Catalog 2010
Technology for Vacuum Systems

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TRADEMARK-INDEX

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Technology for Vacuum Systems

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At a glance
Table of content

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 (perfluorpolyether) 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, almost 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 every pump needs a bit of service occasionally to operate at top performance. 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, but still have a lot of service left in them. Quality pays!

Calibration

VACUUBRAND operates a calibrating laboratory of the German Calibration Service for vacuum measuring instruments. Its accreditation includes calibrating vacuum meters and other absolute pressure measuring instruments in the measuring range of 1000 to 10^{-3} mbar. We are authorised to issue DKD calibration certificates. We can not only calibrate our own instruments, but also the vacuum measuring instruments of other manufacturers.

DKD

Distribution

You can get our standard products from leading laboratory dealers at home and abroad. Consulting support to our customers is very important for us; it ensures that we understand your needs and can recommend the best pump for your application and budget. No matter your location around the world, VACUUBRAND specialists are available to advice our dealers in their technical support to our customers. Just call - you'll find the contact data further back in the catalog, on pages 168 and 169.

Technology
Our people make the difference

Coordinating work preparation and assembly

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 40 year, more than 100 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 degree 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

Efficiently organized production and storage halls with state-of-the-art machines

Shipping and packaging according to environmentally-friendly and ecological 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 80 mbar to 0.6 mbar and volume flow rates of 1-12 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.

▶ pg. 25

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 80 mbar to 0.3 mbar and volume flow rates of 1-13 m³/h. They have a wide range of applications in laboratories and industrial operations. Highly flexible, quiet-running diaphragms made of FPM 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-pump in state-of-the-art wide-range turbo pump, or as a source of vacuum in an analytical apparatus. The new NT series pump models have innovative connection engineering for particularly secure gas sealing.

▶ pg. 83

"XS" Rotary vane pumps

Rotary vane pumps are used wherever it is necessary to have a process vacuum 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, supplies high vapor compatibility for water and solvents. VACUUBRAND rotary vane pumps' volume flow rate is specified at atmospheric pressure, as is customary with PNEUROP®. For process effiency, 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.

▶ pg. 111

CHEMISTRY PUMPING UNITS - VACUUM GAUGES AND VACUUM 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 do 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 continuosly 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.

pg. 40

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. Chemically resistant, long lived gauge heads with high precision are used with instruments that operate in a range to 0.1 mbar (ceramic diaphragm vacuum sensor) or 10^{-3} mbar (plastic/ceramic Pirani vacuum sensor). 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 a certified laboratory of the German Calibration Service (DKD). Our laboratories are certified to calibrate vacuum measuring instruments and controllers in a pressure range of 1000 to 10^{-3} mbar, with confirmation of tracing back to the national standards.

pg. 133

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 convinience of standardization of dimensions in conformity with DIN 28403. This range of products is based on the pipe, T- and cross pieces, elbows, flexible lines, connecting elements and sealing/tension 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 virtually any 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 bellow-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.

pg. 147

"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:
  - 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.
- VACUUBRAND was the first to introduce vapor emission condensers to the market, in 1987. With virtually 100% solvent recovery, these condensers keep solvent vapors from polluting the environment and enable solvent recycling for reuse.
- Oil-free pumps have displaced the classical rotary vane pumps in a number of applications, reducing contaminated-oil disposal.
- You can be sure that our pumps, gauges and controllers are free of cadmium and mercury.

Green manufacture and green operations drive down pollution and resource utilization, while going easy on your wallet. Environmental protection is important to everybody - let's all act responsibly !

The right solution for your application

For over 45 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, and the comparative advantages of each option.

Applications

- Rotary evaporator / parallel evaporator
- Vacuum concentrator
- Drying chamber
- Gel dryer
- Filtration, solid phase extraction and fluid aspiration
- Lyophilization, Schlenk-lines, molecular distillation
- Networked vacuum supply for laboratories (VACUU·LAN®)
- High vacuum technology, backing pumps for turbo pumps
- OEM products

Choosing vacuum equipment

For rotary evaporators / parallel evaporators

- Vacuum requirements for rotation 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 regulation with samples that tend to superheating or foaming
- vacuum regulation for short process times and high reproducibility
- optimum condensation in the cooler of the rotation evaporator
- recovery of residual solvent vapors after the pump

Demands made of the vacuum pump

- excellent chemical and condensate compatibility
- effective gas ballast equipment to prevent condensation in the pump and protect pump performance
- excellent ultimate vacuum even with gas ballast operation for continuous evaporation
- low ultimate vacuum needed at low condensing temperatures or with high boiling point solvents
- emission condenser for solvent recovery minimizes environmental and laboratory air pollution
- for applications with larger amounts of inflammable solvents: pumps and gauges with ATEX-approval

An example of a typical high-temperature boiling solvent is DMF. Its vapor pressure at 40°C is at approximately 11 mbar. For such high-temperature boilers, we recommend a system or pumping unit that reaches 4 mbar of ultimate vacuum even with gas ballast, such as the PC 3001 VARIO.

Recommended systems

Without vacuum regulation, but including vapor capture: Ultimate vacuum 7 mbar or as much as 1.5 mbar: MZ 2C NT +AK+EK or MD 1C +AK+EK ▸ pg. 37, 48

With classical two-point vacuum regulation with a solenoid valve: Ultimate vacuum 7 mbar or to 1.5 mbar: PC 510 NT or PC 610 NT ▸ pg. 42, 59

Precision and fully automatic VARIO® vacuum regulation: Ultimate vacuum 7 mbar or as much as 2 mbar: PC 3002 or PC 3001 VARIO ▸ pg. 44, 50

Especially good ultimate vacuum up to 0.6 mbar, for evaporation at low bath temperature: PC 3003 VARIO ▸ pg. 68

Entry-level systems for precise vacuum regulation that can be upgraded to full automation ▸ pg. 49

ATEX chemistry diaphragm pumps and ATEX chemistry vacuum systems ▸ pg. 79

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. 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 regulation with samples that tend to foam
- condensate and droplet precipitation between the pump and concentrator

Demands made of the vacuum pump

- great resistance to chemicals
- ultimate vacuum as much as 7 mbar or 1.5 mbar
- sufficient volume flow rate (2 m³/h and more)
- not sensitive to 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

Recommended systems

An ultimate vacuum of as much as 7 mbar is sufficient for organic solvents and/or small amounts of H_2O ▶ pg. 34

An ultimate vacuum of as much as 1.5 mbar is advisable for aqueous samples, high boiling point solvents and/or low working temperatures.
This especially concerns solvents such as DMF, DMSO, NMP or DMAC. ▶ pg. 46

VARIO® pumping units with automatic vacuum optimization are the best option for gentle concentration operations and for mixtures of substances that tend to boiling delay. ▶ pg. 44, 50

Final pressures of as low as 10^{-3} mbar may be necessary for optimum residual drying or for high-temperature boilers at very low evaporation temperature. The chemistry-HYBRID™ pump RC 6 has proved its worth here. ▶ pg. 122

A cold trap can be located upstream of any of the pumps to boost flow-through, if helpful.

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 transmission to the sample material for time-saving drying
- large vapor quantities have to be pumped off depending upon the sample material
- condensate and droplet separation between the drying chamber and pump

Demands made of the vacuum pump

- with aqueous samples: oil-free diaphragm vacuum pumps (not necessarily a design resistant to chemicals) or oil-sealed rotary vane pumps for a high ultimate vacuum
- excellent chemical and condensate compatibility for drying samples containing solvents
- for drying ovens previously pumped with water-jet pumps or house vacuum: Pumps with ultimate vacuum of as much as 7 mbar
- pump protected from particles and droplets of liquid with a vacuum inlet separator (AK)
- emission condenser for solvent recovery minimizes environmental and laboratory air pollution
- for applications with large amounts of inflammable solvents: Use pumps and gauges with ATEX-Approval

Recommended systems

For aqueous samples, or those containing solvents vaporable with a water-jet vacuum:
MZ 2C NT + 2AK or MZ 2C NT +AK+EK ▶ pg. 36, 37

For good residual drying, especially with high-temperature boilers and/or low temperatures; vacuum to 1.5 mbar:
MD 4C NT + 2AK or MD 4C NT +AK+EK ▶ pg. 54, 55

VARIO® diaphragm pumps and pumping units afford the best vacuum optimization throughout the drying process:
PC 3001 VARIO, PC 3003 VARIO ▶ pg. 50, 68

We recommend single-stage rotary vane pumps for vacuum requirements up to 10^{-1} mbar or the vapor-compatible chemistry-HYBRID™ pump RC 6. ▶ pg. 114, 122

For especially high volume flow rate to ultimate vacuum of 10^{-1} mbar:
Roots pumping units ▶ pg. 74

Choosing vacuum equipment

For gel dryers

Gel dryers make more limited demands on vacuum system than many lab applications. The ultimate vacuum needed 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 leak rates in gel drying, so the flow rate should be watched closely throughout the process
- condensate and droplet separation between the gel dryer and pump
- vacuum regulation is beneficial to keep the gels from tearing

Demands made of the vacuum pump

- excellent chemical and condensate compatibility
- ultimate vacuum of as much as 7 mbar (for SDS-PAGE below 10%) or to 1.5 mbar (for SDS-PAGE greater than 10%)
- 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 an exhaust emission condenser (EK) to minimize environmental and laboratory air pollution with solvent vapors
- vacuum regulation, such as with a manual flow-control valve

Recommended systems

Ultimate vacuum 7 mbar vacuum for sequencing gels, for example, with SDS-PAGE up to 10%, including gels that may have been previously operated with water jet pumps:

MZ 2C NT +2AK or MZ 2C NT +AK+EK ▶ pg. 36, 37

PC 101 NT for manual vacuum control ▶ pg. 40

Ultimate vacuum to 1.5 mbar for high boiling point solvents at low temperatures, or for gradient gels with SDS-PAGE >10%:

MD 4C NT +2AK or MD 4C NT +AK+EK ▶ pg. 54, 55

PC 201 NT for manual vacuum control ▶ pg. 57

For coolant-free electronic condensing, select the Peltronic™ condenser with either the MZ 2C NT +2AK or the MD 4C NT +2AK, as appropriate to your vacuum needs ▶ pg. 77

Choosing vacuum equipment

Filtration, solid phase extraction, and fluid aspiration

- Filtration is accelerated either with pressure or with the aid of vacuum. The vacuum regulation and ultimate vacuum requirements are generally low. If it is filtered at 80 mbar, 92% of the atmospheric pressure is available as the driving force for filtration. Excess vacuum (e. g., from rotary vane pumps) can even cause evaporation of solvents instead of just liquid flow.

Process requirements

- very modest ultimate vacuum, no more than average requirements
- adequate vacuum flow rate, depending on the filter size, leak rate, condition of the filter cake, and whether a filtration manifold may be used to operate more than one filter at a time
- simple, manual vacuum regulation

Demands made of the vacuum pump

- single- or two-stage diaphragm pumps with as much as 70 or 7 mbar ultimate vacuum are ideal
- excellent chemical and condensate compatibility for filtration or extraction of samples containing solvents
- pump protection from particles and droplets of liquid with a suction-side separator (AK)
- an exhaust condenser to minimize pollution of the environment and laboratory air from solvent vapors
- chemistry pumping units that are equipped with electronic vacuum controllers shut off pump when filtration is complete

Recommended systems

Diaphragm pumps:

Down to 70 mbar	▸pg.30 Chemistry	▸pg. 86 for non-corrosive gases
Down to 7 mbar	▸pg.34 Chemistry	▸pg. 92 for non-corrosive gases

- For professionally aspirating and disposing of liquids in biochemistry, microbiology and cellular culture technology a proven system solution is available with all of the necessary accessories. This BioChem-VacuuCenter BVC NT system includes:
  - integrated chemistry diaphragm pump (not at BVC 01)
  - automatic vacuum control
  - autoclavable collecting bottle (4 l) with hydrophobic protection filter 0.2 µm
  - ergonomic and versatile suction controller, with port for optional second controller

Detailed description: ▸pg. 130

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 is our chemistry-HYBRID™ pump RC 6 (a combination of a rotary vane and a chemistry diaphragm pump). The integrated diaphragm pump enhances condensate compatibility, reducing service needs as much as 90 percent, and results in longer lifetime. 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)
- depending upon material to be dried regulation of material temperature and vacuum level

Demands made of the vacuum pump

- ultimate vacuum to 10^{-3} mbar
- depending upon process conditions, excellent pump condensate compatibility may be important to protect the pump's service life
- low ultimate vacuum even with opened gas ballast valve
- 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

Recommended systems

Ultimate vacuum down to 10^{-3} mbar: Two-stage rotary vane pumps ▸ pg. 111

Oil mists escaping from rotary vane pumps should be captured. We recommend ready-to-connect packages with an oil mist filter and a suction-side valve: For instance, the RZ 6 package with the FO exhaust filter and VS 16 shut-off valve. ▸ pg. 114

For slightly aggressive gases and condensable vapors: Chemistry-HYBRID™ pump RC 6 ▸ pg. 122

For drying of oxygen-sensitive samples in nitrogen/vacuum manifolds ("Schlenk line") under fine- to high-vacuum conditions with cold trap between application and pump ▸ pg. 111, 127, 128

In molecular distillation (short-path distillation), processes are carried out in a vacuum range of 10^{-3} to 10^{-6} mbar. The HP high-vacuum pumping units called for are completely equipped combinations of rotary vane and diffusion pumps with valve switching and bypass system. ▸ pg. 128

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. This also avoids the numerous drawbacks of a central ("house") vacuum supply. These very versatile modules for single workplaces can be subsequently upgraded. All of the components are available for new laboratory furnishings or for installation in existing or renovated laboratories. All of the subassemblies are very resistant to chemicals and have built-in check valves to ensure that adjacent applications do not contaminate or interfere with one another.

Just three steps to the appropriate local vacuum network

- **Step 1: What kind of application?**

  Select your applications from our vacuum application guide.
  Define the needed working vacuum. ▶ pg. 16-21

  Applications that are not well suited to laboratory vacuum networks include those with:

  - very large volumes or a constantly high level of vapor production (such as a vacuum drying oven or dessicator with very "wet" samples)
  - vacuum needs of < 2 mbar

- **Step 2: What kind of vacuum port?**

  Which of the vacuum connections listed meet your requirements?

  - Shut off (ball valve)
  - Manual flow control (for example, very small applications should have flow-control regulation)
  - Electronic vacuum regulation with an in-line solenoid valve and vacuum controller, for applications where automated vacuum control is important for process or productivity reasons
  - Mounting bases for an existing laboratory or one in planning?

- **Step 3: Which vacuum pump or which pumping unit?**

  Condensate protection should always be used on the suction side and an emission condenser should be used on the exhaust side. An electrically-cooled condenser ("Peltronic™") eliminates need for cooling water connections. Also check:

  - the working vacuum needed in the network: Select the larger pump in borderline cases
  - the pump's required volume flow rate: This depends on the number of connections that will be used simultaneously
  - pump and cooling water management: The vacuum and cooling water are regulated as needed. Automatic on-off regulation of pumps and cooling water reduce power and water consumption, and extend service intervals
  - for unsupervised operation: Liquid level sensor on emission condenser catchpot recommendable (with vacuum controller only)

Pump management:
a) with variable-speed VARIO® drive for approximately 20% more performance and demand-responsive pumping speed such as the PC 3004 VARIO ▶ pg. 62

b) with automatic, demand-responsive vacuum generation via pump on-off switching, such as the PC 600 LAN NT ▶ pg. 58

Overview of pumping units and accessories ▶ pg. 27-29
VACUU·LAN® ▶ pg. 147-150

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. Turbo pumps need an auxiliary backing pump as they cannot compress to atmospheric pressure. Using oil-free diaphragm pumps for fore-vacuum generation in connection with state-of-the-art turbomolecular pumps (with "molecular drag" stage) decisively improves the cleanliness of the vacuum generated. In many cases, such an oil-free high vacuum is absolutely necessary.

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 backing vacuum. The volume flow rate of the diaphragm pump then only has an impact on the pump-down time.
- in case of a noticeable gas load, the backing pump has to be appropriately dimensioned to guarantee the maximum acceptable backing pressure of the high vacuum pump. For these applications, it is important to select a diaphragm pump with high flow rates even near ultimate vacuum. All VACUUBRAND diaphragm pumps are excellent in this regard due to their planar diaphragm design.

Demands made of the vacuum pump

- the required ultimate vacuum of the diaphragm pump depends on the maximum permissible backing pressure of the high-vacuum pump; VARIO® diaphragm pumps offer an ultimate vacuum up to 0.3 mbar
- high volume flow rate even close to the ultimate vacuum
- low energy consumption
- low back-streaming leakage rate to prevent venting of the application in the event of power failure
- continuous-duty rated, 24/7
- not sensitive to condensate
- high long-term ultimate vacuum stability and diaphragm lifetime
- reliable start-up even under vacuum
- small size, low weight and very low vibration

Recommended systems

Typical backing pumps for modern wide-range turbo pumps (with molecular drag stage)

down to 4 mbar:	MZ 2D NT	▶ pg. 92				
down to 1 mbar:	MD 1	▶ pg. 94	MD 4 NT, MD 4 NT VARIO	▶ pg. 96	MD 12	▶ pg. 98
down to 0.3 mbar:	MV 2 NT, MV 2 NT VARIO	▶ pg. 100	MV 10, MV 10 VARIO-B	▶ pg. 102		

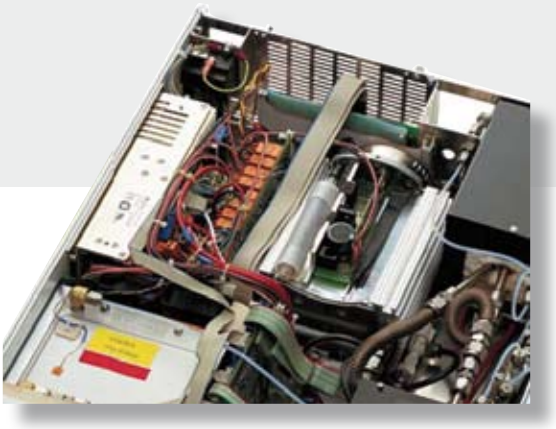
Traditional turbomolecular pumps require lower backing pressures. Therefore, they demand single and two-stage rotary vane pumps:

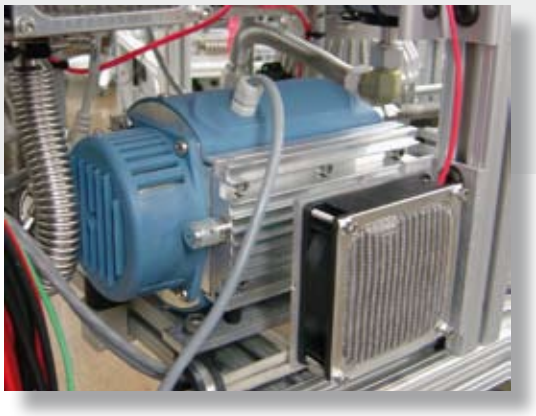
Rotary vane pumps ▶ pg. 111

Choosing vacuum equipment

OEM products: According to individual requirements

For 45 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. A formidable development team and our integrated production 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 quality of the vacuum 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.

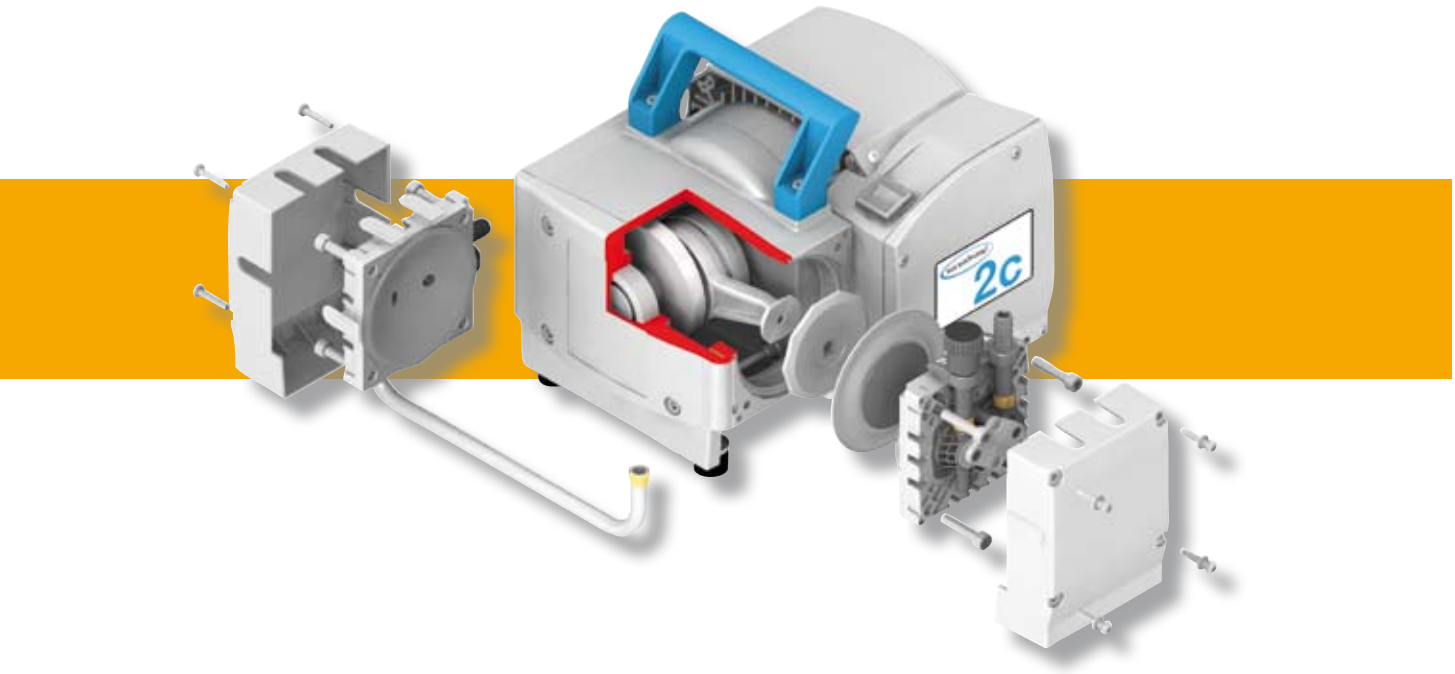
Typical customized modifications

- choice of drives
- adapted electrical connection and vacuum connection
- flexibly adapting the control system (for instance, with VARIO-SP™ pumps)
- using "compatible" materials
- specifying and checking specific vacuum technology parameters
- customized label and color
- product documentation

Technical data of typical built-in pumps:
VARIO-SP™ ▶ pg. 105

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 have uncompromising chemistry designs: Due to fluorocompounds they are very resistant to chemical vapors from inlet to exhaust, and are very tolerant of condensate. Our two-, three- and four-stage pumps also have a gas ballast valve that helps to preserve pump performance when working with condensable vapors. Pumping chambers are hermetically separated from the drive space, 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 water waste of water-jet aspirators, and the contaminated waste-oil disposal of rotary vane pumps.

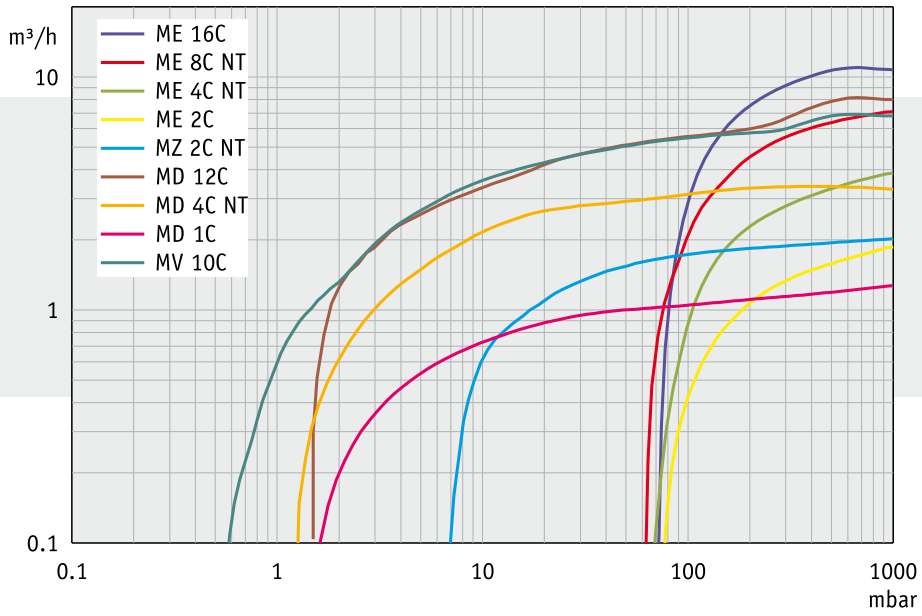


- PTFE sandwich diaphragms and valves made of perfluoro elastomer or PTFE
- internal tubing and fittings made of PTFE/ETFE/ECTFE compounds
- exceptional diaphragm lifetimes with ultra-durable PTFE sandwich design
- head cover and clamping disc made of fluoro compounds with stability core for unsurpassed long-term performance
- very long service intervals for low lifetime cost-of-ownership
- patented new drive system for extra quiet, ultra-low-vibration operation (NT)
- 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)

Oil-free vacuum for corrosive gases and vapors

Chemistry diaphragm pumps

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 from single ("E") to four ("V") stage design
- C = chemistry design
- NT = labels the new series of pumps comprising the New Technology
- AK = separator for condensates, at inlet or at outlet
- EK = exhaust vapor (emission) condenser for solvent recovery
- TE = emission condenser for solvent recovery for dry ice or water ice
- PC = "Pumping Unit, Chemistry" - a chemistry pump with vacuum control and solvent recovery
- VARIO® or VARIO-B = speed controlled pump with vacuum controller CVC 3000

OIL-FREE VACUUM FOR CORROSIVE GASES AND VAPORS

CHEMISTRY DIAPHRAGM PUMPS, CHEMISTRY VACUUM SYSTEMS AND CHEMISTRY PUMPING UNITS

- VACUUBRAND offers chemistry vacuum systems and chemistry pumping units as complete ready-to-connect systems with the best chemistry diaphragm pumps for the desired vacuum range and volume flow rate. You can maximize the vacuum application's efficiency, functioning and environmental protection with the right combination of coordinated accessories. The basic pumps of the different system families are mounted in a space-saving portable system and equipped with the accessories appropriate for particular applications.

The components

- AK - (as shown) the separator catchpot for inlet or outlet-side condensates. The inlet (suction-side) separator catchpot collects particles and droplets of liquid. An exhaust (pressure-side) separator collects outlet condensate, keeps condensate from returning to the pump and helps keep the pump whisper quiet.

- EK - (as shown) the emission condenser for capturing vapors from the exhaust side of the pump. Made of shielded glass, it is compact, but still highly efficient. It allows for virtually 100% recovery of solvents and protection of the atmosphere.

- EK Peltronic™ - an electronic emission condenser that operates without cooling water or dry ice. Peltier elements and air cooling afford clean, convenient refrigeration.
▶ pg. 77

- TE - a condenser for dry ice or water ice for emissions control and solvent recovery without cooling water supply.
▶ pg. 77

- Liquid level sensor: Keeps the collecting catchpots (at AK or EK) from overflowing; supplies warning signals via the electronic vacuum controller with VACUU·BUS™ connections, and stops the pumping process if needed.
▶ pg. 78

- Manual flow-control regulation: The flow-control valve is designed for easy adjustment of the effective volume flow rate, and mounted on the inlet separator on some pumping units

- Manometer: A mechanical vacuum manometer provides trend indication, and approximate vacuum levels on some of our more basic models.
MZ 2C NT +AK+M+D ▶ pg. 39
PC 101 NT ▶ pg. 40
PC 201 NT ▶ pg. 57

- Two vacuum connections on one pumping unit: We have systems and pumping units with a second vacuum connection available for independently operating two processes in parallel with just one pump. Check valves reliably isolate the two different applications from one another.

Oil-free vacuum for corrosive gases and vapors

Vacuum control

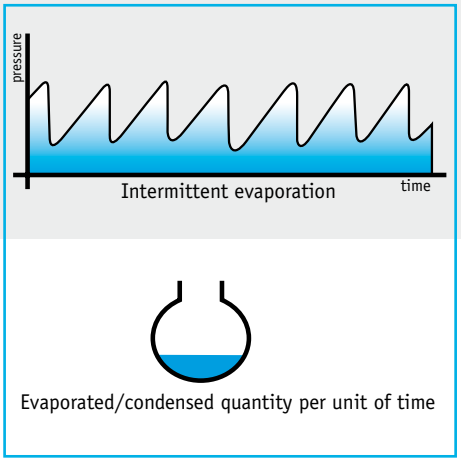
- The various vacuum applications in laboratory and industry often require controlled vacuum or pump management for:
  - reproducible results for drying and evaporation processes
  - reduced process times for distillations
  - minimizing foaming and boiling delay

- Longer lifetime for the diaphragms and pump associated with pump operation only on-demand (e.g., with the VNC 2 vacuum controller or with the CVC 3000 vacuum controller in connection with the Vacuum-Management-System module VMS-B)

- **Two-point regulation by ON/OFF vacuum pump switching**

  The VNC 2 vacuum controller is primarily used in vacuum networks to switch the server pump on and off as required. Additionally, it can control the flow of cooling water for environmental purposes. Switching of a pump also possible using the CVC 3000 and the VMS-B module.

  ▸ Vacuum controller VNC 2 pg. 144
  ▸ Vacuum-Management-System module VMS-B pg. 145
  ▸ Vacuum networks pg. 147

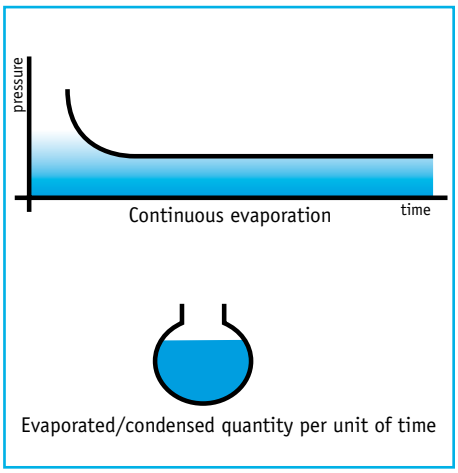


- **Two-point vacuum control via in-line solenoid valve**

  The CVC 3000 vacuum controller regulates the vacuum with the classical method of two-point regulation using an electromagnetic in-line valve. The CVC 3000 is easy to use with its jog-wheel control and high-resolution display, a sensor that is highly resistant to chemicals and a programming tool for recurring processes. ▸ pg. 142

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

  VARIO® - diaphragm pumps and - chemistry pumping units precisely regulate the vacuum by adjusting the speed of the diaphragm pump. Its fast and adaptive regulation always provides the optimum volume flow rate regardless of the quantity of vapor or size of the apparatus. The CVC 3000 vacuum controller with the connected VARIO® pump finds the boiling pressure of the solvent to be evaporated fully automatically and constantly adapts the vacuum to the process. Because conditions are always optimized, evaporative applications typically are completed significantly more quickly than with two-point or manual control.



▸ Product overview: Chemistry diaphragm pumps pg. 29
▸ Vacuum controller CVC 3000 pg. 142

CHEMISTRY DIAPHRAGM PUMPS

SERIES OVERVIEW

	Chemistry diaphragm pumps	Chemistry vacuum systems	Chemistry pumping units	
Examples of use	Basic pump for many systems	without vacuum control	vacuum control and solvent recovery	with two vacuum ports to operate two applications simultaneously
Down to 70 mbar Pumping of aggressive gases and vapors For low-boiling solvents Vacuum filtration	 ME 2C ▶ pg. 30  ME 4C NT ▶ pg. 30  ME 8C NT ▶ pg. 32  ME 16C ▶ pg. 32	 Upgrade kit PC 8 for (among others) ME 16C ▶ pg. 78		
Down to 7 mbar Concentration, drying For many common solvents Rotary evaporator Vacuum concentrators	 MZ 2C NT ▶ pg. 34	 MZ 2C NT +2AK ▶ pg. 36  MZ 2C NT +AK+EK ▶ pg. 37  MZ 2C NT +AK+M+D ▶ pg. 39	 PC 101 NT ▶ pg. 40  PC 510 NT ▶ pg. 42  PC 500 LAN NT ▶ pg. 41  PC 3002 VARIO ▶ pg. 44	 MZ 2C NT +AK SYNCHRO+EK ▶ pg. 38  PC 511 NT ▶ pg. 42  PC 520 NT ▶ pg. 43
Down to 1.5 mbar Concentration, drying For high-boiling solvents Rotary evaporator Vacuum concentrators	 MD 1C ▶ pg. 46  MD 4C NT ▶ pg. 52  MD 12C ▶ pg. 64	 MD 1C +AK+EK ▶ pg. 48  PC 3001 basic ▶ pg. 49  MD 4C NT +2AK ▶ pg. 54  MD 4C NT +AK+EK ▶ pg. 55  Upgrade kit PC 8 for (among others) MD 12C ▶ pg. 78	 PC 3001 VARIO ▶ pg. 50  PC 201 NT ▶ pg. 57  PC 610 NT ▶ pg. 59  PC 600 LAN NT ▶ pg. 58  PC 3004 VARIO ▶ pg. 62  PC 3012 VARIO ▶ pg. 66	 MD 4C NT +AK SYNCHRO+EK ▶ pg. 56  PC 611 NT ▶ pg. 60  PC 620 NT ▶ pg. 61
Down to 0.6 mbar Concentration, drying For high-boiling solvents, evaporation at low temperatures Rotary evaporator Vacuum concentrators	 MV 10C ▶ pg. 70	 PC 8 / MV 10C ▶ pg. 70	 PC 3003 VARIO ▶ pg. 68  PC 3010 VARIO ▶ pg. 72	

Chemistry diaphragm pump
ME 2C and ME 4C NT

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. The new NT-series features further improved performance data and chemical resistance.

ME 4C NT
3.9 m³/h
70 mbar

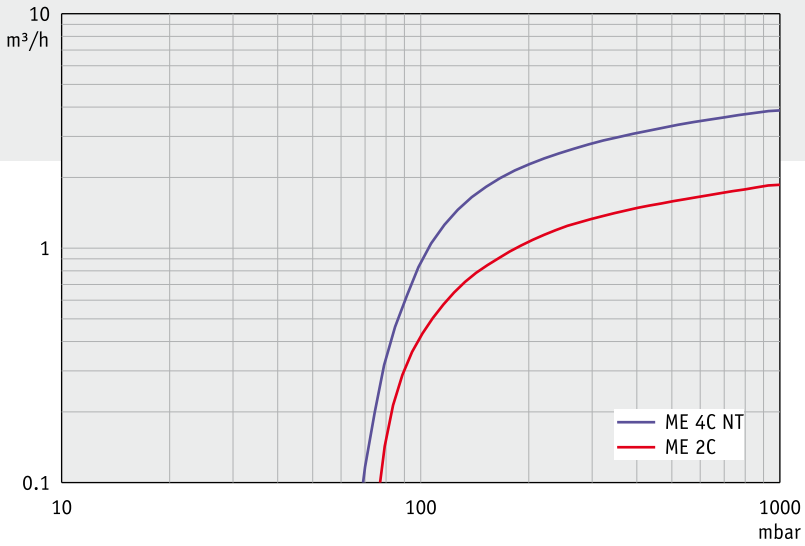
ME 2C
1.9 m³/h
80 mbar

PERFORMANCE FEATURES

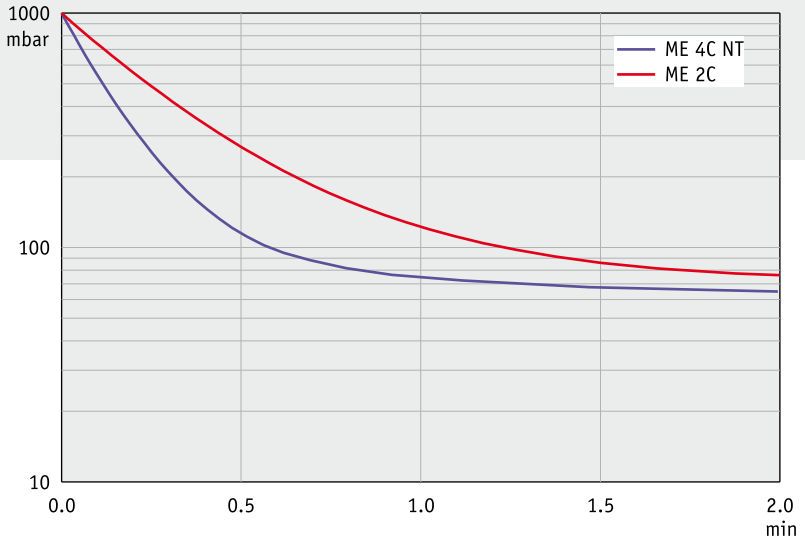
- outstanding chemical resistance
- high performance even at low vacuum levels
- whisper quiet
- low vibration
- long diaphragm life, maintenance-free drive system

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 vacuum ovens, filtration as well as concentration of solvents with low boiling points. The ME 4C NT is recommended for processes which require higher flow rates.



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 (CEE Version)	ME 4C NT
Number of heads / stages		1 / 1	2 / 1
Max. pumping speed 50/60 Hz	m³/h	1.9/2.2	3.9/4.3
Ultimate vacuum (abs.)	mbar	80	70
Max. back pressure (EX) (abs.)	bar	2	1.1
Inlet connection (IN)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Rated motor power	kW	0.12	0.18
Degree of protection		IP 54	IP 40
Dimensions (L x W x H)	mm	258 x 164 x 191	254 x 243 x 198
Weight	kg	7.1	11.1

ORDERING INFORMATION	ME 2C	
230 V ~ 50-60 Hz	CEE	696121
100-120 V/200-230 V ~ 50-60 Hz	UK	696132
100-120 V/200-230 V ~ 50-60 Hz	US	696124

ORDERING INFORMATION	ME 4C NT	
230 V ~ 50-60 Hz	CEE	731200
230 V ~ 50-60 Hz	CH	731201
230 V ~ 50-60 Hz	UK	731202
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US	731203
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual

Chemistry diaphragm pump
ME 8C NT and ME 16C

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.

ME 8C NT
7.1 m³/h
70 mbar

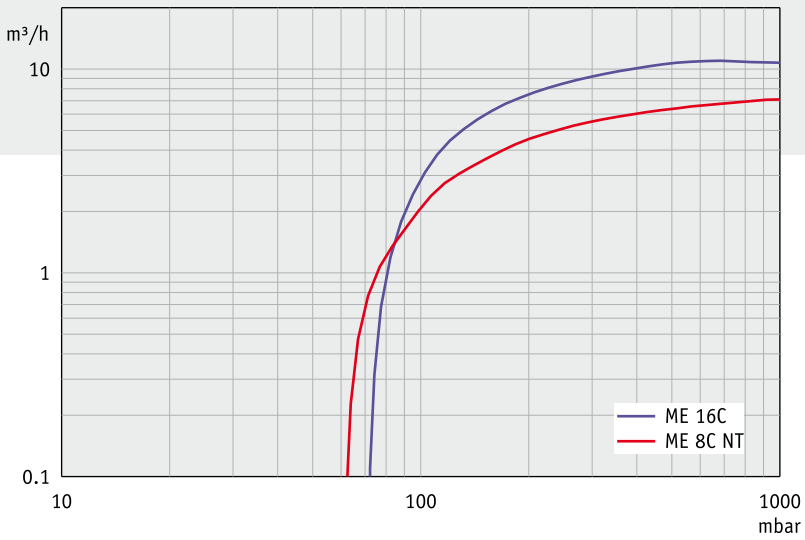
ME 16C
10.1 m³/h
80 mbar

PERFORMANCE FEATURES

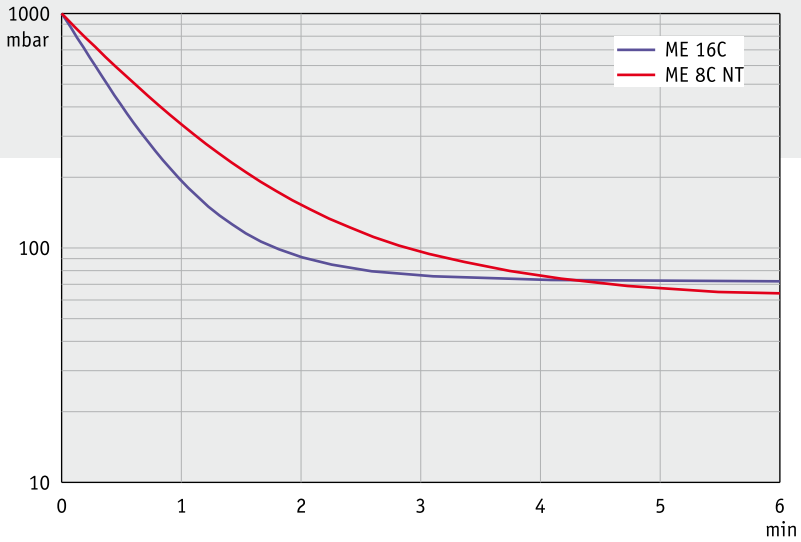
- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- compact design
- whisper quiet and very low vibration
- long diaphragm life, maintenance-free drive system

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 vacuum ovens 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 16C
Number of heads / stages		4 / 1	8 / 1
Max. pumping speed at 50/60 Hz	m³/h	7.1/7.8	10.1/11.6
Ultimate vacuum (abs.)	mbar	70	80
Ultim. vac. (abs.) with gas ballast	mbar	-	150
Max. back pressure (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Hose nozzle DN 10 mm	Small flange KF DN 25
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Rated motor power	kW	0.25	0.39
Degree of protection		IP 40	IP 20
Dimensions (L x W x H)	mm	325 x 243 x 198	515 x 237 x 294
Weight	kg	14.3	25

ACCESSORIES ME 8C NT

Rubber vacuum tubing
DN 10 mm (686002)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual

ORDERING INFORMATION ME 8C NT		
230 V ~ 50-60 Hz	CEE	734200
230 V ~ 50-60 Hz	CH	734201
230 V ~ 50-60 Hz	UK	734202
120 V ~ 60 Hz	US	734203
With NRTL certification for Canada and the USA		

ORDERING INFORMATION ME 16C		
230 V ~ 50-60 Hz	CEE	696467
400 V ~ 50 Hz 3 ph.	CEE	696468
230 V ~ 50-60 Hz	CH	696512
230 V ~ 50-60 Hz	UK	696511
120 V ~ 60 Hz	US	696466
100 V ~ 50-60 Hz	US	696472

ACCESSORIES ME 16C

Rubber vacuum tubing DN 10 mm (686002)
PTFE tubing KF DN 25 (1000 mm: 686033)
Inlet separator AK PC 8 (699980)
Kit PC 8 with emission condenser (699949)

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 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 MZ 2C NT with gas ballast valve is optimally prepared for pumping easily 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.

MZ 2C NT
2.0 m³/h
7 mbar

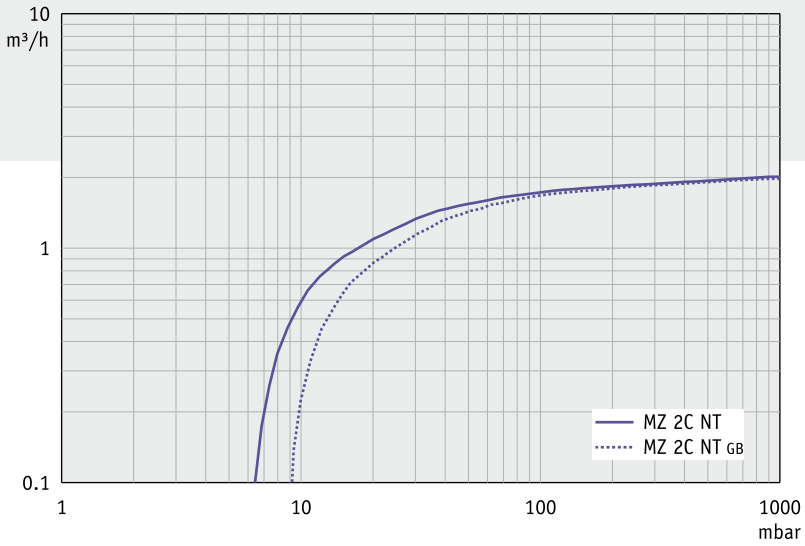
PERFORMANCE FEATURES

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

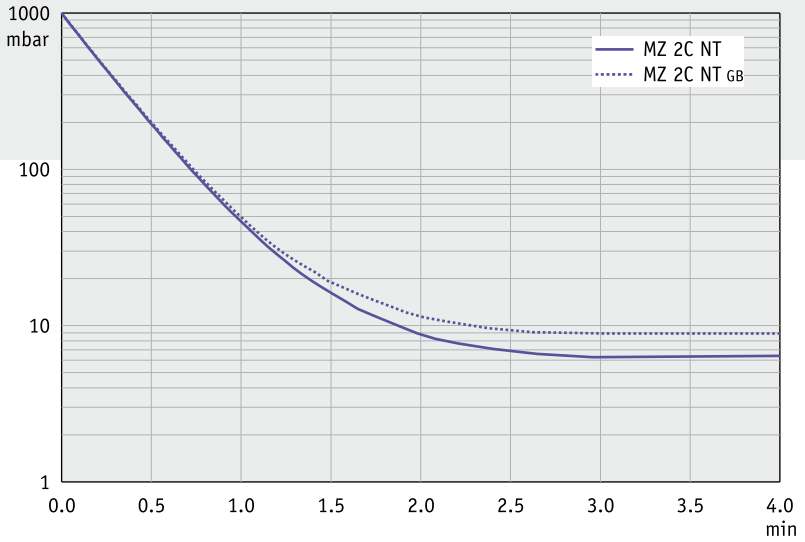
APPLICATIONS

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. Typical applications are rotary evaporators, vacuum concentrators, gel dryers 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.

Further information at **www.vacuubrand.com**



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 at 50/60 Hz	m³/h	2.0/2.3
Ultimate vacuum (abs.)	mbar	7
Ultim. vac. (abs.) with gas ballast	mbar	12
Max. back pressure (EX) (abs.)	bar	1.1
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Rated motor power	kW	0.18
Degree of protection		IP 40
Dimensions (L x W x H)	mm	243 x 243 x 198
Weight	kg	11.1

ORDERING INFORMATION		MZ 2C NT
230 V ~ 50-60 Hz	CEE	732300
230 V ~ 50-60 Hz	CH	732301
230 V ~ 50-60 Hz	UK	732302
100-115 V ~ 50-60 Hz 120 V ~ 60 Hz	US	732303
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual

Chemistry vacuum system
MZ 2C NT +2AK

MZ 2C NT chemistry diaphram 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.

MZ 2C NT +2AK
2.0 m³/h
7 mbar

PERFORMANCE FEATURES

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

TECHNICAL DATA same as MZ 2C NT, except		
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Dimensions (L x W x H)	mm	319 x 243 x 309
Weight	kg	13.6

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	732500
230 V ~ 50-60 Hz	CH	732501
230 V ~ 50-60 Hz	UK	732502
100-115 V ~ 50-60 Hz 120 V ~ 60 Hz	US	732503
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

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.

MZ 2C NT +AK+EK
2.0 m³/h
7 mbar

PERFORMANCE FEATURES

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

TECHNICAL DATA same as MZ 2C NT, except		
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	326 x 243 x 402
Weight	kg	14.2

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	732600
230 V ~ 50-60 Hz	CH	732601
230 V ~ 50-60 Hz	UK	732602
100-115 V ~ 50-60 Hz 120 V ~ 60 Hz	US	732603
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

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.

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

PERFORMANCE FEATURES

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

TECHNICAL DATA same as MZ 2C NT, except		
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	326 x 248 x 402
Weight	kg	14.5

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	732800
230 V ~ 50-60 Hz	CH	732801
100-115 V ~ 50-60 Hz 120 V ~ 60 Hz	US	732803
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

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.

MZ 2C NT +AK+M+D
2.0 m³/h
7 mbar

PERFORMANCE FEATURES

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

TECHNICAL DATA same as MZ 2C NT, except		
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Dimensions (L x W x H)	mm	310 x 243 x 313
Weight	kg	13.4

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	732700
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

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 vapure 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.

PC 101 NT
2.0 m³/h
7 mbar

PERFORMANCE FEATURES

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

TECHNICAL DATA same as MZ 2C NT, except		
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	326 x 243 x 402
Weight	kg	14.5

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	733000
230 V ~ 50-60 Hz	UK	733002
100-115 V ~ 50-60 Hz 120 V ~ 60 Hz	US	733003
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

CHEMISTRY PUMPING UNIT
PC 500 LAN NT

This ready-to-connect chemistry 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. This chemistry vacuum pumping unit is frequently used for medium-sized vacuum applications at multiple workstations in laboratories. The pumping unit includes a vacuum controller VNC 2 with digital vacuum display and connections for a cooling water valve as well as for readout of a liquid level detection sensor for the catchpot at the exhaust waste vapor condenser.

PC 500 LAN NT
2.0 m³/h
7 mbar

PERFORMANCE FEATURES

- optimized 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

TECHNICAL DATA same as MZ 2C NT, except		
Vacuum controller		VNC 2
Inlet connection (IN)		PTFE tubing connection 10/8 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	408 x 264 x 402
Weight	kg	15.3

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	733400
230 V ~ 50-60 Hz	CH	733401
100-120 V ~ 50-60 Hz	US	733403

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
PTFE tubing DN 10/8 mm (638644)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)
Liquid level sensor (699908)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

CHEMISTRY PUMPING UNIT
PC 510 NT AND PC 511 NT

Chemistry pumping units with one (PC 510 NT) or two (PC 511 NT) 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 waste 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.

PC 511 NT
2.0 m³/h
7 mbar

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

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)
Liquid level sensor (699908)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

TECHNICAL DATA same as MZ 2C NT, except		
Vacuum controller		CVC 3000
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	419 x 243 x 444
Weight	kg	16.7

ORDERING INFORMATION		PC 510 NT
230 V ~ 50-60 Hz	CEE	733100
230 V ~ 50-60 Hz	CH	733101
230 V ~ 50-60 Hz	UK	733102
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US	733103

ORDERING INFORMATION		PC 511 NT
230 V ~ 50-60 Hz	CEE	733200
230 V ~ 50-60 Hz	CH	733201
230 V ~ 50-60 Hz	UK	733202
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US	733203

CHEMISTRY PUMPING UNIT
PC 520 NT

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.

PC 520 NT
2.0 m³/h
7 mbar

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

ITEMS SUPPLIED

Pumping unit largely mounted, ready for use, with manual

TECHNICAL DATA same as MZ 2C NT, except		
Vacuum controller		2 x CVC 3000
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	435 x 361 x 444
Weight	kg	17.7

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	733300
230 V ~ 50-60 Hz	CH	733301
230 V ~ 50-60 Hz	UK	733302
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US	733303

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)
Liquid level sensor (699908)

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.

PC 3002 VARIO
2.8 m³/h
7 mbar

MZ 2C NT VARIO
2.8 m³/h
7 mbar

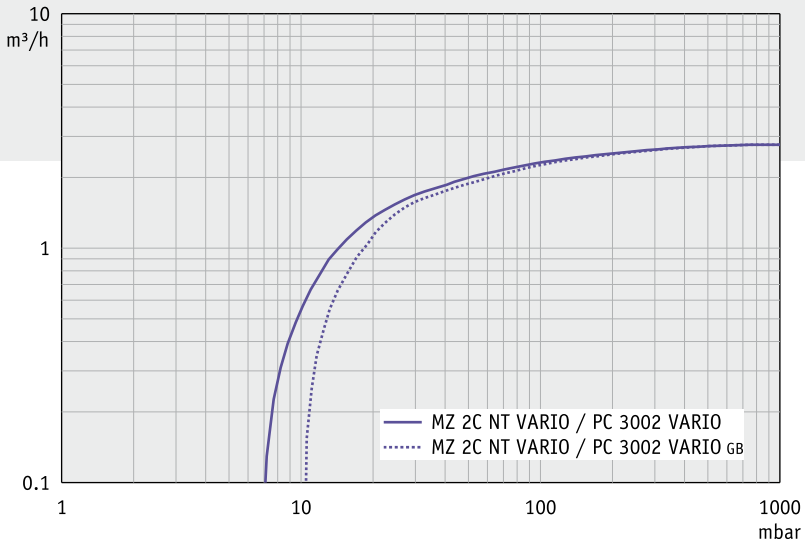
PERFORMANCE FEATURES

- 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

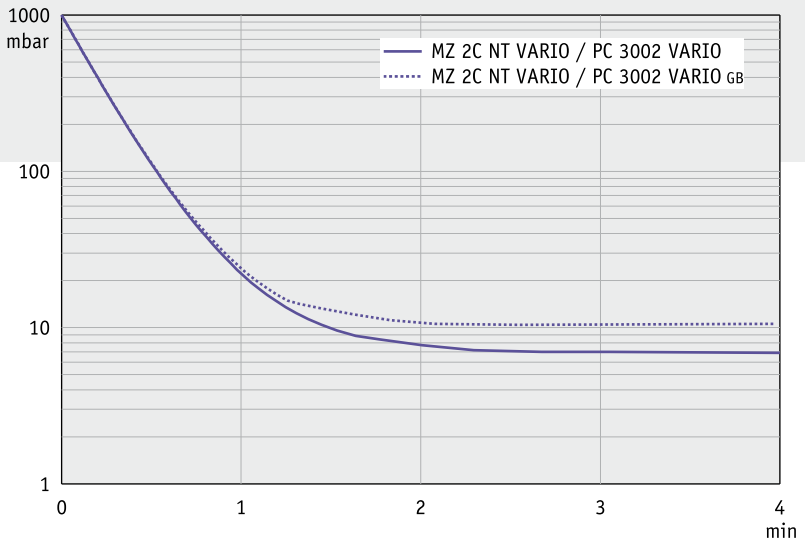
APPLICATIONS

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 an user-friendly configuration of complex vacuum installations.

CVC 3000 ▶ pg. 142 VACUU·BUS™ ▶ pg.145



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	m³/h	2.8	2.8
Ultimate vacuum (abs.)	mbar	7	7
Ultim. vac. (abs.) with gas ballast	mbar	12	12
Max. back pressure (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Coolant connection		-	2 x hose nozzle DN 6-8 mm
Rated motor power	kW	0.53	0.53
Degree of protection		IP 20	IP 40
Dimensions (L x W x H)	mm	243 x 243 x 245	419 x 243 x 444
Weight	kg	13.8	17.4

ORDERING INFORMATION		MZ 2C NT VARIO
200-230 V ~ 50-60 Hz	CEE	732400
200-230 V ~ 50-60 Hz	CH	732401
200-230 V ~ 50-60 Hz	UK	732402
100-120 V ~ 50-60 Hz	US	732403
ORDERING INFORMATION		**PC 3002 VARIO**
200-230 V ~ 50-60 Hz	CEE	733500
200-230 V ~ 50-60 Hz	CH	733501
200-230 V ~ 50-60 Hz	UK	733502
100-120 V ~ 50-60 Hz	US	733503

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)
Liquid level sensor (699908)

ITEMS SUPPLIED

Pumping unit completely mounted,
ready for use, 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 the highest requirements. The three-stage construction provides the advantageous combination of high pumping speed and very low ultimate vacuum in a pump with a very small footprint. 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 MD 1C with gas ballast valve is optimally prepared for pumping easily condensable vapors (high boiling solvents).

MD 1C
1.3 m³/h
2 mbar

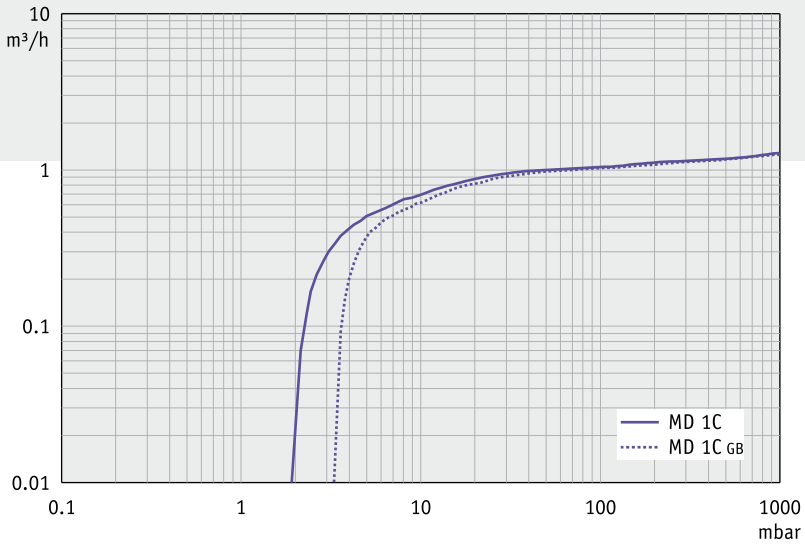
PERFORMANCE FEATURES

- 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

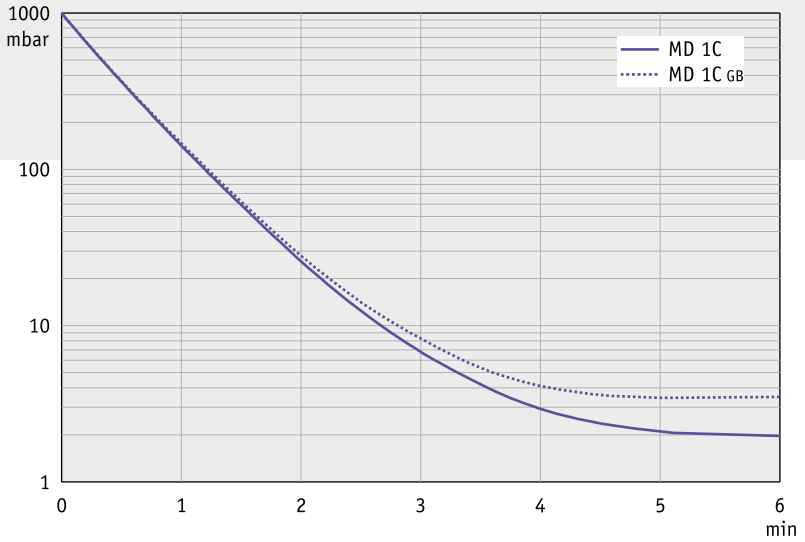
APPLICATIONS

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.

Further information at **www.vacuubrand.com**



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 at 50/60 Hz	m³/h	1.3/1.5
Ultimate vacuum (abs.)	mbar	2
Ultim. vac. (abs.) with gas ballast	mbar	4
Max. back pressure (EX) (abs.)	bar	1.1
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 8 mm
Rated motor power	kW	0.08
Degree of protection		IP 44
Dimensions (L x W x H)	mm	316 x 143 x 175
Weight	kg	6.9

ORDERING INFORMATION		MD 1C
200-230 V ~ 50-60 Hz	CEE	696600
200-230 V ~ 50-60 Hz	CH	696601
200-230 V ~ 50-60 Hz	UK	696602
100-120 V ~ 50-60 Hz	US	696603
120 V ~ 60 Hz*	US	696613

* With NRTL certification for Canada and the USA

ACCESSORIES

Rubber vacuum tubing DN 8 mm (686001)
Rubber vacuum tubing DN 10 mm (686002)

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.

MD 1C +AK+EK
1.3 m³/h
2 mbar

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

TECHNICAL DATA same as MD 1C, except		
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	316 x 239 x 405
Weight	kg	10.2

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

* With NRTL certification for Canada and the USA

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

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 upgrade kits (optional) available to easily upgrade the PC 3001 basic to the fully functional PC 3001 VARIO complete with CVC 3000 vacuum controller and vapor condenser at the outlet.

PC 3001 basic
1.7 m³/h
2 mbar

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 system with two accessory packages: Kit 1, with CVC 3000 and inlet separator; Kit 2, with emission condenser and catchpot

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

TECHNICAL DATA same as PC 3001 VARIO, without CVC 3000, EK, AK

Inlet connection (IN)		Hose nozzle DN 6/10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm / silencer
Dimensions (L x W x H)	mm	251 x 256 x 400
Weight	kg	6.4

ORDERING INFORMATION

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

ACCESSORIES

Rubber vacuum tubing DN 6 mm (686000)
Rubber vacuum tubing DN 10 mm (686002)
Upgrade kit CVC 3000 with inlet separator (699921)
Upgrade kit emission condenser (699922)

VARIO® CHEMISTRY PUMPING UNIT
PC 3001 VARIO

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

This popular VARIO® chemistry pumping unit provides vacuum control by precise and continuous adaptation of the diaphragm pump's motor speed. The integrated CVC 3000 vacuum controller is able to perform fully automatic evaporations with the push of a button. The compact size and low weight of the pumping unit offer great convenience in the lab. The pump's variable motor speed responds to demand, reducing energy waste and mechanical wear, ensuring unrivalled service life for the diaphragms. The pumping unit is also popular for its nearly silent operation. The PC 3001 is based on our MD 1C VARIO-SP chemistry diaphragm pump; its 2 mbar ultimate vacuum is ideal for applications even with high-boiling-point solvents. The highly efficient and insulated exhaust vapor condenser has a very compact design, and provides near-100-percent recovery of solvents.

PC 3001 VARIO
1.7 m³/h
2 mbar

PC 3001 VARIO TE
1.7 m³/h
2 mbar

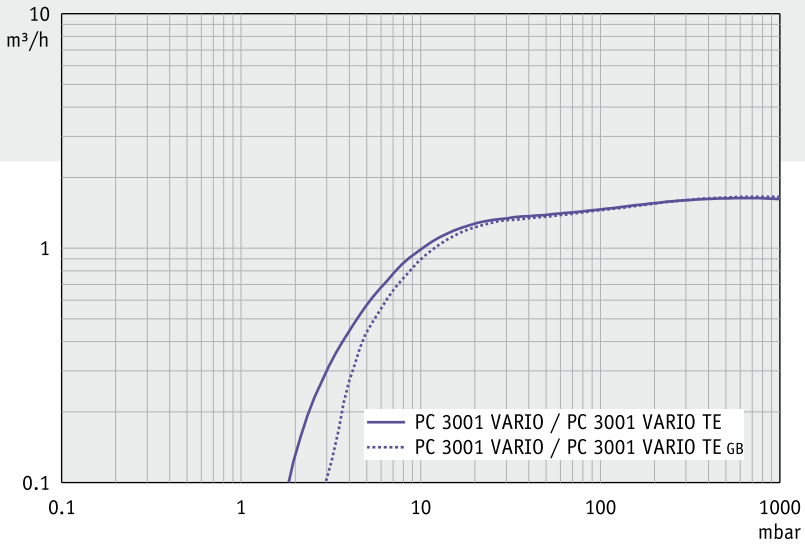
PERFORMANCE FEATURES

- easily operated CVC 3000 vacuum controller with clear text menus, with integrated venting valve
- automatic adaptation 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
- excellent ultimate vacuum even with gas ballast
- whisper quiet and ultra low vibration
- excellent environmental friendliness due to efficient solvent recovery

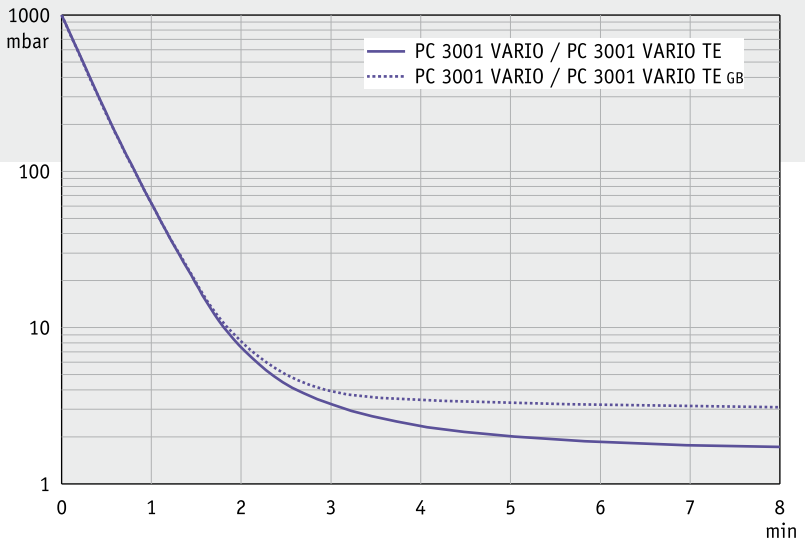
APPLICATIONS

This pumping unit is ideal for vacuum applications with high-boiling-solvents. The hysteresis-free vacuum control prevents superheating and foaming and therefore protects samples and ensures a constantly high process safety. The unique controller automatically detects vapor pressure and automatically adjusts the vacuum level to the process requirements, making it ideal even for complex evaporations. If cooling water is not available or water conservation is critical, consider the PC 3001 VARIO TE with dry ice condenser, or the PC 3001 VARIO with the coolant-free Peltronic™ condenser. For exceptionally large amounts of vapor, the PC 3001 VARIO +IK — with an additional condenser on the vacuum side — is an excellent choice.

▶ Peltronic™ exhaust vapor condenser pg. 77



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	PC 3001 VARIO TE
Vacuum controller		CVC 3000	CVC 3000
Number of heads / stages		4 / 3	4 / 3
Max. pumping speed	m³/h	1.7	1.7
Ultimate vacuum (abs.)	mbar	2	2
Ultim. vac. (abs.) with gas ballast	mbar	4	4
Max. back pressure (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Hose nozzle DN 6/10 mm	Hose nozzle DN 6/10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 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)	mm	300 x 306 x 400	300 x 341 x 493
Weight	kg	7.7	8.2

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

ORDERING INFORMATION	PC 3001 VARIO
100-120 V/200-230 V ~ 50-60 Hz CEE	696700
100-120 V/200-230 V ~ 50-60 Hz CH	696701
100-120 V/200-230 V ~ 50-60 Hz UK	696702
100-120 V/200-230 V ~ 50-60 Hz US	696703

ORDERING INFORMATION	PC 3001 VARIO TE
100-120 V/200-230 V ~ 50-60 Hz CEE	696710

	PC 3001 VARIO EK Peltronic
100-120 V/200-230 V ~ 50-60 Hz	696735*

	PC 3001 VARIO +IK
100-120 V/200-230 V ~ 50-60 Hz	696745*

*Please order power cable separately ▶ pg. 167

ACCESSORIES

Rubber vacuum tubing DN 6 mm (686000)
Rubber vacuum tubing DN 10 mm (686002)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)
Liquid level sensor (699908)

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 many difficult requirements. The three-stage construction provides the advantageous combination of high pumping speed and very low ultimate vacuum. All major 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. The MD 4C NT with gas ballast valve is optimally prepared for pumping condensable vapors also of high boiling solvents due to its very good ultimate vacuum (even with gas ballast). 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.

MD 4C NT
3.4 m³/h
1.5 mbar

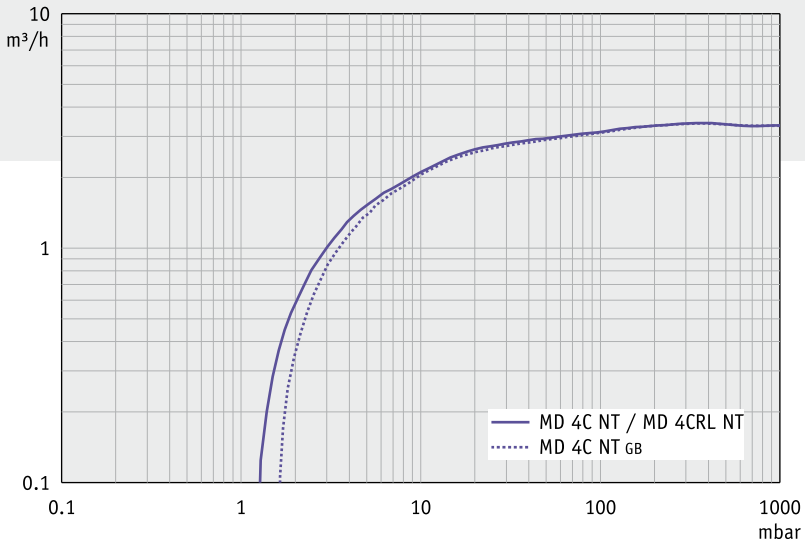
MD 4CRL NT
3.4 m³/h
1.5 mbar

PERFORMANCE FEATURES

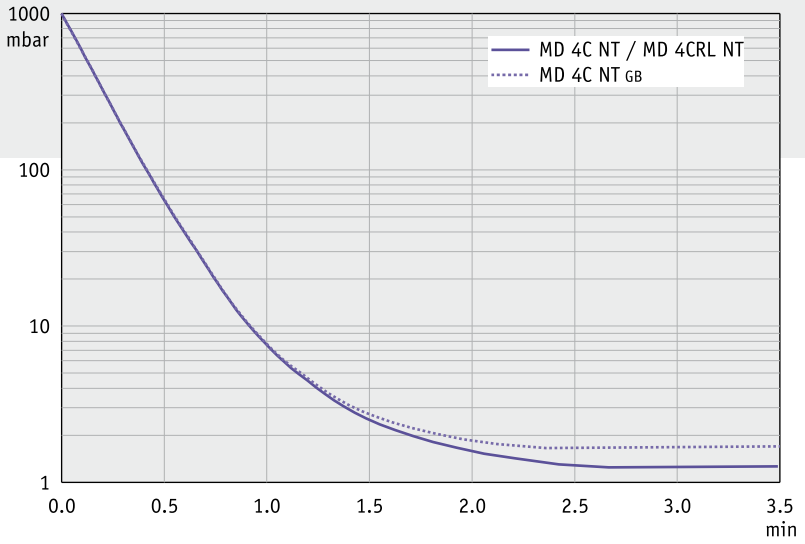
- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum even with gas ballast
- whisper quiet and very low vibration
- long diaphragm life, maintenance-free drive system

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 rotary evaporators, drying ovens and many other laboratory applications. The MD 4C NT has an outstanding performance for pumping large amounts of vapor 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	m³/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 (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Hose nozzle DN 10 mm	Small flange KF DN 16
Outlet connection (EX)		Hose nozzle DN 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)	mm	325 x 243 x 198	325 x 243 x 198
Weight	kg	14.3	19.8

ACCESSORIES MD 4C NT

Rubber vacuum tubing DN 10 mm (686002)

ACCESSORIES MD 4CRL NT

PTFE tubing KF DN 16 (1000 mm: 686031)

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

ORDERING INFORMATION	MD 4C NT	
230 V ~ 50-60 Hz	CEE	736400
230 V ~ 50-60 Hz	CH	736401
230 V ~ 50-60 Hz	UK	736402
100-115 V ~ 50-60 Hz 120 V ~ 60 Hz	US	736403

With NRTL certification for Canada and the USA

ORDERING INFORMATION MD 4CRL NT

100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz

230 V ~ 50-60 Hz
IEC plug EN 60320 736445*

With NRTL certification for Canada and the USA

*Please order power cable separately ▶ pg. 167

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual

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.

MD 4C NT +2AK
3.4 m³/h
1.5 mbar

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

TECHNICAL DATA same as MD 4C NT, except		
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Dimensions (L x W x H)	mm	319 x 243 x 374
Weight	kg	16.7

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	736600
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US	736603
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

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.

MD 4C NT +AK+EK
3.4 m³/h
1.5 mbar

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

TECHNICAL DATA same as MD 4C NT, except		
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	326 x 243 x 402
Weight	kg	17.3

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	736700
230 V ~ 50-60 Hz	CH	736701
230 V ~ 50-60 Hz	UK	736702
100-115 V ~ 50-60 Hz 120 V ~ 60 Hz	US	736703
With NRTL certification for Canada and the USA		

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

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.

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

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

TECHNICAL DATA same as MD 4C NT, except		
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	326 x 248 x 402
Weight	kg	17.6

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	736800
230 V ~ 50-60 Hz	CH	736801
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

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 vapure 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.

PC 201 NT
3.4 m³/h
1.5 mbar

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

TECHNICAL DATA same as MD 4C NT, except		
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	326 x 243 x 402
Weight	kg	17.5

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	737000
100-115 V ~ 50-60 Hz 120 V ~ 60 Hz	US	737003
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

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.

PC 600 LAN NT
3.4 m³/h
1.5 mbar

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

TECHNICAL DATA same as MD 4C NT, except

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

ORDERING INFORMATION

230 V ~ 50-60 Hz	CEE	737400
230 V ~ 50-60 Hz	CH	737401
100-120 V ~ 50-60 Hz	US	737403

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
PTFE tubing DN 10/8 mm (638644)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)
Liquid level sensor (699908)

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 waste vapor condenser is outstandingly efficient and compact. It provides near-100-percent recovery of solvents, for economical recycling and environmental protection.

PC 610 NT
3.4 m³/h
1.5 mbar

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

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

TECHNICAL DATA same as MD 4C NT, except		
Vacuum controller		CVC 3000
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	419 x 243 x 444
Weight	kg	19.9

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	737100
230 V ~ 50-60 Hz	CH	737101
230 V ~ 50-60 Hz	UK	737102
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US	737103

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)
Liquid level sensor (699908)

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.

PC 611 NT
3.4 m³/h
1.5 mbar

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

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

TECHNICAL DATA same as MD 4C NT, except

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

ORDERING INFORMATION

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

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)
Liquid level sensor (699908)

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 waste vapor condenser is outstandingly efficient and compact. It provides near-100-percent recovery of solvents, for economical recycling and environmental protection.

PC 620 NT
3.4 m³/h
1.5 mbar

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

ITEMS SUPPLIED

Pumping unit largely mounted, ready for use, with manual

TECHNICAL DATA same as MD 4C NT, except		
Vacuum controller		2 x CVC 3000
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Coolant connection		2 x hose nozzle DN 6-8 mm
Dimensions (L x W x H)	mm	435 x 361 x 444
Weight	kg	20.9

ORDERING INFORMATION		
230 V ~ 50-60 Hz	CEE	737300
230 V ~ 50-60 Hz	CH	737301

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)
Liquid level sensor (699908)

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 chemistry MD 4C NT VARIO 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.

PC 3004 VARIO
4.6 m³/h
1.5 mbar

MD 4C NT VARIO
4.6 m³/h
1.5 mbar

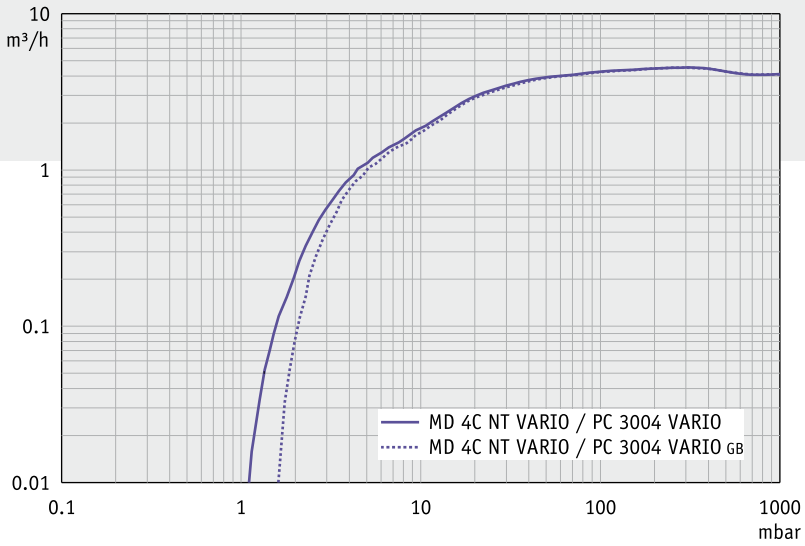
PERFORMANCE FEATURES

- automatic adaptation of the vacuum level throughout the process for high process reliability and unattended operation
- short process times due to 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

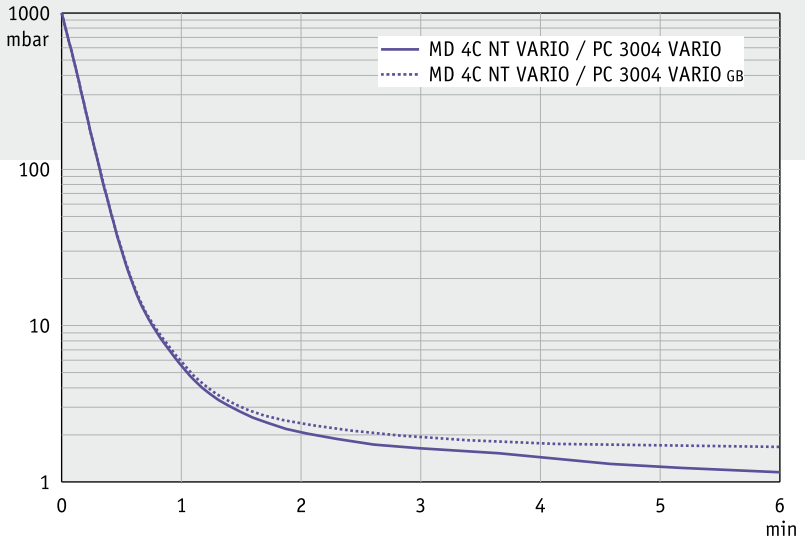
APPLICATIONS

Typical applications are all evaporation processes. They can be run fully automatically and with shorter process times and extra sensitivity to difficult mixtures at the same time. The VARIO® control ensures high process reliability through prevention of boiling retardation or foaming. It allows for an automatic vacuum adaptation and is self-adapting to changing process parameters at any time. The VACUU·BUS™ system ensures user-friendly connections even with complex vacuum set-ups.

▶ CVC 3000 pg. 142 ▶ VACUU·BUS™ pg. 145



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 (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Coolant connection		-	2 x hose nozzle DN 6-8 mm
Rated motor power	kW	0.53	0.53
Degree of protection		IP 20	IP 40
Dimensions (L x W x H)	mm	325 x 243 x 245	419 x 243 x 444
Weight	kg	16.3	20.6

ORDERING INFORMATION		MD 4C NT VARIO
200-230 V ~ 50-60 Hz	CEE	736500
200-230 V ~ 50-60 Hz	CH	736501
100-120 V ~ 50-60 Hz	US	736503

ORDERING INFORMATION		PC 3004 VARIO
200-230 V ~ 50-60 Hz	CEE	737500
200-230 V ~ 50-60 Hz	CH	737501
200-230 V ~ 50-60 Hz	UK	737502
100-120 V ~ 50-60 Hz	US	737503

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)
Liquid level sensor (699908)

ITEMS SUPPLIED

Pumping unit completely mounted,
ready for use, with manual

CHEMISTRY DIAPHRAGM PUMP
MD 12C

Three-stage chemistry-design diaphragm pumps are an excellent solution for continuous, oil-free pumping of corrosive gases and vapors and meet the highest requirements. The three-stage construction of the eight head MD 12C 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 for increased reliability and extended operating life. The PC 8 accessory kit offers upgrading to a system with solvent recovery.

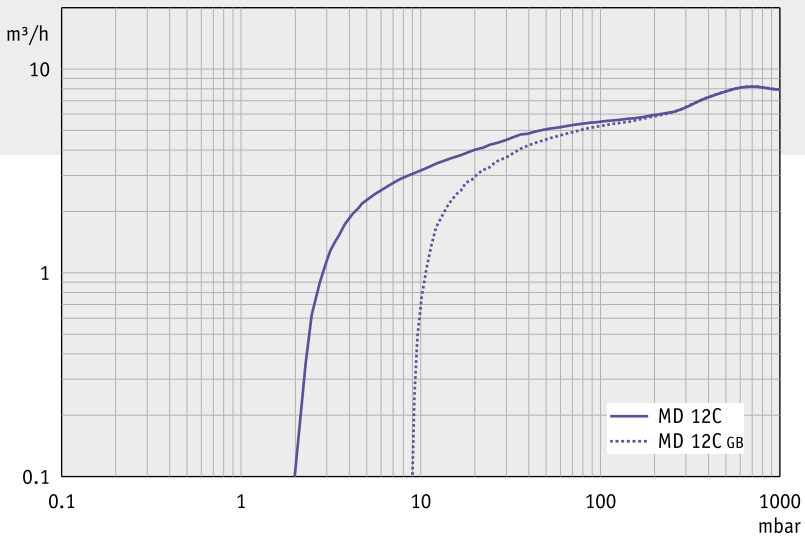
MD 12C
8.3 m³/h
2 mbar

PERFORMANCE FEATURES

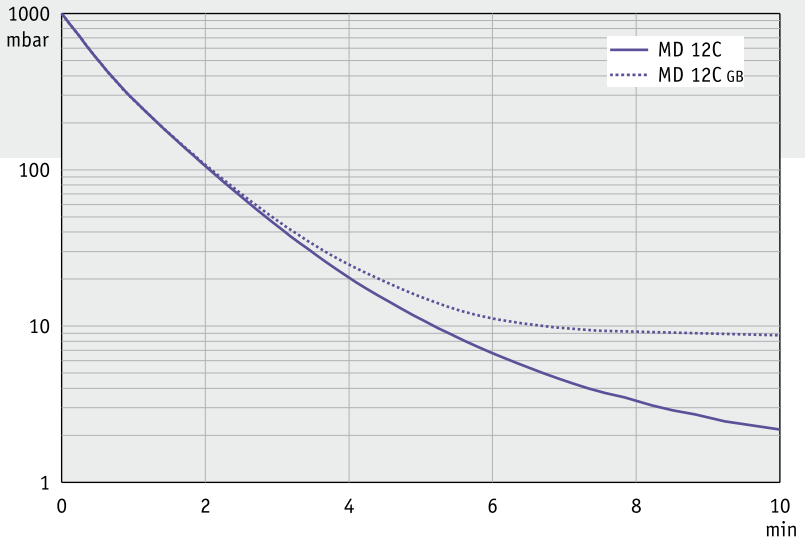
- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- reduced process times
- excellent environmental friendliness due to efficient solvent recovery (with optional emission condenser)
- long diaphragm life, maintenance-free drive system

APPLICATIONS

The high pumping speed of the MD 12C reduces the process time and meets the high vacuum requirements e.g., of parallel processes in vacuum networks. Typical applications are large rotary evaporators and pilot plants. Upgraded with a separator at the inlet (accessory), the MD 12C is well prepared also for rough operating conditions. With a waste vapor condenser (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
Number of heads / stages		8 / 3
Max. pumping speed at 50/60 Hz	m³/h	8.3/8.9
Ultimate vacuum (abs.)	mbar	2
Ultim. vac. (abs.) with gas ballast	mbar	9
Max. back pressure (EX) (abs.)	bar	1.1
Inlet connection (IN)		Small flange KF DN 25
Outlet connection (EX)		Hose nozzle DN 10 mm
Rated motor power	kW	0.39
Degree of protection		IP 20
Dimensions (L x W x H)	mm	505 x 237 x 294
Weight	kg	25.2

ORDERING INFORMATION		MD 12C
230 V ~ 50-60 Hz	CEE	710150
230 V ~ 50-60 Hz	CH	710151
230 V ~ 50-60 Hz	UK	710152
120 V ~ 60 Hz	US	710153

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
PTFE tubing KF DN 25 (1000 mm: 686033)
Inlet separator AK PC 8 (699980)
Kit PC 8 with emission condenser (699949)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual

VARIO® CHEMISTRY PUMPING UNIT
MD 12C VARIO-B AND PC 3012 VARIO

VARIO® pumps and pumping units provide precise vacuum control by adaptation of the diaphragm pump's motor speed and allow fully automatic evaporations. They provide an outstanding pumping speed even close to the excellent ultimate vacuum. The on-demand motor speed control results in unsurpassed total lifetime of service parts such as diaphragms. The basic pump is the three-stage MD 12C chemistry diaphragm pump which offers an outstanding pumping speed and meets high vacuum requirements for most high boiling solvents. The PC 3012 VARIO pumping unit is a well proven choice for evaporation of large amounts of solvents. The waste vapor condenser at the outlet enables near-100-percent solvent recovery.

PC 3012 VARIO
10.0 m³/h
2 mbar

MD 12C VARIO-B
10.0 m³/h
2 mbar

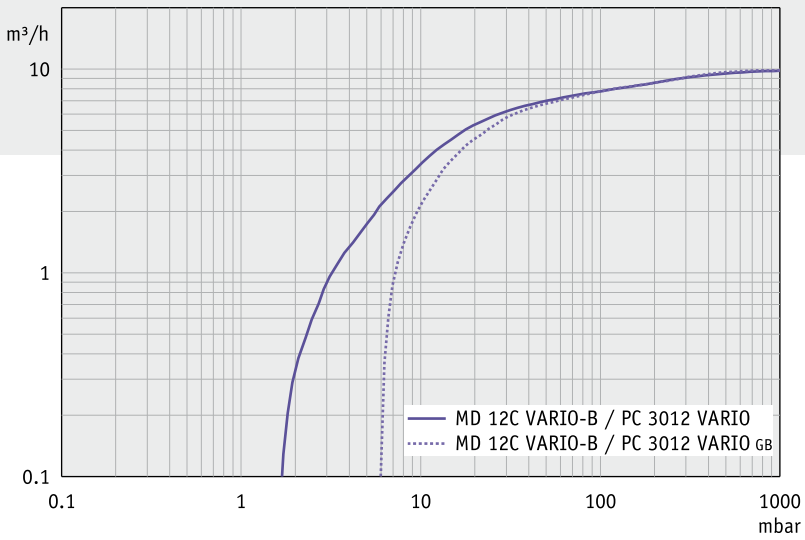
PERFORMANCE FEATURES

- 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, even for large amounts of vapor
- easily operated CVC 3000 vacuum controller with clear text menus, with integrated venting valve
- extraordinary diaphragm life, therefore minimum operational and servicing costs
- PC 3012 VARIO: Excellent environmental friendliness due to efficient solvent recovery

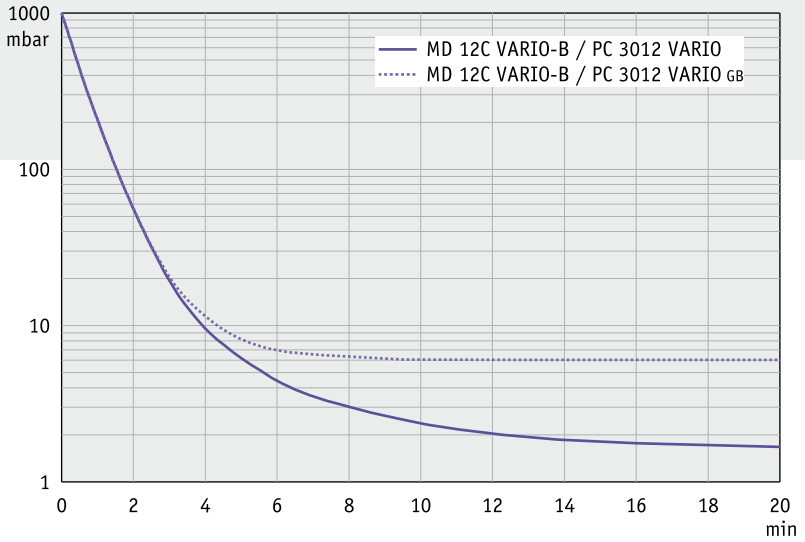
APPLICATIONS

The high pumping speed reduces process times and meets the high vacuum requirements, e.g. of vacuum networks. Typical applications are most large evaporation and drying processes. Evaporation processes, in particular, can be run fully automatically, with shorter process times and extra sensitivity with difficult mixtures. The VARIO® control ensures high process reliability through prevention of boiling retardation, superheating or foaming. The PC 3012 VARIO pumping unit is ideal for tough conditions due to its inlet separator and offers efficient solvent recovery.

▶ CVC 3000 pg. 142 ▶ VACUU·BUS™ pg. 145



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 VARIO-B	PC 3012 VARIO
Vacuum controller		CVC 3000	CVC 3000
Number of heads / stages		8 / 3	8 / 3
Max. pumping speed	m³/h	10.0	10.0
Ultimate vacuum (abs.)	mbar	2	2
Ultim. vac. (abs.) with gas ballast	mbar	9	9
Max. back pressure (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Small flange KF DN 25	Small flange KF DN 25 / hose nozzle DN 15 mm
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Coolant connection		-	2 x hose nozzle DN 6-8 mm
Rated motor power	kW	0.53	0.53
Degree of protection		IP 20	IP 20
Dimensions (L x W x H)	mm	505 x 237 x 303	645 x 365 x 600
Weight	kg	26.6	35.8

ORDERING INFORMATION		MD 12C VARIO-B
200-230 V ~ 50-60 Hz	CEE	710800
100-120 V ~ 50-60 Hz	US	710803

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

ACCESSORIES MD 12C VARIO-B

Rubber vacuum tubing DN 10 mm (686002)
PTFE tubing KF DN 25 (1000 mm: 686033)
Inlet separator AK PC 8 (699980)
Kit PC 8 with emission condenser (699949)
Vent valve VBM-B (674217)

ACCESSORIES PC 3012 VARIO

Rubber vacuum tubing DN 10 mm (686002)
Rubber vacuum tubing DN 15 mm (686003)
PTFE tubing KF DN 25 (1000 mm: 686033)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)

ORDERING INFORMATION		PC 3012 VARIO
200-230 V ~ 50-60 Hz	CEE	710900
200-230 V ~ 50-60 Hz	CH	710901
200-230 V ~ 50-60 Hz	UK	710902

VARIO® CHEMISTRY PUMPING UNIT
PC 3003 VARIO

This VARIO® pumping unit provides precise vacuum control by adaptation of the diaphragm pump's motor speed. It features fully automatic evaporation control on 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. 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. The on-demand motor speed control results in unsurpassed lifetimes for service parts, such as diaphragms.

PC 3003 VARIO
2.8 m³/h
0.6 mbar

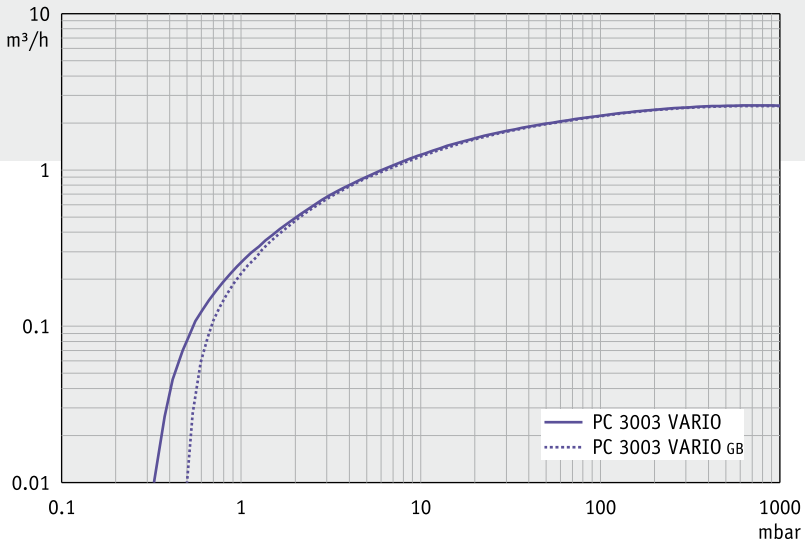
PERFORMANCE FEATURES

- 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
- ideal for high-boiling solvents and evaporation at low temperatures
- easily operated CVC 3000 vacuum controller with clear text menus, with integrated venting valve
- excellent environmental friendliness due to efficient solvent recovery

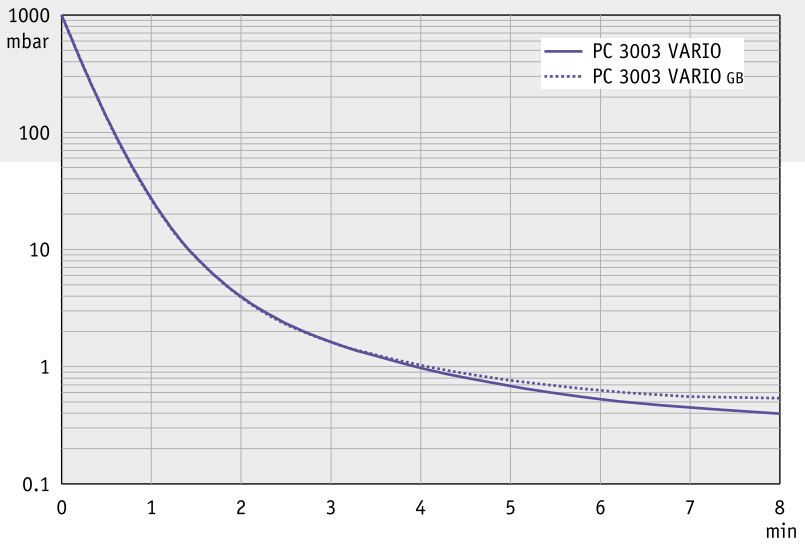
APPLICATIONS

Typical applications are all evaporation processes. Evaporation processes can be run fully automatically and with shorter process times and extra sensitive 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 adapts the vacuum level automatically to changing process parameters. The VACUU·BUS™ system ensures user-friendly connections even with complex vacuum set-ups.

Further information at **www.vacuubrand.com**



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	m³/h	2.8
Ultimate vacuum (abs.)	mbar	0.6
Ultim. vac. (abs.) with gas ballast	mbar	2
Max. back pressure (EX) (abs.)	bar	1.1
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 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)	mm	419 x 243 x 444
Weight	kg	20.6

ORDERING INFORMATION		PC 3003 VARIO
200-230 V ~ 50-60 Hz	CEE	738400
200-230 V ~ 50-60 Hz	CH	738401
200-230 V ~ 50-60 Hz	UK	738402
100-120 V ~ 50-60 Hz	US	738403

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)
Liquid level sensor (699908)

ITEMS SUPPLIED

Pumping unit completely mounted,
ready for use, with manual

CHEMISTRY PUMPING UNIT
MV 10C AND PC 8 WITH MV 10C

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 construction of the eight-cylinder pump MV 10C provides the advantageous combination of high pumping speed and very low ultimate vacuum of 0.9 mbar. 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. The integrated exhaust waste vapor condenser on the PC 8 unit built around the MV 10C offers near-100-percent solvent recovery.

MV 10C
7.0 m³/h
0.9 mbar

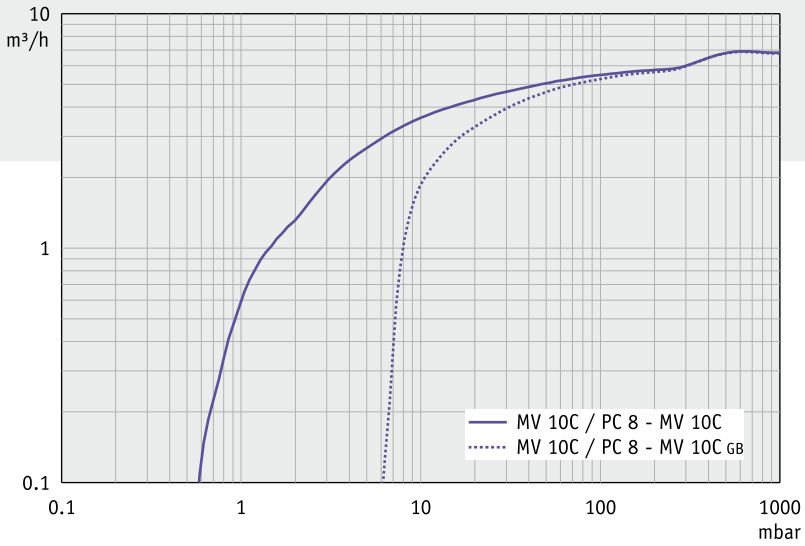
PC 8 / MV 10C
7.0 m³/h
0.9 mbar

PERFORMANCE FEATURES

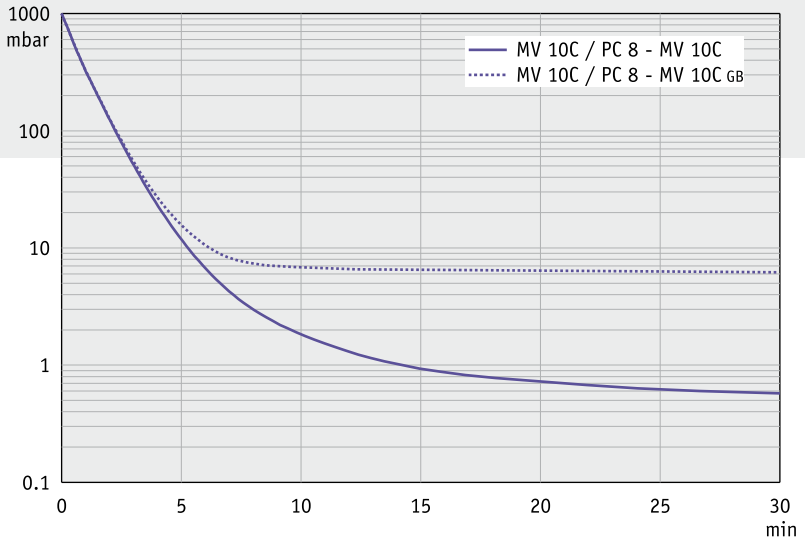
- outstanding chemical resistance and superior vapor tolerance
- exceptionally high performance even at low vacuum
- excellent ultimate vacuum
- reduced process times
- PC 8 with MV 10C: Excellent environmental friendliness due to efficient solvent recovery

APPLICATIONS

The high pumping speed of the MV 10C reduces the process time; the excellent ultimate vacuum meets high vacuum requirements. Typical applications are large rotary evaporators, pilot plants and drying ovens. Equipped with an optional separator at the inlet, the MV 10C is well prepared also for rough operating conditions. The exhaust waste vapor condenser (on the PC 8 or as an 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	PC 8 / MV 10C
Number of heads / stages		8 / 4	8 / 4
Max. pumping speed at 50/60 Hz	m³/h	7.0/7.5	7.0/7.5
Ultimate vacuum (abs.)	mbar	0.9	0.9
Ultim. vac. (abs.) with gas ballast	mbar	9	9
Max. back pressure (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Small flange KF DN 25	Small flange KF DN 25
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Coolant connection		-	2 x hose nozzle DN 6-8 mm
Rated motor power	kW	0.39	0.39
Degree of protection		IP 20	IP 20
Dimensions (L x W x H)	mm	505 x 237 x 294	507 x 367 x 431
Weight	kg	25.2	31.5

ORDERING INFORMATION		MV 10C
230 V ~ 50-60 Hz	CEE	710200
230 V ~ 50-60 Hz	CH	710201
230 V ~ 50-60 Hz	UK	710202
120 V ~ 60 Hz	US	710203
ORDERING INFORMATION		**PC 8 / MV 10C**
230 V ~ 50-60 Hz	CEE	710300
230 V ~ 50-60 Hz	CH	710301
230 V ~ 50-60 Hz	UK	710302
120 V ~ 60 Hz	US	710303

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
PTFE tubing KF DN 25 (1000 mm: 686033)
Inlet separator AK PC 8 (699980)
Kit PC 8 with emission condenser (699949)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual

VARIO® CHEMISTRY PUMPING UNIT
MV 10C VARIO-B AND PC 3010 VARIO

VARIO® pumps and pumping units provide precise vacuum control by adaptation of the diaphragm pump's motor speed and allow fully automatic evaporations. They provide a very high pumping speed and an outstanding ultimate vacuum. Therefore, they are the ideal solution for evaporation of high boiling solvents even at low temperatures. The on-demand motor speed control results in a unsurpassed lifetime of service parts, such as diaphragms. The PC 3010 VARIO pumping unit that is based on the MV 10C VARIO-B offers a well proven choice for evaporation of large amounts of solvents. The waste vapor condenser at the outlet provides near-100-percent solvent recovery.

PC 3010 VARIO
8.6 m³/h
0.6 mbar

MV 10C VARIO-B
8.6 m³/h
0.6 mbar

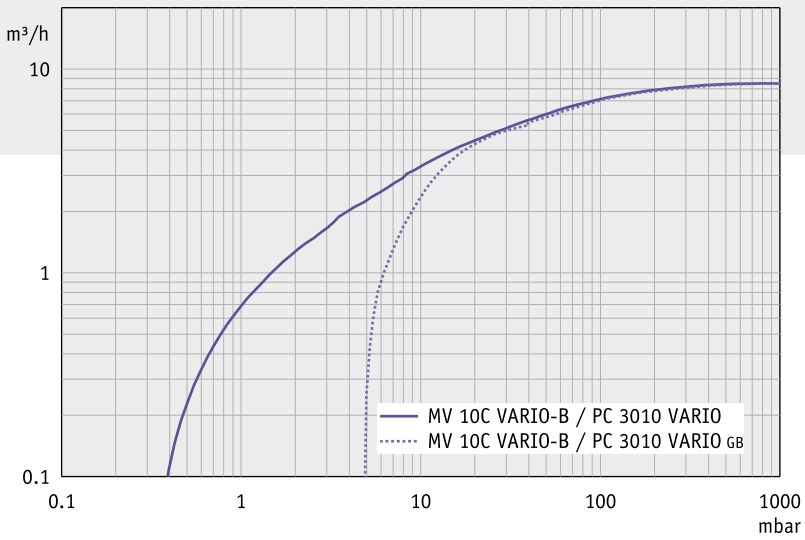
PERFORMANCE FEATURES

- automatic adaptation of the vacuum level throughout the process for high process reliability and unattended operation
- short process times due high pumping speed and zero-fluctuation (hysteresis-free) vacuum control
- easily operated CVC 3000 vacuum controller with clear text menus, with integrated venting valve
- excellent ultimate vacuum even with gas ballast
- PC 3010 VARIO: Excellent environmental friendliness due to efficient solvent recovery

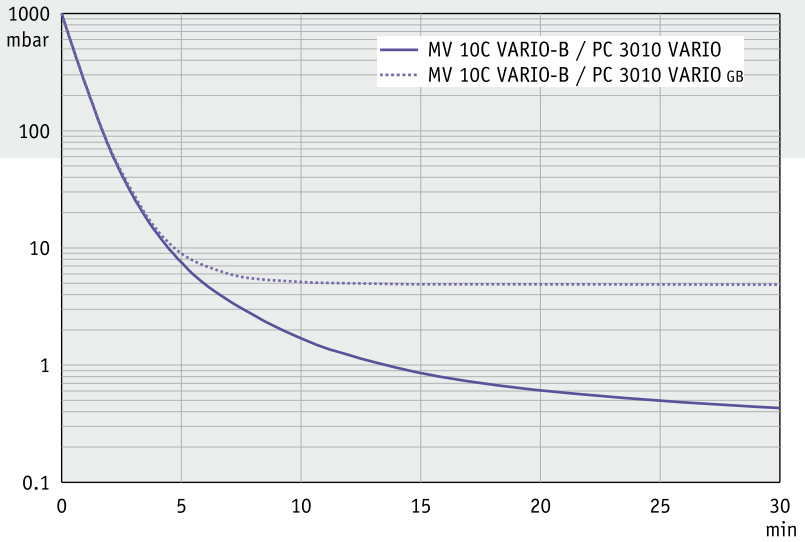
APPLICATIONS

The high pumping speed of the MV 10C VARIO-B reduces the process times for evaporations of high boiling solvents. Typical applications are all evaporation processes. Evaporation processes can be run fully automatically and with shorter process times and extra sensitive at the same time. The VARIO® control ensures high process reliability through prevention of superheating or foaming. The pumping unit PC 3010 VARIO is ideal for tough operating conditions. The integrated inlet catchpot and exhaust vapor condenser add convenient vapor control to the excellent performance of the MV 10C VARIO-B pump.

▶ CVC 3000 pg. 142 ▶ VACUU·BUS™ pg. 145



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 VARIO-B	PC 3010 VARIO
Vacuum controller		CVC 3000	CVC 3000
Number of heads / stages		8 / 4	8 / 4
Max. pumping speed	m³/h	8.6	8.6
Ultimate vacuum (abs.)	mbar	0.6	0.6
Ultim. vac. (abs.) with gas ballast	mbar	9	9
Max. back pressure (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Small flange KF DN 25	Small flange KF DN 25 /
		-	hose nozzle DN 15 mm
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Coolant connection		-	2 x hose nozzle DN 6-8 mm
Rated motor power	kW	0.53	0.53
Degree of protection		IP 20	IP 20
Dimensions (L x W x H)	mm	505 x 237 x 303	645 x 365 x 600
Weight	kg	27	35.8

ORDERING INFORMATION MV 10C VARIO-B		
200-230 V ~ 50-60 Hz	CEE	710600
200-230 V ~ 50-60 Hz	CH	710601

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

ACCESSORIES MV 10C VARIO-B

Rubber vacuum tubing DN 10 mm (686002)
PTFE tubing KF DN 25 (1000 mm: 686033)
Inlet separator AK PC 8 (699980)
Kit PC 8 with emission condenser (699949)
Vent valve VBM-B (674217)

ACCESSORIES PC 3010 VARIO

Rubber vacuum tubing DN 10 mm (686002)
Rubber vacuum tubing DN 15 mm (686003)
PTFE tubing KF DN 25 (1000 mm: 686033)
Coolant valve VKW-B (674220)
Vent valve VBM-B (674217)

ORDERING INFORMATION PC 3010 VARIO		
200-230 V ~ 50-60 Hz	CEE	710700
200-230 V ~ 50-60 Hz	CH	710701
200-230 V ~ 50-60 Hz	UK	710702

Roots pumping unit
RP 12C, RP 15C VARIO, RP 22C VARIO and RP 35C VARIO

The combination of an oil-free chemistry diaphragm pump with a Roots pump leads to a significant increase in pumping speed and improves ultimate vacuum by an order of magnitude. VACUUBRAND "RP" Roots pumping units feature a high specific corrosion resistance. The dry and oil-free compression and their good pumping speed, particularly in the pressure range between 0.2 and 50 mbar, allow the pumping of large amounts of vapors. VARIO® Roots pumping units use automatic, gas-load-dependent adjustment of the speed of the Roots pump. This results in high performance even at high inlet pressures and prevents overheating of the pump.

RP 35C VARIO
40 m³/h
0.1 mbar

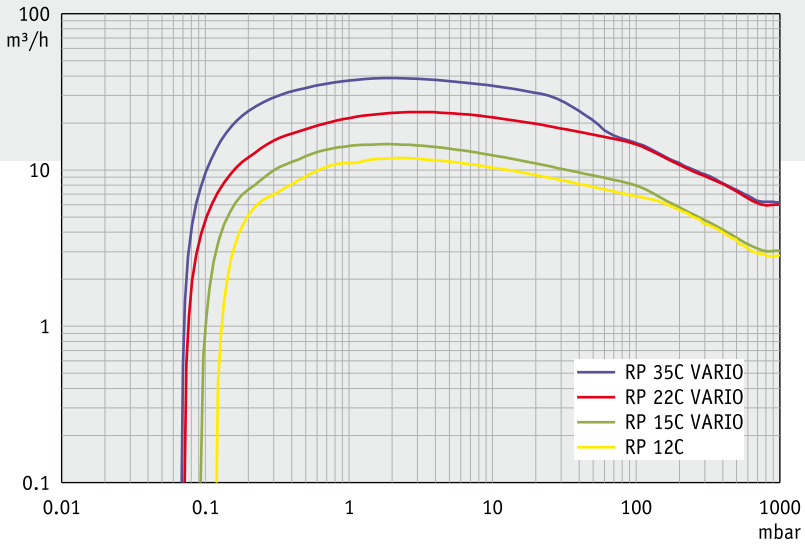
RP 15C VARIO
15 m³/h
0.2 mbar

PERFORMANCE FEATURES

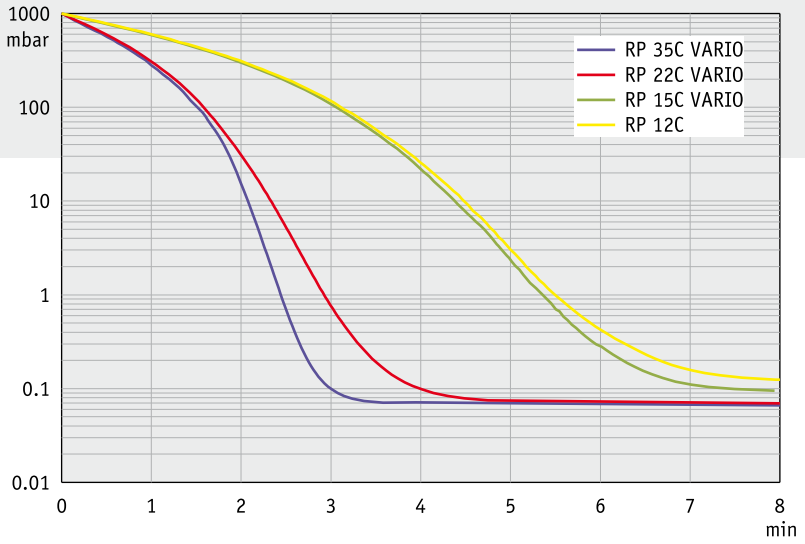
- low ultimate vacuum < 0.2 mbar
- very high pumping speed from 12 to 40 m³/h, maximum between 0.2 and 50 mbar
- measurably reduced backflow of oil due to oil-free pump chamber of Roots pump
- virtually oil-free vacuum compared to rotary vane pumps
- active pollution control: less pollution of environment, no regular discharge of contaminated waste oil

APPLICATIONS

Roots pumping units provide an especially high pumping speed and are therefore used for "large" vacuum applications. They are the ideal vacuum pump for high-boiling solvents due to their good ultimate vacuum. Typical applications are distillations, drying processes, and many other "oil-free" applications such as load lock systems, electron microscopes, mass spectrometers, and backing pumps for turbomolecular pumps and cryo 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		RP 12C	RP 15C VARIO	RP 22C VARIO	RP 35C VARIO
Backing pump		MD 4C	MD 4C	MD 12C	MD 12C
Max. pumping speed at 50/60 Hz	m³/h	12/14	15	22	40
Ultimate vacuum (abs.)	mbar	0.2	0.2	0.2	0.1
Inlet connection (IN)		Small flange KF DN 25	Small flange KF DN 25	Small flange KF DN 25	Small flange KF DN 40
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm	Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Dimensions (L x W x H)	mm	456 x 339 x 362	496 x 338 x 362	573 x 433 x 461	573 x 433 x 467
Weight	kg	34.4	36.8	53.0	55.6

ORDERING INFORMATION		RP 12C	RP 15C VARIO	RP 22C VARIO	RP 35C VARIO
230 V ~ 50-60 Hz	CEE	691035	691040	691050	691060
230 V ~ 50-60 Hz	CH	691036	691042	691052	691062
230 V ~ 50-60 Hz	UK	691037	691041	691051	691061

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
PTFE tubing KF DN 25 (1000 mm: 686033)
Stainless steel tubing KF DN 25 (1000 mm: 673337)
Stainless steel tubing KF DN 40 (1000 mm: 673338)

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. 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. For advantages of VARIO® control with the CVC 3000, see page 142.

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

Outlet exhaust waste vapor condenser and 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 solenoid valves or motor-speed control 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 and pumping units with plastic housing).

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

EMISSION CONDENSER

ACCESSORIES FOR CHEMISTRY PUMPING UNITS

Peltronic™ exhaust vapor condenser

The electronic exhaust waste vapor condenser Peltronic™ condenses solvent vapors without external coolant such as water or dry ice. Peltier elements are used as cooling system. All wetted parts are highly chemical resistant. The condenser is especially designed to be added to existing pumping units and allows the replacement of common condensers made of glass. The condenser is ideally suited for applications where cooling water is not available or desired because of environmental reservations about water use, cost and productivity concerns associated with dry ice condensers, or risk of flooding from cooling water plumbing leakage. This often 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 unit PC 3001 VARIO EK Peltronic is available serially, other pumping units with Peltronic™ on request.

TECHNICAL DATA	
Cooling capacity at 21°C ambient temp.	50 W
Ambient temperature range	10 °C - 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	4.3 kg

ORDERING INFORMATION	
Peltronic™ exhaust vapor condenser 100-120 V/200-230 V ~ 50-60 Hz	699905

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.

pg. 167

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 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.

pg. 50, 51

ACCESSORIES FOR CHEMISTRY PUMPING UNITS

Liquid level sensor for VACUUBRAND catchpot 500 ml

The liquid level sensor is designed to be assembled on the neck of a VACUUBRAND 500 ml catchpot and works with the CVC 3000 or VNC 2 controllers to monitor 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.

For the VACUUBRAND emission condenser type EK 1000 (used, e.g., in pumping units PC 8 and PC 301x VARIO) a suitable liquid level sensor is available, too.

Separator AK PC 8

This separator has a catchpot with good chemical resistance and offers optimal condensate control. Using its small flange KF DN 25 outlet, this separator can be directly mounted at the inlet of VACUUBRAND "double-star"-type (eight-head) diaphragm pumps. The vacuum system can be connected using a small flange KF DN 25 or a hose nozzle DN 15 mm.

Exhaust vapor condenser EK PC 8

The exhaust waste vapor condenser EK PC 8 is designed for large flow rates of condensable vapors. The condenser is thermally isolated and offers an increased collection volume of 1 liter (flask). The condenser is assembled on a platform for diaphragm pumps with eight heads.

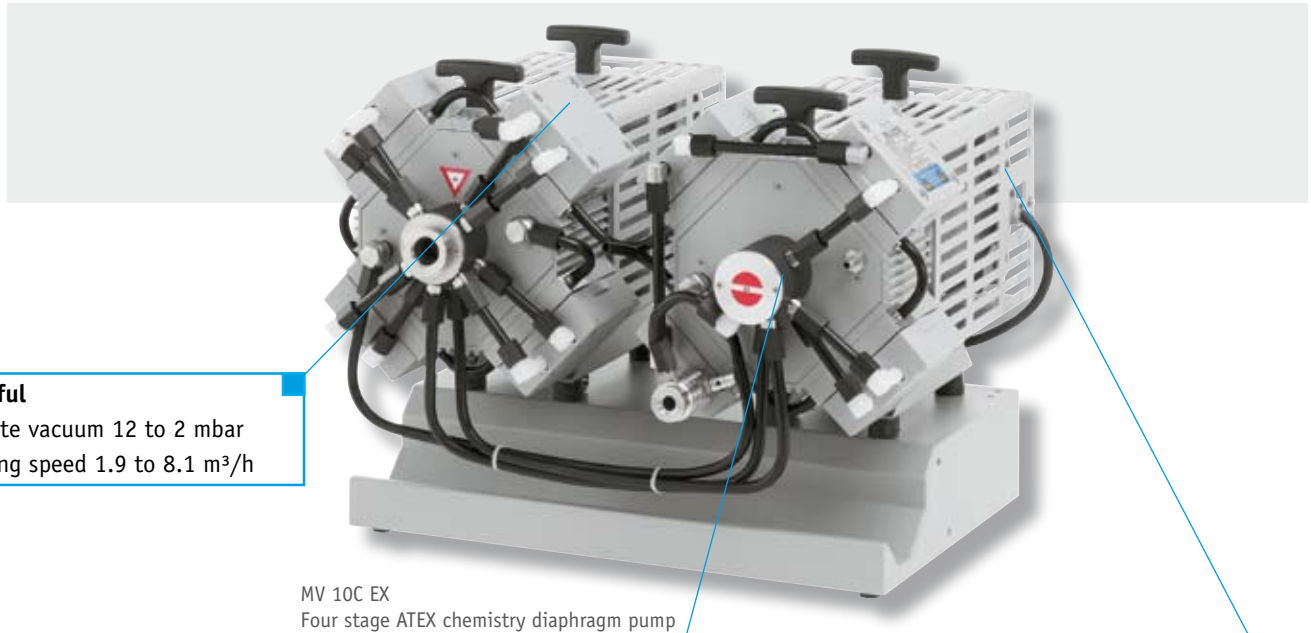
ORDERING INFORMATION	
Liquid level sensor for VACUUBRAND catchpot 500 ml	699908
Liquid level sensor for VACUUBRAND emission condenser EK 1000	699909
Separator AK PC 8	699980
Upgrade kit complete exhaust vapor condenser EK PC 8 with base plate for pump	699949
Cooling water valve VKW 230 V IEC plug EN 60320	676010
Cooling water valve VKW 230 V UK	676012
Cooling water valve VKW 230 V CEE	676014
Silencer with hose*	636588

* 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
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 a series of ATEX vacuum gauges 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

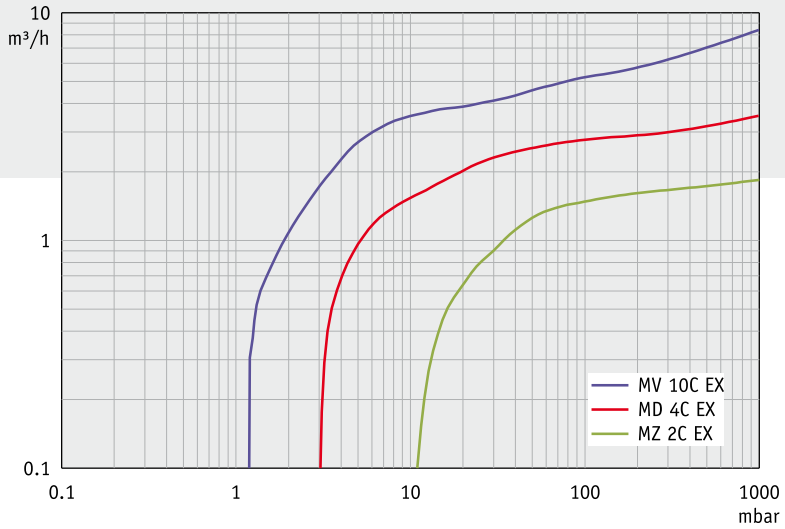
Gas ballast
included as separate inert gas connection

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 a series of ATEX vacuum measuring instruments with excellent corrosion resistance and long-term stability

pg. 136, 137



Pumping speed graph at 50 Hz without gas ballast

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 pumps 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 EEx d IIB T4		
Number of heads / stages		2 / 2	4 / 3	8 / 4
Max. pumping speed at 50 Hz	m³/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 (EX) (abs.)	bar	1.1	1.1	1.1
Inlet connection (IN)		Small flange KF DN 16	Small flange KF DN 25	Small flange KF DN 25
Outlet connection (EX)		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)	mm	337 x 287 x 251	440 x 265 x 305	560 x 430 x 410
Weight	kg	21.6	29.3	63.2

ACCESSORIES MZ 2C EX

PTFE tubing KF DN 16 (1000 mm: 686031)

ACCESSORIES MD 4C EX and MV 10C EX

PTFE tubing KF DN 16 (1000 mm: 686031)
PTFE tubing KF DN 25 (1000 mm: 686033)

ORDERING INFORMATION	MZ 2C EX	
230 V ~ 50 Hz		696920
ORDERING INFORMATION	**MD 4C EX**	
230 V ~ 50 Hz		696930
ORDERING INFORMATION	**MV 10C EX**	
230 V ~ 50 Hz		696945

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	Pumping chamber (pumped gases): II 2G IIC T3 X
		Environment with inert purge gas: II 2G IIB T4 X	Environment with inert purge gas: II 2G IIB T4 X
		Environment without inert purge gas: II 3G IIB T4 X	Environment without inert purge gas: II 3G IIB T4 X
		Motor: II 2G EEx d IIB T4	Motor: II 2G EEx d IIB T4
Basic pump		MZ 2C EX	MD 4C EX
Inlet connection (IN)		Small flange KF DN 16	Small flange KF DN 25
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Degree of protection		IP 52	IP 54
Dimensions (L x W x H)	mm	357 x 308 x 470	600 x 365 x 420
Weight	kg	25.4	37.4

ORDERING INFORMATION	MZ 2C EX +AK+EK	ORDERING INFORMATION	MD 4C EX +AK+EK
230 V ~ 50 Hz	696921	230 V ~ 50 Hz	696931

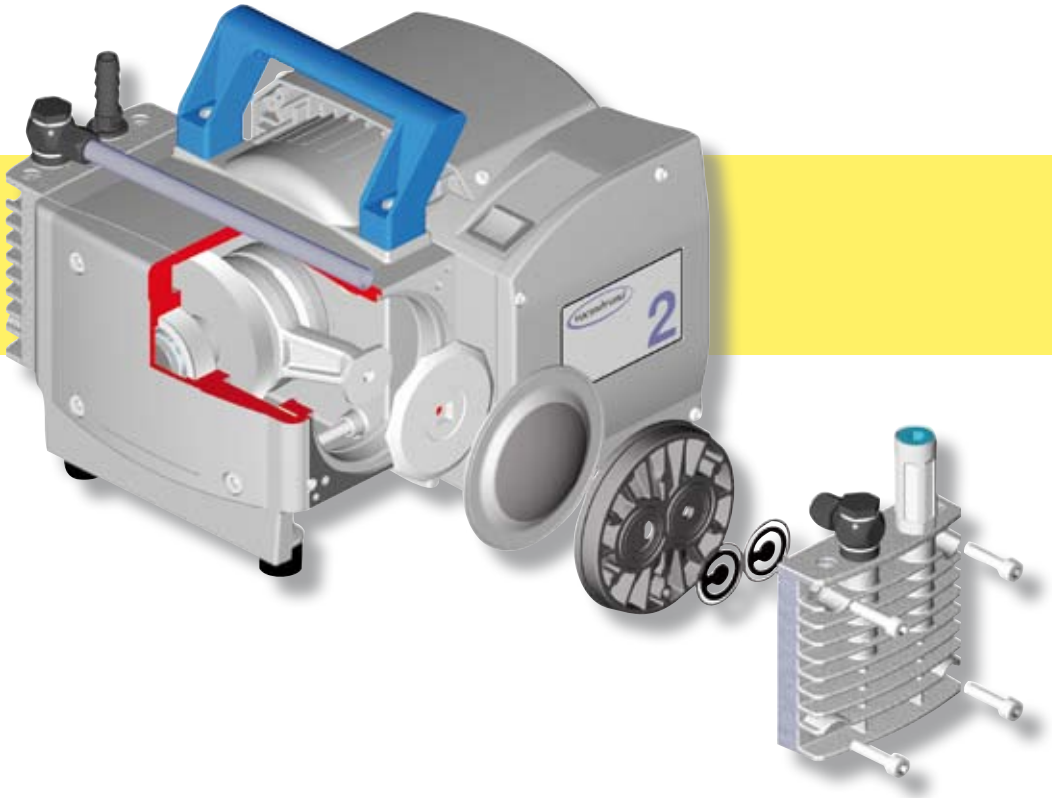
ACCESSORIES	MZ 2C EX +AK+EK	ACCESSORIES	MD 4C EX +AK+EK
PTFE tubing KF DN 16 (1000 mm: 686031)		PTFE tubing KF DN 25 (1000 mm: 686033)	

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 FPM double diaphragms with fabric reinforcement guarantee an extremely long diaphragm lifetime. The pumps operate absolutely oil free and do not have any sliding components on the vapor side; 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 on the vacuum side of scroll or piston pumps.

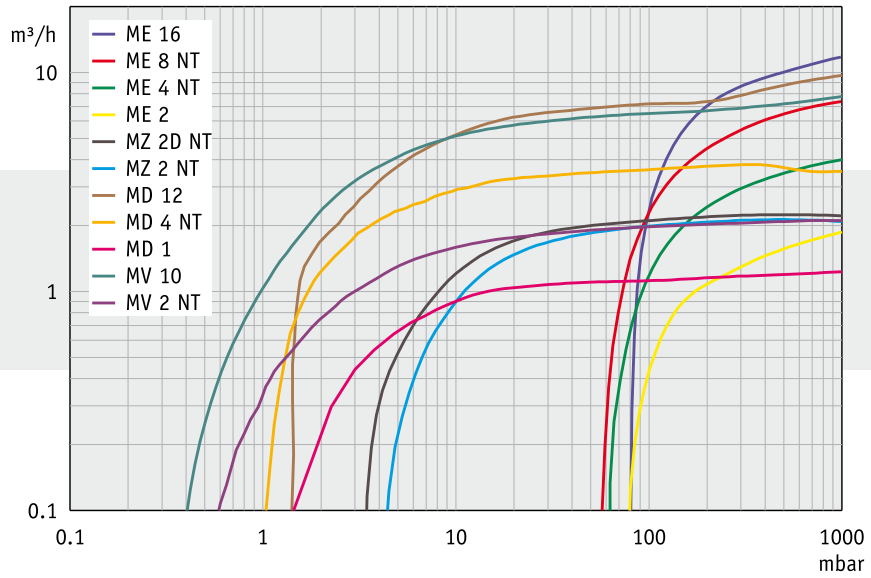


- innovative connections in the new NT models ensure very low leak rates for excellent flow rates under vacuum and long-term performance stability, even after thousands of hours of service.
- no abrasion, making it dust- and contamination-free
- long diaphragm and valve lifetimes: Made of highly flexible FPM, with fabric-reinforced double diaphragms for improved long term stability
- new patented drive support system in NT pump models provide for uniquely quiet, low-vibration operation

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® or VARIO-B = speed controlled pump with vacuum controller CVC 3000

Many vacuum applications in laboratories and industrial operations require electronic vacuum regulation. VACUUBRAND's unique VARIO® regulation offers the distinctive control advantages and convenience of the CVC 3000 controller ▶ pg. 142

- precision vacuum regulation by modifying the diaphragm pump speed to the needs of the application
- unsurpassed diaphragm and valve lifetime by reducing the total number of diaphragm strokes
- exceptionally quiet, with very low vibration and measurably lower energy consumption
- VARIO® pumps include patented TURBO·MODE™ with automatic speed adjustment that provides even better backing when used as a fore-pump for turbomolecular drag pumps (capable of working with backing pressure in the mbar range). The result is a cooler running turbo pump with better residual gas properties

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 Aqueous vacuum filtration Drying chamber Pressure filtration	 ME 2 ▶ pg. 86, 87  ME 4 NT ▶ pg. 86, 87  ME 8 NT ▶ pg. 90, 91  ME 16 ▶ pg. 90, 91	 ME 4R NT ▶ pg. 88, 89	
Down to 7 mbar Drying chamber Aqueous vacuum filtration Backing of wide-range Turbo pumps	 MZ 2 NT ▶ pg. 92, 93  MZ 2D NT ▶ pg. 92, 93		
Down to 1.5 mbar Drying chamber Degassing of viscous media Backing of wide-range turbo pumps	 MD 1 ▶ pg. 94, 95  MD 4 NT ▶ pg. 96, 97  MD 12 ▶ pg. 98, 99		 MD 4 NT VARIO ▶ pg. 96; 97
Down to 0.6 mbar Drying chamber Fast evacuation of larger volumina Backing of wide-range turbo pumps	 MV 2 NT ▶ pg. 100, 101  MV 10 ▶ pg. 102, 103		 MV 2 NT VARIO ▶ pg. 100, 101  MV 10 VARIO-B ▶ pg. 102, 103

Diaphragm pump
ME 2 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 FPM is ideal for extended operating life. The new NT-series features further improved performance data.

ME 4 NT
4.0 m³/h
70 mbar

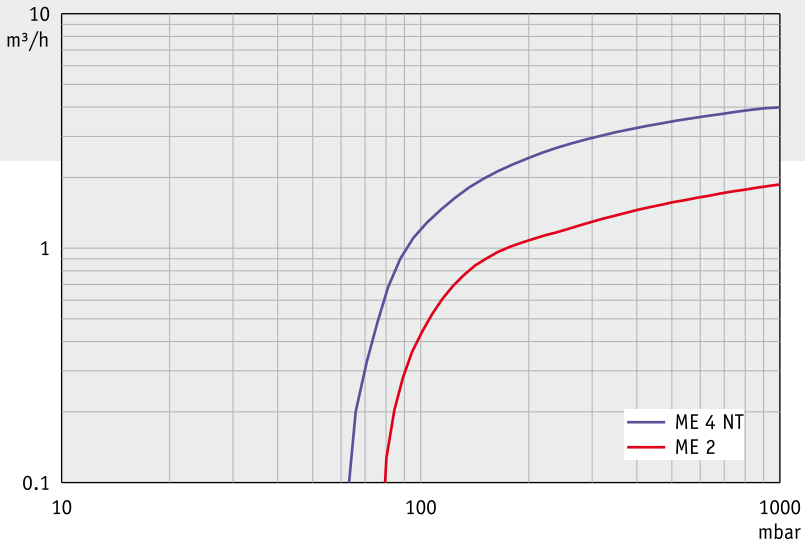
ME 2
1.9 m³/h
80 mbar

PERFORMANCE FEATURES

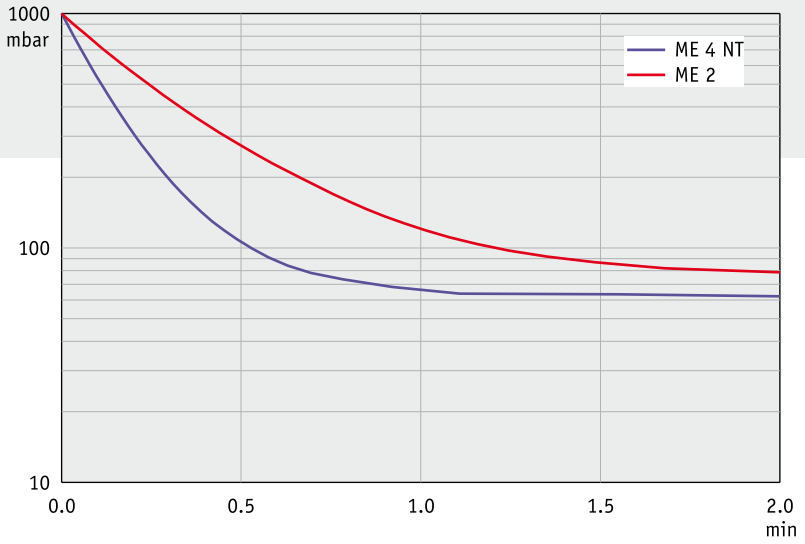
- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- whisper quiet
- ME 4 NT with low vibration and higher pumping speed
- exceptionally long diaphragm life and maintenance-free drive system for low lifetime costs

APPLICATIONS

One-stage diaphragm pumps are an excellent choice for continuous, oil-free pumping at low 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 (CEE Version)	ME 4 NT
Number of heads / stages		1 / 1	2 / 1
Max. pumping speed at 50/60 Hz	m³/h	1.9/2.2	4.0/4.4
Ultimate vacuum (abs.)	mbar	80	70
Max. back pressure at outlet (abs.)	bar	2	2
Inlet connection (IN)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Outlet connection (EX)		Silencer / G1/4"	Silencer / G1/4"
Rated motor power	kW	0.12	0.18
Degree of protection		IP 54	IP 40
Dimensions (L x W x H)	mm	275 x 164 x 188	243 x 239 x 198
Weight	kg	6.8	11.0

ORDERING INFORMATION	ME 2	
230 V ~ 50-60 Hz	CEE	696120
100-120 V/200-230 V ~ 50-60 Hz	UK	696126
100-120 V/200-230 V ~ 50-60 Hz	US	696123

ORDERING INFORMATION	ME 4 NT	
230 V ~ 50-60 Hz	CEE	731000
230 V ~ 50-60 Hz	CH	731001
230 V ~ 50-60 Hz	UK	731002
100-115 V ~ 50-60 Hz 120 V ~ 60 Hz	US	731003
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual

Diaphragm pump
ME 4R NT

This one-stage diaphragm pump works simultaneously as a vacuum generator and as 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 regulation valves for vacuum and overpressure, respectively. Compression pressure and vacuum level can be adjusted. The new NT-series features further improved performance data.

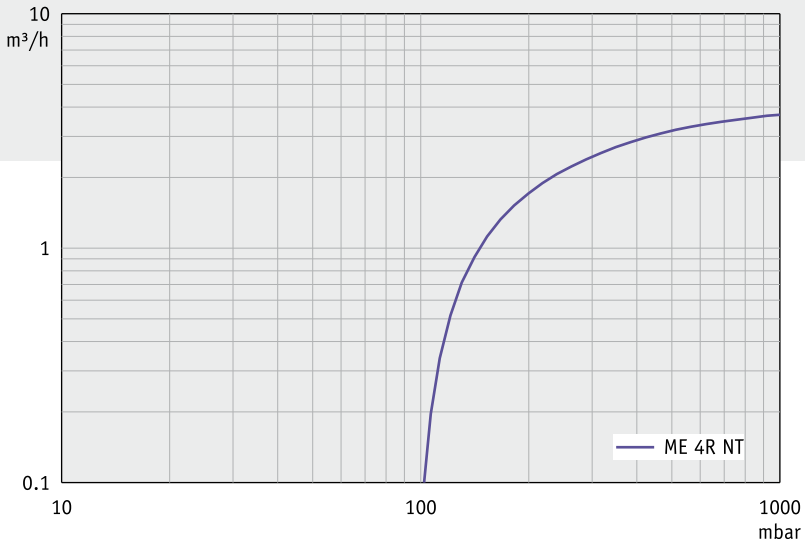
ME 4R NT
3.8 m³/h
100 mbar

PERFORMANCE FEATURES

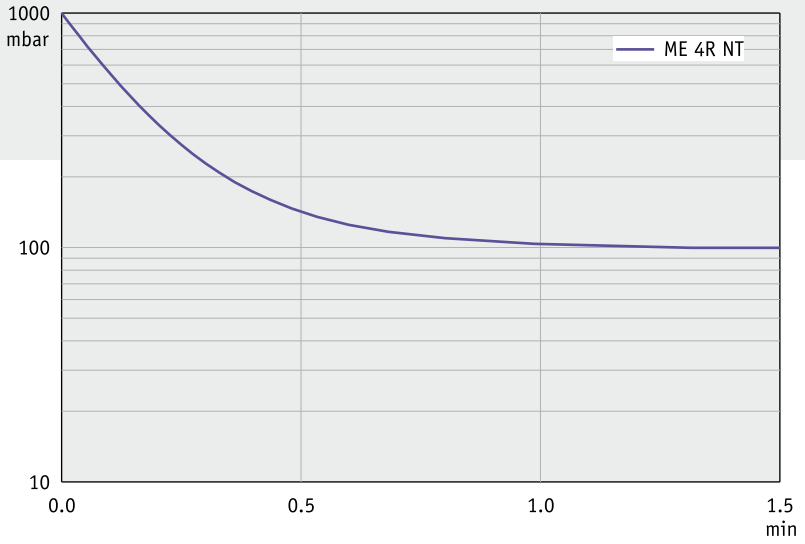
- contamination-free pumping, evacuation and compression
- high flow rate even near ultimate vacuum
- adjustment of outlet pressure and vacuum level with regulation valves
- very low vibration
- exceptionally long diaphragm life and maintenance-free drive system for low lifetime costs

APPLICATIONS

One-stage diaphragm pumps are 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 regulation 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 at 50/60 Hz	m³/h	3.8/4.2
Ultimate vacuum (abs.)	mbar	100
Max. back pressure (EX) (abs.)	bar	4
Inlet connection (IN)		Hose nozzle DN 10 mm
Outlet connection (EX)		Hose nozzle DN 10 mm
Rated motor power	kW	0.18
Degree of protection		IP 40
Dimensions (L x W x H)	mm	243 x 239 x 290
Weight	kg	11.5

ORDERING INFORMATION		ME 4R NT
230 V ~ 50-60 Hz	CEE	731100
230 V ~ 50-60 Hz	UK	731102
With NRTL certification for Canada and the USA		

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual

Diaphragm pump
ME 8 NT and ME 16

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 highly flexible, fabric-reinforced double diaphragm made of FPM is ideal for extended operating life. These powerful pumps have an exceptionally high pumping speed. The new NT-series features further improved performance data.

ME 8 NT
7.3 m³/h
70 mbar

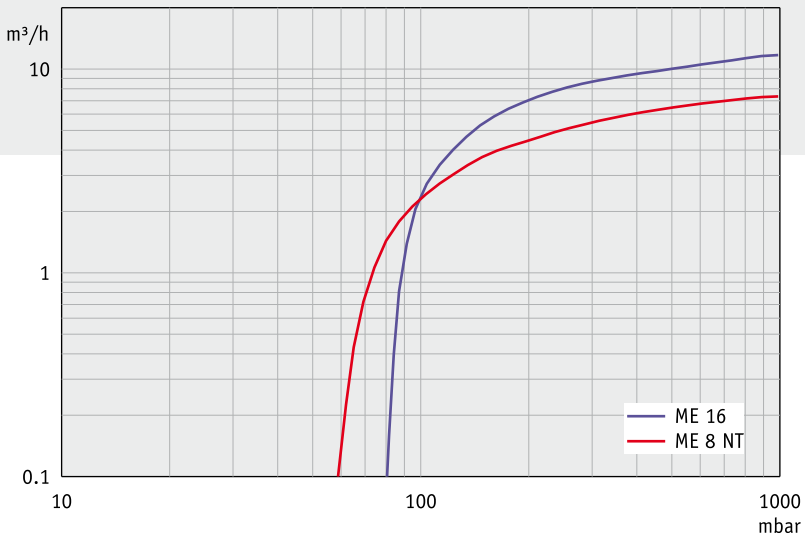
ME 16
12.0 m³/h
80 mbar

PERFORMANCE FEATURES

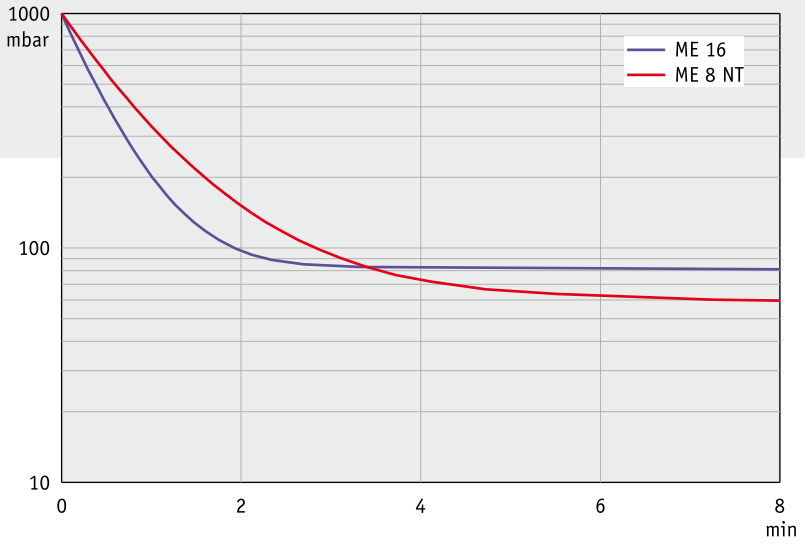
- contamination-free pumping and evacuation
- very high flow rate even near ultimate vacuum
- quiet operation
- very low vibration
- exceptionally long diaphragm life and maintenance-free drive system for low lifetime costs

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 pumping of non-corrosive gases in general. We recommend these pumps especially for processes with high inlet and process pressures. They are excellent for very fast evacuations.



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
Number of heads / stages		4 / 1	8 / 1
Max. pumping speed 50/60 Hz	m³/h	7.3/8.1	12.0/12.9
Ultimate vacuum (abs.)	mbar	70	80
Max. back pressure (EX) (abs.)	bar	2	1.1
Inlet connection (IN)		Hose nozzle DN 10 mm	Small flange KF DN 25
Outlet connection (EX)		2 x silencer / G1/4"	Hose nozzle DN 10 mm / silencer / G1/4"
Rated motor power	kW	0.25	0.39
Degree of protection		IP 40	IP 20
Dimensions (L x W x H)	mm	325 x 239 x 198	470 x 222 x 294
Weight	kg	16.4	23.0

ORDERING INFORMATION		ME 8 NT
230 V ~ 50-60 Hz	CEE	734000
230 V ~ 50-60 Hz	CH	734001
230 V ~ 50-60 Hz	UK	734002
120 V ~ 60 Hz	US	734003
100 V ~ 50-60 Hz	US	734006
With NRTL certification for Canada and the USA		

ORDERING INFORMATION		ME 16
230 V ~ 50-60 Hz	CEE	696427
400 V ~ 50 Hz 3 ph.	CEE	696428
230 V ~ 50-60 Hz	CH	696435
230 V ~ 50-60 Hz	UK	696434
120 V ~ 60 Hz	US	696426
100 V ~ 50-60 Hz	US	696432

ACCESSORIES ME 8 NT

Rubber vacuum tubing DN 10 mm (686002)

ACCESSORIES ME 16

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

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 diaphragm made of FPM is ideal for extended operating life. The new NT-series features further improved performance data.

MZ 2D NT
2.3 m³/h
4 mbar

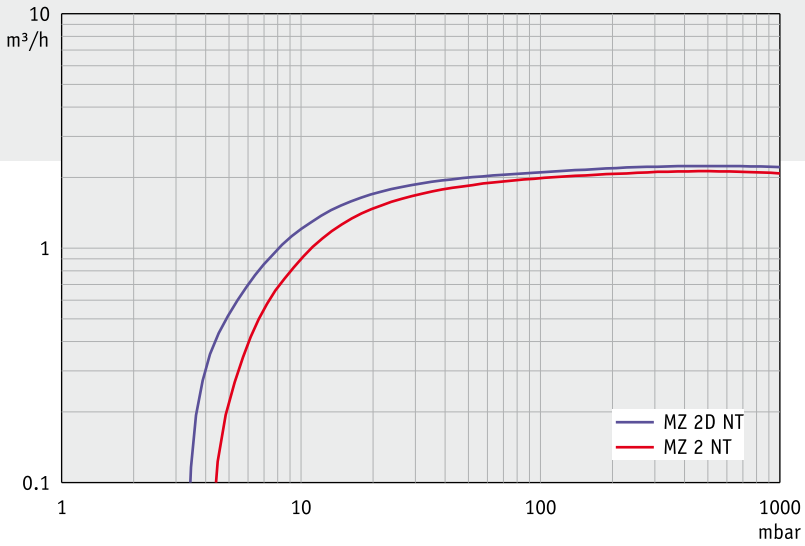
MZ 2 NT
2.2 m³/h
7 mbar

PERFORMANCE FEATURES

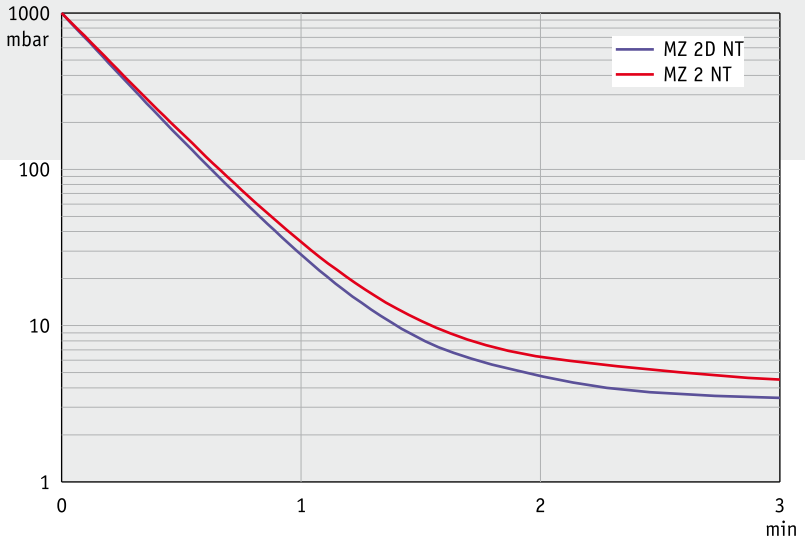
- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- good ultimate vacuum
- whisper quiet and very low vibration
- exceptionally long diaphragm life and maintenance-free drive system for low lifetime costs

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	m³/h	2.2/2.4	2.3/2.5
Ultimate vacuum (abs.)	mbar	7	4
Max. back pressure (EX) (abs.)	bar	2	1.1
Inlet connection (IN)		Hose nozzle DN 10 mm	Small flange KF DN 16
Outlet connection (EX)		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)	mm	243 x 239 x 198	243 x 242 x 198
Weight	kg	11.0	11.4

ACCESSORIES MZ 2 NT
Rubber vacuum tubing DN 10 mm (686002)

ACCESSORIES MZ 2D NT
Stainless steel tubing KF DN 16 (1000 mm: 673336)

ORDERING INFORMATION MZ 2 NT		
230 V ~ 50-60 Hz	CEE	732000
230 V ~ 50-60 Hz	CH	732001
230 V ~ 50-60 Hz	UK	732002
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US	732003
With NRTL certification for Canada and the USA		

ORDERING INFORMATION MZ 2D NT		
230 V ~ 50-60 Hz	CEE	732200
230 V ~ 50-60 Hz	UK	732202
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US	732203
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz 200-230 V ~ 50-60 Hz IEC plug EN 60320		732205
With NRTL certification for Canada and the USA		

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 lilfetimes documented with years of testing. With a flow path consisting of aluminum and selected plastics (diaphragms and valves made of PTFE/FPM and FPM respectively), the pumps are suitable for a wide range of applications with non-corrosive gases.

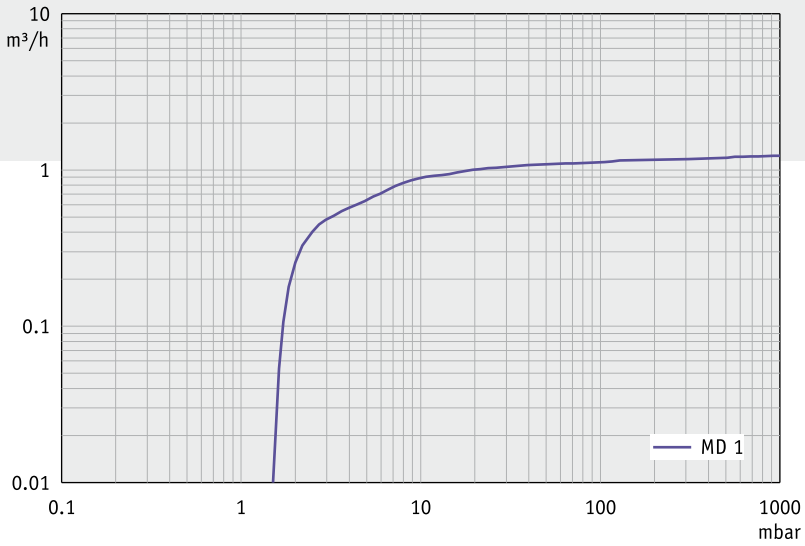
MD 1
1.2 m³/h
1.5 mbar

PERFORMANCE FEATURES

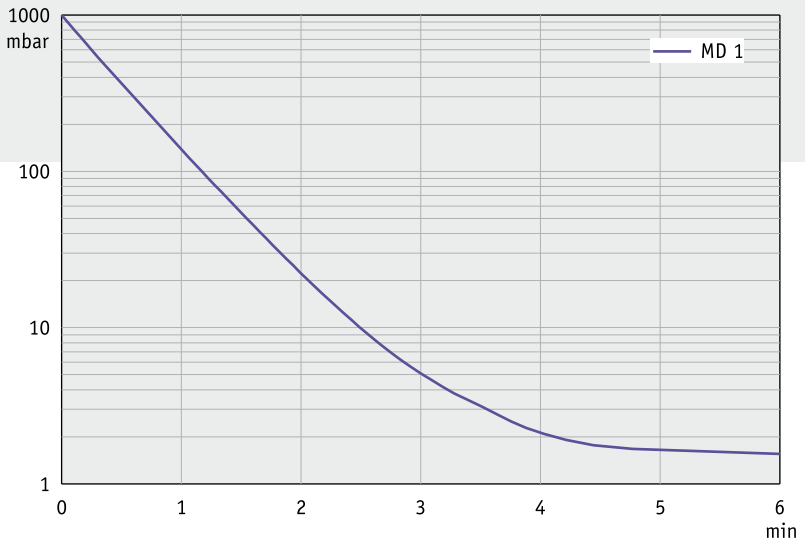
- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- excellent ultimate vacuum
- whisper quiet and ultra-low vibration
- proven long diaphragm life, maintenance-free drive system

APPLICATIONS

The MD 1 is an excellent choice for continuous, oil-free evacuation and pumping of non-aggressive gases. With its low ultimate vacuum, the MD 1 is well-suited to applications in physics and analytics. The compact design and vacuum capacity make it an alternative to small rotary vane pumps for degassing of small amounts of viscous media, and as backing pump for compact turbomolecular drag 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		MD 1
Number of heads / stages		4 / 3
Max. pumping speed at 50/60 Hz	m³/h	1.2/1.4
Ultimate vacuum (abs.)	mbar	1.5
Max. back pressure at outlet (abs.)	bar	1.1
Inlet connection (IN)		Hose nozzle DN 6 mm
Outlet connection (EX)		Silencer / G1/8"
Rated motor power	kW	0.08
Degree of protection		IP 44
Dimensions (L x W x H)	mm	303 x 143 x 163
Weight	kg	6.5

ORDERING INFORMATION		MD 1
200-230 V ~ 50-60 Hz	CEE	696080
200-230 V ~ 50-60 Hz	CH	696081
200-230 V ~ 50-60 Hz	UK	696082
100-120 V ~ 50-60 Hz	US	696083
120 V ~ 60 Hz*	US	696073
100-120 V ~ 50-60 Hz		
200-230 V ~ 50-60 Hz		
IEC plug EN 60320		696087

* With NRTL certification for Canada and the USA

ACCESSORIES

Rubber vacuum tubing DN 6 mm (686000)

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 FPM 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 VACUUBRAND diaphragms and valves.

MD 4 NT
3.8 m³/h
1 mbar

MD 4 NT VARIO
5.7 m³/h
1 mbar

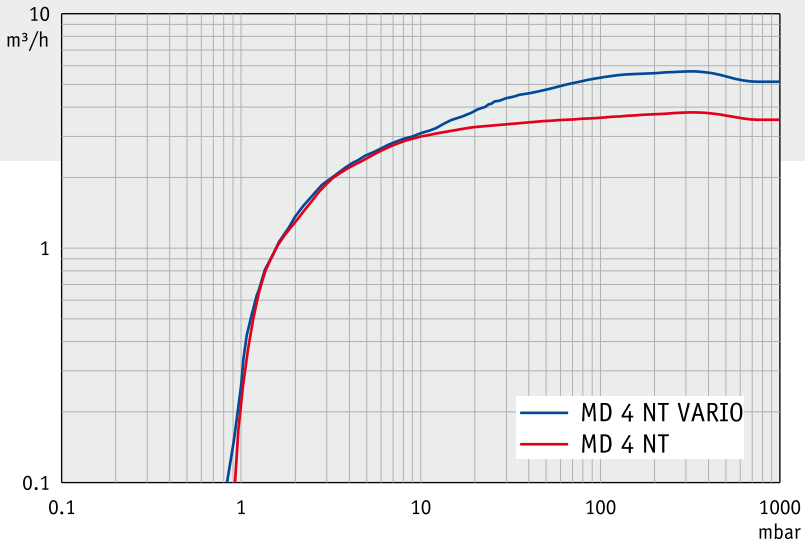
PERFORMANCE FEATURES

- 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

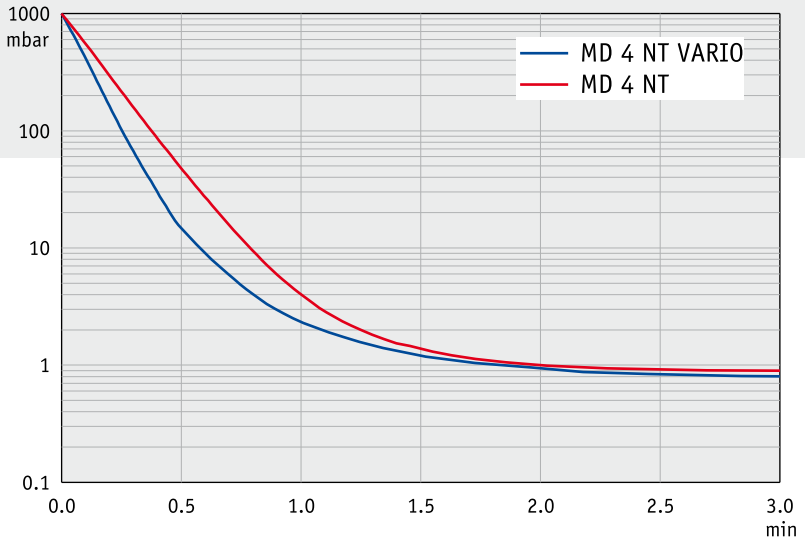
APPLICATIONS

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 in physics and analytics. The low ultimate vacuum makes these an attractive alternative to rotary vane pumps in many applications. Typical uses are as backing pump for turbomolecular drag pumps, and for degassing of viscous media. Additionally, the VARIO® model provides vacuum control by precise adjustment of the diaphragm pump's motor speed to process conditions. Depending on the application, the demand-responsive motor speed control of VARIO® models further extends the long diaphragm life for which VACUUBRAND pumps are known, and produces an even higher pumping speed.

Further information at **www.vacuubrand.com**



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	m³/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 (IN)		Small flange KF DN 16	Small flange KF DN 16
Outlet connection (EX)		Silencer / G1/4"	Silencer / G1/4"
Rated motor power	kW	0.25	0.53
Degree of protection		IP 40	IP 20
Dimensions (L x W x H)	mm	325 x 239 x 198	325 x 235 x 245
Weight	kg	16.4	18.6

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)

ORDERING INFORMATION MD 4 NT		
230 V ~ 50-60 Hz	CEE	736000
230 V ~ 50-60 Hz	CH	736001
230 V ~ 50-60 Hz	UK	736002
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US	736003
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz 200-230 V ~ 50-60 Hz IEC plug EN 60320		736005
With NRTL certification for Canada and the USA		

ORDERING INFORMATION MD 4 NT VARIO		
200-230 V ~ 50-60 Hz	CEE	736300
200-230 V ~ 50-60 Hz	CH	736301
100-120 V ~ 50-60 Hz	US	736303

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual

Diaphragm pump
MD 12

The MD 12 diaphragm pump is an especially powerful pump for oil-free evacuation and pumping of non aggressive gases. The three-stage construction of the eight-head pump provides the advantageous combination of very high pumping speed and excellent ultimate vacuum. The flowpath consists of aluminum, stainless steel and carefully selected plastics (diaphragms and valves made of FPM) to permit a wide range of applications. The fabric-reinforced double diaphragms are made of highly flexible FPM for extended operating life. The special ("double star") design offers quiet, continuous-duty reliability even at high inlet pressure.

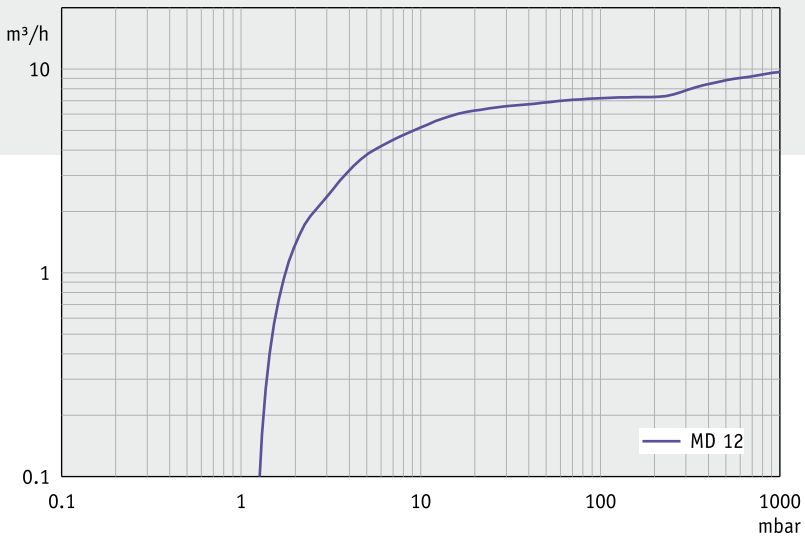
MD 12
9.6 m³/h
2 mbar

PERFORMANCE FEATURES

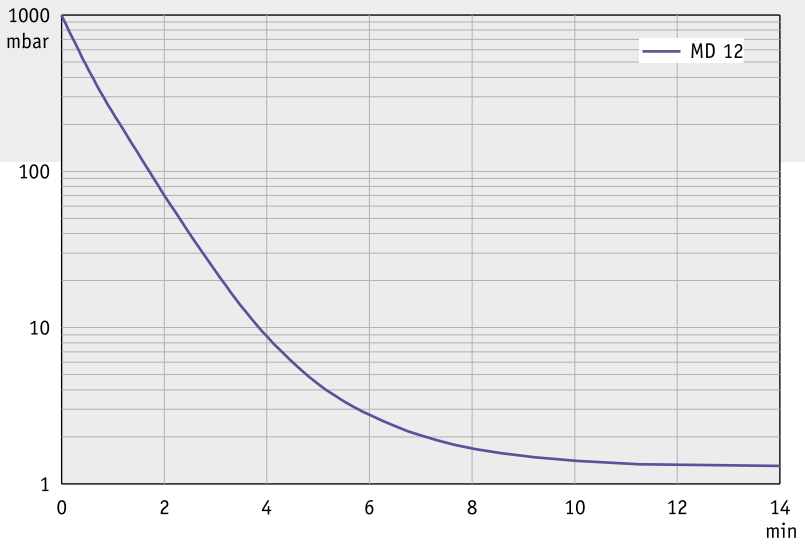
- contamination-free pumping and evacuation
- very high flow rate even near ultimate vacuum
- whisper quiet
- powerful vacuum and high flow rates reduce process times
- exceptionally long diaphragm life and maintenance-free drive system for low lifetime costs

APPLICATIONS

The MD 12 is an excellent choice for continuous, oil-free evacuation and pumping of non-aggressive gases, especially for applications in physics and analytics. Due to the very good ultimate vacuum, the MD 12 is often used as an alternative to rotary vane pumps, for vacuum ovens, for very quick and efficient degassing of viscous media, and especially as backing pump for large turbomolecular drag 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
Number of heads / stages		8 / 3
Max. pumping speed at 50/60 Hz	m³/h	9.6/10.4
Ultimate vacuum (abs.)	mbar	2
Max. back pressure (EX) (abs.)	bar	1.1
Inlet connection (IN)		Small flange KF DN 25
Outlet connection (EX)		Hose nozzle DN 10 mm / silencer / G1/4"
Rated motor power	kW	0.39
Degree of protection		IP 20
Dimensions (L x W x H)	mm	486 x 222 x 294
Weight	kg	23.0

ORDERING INFORMATION		MD 12
230 V ~ 50-60 Hz	CEE	710000
230 V ~ 50-60 Hz	CH	710001
230 V ~ 50-60 Hz	UK	710002
120 V ~ 60 Hz	US	710003

ACCESSORIES

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

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 vacuums. 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 FPM offers extended operating life. The VARIO® versions of these pumps automatically adjust the vacuum level to optimize the process conditions by continuously varying the motor speed. The VARIO® design 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, such as diaphragms.

MV 2 NT
2.2 m³/h
0.5 mbar

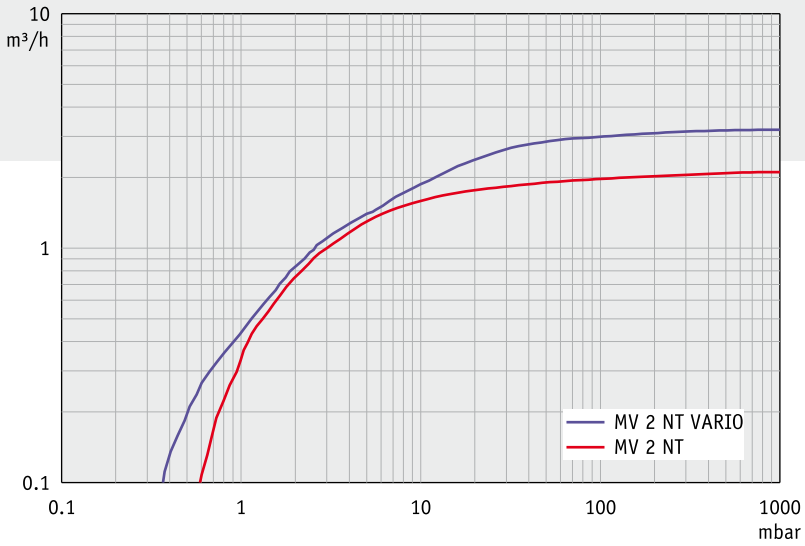
MV 2 NT VARIO
3.3 m³/h
0.3 mbar

PERFORMANCE FEATURES

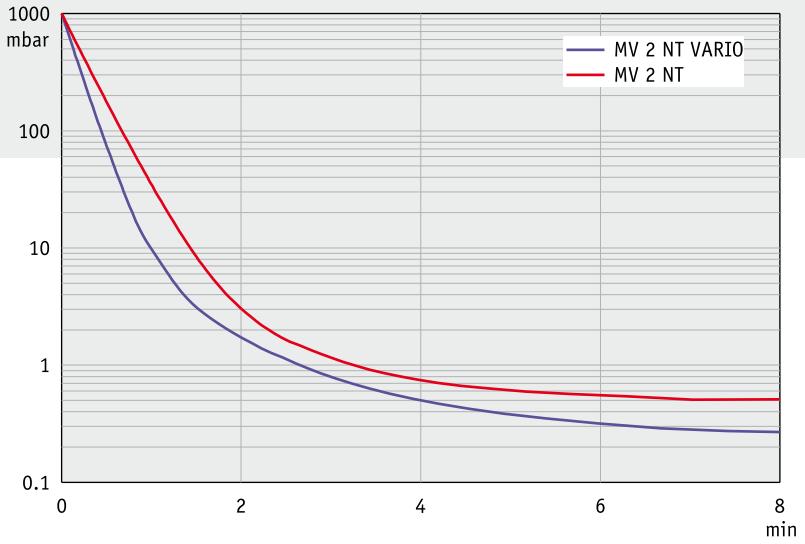
- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- VARIO® option for self-regulating vacuum optimization throughout the process
- excellent ultimate vacuum, and even better ultimate vacuum with VARIO® version in TURBO·MODE™ for use as backing pump for turbo pumps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

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 alternative to rotary vane pumps. A typical application is the use as backing pump for turbomolecular drag pumps. Additionally, the VARIO® design 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 such as 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	m³/h	2.2/2.4	3.3
Ultimate vacuum (abs.)	mbar	0.5	0.3
Max. back pressure (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Small flange KF DN 16	Small flange KF DN 16
Outlet connection (EX)		Silencer / G1/4"	Silencer / G1/4"
Rated motor power	kW	0.25	0.53
Degree of protection		IP 40	IP 20
Dimensions (L x W x H)	mm	325 x 239 x 198	325 x 235 x 245
Weight	kg	16.4	18.9

ORDERING INFORMATION	MV 2 NT	
230 V ~ 50-60 Hz	CEE	738000
230 V ~ 50-60 Hz	CH	738001
230 V ~ 50-60 Hz	UK	738002
100-115 V ~ 50-60 Hz / 120 V ~ 60 Hz	US	738003
With NRTL certification for Canada and the USA		

ORDERING INFORMATION	MV 2 NT VARIO	
200-230 V ~ 50-60 Hz	CEE	738100
200-230 V ~ 50-60 Hz	CH	738101
100-120 V ~ 50-60 Hz	US	738103

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 and MV 10 VARIO-B

VACUUBRAND four-stage diaphragm pumps are an excellent solution for continuous, oil-free pumping of gases requiring very low vacuum and high flow rates. All parts in contact with pumped vapors or gases are made of aluminum, stainless steel and carefully selected plastics compatible with a wide range of applications with non-corrosive gases. The four-stage, "double-star" design provides the advantageous combination of high pumping speed and an outstanding ultimate vacuum down to 0.3 mbar. The highly flexible, fabric-reinforced double diaphragms made of FPM ensure extended operating life. The VARIO® version of these pumps provides vacuum control by precise adjustment of the diaphragm pump's motor speed to process conditions. The VARIO® system includes the VARIO® pump, as well as the CVC 3000 vacuum controller with external gauge head. The demand-responsive motor speed control results in extra long diaphragm life and low lifetime cost of ownership.

MV 10
8.1 m³/h
0.6 mbar

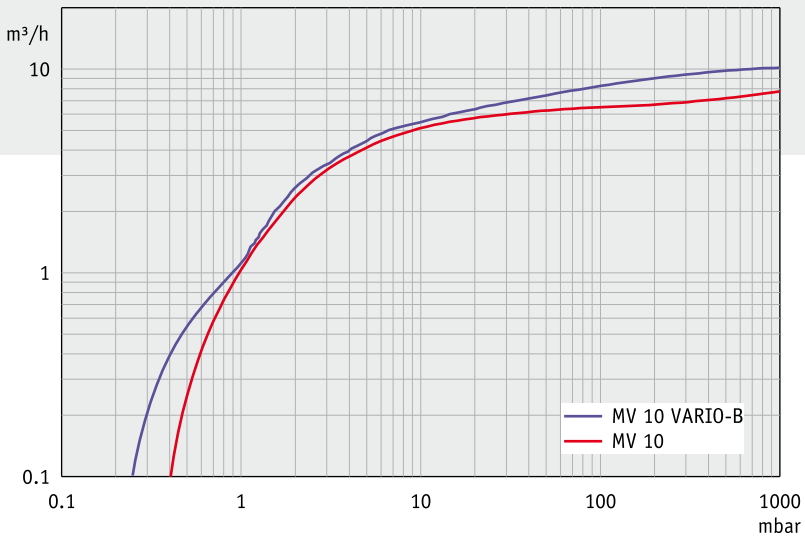
MV 10 VARIO-B
10.4 m³/h
0.3 mbar

PERFORMANCE FEATURES

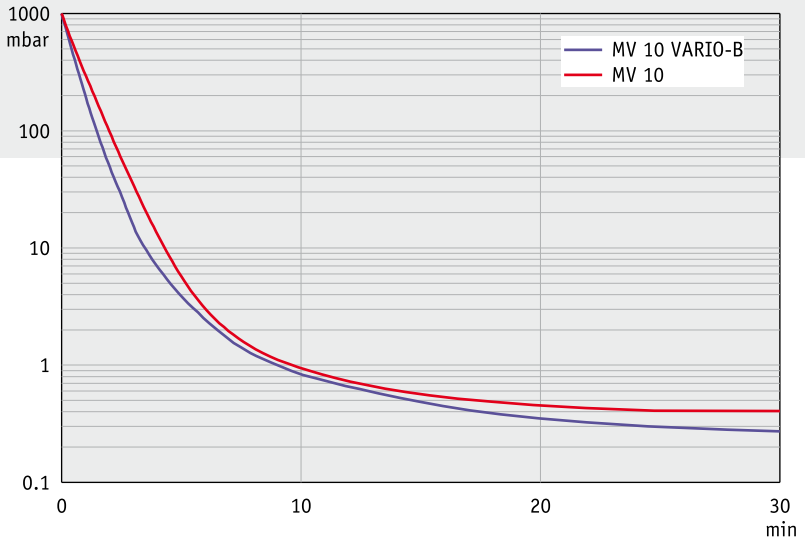
- outstanding ultimate vacuum
- high flow rate even near ultimate vacuum
- VARIO® option for self-regulating vacuum optimization throughout the process
- excellent ultimate vacuum, and even better ultimate vacuum with VARIO® version in TURBO·MODE™ for use as backing pump for turbo pumps
- CVC 3000 controller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

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 alternative to rotary vane pumps. Typical applications are the use as backing pumps for turbomolecular drag pumps and for quick and efficient degassing of viscous media. Additionally, the VARIO® design 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 such as 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	MV 10 VARIO-B
Vacuum controller		-	CVC 3000
Number of heads / stages		8 / 4	8 / 4
Max. pumping speed at 50/60 Hz	m³/h	8.1/8.8	10.4
Ultimate vacuum (abs.)	mbar	0.6	0.3
Max. back pressure (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Small flange KF DN 25	Small flange KF DN 25
Outlet connection (EX)		Hose nozzle DN 10 mm / silencer / G1/4"	Hose nozzle DN 10 mm / silencer / G1/4"
Rated motor power	kW	0.39	0.53
Degree of protection		IP 20	IP 20
Dimensions (L x W x H)	mm	486 x 222 x 294	486 x 222 x 303
Weight	kg	23.0	25.0

ORDERING INFORMATION		MV 10
230 V ~ 50-60 Hz	CEE	710050
230 V ~ 50-60 Hz	CH	710051
230 V ~ 50-60 Hz	UK	710052
120 V ~ 60 Hz	US	710053
100 V ~ 50-60 Hz	US	710055

ORDERING INFORMATION		MV 10 VARIO-B
200-230 V ~ 50-60 Hz	CEE	710500
200-230 V ~ 50-60 Hz	CH	710501
200-230 V ~ 50-60 Hz	UK	710502

ACCESSORIES MV 10

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

ACCESSORIES MV 10 VARIO-B

Stainless steel tubing KF DN 25 (1000 mm: 673337)
Vent valve VBM-B (674217)

ITEMS SUPPLIED

Pump completely mounted, ready for use, with manual

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	on request
MD 4 NT, MV 2 NT, ME 8 NT	662512

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. 166

Small flange components ▸ pg. 161

Gas inlet valves for inert gas supply or inert gas purging ▸ pg. 158

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 diaphragm and valve live, vibration, sound levels and energy consumption. The speed may be specified internally (fixed specification) 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

- speed-variable from 400 to 2200 min^{-1} making possible shorter pump down times at high speed
- improved ultimate vacuum at low speed
- extended lifetime of diaphragms and valves
- extremely compact, with flexible mounting positions
- much quieter and much less vibration
- lower energy consumption and lower waste heat
- speeds can be set fixed or controlled with various external analog and digital signals
- supply voltage 24 V DC for use all over the world
- customized designs for overall system streamlining are a VACUUBRAND specialty

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 extraordinarily silent and vibration-free, with an extended lifetime for its diaphragms. For exceptional chemical resistance of the pump's internal flowpath, it is also available in a chemistry design (MD 1C VARIO-SP).

MD 1 VARIO-SP
1.7 m³/h
1 mbar

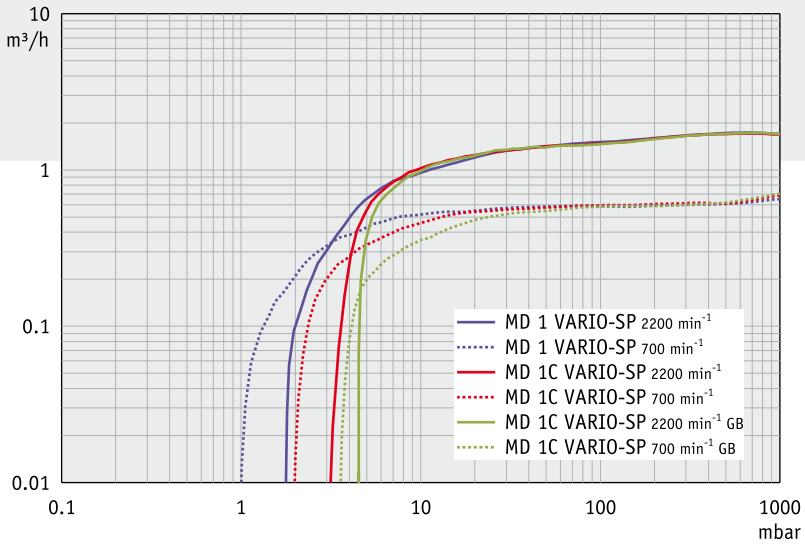
MD 1C VARIO-SP
1.7 m³/h
2 mbar

PERFORMANCE FEATURES

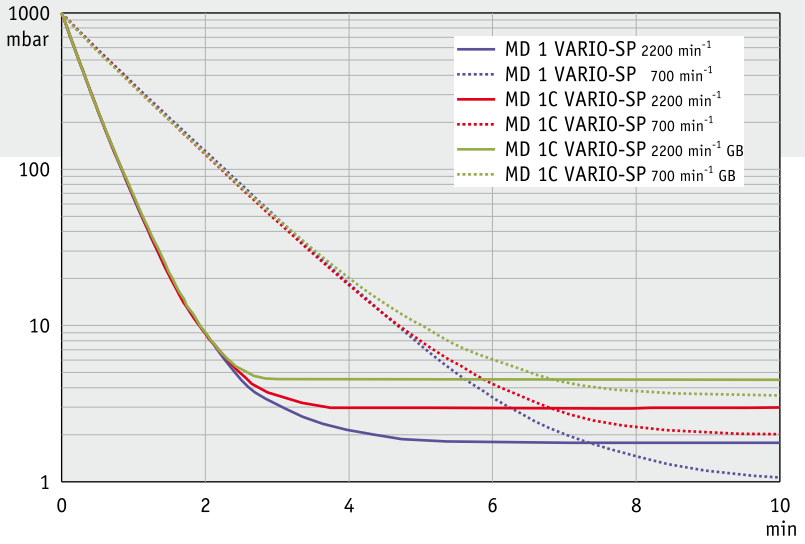
- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- variable speed: Fast pump down at high motor speed, with reduced speeds to maintain vacuum
- very powerful and extremely compact; whisper quiet and ultra-low vibration, especially at low speed
- MD 1C VARIO-SP in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

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 adaptation 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 (2200 min-1)	m³/h	1.7	1.7
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 (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Hose nozzle DN 6 mm	Hose nozzle DN 10 mm
Outlet connection (EX)		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 - 2200	200 - 2200
Dimensions (L x W x H)	mm	223 x 143 x 163	235 x 143 x 175
Weight	kg	4.1	4.2

ORDERING INFORMATION	MD 1 VARIO-SP
24 V DC	696101

ORDERING INFORMATION	MD 1C VARIO-SP
24 V DC	696110

ACCESSORIES MD 1C VARIO-SP

Rubber vacuum tubing DN 8 mm (686001)
Rubber vacuum tubing DN 10 mm (686002)

ITEMS SUPPLIED

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

ACCESSORIES MD 1 VARIO-SP

Rubber vacuum tubing DN 6 mm (686000)

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 extraordinarily silent operation and an extended diaphragm life. The three-stage MD 4 VARIO-SP diaphragm pump offers exceptionally high flow rate and excellent ultimate vacuum.

MD 4 VARIO-SP
3.8 m³/h
1 mbar

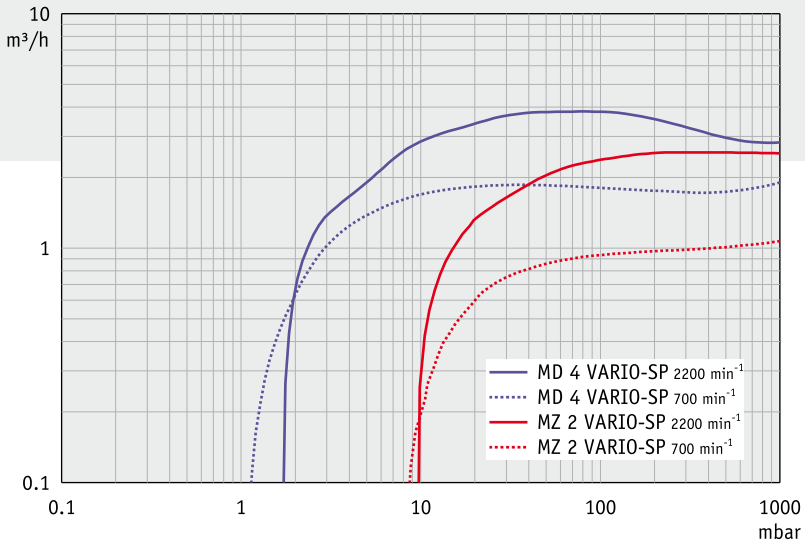
MZ 2 VARIO-SP
2.5 m³/h
9 mbar

PERFORMANCE FEATURES

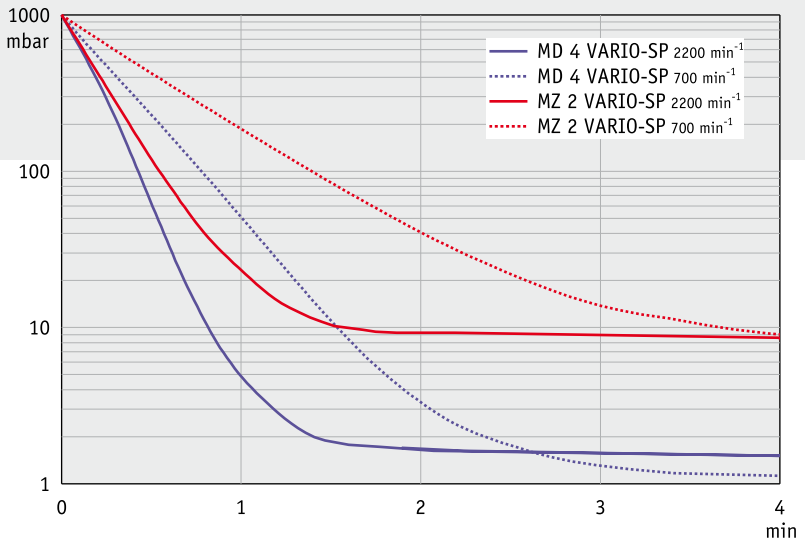
- contamination-free pumping and evacuation
- high flow rate even near ultimate vacuum
- variable speed: Fast pump down at high motor speed, with reduced speeds to maintain vacuum
- very powerful and extremely compact; whisper quiet and ultra-low-vibration, especially at low speed
- choose the MZ 2 VARIO-SP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

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 adaptation 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. Customized versions of these pumps are available 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 (2200 min^{-1})	m³/h	2.5	3.8
Ultimate vacuum (abs.)	mbar	9 (1500 min^{-1})	1 (700 min^{-1})
Max. back pressure (EX) (abs.)	bar	1.1	1.1
Inlet connection (IN)		Hose nozzle DN 10 mm	Small flange KF DN 16
Outlet connection (EX)		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 - 2200	400 - 2200
Dimensions (L x W x H)	mm	161 x 235 x 177	259 x 238 x 179
Weight	kg	6.3	12.2

ORDERING INFORMATION	MZ 2 VARIO-SP
24 V DC	720000

ORDERING INFORMATION	MD 4 VARIO-SP
24 V DC	720100

ACCESSORIES MZ 2 VARIO-SP

Rubber vacuum tubing DN 10 mm (686002)

ACCESSORIES MD 4 VARIO-SP

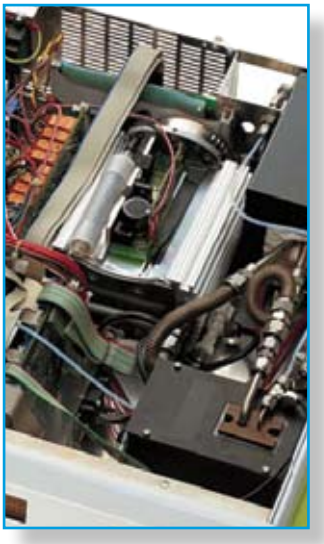
Stainless steel tubing KF DN 16 (1000 mm: 673336)

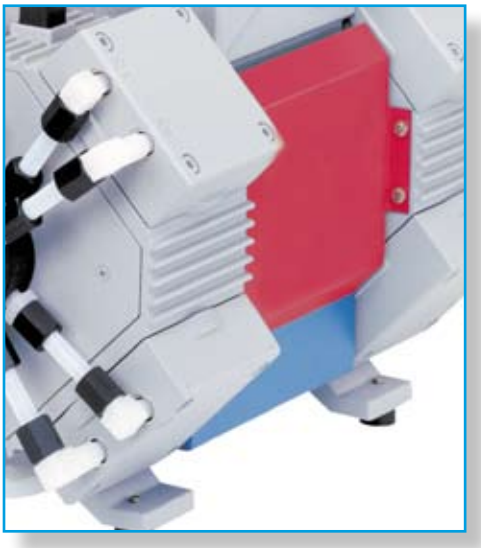
ITEMS SUPPLIED

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

Representative OEM Modifications

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.

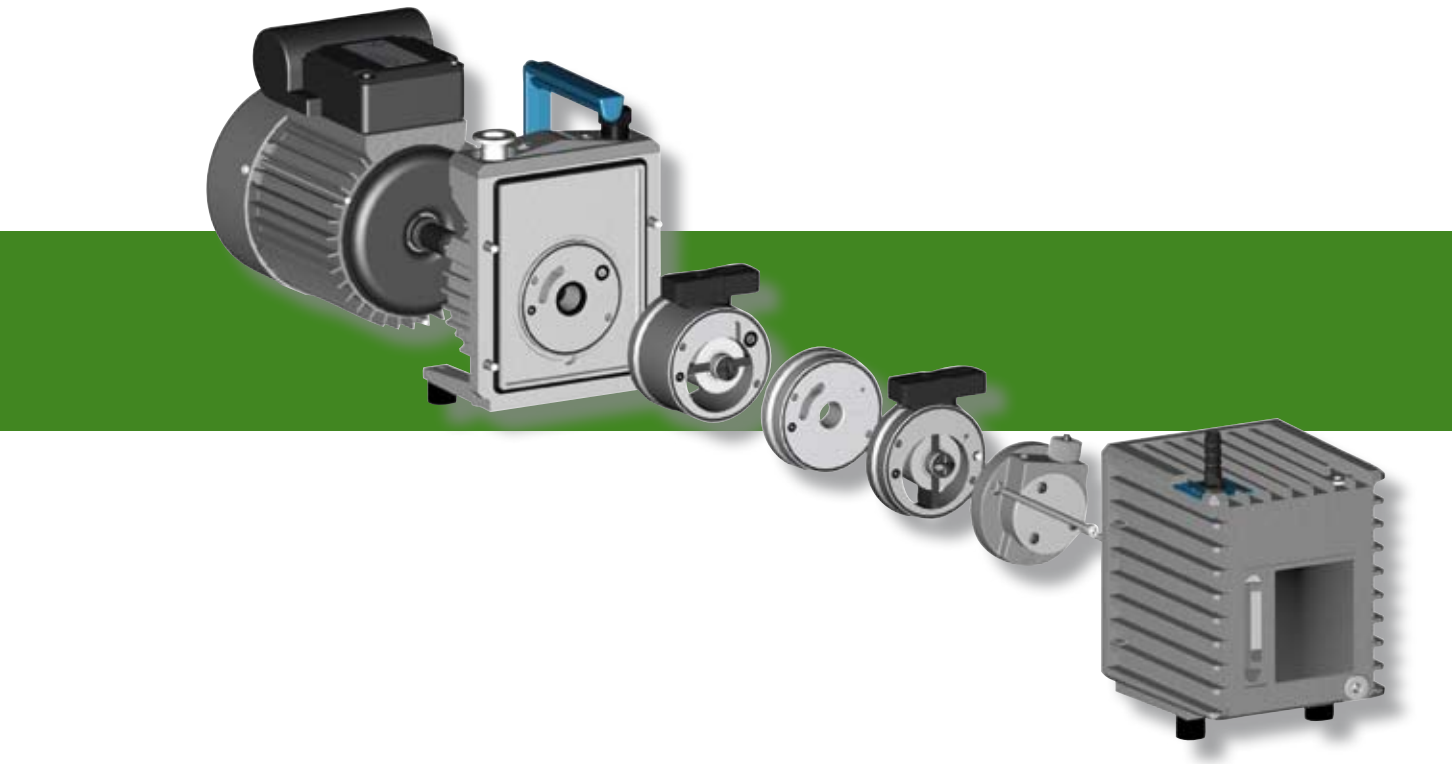




ROTARY VANE PUMPS AND PUMPING UNITS, CHEMISTRY-HYBRID™ PUMPS

"XS" Rotary vane pumps

Rotary vane pumps are used wherever it is necessary to have a process vacuum 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, supplies high vapor compatibility for water and solvents. VACUUBRAND rotary vane pumps' volume flow rate is specified at atmospheric pressure, as is customary with PNEUROP®. For process effiency, 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.



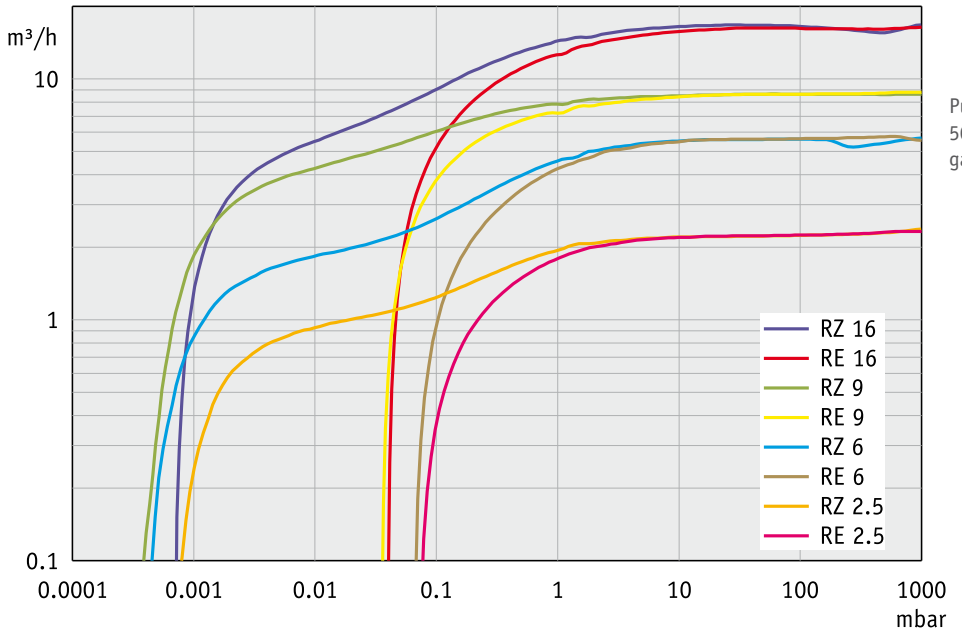
- constriction-free vapor pathway allows high volume flow rates, even when close to the ultimate vacuum
- high tolerance for water and solvent vapors, because of the high-volume gas ballast
- quiet running and excellent ultimate vacuum, even with gas ballast
- active corrosion protection: Oil cycle closes 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 with telescopic design

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

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 greater 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 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



Pumping speed graph at 50 Hz without gas ballast

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.

Additional accessories ▶ pg. 124

SERIES OVERVIEW

ROTARY VANE PUMPS

Design	Max. pumping speed at 50 Hz in m³/h	Attainable ultimate vacuum			
		down to 2×10^{-1} mbar	down to 2×10^{-3} mbar	Pumping unit PC 3 down to 2×10^{-3} mbar	Package solutions down to 2×10^{-3} mbar
RE 2.5	2.3	 pg. 114	 pg. 114	 pg. 114	 pg. 114
RZ 2.5	2.3				
RZ 2.5 +FO +VS 16	2.3				
RE 6	5.7	 pg. 116	 pg. 116	 pg. 116	
RZ 6	5.7				
RZ 6 +FO +VS 16	5.7				 pg. 116
RZ 6 +FO +VS 16 +Set DCP+VSP 3000	5.7				 pg. 116
RE 9	8.9	 pg. 118	 pg. 118	 pg. 118	
RZ 9	8.9				
RE 16	16.6	 pg. 120	 pg. 120	 pg. 120	
RZ 16	16.6				

CHEMISTRY-HYBRID™ PUMPS

Design	Max. pumping speed at 50 Hz in m³/h	Attainable ultimate vacuum	
		down to 2×10^{-3} mbar	Pumping unit PC 8 down to 2×10^{-3} mbar
RC 6 and PC 8 with RC 6	5.9	 pg. 122	 pg. 122

ACCESSORIES

Components	Further information	Components	Further information
Oils for rotary vane pumps	 pg. 124	Cold traps and in-line oil filter	 pg. 127
Oil mist filters FO	 pg. 126	Manually operated valves, e.g., VS 16	 pg. 151
Separator at inlet AK	 pg. 126	Electrically operated (solenoid) valves	 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.

RZ 2.5
2.3 m³/h
2 x 10^{-3} mbar

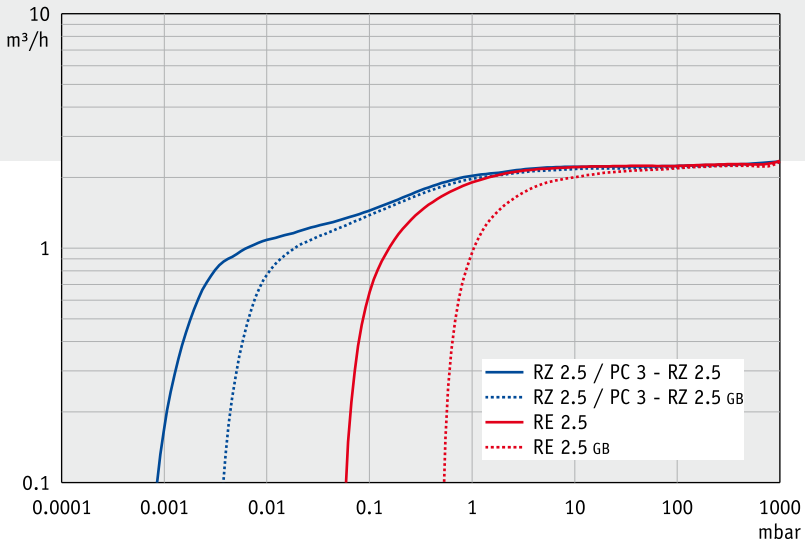
PC 3 / RZ 2.5
2.3 m³/h
2 x 10^{-3} mbar

PERFORMANCE FEATURES

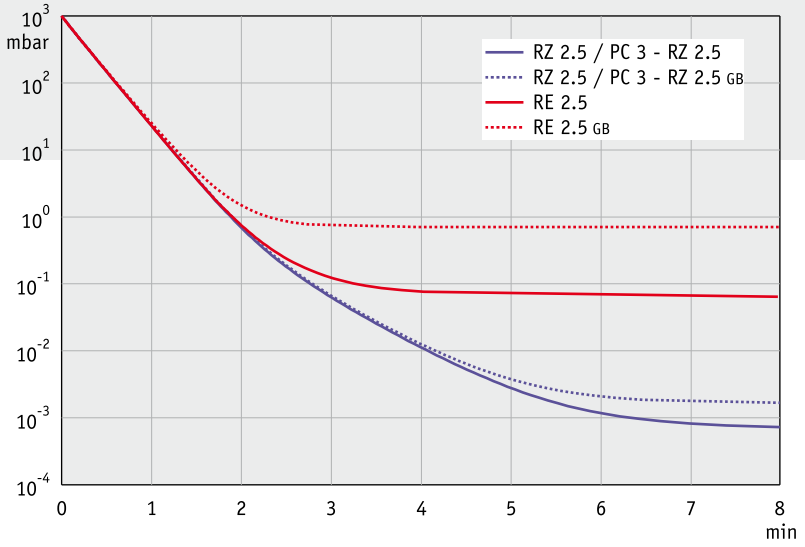
- high flow rates even at vacuum levels approaching ultimate vacuum
- high water vapor tolerance due to efficient gas ballast; very good ultimate vacuum even with gas ballast
- vacuum-tight at switch-off; external anti-suckback valve not needed
- large oil volume: Long intervals between oil changes
-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

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 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	m³/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	mbar	40	40
Oil capacity (B-Oil) min / max	l	0.18 / 0.51	0.1 / 0.28
Inlet connection (IN)		Small flange KF DN 16	Small flange KF DN 16
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Rated motor power	kW	0.18	0.18
Rated speed at 50/60 Hz	min^{-1}	1500/1800	1500/1800
Degree of protection		IP 40	IP 40
Dimensions (L x W x H)	mm	316 x 125 x 190	316 x 125 x 190
Weight	kg	10.2	11.4

ITEMS SUPPLIED

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

ORDERING INFORMATION		RE 2.5
230 V ~ 50-60 Hz	CEE	697150
230 V ~ 50-60 Hz	CH	697151
230 V ~ 50-60 Hz	UK	697152
120 V ~ 60 Hz	US	697153
ORDERING INFORMATION		**RZ 2.5**
230 V ~ 50-60 Hz	CEE	698120
230 V ~ 50-60 Hz	CH	698121
230 V ~ 50-60 Hz	UK	698122
120 V ~ 60 Hz	US	698123
ORDERING INFORMATION		**PC 3 / RZ 2.5**
230 V ~ 50-60 Hz	CEE	699890
ORDERING INFORMATION		**RZ 2.5 +FO +VS 16**
230 V ~ 50-60 Hz	CEE	698029

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
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)

Rotary vane pump
RE 6, RZ 6 and
Pumping unit PC 3 with RZ 6

These powerful rotary vane pumps feature an unusually 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 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.

RZ 6
5.7 m³/h
2 x 10^{-3} mbar

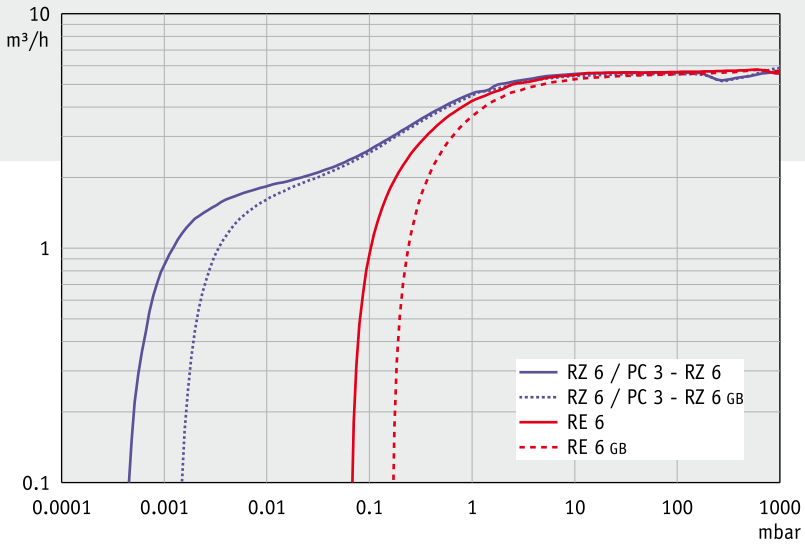
PC 3 / RZ 6
5.7 m³/h
2 x 10^{-3} mbar

PERFORMANCE FEATURES

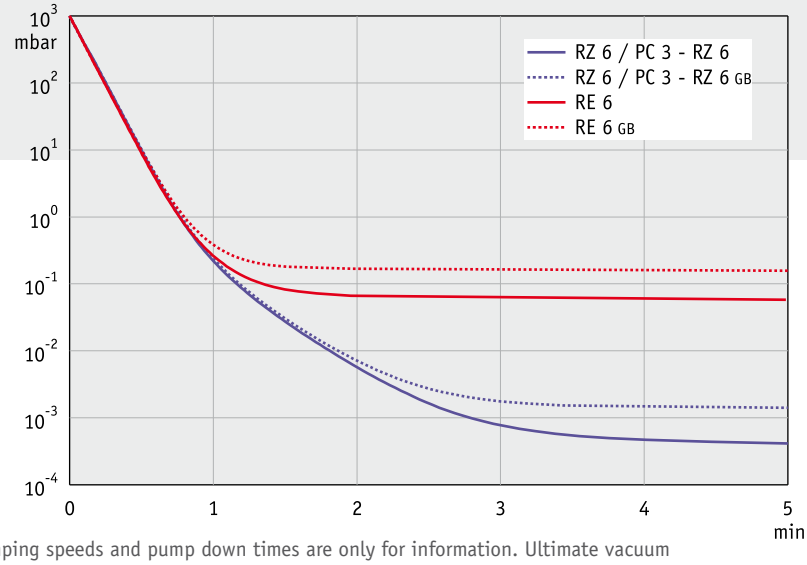
- high flow rates even at vacuum levels approaching ultimate vacuum
- high water vapor tolerance due to efficient gas ballast; very good ultimate vacuum even with gas ballast
- vacuum-tight at switch-off; external anti-suckback valve not needed
- large oil volume: Long intervals between oil changes
-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

APPLICATIONS

Rotary vane pumps are used where 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 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	m³/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	mbar	40	40
Oil capacity (B-Oil) min / max	l	0.36 / 0.93	0.34 / 0.73
Inlet connection (IN)		Small flange KF DN 16	Small flange KF DN 16
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 10 mm
Rated motor power	kW	0.3	0.3
Rated speed at 50/60 Hz	min^{-1}	1500/1800	1500/1800
Degree of protection		IP 40	IP 40
Dimensions (L x W x H)	mm	370 x 142 x 207	370 x 142 x 207
Weight	kg	15.4	16.4

ORDERING INFORMATION		RZ 6 +FO +VS 16 +Set DCP+VSP 3000
230 V ~ 50-60 Hz	CEE	698150
230 V ~ 50-60 Hz	CH	698151

ORDERING INFORMATION		RE 6
230 V ~ 50-60 Hz	CEE	697160
230 V ~ 50-60 Hz	CH	697161
230 V ~ 50-60 Hz	UK	697162
120 V ~ 60 Hz	US	697163

ORDERING INFORMATION		RZ 6
230 V ~ 50-60 Hz	CEE	698130
230 V ~ 50-60 Hz	CH	698131
230 V ~ 50-60 Hz	UK	698132
120 V ~ 60 Hz	US	698133
400 V ~ 50 Hz 3 ph.	CEE	698135

ORDERING INFORMATION		PC 3 / RZ 6
230 V ~ 50-60 Hz	CEE	699893

ORDERING INFORMATION		RZ 6 +FO +VS 16
230 V ~ 50-60 Hz	CEE	698039
230 V ~ 50-60 Hz	CH	698009

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
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)

ITEMS SUPPLIED

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

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 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.

RZ 9
8.9 m³/h
2 x 10^{-3} mbar

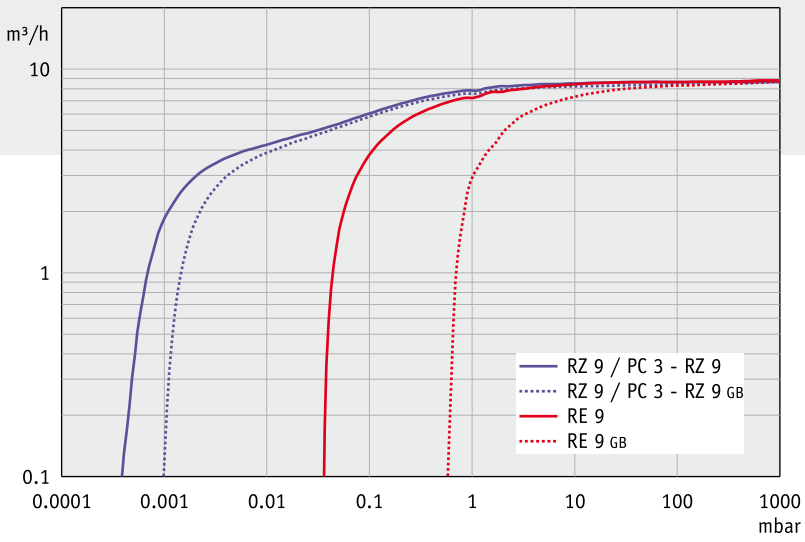
PC 3 / RZ 9
8.9 m³/h
2 x 10^{-3} mbar

PERFORMANCE FEATURES

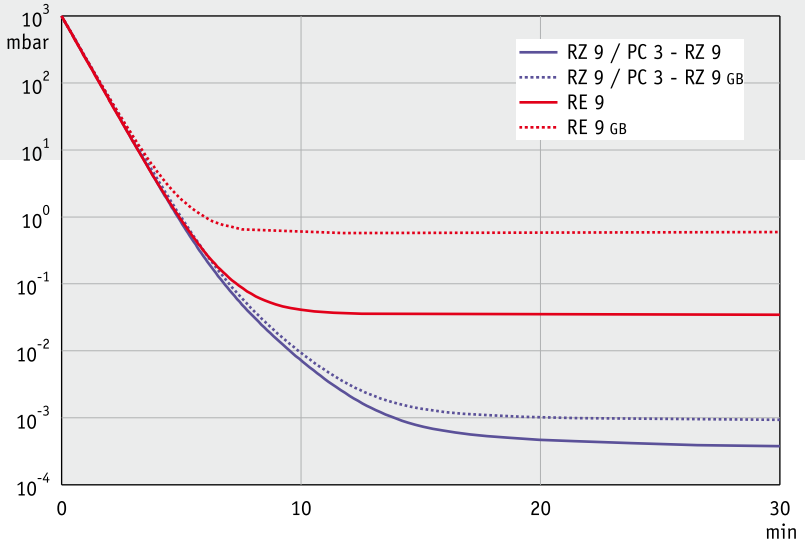
- very high flow rates even at vacuum levels approaching ultimate vacuum
- high water vapor tolerance due to efficient gas ballast; very good ultimate vacuum even with gas ballast
- vacuum-tight at switch-off; external anti-suckback valve not needed
- large oil volume: Long intervals between oil changes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

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 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 50/60 Hz	m³/h	8.9/10.2	8.9/10.2
Ultimate partial vacuum (abs.)	mbar	1 x 10^{-1}	4 x 10^{-4}
Ultimate vacuum (abs.)	mbar	1 x 10^{-1}	2 x 10^{-3}
Ultim. vac. (abs.) with gas ballast	mbar	6 x 10^{-1}	1 x 10^{-2}
Water vapor tolerance	mbar	40	40
Oil capacity (B-Oil) min / max	l	0.4 / 1.4	0.2 / 0.8
Inlet connection (IN)		Small flange KF DN 25	Small flange KF DN 25
Outlet connection (EX)		Small flange KF DN 25	Small flange KF DN 25
Rated motor power	kW	0.37	0.37
Rated speed at 50/60 Hz	min^{-1}	1500/1800	1500/1800
Degree of protection		IP 40	IP 40
Dimensions (L x W x H)	mm	460 x 152 x 232	460 x 152 x 232
Weight	kg	21.4	24.2

ITEMS SUPPLIED

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

ORDERING INFORMATION		RE 9
230 V ~ 50-60 Hz	CEE	697170
ORDERING INFORMATION		**RZ 9**
230 V ~ 50-60 Hz	CEE	698140
230 V ~ 50-60 Hz	CH	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

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)

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 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.

RZ 16
16.6 m³/h
2 x 10^{-3} mbar

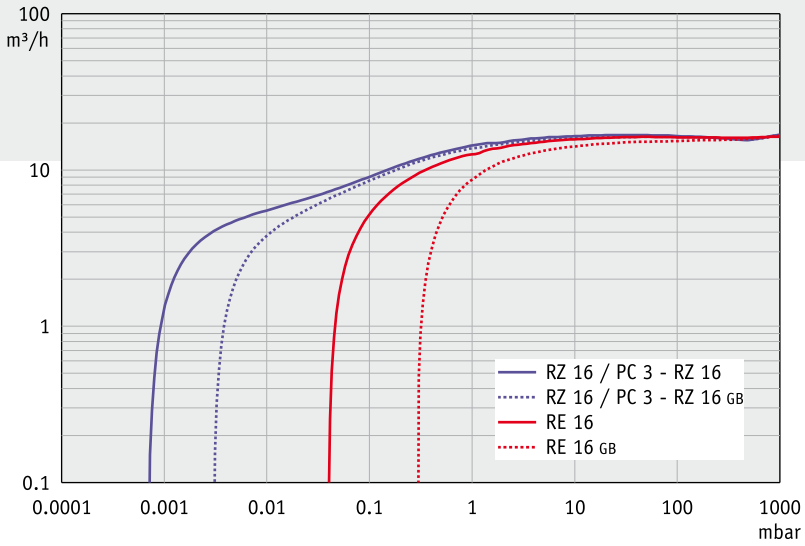
PC 3 / RZ 16
16.6 m³/h
2 x 10^{-3} mbar

PERFORMANCE FEATURES

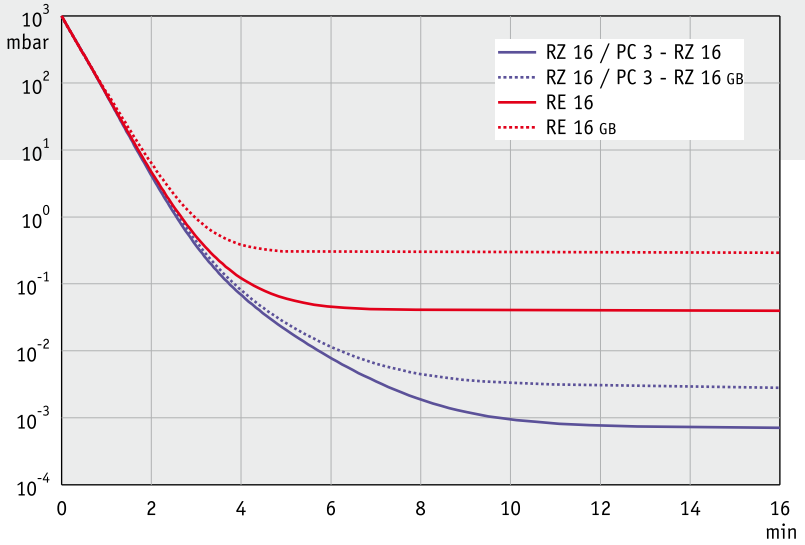
- very high flow rates even at vacuum levels approaching ultimate vacuum
- high water vapor tolerance due to efficient gas ballast; very good ultimate vacuum even with gas ballast
- vacuum-tight at switch-off; external anti-suckback valve not needed
- large oil volume: Long intervals between oil changes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

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 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 50/60 Hz	m³/h	16.6/19.1	16.6/19.1
Ultimate partial vacuum (abs.)	mbar	1 x 10^{-1}	4 x 10^{-4}
Ultimate vacuum (abs.)	mbar	1 x 10^{-1}	2 x 10^{-3}
Ultim. vac. (abs.) with gas ballast	mbar	6 x 10^{-1}	1 x 10^{-2}
Water vapor tolerance	mbar	40	40
Oil capacity (B-Oil) min / max	l	0.3 / 1.0	0.5 / 1.0
Inlet connection (IN)		Small flange KF DN 25	Small flange KF DN 25
Outlet connection (EX)		Small flange KF DN 25	Small flange KF DN 25
Rated motor power	kW	0.55	0.55
Rated speed at 50/60 Hz	min^{-1}	1500/1800	1500/1800
Degree of protection		IP 40	IP 40
Dimensions (L x W x H)	mm	505 x 152 x 232	545 x 152 x 232
Weight	kg	25.2	29

ITEMS SUPPLIED

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

ORDERING INFORMATION		RE 16
230 V ~ 50-60 Hz	CEE	697080
230 V ~ 50-60 Hz	CH	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	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

ACCESSORIES

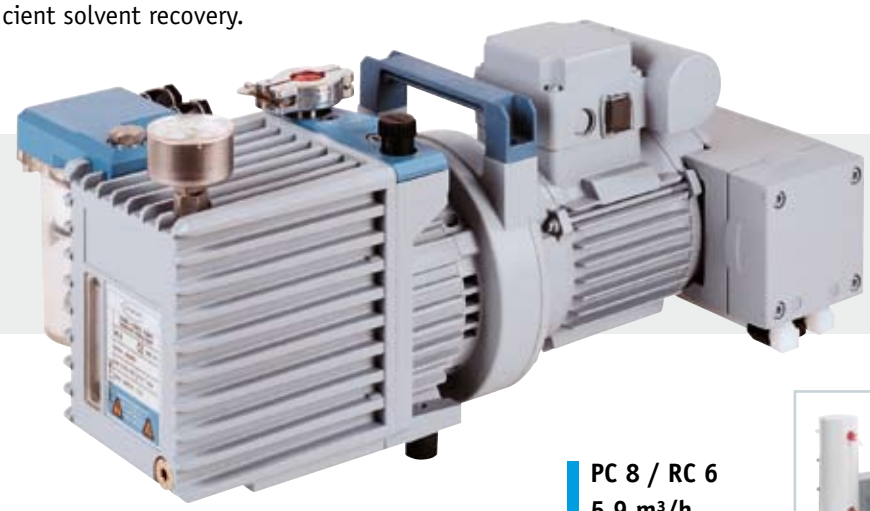
Stainless steel tubing KF DN 25 (1000 mm: 673337)
Separator inlet side AK R 8/9/16 (698007)
Oil mist filter FO R 8/9/16 (698017)
Inline oil filter HF R 8/9/16 (698010)

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. The pumping unit version PC 8 with RC 6 offers excellent environmental friendliness due to efficient solvent recovery.

RC 6
5.9 m³/h
2 x 10^{-3} mbar

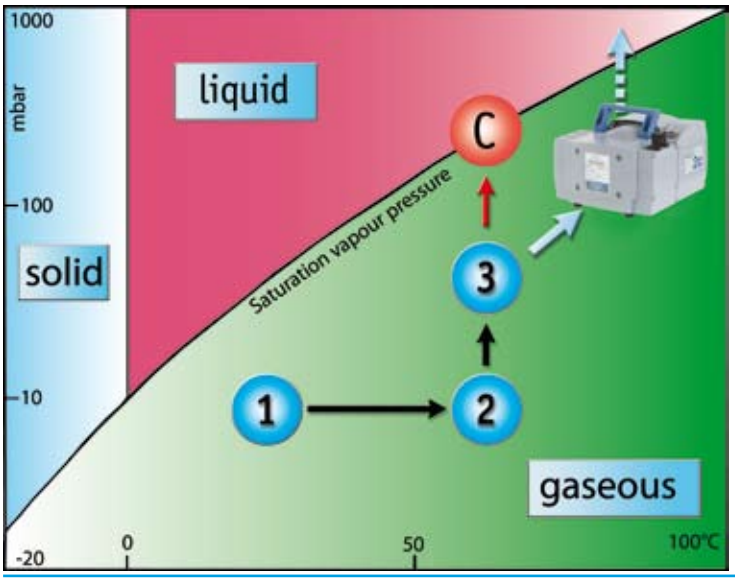


PC 8 / RC 6
5.9 m³/h
2 x 10^{-3} mbar

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)
- drastically reduced amount of waste oil for disposal due to extended service intervals
- ease of maintenance due to telescopic design

THERMODYNAMIC FUNCTIONAL PRINCIPLE OF THE CHEMISTRY-HYBRID™ PUMP

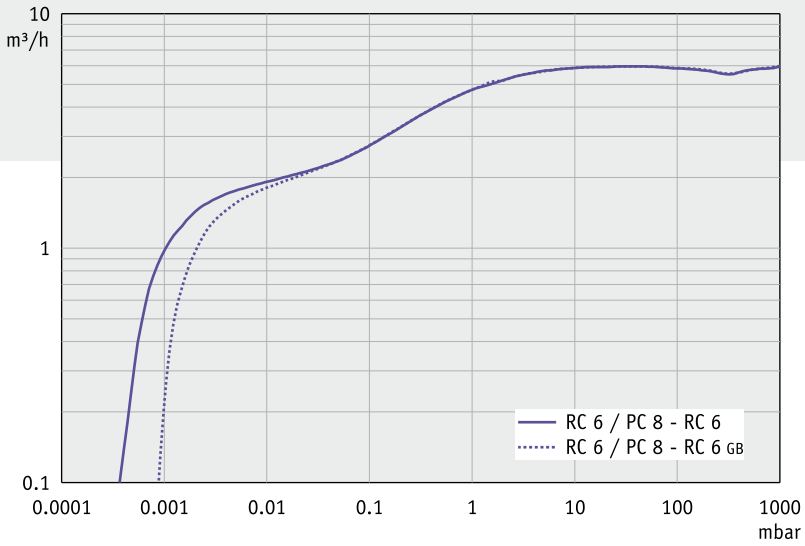


1 - Vapor is aspirated at low pressure and ambient temperature.

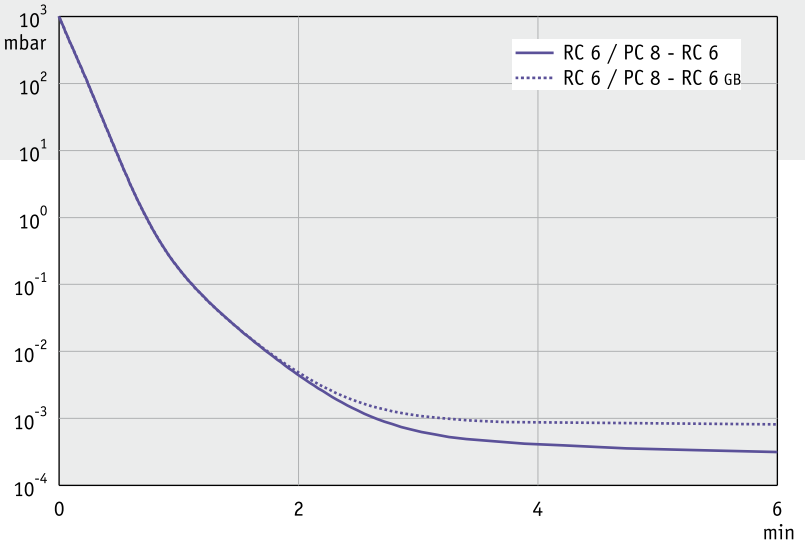
2 - Vapor is heated to approx. 60°C by heat exchange and compression within pump.

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	mbar	>> 40 mbar
Oil capacity (B-Oil) min / max	l	0.34 / 0.53
Inlet connection (IN)		Small flange KF DN 16
Outlet connection (EX)		Hose nozzle DN 10 mm
Rated motor power	kW	0.37
Rated speed at 50/60 Hz	min^{-1}	1500/1800
Degree of protection		IP 40
Dimensions (L x W x H)	mm	510 x 305 x 230
Weight	kg	24.2

ORDERING INFORMATION		RC 6
230 V ~ 50-60 Hz	CEE	698560
230 V ~ 50-60 Hz	CH	698561
230 V ~ 50-60 Hz	UK	698562
100-120 V ~ 50-60 Hz	US	698563
ORDERING INFORMATION		**PC 8 / RC 6**
230 V ~ 50-60 Hz	CEE	698570

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
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)

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 backflow
  - 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 vapor pressure and the viscosity characteristics of Pump Oil B. Pumps will not reach the stated ultimate vacuum and may not start up well at temperatures < 18°C.

Silicone Oil SI 2*

This oil is characterized by extremely high aging resistance. This oil is stable against many aggressive gases (especially chlorine and hydrochloric acid).

*Contact VACUUBRAND before first use, please.

Perfluoropolyether Oil

This synthetic oil has excellent chemical resistance and is certified for pumping pure oxygen. Therefore it is used for pumping strong oxidants (halogenides, nitrogen oxides, etc.). For these applications, the rotary vane pump must be prepared (completely disassembled, cleaned and filled with perfluoropolyether oil) by VACUUBRAND.

TECHNICAL DATA	Vapor pressure at operating temperature of pump		Flashpoint °C	Viscosity at 40°C mm²/sec	Density at 20°C g/cm³
Rotary-vane Pump Oil B	< 1 x 10^{-3}		264	94	0.87
Rotary-vane Pump Oil K 8	< 5 x 10^{-3}		249	128	0.89
Silicone Oil SI 2	< 1 x 10^{-3}		> 255	75	0.96
Perfluoropolyether Oil	< 3 x 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	-
Silicone Oil SI 2	-	687500	687502	-	-
Perfluoropolyether Oil	687600	-	-	-	-

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 may reduce the backflow of oil molecules. Furthermore, a cold trap will considerably increase the effective pumping speed by reducing vapor load on the pump.

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

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

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

Tips to obtain the best vacuum

- set up the vacuum tubing with maximum cross section. If the cross-section is smaller than the pump inlet, the volume flow rate may be very limited, especially near ultimate vacuum.
- keep vacuum tubing between your application and the pump as short as possible. The hose length has a major impact on effective volume flow rate.
- we recommend PTFE corrugated hoses for operations requiring high chemical resistance ▶ pg. 167

AK and FO

Separators (AK) protect the vacuum pump at the inlet. 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)	mm	200 x 80 x 161	223 x 80 x 161	163 x 110 x 161
Weight	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	m³/h	6	20
Wetted materials		Aluminum, PMP, fiberglass epoxy	Aluminum, PMP, fiberglass epoxy
Volume catchpot	ml	250	500
Dimensions (L x W x H)	mm	119 x 80 x 181	163 x 110 x 196
Weight	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 may reduce the backflow of oil molecules. Furthermore, a cold trap will considerably increase the effective pumping speed by reducing vapor load on the pump.

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

SKF H 25

GKF 1000i

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

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, full-flow design
- 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, FPM, NBR	Stainless steel, FPM, NBR	Borosilicate glass, PTFE, FPM
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)	mm	166 x 140 x 303	166 x 140 x 319	D 148 x 580

* for liquid N_2 at pressure < 10^{-2} mbar and 20°C ambient temperature

TECHNICAL DATA		HF R 8/9/16
Nominal flow	l/h	700
Opening pressure service indicator	bar	1
Additional oil amount	l	0.35
For VACUUBRAND pumps		RE 8, RZ 8, RE 9, RZ 9, RE 16, RZ 16

ORDERING INFORMATION	
SKF H 25	667051
SKF H 40	667053
GKF 1000i	667056
HF R 8/9/16	698010
Spare filter element HF	698011
Adapter KF DN 16 / tube OD 22 mm (for GKF 1000i)	637708

High-vacuum pumping unit
HP 40 B2 and HP 63 B2

High-performance, reliable vacuum equipment is essential for successful and time-saving work in many science laboratories. The VACUUBRAND high-vacuum pumping units HP 40 B2 and HP 63 B2 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 the RZ 2.5 in the HP 40 B2, or the RZ 6 in the HP 63 B2), and all connecting parts, including high-vacuum valves, ventilation valves, and a bypass line.

HP 40 B2
22 l/s
1 x 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 power switch, starting the rotary vane pump, is switched on. 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 HP 40 B2 and HP 63 B2 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.

HP 63 B2
37 l/s
1 x 10^{-6} mbar

TECHNICAL DATA		HP 40 B2	HP 63 B2
Backing pump		RZ 2.5	RZ 6
Max. pumping speed of pumping unit	l/s	22	37
Ultimate vacuum (abs.)	mbar	1 x 10^{-6}	1 x 10^{-6}
Inlet connection (IN)		Small flange KF DN 40	Clamping flange ISO-K DN 63
Outlet connection (EX)		Hose nozzle DN 10 mm	Hose nozzle DN 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	30
Heating power	kW	0.2	0.2
Heat-up time	min	7	7
Dimensions (L x W x H)	mm	445 x 385 x 435	445 x 381 x 460
Weight	kg	25.4	30.9

ORDERING INFORMATION	HP 40 B2	
230 V ~ 50-60 Hz	CEE/CH/UK	699029

ORDERING INFORMATION	HP 63 B2	
230 V ~ 50-60 Hz	CEE/CH/UK	699037

ACCESSORIES HP 40 B2

Rubber vacuum tubing DN 10 mm (686002)
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 100 (683175)

ACCESSORIES HP 63 B2

Rubber vacuum tubing DN 10 mm (686002)
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 100 (683175)

ITEMS SUPPLIED

Pumping unit completely mounted, ready for use, with manual

Fluid aspiration system
BioChem-VacuuCenter BVC 21 NT

The BVC 21 NT BioChem-VacuuCenter supports professional aspiration and disposal of liquids with high performance and easy handling for applications in biochemistry, biology, medicine and cell culture laboratories. Aspiration is managed with a control button on the ergonomic hand controller, the VacuuHandControl (VHC). A thumb-wheel allows especially careful and precise microliter-volume aspiration and dispensing, avoiding turbulence in the sample. Thanks to automatic vacuum control, a bothersome foot-switch at the pump becomes unnecessary. All aspirated liquids are collected in the autoclavable, shatter-proof collection bottle. By connecting an additional VHC hand control, a second user can work simultaneously with the BVC in a comfortable and cost-saving way.

BVC 21 NT
1.9 m³/h
150 mbar

PERFORMANCE FEATURES

- thumb-wheel control for microliter precision
- automatic vacuum-on-demand reduces pump run-time for quiet operation and long service intervals
- autoclavable collection bottle with 0.2 µm sterile filter and self-locking quick-fit couplings
- minimal formation of aerosols and foam in collection bottle extends filter lifetime
- powerful chemistry-design diaphragm pump permits simultaneous support of two separate workstations (with optional second handset and coupling)

APPLICATIONS

The BVC is an excellent choice for removing supernatants and other fluids from microtitration plates, Petri dishes and cell culture flasks using pipettes and tips of different sizes. Especially if liquids have to be removed frequently in daily work the professionally designed BVC improves work efficieny a lot. The BVC is ideal for working with pathogenic or biohazardous liquids and is especially widely used in biological safety cabinets.

FLUID ASPIRATION SYSTEM
BIOCHEM-VACUUCENTER BVC 21 NT VARIO AND BVC 01

- The BVC 21 NT VARIO BioChem-VacuuCenter provides a continuously adjustable vacuum level for different applications from gentle to powerful fluid aspiration. The vacuum level is controlled by a variable speed drive of the chemistry-design diaphragm pump. Even low differential vacuum can be set for delicate aspiration and filtration. In addition, the VARIO® system runs whisper quiet.
- If a suitable external vacuum supply is already available, such as a diaphragm pump or vacuum network (e.g. VACUU·LAN®) then the BVC 01 as a system without pump is the perfect choice. The vacuum level in the completely equipped collection bottle VacuuTransContainer VTC is automatically controlled by an in-line valve.

BVC 21 NT VARIO
2.2 m³/h
100 mbar

BVC 01

PERFORMANCE FEATURES BVC 21 NT VARIO

- all advantages of the BVC 21 NT
- sensitive-to-powerful aspiration of excess liquids, electronically adjustable
- whisper quiet due to VARIO® technology
- reduces the risk of foaming in the collection bottle considerably
- precise aspiration of smallest volumes, recommended for extra-sensitive filtration of biological substances

PERFORMANCE FEATURES BVC 01

- all benefits of VacuuTransContainer VTC and VacuuHandControl VHC
- economical, via reliance on external vacuum source
- automatic vacuum-on-demand via valve switching
- when used with vacuum networks or house vacuum: VTC collection bottle keeps liquids from vacuum lines
- sterile 0.2 µm filter prevents infectious material from entering the vacuum network

Fluid aspiration system

BioChem-VacuuCenter BVC 21 NT, BVC 21 NT VARIO and BVC 01

VHC
VacuuHandControl

TECHNICAL DATA		BVC 01	BVC 21 NT	BVC 21 NT VARIO
Vacuum pump		-	ME 2C	ME 2C VARIO
Ultimate vacuum (abs.)	mbar	-	150	100
Dimensions (L x W x H)	mm	300 x 255 x 500	275 x 450 x 520	275 x 450 x 520
Weight	kg	4.0	12.2	14.5

ITEMS SUPPLIED BVC 01

Complete aspiration system for existing vacuum source, with automatic vacuum controlled in-line valve, hose nozzle DN 10 mm for connection to a vacuum supply, aspiration hand set VacuuHandControl VHC, 4 l collection bottle VacuuTransContainer VTC, manual.

ORDERING INFORMATION BVC 01

230 V ~ 50-60 Hz	CEE	688067
230 V ~ 50-60 Hz	CH	688069
230 V ~ 50-60 Hz	UK	688068
100-120 V ~ 50-60 Hz	US	688070

ITEMS SUPPLIED BVC 21 NT

Complete aspiration system with chemistry diaphragm pump ME 2C, automatic pressure control via pump on/off, exhaust separator, aspiration hand set VacuuHandControl VHC, 4 l collection bottle VacuuTransContainer VTC, manual.

ORDERING INFORMATION BVC 21 NT

230 V ~ 50-60 Hz	CEE	688250
230 V ~ 50-60 Hz	CH	688251
230 V ~ 50-60 Hz	UK	688252
100-120 V ~ 50-60 Hz	US	688253

ITEMS SUPPLIED BVC 21 NT VARIO

Complete aspiration system with automatically speed-controlled chemistry diaphragm pump ME 2C VARIO with continuously adjustable vacuum, with exhaust separator, aspiration hand set VacuuHandControl VHC, 4 l collection bottle VacuuTransContainer VTC, manual.

ORDERING INFORMATION BVC 21 NT VARIO

230 V ~ 50-60 Hz	CEE	688260
230 V ~ 50-60 Hz	CH	688261
230 V ~ 50-60 Hz	UK	688262
100-120 V ~ 50-60 Hz	US	688263

ITEMS SUPPLIED VacuuTransContainer VTC

4 l collection bottle with high chemical resistance (PP), special bottle head for minimized foam and aerosol formation, with quick coupling for VacuuHandControl VHC and second port to connect a second VHC (optional), filter element 0.2 µm with hydrophobic filter to protect pump, tubing and environment.

Hose coupling and plug

Self-locking quick-fit coupling for an easy and fast connection between VacuuHandControl VHC and collection bottle

ITEMS SUPPLIED VacuuHandControl VHC

Ergonomic aspiration hand set with adjustable tip holder, three adapters to accept a variety of common pipettes and tips, control button for permanent aspiration, thumb-wheel control for microliter aspiration, with 2 m tubing.

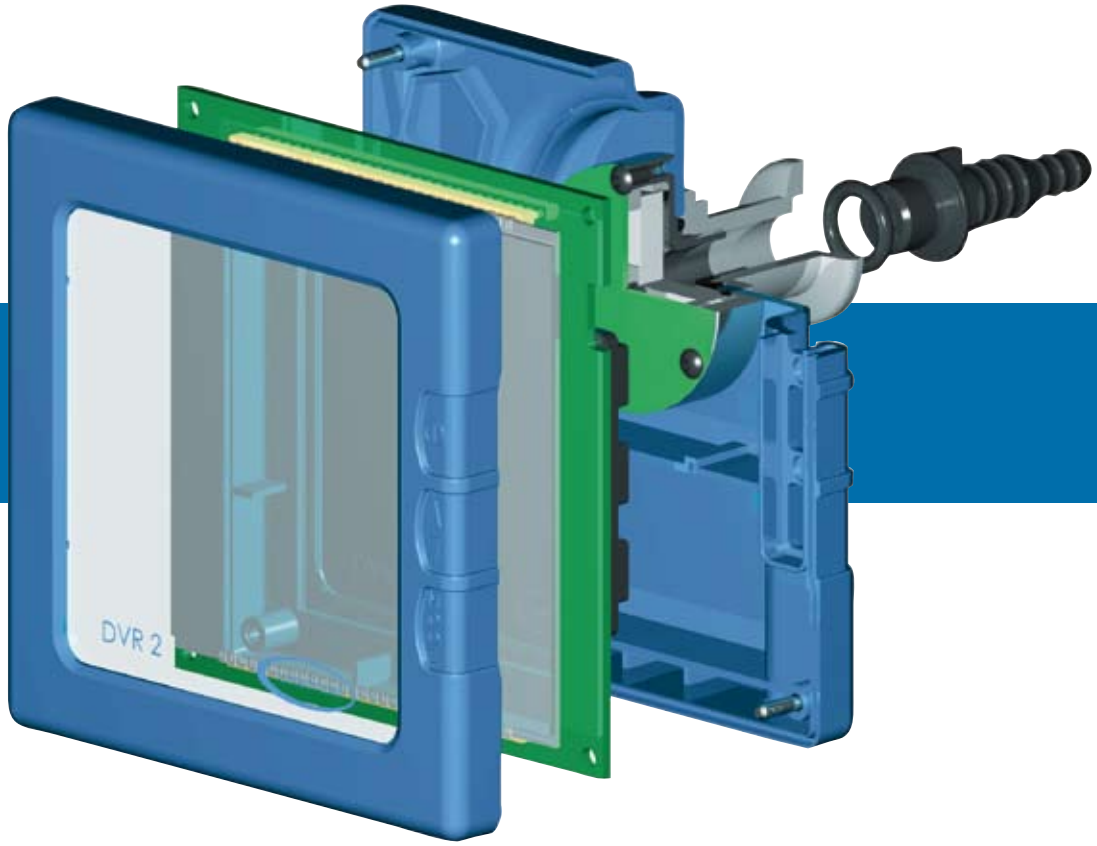
ACCESSORIES

VacuuTransContainer VTC (688057)
Quick-fit coupling for VHC (688060)
Protection filter 20/0.2 µm hydrophobic (638264)
Extension kit second VHC connection (from Ser.No 27150401: 688056+688060)

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 x 10^{-9} mbar.

- We use a capacitive ceramic diaphragm gauge head in the rough vacuum range to 0.1 mbar that measures independent of the type of gas and is exceptionally resistant to chemicals. It also has outstanding measuring accuracy and long-term stability.



- Pirani vacuum sensors are preferably used in the lower rough and fine vacuum ranges from below 10 mbar 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 100 to 10^{-2} mbar. The reading display 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 x 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 100.

VACUUM GAUGES AND CONTROLLERS

- The new DCP 3000 gauges (as CVC 3000 und 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 100.
- The final touch is put on this range of products with ATEX-approved measuring instruments for use in locations with potentially explosive atmospheres, as per ATEX category 2 or ATEX category 1.

Vacuum gauges	Measurement principle	Measuring range	
DVR 2	Ceramic diaphragm	1080 - 1 mbar (hPa), 810 - 1 torr	pg. 135
DVR 3	Ceramic diaphragm	1080 - 1 mbar (hPa), 810 - 1 torr	pg. 136
DVR 4	Ceramic diaphragm	1080 - 1 mbar (hPa), 810 - 1 torr	pg. 137
DVR 4S	Ceramic diaphragm	1080 - 1 mbar (hPa), 810 - 1 torr	pg. 137
Set DCP 3000 + VSK 3000	Ceramic diaphragm	1080 - 0.1 mbar (hPa), 810 - 0.1 torr	pg. 138
Set DCP 3000 + VSP 3000	Thermal conductivity (Pirani), chemically resistant plastics / ceramics	1 x 10^3 - 1 x 10^{-3} mbar (hPa), 7.5 x 10^2 - 1 x 10^{-3} torr	pg. 139
Set DCP 3000 + MPT 100	Combined thermal conductivity (Pirani) / cold cathode (Penning)	1 x 10^3 - 5 x 10^{-9} mbar (hPa), 7.5 x 10^2 - 3.7 x 10^{-9} torr	pg. 139

Vacuum controller			
CVC 3000	Ceramic diaphragm	1080 - 0.1 mbar (hPa), 810 - 0.1 torr	pg. 142
VNC 2	Ceramic diaphragm	1100 - 1 mbar (hPa), 825 - 1 torr	pg. 144

VACUUM GAUGE
DVR 2

The DVR 2 is a fully electronic, versatile vacuum gauge for the measuring range from atmospheric pressure to 1 mbar. The DVR 2 has an integrated vacuum sensor made of alumina ceramic with outstanding corrosion resistance and superior long-term stability. A particular advantage 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

- capacitive alumina ceramic diaphragm vacuum sensor with excellent chemical resistance, accuracy and long term stability
- large analog and digital vacuum display: Quick trend detection, precise readout
- user-selectable pressure units (mbar, hPa, Torr)
- digital readjustment
- high electromagnetic compatibility: Low emission level near detection limit, high degree of immunity to electromagnetic interference for use in industrial environments

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)	mm	115 x 115 x 66
Weight	kg	0.375

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
PTFE tubing KF DN 16 (1000 mm: 686031)
Battery 9V Lithium 1.2 Ah (612220)
DKD calibration with first delivery (900216)
DKD recalibration (900217)

ORDERING INFORMATION

DVR 2	682902

ITEMS SUPPLIED

Vacuum gauge complete with integrated vacuum sensor and battery, ready for use, with manual.

VACUUM GAUGE
DVR 3

The DVR 3 is a fully electronic vacuum gauge with ATEX approval for use in areas with potentially explosive atmospheres (ATEX category 2). The DVR 3 has an integrated vacuum sensor made of alumina ceramic with outstanding corrosion resistance and superior long-term stability. A particular advantage 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 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 EEx 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 EEx ia IIC T5
Dimensions (L x W x H)	mm	116 x 116 x 66
Weight	kg	0.43

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)
DKD calibration with first delivery (900216)
DKD recalibration (900217)

ORDERING INFORMATION

DVR 3	682903

ITEMS SUPPLIED

Vacuum gauge complete with integrated vacuum sensor and power supply unit, ready for use, with manual.

VACUUM GAUGE
DVR 4 AND DVR 4S

The DVR 4 / DVR 4S are fully electronic vacuum gauges with ATEX approval for use in areas with potentially explosive atmospheres (measuring volume ATEX category 1, e.g., for zone 0). The integrated vacuum sensor made of alumina ceramic has an outstanding corrosion resistance and superior long-term stability. A particular advantage is its cordless, battery-powered operation. The combined digital / analog vacuum reading for precise readout and quick trend detection, respectively, as well as measurement readout out via current loop (only DVR 4S), make the devices very versatile.

PERFORMANCE FEATURES

- large analog and digital vacuum display
- mains independent power supply unit BVE 9V, with ATEX approval
- high reliability, low emission level near detection limit, high degree of immunity to electromagnetic interference also for industrial environments
- remote pressure readout via current loop interface (DVR 4S)
- capacitive alumina ceramic diaphragm vacuum sensor with excellent chemical resistance, accuracy and long term stability

TECHNICAL DATA		DVR 4	DVR 4S
ATEX-approval		II 1/2G EEx ia IIC T5	II 1/2G EEx ia IIC T5
Upper measuring limit	mbar/hPa / torr	1080 / 810	1080 / 810
Lower measuring limit	mbar/hPa / torr	1 / 1	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	< 0.07 mbar/hPa/0.05 torr /K
Vacuum connection		similar to KF DN 16 (stainless steel)	similar to KF DN 16 (stainless steel)
Permissible ambient temp. range storage / operation	°C	-10 - 60 / 10 - 40	-10 - 60 / 10 - 40
Max. media temp. for continuous operation / short times	°C	40 / 80	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	IP 54
Power supply		Power supply unit BVE 9 V, ATEX - certification II 2G EEx ia IIC T5	
Interface		-	4 - 20mA (only commun., no power supply)
Dimensions (L x W x H)	mm	116 x 116 x 86	116 x 116 x 86
Weight	kg	0.7	0.73

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)
DKD calibration with first delivery (900216)
DKD recalibration (900217)

ORDERING INFORMATION

DVR 4	682904
DVR 4S	682905

ITEMS SUPPLIED

Vacuum gauge complete with integrated vacuum sensor and power supply unit, ready for use, with manual.

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	138 x 124 x 115
Weight of display unit	kg	0.44

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
PTFE tubing KF DN 16 (1000 mm: 686031)
DKD calibration with first delivery (900214)
DKD recalibration (900215)
Vent valve VBM-B (674217)
Vacuum sensor VSK 3000 (636657)
Vacuum sensor VSP 3000 (636163)

ORDERING INFORMATION

100-230 V ~ 50-60 Hz	CEE/CH/UK/US/AUS	683170

ITEMS SUPPLIED

Vacuum gauge with external vacuum sensor VSK 3000, ready for operation, with wall-plug power supply and manual

VACUUM GAUGE

DCP 3000 WITH VSP 3000

■ The DCP 3000 is an outstanding vacuum gauge with large illuminated display. The brand new 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 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 x 10^{-9} mbar) the DCP 3000 is also available with the combined thermal conductivity / cold cathode (Pirani / Penning) vacuum sensor MPT 100.

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, splash-water proof, also for rough operating conditions
- wide measurement range from atmospheric pressure to fine vacuum (10^{-3} mbar)
- 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

TECHNICAL DATA		
Vacuum sensor		VSP 3000
Cable length of vacuum sensor	m	2
Upper measuring limit	mbar/hPa / torr	1 x 10^3 / 7.5 x 10^2
Lower measuring limit	mbar/hPa / torr	1 x 10^{-3} / 1 x 10^{-3}
Measurement principle		Thermal conductivity (Pirani), chemically resistant plastics / ceramics
Measurement uncertainty		+- 15% of indicated value in the range 0.01-100 mbar/hPa/torr
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
Degree of protection, front side of display unit		IP 42
Dimensions of display unit (L x W x H)	mm	138 x 124 x 115
Weight of display unit	kg	0.44

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
Stainless steel tubing KF DN 16 (1000 mm: 673336)
DKD calibration with first delivery (900214)
DKD recalibration (900215)
Vent valve VBM-B (674217)
Vacuum sensor VSK 3000 (636657)
Vacuum sensor VSP 3000 (636163)
Vacuum sensor MPT 100 (683176)

ORDERING INFORMATION		Set DCP 3000 + VSP 3000
100-230 V ~ 50-60 Hz	CEE/CH/UK/US/AUS	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
100-230 V ~ 50-60 Hz	CEE/CH/UK/US/AUS	683175

ITEMS SUPPLIED Set DCP 3000 + MPT 100

Vacuum gauge with external vacuum sensor MPT 100, ready for operation, with wall-plug power supply and manual

DKD CALIBRATION FOR VACUUM GAUGES AND CONTROLLERS

Calibration of vacuum measuring instruments in the VACUUBRAND DKD 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 German calibration service (DKD) as a calibration laboratory for vacuum measuring instruments. VACUUBRAND´s DKD laboratory is approved to calibrate and certify vacuum gauges in the range from 1000 to 10^{-3} mbar (abs.) and to issue the corresponding DKD Calibration Certificates. VACUUBRAND also offers DKD calibration as a service for vacuum gauges from other manufacturers.

Deutscher Kalibrierdienst (DKD)
Akkreditierungsstelle
vertreten im

Deutschen AkkreditierungsRat

Akkreditierung

Die Akkreditierungsstelle des **Deutschen Kalibrierdienstes** akkreditiert hiermit
VACUUBRAND GMBH + CO KG
Alfred-Zippe-Strasse 4
97877 Wertheim

nach DIN EN ISO/IEC 17025: 2005 für Kalibrierungen im Bereich / in den Bereichen:

Vakuummessgrößen

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Dr.-Ing. Wolfgang Bosch
Leiter der Akkreditierungsstelle

ORDERING INFORMATION	
DKD calibration with first delivery	
DVR 2, DVR 3, DVR 4, DVR 4S, CVC 3000, VNC 1, VNC 2	900216
DCP 3000 with VSK 3000, DCP 3000 with VSP 3000	900214
DKD recalibration	
DVR 2, DVR 3, DVR 4, DVR 4S, CVC 2^{II}, CVC 2000^{II}, CVC 3000, VNC 1, VNC 2	900217
DVR 5, DCP 3000, VAP 5	900215

VACUUM CONTROLLER

- A lot of applications in the laboratory call for electronic vacuum regulation, 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 the VNC 2 controller or the CVC 3000 controller with module VMS-B)
  - by cyclically opening/closing an in-line solenoid valve (CVC 3000 or VNC 2) or
  - by changing the pump´s motor speed continuously (VARIO® pumps in connection with CVC 3000 or VNC 2 VARIO)
- While VNC 2 is mostly used in vacuum network solutions where parameters are set once to control vacuum conditions, the CVC 3000 is normally used as a workplace controller with its large display and user-friendly full-text menus.

An overview of control processes is found on ▶ pg. 28

- 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 connected components is via the VACUU·BUS™ control system. The auto-configuration of VACUU·BUS™ 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
  - sealed plugs highly resistant to chemicals
  - no danger of getting plugs confused
  - connect almost any number of components

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 its version 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 accurate. With VARIO® pumps fully automatic evaporations on the push of a button are possible. Ten fully configurable programs (with up to ten time and pressure steps each with control functions such as venting, pumping or automatic evaporation) can be easily edited and stored. External valves and sensors for liquid level and vacuum down to the fine vacuum range (VSK 3000 and VSP 3000) connect simply and are 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).

CVC 3000

PERFORMANCE FEATURES

- automatic adjustment of the vacuum level throughout the process for high process reliability and unattended operation (with VARIO® pumps)
- 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: VARIO® pumps, valves (vacuum, venting, coolant), sensors (vacuum, liquid level), Peltronic™

APPLICATIONS

Many vacuum processes, such as evaporation or concentration, benefit from automated electronic vacuum control to achieve the most efficient, but also gentle, conditions. The CVC 3000 provides two-point vacuum control by operating a solenoid valve, as well as providing continuous vacuum control and even fully automatic process control with VARIO® pumps. In case of valve control, a hysteresis value is suggested automatically. Any parameter can be adjusted, even during vacuum control. Pressure and time settings, as well as run-on time for pump and valves after application is complete, can be adjusted.

VACUUM CONTROLLER
CVC 3000E

CVC 3000E workstation vacuum controller for integration into laboratory furniture

For vacuum networks integrated into laboratory furniture like VACUU·LAN® VACUUBRAND offers easily adaptable built-in versions of the CVC 3000 controller. The CVC 3000E built-in version for lab workstations features a solenoid vacuum valve mounted directly to the rear of the controller and an integrated check valve to avoid interference and contamination among neighboring work stations. The layout and installation of built-in controllers can be easily accomplished by lab furniture manufacturers. For other built-in versions of the CVC 3000E external vacuum gauge heads with ceramic sensor (VSK 3000) or chemically resistant Pirani sensor (VSP 3000) are available as accessories for vacuum measurement directly at the process. VACUU·BUS™ connections including sensor cables may be extended up to 30 m.

▶ pg. 150

CVC 3000E

TECHNICAL DATA		CVC 3000
Control range	mbar / hPa	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
Cable length of external power supply	m	2
Dimensions (L x W x H)	mm	138 x 124 x 115
Weight	kg	0.44

ACCESSORIES

Rubber vacuum tubing DN 6 mm (686000)
PTFE tubing DN 10/8 mm (638644)
DKD calibration with first delivery (900216)
DKD recalibration (900217)
VACUU·BUS™ accessories
Vacuum sensor VSK 3000 (636657)
In-line solenoid vacuum valve VV-B 6C (674291)
Vacuum sensor VSP 3000 (636163)

ORDERING INFORMATION	CVC 3000	
100-230 V ~ 50-60 Hz	CEE/CH/UK/US/AUS	683160
Built-in versions upon request		

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 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 or 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.

VNC 2

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

ORDERING INFORMATION	VNC 2	
100-230 V ~ 50-60 Hz	IEC plug EN 60320	683070
VNC 2 VARIO		on request
Please order power cable separately		pg. 167

ACCESSORIES

Rubber vacuum tubing DN 10 mm (686002)
PTFE tubing DN 10/8 mm (638644)
DKD calibration with first delivery (900216)
DKD recalibration (900217)
VACUU·BUS™ accessories

ITEMS SUPPLIED

Vacuum controller complete with integrated vacuum sensor, ready for use, with manual.

TECHNICAL DATA		VNC 2
Control range	mbar / hPa	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)
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		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	V / Hz	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 switching capacity ohmic(inductive) load below 30°C		7.2(4) A at 250V~ / 7.2(7.2) A at 125 V~
Max. AC switching capacity ohmic(inductive) load at 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

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.

Bus plug at CVC 3000

- 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.

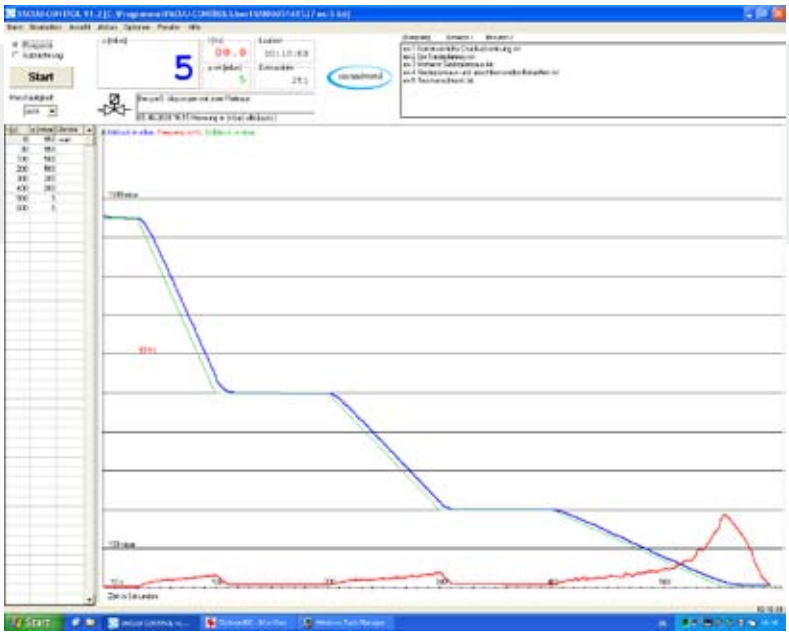
- Analog I/O module, digital I/O module: Modules for input and output of analog or digital signals to the vacuum controllers CVC 3000 or VNC 2. Details on request.

ORDERING INFORMATION	
Vacuum sensor VSK 3000	636657
Vacuum sensor VSP 3000	636163
Vacuum sensor MPT 100	683176
In-line valve VV-B 6 with KF DN 16 or hose nozzle DN 6/10 mm pg.159-160	674290
In-line valve VV-B 6C with KF DN 16 or hose nozzle DN 6/10 pg.159-160	674291
In-line valve VV-B 15C with KF DN 16 pg.159-160	674210
In-line valve VV-B 15C with KF DN 25 pg.159-160	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
Liquid level sensor for VACUUBRAND emission condenser EK 1000	699909
VACUU·BUS™ extensions 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

PC SOFTWARE

VACUU·CONTROL™ (GERMAN / ENGLISH)

The VACUU·CONTROL™ PC software provides control of vacuum processes in research, development and production. VACUU·CONTROL™ works in conjunction with the CVC 2000 and CVC 3000 vacuum controllers, the VNC 1 and VNC 2 vacuum network controllers, and the DCP 3000 vacuum gauges. The software can interface with pumps and pumping units fitted with any of these gauges and controllers, including the (NT) VARIO® chemistry pumping units, NT chemistry pumping units and (NT) VARIO® pumps, as well as LAN (NT) network pumping units.



VACUU·CONTROL™ automatically documents the process data, which can be exported to other programs. The graphical display and simple programming make the software very user-friendly.

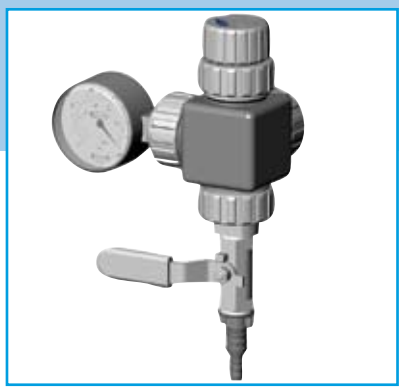
The software makes it easy to define a vacuum process run (e.g., distillation or drying process), including ramps, stopping and venting points, or vacuum levels. The software is installed from a CD-ROM on a Microsoft Windows® compatible PC, which is connected via RS 232C interface to a vacuum controller or measuring gauge. Demo programs are provided to help the user with programming ramps, vacuum cycles, programs with or without venting, and much more. Measured pressure data are recorded and made available for subsequent analysis, e.g., in Microsoft Excel®. This facilitates process validation, which is becoming increasingly important in many areas.

SYSTEM REQUIREMENTS	
Hardware	PC or Notebook, serial interface RS 232C, CD ROM drive
Software	Microsoft Windows® 95, 98, ME, NT, 2000 or XP

ORDERING INFORMATION	
VACUU·CONTROL™ (German / English)	682920
Cable RS 232C, 9-pole, for serial interface	637837

VACUU·LAN® Local Area Vacuum Network

Today, our VACUU·LAN® vacuum networks are the standard in a state-of-the-art laboratory. With a VACUU·LAN® vacuum network, several users at different workstations within a single laboratory jointly use one high performance chemistry diaphragm pump. This avoids the numerous drawbacks of central (building) vacuum systems, while providing an excellent applications solution at low cost. You can integrate the various connecting modules into old or new laboratories, meeting all of the needs of everyday laboratory work. VACUUBRAND conceived this unique and adaptable module concept for vacuum networks almost two decades ago, and has worked with customers to install simple networks, as well as some with hundreds of workstations, in the years since. We are now in the third generation VACUU·LAN® vacuum network technology. These networks reach an ultimate vacuum of as much as 2 mbar, and built-in check valves on every vacuum connection help avoid interference among applications on the network.



VACUU·LAN® at a glance

- the installation saves space: Multiple pumps can be removed from workplaces and open up working space
- vacuum generation responds to demand, automatically turning pumps on and off as needed
- compatible with virtually all installation situations, with models for furniture and wall mounting of vacuum connections and controllers
- many valve options to match workplace needs, from ball valves to solenoids
- adaptable to changing needs and network expansion, with easy-to-change valve elements

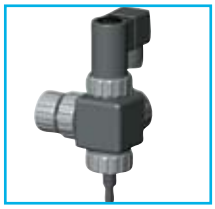
MODULAR VACUU·LAN® CONCEPT

VACUU·LAN® modules (VCL) are shipped leak tested and ready to be connected. They can be surface mounted, installed in furniture, or installed through walls, as needed. Because of this flexibility, they integrate well with new laboratory furnishings, retrofit into existing laboratories, or enable easy expansion of established networks. Components can even be moved if a lab relocates. The VACUU·LAN® modules are built modularly to ensure that a greater variety of ready-to-connect combinations are always on-hand.

Manual flow control module for hoods VCL AR

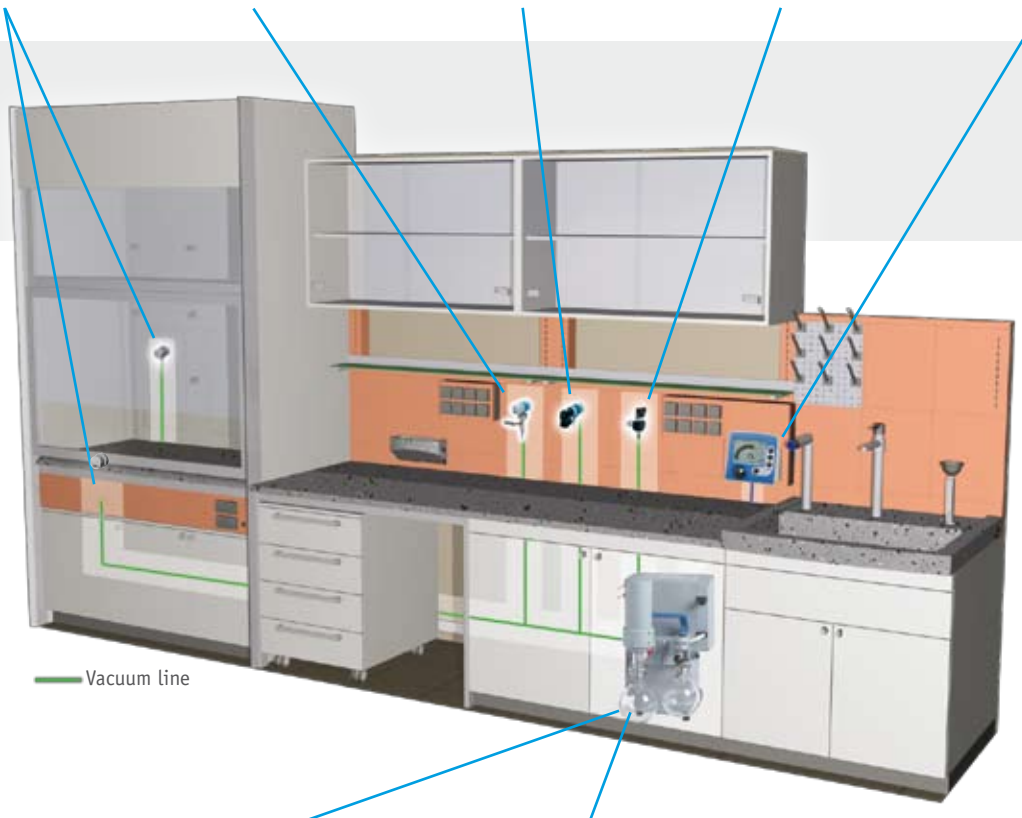
Shut-off/manual flow control module VCL 02

Automatic control module VCL-B 10



Manual flow control / automatic control module VCL-B 11

Vacuum controller CVC 3000



Network vacuum pumping unit PC 600 LAN NT

VARIO® chemistry pumping unit PC 3004 VARIO w/o controller, with Peltronic™

LOCAL AREA VACUUM NETWORK VACUU·LAN®

CHOOSING THE VACUU·LAN® MODULES

The first step is to select the right mounting base. They are used for mounting on or in the wall and they form the link between the vacuum network and vacuum connection.

The mounting base A1 is designed for retrofitting of vacuum networks into an existing laboratory. The vacuum network tubing will be laid visibly onto laboratory furniture or walls.

The mounting base A5 is designed for installation of vacuum networks into laboratory furniture. The network tubing is laid hidden behind walls or underneath the work plate. The vacuum ports are mounted from the front.

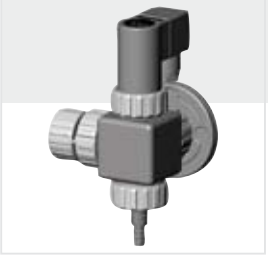
The second step involves selecting the functional element, that is, the operation desired for each workstation (such as manually or electronically controlled valves). Options include the following:

Manual flow control module VCL 01
with flow control diaphragm to open and close the vacuum port, and to fine-tune the pumping speed.

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. Seal seat made of chemically resistant fluoroelastomer for continuous long term use.

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 / automatic control VCL-B 11
with flow control diaphragm valve to fine-tune the pumping speed and electromagnetic (solenoid) automatic vacuum control. With convenient VACUU·BUS™ control connections.

Manual flow control module for hoods VCL AR
consisting of a manual control unit and a separate vacuum port for installation in laboratory exhaust hoods.

Manual flow control / shut-off / gauge module VCL RKM
similar to module VCL 02, but with additional mechanical bourdon vacuum gauge for quick reading and trend detection

LOCAL AREA VACUUM NETWORK
VACUU·LAN®

ORDERING INFORMATION - with mounting base A1			
Manual flow control module	VCL 01	A1	677106
Shut off / manual flow control module	VCL 02	A1	677107
Automatic control module	VCL-B 10	A1	677208
Manual flow control / automatic control VCL-B 11	VCL-B 11	A1	677209
Shut off module	VCL K	A1	677155
Manual flow control / shut off / gauge module	VCL RKM	A1	677175

ORDERING INFORMATION - with mounting base A5			
Manual flow control module	VCL 01	A5	677190
Shut off / manual flow control module	VCL 02	A5	677191
Automatic control module	VCL-B 10	A5	677292
Automatic control / manual flow control module	VCL-B 11	A5	677293
Shut off module	VCL K	A5	677194
Manual control module for hoods	VCL AR	A5 + B8	677195
Manual flow control / shut off / gauge module	VCL RKM	A5	677197

The VACUU·LAN® modules with electromagnetic (solenoid) valves (VCL-B 10, VCL-B 11) are VACUU·BUS™-compatible (labelled with "-B"). In other words, they communicate with the CVC 3000 or VNC 2 vacuum controllers via VACUU·BUS™ control. Other modules designed especially for laboratory fume hoods with outside operation and modules with electromagnetic solenoid valve without bus control are available on request.

Our line does not only include the most frequently used VCL modules with A1 and A5 mounting bases as listed above, but also further modules for extension of older networks. Please ask for details.

CVC 3000E workstation vacuum controller for integration into laboratory furniture

The CVC 3000E with solenoid-operated valve for vacuum control is designed for panel mounting in laboratory furniture. It is ideal as a single workstation controller at an outlet of a vacuum network. The design of the controller provides neat installation with concealed tubing (PTFE) for vacuum supply. This CVC 3000E vacuum controller features a solenoid valve block mounted directly at the vacuum sensor at the rear of the controller and an integrated check valve to avoid interference and contamination among neighboring work stations. The unit is completely equipped, very compact and easy to install.

▶ pg. 143

ACCESSORIES

PTFE tubing DN 10/8 mm (sold by the meter) (638644)
Coolant valve VACUU·BUS™, G3/4" + G1/2" / nozzle DN 6 mm (674220)
VACUU·BUS™ wall feedthrough (plug-socket), for wall thickness of 1 - 10 mm (636153)
additional VACUU·BUS™-controlled components: ▶ pg. 145
Vacuum controller for VCL-B modules:
Vacuum controller CVC 3000 (683160)
Vacuum controller VNC 2 (683070)
Built-in versions upon request ▶ pg. 141
Choosing the right vacuum equipment overview ▶ pg. 29
Network pumping unit PC 500 LAN NT ▶ pg. 41
Network pumping unit PC 600 LAN NT ▶ pg. 58

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 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 FPM, 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 connecting elements 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. When open, they open up the entire cross-section, which is why 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 bellow 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: Leakage rate < 10^{-6} mbar l/s, stainless steel components: Leakage rate < 10^{-9} mbar l/s).

Flexible connection elements

Flexible hoses made natural rubber or PVC are enjoying great popularity in laboratories. VACUUBRAND offers special hoses made of antistatic PTFE with small flanges 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 such as 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 (with hard-chrome plated brass ball and fiberglass 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

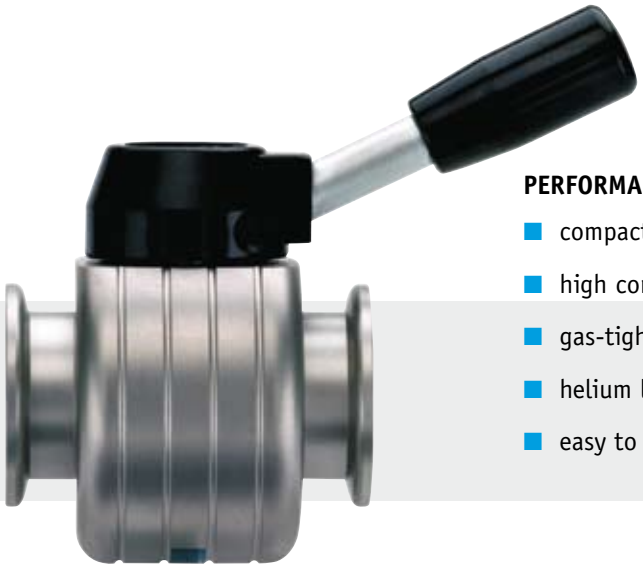
ORDERING INFORMATION - VKE valves made of stainless steel (with ball made of stainless steel and fiberglass reinforced PTFE seal seat)

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.



VS 16

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

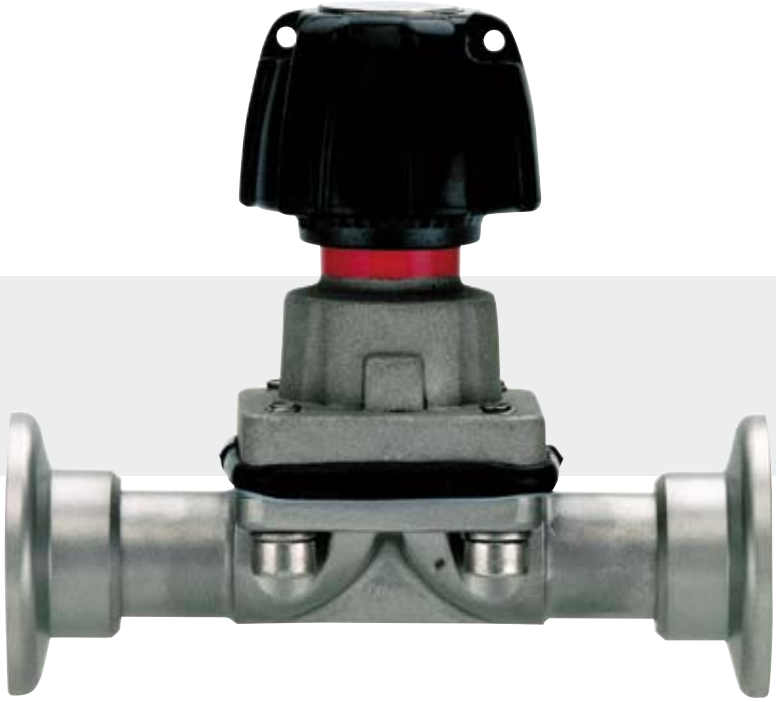
TECHNICAL DATA		VS 16	VS 16C	VS 25	VS 25C
Nominal width of flange	mm	16	16	25	25
Connection of bypass		-	-	-	-
Wetted materials		SS, FPM, NBR	SS, FFKM, NBR	SS, FPM, NBR	SS, FFKM, NBR
Leakage rate	mbar l/s	1 x 10^{-6}	1 x 10^{-6}	1 x 10^{-6}	1 x 10^{-6}
Fitting length between flanges	mm	65	65	65	65
Weight	kg	0.6	0.6	0.8	0.8

TECHNICAL DATA		VS 40	VS 40C	VS 50B	VS 63B
Nominal width of flange	mm	40	40	40	63
Connection of bypass		-	-	Small flange KF DN 16	Small flange KF DN 16
Wetted materials		SS, FPM, NBR	SS, FFKM, NBR	SS, FPM, NBR	SS, FPM, NBR
Leakage rate	mbar l/s	1 x 10^{-6}	1 x 10^{-6}	1 x 10^{-6}	1 x 10^{-6}
Fitting length between flanges	mm	65	65	65	120
Weight	kg	0.9	0.9	1.2	2.1

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
VS 50B	Small flange KF DN 50 / KF DN 40	638147
VS 63B	Clamping flange ISO K DN 63 / Small flange KF DN 50	665012

DIAPHRAGM VALVE
DIAPHRAGM VALVES VM

VM series valves are hand-operated diaphragm valves. They are used as isolation valves, air-admittance valves or manual-control valves. By the rotation of the wheel, a flexible PTFE diaphragm will be moved and be pressed against the stainless steel seating or be removed from it (valve closes or is open more or less). The gas-contacting parts are made of materials such as stainless steel and PTFE, which offer a good resistance to corrosive gases and vapors.



VM 16

VM 25

PERFORMANCE FEATURES

- high chemical resistant material
- high conductance, low leakage rate
- flow control
- gas-tight against atmosphere in both directions

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.

VE 16 WIG

PERFORMANCE FEATURES

- high conductance due to large stroke length
- excellent gas tightness, minimum degassing
- stainless steel design, out-bakable to +150 °C
- simple dismantling and easy changing of seal
- dimensions of the VE valve are the same as elbow with corresponding nominal width

TECHNICAL DATA		VE 16	VE 25	VE 40
Nominal width of flange	mm	16	25	40
Wetted materials		Aluminum, SS, FPM	Aluminum, SS, FPM	Aluminum, SS, FPM
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, FPM	SS, FPM	SS, FPM
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 - High vacuum bellow 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 - High vacuum bellow 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

These valves are compact air admittance valves with a 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 valves VB M are solenoid operated with VACUU·BUS™ control connection and are frequently used for remote-controlled systems (such as the CVC 3000, VNC 2, or DCP 3000), interlocking systems and inert gas flushing.

VB M-B

VB 10

TECHNICAL DATA		VB 10	VB M-B
Flange connection	mm	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, FPM
Leakage rate	mbar l/s	1 x 10^{-6}	1 x 10^{-3}
Operation	mm	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 VG

Gas inlet valves VG 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 is small-flange-mounted to the system and has a hose nozzle DN 8 mm for connection to 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.

VGS 10

VGL

TECHNICAL DATA		VGS 10	VGL
Flange connection		Small flange KF DN 10	Brass sleve 5.1 mm
Gas inlet connection		Hose nozzle DN 8 mm	Brass sleve 5.1 mm
Wetted materials		SS, FPM, NBR	SS, FPM, NBR, brass
Leakage rate of housing	mbar l/s	1×10^{-9}	1×10^{-9}
Leakage rate of seat	mm	1×10^{-6}	1×10^{-6}
Weight	kg	0.15	0.12

ORDERING INFORMATION - Gas inlet valves made of stainless steel / brass		
VGS 10	Small flange KF DN 10	666000
VGL	Brass sleve 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 sealing material of the VV-B 6C is a chemically highly resistant fluoroelastomer with better form stability than common PTFE, and with excellent long-term leak tightness characteristics.

VV 6C

VV 15C

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

SOLENOID-OPERATED VALVES

SOLENOID-OPERATED VALVES VV AND VV C

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, FPM, PPS	SS, PP, FPM, 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	80	100
Weight	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^{-2}
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	100	110
Weight	kg	0.35	1.2

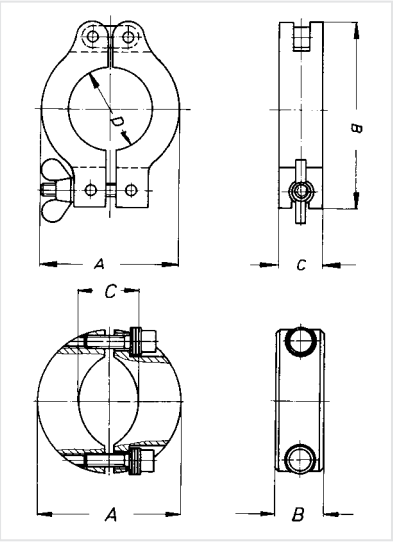
TECHNICAL DATA		VV-B 15C	VV 25
Flange connection		Small flange KF DN 25	Small flange KF DN 25
Wetted materials		SS, PVDF, PTFE	SS, FPM, brass (Nickel plated)
Leakage rate	mbar l/s	1 x 10^{-2}	1 x 10^{-4}
Ambient temperature range	°C	0 - 40	0 - 50
Maximum gas temperature	°C	100	80
Max. switching frequency	/min	50	120
Supply voltage/Plug		VACUU·BUS™	Solenoid 230 V/~ 50-60 Hz / IEC plug EN 60320
Cable length	m	2	2.5
Fitting length between flanges	mm	110	100
Weight	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/~ 50-60 Hz	674105

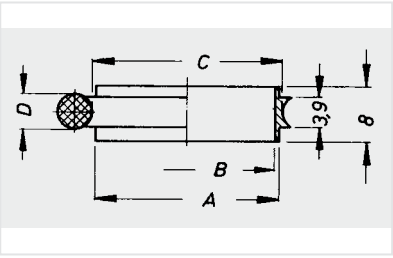
SMALL-FLANGE COMPONENTS

Dimensions in millimeters



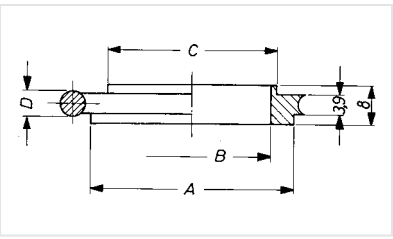
CLAMPING RINGS FOR SMALL FLANGE KF

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



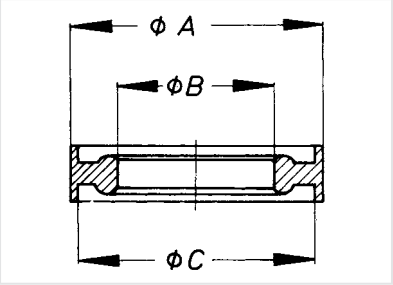
CENTERING RINGS FOR SMALL FLANGE KF made of stainless steel

Size	A	B	C	D	Order-no.
with sealing ring made of FPM					
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



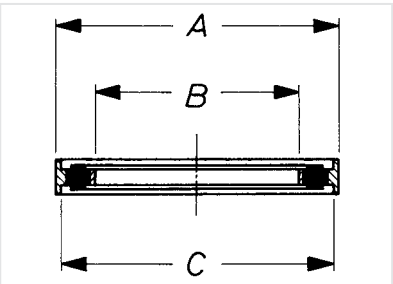
ADAPTING CENTERING RINGS FOR SMALL FLANGE KF made of stainless steel

Size	A	B	C	D	Order-no.
with sealing ring made of FPM					
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 made of aluminum

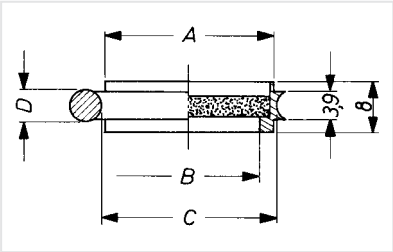
Size	A	B	C	Order-no.
with aluminum sealing ring				
KF DN 10/16	32	17.2	30.1	660140
KF DN 20/25	42	26.2	40.1	660141
KF DN 32/40	57	41.2	55.1	660142
KF DN 50	77	52.2	75.1	660143



INDIUM SEALING FOR KF - with stainless steel/aluminum centering rings (inside/outside)

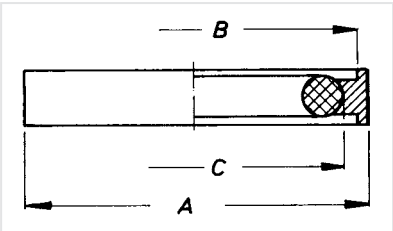
Size	A	B	C	Order-no.
KF DN 10/16	32	17.2	30.1	660150
KF DN 20/25	42	26.2	40.1	660151
KF DN 32/40	57	41.2	55.1	660152

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

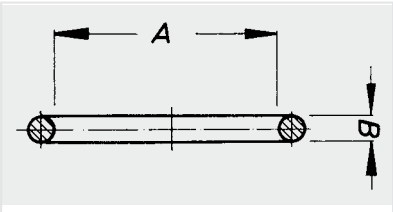


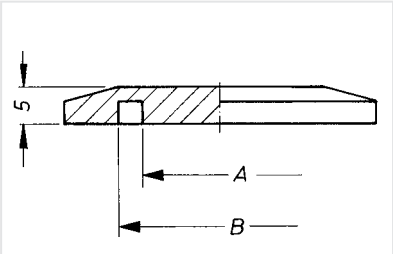
TRAPPED O-RING CENTERING RINGS FOR SMALL FLANGE KF made of PBT (not wetted)

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 FPM				
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 FPM			
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

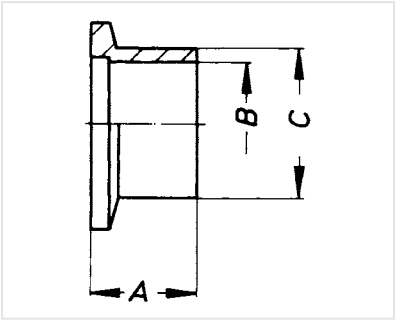




BLIND SMALL FLANGES KF

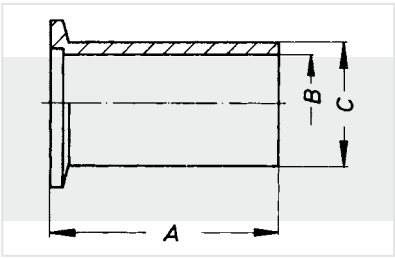
Size	A	B	Order-no.
made of aluminum			
KF DN 10	7.2	12.2	669000
KF DN 16	9.8	17.2	669004
KF DN 25	19.8	26.2	669005
KF DN 40	31.7	41.2	669006
KF DN 50	47.2	52.2	669003
made of stainless steel			
KF DN 10	7.2	12.2	671000
KF DN 16	9.8	17.2	671004
KF DN 25	19.8	26.2	671005
KF DN 40	31.7	41.2	671006
KF DN 50	47.2	52.2	671003

SMALL-FLANGE COMPONENTS



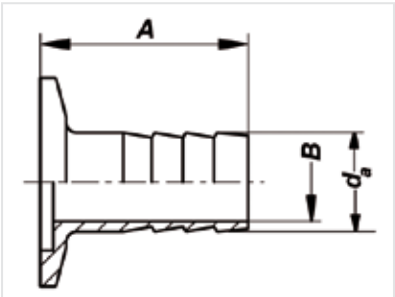
SMALL FLANGES KF WITH WELD STUB short

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



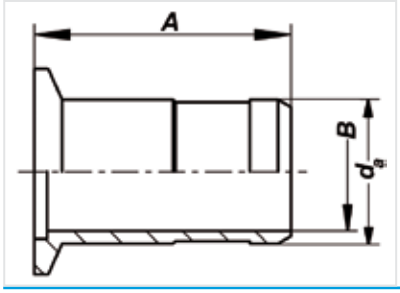
SMALL FLANGES KF WITH WELD STUB long

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

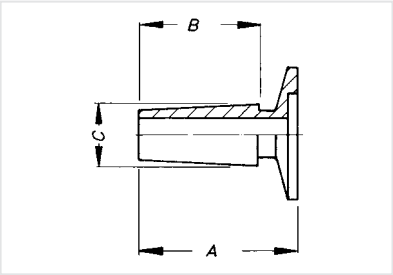
Size	A	B	d_a	Tubing ID	Order-no.
made of aluminum					
KF DN 10 / DN 6 mm	40	4	8	6	662500
KF DN 16 / DN 6 mm	40	4	8	6	662510
KF DN 16 / DN 10 mm	40	7	12	10	662511
KF DN 25 / DN 8 mm	40	6	10	8	662516
KF DN 25 / DN 10 mm	40	7	12	10	662517
KF DN 25 / DN 12 mm	40	10	15	12	662518
KF DN 25 / DN 15 mm	40	15	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

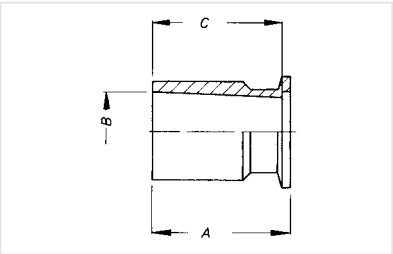
Size	A	B	d_a	Tubing ID	Order-no.
made of aluminum					
KF DN 10 / DN 12 mm	50	9	14	12	662530
KF DN 16 / DN 19 mm	50	15	20	19	662531
KF DN 25 / DN 20 mm	50	15	22	20	662532
KF DN 25 / DN 25 mm	50	23	28	25	662533
KF DN 40 / DN 25 mm	50	23	28	25	662534
KF DN 40 / DN 40 mm	50	38	43	40	662535

SMALL-FLANGE COMPONENTS



SMALL FLANGES KF WITH MALE GROUND JOINT

Size and grinding type	A	B	C	Order-no.
made of stainless steel				
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

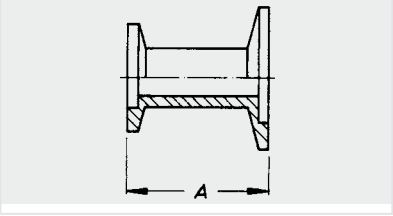


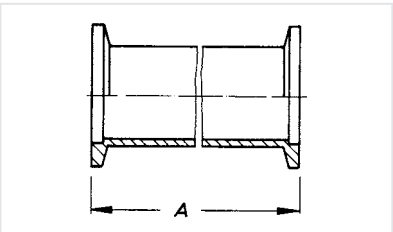
SMALL FLANGES KF WITH FEMALE GROUND JOINT

Size and grinding type	A	B	C	Order-no.
made of stainless steel				
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

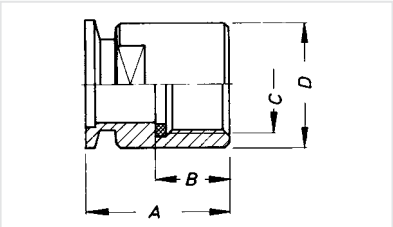
Size	A	Order-no.
made of aluminum		
KF DN 25/10	40	669040
KF DN 25/16	40	669041
KF DN 40/10	40	669042
KF DN 40/16	40	669043
KF DN 40/16	40	669043
made of stainless steel		
KF DN 25/10	40	672910
KF DN 25/16	40	672911
KF DN 40/10	40	672912
KF DN 40/16	40	672913
KF DN 40/25	40	672914





VACUUM TUBING WITH SMALL FLANGES KF

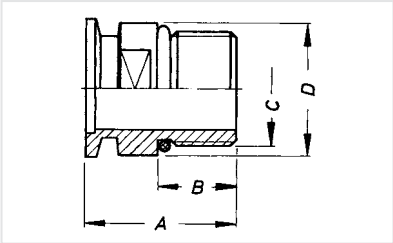
Size	A	Order-no.
made of aluminum		
KF DN 10	60	669010
KF DN 16	80	669014
KF DN 25	100	669015
KF DN 40	130	669016
made of stainless steel (flange and tube TIG welded)		
KF DN 10	60	673000
KF DN 16	80	673014
KF DN 25	100	673015
KF DN 40	130	673016



SCREW-ON SMALL FLANGE KF made of stainless steel (internal thread)

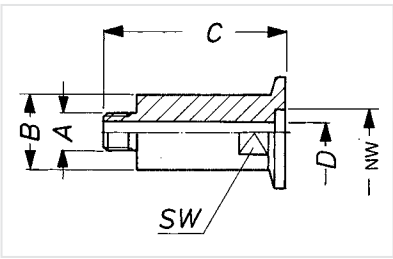
Size	A	B	C	D	Order-no.
with sealing ring made of NBR					
KF DN 10 / G3/8"	35	15.5	G3/8"	20	672000
KF DN 16 / G1/2"	35	16	G1/2"	25	672001
KF DN 25 / G1"	45	22	G1"	38	672002

SMALL-FLANGE COMPONENTS



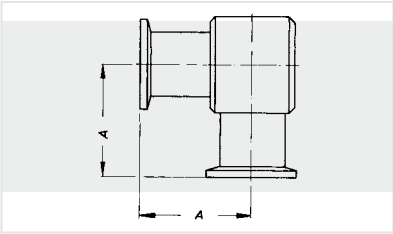
SCREW-IN SMALL FLANGES KF made of stainless steel (external thread)

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



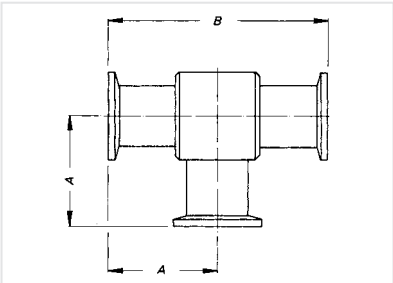
SMALL FLANGES KF WITH THREAD

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

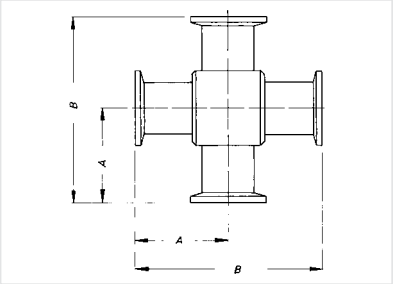
Size	A	Order-no.
made of aluminum		
KF DN 10/10	30	669400
KF DN 16/16	40	669404
KF DN 25/25	50	669405
KF DN 40/40	65	669406
made of stainless steel		
KF DN 10/10	30	673400
KF DN 16/16	40	673414
KF DN 25/25	50	673415
KF DN 40/40	65	673416



T-PIECES WITH SMALL FLANGES KF

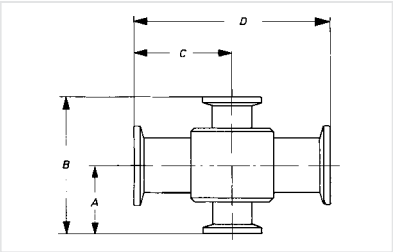
Size	A	B	Order-no.
made of aluminum			
KF DN 10/10/10	30	60	669500
KF DN 16/16/16	40	80	669504
KF DN 25/25/25	50	100	669505
KF DN 40/40/40	65	130	669506
made of stainless steel			
KF DN 10/10/10	30	60	673500
KF DN 16/16/16	40	80	673514
KF DN 25/25/25	50	100	673515
KF DN 40/40/40	65	130	673516

SMALL-FLANGE COMPONENTS



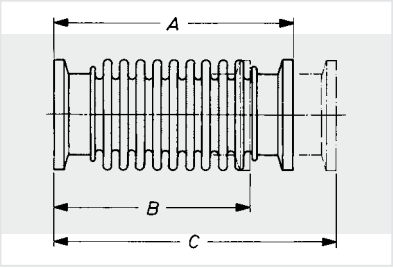
CROSS PIECES WITH SMALL FLANGES KF

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



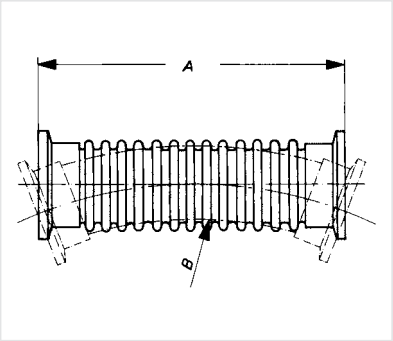
REDUCING CROSS PIECES WITH SMALL FLANGES KF

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	40	80	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

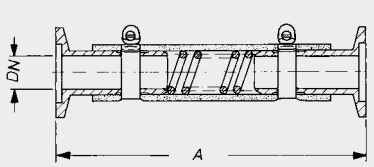
Size	A	B	C	Order-no.
made of stainless steel (1.4541)				
KF DN 10	74	62	86	673210
KF DN 16	74	62	86	673220
KF DN 25	88	72	104	673221
KF DN 40	113	88	138	673222



METAL VACUUM TUBINGS WITH SMALL FLANGES KF

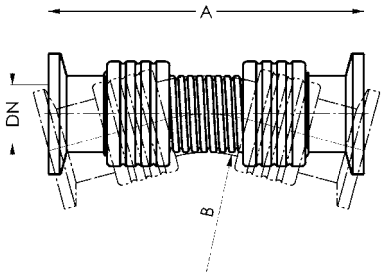
Size	A	B: minimum bend radius for		Order-no.
		single	repeated	
made of stainless steel (1.4541)		bending	bending	
KF DN 10	250	18	50	673305
KF DN 10	500	18	50	673315
KF DN 10	750	18	50	673325
KF DN 10	1000	18	50	673335
KF DN 16	250	25	75	673306
KF DN 16	500	25	75	673316
KF DN 16	750	25	75	673326
KF DN 16	1000	25	75	673336
KF DN 25	250	35	100	673307
KF DN 25	500	35	100	673317
KF DN 25	750	35	100	673327
KF DN 25	1000	35	100	673337
KF DN 40	250	60	150	673308
KF DN 40	500	60	150	673318
KF DN 40	750	60	150	673328
KF DN 40	1000	60	150	673338

SMALL-FLANGE COMPONENTS



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



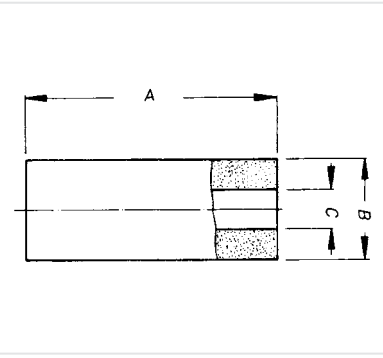
PTFE VACUUM TUBINGS with small flanges KF

made of antistatic PTFE, flanges made of stainless steel (1.4305)

Special features:

- Ribbed only on the outside, almost smooth walls on the inside, no accumulation of liquids or particles as in corrugated hoses, high conductance due to reduced turbulences.
- Material PTFE, with excellent chemical resistance.
- Material is antistatic in conformity with the standard BS 2050:1978 with < 10^7 Ohm resistance between the hose inside and the flanges, preventing electrostatic charges on the inside or outside. However, the tubing may not be used for grounding equipment.

Size	A	B: minimum bend radius for single bending	B: minimum bend radius for repeated bending	Order-no.
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

POWER CABLES (e.g., for Peltronic™ exhaust vapor condenser and VNC 2)

Power cable CEE	612058
Power cable CH	676021
Power cable UK	676020
Power cable US	612065

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General Terms and Conditions
VACUUBRAND GMBH + CO KG

1 General

1.1 Conflicting business conditions, written form, additional agreements and contract language. - These General Terms and Conditions shall apply to all contracts, including all future contracts with the Customer. Other conditions shall not become a part of the contract even if we do not expressly object to such conditions. The language of the contract shall be German or English. The Customer may only claim validity of additional agreements before or upon the conclusion of the contract only if they provide immediate written confirmation. Renunciation of the written form is only possible in writing.

1.2 Offers, right to make changes - Our offers are subject to confirmation. We reserve the right to make technical improvements to our products.

1.3 Recording of data - We may store and process relevant contract data in our EDP systems.

1.4 Setting off and retention - The setting off or the retention by the Customer is not permitted except in cases of undisputed or indefeasible counter claims.

1.5 Place of jurisdiction - The place of jurisdiction shall be the court responsible for our domicile in Wertheim/Mosbach, Germany. We are also entitled to call upon the court responsible for our Customer's domicile. Furthermore, we as Plaintiffs have the right to call the arbitral tribunal at the Chamber of Industry and Commerce in Heilbronn, Franconia, Germany. In this case, the arbitral tribunal conclusively decides the legal dispute in accordance with the ICC Rules of Arbitration excluding the due legal process. The institution of legal dunning procedures does not exclude our right to choose for the option to call upon the arbitral tribunal at the Chamber of Industry and Commerce. Mentioned option is in either case admissible.

1.6 German law is applicable, to the exclusion of the UN Convention on Contracts for the International Sale of Goods', CISG.

2 Delivery

2.1 Place of performance shall be our factory in Wertheim. The risk shall be transferred to the Customer when the shipment leaves the ramp in our factory. This shall apply also to partial deliveries and where we have undertaken additional services such as freight forwarding; costs of transporting, packing or insurance; exportation; and installation. This also applies in the case of delivery to a consignment warehouse.

2.2 If there be any delay in the Customer's acceptance of a shipment, we may, at our own discretion, have the products stored at the Customer's expense or, after providing a warning and setting a deadline, sell the products for account of the customer.

3 Delivery period, Delay

3.1 Indicated delivery periods are ex works. Delivery deadline shall commence upon the Customer's receipt of our order confirmation; however, only after settlement of the technical questions that are still open at the conclusion of the contract and after we have received from the customer all documents, such as diagrams, permits or releases required from the Customer and definitely not before any advance payments that have been agreed upon. The delivery deadline is considered to have been observed if the readiness for shipment has been declared prior to the expiration of this period. Correct and punctual delivery remains a requirement.

3.2 Force Majeure, strikes, lockouts, operating breakdowns, shortages of raw materials or means of production for which we are not responsible, including delayed deliveries or failure to deliver by upstream suppliers, shall extend the delivery deadline accordingly and shall release us from our obligation to deliver if delivery becomes impossible as a result. We are considered not to be responsible for the aforementioned circumstances, even where they occur during an existing delay. The same applies in the case of additional or amended services requested by the Customer.

3.3 Our default in delivery shall not exist unless the Customer has provided us with a warning and an indicated reasonable additional period of time has lapsed.

3.4 In the case of delay damages, we shall limit our liability for damage compensation to 10% of the value of our delayed delivery/service. The limitation does not apply in the case of wilful intent, gross negligence and/or damage to life, body or health. The Customer shall be obligated to promptly notify us in writing of any consequences of delay.

4 Prices, Terms of Payment

4.1 Prices quoted shall be ex works and do not include VAT, if applicable. Charges for packaging, freight and insurance shall be at the Customer's expense. The prices are understood to be exclusive of costs for the return and recycling/disposal of old equipment.

4.2 Invoices shall be paid in full, without deductions, and must be credited to our account in EURO immediately or by the due date indicated on the invoice. Receipt of payment is applicable. We shall accept bills of exchange or checks only with a view to performance and at the Customer's expense.

4.3 In the case of Customers, with whom we are working for the first time or with whom we do not regularly work, after delays in payment or in the case of reasonable doubt of the creditworthiness of the client, we retain the right to make any individual shipment dependent on payment in advance or a security deposit to the value of the invoice amount.

4.4 If the period between conclusion of the contract and the agreed delivery is longer than four months, we reserve the right to demand an extra charge, which corresponds to our cost increase until delivery, at our own discretion.

4.5 In the case of an agreed return of faultless products, the customer will be charged a checking and processing fee to the value of 15% of the invoice amount (10 Euros minimum).

4.6 If the Customer is in default of payment, then all of our debt claims against him shall be due immediately and we shall not be obligated to make any further deliveries based on current delivery contracts.

4.7 If default of payment occurs, we shall charge, notwithstanding further damage compensation claims, default interest to the amount legally allowed.

4.8 We may offset amounts payable to the Customer, such as a credit notes, against our claims against the Customer, if necessary.

5 Retention of Title and Assignment of Future Claims

5.1 Goods delivered shall remain our property until the complete and unlimited payment of all of our debt claims against the Customer. If we still have further claims against the Customer, we reserve our property rights until the payment of this.

5.2 The Customer may neither use conditional goods nor merge nor combine them with other objects, to which a third party may have rights. If, however, conditional goods become a component of a new object, then we shall be a direct proportional co-owner of this object even if it constitutes a new legal entity. Our proportion of co-ownership shall be based on the relation of the invoice value of the conditional goods to the value of the new object at the time of the connection.

5.3 The Customer may resell the conditional goods in his normal course of business as long as his claims from the resale have not been assigned, pledged or otherwise encumbered.

5.4 The Customer shall assign to us in advance as collateral any claims against his customers from the resale of the conditional goods (see clause 5.3) and/or newly formed objects (see clause 5.2) to the value of our invoice for the conditional goods. If the Customer is not in default of payment for the conditional goods, he may collect the assigned claims in his normal course of business. However, he may only use the proportional proceeds for the payment to us for the conditional goods.

5.5 Upon the Customer's request, we shall release collateral at our discretion, if and to the degree that the nominal value of the collateral exceeds 120 % of the nominal value of our open debt claims against the Customer.

5.6 The Customer is required to immediately inform us of any attachments, confiscation or any other right to disposal of a third party with regard to the conditional goods or the goods co-owned by us.

5.7 In the case of failure to pay in exchanges or checks, or if debit requests or direct debit authorizations are not carried out or are retroactively cancelled, or if the Customer or the end user become insolvent or suspend payments, the Customer shall lose all rights as per clause 5.3. The Customer must immediately notify any subsequent purchaser of our extended retention of property rights. He may only use the proportional proceeds, which are based on the assignment, for the payment of the goods delivered.

5.8 If default of payment occurs or in those cases covered in clause 5.7, we shall be authorized to withdraw from the contract, and/or to demand the return of any conditional goods, even without withdrawal, in the possession of the Customer and/or to collect the assigned debt claims directly. In order to determine our rights, we shall have the right to have the Customer's documents and books concerning our reserved rights examined by a person who is subject to the professional duty of confidentiality.

6 Defects and claims for damages

6.1 We shall be liable for insuring that our products, including any agreed installation, are free of defects at the time of the transfer of risk (clause 2.1). The required composition, shelf life and use of our products are based solely on the written agreed specification, product description and/or operating instructions. Any information beyond this and in particular in preliminary discussions, advertisement and/or referenced industrial standards shall only become a part of the contract if they are expressly referenced in writing.

6.2 If the Customer requires the delivered goods for purposes other than those agreed, he must check before use if the products are specifically suitable for such purposes – including all aspects pertaining to product safety – and the Customer is required to ensure that products comply with all relevant technical, legal and official regulations and requirements. We shall not be responsible for the fulfilment of any application not expressly confirmed by us in writing. We are not liable for material or design guidelines of the Customer, concerning the suitability or permissibility of the desired materials or designs and thus have no particular testing obligation. The observation of safety-related and occupational health regulations depends on the place and conditions of the use, of which we have no knowledge. Measures of the observation of these regulations are, therefore, the responsibility of the user.

6.3 We shall not be liable for the consequences of improper handling, use, servicing or operation of the products or the consequences of normal wear and tear 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 the failure to follow the instructions in the operating instructions.

6.4 In the case of justified deficiency claims we shall only initially be required to provide subsequent performance (i.e. free replacement or repair at our sole discretion). Any additional warranty claims shall only exist due to rejection, impossibility or failure of said subsequent performance. Additional expenses, resulting from the fact that the goods have been relocated from the initial place of delivery, shall be borne by the Customer.

6.5 The Customer shall be obliged to promptly and carefully check incoming products – also for product safety – and to notify us of any apparent deficiencies in writing, any hidden defects as soon as they are found. The Customer must notify the carrier immediately of any transport damage. Non-observation of the obligation to check and give notice of defects will void any and all warranty claims for those deficiencies.

6.6 Our liability for slight negligence is limited to claims owing to injury to life, the body or the health, to claims from product liability as well as claims from the culpable breach of essential contractual duties, through which the contract is endangered. Incidentally, our liability for slightly negligent breach of essential contractual duties is limited to the typically incurring damages which we could have foreseen when the contract was concluded.

6.7 If the Customer uses the delivered goods with materials that are harmful to the environment, poisonous, radioactive or dangerous in any other way, he shall be obliged to clean them prior to any return shipment. We can put any necessary costs of decontamination/cleaning and disposal in the client's invoice.

7 Limitation of actions - Claims for defects against us shall be limited to one year from delivery of the goods to the customer. The same shall apply to claims for damages no matter for what legal grounds. The period of limitations of § 438, paragraph 1, no.1 and 2 of the German Civil Code, and § 479, paragraph 1 and § 634a, paragraph 1, no. 2 remain unaffected. The restriction of the statute of limitations shall not apply to claims owing to malicious nondisclosure of a defect, for claims according to product liability and for damages from injury to life, the body or the health and for other damages, which are due to wilful intent or gross negligence.

8 Software use

8.1 Insofar as software is contained in the delivery, the Customer will be granted the non-exclusive right to use the software delivered including its paperwork. It shall also be available for use on the specific delivery item. Use of the software on more than one system is prohibited.

8.2 The Customer may only copy, transfer or translate the software in a legally acceptable scope (§§ 69 a ff of Copyright Law (UrhG)) or convert from the object code into the source code. The Customer is obliged to not remove manufacturer's instructions, especially copyright entries, or to change them without prior permission of the Supplier.

8.3 All remaining rights to the software and the documentation thereof, including copies, remain with the Supplier and/or Software Supplier. The allocation of sublicenses is not permissible.

9 Installation

9.1 Installation costs can be invoiced monthly. Fixed installation prices shall only apply to the work, which has been agreed upon.

9.2 The Customer shall be responsible for providing the following if required at his own expense: lighting, motive power: compressed air, water, electrical power for welding, heating including any required connections, electrical installations for the connection of the products delivered by us, the required devices (e.g. hoisting equipment), a room, which can be closed, for storing material, tools and clothing during the installation.

10 Replacement parts, Maintenance/Repair

10.1 For replacement parts, our price list shall apply.

10.2 If we have an obligation to maintain/deliver spare parts, then this shall be limited to a period of five years from the date of delivery. If the spare parts are not manufactured by us or are no longer available on the market, e.g. electrical components, or if the raw materials required for their production are no longer available, then our obligation to supply spare parts shall lapse.

10.3 Any servicing and/or calibration service may only be performed after the Customer has declared the absence of health hazards with regard to the devices sent.

11 Legal reservation, Industrial proprietary rights, Secrecy

11.1 We reserve ownership of any of the moulds, tools or other appliances, samples, diagrams, commercial or technical documents produced or provided by us as well as all copyrights, proprietary and intellectual property rights. This applies also if the Customer has wholly or partially borne the costs of this. The use of any such item by the Customer is subject to our prior written approval. The Customer is neither entitled to manufacture the subjects of this agreement nor to have them manufactured on his behalf, without our approval in writing.

11.2 If we deliver goods according to designs or other requirements specified by the Customer (models, samples etc.), he is liable by default for ensuring that through the production and delivery of these products industrial property rights or other rights of third parties are not infringed. He shall be obligated by default to provide compensation for all damages resulting from such legal infringements.

11.3 All information acquired through the business relationship with us which is not deemed to be public knowledge may not be disclosed by the Customer to any third party.

Status as of: December 2009

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	$1.45x10^{-4}$
$1x10^{-3}$	$7.5x10^{-4}$	$1x10^{-1}$	$1.45x10^{-5}$
$1x10^{-6}$	$7.5x10^{-7}$	$1x10^{-4}$	$1.45x10^{-8}$