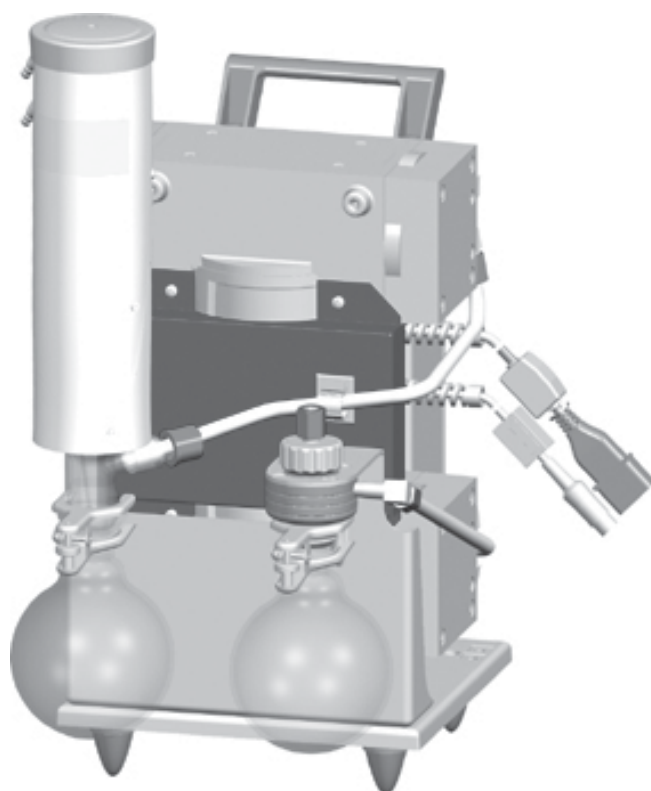


vacuubrand

Instructions for use

Technology for vacuum systems



**PC 2002 VARIO / PC 2004 VARIO
(without controller)**

Chemistry pump unit

Dear customer,

Your VACUUBRAND diaphragm pump shall support you at your work for a long time without any trouble and with full load output. Thanks to our large practical experience we attained much information how you could add to an efficient application and to personal safety. Please read these instructions for use prior to the initial start-up of your pump.

VACUUBRAND diaphragm pumps are the result of many years of experience in construction and practical operation of these pumps combined with the latest results in material and manufacturing technology.

Our quality maxim is the "zero fault principle":

Every delivered diaphragm pump is tested extensively including an endurance run of 18 hours. Due to this endurance run, also faults, which occur rarely, are reported and can be corrected. Every single diaphragm pump is tested on achievement of the specification after the endurance run.

Every VACUUBRAND pump leaving our factory achieves the specification. We feel obliged to this high quality standard.

We are aware that the vacuum pump should not draw a part of the real work and we hope to contribute with our products to an effective and trouble-free realisation of your work.

Yours

VACUUBRAND GMBH + CO KG

After sales service: Contact your local dealer or call +49 9342 808-193.



Attention! Important notes!



Not permitted! Misuse may cause damage.



Caution! Hot surface!



Isolate equipment from mains.



Note.

Contents

Safety information!	4
Technical data	8
Notes on operation	12
Troubleshooting	15
Replacing diaphragms and valves	16
Cleaning and assembling components	22
Notes on return to the factory	23
Health and safety clearance form	24

Safety information!



Remove all packing material, remove the product from its packing-box, remove the protective covers from the inlet and outlet ports and keep, inspect the equipment. If the equipment is damaged, notify the supplier and the carrier in writing within three days; state the item number of the product together with the order number and the supplier's invoice number. Retain all packing material for inspection.

Do not use the equipment if it is damaged.

If the equipment is not used immediately, replace the protective covers. Store the equipment in suitable conditions.

- ☞ **Read and comply with this manual before installing or operating the equipment.**
- ☞ **To operate the VARIO pump a vacuum controller CVC 2000 is necessary!**
- ☞ Transport the pump at the provided handles.

Use the equipment **for the intended use only** (for generation and measurement of vacuum).

- ☞ **Prevent any part of the human body from coming in contact with the vacuum.**
- ☞ Comply with notes on correct vacuum and electrical connections, see section "Use and operation".
- ☞ Make sure that the individual components are only connected, combined and operated according to their design and as indicated in the instructions for use.



Comply with **national safety regulations and safety requirements** concerning the use of vacuum and electrical equipment.

- ☞ The mains switch for the controller and the pump is at the rear side of the controller.
- ☞ After switching off the pump, wait 60 sec. minimum until next switching on.
- ☞ Due to the **high leakage current (up to 3.5 mA)**, a too low rated fault-current circuit breaker may be activated, especially if several pumps are operated parallelly.



Attention: Make sure that a protective conductor connection is established before the equipment is connected to mains supply!

- The pumping units PC 2002 VARIO and PC 2004 VARIO are devices with double-pole cutoff and a symmetric capacitive circuit.
- ☞ If the leakage current is obtained by measuring the equivalent leakage current (according to VDE 0701, September 2000, section 5.7), the measured value may be divided by a factor of 2 in case the device is equipped with a double-pole cutoff and a symmetric capacitive circuit.
- ☞ The shock currents according to EN 61010 are below the limit of 3,5 mA.
- ☞ Equipment must be connected only to a **suitable fused and protected electrical supply** and a suitable earth point. Failure to connect the motor to ground may result in deadly electrical shock.
- ☞ The supply cable may be fitted with a moulded European IEC plug or a plug suitable for your local electrical supply. If the plug has been removed or has to be removed, the cable will contain wires colour coded as follows: green or green and yellow: earth; blue or white: neutral; brown or black: live.
- ☞ Check that mains voltage and current conform with the equipment (see rating plate).
- ☞ If the equipment is brought from cold environment into a room for operation, allow the equipment to warm up (pay attention to water condensation on cold surfaces).
- ☞ Make sure ventilation is adequate if pump is installed in a housing or if ambient temperature is elevated.



Comply with all **relevant safety requirements** (regulations and guidelines) and adopt suitable safety measures.

- ☞ Provide a firm level platform for the equipment and check that the system to be evacuated is mechanically stable and that all fittings are secure.
Attention: Flexible elements tend to shrink when evacuated.

Due to the high compression ratio of the pumps, pressure at the outlet port might be generated being higher than the max. permitted pressure compatible with the mechanical stability of the system.

- ☞ Comply with **maximum permitted pressures** and pressure differences, see section "Technical data". Do not operate the pump with overpressure at the inlet.



Do not permit any **uncontrolled pressurizing** (e. g. make sure that the exhaust pipeline cannot become blocked). If you have an exhaust-isolation valve, make sure that you cannot operate the equipment with the valve closed. **Risk of bursting!**

- ☞ Ensure that the system design does not allow the exhaust pipeline to become blocked.
- ☞ Max. **permitted pressure at the pressure transducer:** 2 bar (absolute).
- ☞ Ensure that the system design does not allow the coolant outlet pipeline to become blocked.
- ☞ Secure coolant hoses at the hose nozzles (e.g. with hose clip) to prevent their accidental slipping.
- ☞ Check liquid level in both catchpots regularly and drain condensate in time.
- ☞ Check the overpressure safety relief device at the exhaust waste vapour condenser in appropriate intervals.
- ☞ Avoid overpressure of more than 0.2 bar in case inert gas is connected.
- ☞ The diameter of the inlet and outlet pipeline should be at the least as large as the diameter of the pump connection pipelines.



To the best of our knowledge the equipment is in compliance with the requirements of the applicable EC-directives and harmonized standards (see "Declaration of conformity") with regard to design, type and model, especially directive IEC 1010. This directive gives in detail conditions, under which the equipment can be operated safely (see also IP degree of protection).

- ☞ Adopt suitable measures in case of differences, e. g. using the equipment outdoors, installation in altitudes of more than 1000 m above mean sea level, conductive pollution or dewiness.



Pay attention to symbol "hot surfaces" on the equipment.

- ☞ Adopt suitable measures to prevent any danger arising from the formation of hot surfaces or electric sparks.



The pumps are **not suitable** to pump **dangerous or explosive gases or explosive or flammable mixtures**. Ensure that the materials of the wetted parts are compatible with the pumped substances, see section "Technical data".

- ☞ Adopt suitable measures to prevent the release of dangerous, explosive, corrosive or polluting fluids.
- ☞ Use inert gas for gas ballast or venting if necessary.
- ☞ The user must take suitable precautions to prevent any formation of explosive mixtures in the expansion chamber. In case of a diaphragm crack, mechanically generated sparks, hot surfaces or static electricity may ignite these mixtures.
- ☞ Take adequate precautions to protect people from the effects of dangerous substances (chemicals, thermal decomposition products of fluoroelastomers), wear appropriate safety-clothing and safety glasses.
- ☞ Comply with applicable regulations when disposing of chemicals. Take into consideration that chemicals may be polluted.



The motor is shut down by a **thermal cutout** in the winding.

- ☞ Manual reset is necessary. Switch off the pump or isolate the equipment from mains. Wait approx. five minutes before restarting the pump.

⚠ **Attention:** In case of **supply voltage below 100V**, the lock of the cutout might be restricted and the pump might restart on its own after sufficient cooling down. Take suitable precautions, if an automatic restart of the pump may lead to a critical dangerous situation.

- ⚠ Avoid high heat supply (e. g. due to hot process gases).
- ⚠ Ensure sufficient air admittance if pump is installed in a housing.

Due to the residual **leak rate of the equipment**, there may be an exchange of gas, albeit extremely slight, between the environment and the vacuum system.

- ⚠ Adopt suitable measures to prevent contamination of the pumped substances or the environment.



Pumping at **high inlet pressure** may lead to overpressure at the gas ballast valve.

- ⚠ Pumped gases or condensate might be pushed out in case the valve is open.
- ⚠ If an inert gas supply is connected, ensure that the inlet pipeline is not contaminated.
- ⚠ Failure of the pump (e. g. by power failure) or connected components, parts of the supply (e. g. coolant) or change of parameters (e. g. increase of pressure in the coolant system) must not lead to a critical dangerous situation under any circumstances.



Electronic equipment is never 100% fail-safe. This may lead to an indefinite status of the equipment. Provide protective measures against malfunction and failure.

- ⚠ Operating the pump with high or low frequency, stand still of the pump or operating the air admittance valve must not lead to a critical dangerous situation under any circumstances.



Ensure that in case of failure the pump and the vacuum system always will turn into a safe status.

- ⚠ In case of diaphragm cracks or leaks in the manifold pumped substances might be released into the environment or into the pump housing. To reduce the risk of leaks, ask for a diaphragm pump with additional safety diaphragm.
- ⚠ Comply especially with notes on operation and use and maintenance.

Use only **genuine spare parts and accessories**.

- ⚠ Otherwise safety and performance of the equipment as well as the electromagnetic compatibility of the equipment might be reduced.
Possibly the CE mark becomes void if not using genuine spare parts.

Ensure that maintenance is done only by suitable trained and supervised technicians. Ensure that the maintenance technician is familiar with the safety procedures which relate to the product processed by the vacuum system and that the equipment, if necessary, is appropriately decontaminated before starting maintenance. Comply with local and national safety regulations.

Wear parts have to be replaced regularly. In case of normal wear the lifetime of the diaphragms and valves is > 10000 operating hours. Bearings have a typical durability of 40000 h.



- ➔ **Isolate equipment from mains and wait two minutes** before starting maintenance to allow the capacitors to discharge.
- ➔ Before starting maintenance, wait **two minutes** after isolating the equipment from mains to allow the capacitors to discharge.
- ⚠ **Ensure that the pump cannot be operated accidentally. Never operate the pump if covers or other parts of the pump are disassembled. Never operate a defective or damaged pump.**

- ☞ **Attention:** The pump might be contaminated with process chemicals which have been pumped during operation. Ensure that the pump is decontaminated before maintenance and take adequate precautions to protect people from the effects of dangerous substances if contamination has occurred.

- ☞ Before starting maintenance vent the pump, isolate the pump and other components from the vacuum system. Allow sufficient cooling of the pump. Drain condensate, if applicable. Separate the pump from the coolant circuit.

In order to comply with law (occupational, health and safety regulations, safety at work law and regulations for environmental protection) vacuum pumps, components and measuring instruments returned to the manufacturer can be repaired only when certain procedures (see section "**Notes on return to the factory**") are followed.

Technical data

Type		PC 2002 VARIO without Controller	PC 2004 VARIO without Controller
Maximum pumping speed* (ISO 21360)	m ³ /h	2,5**	3,8**
Ultimate vacuum* (absolute)	mbar	9	2
Ultimate vacuum* (absolute) with gas ballast	mbar	15	9
Max. permissible outlet pressure (absolute)	bar	1,1	
Max. permissible pressure at inert gas connection (absolute)	bar	1,2	
Permissible ambient temperature storage / operation	°C	-10 to +60 / +10 to +40	
Permissible relative atmospheric moisture during operation (no condensation)	%	30 to 85	
Rated power 100-120 V~ 50/60 Hz	kW	0.33	0.575
230 V~ 50/60 Hz	kW	0.33	0.575
No-load speed	min ⁻¹	30 - 2400	
Maximum current 100-120 V~ 50/60 Hz	A	2,7	4,2
230 V~ 50/60 Hz	A	1,5	2,5
Typical operational current*** (at ultimate vacuum) 100-120 V~ 50/60 Hz	A	1,0	1,1
230 V~ 50/60 Hz	A	0,6	0,7
Maximum permissible range of supply voltage Attention: Observe specifications of rating plate!		100-120 V~ +5%/-10% 50/60 Hz 230 V~ +/-10% 50/60 Hz	
Motor protection		thermal cutout	
Degree of protection IEC 529		IP 20	
Inlet		straight screw-in fitting for tubing NW 10/8	
Outlet		hose nozzle NW 10	
Cooling water connection		hose nozzle NW 6	
Dimensions L x W x H	mm	380 x 260 x 525	380 x 275 x 525
Weight approx.	kg	20,2	21.6

* Technical data according to EN 61010-1 and EN 1012-2. The pump achieves its ultimate pumping speed and ultimate vacuum only at operating temperature (after approx. 15 min.).

** Pumping speed of diaphragm pump

*** Typical current draw in mode "Continuous pumping" and frequency "H".

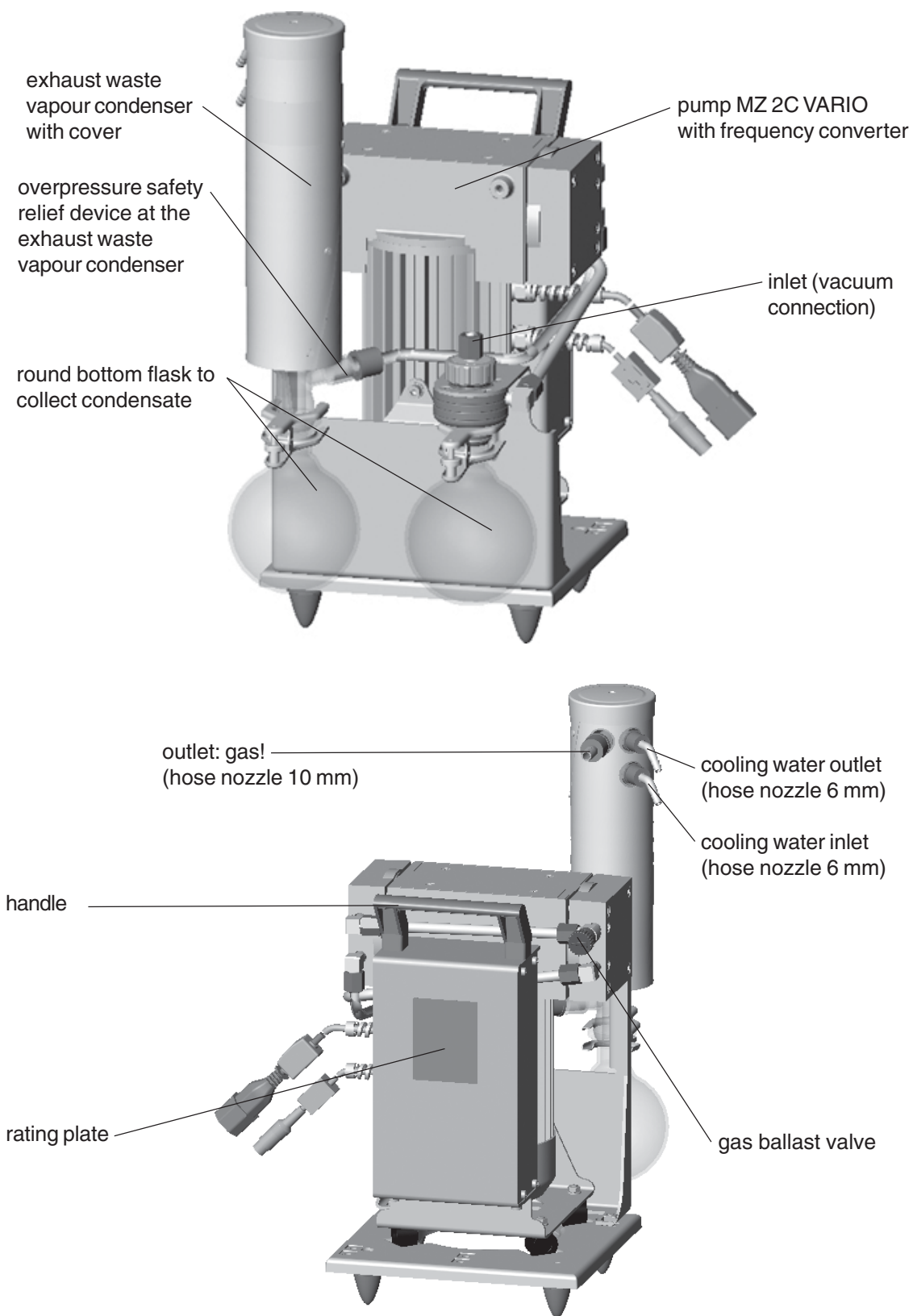
Components	Wetted parts
Pumping unit	
Outlet	PET
Inlet	ETFE/ECTFE (PC 2002 VARIO), PP (PC 2004 VARIO)
Hose	PTFE
Fitting	ETFE / ECTFE
O-rings at the catchpot	FPM
Overpressure safety relief device	silicon rubber / PTFE foil
Catchpot cover plate	PP
Exhaust waste vapour condenser, collecting flask	borosilicate glass
Pump	
Housing cover insert	PTFE carbon reinforced
Head cover	ETFE carbon fibre reinforced
Diaphragm clamping disc	ETFE carbon fibre reinforced
Valve	FFKM
Diaphragm	PTFE
O-ring	FPM

Gas inlet temperatures:

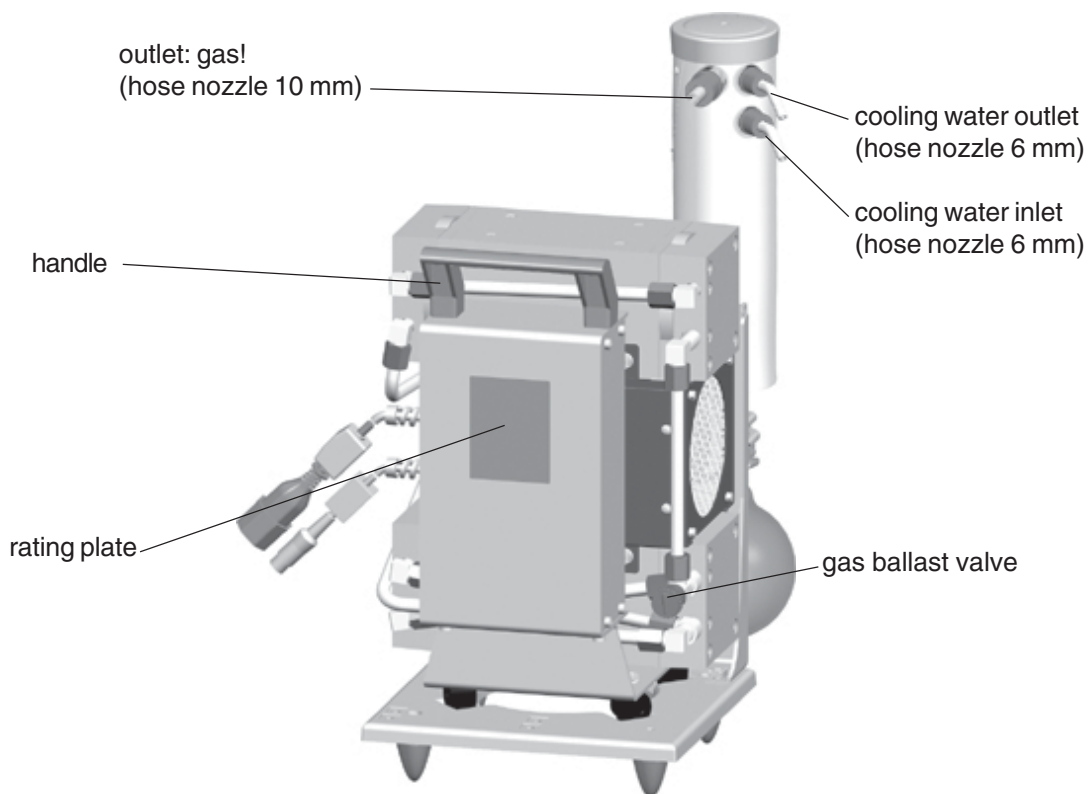
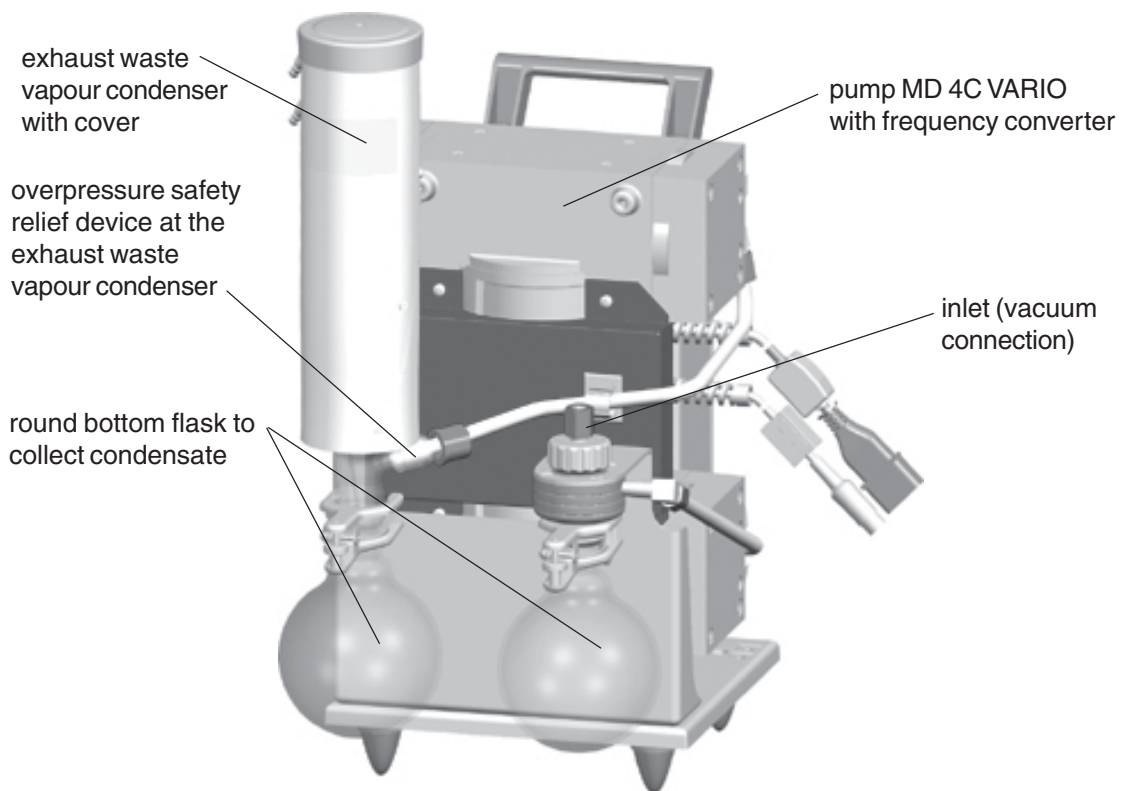
Operating condition	Inlet pressure	Permitted range of gas temperatures at inlet
Continuous operation	> 100 mbar (high gas load)	➡ +10°C to +40°C
Continuous operation	< 100 mbar (low gas load)	➡ 0°C to +60°C
Short-time operation (< 5 minutes)	< 100 mbar (low gas load)	➡ -10°C to +80°C

We reserve the right for technical modification without prior notice!

PC 2002 VARIO without controller



PC 2004 VARIO without controller



Notes on operation



Installing in a vacuum system:

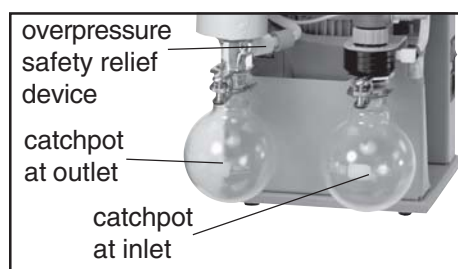
- ☞ Avoid throttling losses by using connecting pipes with large diameter and keep them as short as possible.
- ☞ Reduce the transmission of vibration and prevent loading due to rigid pipelines. Insert elastic hoses or flexible elements as couplings between the pump and rigid pipes. **Attention:** Flexible elements tend to shrink when evacuated.
- ☞ Use a suitable valve to isolate the pump from the vacuum system to allow the pump to warm up before condensable vapours are pumped or to clean the pump before it is switched off.
- ☞ Connect the exhaust to a suitable treatment plant to prevent the discharge of dangerous gases and vapours to the surrounding atmosphere. Use a catchpot to prevent the drainage of contaminated condensate back into the pump.



Prior to use:

- ☞ **Max. ambient temperature:** 40 °C
- ☞ Make sure ventilation is adequate if pump is installed in a housing or if ambient temperature is elevated. Keep a distance of min. 20 cm between fans and ambient parts.
- ☞ If pump is installed in altitudes of more than 1000 m above mean sea level check compatibility with applicable safety requirements, e. g. IEC 60034 (motor may overheat due to insufficient cooling).
- ☞ When assembling, ensure **vacuum-tightness**. After assembly, check the complete system for leaks.

Separator at the inlet and exhaust waste vapour condenser at the outlet:

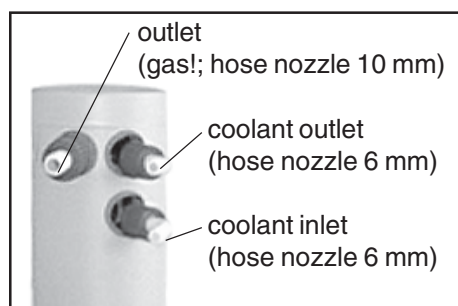


Round bottom flasks:

The catchpot at the inlet prevents droplets and particles from entering the pump.

- ☞ Lifetimes of diaphragms and valves are enhanced.
 - ☞ Improves vacuum in case of condensation.
- Both round bottom flasks are coated with a protective layer to prevent disintegration in case of breakage or implosion.

- Assemble the catchpots at the inlet and at the outlet using joint clips.



Exhaust waste vapour condenser:

- Assemble hose nozzles for coolant inlet and coolant outlet pipelines at the exhaust waste vapour condenser.

The **exhaust waste vapour condenser** enables an efficient condensation of the pumped vapours at the outlet.

- ☞ No backflow of condensates.
- ☞ Controlled recovery of condensates.
- ☞ Next to 100% solvent recovery.
- ☞ The isolation cover protects against glass splinters in case of breaking, acts as thermal isolation to avoid condensation of humidity and is intended to absorb shocks.

- Attach the pipelines of the coolant circuit to the respective hose nozzles (see image) at the waste vapour condenser. Check hose connections prior to starting operation of the cooling system.
- ☞ Secure coolant hoses at the hose nozzles (e.g. with hose clip) to prevent their accidental slipping.
- ☞ Ensure that the **coolant outlet pipeline** is always free and that it cannot get blocked.
- ☞ The gas outlet (hose nozzle 10 mm) must not be blocked. The exhaust pipeline has always to be free and pressureless to enable an unhindered discharge of gases.

- ☞ Connect the exhaust to a suitable treatment plant to prevent the discharge of dangerous gases and vapours to the surrounding atmosphere.



During operation:

Do not start pump if **pressure difference** between inlet and outlet port exceeds **max. 1 bar**. Attempts to start pump at higher difference may cause blockade and damage of the motor.

- ☞ Check compatibility with **max. permitted pressure** at outlet and **max. pressure difference** between inlet and outlet ports.

Due to the high compression ratio of the pumps, pressure at the outlet port might be generated being higher than the max. permitted pressure compatible with the **mechanical stability** of the system.

The pump achieves its **pumping speed, ultimate total vacuum** and vapour pumping rate only at operating temperature (after approx. 15 minutes).

- ☞ Prevent internal condensation, transfer of liquids or dust. The diaphragm and valves will be damaged, if liquids are pumped in significant amounts.
- ☞ Let the pump run with **gas ballast** to reduce condensation of pumped substances (water vapour, solvents, ...) in the pump.

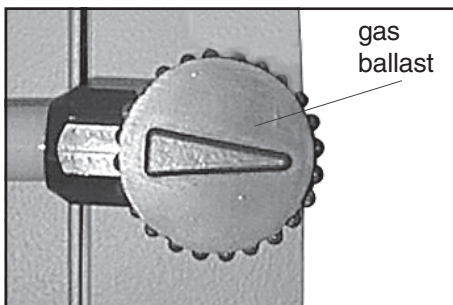
In case of excess temperature, the motor is shut down by a **thermal cutout** in the winding.

- ☞ Manual reset is necessary. Switch off the pump or isolate the equipment from mains. Wait approx. five minutes before restarting the pump. Determine cause of failure and eliminate.
- ☞ **Attention:** In case of **supply voltage below 100V**, the lock of the cutout might be restricted and the pump might restart on its own after sufficient cooling down. Take suitable precautions, if an automatic restart of the pump may lead to a critical dangerous situation.



Attention: Important notes regarding the use of gas ballast

- ☞ Make sure that air/gas inlet through the gas ballast valve never lead to hazardous, explosive or otherwise dangerous mixtures. If in doubt, use inert gas.
- ☞ When using air rather than inert gas, risk of significant damage to equipment and/or facilities, risk of personal injury or even loss of life exists due to the formation of hazardous and/or explosive mixtures if air and pumped media react inside or at the outlet of the pump.



For **condensable vapours** (water vapour, solvents, ...):

- ☞ Do not pump vapour before pump has reached its operating temperature and with gas ballast valve closed.
- ☞ The gas ballast valve is open if the arrow on the gas ballast cap points away from the pump (PC 2002 VARIO), respectively downwards (PC 2004 VARIO).
- ☞ The gas ballast valve is open if the arrow on the gas ballast cap points away from the pump.
- ☞ With gas ballast valve open ultimate vacuum will be reduced, pumping speed is decreased.
- ☞ Use inert gas at the air inlet to avoid the formation of explosive mixtures.

In case of low boiling solvents when the formation of condensate is unlikely, the use of gas ballast might be unnecessary.

- ☞ Operating the pump without gas ballast increases the solvent recovery rates at the exhaust waste vapour condenser.



Attention: Notes concerning the operation of the exhaust waste vapour condenser

- Check hose connections prior to starting operation of the cooling system.
- Check coolant hoses regularly during operation.
- ☞ Ensure that the **coolant outlet pipeline** is always free and that it cannot get blocked.
- ☞ Maximum permissible coolant pressure at the exhaust waste vapour condenser: 6 bar (absolute)
- ☞ Comply with the maximum permissible coolant pressures of additional components in the coolant circuit (e.g. cooling water valve).
- ☞ Avoid overpressure in the coolant circuit (e.g. caused by blocked or squeezed coolant hoses).
- ☞ Permissible range of coolant temperature at the exhaust waste vapour condenser: -15°C to +20°C
- ☞ The gas outlet (hose nozzle 10 mm) must not be blocked. The exhaust pipeline has always to be free and pressureless to enable an unhindered discharge of gases.
- ☞ Connect the exhaust to a suitable treatment plant to prevent the discharge of dangerous gases and vapours to the surrounding atmosphere.



In case of **condensation**:

- Check liquid level in both catchpots during operation. Avoid overflowing of the catchpots.
- ☞ Do not overfill the catchpots. Maximum liquid level approx. 80%, to avoid problems when removing the catchpots.
- Check liquid level in both catchpots regularly and drain catchpots in time.

Removing the catchpots:

Catchpot at outlet:

- Remove joint clip, remove catchpot and drain condensate.

Catchpot at inlet:

- Admit air or inert gas (via inlet of pumping unit) to atmospheric pressure. Remove joint clip, remove catchpot and drain condensate.

- Reassemble drained catchpots.

Important: Comply with regulations when disposing solvents/condensates. Reuse if possible, purify if contaminated.



Shutdown:

Short-term:

Has the pump been exposed to condensate?

- ☞ Allow the pump to continue to run at atmospheric pressure for a few minutes.

Has the pump been exposed to media which may damage the pump materials or forms **deposits**?

- ☞ Check and clean pump heads if necessary.

Long-term:

- Take measures as described in section short-term shutdown.
- Separate pump from the apparatus.
- Drain catchpots.
- Close inlet and outlet port (e. g. with transport caps).
- Store the pump in dry conditions.

Troubleshooting

Please read also instructions for use for the controller!

Fault	Possible cause	Remedy
<input type="checkbox"/> Pump fails to start or stops immediately.	→ Pump has been exposed to condensate?	<input type="checkbox"/> Allow the pump to run with inlet port open for some minutes at max. frequency.
<input type="checkbox"/> Pump does not achieve ultimate vacuum or normal pumping speed.	→ Incorrect settings at the controller? → Centring ring not correctly positioned or leak in the pipeline or vacuum system? → Long, narrow line? → Pump has been exposed to condensate? → Deposits have been formed inside the pump? → Diaphragms or valves defective? → Outgasing substances or vapour generated in the process? → Pressure for automatic switching off achieved?	<input type="checkbox"/> Choose operation mode continuous pumping with frequency "HI" and check again. <input type="checkbox"/> Check pump with a vacuum gauge directly at pump inlet port, check connections and lines. <input type="checkbox"/> Use line with larger diameter, length as short as possible. <input type="checkbox"/> Allow the pump tu run with inlet port open for some minutes at max. frequency. <input type="checkbox"/> Clean and inspect pump heads. <input type="checkbox"/> Replace diaphragms and/or valves. <input type="checkbox"/> Check process parameters. <input type="checkbox"/> Change pressure for automatic switching off if necessary.
<input type="checkbox"/> Pump to noisy.	→ Atmospheric or high pressure at the inlet port? → Diaphragm clamping disc loose? → None of above mentioned causes?	<input type="checkbox"/> Connect hose to pump outlet. <input type="checkbox"/> Perform maintenance. <input type="checkbox"/> Contact local distributor.
<input type="checkbox"/> Pump seized.		<input type="checkbox"/> Contact local distributor.



A service manual with exploded view drawing, spare part lists and directions for repair is available on request.

🗨️ The service manual is for trained service people.

Replacing diaphragms and valves



All bearings are encapsulated and are filled with long-life lubricant. Under normal operating conditions, the pump is maintenance free. The valves and the diaphragms are wear parts. If the rated ultimate vacuum is no longer achieved or in case of increased noise level, the pump interior, the diaphragms and the valves must be cleaned and the diaphragms and valves must be checked for cracks or other damage.

Depending on individual cases it may be efficient to check and clean the pump heads on a regular basis. In case of normal wear the lifetime of the diaphragms and valves is > 10000 operating hours.

☞ Prevent internal condensation, transfer of liquids or dust. The diaphragm and valves will be damaged, if liquids are pumped in significant amount.



If the pump is exposed to corrosive gases or vapour or in case of deposits, maintenance should be carried out frequently.

☞ Regular maintenance will improve the lifetime of the pump and also protect both man and environment.



Before starting maintenance vent the system, isolate the pump and other components from the vacuum system and the electrical supply. Drain condensate if applicable, avoid the release of pollutants. Allow sufficient cooling of the pump. **Ensure that the pump cannot be operated accidentally. Never operate the pump if covers or other parts of the pump are disassembled. Never operate a defective or damaged pump.**

Ensure that the maintenance technician is familiar with the safety procedures which relate to the products processed by the pumping system.



The pump might be contaminated with the process chemicals that have been pumped during operation. Ensure that the pump is decontaminated before maintenance and take adequate precautions to protect people from the effects of dangerous substances if contamination has occurred.

☞ Wear appropriate safety-clothing when you come in contact with contaminated components.

Set of seals (diaphragms, valves, face wrench) for PC 2002 VARIO	696814
Set of seals (diaphragms, valves, face wrench) for PC 2004 VARIO	696815
O-ring (in head covers)	637349
Face wrench with torque indicator	637580



Tools required (metric):

- Phillips screw driver size 2
- Open-ended wrench w/f 10/14/17
- Hex key size 5
- Face wrench size 40/4 with torque indicator

☞ **Please read section "Replacing diaphragms and valves" completely before starting maintenance.**

Partially the pictures show pumps in other versions. This doesn't influence replacing diaphragms and valves of the pump.

Disassembling the pump from the pumping unit



- ➔ Use an open-ended wrench (w/f 17) to remove the union nut of the fitting of the cover plate.



- ➔ Use open-ended wrench (w/f 15) to turn elbow fitting 1/4 of a turn, remove hose. Do not remove the elbow fitting from the cover plate.
- ⚠ Through reassembly a leak might result.



- ➔ Remove union nut at the exhaust waste vapour condenser and remove hose from the inlet of the condenser.

PC 2002:

- ➔ Do not disassemble pump from pump support.

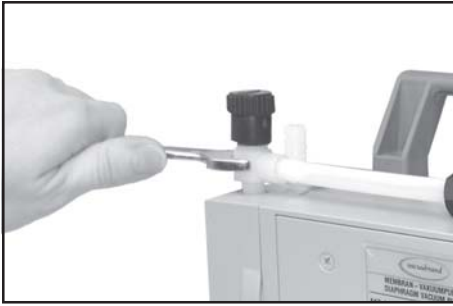
PC 2003 / PC 2004:

- ➔ Use open-ended wrench (w/f 10) to remove four hexagon nuts from the feet of the pump support and lift off pump together with pump support from the base plate.
- ➔ Disassemble pump from pump support. Support pump appropriately.
- ➔ Loosen at each case two socket head screws at the front of the pump and underneath the terminal box with hex key size 5. Pay attention to washers.
- ⚠ Remove pump from pump support.

Cleaning and inspecting the pump heads



- ➔ Use open-ended wrench (w/f 17) to remove union nuts.

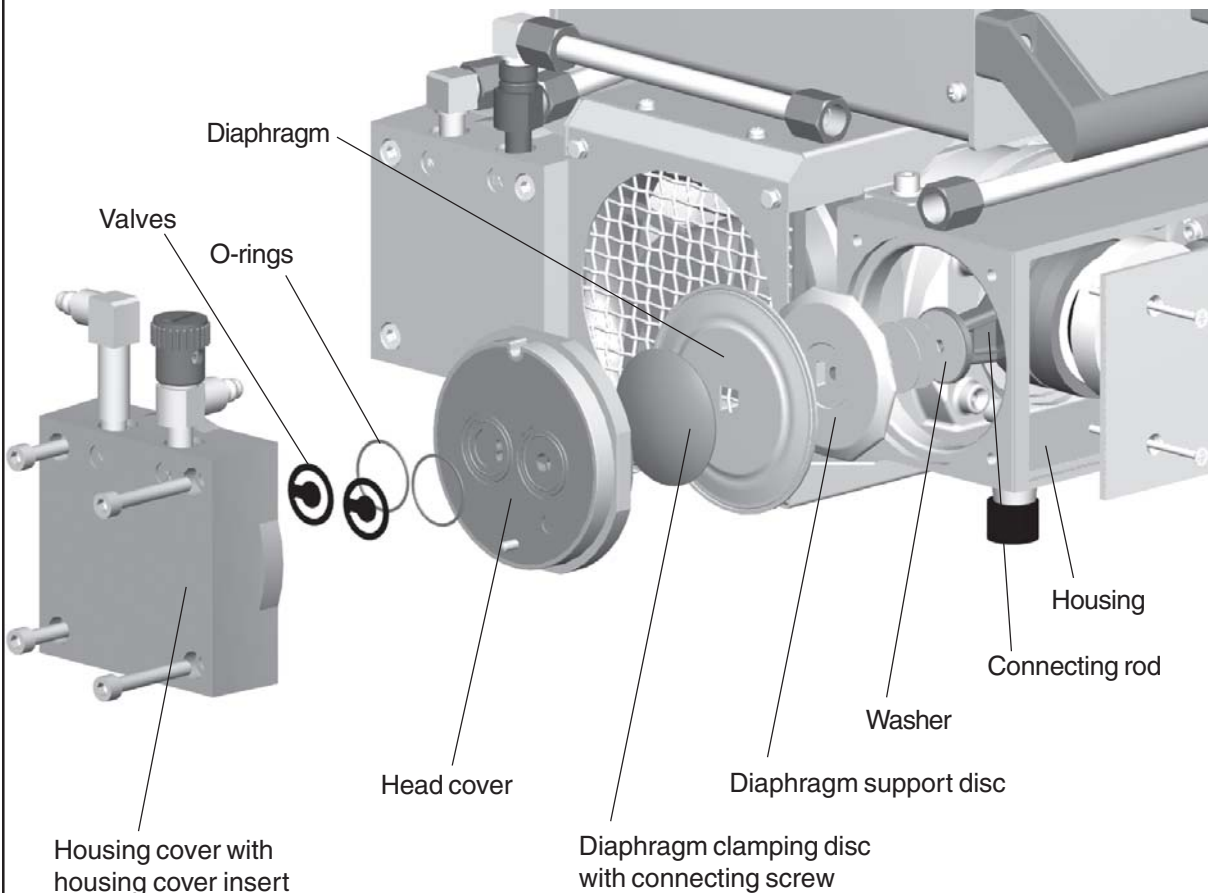


- ➔ Use open ended wrench (w/f 14) to turn elbow fitting 1/4 of a turn, remove hose. Do not remove the elbow fitting from the pump head.
- ⚠ Through reassembly a leak may result.



- ➔ Use hex key to remove four socket head screws from pump head and remove upper housing (housing cover with housing cover insert and head cover).
- ⚠ Never remove parts by using a spiky or sharp-edged tool (e.g. screw driver), we recommend to use a rubber mallet or compressed air (to be blown carefully into port).

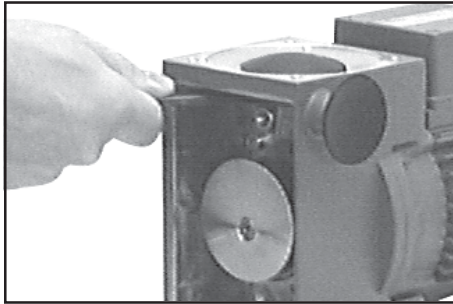
View of the disassembled pump head parts





- Remove head cover from housing cover insert and check valves. Note position of valves and remove.
- ⚠ Replace valves if necessary.
- Use petroleum ether or industrial solvent to remove deposits. Do not inhale.
- Check diaphragm for damage and replace if necessary. Use Phillips screw driver to remove four countersunk head screws and lift off housing plate.

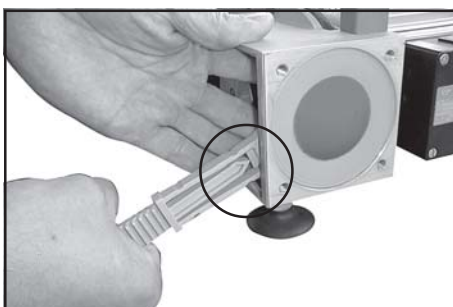
Replacing the diaphragm



- Use face wrench to remove diaphragm support disc.

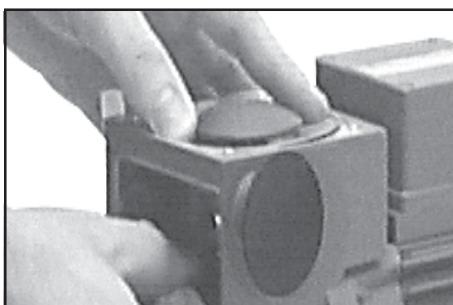


- Check for washers. Do **not mix** the washers from the different heads. Make sure that the original number is reassembled at the individual pump head.
- ⚠ Smaller number of washers: The pump will not attain final vacuum. More washers: Clamping disc will hit head cover; noise or even blockade of the pump.
- Position new diaphragm between diaphragm clamping disc with square head screw and diaphragm support disc.
- ⚠ **Note:** Position diaphragm with white PTFE side to diaphragm clamping disc (to pump chamber).

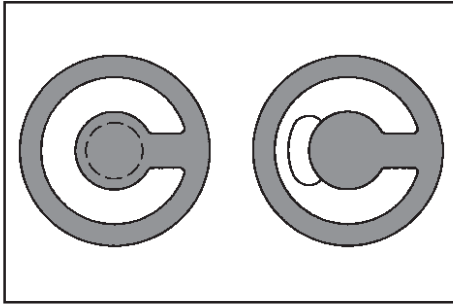


- **Use the face wrench with torque indicator** to assemble diaphragm clamping disc, diaphragm and diaphragm support disc (and eventually washers) to the connecting rod.
- ⚠ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.
- ⚠ Optimum torque for the diaphragm support disc: **6 Nm**.
- ⚠ The optimum torque is achieved if the pointer in the handle of the VACUUBRAND face wrench shows to the longer marking line.

Assembling pump heads

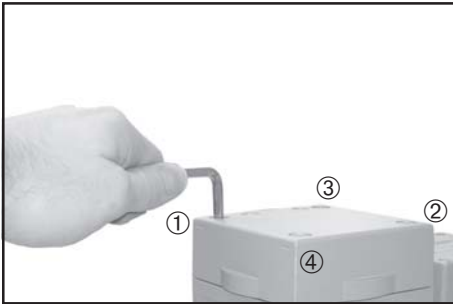


- By turning eccentric bushing (front of connecting rod), bring connecting rod into a position in which diaphragm is in contact with housing and centred with respect to bore.



Reassemble in reverse order.

- ➔ Install head cover (with O-ring if applicable), valves and housing cover.
- ⚠ Make sure that the **valves are correctly seated**: Valves at the outlet with round centred opening under valve, valves at the inlet with kidney-shaped opening beside valve.
- ➔ By turning eccentric bushing, bring connecting rod into upper turning point position (Max. stroke of the rod).
- ⚠ Pay attention that the diaphragm stays positioned centrally so that it will become clamped uniformly between housing and head cover.



- ➔ Screw in four socket head screws fixing housing cover cross-wise (e. g. in the sequence ①, ②, ③, ④) first slightly, then tighten.
- ⚠ Do not tighten until head cover is in contact with housing, torque **12 Nm**.

Individual performance check of a pump head



By measuring the pressure at the inlet port of the individual head:

Use a suitable vacuum gauge (e. g. DVR 2, cat. no.: 682902), make sure that it is correctly calibrated, and measure the pressure at the inlet port. A vacuum of less than 120 mbar should be indicated.

- ⚠ If the reading is higher, recheck the pump chamber and make sure that the valves and the diaphragms are correctly seated (diaphragms concentric with bore).

Montage of the connecting hose



- ➔ Use open ended wrench (w/f 14) to reconnect hose to elbow fitting.



- ➔ Tighten union nuts first by hand and then tighten one full turn using open ended wrench (w/f 17).

Assembling the pumping unit

PC 2003 / PC 2004:

- Assemble pump at pump support. Support pump appropriately.
- Screw in at each case two socket head screws at the front of the pump an underneath the terminal box with hex key size 5. Pay attention to washers.
- Position pump with pump support on the base plate and tighten the four hexagon nuts on the feet of the pump support (open-ended wrench w/f 10).



- Reconnect hose to the inlet of the condenser and tighten union nut.



- Use open-ended wrench to reconnect hose to elbow fitting.



- Tighten union nut first by hand and then tighten by one full turn using open-ended wrench.



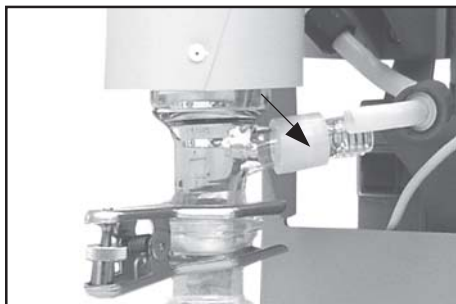
If the pump does not achieve the ultimate pressure:

- ☞ In case the diaphragms and valves have been replaced, a run-in period of several hours is required before the pump achieves its ultimate vacuum.

If all pump heads achieve a vacuum below 120 mbar but pump does not achieve the ultimate total pressure:

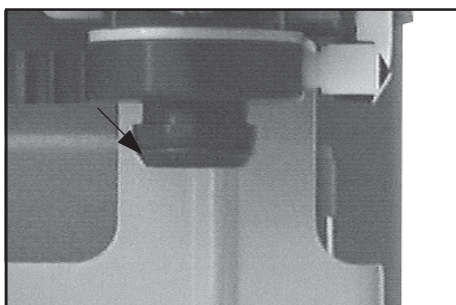
Check hose connectors between pump heads and manifolds for leaks. If necessary recheck pump chamber.

Cleaning and assembling components



Overpressure safety relief device **638821**
(at the exhaust waste vapour condenser)

- ☞ Remove union nut at the condenser and remove hose from the inlet of the condenser.
- ☞ Pull off old overpressure safety relief device and install new one.
- ☞ Connect hose to the inlet of the exhaust waste vapour condenser and tighten union nut.



Round bottom flask 500 ml, coated **638497**

O-ring 28 x 2,5 **3120553**
(FPM) at the spherical ground joint of the round bottom flask at the inlet

alternative:

O-ring 28 x 2,5 **638304**
(FEP) at the spherical ground joint of the round bottom flask at the inlet

Notes on return to the factory

Repair - return - DKD calibration



Safety and health of our staff, laws and regulations regarding the handling of dangerous goods, occupational health and safety regulations and regulations regarding safe disposal of waste require that for all pumps and other products the “**Health and safety clearance form**“ must be send to our office duly completed and signed before any equipment is dispatched to our premises.

Fax or post a completed copy of the health and safety clearance form to us in advance. The declaration must arrive before the equipment. Enclose a second completed copy with the product. If the equipment is contaminated you must notify the carrier.

No repair / DKD calibration is possible unless the correctly completed form is returned. Inevitably, there will be a delay in processing the equipment if information is missing or if this procedure is not complied with.



If the product has come in contact with chemicals, radioactive substances or other substances dangerous to health or environment, the product must be decontaminated prior to **sending it back to the factory.**

☞ Return the product to us **disassembled and cleaned** and accompanied by a certificate verifying decontamination or

☞ Contact an industrial cleaning and **decontamination service** directly or

☞ Authorize us to send the product to an industrial cleaning facility **at your expense.**

To expedite repair and to reduce costs, please enclose a detailed description of the problem and the product’s operating conditions with every product returned for repair.

We submit **quotations** only on request and always at the customer’s expense. If an order is given, the costs incurred are offset from the costs for repair or from the purchase price, if the customer prefers to buy a new product instead of repairing the defective one.



☞ **If you do not wish a repair on the basis of our quotation, the equipment might be returned to you disassembled and at your charge!**

In many cases, the **components must be cleaned in the factory** prior to repair.

For cleaning we use an environmentally responsible water based process. Unfortunately the combined attack of elevated temperature, cleaning agent, ultrasonic treatment and mechanical stress (from pressurised water) may result in damage to the paint. Please mark in the health and safety clearance form if you wish a **repaint at your expense** just in case such a damage should occur.

We also replace parts due to optical aspects upon your request.



Before returning the equipment ensure that (if applicable):

☞ Oil has been drained and an adequate quantity of fresh oil has been filled in to protect against corrosion.

☞ Equipment has been cleaned and/or decontaminated.

☞ All inlet and outlet ports have been sealed.

☞ Equipment has been properly packed, if necessary, please order an original packaging (costs will be charged), marked as appropriate and the carrier has been notified.

☞ Ensure that the completed health and safety declaration is enclosed.

We hope for your understanding for these measures, which are beyond our control.



Scrapping and waste disposal:

Dispose of the equipment and any components removed from it safely in accordance with all local and national safety and environmental requirements. Particular care must be taken with components and waste oil which have been contaminated with dangerous substances from the process. Do not incinerate fluoroelastomer seals and “O” rings.

☞ You may authorize us to dispose of the equipment **at your expense.**

Disclaimer: Our technical literature is only intended to inform our customer. The validity of general empirical values and results obtained under test conditions for specific applications depend on a number of factors beyond our control. It is therefore strictly the users' responsibility to very carefully check the validity of application to their specific requirements. No claims arising from the information provided in this literature will, consequently, be entertained.

VACUUBRAND GMBH + CO KG
-Vakuumtechnik im System-
© 2008 VACUUBRAND GMBH + CO KG Printed in Germany

Alfred-Zippe-Str. 4 - 97877 Wertheim/Germany
Tel.: +49 9342 808-0 - Fax: +49 9342 808-450
E-Mail: info@vacuubrand.de
Web: www.vacuubrand.com

