 1 x LKG	636273

(L)KG = (elbow) instrument coupling IEC 60320 C13

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1. General

- 1.1. These General Terms and Conditions (GT&C) are intended for use in commercial transactions between businesses.
- 1.2. These GT&C shall apply for all, including future, contracts with the customer. Other terms and conditions shall not become part of the contract, even if we do not expressly object to them. Subsidiary agreements made before or at the time of conclusion of contract may only be invoked if they are immediately confirmed in writing. The waiver of the requirement for written form shall only be possible in writing. The language of the contract shall be German or English. In the event of a discrepancy between the German language version of these GT&C and a version in any language, the German language version shall prevail.
- 1.3. Our offers are subject to change and non-binding. We reserve the right to make technical improvements to our products.
- 1.4. We may store and process data in our IT system necessary for the purpose of processing the contract.
- 1.5. A set-off by the customer shall not be permitted unless the counterclaims are undisputed or legally established, or pecuniary counterclaims arising from the right to refuse payment pursuant to Section 320 Bürgerliches Gesetzbuch (BGB) (German Civil Code).
- 1.6. The place of jurisdiction shall be the court responsible for our head office in Wertheim/Mosbach, Germany. We shall also be entitled to appeal to the court responsible for the head office of our customer. We shall, furthermore, as plaintiffs have the right to invoke the Arbitration Court at the Chamber of Commerce and Industry in Heilbronn, Franconia, Germany. The Arbitration Court shall, in this case, make the final judgment in accordance with the Rules of Arbitration of the Chamber of Commerce and Industry in Heilbronn, Franconia without recourse to the ordinary courts of law. The instigation of legal dunning proceedings by us shall not signify the exertion of our right of choice; it shall be admissible in all cases.
- 1.7. German law shall apply exclusively under the exclusion of the conflict of laws principles of Private International Law and the UN Convention on Contracts for the International Sale of Goods (CISG).

2. Delivery

- 2.1. The place of performance shall be our factory in Wertheim, Germany. The risk shall transfer to the customer when the delivery leaves the ramp at our factory. This shall also apply to partial deliveries or where we have performed additional services, such as shipping; costs for transport, packaging or insurance; exportation and installation. This shall also apply to partial deliveries, deliveries to a consignment location and all deliveries where we have agreed to provide additional services such as freight forwarding, packing, exportation and installation.
- 2.2. In the case of a delay in the customer's acceptance of a delivery, we may, without prejudicing our claim for performance, have the goods put into storage at the cost of the customer or, after providing a warning and setting a deadline for the customer, otherwise dispose of them.

3. Delivery Period, Delay

- 3.1. Delivery times shall be ex works. Delivery periods shall begin on receipt of our order confirmation by the customer; however only after settlement of any technical issues pending from the conclusion of the contract; and after receipt of any documents to be provided to us by the customer, such as drawings, permits or approvals; and definitely not before receipt of agreed advance payments. The delivery period shall be considered to have been met if readiness for dispatch has been notified before the expiry of this period. Delivery shall be subject to us receiving our own supplies punctually and in good order.
- 3.2. Force Majeure and circumstances beyond our control, such as strikes, lock-outs, operational disruption, shortages of raw materials and equipment, delayed delivery or non-delivery by our suppliers, shall extend the delivery periods accordingly and shall release us from our delivery obligations if they, as a result, render delivery impossible. We shall also not be liable for the circumstances described above if they arise during an already existing delay. The same shall apply for any additional or amended services requested by the customer.
- 3.3. We shall be considered to be in default of delivery only if the customer has issued us with a reminder, has set a reasonable extension period which has elapsed.
- 3.4. In the case of delay damages, our liability for compensation shall be limited to 10% of the value of the delayed delivery/service. The limitation shall not apply in cases of wilful intent, gross negligence and/or injury to life, limb or health. The customer shall be obliged to immediately inform us in writing of any likely consequences of delay.

4. Prices, Terms of Payment

- 4.1. Prices shall be ex works and exclusive of statutory VAT, if applicable. Costs of packaging, transportation, freight and insurance shall be borne by the customer. Prices shall also be exclusive of the cost of returning and recycling/disposing of old equipment.
- 4.2. Invoices shall be payable to our account in EURO (€) without deductions and free of charges and expenses. Payment shall be made immediately or by the date stated. The determinant factor shall be the receipt of payment. Cheques and bills of exchange shall only be accepted on account of performance and at the cost of the customer.
- 4.3. In the case of customers, with whom we are working for the first time or with whom we do not work regularly, after delay in payment or in the case of reasonable doubt as to the creditworthiness of the customer, we shall reserve the right to make individual deliveries dependent on a pre-payment or a security deposit to the value of the invoice amount.
- 4.4. Should the period between conclusion of contract and agreed delivery exceed four (4) months, so may we, at our discretion, demand a reasonable additional charge equivalent to the increase in our costs up until delivery. For deliveries on call, our current price shall apply.
- 4.5. In the case of an agreed return of goods that are free of defects, the customer shall be charged a checking and processing fee of 15% of the invoice amount (minimum € 10).
- 4.6. Should the customer be in arrears with payment, our debt claims against him shall be due immediately, and we shall not be obliged to make any further deliveries based on current delivery contracts.
- 4.7. If payment is delayed, we shall charge - notwithstanding further damage compensation claims - interest on arrears at the statutory rate
- 4.8. We may offset amounts payable to the customer (e.g. from credit notes) against our claims against the customer.

5. Retention of Title, Assignment of Future Claims

- 5.1. The goods delivered shall remain our property until the complete and unlimited payment. Should we still have further claims against the customer, we shall then retain our property rights until payment of these has been effected.
- 5.2. The customer may neither use goods subject to retention of title nor combine them with other objects to which a third party may have rights. Should, however, goods subject to retention of title become, through their combination with other objects, part of a new (complete) item, we shall be a proportional co-owner of this new item directly, even if this latter component is regarded as the main component. Our proportion of co-ownership shall be determined by the ratio of the invoice value of the goods to the value of the new item at the time of combination.
- 5.3. The customer may resell goods subject to retention of title in the course of his normal business as long as he has not assigned, pledged or otherwise encumbered his claims from the resale.
- 5.4. The customer shall assign to us in advance as collateral any claims against his customers from the resale of the goods subject to retention of title (see Clause 5.3) and/or newly formed items (see Clause 5.2) to the value of our invoice for the goods subject to retention of title. As long as the customer is not in default of payment for the goods subject to retention of title, he may collect the assigned claims in the ordinary course of business. He may, however, only use the proportional proceeds for the payment to us for the goods subject to retention of title.
- 5.5. At the customer's request, we shall release collateral at our discretion if and to the extent that the nominal value of the collateral exceeds 120% of the nominal value of our outstanding debt claims against the customer.
- 5.6. The customer shall be required to inform us immediately of any attachments, seizures or any other third-party dispositions relating to the goods that are reserved or co-owned by us.
- 5.7. In the event of failure to pay bills of exchange or cheques, or failure or recall of a payment made by debit order/direct debit mandate, suspension of payments or

insolvency of the customer or of the end buyer, the rights of the customer under Clause 5.3. shall no longer be valid. The customer must then immediately inform the buyer of our extended retention of title; he may use the assignment of relevant proportional proceeds only to pay for the delivered goods.

- 5.8. Where payment is delayed and in the cases covered in Clause 5.7, we shall be entitled to withdraw from the contract and/or, without withdrawing from the contract, demand the return of any goods subject to retention of title still in possession of the customer and to collect the assigned receivables ourselves. In order to ascertain our rights, we shall be entitled to have all of our customer's documents/books concerning our reserved rights examined by a person who is subject to the professional duty of confidentiality.
- 6. Warranty, Limitation of Liability**
 - 6.1. We warrant that our delivered goods (including any agreed installation) are free of defects at time of risk transfer. The required quality, durability and use of our delivered goods are based solely on the agreed written specification, product description and/or operating manuals. Any information beyond this, in particular in preliminary discussions, advertising and/or referencing industrial standards shall only become part of the contract if they are expressly referenced in writing.
 - 6.2. Should the customer require the delivered goods for purposes other than those agreed, he must take responsibility himself for examining their special suitability for this - also in terms of product safety - and ensure their compliance with all relevant technical, legal or regulatory provisions before the intended use. We shall not be liable for any usability that was not expressly confirmed by us in writing. In the case of material or design requirements of the customer, we shall accept no liability for the suitability or permissibility of the desired materials or designs, and shall, in this respect, have no particular testing obligation. Compliance with safety-related and occupational health regulations depends on the location and operating conditions of which we have no prior knowledge. Action for ensuring compliance shall therefore be the responsibility of the customer or his buyer.
 - 6.3. We shall not be liable for the consequences of improper handling, use, maintenance and operation of the delivered goods; the consequences of normal wear and tear, in particular of wearing parts such as diaphragms, seals, valves, vanes, condensers, oil and the breakage of glass or ceramic parts; for the consequences of chemical, electrochemical or electrical influences; or non-observance of the operating instructions.
 - 6.4. If a notice of defect is justified, we shall initially only be required to provide supplementary performance. Supplementary performance shall be, at our discretion, either rectification of the defect or delivery of goods free of defects. Further warranty claims shall only apply in the event of rejection, impossibility or failure of the supplementary performance. The customer shall bear additional expenses, which arise from the fact that the goods were taken after delivery to a location other than the agreed place of performance.
 - 6.5. The customer must, immediately upon receipt of the goods, inspect them carefully, also in terms of product safety, and notify obvious defects immediately in writing; any hidden defects must be immediately notified upon discovery. The customer must notify the carrier immediately of any transport damage. Failure to observe the testing and notification obligation shall void any customer claims for defects.
 - 6.6. Our liability for slight negligence shall be limited to claims for injury to life, limb or health, to claims under the Produkthaftungsgesetz (German Product Liability Act) or to claims of culpable breach of fundamental contractual obligations through which the purpose of the contract is endangered. Otherwise, our liability for slightly negligent breach of fundamental contractual obligations is limited to the typically occurring damages which we could have foreseen when the contract was concluded.
 - 6.7. Should the customer use the delivered goods in conjunction with environmentally harmful, toxic, radioactive or otherwise hazardous materials, he shall be obliged to clean them before returning them to us. If applicable, we may charge any necessary costs for decontamination/cleaning and disposal to the customer's account.
- 7. Limitation Period**

The warranty period shall be one year and starts from the date of delivery of the goods to the customer. The same shall apply for claims for damages, irrespective of their legal basis. The limitation periods of Section 438 Para. 1 Nos. 1 and 2, Section 479 Para. 1 and Section 634a Para. 1 No. 2 of the BGB (German Civil Code) shall remain unaffected. The restriction of the limitation period shall not apply to claims based on fraudulent concealment of a defect, for claims under the Produkthaftungsgesetz (German Product Liability Act) or for damages resulting from injury to life, limb or health and other damages based on intent or gross negligence. The limitation period in respect of replaced or repaired goods shall not commence anew.
- 8. Software Use**
 - 8.1. If software is included in the scope of a delivery, the customer shall be granted a non-exclusive right to use the software and its associated documentation. It is provided for use on the designated delivery item. The use of the software on more than one system shall be prohibited.
 - 8.2. The customer shall only be entitled to copy, transfer or translate the software or to convert it from object code to source code to the extent permitted by law (Sections 69a et seq. Urheberrechtsgesetz - German Copyright Act). The customer undertakes to refrain from removing manufacturer information, in particular copyright notices, or from changing these without our prior express consent or the prior express consent of the software supplier.
 - 8.3. All other rights to the software and the documentation including copies thereof shall remain with us and/or the software supplier. The issue of sublicenses is not permitted.
- 9. Installation**
 - 9.1. Installation costs may be invoiced on a monthly basis. Fixed installation prices shall only cover the work that has been agreed upon.
 - 9.2. The customer shall be responsible for providing the following at his own expense: lighting, motive power; if necessary, compressed air; water; electrical power for welding and heating, including the necessary connections; electrical installations to connect the products supplied by us; the devices required (such as lifting equipment); a lockable room that can be used for storing materials, tools and clothing during the installation.
- 10. Spare Parts, Maintenance/Repair**
 - 10.1. For spare parts, maintenance and repair current repair and exchange price list shall apply.
 - 10.2. Insofar as there is an obligation on our part to maintain/supply spare parts, then this obligation shall be limited to a period of five (5) years from the date of delivery. If spare parts are not manufactured by us, or are no longer available on the market, for example electronic components, or if the raw material for their production is no longer available, our obligation to deliver spare parts shall lapse.
 - 10.3. Maintenance and calibration services can only be provided if the customer has declared the devices sent to be safe to work on from a health hazard perspective.
- 11. Legal Reservation, Industrial Property Rights, Confidentiality**
 - 11.1. We reserve ownership and all industrial property rights and copyrights to all moulds, tools or other devices, samples, pictures, and business and technical documents produced or provided by us. This also applies where the customer has wholly or in part taken on the costs hereof. The customer may use these only in the manner agreed with us. Without our written consent, he may not himself manufacture contractual objects delivered or have the same manufactured by third parties.
 - 11.2. Insofar as we deliver goods according to the designs or other requirements specified by the customer (models, patterns etc.), the customer shall be liable to us by default for ensuring that, through the manufacture and delivery of these goods, the industrial property rights or other rights of third parties are not infringed. If the customer is at fault he shall reimburse us all damage resulting from any such infringement of rights.
 - 11.3. All information acquired through the business relationship with us which is not deemed to be public knowledge shall be deemed proprietary and may not be disclosed to any third party.

EASY CONVERSION

The following tables will easily allow you to convert the pumping speed and the ultimate vacuum of the units used in the catalog into your preferred unit

Pumping speed

m³/h	cfm	l/sec	l/min
1	0.589	0.278	16.67
0.5	0.295	0.139	8.34
1.5	0.884	0.417	25.01
2	1.18	0.556	33.34
3	1.77	0.834	50.01
4	2.36	1.11	66.68
5	2.95	1.39	83.35
6	3.53	1.67	100.0
7	4.12	1.95	116.7
8	4.71	2.22	133.4
9	5.30	2.50	150.0
10	5.89	2.78	166.7
15	8.84	4.17	250.1
20	11.8	5.56	333.4
30	17.7	8.34	500.1
40	23.6	11.1	666.8

Ultimate vacuum

mbar (hPa)	torr (mm Hg)	Pa N/m²	psi lbf/inch²
1	0.750	100	1.45x10⁻²
100	75.0	10000	1.45
70	52.5	7000	1.02
50	37.5	5000	0.725
20	15.0	2000	0.290
15	11.3	1500	0.218
10	7.50	1000	0.145
7	5.25	700	0.102
5	3.75	500	7.25x10 ⁻²
2	1.50	200	2.90x10 ⁻²
1.5	1.13	150	2.18x10 ⁻²
1	0.75	100	1.45x10 ⁻²
0.5	0.38	50	7.25x10 ⁻³
0.1	7.5x10 ⁻²	10	1.45x10 ⁻³
1x10 ⁻²	7.5x10 ⁻³	1	1.45x10 ⁻⁴
1x10 ⁻³	7.5x10 ⁻⁴	1x10 ⁻¹	1.45x10 ⁻⁵
1x10 ⁻⁶	7.5x10 ⁻⁷	1x10 ⁻⁴	1.45x10 ⁻⁸