



## Technology for Vacuum Systems

### Instructions for use

### Part I of II



**Part I:**  
**Safety information - Technical data -**  
**Use and operation**

**PC 500 LAN NT**  
**PC 600 LAN NT**

**Chemistry pumping units**

Dear customer,

Your VACUUBRAND diaphragm pumps are designed to provide you with many years of trouble-free service with optimal performance. Our many years of practical experience allow us to provide a wealth of application and safety information. Please read these instructions for use before the initial operation of your pump.

VACUUBRAND diaphragm pumps combine our many years of experience in design, construction and practical operation, with the latest developments in material and manufacturing technology.

Our quality maxim is the "zero defect" principle:

Every diaphragm pump, before leaving our factory, is tested intensively, including an endurance run of 14 hours. Any faults, even those which occur rarely, are identified and can be eliminated immediately.

After completion of the endurance run, every pump is tested, and must achieve specifications before shipment.

We are committed to providing our customers only pumps that meet this high quality standard.

While our pumps cannot eliminate all of your work, we design, manufacture and test them to ensure that they will be an effective and trouble-free tool to assist you in that work.

Yours,

VACUUBRAND GMBH + CO KG


### **After sales service:**

**Contact your local dealer or call +49 9342 808-5500.**


### **Trademark index:**

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## DE

Achtung: Die vorliegende Betriebsanleitung ist nicht in allen EU-Sprachen verfügbar. Der Anwender darf die beschriebenen Geräte nur dann in Betrieb nehmen, wenn er die vorliegende Anleitung versteht oder eine fachlich korrekte Übersetzung der vollständigen Anleitung vorliegen hat. Die Betriebsanleitung muss vor Inbetriebnahme der Geräte vollständig gelesen und verstanden werden, und alle geforderten Maßnahmen müssen eingehalten werden.  "Sicherheitshinweise für Vakuumgeräte"

## EN

Attention: This manual is not available in all languages of the EU. The user must not operate the device if he does not understand this manual. In this case a technically correct translation of the complete manual has to be available. The manual must be completely read and understood before operation of the device and all required measures must be applied.  "Safety instructions for vacuum equipment"

## FR

Attention: Le mode d'emploi présent n'est pas disponible dans toutes les langues d'Union Européenne. L'utilisateur ne doit mettre le dispositif en marche que s'il comprend le mode d'emploi présent ou si une traduction complète et correcte du mode d'emploi est sous ses yeux. Le dispositif ne doit pas être mis en marche avant que le mode d'emploi ait été lu et compris complètement et seulement si le mode d'emploi est observé et tous les mesures demandées sont prises.

 «Avis de sécurité pour des dispositifs à vide»


## BG

Внимание: Тези инструкции не са преведени на всички езици от ЕО. Потребителят не бива да работи с уреда, ако не разбира инструкциите за ползване. В този случай е необходимо да бъде предоставен пълен технически превод на инструкциите за ползване. Преди работа с уреда е задължително потребителят да прочете изцяло инструкциите за работа.


 "Указания за безопасност за вакуумни уреди"

## CN

注意：该操作手册不提供所有的语言版本。操作者在没有理解手册之前，不能操作该设备。在这种情况下，需要有一个整个操作手册技术上正确的翻译。在操作该设备前，必须完全阅读并理解该操作手册，必须实施所有需要的测量。

 真空设备的安全信息

## CZ


Upozornění :Tento návod k použití není k dispozici ve všech jazycích Evropské unie. Uživatel není oprávněn požit přístroj pokud nerozumí tomuto návodu. V takovém případě je nutno zajistit technicky korektní překlad manuálu do češtiny. Návod musí být uživatelem prostudován a uživatel mu musí plně porozumět před tím než začne přístroj používat. Uživatel musí dodržet všechna příslušná a požadovaná opatření.  "Bezpečnostní upozornění pro vakuové přístroje".

## DA


Bemærk: Denne manual foreligger ikke på alle EU sprog. Brugeren må ikke betjene apparatet hvis manualen ikke er forstået. I det tilfælde skal en teknisk korrekt oversættelse af hele manual stilles til rådighed. Manual skal være gennemlæst og forstået før apparatet betjenes og alle nødvendige forholdsregler skal tages.

 »Sikkerhedsregler for vakuumdstyr«


## EE

Tähelepanu! Käesolev kasutusjuhend ei ole kõigis EL keeltes saadaval. Kasutaja ei tohi seadet käsitseda, kui ta ei saa kasutusjuhendist aru. Sel juhul peab saadaval olema kogu kasutusjuhendi tehniliselt korrektne tõlge. Enne seadme kasutamist tuleb kogu juhend läbi lugeda, see peab olema arusaadav ning kõik nõutud meetmed peavad olema rakendatud.  "Ohutusnõuded vaakumseadmetele"


## ES

Atención: Este manual no está disponible en todos los idiomas de UE. El usuario no debe manejar el instrumento si no entiende este manual. En este caso se debe disponer de una traducción técnicamente correcta del manual completo. El manual debe ser leído y entendido completamente y deben aplicarse todas las medidas de seguridad antes de manejar el instrumento.  "Notas sobre la seguridad para equipos de vacío"

## FI


Huomio: Tämä käyttöohje ei ole saatavilla kaikilla EU: n kielillä. Käyttäjä ei saa käyttää laitetta, jos hän ei ymmärrä tätä ohjekirjaa. Tässä tapauksessa on saatavilla oltava teknisesti oikein tehty ja täydellinen ohjekirjan käännös. Ennen laitteen käyttöä on ohjekirja luettava ja ymmärrettävä kokonaan sekä suoritettava kaikki tarvittavat valmistelut ja muut toimenpiteet.  "Vakuumlaitteen turvallisuustiedot"

## GR


Προσοχή! : Οι οδηγίες αυτές δεν είναι διαθέσιμες σε όλες τις γλώσσες της Ευρωπαϊκής Ένωσης. Ο χρήστης δεν πρέπει να θέσει σε λειτουργία την συσκευή αν δεν κατανοήσει πλήρως τις οδηγίες αυτές. Σε τέτοια περίπτωση ο χρήστης πρέπει να προμηθευτεί ακριβή μετάφραση του βιβλίου οδηγιών. Ο χρήστης πρέπει να διαβάσει και να κατανοήσει πλήρως τις οδηγίες χρήσης και να λάβει όλα τα απαραίτητα μέτρα πριν θέσει σε λειτουργία την συσκευή.  "Υποδείξεις ασφάλειας για αντλίες κενού"

## HR


Pažnja: ove upute ne postoje na svim jezicima Europske Unije. Korisnik nemora raditi sa aparatom ako ne razumije ove upute. U tom slučaju tehnicki ispravni prijevod cijelih uputstava mora biti na raspolaganju. Uputstva moraju biti cijela procitana i razumljiva prije rada sa aparatom i sve zahtijevane mjere moraju biti primjenjene.

 "Sigurnosne napomene za vakuumske uređaje"

## HU

Figyelem! Ez a kezelési utasítás nem áll rendelkezésre az EU összes nyelvén. Ha a felhasználó nem érti jelen használati utasítás szövegét, nem üzemeltetheti a készüléket. Ez esetben a teljes gépkönyv fordításáról gondoskodni kell. Üzembe helyezés előtt a kezelőnek végig kell olvasnia, meg kell értenie azt, továbbá az üzemeltetéshez szükséges összes mérést el kell végeznie.  "A vákuum-készülékekkel kapcsolatos biztonsági tudnivalók"

## IT

Attenzione: Questo manuale non è disponibile in tutte le lingue della Comunità Europea (CE). L'utilizzatore non deve operare con lo strumento se non comprende questo manuale. In questo caso deve essere resa disponibile una traduzione tecnicamente corretta del manuale completo. Il manuale deve essere completamente letto e compreso prima di operare con lo strumento e devono essere applicati tutti gli accorgimenti richiesti.  "Istruzioni di sicurezza per apparecchi a vuoto"


## JP

注意：この取扱説明書はすべての言語で利用可能ではありません。もしこの取扱説明書を理解できないならば、ユーザーは装置を操作してはなりません。この場合、技術的に正しい翻訳がなされた完全なマニュアルを用意しなければなりません。装置を作動する前にマニュアルを完全に読み、そして理解されなくてはなりません。そして、すべての要求される対策を講じなければなりません。


 真空装置を安全に取り扱うために

## KR


주의: 이 매뉴얼은 모든 언어로 번역되지 않습니다. 만약 이 매뉴얼의 내용을 충분히 인지하지 못했다면 기기를 작동하지 마십시오. 매뉴얼의 내용을 기술적으로 정확하게 번역한 경우에 이용하십시오. 기기를 사용하기 전에 이 매뉴얼을 충분히 읽고 이해하고 모든 요구되는 사항들을 적용해야 합니다.

 진공 장비에 대한 안전 정보


## LT

Dėmesio: šis vadovas nėra pateikiamas visomis ES kalbomis. Naudotojui draudžiama eksploatuoti įtaisą, jeigu jis nesupranta šio vadovo. Tokiu atveju reikia turėti viso vadovo techniškai taisyklingą vertimą. Vadovą būtina visą perskaityti ir suprasti pateikiamas instrukcijas prieš pradėdant eksploatuoti įtaisą, bei imtis visų reikiamų priemonių.  "Vakuuminės įrangos saugos informacija"

## LV

Uzmanību: Lietotāja instrukcija nav pieejama visās ES valodās. Lietotājs nedrīkst lietot iekārtu, ja viņš nesaprot lietotāja instrukcijā rakstīto. Šādā gadījumā, ir nepieciešams nodrošināt tehniski pareizu visas lietotāja instrukcijas tulkojumu. Pirms sākt lietot iekārtu, un, lai izpildītu visas nepieciešamās prasības, iekārtas lietotāja instrukcija ir pilnībā jāizlasa un jāsaprot.  "Vakuuma iekārtu drošības noteikumi"

## NL


Attentie: Deze gebruiksaanwijzing is niet in alle talen van de EU verkrijgbaar. De gebruiker moet niet met dit apparaat gaan werken als voor hem/haar de gebruiksaanwijzing niet voldoende duidelijk is. Bij gebruik van deze apparatuur is het noodzakelijk een technisch correcte vertaling van de complete gebruiksaanwijzing te hebben. Voor het in gebruik nemen van het apparaat moet de gebruiksaanwijzing volledig gelezen en duidelijk zijn en dienen alle benodigde maatregelen te zijn genomen.  "Veiligheidsvoorschriften voor vacuümapparaten"

## PL

Uwaga!! Ta instrukcja nie jest dostępna we wszystkich językach Unii Europejskiej. Użytkownik nie może rozpocząć pracy z urządzeniem dopóki nie przeczytał instrukcji i nie jest pewien wszystkich informacji w niej zawartych. Instrukcja musi być w całości przeczytana i zrozumiana przed podjęciem pracy z urządzeniem oraz należy podjąć wszystkie niezbędne kroki związane z prawidłowym użytkowaniem.

 "Wskazówki bezpieczeństwa do urządzeń próżniowych"

## PT


Atenção: Este manual não está disponível em todas as línguas da UE. O usuário não deve utilizar o dispositivo, se não entender este manual. Neste caso, uma tradução tecnicamente correta do manual completo tem de estar disponível. O manual deve ser lido e entendido completamente antes da utilização do equipamento e todas as medidas necessárias devem ser aplicadas.  "Informação de Segurança para Equipamento que funciona a Vácuo"

## RO

Atentie: Acest manual nu este disponibil in toate limbile EU. Utilizatorul nu trebuie sa lucreze cu aparatul daca nu intelege manualul. Astfel, va fi disponibile o traducere corecta si completa a manualului. Manualul trebuie citit si inteles in intregime inainte de a lucra cu aparatul si a luat toate masurile care se impun.

 "Instrucțiuni de siguranță pentru aparatele de vidare"

## RU

Внимание: Эта инструкция по эксплуатации не имеется на всех языках. Потребителю не дозволено эксплуатировать данный прибор, если он не понимает эту инструкцию. В этом случае нужен технически правильный перевод полной инструкции. Прежде чем использовать этот прибор, необходимо полностью прочитать и понять эту инструкцию и принять все необходимые меры.  "Указания по технике безопасности при работе с вакуумными устройствами"



## SE

Varning: Denna instruktion är inte tillgänglig på alla språk inom EU. Användaren får inte starta utrustningen om hon/han inte förstår denna instruktion. Om så är fallet måste en tekniskt korrekt instruktion göras tillgänglig. Instruktionen måste läsas och förstås helt före utrustningen tas i drift och nödvändiga åtgärder göres.


 "Säkerhetsinformation för vakuumutrustning"

## SI


Pozor: Ta navodila niso na voljo v vseh jezikih EU. Uporabnik ne sme upravljati z napravo, če ne razume teh navodil. V primeru nerazumljivosti mora biti na voljo tehnično pravilen prevod. Navodila se morajo prebrati in razumeti pred uporaba naprave, opravljene pa moraja biti tudi vse potrebne meritve.

 "Varnostni nasveti za vakuumske naprave"

## SK

Upozornenie: Tento manuál nie je k dispozícii vo všetkých jazykoch EÚ. Užívateľ nesmie obsluhovať zariadenie, pokiaľ nerozumie tomuto manuálu. V takomto prípade musí byť k dispozícii technicky správny preklad celého manuálu. Pred obsluhou zariadenia je potrebné si prečítať celý manuál a porozumieť mu, a musia byť prijaté všetky opatrenia.  "Bezpečnostné pokyny pre vákuové zariadenia"

## TR

Dikkat : Bu kullanım kitabı, tüm dillerde mevcut değildir. Kullanıcı, bu kullanım kitabını anlayamadıysa cihazı çalıştırmamalıdır. Bu durumda, komple kullanım kitabının, teknik olarak düzgün çevirisinin bulunması gerekir. Cihazın çalıştırılmasından önce kullanım kitabının komple okunması ve anlaşılması ve tüm gerekli ölçümlerin uygulanması gerekir.  "Vakumlu cihazlar için güvenlik uyarıları"

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# Safety information!

## *Important information!*

### **WARNING**

- ☞ Keep this manual complete and accessible to personnel at all times!
- ☞ Read this manual carefully before installing or operating the equipment. Observe the instructions contained in this manual.
- ☞ Do not modify the equipment without authorization.

### **NOTICE**

This manual is an integral part of the equipment described therein. It describes the safe and proper use of the vacuum pump. The manual consists of two parts. Make operating personnel aware of dangers arising from the pump and the pumped substances. **VACUUBRAND** disclaims any liability for inappropriate use of these pumps and for damage from failure to follow instructions contained in this manual.

This manual is only to be used and distributed in its complete and original form. It is strictly the users' responsibility to check carefully the validity of this manual with respect to his product.

Manual-no.: 999191 / 02/03/2014

**The following signal word panels and safety symbols are used throughout this manual:**



This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury and death.



➔ DANGER indicates a hazardous situation which, if not avoided, will result in death or serious injury.



☞ WARNING indicates a hazardous situation which, if not avoided, could result in death or serious injury.



• CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



NOTICE is used to address practices not related to personal injury.



Caution! Hot surface!



Disconnect equipment from AC power.



Dispose of electronic equipment according to regulations.

### Formatting used in this manual:

**Note:** The signal word panels in all sections of this manual always refer to all paragraphs of the same format (➔ / ☞ / • / plain text) following each signal word panel.

**The document "Safety information for vacuum equipment" is part of this manual! Read the "Safety information for vacuum equipment" and observe the instructions contained therein!**

## General information

### NOTICE

Remove all packing material from the packing box. Remove the product from its packing-box and retain all packaging until the equipment is inspected and tested. Remove the protective caps from the inlet and outlet ports and retain for future use. Inspect the equipment promptly and carefully.

If the equipment is damaged, notify the supplier and the carrier in writing within three days. Retain all packing material for inspection. State the item number of the product together with the order number and the supplier's invoice number. Failure to check and give notice of damage will void any and all warranty claims for those deficiencies.

Replace the protective caps, if the equipment is not used immediately. Store the equipment in dry and non-corrosive conditions (see also "Technical data", pg. 25).

### WARNING

☞ **Do not use any damaged equipment.**

### CAUTION

- Use the mounted handle when moving the pump.

## Intended use

### WARNING

☞ Do not use the pump or any system parts on humans or animals.

☞ Ensure that the individual components are only connected, combined and operated according to their design and as indicated in the instructions for use. Use only **original manufacturer's spare parts and accessories**. Otherwise the safety and performance of the equipment, as well as the electromagnetic compatibility of the equipment might be reduced.

The CE mark may be voided if not using original manufacturer's spare parts.

☞ Comply with all notes on correct vacuum and electrical connections; see section "Use and operation", pg. 31.

- ☞ Do not use the pump to generate pressure.
- ☞ The pumps are designed for **ambient temperatures** during operation between +50°F and +104°F (+10°C and +40°C). Periodically check maximum temperatures if installing the pump in a cabinet or a housing. Make sure ventilation is adequate to maintain recommended operating temperature. Install an external automatic ventilation system if necessary. If pumping hot process gases, make sure that the maximum permitted gas inlet temperature is not exceeded. The maximum permitted gas inlet temperature depends on several parameters like inlet pressure and ambient temperature (see “Technical data”, pg. 25).
- ☞ Particles and dust must not enter the pump.
- ☞ Do not pump liquids.

**CAUTION**

- Ensure that the pump is chemically resistant to the pumped substances prior to operation.

**NOTICE**

Use the equipment **only as intended**, that is, for generation, measurement, and control of vacuum in vessels designed for that purpose. Any other use will automatically invalidate all warranty and liability claims. Remain aware of safety and risks.

### ***Setting up and installing the equipment***

**DANGER**

- ➔ Equipment must be connected only to a **suitable electrical supply** and a suitable ground point. As such, the plug must be plugged into an outlet that is properly grounded. Failure to connect the motor to ground may result in deadly electrical shock.

The supply cable may be fitted with a molded European IEC plug or a plug suitable for your local electrical supply. The cable contains wires color coded as follows: green or green and yellow: ground; blue or white: neutral; brown or black: hot.

**⚠ WARNING**

- ☞ Due to the high compression ratio, the pump may generate overpressure at the outlet. Check pressure compatibility with system components (e.g., exhaust pipeline or exhaust valve) at the outlet.
- ☞ Do not permit any **uncontrolled pressurizing**. Make sure that the exhaust pipeline cannot become blocked. If there is an exhaust isolation valve, make sure that you cannot operate the equipment with the valve closed to avoid a **risk of bursting!**
- ☞ Maximum permissible pressure at the pressure transducer: 21.8 psi (1.5 bar) absolute.
- ☞ Keep the electrical power cord away from heated surfaces.

**⚠ CAUTION**

- Provide a firm, level platform for the equipment. Check that the system which you are going to evacuate is mechanically stable. Check that all fittings are secure. Ensure a stable position of the pump without any mechanical contact other than the pump feet.
- Comply with **maximum permissible pressures** at inlet and outlet and with **maximum permissible pressure differences** between inlet and outlet. See section “Technical data”, pg. 25. Do not operate the pump with overpressure at the inlet.
- Avoid overpressure of more than 17.5 psi absolute (1.2 bar absolute) in the event that inert gas is connected to the pump, to the gas ballast or to a venting valve.
- **Note:** Flexible elements will shrink when evacuated.
- Connect hoses gas tight at inlet and outlet of the pump.
- Ensure that no foreign objects can be drawn into the pump.
- Check the power source and the pump’s rating plate to be sure that the power source and the equipment match in voltage, phase, and frequency.



- Ensure that the **coolant outlet pipe** is always free and that it cannot get blocked. If installing an optional coolant valve, it must always be in the supply line of the exhaust waste vapor condenser.

**NOTICE**

Make sure ventilation is adequate to maintain recommended operating temperature. Keep a minimum distance of 2 in (5 cm) between the cooling fan and surrounding items (e.g., housing, walls, etc.), or else install an external automatic ventilation system. Check fan regularly for dust/dirt. Clean fan guard grill if necessary to avoid a reduction of ventilation.

Use only hoses at the inlet and outlet of the pump with an inner diameter at least as large as the diameter of the pump's tubing (to avoid overpressure at the outlet, and reduction of pumping speed at the inlet).

Allow the equipment to equilibrate to ambient temperature if you bring it from cold environment into a room prior to operation. Notice if there is water condensation on cold surfaces.

Secure coolant hoses at the hose nozzles (e.g., with hose clamp) to prevent their accidental slipping.

Comply with all **applicable and relevant safety requirements** (regulations and guidelines). **Implement the required actions and adopt suitable safety measures.**

***Ambient conditions*****! DANGER**

- ➔ Do not reach for this product if it has fallen into liquid. There is a risk of deadly electrical shock. Unplug the system immediately.

**! WARNING**

- ☞ Do not use this product in an area where it can fall or be pulled into water or other liquids.

**CAUTION**

- Adopt suitable measures in case of differences from recommended conditions, e.g., using the equipment outdoors, installation in higher altitudes, conductive pollution or external condensation on the pump.
- Do not operate this product near flames.

**NOTICE**

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. Directive EN 61010-1 gives in detail the conditions under which the equipment can be operated safely (see also IP degree of protection, "Technical data", pg. 25).

### *Operating conditions*

**DANGER**

- ➔ These pumps are not approved for operation in potentially explosive atmospheres. **Do not operate the pumps in potentially explosive atmospheres.**
- ➔ Pumps **without the "⊕x" mark on the rating plate are not approved for the pumping of potentially explosive atmospheres. Do not pump potentially explosive atmospheres** with those pumps.
- ➔ Pumps **bearing the "⊕x" mark on their rating plates are approved for the pumping of potentially explosive atmospheres** according to their classification **II 3G IIC T3 X** according to ATEX, but they are **not approved for operation in potentially explosive atmospheres** (see section "⊕x Important information: Equipment marking (ATEX)", pg. 23).
- ➔ The pumps are **not suitable** to pump any of the substances listed below.

**Do not pump:**

- **unstable substances**
- substances which react explosively under **impact** (mechanical stress) without air

- substances which react explosively when being exposed to **elevated temperatures** without air,
- substances subject to **auto-ignition**,
- substances which are **inflammable without air**
- **explosive substances**.

➔ The pumps are **not approved** for operation below ground. **Do not operate** the pump **below ground**.

### CAUTION

- **Do not pump** substances which may form **deposits** inside the pump. The pumps are not suitable for pumping substances which may form deposits inside the pump. Deposits and condensate in the pump may lead to increased temperatures even to the point of exceeding the maximum permitted temperatures.
- Check the inlet and outlet of the pump, if there is a danger of forming **deposits** inside the pump, e.g., in the pump chambers (The pump chamber is the part between diaphragm and head cover. See section “Replacing diaphragms and valves”, pg. 81). Inspect the pump chambers regularly and clean if necessary.
- **Consider interactions and chemical reactions of the pumped media.** Ensure that the materials of the pump’s wetted parts are compatible with the pumped substances, see section “Technical data”, pg. 25. When changing the substances pumped, we recommend purging the pump with air or inert gas prior to changing the pumped media. Purging the pump will pump out residues and it will reduce the possibility of reactions of the pumped substances with each other and with the pump’s materials.

### ***Safety during operation***

### DANGER

- ➔ Adopt suitable measures to prevent the release of dangerous, toxic, explosive, corrosive, noxious or polluting fluids, vapors and gases. To prevent any emission

of such substances from the pump outlet, install an appropriate collecting and disposal system and take protective action for pump and environment.

- ➔ You must take suitable precautions to prevent any formation of explosive mixtures in the pump chamber or at the outlet of the pump. In case, e.g., of a diaphragm failure, mechanically generated sparks, hot surfaces or static electricity may ignite these mixtures. Use inert gas for gas ballast or venting, if necessary.
- ➔ Drain appropriately or otherwise remove any potentially explosive mixtures at the outlet of the pump, or dilute them to non-explosive concentrations.
- ➔ Never operate this pump if it has a damaged cord or plug.

## **WARNING**

- ☞ If the pump is not working properly, has been dropped or has fallen into water, contact your pump service provider.
- ☞ Prevent any part of the human body from coming into contact with vacuum.
- ☞ Make sure that the exhaust pipeline cannot become blocked.
- ☞ Check the overpressure safety relief device at the exhaust waste vapor condenser at appropriate intervals.
- ☞ **Attention:** At pressures above approximately 795 Torr (1060 mbar) the pressure reading becomes incorrect due to saturation of the pressure transducer. The display flashes. Release pressure immediately! Risk of bursting!
- ☞ Comply with applicable regulations when disposing of chemicals. Take into consideration that chemicals may be contaminated. Take adequate precautions to protect people from the effects of dangerous substances (chemicals, thermal decomposition products of fluoro-

elastomers). Use appropriate protective clothing and safety goggles.

- ☞ Interruption of the pump (e.g., due to power failure), failure of connected components or of parts of the supply, or change in parameters must not be allowed to lead to dangerous conditions. In case of a diaphragm failure or in case of a leak in the manifold, pumped substances might be released into the environment or into the pump housing or motor.

Comply with all notes regarding proper use of the pumps, as well as operation and maintenance guidance.

- ☞ The residual **leak rate of the equipment** might render possible 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.

### CAUTION

- Ensure that no parts of your clothing, hair or fingers can be caught or drawn in at the inlet of the pump. Never insert fingers or drop any other object into the inlet or outlet.
- Pumping at high inlet pressure may lead to overpressure at the gas ballast valve. Pumped gases or condensate might be expelled if the valve is open. If an inert gas supply is connected to the gas ballast, ensure that its inlet pipeline is not contaminated.
- You must take suitable precautions to prevent any dangerous situation from arising if the controller starts a vacuum pump (in combination with a VMS Module), switches an in-line valve or a coolant valve, or opens a venting valve.
- **Attention:** If the controller is set to **Autostart** (*Auto-St. : On*), the process will start immediately after a power failure without pressing any further key. It is your responsibility to ensure that automatic start-up of the

system will not lead to any dangerous condition. Provide appropriate safety measures. Check prior to starting the process whether the option "Autostart" (device menu) is enabled.



- Pay attention to the safety symbol "hot surfaces" on the equipment. Hot parts may cause burns if touched. Adopt suitable measures to prevent any danger arising from hot surfaces or electric sparks. Ensure that hot surfaces of the pump do not cause burns. Provide a suitable contact guard if necessary.
- Ensure that the **coolant outlet pipe** at the waste vapor condenser is always free and that it cannot get blocked.

## NOTICE

Prevent the backpressure of gases and the backflow of condensates at the outlet.

Check the liquid level in the catchpots regularly and drain condensate in time to prevent overflowing. Install a level sensor (see "Accessories", pg. 74) for monitoring, if necessary.

Provide appropriate protective measures to allow for the possibility of failure and **malfunction**. The protective measures must also allow for the requirements of the respective application.

The VNC 2 controller is powered by a short circuit proof wide-range power supply with integrated overload protection and a user-servicable slow-blow fuse T8A (one spare fuse included in fuse compartment of VNC 2).

In case of overload, the motor is shut down by a **self-hold thermal cutout** in the winding.

**Note:** Only manual reset is possible. Switch off the pump and disconnect from the power source. Identify and eliminate the cause of failure. Wait approx. five minutes before restarting the pump.




**CAUTION**

- **Note:** In case of **supply voltage below 100V**, the lock of the cutout might be impaired and the pump may restart on its own after sufficient cooling down. Take appropriate precautions, if an automatic restart of the pump may lead to a dangerous situation (e.g., switch off the pump and disconnect from the power source).

## *Maintenance and repair*


**NOTICE**

In order to comply with laws (occupational, health and safety regulations, safety at work law and regulations for environmental protection) vacuum pumps, components and measuring instruments can only be returned when certain procedures (see section “Notes on return to the factory”, pg. 96) are followed.

Take advantage of our service seminars, which put special focus on the maintenance and repair of vacuum pumps. For details and for the online “Instructions for repair” manual see [www.vacuubrand.com](http://www.vacuubrand.com).

In normal use, the lifetime of the diaphragms and valves is typically 15,000 operating hours. Bearings have a typical durability of 40000 h. Motor capacitors have a typical durability in the range of 10000 to 40000 h depending strongly on operation conditions including ambient temperature, humidity or load.


**DANGER**


- ➔ **Ensure that the pump cannot be operated accidentally. Never operate the pump if covers or other parts of the pump are disassembled.**
- ➔ **Switch off the pump. Disconnect the electrical power cord and wait five seconds** before starting maintenance to allow the capacitors to discharge.
- ➔ **Note:** The pump may be contaminated with process chemicals, which have been pumped during operation. Ensure that the pump is completely decontaminated before maintenance commences.

**WARNING**

- ☞ Take adequate precautions to protect people from the effects of dangerous substances if contamination has occurred. Use appropriate protective clothing, safety goggles and protective gloves.
- ☞ **Wear parts have to be replaced regularly.**
- ☞ **Never operate a defective or damaged pump.**
- ☞ Check every motor capacitor regularly by measuring its capacity and estimating its time in operation. Replace old capacitors early enough to prevent a failure in operation. If an old motor capacitor fails, the capacitor may get hot. It may even melt or emit a flame, which could be **dangerous for persons and equipment in the vicinity**. The capacitors have to be replaced by an electrician.
- ☞ Vent the pump before starting maintenance. Isolate the pump and other components from the vacuum system. Allow sufficient cooling of the pump. Separate the pump from the coolant circuit and drain condensate, if applicable.

**NOTICE**

Ensure that **maintenance** is done only by suitably trained and supervised technicians. Ensure that the maintenance technician is familiar with the safety procedures, which relate to the products processed by the pumping system. Only dismantle the pump as far as necessary.

**⊕ *Important information: Equipment marking (ATEX)*****VACUUBRAND equipment bearing mark (see rating plate)**

**⊕ II 3G IIC T3 X**  
**Internal Atm. only**  
**Tech. File Ref.: VAC-EX01**

**and**

**VACUUBRAND equipment bearing mark (see rating plate)**

**⊕ X see manual**

For equipment labelled with „⊕ X see manual“ the following classification according to Directive 94/9/EC (ATEX) is valid: ⊕ II 3G IIC T3 X, Internal Atm. only, Tech. File Ref.: VAC-EX01.

The classification II 3G IIC T3 X according to ATEX is only valid for the inner part (wetted part, pumped gas or vapor) of the equipment. The equipment is not suitable for use in external, potentially explosive atmospheres (environment).

The overall category of the equipment depends on the connected components. If the connected components do not comply with the classification of the VACUUBRAND equipment, the specified category of the VACUUBRAND equipment is no longer valid.

Vacuum pumps and vacuum gauges in category 3 are intended for connection to equipment in which during normal operation explosive atmospheres caused by gases, vapors or mists normally don't occur; or, if they do occur, are likely to do so only infrequently and for a short period only. Equipment in this category ensures the requisite level of protection during normal operation.

The use of gas ballast or the operation of venting valves is only permitted if thereby explosive atmospheres normally don't occur in the interior of the equipment or, if they do occur, are likely to do so only infrequently and for a short period.

The pumps are marked with "X" (according to EN 13463-1), i.e., restrictions of the operation conditions:

- The equipment is designated for a low degree of mechanical stress and has to be installed in a way so that it cannot be damaged from outside.  
Pumping units have to be installed so that they are protected against shocks from the outside and against glass splinters in the event of breakage (implosion).
- The equipment is designated for an ambient and gas inlet temperature during operation of +10 to +40°C. Never exceed these ambient and gas inlet temperatures. If pumping / measuring gases which are not potentially explosive, extended gas inlet temperatures are permissible. See instructions for use, section "Gas inlet temperatures" or "Technical data".

After any intervention at the equipment (e.g., repair / maintenance) the ultimate vacuum of the pump has to be checked. Only if the pump achieves its specified ultimate vacuum is the pump's leak rate low enough to ensure that no explosive atmospheres will occur in the interior of the equipment.

After any intervention at the vacuum sensor, the leak rate of the equipment has to be checked.



**Attention: This manual is not available in all languages of the EU. The user must not operate the device if he does not understand this manual. In this case a technically correct translation of the complete manual has to be available. The manual must be completely read and understood before operation of the device. All specified measures must be applied, or else must be replaced by equivalent measures at the user's own risk.**

# Technical data

Type		PC 500 LAN NT	PC 600 LAN NT
Maximum pumping speed* 50/60 Hz (ISO 21360)	cfm (m <sup>3</sup> /h)	1.2 / 1.4 (2.0 / 2.3)	2.0 / 2.2 (3.4 / 3.8)
Ultimate vacuum (absolute) without gas ballast	Torr (mbar)	5.3 (7)	1.1 (1.5)
Ultimate vacuum (absolute) with gas ballast	Torr (mbar)	9.0 (12)	2.3 (3)
Maximum permissible inlet pressure (absolute)	psi (bar)	16 (1.1)	
Maximum permissible outlet pressure (absolute)	psi (bar)	16 (1.1)	
Maximum pressure difference between inlet and outlet	psi (bar)	16 (1.1)	
Maximum permissible pressure (absolute) at gas ballast valve	psi (bar)	17.5 (1.2)	
Permissible ambient temperature storage / operation	°F (°C)	14 to 140 / 50 to 104 (-10 to +60 / +10 to +40)	
Permissible relative atmospheric moisture during operation (no condensation)	%	30 to 85	
Maximum permissible installation altitude above mean sea level	ft (m)	6500 (2000)	
Rated motor power	hp (kW)	0.24 (0.18)	0.34 (0.25)
No-load speed 50/60 Hz	rpm	1500 / 1800	
Maximum permissible range of supply voltage ( ±10% ) Attention: Observe specifications of rating plate!		100-115 V~ 50/60 Hz, 120 V~ 60 Hz 230 V~ 50/60 Hz	
Maximum rated current at: 100-115 V~ 50/60 Hz, 120 V~ 60 Hz 230 V~ 50/60 Hz	A A	3.4 1.8	5.7 3.0
Device fuse		2 slow blow fuses 6.3A	
Motor protection		thermal cutout, manual reset	

\* Pumping speed of diaphragm pump

Type		PC 500 LAN NT	PC 600 LAN NT
Degree of protection IEC 529		IP 40	
Inlet		connection for PTFE tube O.D. 3/8", I.D. 5/16" (10 / 8 mm)	
Outlet		hose nozzle for tubing I.D. 3/8" (hose nozzle DN 10 mm)	
Coolant connection (waste vapor condenser)		hose nozzle for tubing I.D. 1/4" - 5/16" (hose nozzle DN 6-8 mm)	
Maximum permissible pressure of coolant at waste vapor condenser	psi (bar)	87 (absolute) (6 (absolute))	
Permissible range of cool- ant temperature (waste vapor condenser)	°F (°C)	5 to 68 (-15 to +20)	
Volume of catchpot (only pumping unit)	qt (ml)	0.52 (500)	
A-weighted emission sound pressure level** (uncertainty $K_{pA}$ : 3 dB(A))	dB(A)	45	
Dimensions L x W x H approx.	in (mm)	16.1 x 10.4 x 15.8 (408 x 264 x 402)	16.1 x 10.4 x 18.5 (408 x 264 x 470)
Weight approx.	lbs. (kg)	33.7 (15.3)	40.6 (18.4)

\*\* Measurement according to EN ISO 2151:2004 and EN ISO 3744:1995 at 230V/50Hz and ultimate vacuum with exhaust tube at outlet.

Controller	VNC 2
Pressure transducer	ceramic diaphragm (alumina), capacitive, absolute pressure, gas type independent
Display	LCD alphanumeric display, illuminated 2 x 8 characters
Pressure units / scale (selectable)	Torr, mbar or hPa
Measuring range (absolute)	825 - 1 Torr (1100 - 1 mbar)
Maximum control range (absolute)*	795 - 1 Torr (1060 - 1 mbar)
Maximum permissible pressure at pres- sure transducer (absolute)	1125 Torr (1.5 bar)
Maximum permissible temperature of gaseous media**	continuous operation: 104°F (40°C), for short periods (less than 5 minutes) up to 176°F (80°C)



<b>Controller</b>	<b>VNC 2</b>
Measurement uncertainty (absolute) after careful adjustment and at constant temperature	<± 0.75 Torr (1 mbar) ± 1 digit
Temperature coefficient	<± 0.05 Torr/K (0.07 mbar/K)
Ambient temperature range (operation)	50°F to 104°F (10°C to +40°C)
Ambient temperature range (storage)	14°F to 158°F (-10°C to +70°C)
Permissible relative atmospheric moisture during operation (no condensation)	30% to 85%
Maximum permitted range of supply voltage	100 V~ (-10%) to 230 V~ (+10%) 50/60 Hz
Fuse (IEC connection)	slow-blow fuse 5x20 mm, T8A / 250 V
Power draw (no-load operation)	3 VA
Power draw with VACUUBRAND VV-B 6C in-line valve and coolant valve	max. 10 VA (without switch output)
Interface	RS-232 C
Supply line VACUU•BUS voltage supply 110-230 V 50/60 Hz voltage supply 100-110 V 50/60 Hz  designed for the simultaneous operation (parallel connection) with the following original accessories:	24 V, max. 400 mA 24 V, max. 340 mA  in-line valve VV-B 6C 24 V DC coolant valve VKW-B 24 V DC venting valve VB M-B 24 V DC
Breaking capacity of IEC socket ambient temperature 86°F (30°C) ambient temperature 104°F (40°C)	7.2(4) <sup>***</sup> A 250 V~ / 7.2(7.2) <sup>***</sup> A 125 V~ 6(4) <sup>***</sup> A 250 V~ / 6(6) <sup>***</sup> A 125 V~
Degree of protection IEC 529	IP 20
Vacuum connection	connection for PTFE tube O.D. 3/8", I.D. 5/16" (10 / 8 mm)
Weight approx.	1.8 lbs. (0.8 kg)
Dimensions L x W x H approx. (without connection for PTFE tube)	6.4" x 3.5" x 2.7" (163 mm x 90 mm x 68 mm)
Mounting of stand rod	via thread M8
Power supply	integrated IEC combination

\* The actual vacuum control range in your application might be reduced due to ultimate vacuum of the pump, volume of gas present, etc.

\*\* if pumping potentially explosive atmospheres: 50 °F to 104 °F (+10°C to +40°C)

\*\*\*ohmic (inductive) load

## Wetted parts

Components	Wetted materials
<b>Pump</b>	
Head cover; diaphragm clamping disc	ETFE carbon fiber reinforced
Diaphragm	PTFE
Valves	FFKM
O-rings	FPM
Valve head	ECTFE carbon fiber reinforced
Tubing	PTFE
Gas ballast tube	PTFE carbon reinforced
<b>Pumping unit</b>	
Inlet pumping unit	PPS
Outlet pumping unit	PET
Distribution head	PPS glass fiber reinforced
Tubing	PTFE
Screw-in fittings	ETFE / ECTFE
O-ring at the catchpot	Fluoroelastomer
Overpressure safety relief device at exhaust waste vapor condenser	Silicone rubber / PTFE foil
Exhaust waste vapor condenser / catchpot	Borosilicate glass
<b>VNC 2</b>	
Sensor	Aluminum oxide ceramic
Sensor housing	PPS / glass fiber
Sensor seal	Chemically resistant fluoroelastomer
Venting valve seal	FPM

**We reserve the right for technical modification without prior notice!**

## Gas inlet temperatures

Operating condition	Inlet pressure	Permitted range of gas temperatures at inlet
Continuous operation	> 75 Torr (100 mbar) (high gas load)	➡ 50 °F to 104 °F (+10°C to +40°C)
Continuous operation	< 75 Torr (100 mbar) (low gas load)	➡ 32 °F to 140 °F* (0°C to +60°C*)
Short-time (< 5 minutes)	< 75 Torr (100 mbar) (low gas load)	➡ 14 °F to 176 °F* (-10°C to +80°C*)

\* if pumping potentially explosive atmospheres: 50 °F to 104 °F (+10°C to +40°C)

## Abbreviations

**ETFE:** Ethylene/Tetrafluoroethylene  
**ECTFE:** Ethylene/Chlorotrifluoroethylene  
**FFKM:** Perfluoro elastomer  
**FPM:** Fluoroelastomer  
**PET:** Polyethylene terephthalate  
**PPS:** Polyphenylene sulfide  
**PTFE:** Polytetrafluoroethylene

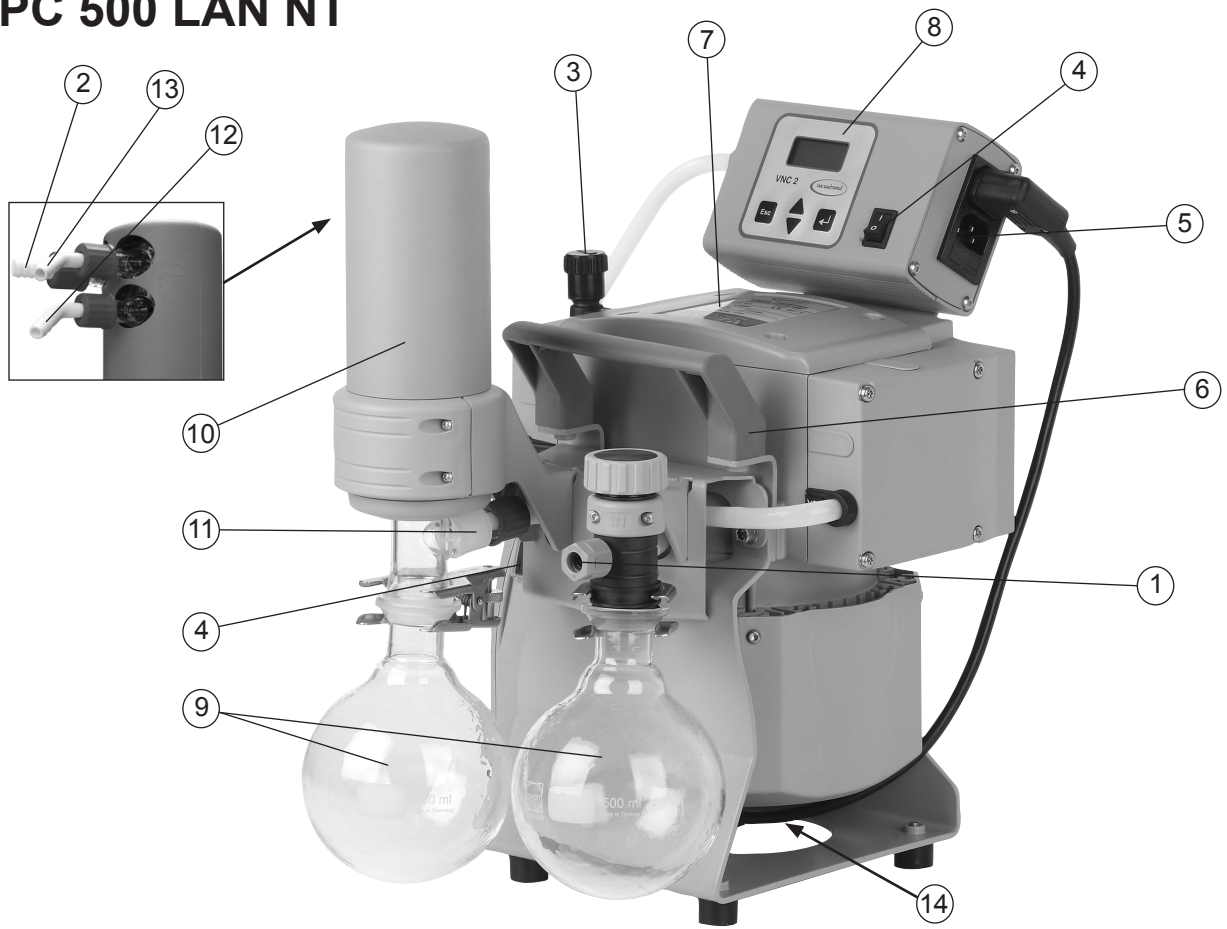
**We reserve the right for technical modification without prior notice!**

## Pump parts

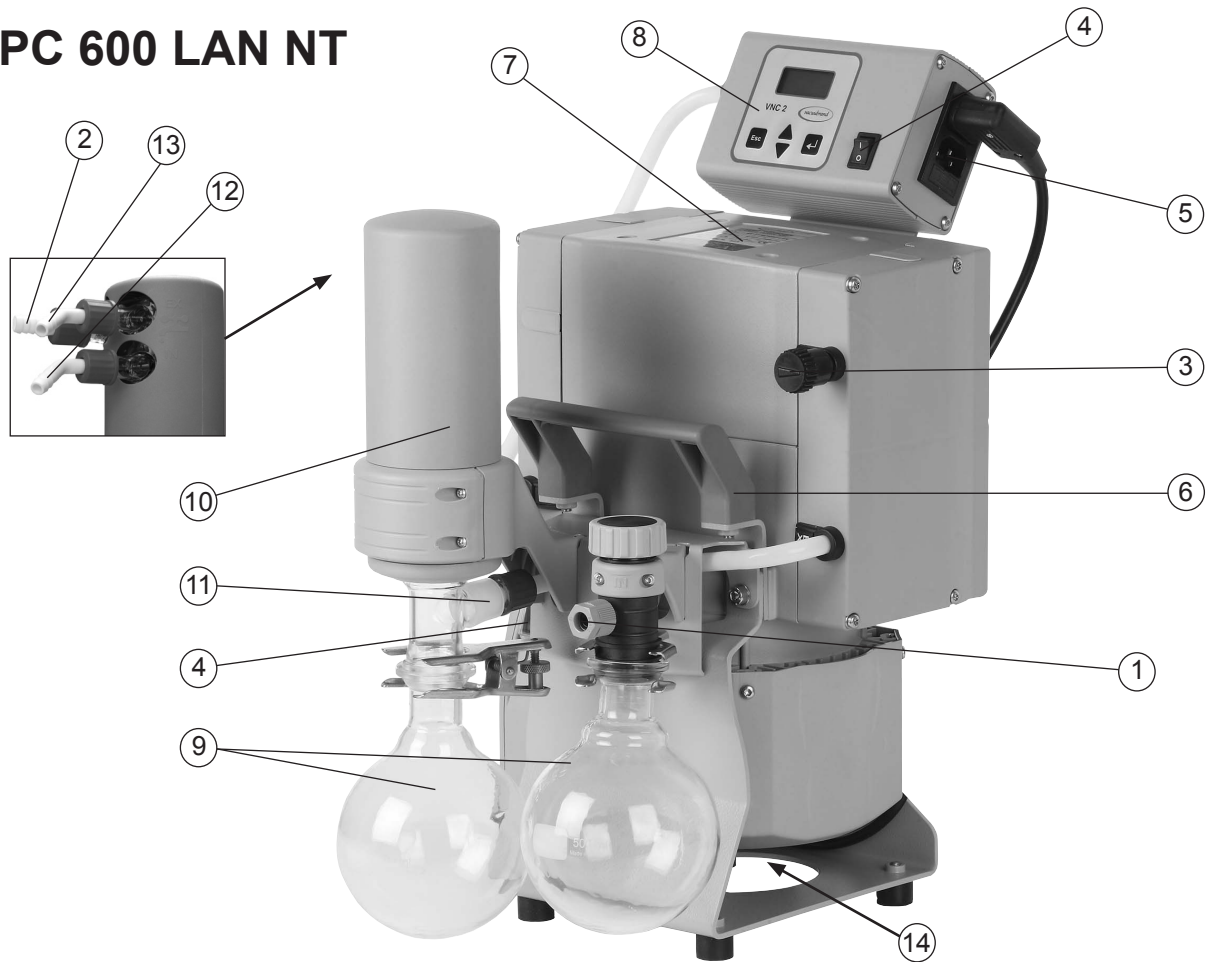
Position	Component
1	Inlet
2	Outlet
3	Gas ballast valve
4	ON/OFF switch
5	Mains connection
6	Handle
7	Pump rating plate
8	Controller VNC 2

Position	Component
9	Catchpot
10	Exhaust waste vapor condenser
11	Overpressure safety relief device
12	Coolant inlet
13	Coolant outlet
14	Fan

### PC 500 LAN NT



### PC 600 LAN NT



# Use and operation

When switching on the controller VNC 2 for the very first time, a menu to select the language of the controller menu is displayed. Select the desired language (e.g., "English") by pressing the ▼ or ▲ keys and press "Enter" to confirm. Then select the pressure unit ("mbar", "Torr" or "hPa") in the same way.

**It is possible to access the language selection menu at any time via the "Device menu".**

## *Installing a pump in a vacuum system*

### **DANGER**

- ➔ If dangerous or polluting fluids could be released at the outlet, install an appropriate system to catch and dispose of those fluids.

### **WARNING**

- ☞ Connect a gas-tight exhaust line at the pump outlet if necessary. Always vent exhaust gases appropriately (e.g., into a fume hood).
- ☞ Never block the gas outlet. The exhaust line must always be free of obstructions (no back pressure) to ensure an unimpeded discharge of gas. The cross-section of the outlet tubing must be at least the size of the pump's exhaust connection.
- ☞ Maximum permissible pressure: 21.8 psi (1.5 bar) absolute.
- ☞ **Attention:** At pressures above approximately 795 Torr (1060 mbar) the pressure reading becomes incorrect due to saturation of the pressure transducer. The display will flash. Release pressure immediately! Risk of bursting!
- ☞ Particles and dust must not be aspirated. If necessary, you must install appropriate filters. You must ensure their suitability concerning gas flow, chemical resistance and resistance to clogging prior to use.

- ☞ Make sure ventilation is adequate, especially if the pump is installed in an enclosure, or if the ambient temperature is elevated. Provide external ventilation, if necessary.

**CAUTION**

- Reduce the transmission of vibration. Prevent mechanical load due to rigid pipelines. Insert elastic hoses or flexible elements as couplings between the pump and rigid pipes.

**Note:** Flexible elements will compress or flatten when evacuated if not designed for use under vacuum.

- Hose connections at the pump inlet must always be gas tight.
- A power failure may cause accidental ventilation of the pump, especially if the gas ballast valve is open. If this constitutes a potential source of danger, take appropriate safety measures.
- Check the power source and the pump's rating plate to be sure that the power source and the equipment match in voltage, phase, and frequency.

**NOTICE**

Make sure ventilation is adequate to maintain recommended operating temperature. Keep a minimum distance of 2 in (5 cm) between the cooling fan and surrounding items (e.g., housing, walls, etc.), or else install an external automatic ventilation system.

Use connecting hoses with large diameter and keep them as short as possible to avoid flow losses. Locate the pump as closely as possible to the application.

Always install outlet tubing descending from the pump or provide other measures to avoid backflow of condensate towards the pump.

When assembling, ensure **vacuum-tightness**. After assembly, check the whole system for leaks.

Secure hose connections at the pump appropriately, e.g., with hose clamps, to protect against accidental detachment.



To reduce pump noise emanating from the pump exhaust port, connect an exhaust hose or use a silencer (see “Accessories”, pg. 74).

The VACUUBRAND VNC 2 controller can only be operated with components compatible with the VACUUBRAND VACUU•BUS system, (see “Accessories”, pg. 74).

The VNC 2 vacuum controller controls VACUUBRAND diaphragm pumps NT and optional in-line, coolant, and venting valves. Connected components (e.g., venting valve, level sensor, external pressure transducer VSK 3000) are automatically identified and configured.

**Do not use more than one controller within the same VACUU•BUS system. Several controllers in the same VACUU•BUS system will interfere with each other and result in error messages of the connected components (pumps, valves).**

## VNC 2

The VNC 2 is equipped with an internal capacitive pressure transducer with ceramic diaphragm. It measures the actual pressure independently of the gas type, and with reference to the vacuum, i.e., absolute.



Inside a vacuum system where evaporation occurs, e.g., a rotary evaporator, the vacuum is not uniform. For example, a condenser can act as a pump, or the vacuum in the connecting tubing can be higher or lower than in the application itself. This affects the measurement results as well as the control levels.

Therefore, carefully choose the position where to connect an external (optional) gauge head. Position an optional external gauge head and its vacuum line in such a way that condensate cannot flow towards the pressure transducer. Condensate and deposits will affect the measurement results. Clean the pressure transducer, if necessary. See section “Cleaning the pressure transducer”, pg. 61.



## Connection of components at the controller



At the side of the controller are the serial interface RS-232 C and VACUU•BUS jacks for connection of accessory components: in-line valve / coolant valve / external pressure transducer / external venting valve / etc.

- ☞ Plug the VACUU•BUS lines of accessory components into the VACUU•BUS jacks. Do not apply off-axis forces when assembling or removing plug connections! Observe correct orientation of the plugs.

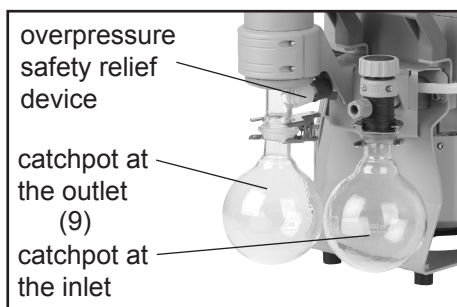
### Catchpots:

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

- ☞ Enhances lifetimes of diaphragms and valves.
- ☞ Improves vacuum performance in applications with condensable vapors.

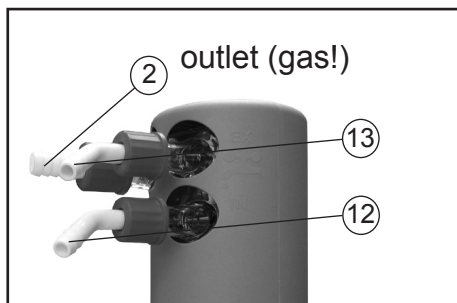
Both catchpots are coated with a protective layer to protect against shattering in case of breakage or implosion.

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



### Exhaust waste vapor condenser:

- ➡ Assemble the hose nozzles for coolant inlet (12) and coolant outlet (13) tubing at the exhaust waste vapor condenser.



The exhaust waste vapor condenser enables an efficient condensation of the pumped vapors at the outlet.

- ☞ No backflow of condensates.
- ☞ Controlled recovery of condensates.
- ☞ Close to 100% solvent recovery.
- ☞ The isolation cover protects against glass splinters in case of breakage, acts as thermal isolation to avoid

condensation of humidity and is intended to absorb shocks.

- ➔ Attach the tubing of the coolant circuit to the respective hose nozzles (hose nozzles for tubing I.D. 1/4"-5/16" (6-8 mm), see image) at the waste vapor condenser.

## NOTICE

Check all hose connections prior to starting operation of the cooling system.

Secure coolant hoses at the hose nozzles (e.g., with hose clamps) to prevent their accidentally slipping off.

## DANGER

- ➔ Prevent the discharge of dangerous gases and vapors to the surrounding atmosphere. If appropriate, connect the exhaust line to a suitable treatment system.

## WARNING

- ☞ Never block the gas outlet ((2) hose nozzle for tubing I.D. 3/8" (10 mm)). The exhaust hose has always to be unobstructed and without back pressure to enable an unhindered discharge of gases and protect the pump valves from damage.

## CAUTION

- **Note:** Install the hoses of the cooling system in a way to avoid the flow / dripping of condensed water onto the pumping unit (especially cables and electronic parts, see also IP degree of protection, "Technical data", pg. 25).
- Ensure that the **coolant outlet tubing** is always unobstructed and that it cannot get blocked.
- Maximum permissible coolant pressure at the exhaust waste vapor condenser: 87 psi (6 bar) absolute. Outlet flow must always be unhindered.
- Comply with the maximum permissible coolant pressures of additional components in the coolant circuit (e.g., coolant valve).
- Avoid overpressure in the coolant circuit (e.g., caused by blocked or squeezed coolant hoses).
- Only install the optional coolant valve in the supply line of the exhaust waste vapor condenser.

The pumping units feature two separate ON/OFF switches, one at the diaphragm pump and another one at the VNC 2 controller. To operate the pumping unit you must switch on both the pump and the controller!

### *During operation*

#### **DANGER**

- ➔ Vent and dispose of **potentially dangerous gases or vapors** at the outlet of the pump appropriately.

#### **WARNING**

- ☞ Due to the high compression ratio, the pump might generate overpressure at the outlet. Check pressure compatibility with system components (e.g., exhaust tubing or exhaust valve) at the outlet. Ensure that the pump outlet is neither blocked nor restricted.

- ☞ **Maximum ambient temperature:** 104 °F (40 °C)  
Check the maximum temperatures, if installing the pump in a cabinet or a housing. Make sure ventilation is adequate, especially if the ambient temperature is elevated.

- ☞ Operation with silencer (accessory) at the outlet: Operating the pump at a high inlet pressure or pumping dusty gases for a long time may cause clogging of the silencer. Check the silencer regularly and replace if necessary.

#### **CAUTION**

- If the pump is installed at an altitude of more than 6500 ft (2000 m) above mean sea level, check compatibility with applicable safety requirements, and adopt suitable measures. There is a risk of the motor overheating due to insufficient cooling.
- Check compatibility with the **maximally permitted pressure** at outlet and the **maximum pressure difference** between inlet and outlet ports.

**NOTICE**

Do not start the pump if the **pressure difference between inlet and outlet ports exceeds max. 16.0 psi (1.1 bar)**. Attempts to start the pump at higher pressure difference may cause stalling and damage of the motor.

If pumping condensable vapors (water vapor, solvents, etc.), let the pump run with **gas ballast** to help purge any condensation in the pump.

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

Check the pump regularly for external soiling and deposits. Clean the pump if necessary to avoid an increase of the pump's operating temperature.

In case of overload, the motor is shut down by a **self-hold thermal circuit breaker** in the winding.

**Note:** Only a manual reset is possible. Switch off the pump and disconnect the electrical power cord. Identify and eliminate the cause of failure. Wait approximately five minutes before restarting the pump.

**CAUTION**

- **Note:** In case of **supply voltage below 100V**, the lock of the breaker may not latch and the pump might restart on its own after sufficient cooling. Take appropriate precautions, if an automatic restart of the pump may lead to a dangerous situation.

**NOTICE**

A warm up period (approximately 15 min.) is required to ensure that the rated ultimate vacuum and pumping speed are attained. Avoid overheating (e.g., due to hot process gases).

### ***Important notes regarding the use of gas ballast***

Gas ballast is a continuous purge to keep the pump's interior as clean as possible and to reduce the possibility of condensation inside the pump.

**! DANGER**

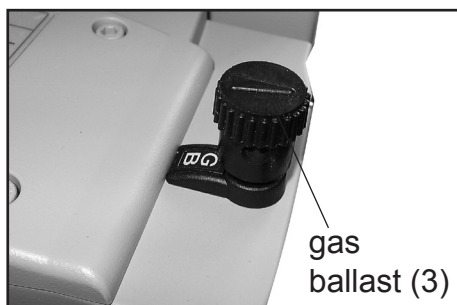
➔ Air and pumped media might react inside the pump or at the outlet of the pump and form hazardous or explosive mixtures, when you use air rather than inert gas for the gas ballast. This constitutes a risk of significant damage to equipment and/or facilities, a risk of personal injury or even loss of life.

**! WARNING**

☞ Make sure that air/gas intake through the gas ballast valve can never lead to hazardous, explosive or otherwise dangerous mixtures. If in doubt, use inert gas.

**NOTICE**

To reduce condensation in the pump, do not pump vapor before the pump has reached its operating temperature. Open the gas ballast valve when pumping condensable vapors. Turn gas ballast cap to open valve.



For **condensable vapors** (water vapor, solvents, etc.):

- The gas ballast valve is open if the arrow on the gas ballast cap is pointing towards the labelling "GB".
- With gas ballast valve open, the ultimate vacuum will be reduced.
- Use inert gas for gas ballast to avoid the formation of explosive mixtures. A special adapter fitting is needed to connect an inert gas supply line (see "Accessories", pg. 74). This adapter replaces the standard gas ballast cap and allows for an inert gas line to be connected via a KF DN 16 small flange at a maximum supply pressure of 17.5 psi (1.2 bar) absolute.
- Close the gas ballast valve by turning the cap 180°.

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 rate at the exhaust waste vapor condenser.

## ***Important notes concerning the operation of the exhaust waste vapor condenser***

### **! DANGER**

- ➔ Connect the exhaust to a suitable treatment system to prevent the discharge of dangerous gases and vapors to the surrounding atmosphere.

### **! WARNING**

- ☞ Never block the gas outlet ((2) hose nozzle for tubing I.D. 3/8" (10 mm)). The exhaust hose must always be unobstructed and without back-pressure to enable an unhindered discharge of gases.
- ☞ Check the overpressure safety relief device (11) at the exhaust waste vapor condenser (10) regularly; replace if necessary. Check especially for deterioration, coalescence and cracks.

### **! CAUTION**

- Ensure that the **coolant outlet hose** is always free and that it cannot get blocked.
- Maximum permissible coolant pressure at the exhaust waste vapor condenser: 87 psi (6 bar) absolute
- Comply with the maximum permissible coolant pressures of additional components in the coolant circuit (e.g., coolant valve).
- We strongly recommend installing an optional coolant valve (see "Accessories", pg. 74) **in the supply line** of the exhaust vapor condenser to save water and reduce the risk of water spill.
- Avoid overpressure in the coolant circuit (e.g., caused by blocked or kinked coolant hoses).

### **NOTICE**

In case of **condensation**: Check the liquid level in both catchpots (9) during operation. Check the liquid level regularly. Do not allow the catchpots to overflow. Drain catchpots in time to avoid overflow. Install a level sensor (see "Accessories", pg. 74) for monitoring, if necessary.

The maximum liquid level is at approximately 80% of the total filling level to avoid problems when removing the catchpots.



Permissible range of coolant temperature at the exhaust waste vapor condenser:

5 °F to 68 °F (-15°C to +20°C)

Check hose connections prior to starting operation of the cooling system.

Check coolant hoses regularly during operation.

### **Removing the catchpots:**

Catchpot at outlet:

Remove joint clip. Remove catchpot and drain condensate.

Catchpot at inlet:

Admit air or inert gas (via the pump inlet) to restore atmospheric pressure in the catchpot before attempting removal. Remove joint clip. Remove catchpot and drain condensate.

### **NOTICE**

Reattach drained catchpots.

### **WARNING**

☞ **Important:** Comply with regulations when disposing of solvents/condensates. Recycle if possible; purify if contaminated.

## ***Shutdown & storage***

The pump can be switched off under vacuum.

### **NOTICE**

#### **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 form **deposits**?

- Check and clean pump heads if necessary.

Has the pressure transducer been exposed to media which may form deposits?



- Clean pressure transducer at the controller if necessary.

**Long-term:**

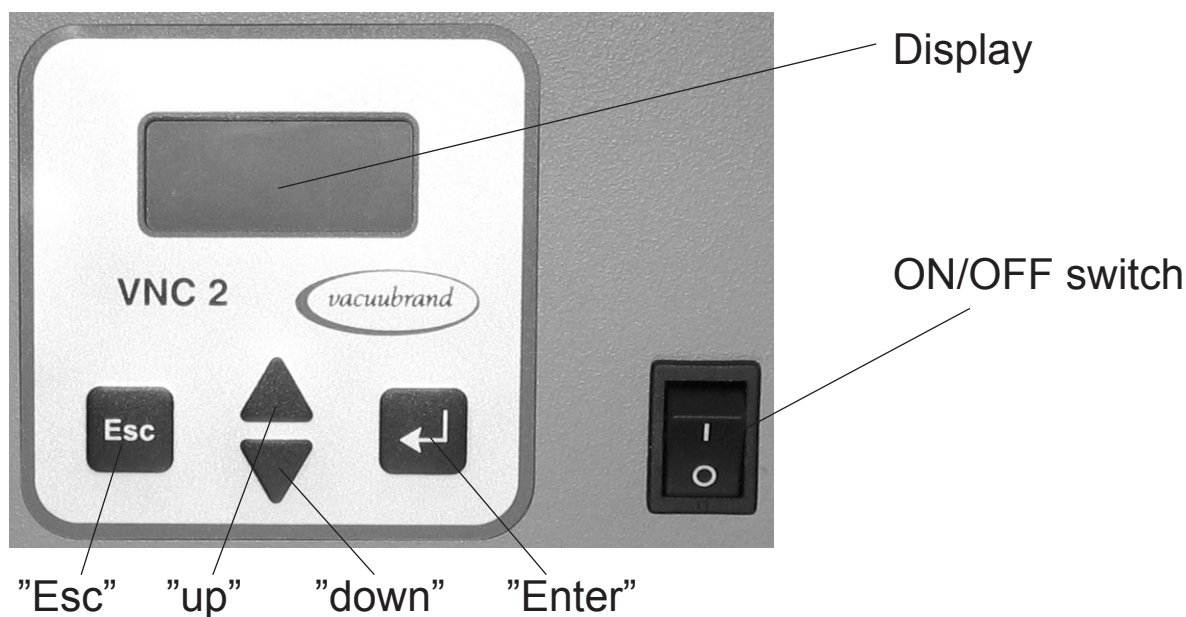
- Take measures as described above regarding short-term shutdown.
- Separate the pump from the application.
- Close inlet and outlet ports (e.g., with transport caps).
- Close the gas ballast valve.
- Drain catchpots.
- Store the pump under dry conditions.

# Description of the VNC 2 controller

After the connection of components, the controller can be operated in different basic modes, see “General view of factory-set basic modes”, pg. 45.

After switching on the device, the preselected basic mode and the **version number of the software** are displayed for two seconds.

## Keys



### Esc:

- Stop control.
- Return to previous menu level.
- Interrupt operation (reset to previous settings).
- Pressing longer than 2 seconds vents the system to atmospheric pressure; control stops.

### up:

- Select menu.
- Return to previous menu item.
- Increase parameter.
- Venting during control.

### down:

- Select menu.
- Go to next menu item.
- Decrease parameter.
- Decrease pressure during control.

### Enter:

- Start of control.
- Next step in menu setting.
- Adopt setting and quit menu.

## Display

In menus:

line 1: Caption

line 2: Menu item

After selection of menu item:

line 1: Menu item (or submenu)

line 2: Parameter to be set

In program:

line 1: Pressure

line 2: Status message.

In submenus (only setting of RS-232C):

line 1: Menu item (RS 232)

line 2: Submenu

## VNC 2 connections



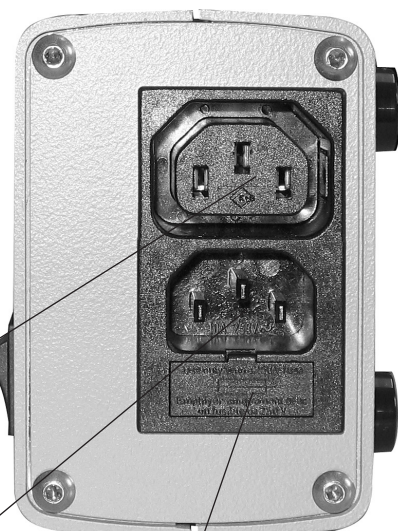
vacuum connection

jacks for connection of VACUU•BUS components (e.g., coolant valve, venting valve, in-line valve, level sensor, external pressure transducer)

serial interface  
RS-232 C

socket for connection of pump or valve  
(switch output according to supply voltage)

connection of power cord



fuse compartment  
of switch output

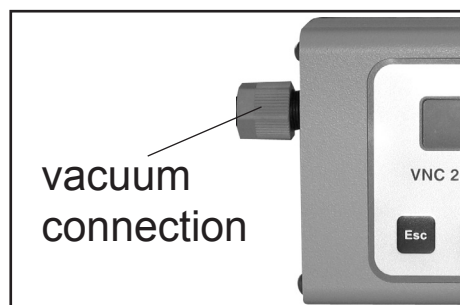
## Notes on operating the controller

**Valves and/or vacuum pumps are necessary to operate the controller.**

**Note:** Texts written in Courier font mirror the display of the controller.

### **WARNING**

- ☞ Maximum permissible pressure: 21.8 psi (1.5 bar) absolute.
- ☞ **Attention:** At pressures above approximately 810 Torr (1080 mbar) the pressure reading becomes incorrect due to saturation of the pressure transducer. The display will flash. Release pressure immediately! Risk of bursting!

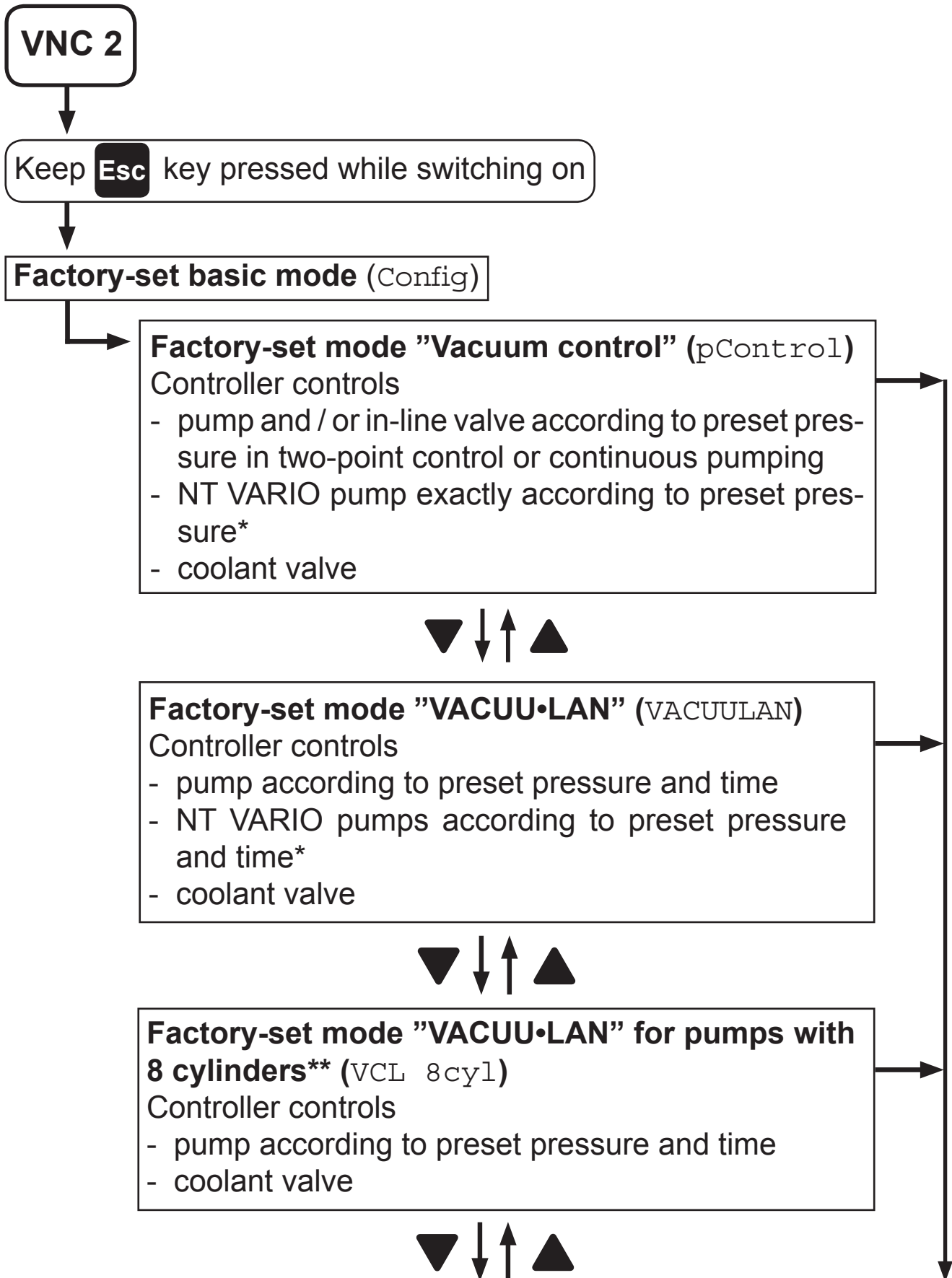


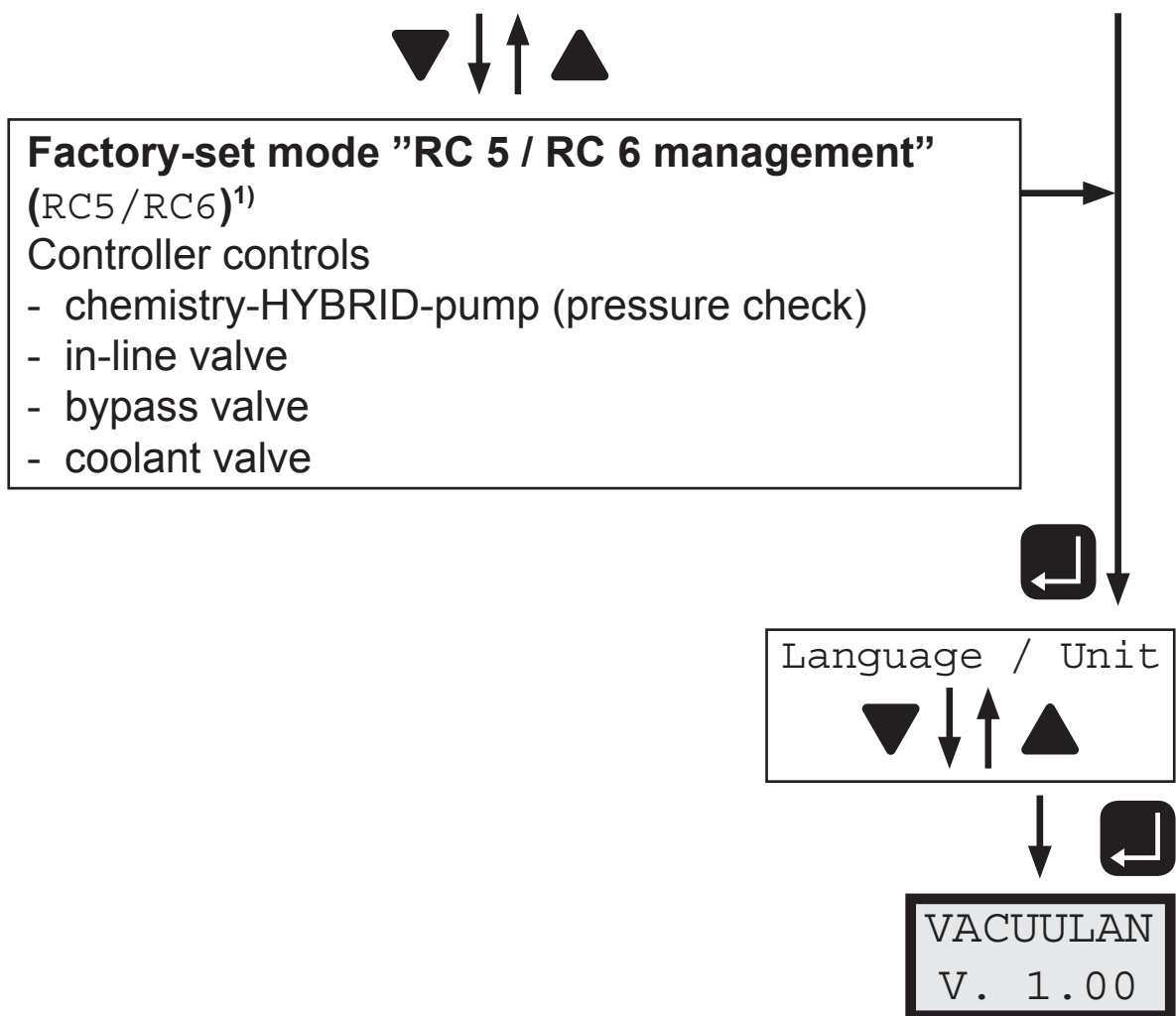
- ☞ Inside a vacuum system where evaporation occurs, e.g., a rotary evaporator, the vacuum is not uniform. For example, a condenser can act as a pump, or the vacuum in the connecting tubing can be higher or lower than in the application itself. This affects the measurement results as well as the control levels.

Therefore, carefully choose the position where to connect an external (optional) gauge head. Position an optional external gauge head and its vacuum line in such a way that condensate cannot flow towards the pressure transducer. Condensate and deposits will affect the measurement results. Clean the pressure transducer, if necessary. See section "Cleaning the pressure transducer", pg. 61.

- ☞ Setting of the interface, see "Interface parameters", pg. 65.
- ☞ Presettings at the controller, see "General view of factory-set basic modes", pg. 45 and "Menu guide", pg. 47.
- ☞ Operating the controller, see "Working with the controller", pg. 52.

# General view of factory-set basic modes



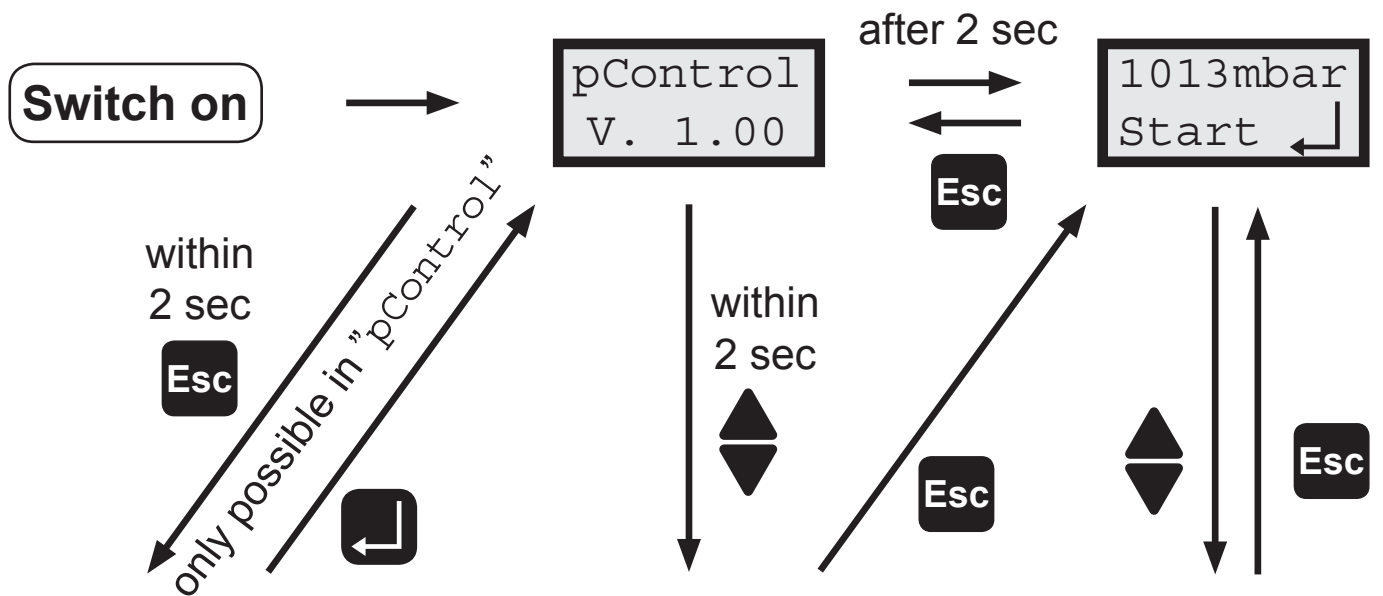


- \* only with speed controlled VACUUBRAND NT VARIO pumps
- \*\* intended for VACUUBRAND diaphragm pumps type ME 16(C), MD 8(C), MD 12(C) and MV 10(C)

1) Attention: For factory-set mode "RC 5 / RC 6 management" please order separate instructions for use!

**⚠ CAUTION** Attention: When connecting pumps pay attention to the breaking capacity of the IEC socket (see "Technical data", pg. 25)!

# Menu guide



## Function menu

Function  
Cont.pum



Function  
pControl

## Device menu

see page 50

- Readjustment
- RS 232 parameters
- Sound
- Units of pressure
- Auto start
- Lighting of display
- Language
- Time delay (not for VACUULAN)
- Control (only for RC 5/RC 6)

## Program menu

see section  
"Working with the  
controller" pg. 52  
"Program menu"



Start of program

## **Notes on the menus of the controller**

### **Function menu:**

- Setting the basic function of the controller (only in "Vacuum control" (pControl)).

### **Device menu:**

- Setting of device specific features and the periphery of the controller.



- Readjustment: Adjustment of the pressure transducer under vacuum and/or at atmospheric pressure, see also section “Readjustment of VNC 2”, pg. 58.
- RS 232 parameters: Configuration of the interface, setting of parameters and commands, see section “Interface parameters”, pg. 65.
- Sound: Switching the function “acoustic warning signal” on/off.
- Pressure unit: Selecting the pressure unit mbar, Torr or hPa.
- Auto start: Process starts immediately after switching on the controller.
- Lighting: Setting of the lighting intensity of the display.
- Language: Selecting the menu language (English, German, French).
- Time delay: Delayed switching off of coolant and pump (not in mode VACUULAN)
- Control: Control of a valve or a pump via the IEC control line (only for RC5/RC6).

### **Program menu:**

- Setting of the mode-specific parameters specific of the (e.g., preset pressure).

**Attention: The factory-set configuration determines the active menu items!**

## ***Notes on configuring the controller***

### **Time delay**

- “Delay” determines the time the coolant valve remains open after the process has been stopped. Determines also the time the pump (only with an in-line valve) remains running after the process has been stopped.

## ***Notes on selecting the factory-set basic mode***

### **NOTICE**

The controller VNC 2 can be adapted optimally to the specific application by choosing the appropriate factory-set mode depending on the components, the application and the process.

### **Automatic valve detection:**

When switching on the controller, the configuration of the connected components is checked automatically. If a valve (in-line valve or coolant valve) is connected it is **detected automatically** and controlled by the VNC 2 until the controller is switched off.

The last mode of operation and the preselected values (e.g., pressure value or time for switching off) are stored.

If the preselections are chosen appropriately, it is possible to start immediately if similar operating conditions are desired.

If another factory-set mode is selected, the default configuration for this newly selected mode is adopted; any user-selected parameters are overwritten. The four available factory-set modes are reviewed below. To select a different factory-set mode, keep the "Esc" key pressed while switching on the controller..

The controller features four factory-set modes (see section "General view of factory-set basic modes", pg. 45). Each of these modes involves different menu options in the program menu, as follows:

Vacuum control (pControl): Two point control with 5 minutes time delay.  
p set: 25 mbar,  $\Delta p$ : Auto, t Off: off, limit: 1060 mbar.

VACUU•LAN (VACUULAN):

p set: 25 mbar, p On: 150 mbar, t Off: 15 min

VACUU•LAN for diaphragm pumps with 8 cylinders with start-up control (3 minutes start-up delay) (VCL 8cyl):

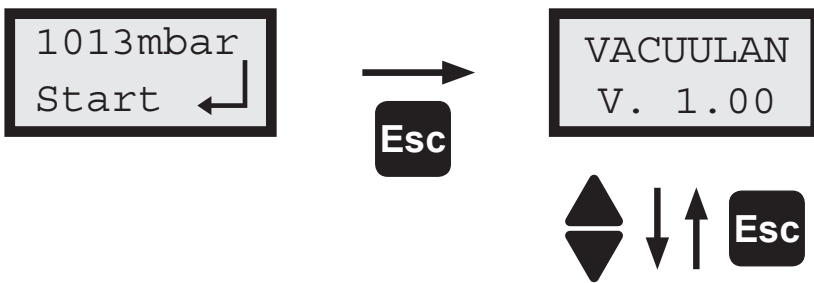
p set: 25 mbar, p On: 150 mbar, t Off: 15 min

RC 5 / RC 6 management:

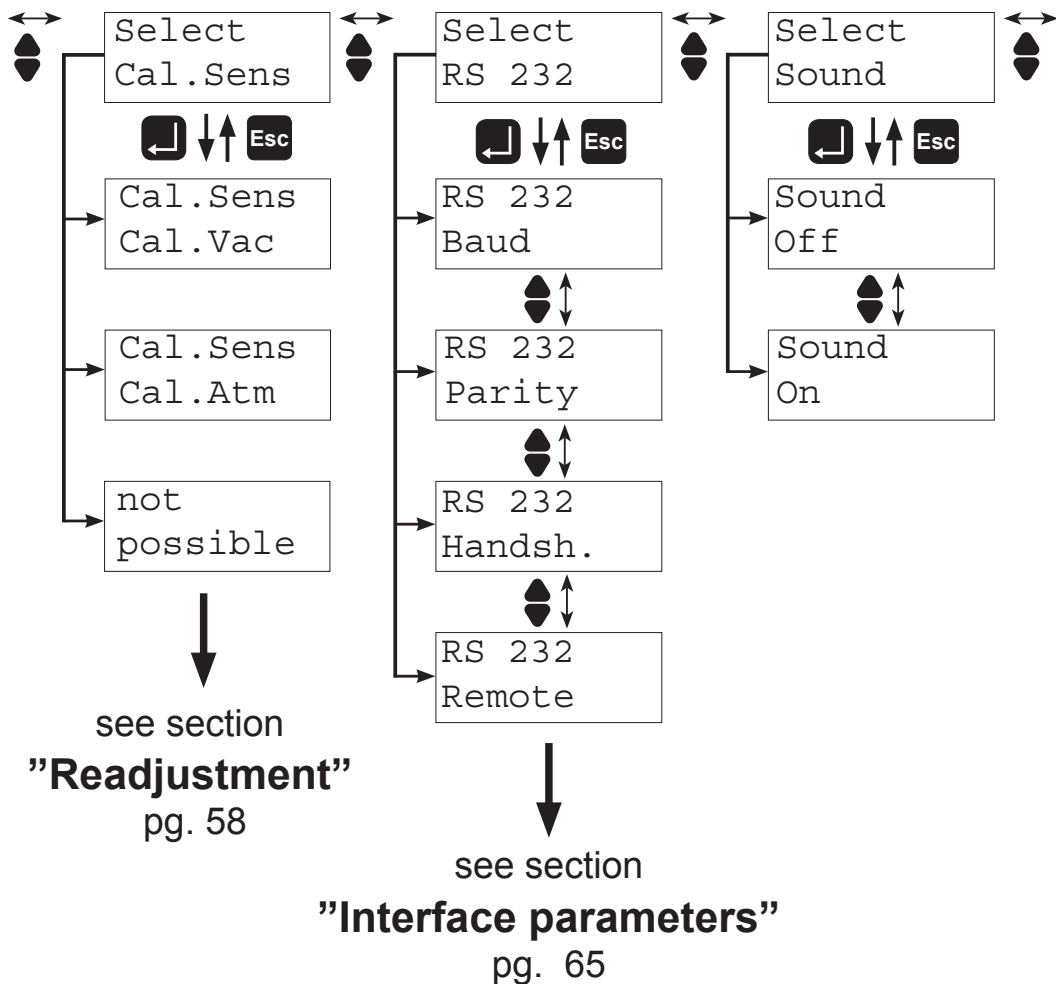
Attention: For factory-set mode "RC 5 / RC 6 management" please order separate instructions for use!

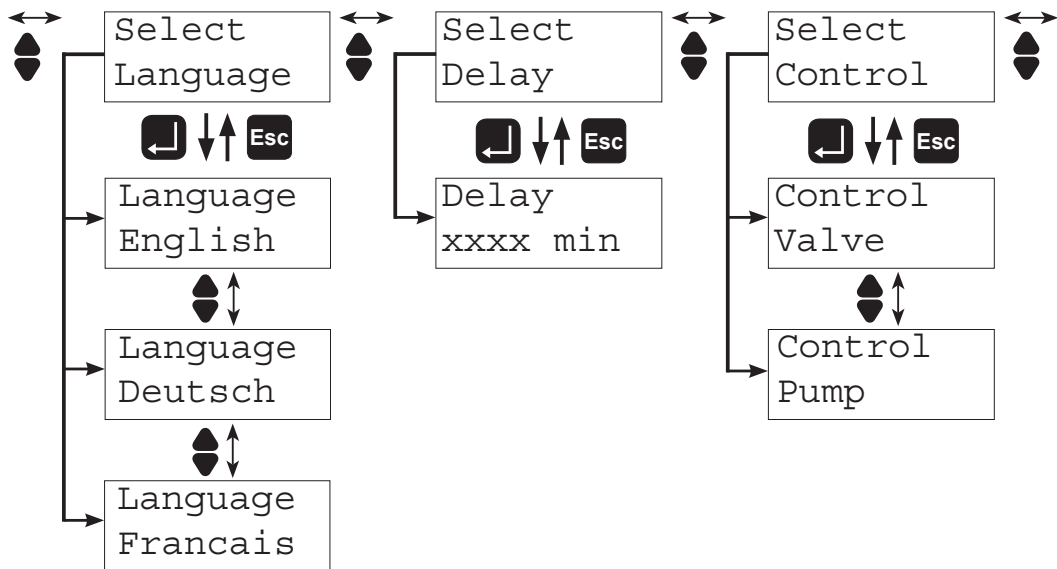
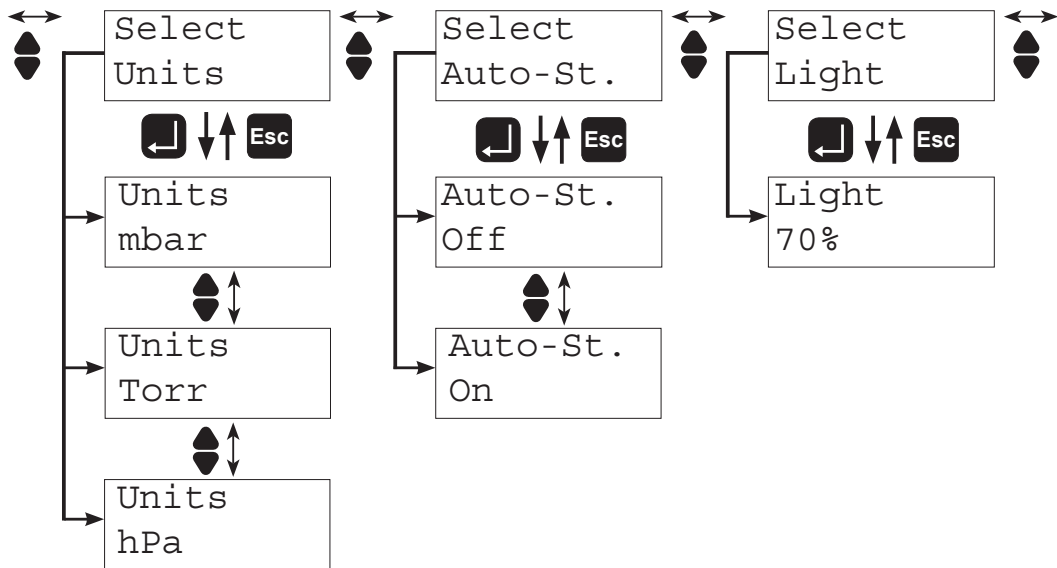
## Device menu

- ☞ Select a menu item with ▲ or ▼ keys.
- ☞ Confirm selection with "Enter" key.
- ☞ Adjust parameters with ▲ or ▼ keys.
- ☞ Confirm with "Enter" key or return to original setting pressing "Esc".
- ☞ The new device configuration is stored completely only when the device menu is terminated by pressing "Esc". You can cancel a new configuration before storing it by switching the controller off before quitting the device menu.



### Device menu:





# Working with the controller

## Notes on selecting the factory-set basic mode

### NOTICE

The controller VNC 2 can be adapted optimally to the specific application by choosing the appropriate factory-set basic mode **VACUU•LAN, continuous pumping, vacuum control or RC 5/RC 6 management**. The components of a chemistry vacuum system (e.g., "Valve", "VACUU•LAN") have to be preset once only.

The last mode of operation and the preselected values (e.g., pressure value or time for switching off) are stored.

If the preselections are chosen appropriately, it is possible to start immediately if similar operating conditions are desired.

The controller has been shipped with the following configuration:

- Basic mode "VACUU•LAN" (VACUULAN)
- "Control Pump" is configured (pump is switched)

### Basic mode "VACUU•LAN" (VACUULAN)

- operation of a vacuum pump with or without an in-line valve
- control of a speed controlled pump (NT VARIO) according to requirements (only with VNC 2 VARIO!)
- control of a vacuum local area network (VACUU•LAN®)

### Parameters

- ☞ **Switch-off time** ( $t_{\text{Off}}$ , factory-set: 15 min): If the pressure drops below the "Lower pressure value" ( $p_{\text{Set}}$ ), a time-meter starts to run and the motor speed is reduced (only with NT VARIO / VARIO-B pumps). When the pressure exceeds the "Lower pressure value", the time meter for automatic shut down is reset. If the vacuum is below " $p_{\text{Set}}$ " for longer than the "Switch-off time", the process control stops. The vacuum pump is switched off. In the event of a sudden high-pressure spike, the pump starts again even if the "Upper pressure value" has

not been reached (pressure increase control).

- ☞ **Upper pressure value** ( $p_{On}$ , factory-set: 150 mbar): Condition for restart of the pump when the pressure is increasing. If the pressure exceeds this pressure, the pump starts again.
- ☞ **Lower pressure value** ( $p_{Set}$ , factory-set: 25 mbar): Condition for switching off the pump. If the pressure drops below " $p_{Set}$ ", a time-meter (see "Switch-off time") starts to run. If the vacuum is below " $p_{set}$ " for longer than the "Switch-off time", the process control stops. The vacuum pump is switched off.
- ☞ **Time of process** ( $t_{Process}$ , factory-set: 99 h, only via serial interface): Check if the switch-off time is reached within the preset time of process. If the switch-off time is not reached, an error message "CheckSys" appears. In that case, check the process parameters and/or the vacuum system, see section "Troubleshooting", pg. 77.
- ☞ Preselection of **Auto-Start** ( $Auto-St.$ , factory-set "Off"): Process starts immediately after switching on the controller.

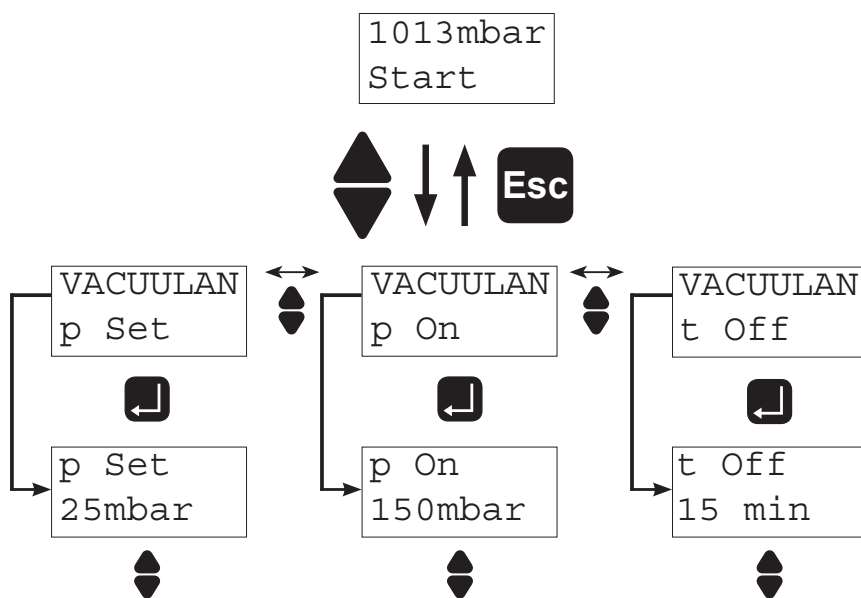
## ⚠ CAUTION

- **Attention:** If the controller is set to **Autostart** ( $Auto-St. : On$ ), the process will start immediately without pressing any further key after a power failure, or after switching on the controller if process control has not been terminated by pressing "Esc". It is your responsibility to ensure that automatic start-up of the system will not lead to any dangerous condition. Provide appropriate safety measures. Check prior to starting the process whether the option "Autostart" (device menu) is enabled.

## Suggested values for process parameters

Pumping unit	Switch-off time (min)	Lower pressure value (Torr/mbar)	Upper pressure value (Torr/mbar)
PC 500 LAN NT	5-10	11-15 / 15-20	75-150 / 100-200
PC 600 LAN NT	5-10	4-8 / 5-10	75-150 / 100-200

### Program menu in modes VACUULAN and VCL 8cy1



- ☞ Use ▲ or ▼ keys in the program menu to select an item.
- ☞ Confirm selection with "Enter" key.
- ☞ Adjust parameters with ▲ or ▼ keys.
- ☞ Confirm with "Enter" key or return to original setting pressing "Esc".

### Status messages displayed during operation of a program

The messages are always displayed in the second line. The first line always displays the pressure value.

Displays in basic mode "VACUU•LAN"	
Process running, pressure above lower pressure value	Process
Time delay, pressure below lower pressure value	xxx min
"Enter" key pressed	xx.x Hz (only with NT VARIO pumps during process)
After process, pressure check	Monitor
"Enter" key pressed after process:	xxx/min (pressure increase)

In remote mode: **P** is displayed in the second line.

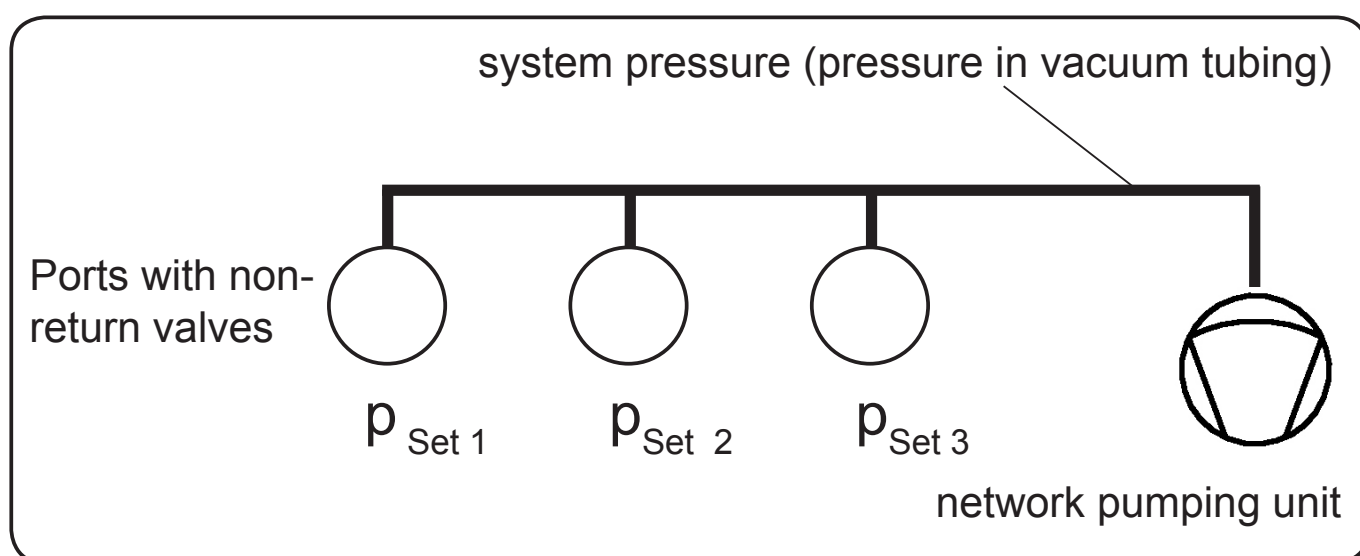


## Notes on operating a VACUU•LAN® Local Area Vacuum Network.

Assembling the components of a VACUU•LAN® network:

A VACUU•LAN® Local Area Vacuum Network consists of three main components: **vacuum pump or vacuum pumping unit, vacuum tubing and ports.**

The ports, i.e. the VACUU•LAN® modules, are composed of three components: a mounting base with connections for tubing, a module body, and one or more functional elements. They can be combined or adapted in accordance to the requirements in the laboratory. A non-return valve is integrated in each VACUU•LAN® module.



### Manually controlled vacuum applications:

In general, avoid running parallel processes on the same VACUU•LAN® network which vary significantly in the required pumping speed and/or required vacuum level. This is especially important if these processes will be operating simultaneously.

If several manually controlled ports are operated simultaneously, it is recommended that a means of flow control be installed, such that the required process pressures of the applications are just attained. Permanent gas flow through VACUU•LAN® ports has the same effect as a leak and leads to reduced vacuum (i.e., higher pressure) to serve the vacuum network. For example, if ports are permanently left in the open position as part of filtration process, then this will increase the pressure level in the vacuum network resulting in diminished capacity to support work at other VACUU•LAN® ports in the network.

If the pressure in the network exceeds the preset pressure of an application operated in parallel, the non-return valve of that port closes in order to protect the lower-pressure application against backflow or contamination. When the non-return valve closes, it is no longer possible to evacuate or control the application until network vacuum is restored to a level below that needed by the application.

Remedial action: In order to restore control or resume evacuation of the application, the gas flow at the open port must be reduced until the network pressure is decreased below the lowest process pressure of the parallel application.

### **Automatically controlled vacuum applications:**

An increase of system pressure (that is, some loss of vacuum) due to formation of gas (e.g., pumping down) and/or programmed preset pressures can occur if several automatically controlled ports of a vacuum network are operated simultaneously. Such an increase of pressure usually occurs in form of a pressure peak. Therefore the vacuum supply of applications operated in parallel is cut off only temporarily; the non-return valves counteract the mutual interference.

In general: It is recommended to reduce the pumping speed at automatically controlled ports as well by using an additional flow control. By that means, pressure bursts on the application side or in the vacuum network are minimized. The hysteresis ( $\Delta p$ ) at the vacuum controller at the port should not be set too low ( $\Delta p = \text{approx. } \pm 10\% p_{\text{Set}}$ ), if possible use the automatic hysteresis preset at the controller.

Notes: If the system pressure is increasing, the port with the lowest preset pressure is closed first. With decreasing system pressure the port with highest preset pressure is opened first.

### **Effect of the integrated non-return valves:**

At each port, a non-return valve is integrated to avoid an increase of pressure or contamination. The preset pressures of the different applications are related to the system pressure in the vacuum network as shown below:

Status of non-return valve		System pressure in local vacuum network (mbar)													
		20	40	60	80	100	120	140	160	180	200	220	240	260	280
preset pressure (mbar)															
Application 1	250														
Application 2	100														
Application 3	35														

non-return valve closed    
 non-return valve open

Notes: If the system pressure is increasing, the port with the lowest preset pressure is closed first. At decreasing system pressure the port with highest preset pressure is opened first.

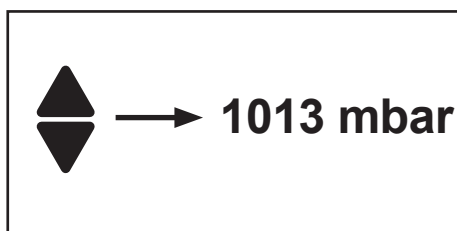
# Readjustment of VNC 2

## NOTICE

The vacuum gauge was adjusted using factory standards, which are traceable through regular calibration in an accredited laboratory (DAkkS calibration laboratory) to the German national pressure standard. Depending on the process and/or accuracy requirements, check the adjustment and readjust if necessary. For readjustment, the device has to be adjusted both at atmospheric pressure as well as under vacuum but only if the reference pressures are known with certainty. The adjustment mode can be activated only if the process control is inactive. Press "Esc" key, if necessary. If no adjustment is possible in the actual pressure range:

"not possible" is displayed.

## Adjustment at atmospheric pressure



An adjustment at atmospheric pressure is only possible if the pressure is higher than 525 Torr (700 mbar).

Vent the measurement connection of the VNC 2 and/or the vacuum system. Make sure that the pressure transducer is at atmospheric pressure.

- ➔ In "Device menu", select program "Cal.Sens" at the controller.
- ➔ Use the ▲ and ▼ keys to adjust the reading to the current atmospheric pressure.
- ➔ Press the "Enter" key to confirm.

**Note:** To determine the actual atmospheric pressure, use an accurate barometer or get accurate reading from the weather service, or a nearby airport or other reliable source (taking into account the difference in altitude between the source and the laboratory).

## Adjustment under vacuum

0 mbar

An adjustment under vacuum is only possible if the pressure is lower than 15 Torr (20 mbar) absolute.

Evacuate the measurement connection of the VNC 2 to a pressure  $< 0.5$  Torr (mbar) (e.g. by applying a good two-stage rotary vane pump).

- ➔ In "Device menu", select program "Cal.Sens" at the controller.
- ☞ The reading is automatically adjusted to "zero".
- ➔ Press the "Enter" key to confirm.

**Note:** Adjustment under vacuum with an actual pressure higher than 0.5 Torr (mbar) reduces the accuracy of the measurement. If the pressure is significantly higher than 0.5 Torr (mbar), adjustment to a reference pressure is recommended.

## Adjustment at a reference pressure

↕ → 0...20 mbar

Instead of adjustment under vacuum to a pressure  $< 0.5$  Torr (mbar), adjustment to a precisely known reference pressure within the range of 0..... 15 Torr (20 mbar) is possible. Evacuate the measurement connection of the VNC 2 to a pressure within 0 ..... 15 Torr (0.....20 mbar).

- ➔ In "Device menu", select program "Cal.Sens" at the controller.
- ☞ The reading is automatically adjusted to "zero".
- ➔ Use the ▲ and ▼ keys to adjust the reading to the reference pressure at the vacuum line within the range of 0 ..... 15 Torr (0.....20 mbar).
- ➔ Press the "Enter" key to confirm.

**Note:** The accuracy of the value of the reference pressure will directly affect the accuracy of the adjustment. If the nominal ultimate vacuum of a diaphragm pump is used as reference vacuum, the accuracy of the controller might be doubtful. The diaphragm pump may not achieve the specified value (due to condensate, poor condition, failure of valves or diaphragm, leaks).

# Calibration in the factory

## Control of measuring equipment

The **VACUUBRAND DAkkS calibration laboratory** is accredited by the Deutsche Akkreditierungsstelle GmbH (national accreditation body of the Federal Republic of Germany) for the measurable variable **pressure in the pressure range from  $7.5 \cdot 10^{-3}$  Torr to 975 Torr ( $10^{-3}$  mbar to 1300 mbar)** in accordance with the general criteria for the operation of testing laboratories defined in the DIN EN ISO/IEC 17025:2000 series of standards (accreditation number D-K-15154-01).

The DAkkS is signatory to the multilateral agreements of the European cooperation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.

Rely on calibration in the VACUUBRAND calibration laboratory:

- To meet the requirements of the DIN ISO 9000ff and 10012 series of standards regarding the calibration of inspection, measuring and test equipment at specified intervals.
- To document that the vacuum gauges calibrated are traceable to national standards of the PTB (Physikalisch-Technische Bundesanstalt; German national institute for science and technology and the highest technical authority of the Federal Republic of Germany for the field of metrology and certain sectors of safety engineering).

To order **DAkkS calibration** of the VNC 2 pressure transducer,  
order number: ..... **900217**

# Cleaning the pressure transducer

## **The controller itself is maintenance-free.**

Contamination of the pressure transducer or deposits will influence the accuracy of measurement.

- ➔ **Attention: Never use a pointed or sharp-edged tool to clean the pressure transducer.**
- ➔ **Never touch the ceramic diaphragm of the pressure transducer with hard objects.**
- ➔ Fill the measurement chamber with a solvent (e.g., benzene) and allow sufficient cleaning time. Observe all regulations concerning usage and disposal of solvents!
- ➔ Drain the solvent and dispose of in accordance with regulations. Repeat cleaning if necessary.
- ➔ Rinse the measurement chamber several times with alcohol in order to remove all solvent residues.
- ➔ Allow the pressure transducer to dry.
- ➔ Readjust the pressure transducer if necessary.

## **Readjustment of the VNC 2 controller**

See section “Readjustment of VNC 2”, pg. 58.

**Please continue with part 2 of this manual.**





## Technology for Vacuum Systems

### Instructions for use

### Part II of II



**Part II:**  
**Interface parameters - Accessories -**  
**Maintenance**

**PC 500 LAN NT**  
**PC 600 LAN NT**

**Chemistry pumping units**

# Contents

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# Interface parameters

The VNC 2 controller is equipped with a serial interface (RS 232C, nine-pin Sub-D-plug).

- ☞ Plug-in or remove the cable (cable RS 232C) from the interface only if the equipment is switched off.
- ☞ The interface is **not** electrically isolated from the measuring circuit.
- ☞ For optimal electromagnetic compatibility assemble an interface filter (cat. no.: 638235).

The controller is fully operable via the serial interface. Measuring results, preselections and the status of the controller can be read at any time.

The factory-set read and write commands of the VNC 2 are completely compatible with the VACUUBRAND CVC 2000 controller (see sections "Read / Write commands compatible to CVC 2000"). An extended instruction set for the VNC 2 controller is available using the command "CVC 3" (see sections "Read / Write commands compatible to CVC 3000").

## Setting of the interface

Set the interface parameters directly at the controller VNC 2. The factory set values are underlined.

Edit the interface parameters in the device menu "Select, RS 232" using the ▲ and ▼ keys and confirm with "Enter".

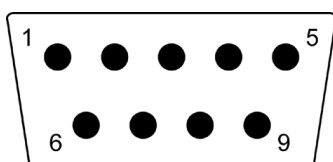
- ➔ Baud: 2400, 4800, 9600 or 19200
- ➔ Parity: 7 data bits odd (Parity 7-O-1); 7 data bits even (Parity 7-E-1); 8 data bits none (Parity 8-N-1)
- ➔ Handshake (Handsh.): no Handshake (Handsh. None), XON/XOFF Handshake (Handsh. Xon-Xoff), RTS/CTS Handshake (Handsh. RTS-CTS)
- ➔ Remote On, Remote Off
- ➔ Startbit = 1, Stopbit = 1
- ➔ Timeout: Sending 1s, receiving 10s.

In remote mode (Remote On, "P" is displayed) all keys at the controller are inoperable.

**To return to the manual operation of the controller, set the controller to "Remote off" via the interface, or switch off the controller. Then switch the controller back on, and enter the device menu within 2s by pressing the "up" or "down" key. Then select "select" / "RS 232" / "Remote" / "Off".**

- ➔ A maximum of ten commands per second is possible.
- ➔ Read commands and commands "REMOTE", "CVC", and "STORE" can always be sent. The sending of other write commands is only possible, if "Remote On" is selected.
- ➔ The commands have to be written in capital letters.
- ➔ Command and parameter have to be separated by a blank.
- ➔ The string is terminated with <CR> or <CR><LF>.
- ➔ The response of the controller is always terminated with <CR><LF>.
- ➔ Numerical values and parameters can be written without leading zeros.
- ➔ The response of the controller always includes leading zeros.

## Pin assignment RS-232 C



2: RxD  
3: TxD  
4: DTR

5: Mass  
7: RTS  
8: CTS

9: +5V (Bluetooth)

## Read commands compatible to "CVC 2000"

Command	Operation	Response	Description
IN_PV_1	current pressure	XXXX mbar/ Torr/hPa	unit according to preselections
IN_PV_2	current frequency	XX.X Hz	pump speed
IN_PV_3	process runtime	XX:XX	hh:mm (hours:minutes)
IN_PV_4	LAN pressure increase	XXX mbar/Torr/ hPa per minute	pressure unit according to preselections
IN_PV_5	LAN process time	XX:XX	hh:mm (VACUU•LAN: runtime of pump since last switching of the pump)
IN_SP_1	preset pressure	XXXX mbar/ Torr/hPa	unit according to preselections
IN_SP_2	preset frequency	XX:X Hz	preset pump speed, 99.9 Hz corresponds to "HI"
IN_CFG	device set preselections	0XXXX 1XXXX 2XXXX 4XXXX X0XXX X1XXX XX0XX XX1XX XXX0X XXX1X XXXX0 XXXX1	VACUU•LAN continuous pumping vacuum control RC 5 / RC 6 management no coolant valve coolant valve no venting valve venting valve no automatic switch off automatic switch off remote operation off remote operation on
IN_ERR	error code	1XXX X1XX XX1X XXX1	fault at pump electronics, valve, etc. overpressure maloperation mode pressure transducer last command to interface incorrect
IN_STAT	status of process control	0XXX 1XXX X0XX X1XX XX00 XX01  XX02  XX03 XX10 XX11 XX20 XX21  XX22  XX23	coolant valve closed coolant valve open venting valve closed venting valve open VACUU•LAN: inactive VACUU•LAN: pumping down, current pressure > selected pressure VACUU•LAN: pumping down, time for automatic switching off is running VACUU•LAN: system is switched off continuous pumping: not active continuous pumping; active vacuum control: not active vacuum control: current pressure above set vacuum vacuum control: current pressure equals set vacuum ( $\pm 1$ Torr/mbar) vacuum control: current pressure below set vacuum

Command	Operation	Response	Description
IN_STAT	status of process control	XX40 XX41 XX42 XX43	RC 5 / RC 6 management: not active RC 5 / RC 6 management: pumping down RC 5 / RC 6 management: preset vacuum is achieved RC 5 / RC 6 management: system is switched off

### Write commands compatible to "CVC 2000"

Command	Operation	Parameter	Description
OUT_MODE	basic mode	0 1 2 4	VACUU•LAN continuous pumping vacuum control RC 5 / RC 6 management <b>Attention:</b> If control is running, only switching from 1 to 2 and from 2 to 1 is possible.
OUT_SP_1	set vacuum	XXXX	unit according to preselection; (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
OUT_SP_V	set vacuum with venting*	XXXX	unit according to preselection; (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
OUT_SP_2	set frequency	XX.X	motor speed in Hz (01.0 to 60.0 in steps of 0.5 Hz or 99.9 for "HI")
OUT_SP_3	vacuum for restart (VACUU•LAN)	XXXX	unit according to preselection; (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
OUT_SP_4	delay	XX:XX	hh:mm (hours:minutes)
OUT_SP_5	vacuum for automatic switching off	XXXX	unit according to preselection; (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
OUT_SP_6	time for automatic switching off (VACUU•LAN)	XX:XX	hh:mm (hours:minutes) (00:00 = switch-off)
START	starting process control		
STOP	stopping process control	1 2	termination of process control termination of process control and storage of the current pressure as new set point
REMOTE	remote operation**	0 1	set controller to local operation set controller to remote operation



Command	Operation	Parameter	Description
OUT_VENT	driving venting valve	0 1	close venting valve (not automatically) open venting valve (process control stopped, valve does not close again automatically)
STORE	store settings permanently		

- \* Pressure setting with venting is only possible in "Vacuum control" mode if a venting valve is connected to the VNC 2 and configured, and vacuum control is started. The venting valve opens automatically if the actual pressure is at least 7.5 Torr (10 mbar) below the pre-set pressure. Automatic venting becomes inactive if vacuum control is stopped (by pressing "Esc"), a pressure value is set using the command OUT\_SP\_1, or if the basic mode is changed. Activate the command OUT\_SP\_V again if necessary.
- \*\* If remote operation is selected or deselected, the user has to ensure that no dangerous status of the system can occur due to the change of the mode of operation, and must take appropriate safety precautions, especially if selecting remote operation interferes with a locally operated active process.

**Read commands compatible to "CVC 3000"**

<b>Command</b>	<b>Operation</b>	<b>Response</b>	<b>Description</b>
IN_PV_1	current pressure	XXXX.X mbar/Torr/hPa	unit according to preselections
IN_PV_2	current speed	XXX%	1-100% or "HI"
IN_PV_3	time	XX:XX h:m	process runtime (hours:minutes)
IN_PV_4	LAN pressure increase	XXX/min	pressure unit according to preselections
IN_PV_5	LAN process time	XX:XX	hh:mm (hours:minutes) VACUU•LAN: runtime of pump since last switching of the pump
IN_CFG	device set preselections	0XXXXXXXXXXXXXXXXX 1XXXXXXXXXXXXXXXXX 2XXXXXXXXXXXXXXXXX 4XXXXXXXXXXXXXXXXX X0XXXXXXXXXXXXXXXX X1XXXXXXXXXXXXXXXX X2XXXXXXXXXXXXXXXX XX0XXXXXXXXXXXXXXXX XX1XXXXXXXXXXXXXXXX XX2XXXXXXXXXXXXXXXX XXX0XXXXXXXXXXXXXXXX XXX1XXXXXXXXXXXXXXXX XXX0XXXXXXXXXXXXXXXX XXX1XXXXXXXXXXXXXXXX XXXX0XXXXXXXXXXXXXXXX XXXX1XXXXXXXXXXXXXXXX XXXXX0XXXXXXXXXXXXXXXX XXXXX1XXXXXXXXXXXXXXXX XXXXXXX0XXXXXXXXXXXX XXXXXXX1XXXXXXXXXXXX XXXXXXX0XXXXXXXXXXXX XXXXXXX1XXXXXXXXXXXX XXXXXXX0XXXXXXXXXXXX XXXXXXX1XXXXXXXXXXXX XXXXXXX0XXXXXXXXXXXX XXXXXXX1XXXXXXXXXXXX XXXXXXX0XXXXXXXXXXXX XXXXXXX1XXXXXXXXXXXX XXXXXXX0XXXXXXXXXXXX XXXXXXX1XXXXXXXXXXXX XXXXXXXXXXXXXXXXXyXX XXXXXXXXXXXXXXXXXyX XXXXXXXXXXXXXXXXXXX0 XXXXXXXXXXXXXXXXXXX1	VACUU•LAN continuous pumping vacuum control RC 5 / RC 6 management language: German language: English language: French pressure unit mbar pressure unit Torr pressure unit hPa autostart off autostart on acoustic signal off acoustic signal on NT VARIO pump not connected NT VARIO pump connected VMS not connected VMS connected in-line valve not connected in-line valve connected coolant valve not connected coolant valve connected venting valve not connected venting valve connected fault indicator not connected fault indicator connected level sensor not connected level sensor connected remote module not connected remote module connected y: 1.....9: sensor number y: 1.....9: sensor quantity remote operation off remote operation on

Command	Operation	Response	Description
IN_STAT	status process control	0XXXXXX 1XXXXXX X0XXXXX X1XXXXX XX0XXXX XX1XXXX XXX0XXX XXX1XXX XXXX0XX XXXX1X XXXX2X XXXX4X XXXXX0 XXXXX1 XXXXX2 XXXXX3	pump off pump on in-line valve closed in-line valve open coolant valve closed coolant valve open venting valve closed venting valve open VACUU•LAN continuous pumping vacuum control RC 5 / RC 6 management control off pump down set vacuum reached current pressure below set vacuum
IN_ERR	fault status	0XXXXXXXXX 1XXXXXXXXX X0XXXXXXXXX X1XXXXXXXXX XX0XXXXXXXXX XX1XXXXXXXXX XXX0XXXXXXXXX XXX1XXXXXXXXX XXXX0XXXXX XXXX1XXXXX XXXXX0XXX XXXXX1XXX XXXXXX0XX XXXXXX1XX XXXXXX0X XXXXXX1X  XXXXXXXX0 XXXXXXXX1	no fault at pump fault at pump no fault at in-line valve fault at in-line valve no fault at coolant valve fault at coolant valve no fault at venting valve fault at venting valve no overpressure overpressure no fault at pressure transducer fault at pressure transducer no external fault, catchpot not full external fault, catchpot full no internal fault internal fault (over temperature at relay)  last interface command correct last interface command incorrect
IN_SP_1	set vacuum	XXXX mbar/Torr/hPa	unit according to preselections
IN_SP_2	maximum speed	XXX%	1-100% (100% = "HI")
IN_SP_3	switching pressure	XXXX mbar/Torr/hPa	unit according to preselections (switching pressure for VACUU•LAN or two point control)
IN_SP_4	delay	XX:XX h:m	hours:minutes (00:00 = Off)

Command	Operation	Response	Description
IN_SP_5	switch-off pressure	XXXX mbar/Torr/hPa	"Maximum" for "vacuum control", "Minimum" for "continuous pumping")
IN_SP_6	process runtime	XX:XX h:m	hours:minutes (00:00 = off)

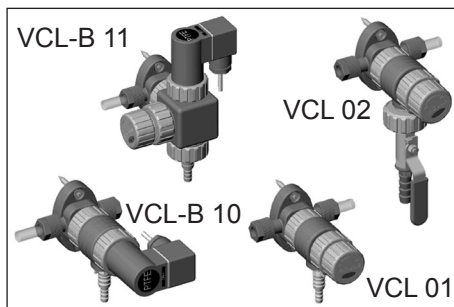
## Write commands compatible to "CVC 3000"

Command	Operation	Parameter	Description
OUT_MODE	basic mode	0 1 2 4	VACUU•LAN continuous pumping vacuum control RC 5 / RC 6 management <b>Attention:</b> If control is running, only switching from 1 to 2 and from 2 to 1 is possible.
OUT-SP_1	set vacuum	XXXX	unit according to preselection; (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
OUT_SP_V	set vacuum with venting*	XXXX	unit according to preselection; (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
OUT_SP_2	speed	XXX	speed in % (100% = "HI")
OUT_SP_3	start-up pressure	XXXX	unit according to preselection; (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
OUT_SP_4	delay	XX:XX	hh:mm (hours:minutes)
OUT_SP_5	switch-off pressure	XXXX	unit according to preselection; (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
OUT_SP_6	time for automatic switching off (VACUU•LAN)	XX:XX	hh:mm (hours:minutes) (00:00 = switch-off)
START			started
STOP		1 2	Stop Stop and adopt the set vacuum
REMOTE**		0 1	Remote off Remote on
CVC***		2 3	CVC 2000 commands CVC 3000 commands
OUT_VENT		0 1	venting valve closed venting valve open
STORE			store settings permanently

- \* Pressure setting with venting is only possible in "Vacuum control" mode if a venting valve is connected and configured, and vacuum control is started. The venting valve opens automatically if the actual pressure is at least 7.5 Torr (10 mbar) below the preset pressure. Automatic venting becomes inactive if vacuum control is stopped (by pressing "Esc"), a pressure value is set using the command `OUT_SP_1`, or if the basic mode is changed. Activate the command `OUT_SP_V` again if necessary.
  
- \*\* If remote operation is selected or deselected, the user has to ensure that no dangerous status of the system can occur due to the change of the mode of operation, and must also take appropriate safety precautions, especially if selecting remote operation interferes with a locally operated active process.
  
- \*\*\* After being switched on, the controller is in "CVC 2" mode by default. Send "CVC 3" and "STORE" to permanently set the controller RS 232C commands to the extended set "CVC 3000".

# Accessories

## Vacuum distribution:



The VACUU•LAN® modules allow process-oriented, flexible and cost effective connections according to your requirements. One vacuum pump can support several workstations. Contact VACUUBRAND for details.

<b>VACUU•LAN® manual flow control module VCL 01</b> .....	<b>677106</b>
<b>VACUU•LAN® shut off / manual flow control module VCL 02</b> .....	<b>677107</b>
<b>VACUU•LAN® automatic control module VCL-B 10</b> .....	<b>677208</b>
<b>VACUU•LAN® manual flow control/ automatic control module VCL-B 11</b> .....	<b>677209</b>

On this page we offer only a small selection of VACUU•LAN® options. Please contact VACUUBRAND for further information. Listed modules are designed for surface-mounted installation. Different catalog numbers are used for modules designed for flush-mounting with concealed tubing.

<b>External pressure transducer VSK 3000</b> , .....	<b>636657</b>
capacitive, ceramic diaphragm sensor 1080-0.1 mbar	
<b>Coolant valve VKW-B, 24 V=</b> .....	<b>674220</b>
<b>Venting valve VBM-B / KF 16, 24 V=</b> .....	<b>674217</b>
<b>In-line valve VV-B 6, 24 V=</b> .....	<b>674290</b>
<b>In-line valve VV-B 6C, 24 V=</b> .....	<b>674291</b>
<b>In-line valve VV-B 15C, KF 16, 24 V=</b> .....	<b>674210</b>
<b>In-line valve VV-B 15C, KF 25, 24 V=</b> .....	<b>674215</b>
<b>Level sensor</b> .....	<b>699908</b>
(control of liquid level in catchpots)	
<b>Peltronic exhaust waste vapor condenser</b> .....	<b>699905</b>
<b>VACUU•BUS Y-type adapter</b> .....	<b>636656</b>
<b>VACUU•BUS extension cable, 6.6ft (2m)</b> .....	<b>612552</b>
<b>VACUU•BUS wall jack</b> .....	<b>636153</b>
<b>Serial cable RS 232C, 9-pin, Sub-D</b> .....	<b>637837</b>
<b>Elbow piece (90°) for PTFE tubing*</b> .....	<b>637873</b>
<b>Hose nozzle for tubing I.D. 1/4" / 3/8" (6/10 mm)</b> .....	<b>636635</b>
for inlet	
<b>Hose nozzle for tubing I.D. 3/8" (10 mm)</b> .....	<b>636381</b>
for inlet	
<b>PTFE tubing* (sold by meter)</b> .....	<b>638644</b>
<b>Adapter for gas ballast connection via small flange KF DN 16</b> .....	<b>636193</b>
<b>Silencer (with connection hose)</b> .....	<b>636588</b>

\* PTFE tubing DN 10/8 mm

VACUU•LAN® networks are engineered to perform to specification when installed with PTFE tubing, DN 10/8 mm. All VACUU•LAN® modules, pumps and connectors are designed for compatibility with this tubing.

**Attention:** Dust-laden gases, deposits and condensed solvent vapor can restrict air flow out 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.

For additional accessories such as vacuum valves, small-flange components, vacuum gauges or vacuum controllers refer to [www.vacuubrand.com](http://www.vacuubrand.com).

## Conversion of VACUUBRAND valves with DIN plug to VACUUBRAND valves with VACUU•BUS plug:

VACUUBRAND-valve with DIN plug	Conversion kit valve cable with VACUU•BUS plug
Coolant valve VKW, 24 V= (676013)	612567
Venting valve VBM, 24 V= (666817)	612554

## How to determine the best distillation conditions

### Determine the temperature of the available coolant.

- ☞ In most cases the coolant temperature is given (e.g., tap water, in house cooling water circuit). For maximum solvent recovery, carefully choose the boiling point of the product (by choosing the vacuum level) and the bath temperature accordingly.
- ☞ Determine the lowest boiling point of the product (solvent).
- ☞ The temperature difference between the product's boiling point and the coolant should be more than 68°F (20°C), otherwise a low vacuum level will lead to significant loss of solvent.
- ☞ Select a water bath temperature of 68-86°F (20-30°C) above the product's boiling point to provide sufficient heat transfer.



## Determine the bath temperature

☞ If there is no limitation from the product side, a water bath temperature of 140-158°F (60-70°C) is usually recommended (efficient heating with minimum generation of water vapor from the bath).

### Example:

- ☞ The cooling temperature is assumed to be 59-68°F (15-20°C).
- ☞ Water bath temperature between 140-158°F (60-70°C). Wait until temperature is reached.
- ☞ Determine the vacuum level for a boiling point (use published data of solvents). Reduce pressure until a sufficient level of evaporation is attained.
- ☞ If the hysteresis is set manually, avoid frequent operation of the vacuum pump or of an optional in-line valve (approx. not more than two operations per minute).


## List of solvents

Solvent	Boiling point at 760 Torr (1013 mbar) in °F (°C)	Vacuum for boiling point (abs.) at T <sub>s</sub> = 104°F (40°C) in Torr (mbar)	Solvent	Boiling point at 760 Torr (1013 mbar) in °F (°C)	Vacuum for boiling point (abs.) at T <sub>s</sub> = 104°F (40°C) in Torr (mbar)
Acetone	133 (56)	417 (556)	Ethyl acetate	171 (77)	180 (240)
Acetonitrile	180 (82)	173 (230)	1,2-Dichloroethane	181 (83)	158 (210)
Benzene	176 (80)	177 (236)	Hexane	156 (69)	251 (335)
t-Butanol	180 (82)	98 (130)	Methanol	147 (64)	253 (337)
1-Butanol	244 (118)	19 (25)	Pentane	97 (36)	>750 (1000)
Chloroform	144 (62)	356 (474)	Isopropanol	180 (82)	103 (137)
Cyclohexane	178 (81)	176 (235)	Pyridine	239 (115)	45 (60)
Dichloromethane	104 (40)	750 (1000)	Tetrachloromethane	171 (77)	203 (271)
Diethyl ether	95 (35)	>750 (1000)	Tetrahydrofuran	151 (66)	268 (357)
Diisopropyl ether	154 (68)	281 (375)	Toluene	232 (111)	58 (77)
Dimethylformamide	307 (153)	8 (11)	Trichloroethylene	189 (87)	137 (183)
1,4-Dioxane	214 (101)	80 (107)	Xylene	280 (138)	19 (25)
Ethanol	167 (75)	131 (175)	Water	212 (100)	54 (72)

The above given temperature and pressure values are only of approximate nature (due to rounding, unit conversion).

# Troubleshooting

Fault	Possible cause	Remedy
<input type="checkbox"/> No display.	<ul style="list-style-type: none"> <li>➔ Electrical power cord not plugged in, electrical supply failure?</li> <li>➔ Device fuse blown?</li> <li>➔ Device switched off?</li> <li>➔ Other than above mentioned causes?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Plug in power cord. Check fuse.</li> <li>✓ Identify cause of failure. Replace device fuse at switch output of VNC 2 or at diaphragm pump.</li> <li>✓ Switch on controller and/or pump.</li> <li>✓ Contact local distributor.</li> </ul>
<input type="checkbox"/> Display disappears, internal overload protection activated.	<ul style="list-style-type: none"> <li>➔ Too much load (e.g., valves) connected?</li> <li>➔ Thermal overload at controller, ambient temperature too high?</li> <li>➔ Short circuit at connected valves?</li> <li>➔ Short circuit at the RS 232 plug?</li> <li>➔ Other than above mentioned causes?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Check current draw of the connected devices (pump, valves).</li> <li>✓ Ensure sufficient ventilation.</li> <li>✓ Replace valves.</li> <li>✓ Check plug and cable.</li> <li>✓ Contact local distributor.</li> </ul>
<input type="checkbox"/> Pressure reading incorrect.	<ul style="list-style-type: none"> <li>➔ Pressure transducer decalibrated?</li> <li>➔ Humidity in the measurement chamber?</li> <li>➔ Pressure transducer contaminated?</li> <li>➔ Other than above mentioned causes?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Readjust VNC 2.</li> <li>✓ Let the pressure transducer dry, e.g., by pumping. Readjust if necessary. Determine and eliminate the cause for humidity.</li> <li>✓ See "Cleaning the pressure transducer".</li> <li>✓ Contact local distributor.</li> </ul>
<input type="checkbox"/> Error message "ErrValve", two blips*.	<ul style="list-style-type: none"> <li>➔ External venting valve removed or defective?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Connect or check valve or replace with a new one or reconfigure without valve. Switch VNC 2 off/on.</li> </ul>

Fault	Possible cause	Remedy
❑ Error message "ErrValve", three blips*.	➔ In-line valve removed or defective?	✓ Connect or check valve or replace with a new one or reconfigure without valve. Switch VNC 2 off/on.
❑ Error message "ErrValve", four blips*.	➔ Coolant valve removed or defective?	✓ Connect or check valve or replace with a new one or reconfigure without valve. Switch VNC 2 off/on.
❑ Error message "p Error", five blips*.	➔ Overpressure at the pressure transducer, pressure > 810 Torr (1080 mbar)? ➔ External pressure transducer VSK 3000 removed or defective? ➔ Internal pressure transducer defective?	✓ Release pressure immediately (risk of bursting).  ✓ Plug in or check external pressure transducer or use a new one or reconfigure without VSK 3000. Switch VNC 2 off/on. ✓ Contact local distributor.
❑ Error message "ErrTemp.", seven blips*.	➔ Excess temperature? ➔ Relay circuit defective?	✓ Check configuration and process parameters. ✓ Contact local distributor.
❑ Error message "CheckSys", eight blips*.	➔ Switch-off time is not reached within the pre-set time of process?	✓ Check system for leaks. Check process time. Select suitable pressure value "p set".
❑ Error message "ext. Err", nine blips*.	➔ Level sensor has been set off? ➔ Level sensor has been removed? ➔ External fault indicator has been set off? ➔ External fault indicator has been removed? ➔ Emission condenser EK Peltronic has been removed? ➔ Excess temperature at condenser EK Peltronic? Process stopped?	✓ Drain catchpot. Message disappears. In case, restart process. ✓ Connect level sensor again or reload a factory-set basic mode. ✓ Eliminate external error. ✓ Connect external fault indicator again or switch controller off/on. ✓ Connect EK peltronic again or switch controller off/on. ✓ Allow condenser EK Peltronic to cool down. In case, restart process.

Fault	Possible cause	Remedy
<input type="checkbox"/> Controller does not respond when pressing keys (except ON/OFF). "P" is displayed.	➔ Controller in remote mode?	✓ Control VNC 2 controller via interface or switch off remote mode.
<input type="checkbox"/> Controller does not respond when operating any keys. No change after switching off/on.		✓ Contact local distributor.
<input type="checkbox"/> Pump does not work.	➔ Pump too hot?  ➔ Electrical power cord not plugged in, electrical supply failure?	✓ Allow pump to cool down, identify and eliminate cause of failure. Manual reset is necessary. Switch off pump or unplug.  ✓ Plug in power cord. Check fuse.
<input type="checkbox"/> Pump does not start or stops immediately.	➔ Motor overloaded?  ➔ Overpressure in outlet line? ➔ Pump has been exposed to condensate?	✓ Allow motor to cool down, identify and eliminate cause of failure. Manual reset is necessary. Switch off pump or unplug.  ✓ Remove blockage in line, open valve. ✓ Perform maintenance.
<input type="checkbox"/> Pump does not achieve its ultimate vacuum or usual pumping speed.	➔ Outgassing substances or vapor generated in the process?  ➔ Leak in the tubing or in the vacuum system? ➔ Wrong setting at controller?  ➔ Long, narrow vacuum line?  ➔ Pump has been exposed to condensate?	✓ Check process parameters.  ✓ Check connections, pipeline and vacuum system. ✓ Select mode "continuous pumping" and check again.  ✓ Use lines with larger diameter, length as short as possible.  ✓ Allow pump to run for some minutes with atmospheric pressure at the inlet to purge.

Fault	Possible cause	Remedy
<input type="checkbox"/> Pump does not achieve its ultimate vacuum or usual pumping speed.	<ul style="list-style-type: none"> <li>➔ Deposits have been formed inside the pump?</li> <li>➔ Diaphragms or valves damaged?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Clean and inspect the pump heads.</li> <li>✓ Replace diaphragms and/or valves.</li> </ul>
<input type="checkbox"/> Pump too noisy.	<ul style="list-style-type: none"> <li>➔ Atmospheric or high pressure at the pump inlet?</li> <li>➔ Diaphragm crack or diaphragm clamping disc loose?</li> <li>➔ Other than above mentioned causes?</li> </ul>	<ul style="list-style-type: none"> <li>✓ Connect hose or silencer to pump outlet. Be careful not to cause outlet over-pressure, especially with condensable vapors.</li> <li>✓ Perform maintenance.</li> <li>✓ Contact local distributor.</li> </ul>
<input type="checkbox"/> Pump seized.		<ul style="list-style-type: none"> <li>✓ Contact local distributor.</li> </ul>

\* only if "Sound: On" is selected

- ➔ A service manual with exploded view drawings, spare parts list and directions for repair is available on request.
- 👉 The service manual is intended for trained service people only.

# Replacing diaphragms and valves

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

The pictures may show other versions of pumps. This does not change the method of replacing diaphragms and valves.

## DANGER

➔ Never operate the pump if covers or other parts of the pump are disassembled.



➔ Before starting maintenance, **disconnect the electrical power cord. Wait five seconds** after isolating the equipment from AC power to allow the capacitors to discharge.

➔ Ensure that the pump cannot be operated accidentally.

➔ **Note:** The pump might be contaminated with the process chemicals that have been pumped during operation. Ensure that the pump is decontaminated before maintenance.

➔ Avoid the release of pollutants.

## WARNING

☞ Never operate a defective or damaged pump.

☞ Take adequate precautions to protect people from the effects of dangerous substances that may have contaminated the pump and may be released upon disassembly. Ensure that the maintenance technician is familiar with the safety procedures which relate to the products processed by the pumping system.

Use appropriate protective clothing, safety goggles and protective gloves.

☞ Check every motor capacitor regularly by measuring its capacity and estimating its service life. Replace old capacitors early enough to prevent a failure. The capacitors must be replaced by a trained electrician.

☞ Allow sufficient cooling of the pump before starting maintenance. Drain condensate, if applicable.

☞ **Vent the pump and isolate it from the vacuum system before you start maintenance.**

**NOTICE**

**Ensure that maintenance is done only by suitably trained and supervised technicians.**

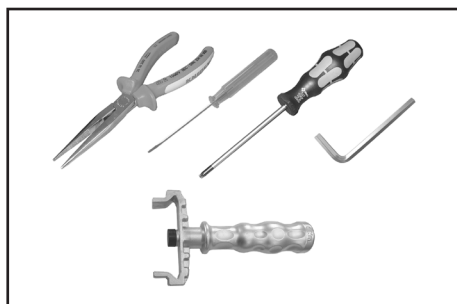
The valves and diaphragms as well as the motor capacitors are wear parts. If the rated ultimate vacuum is no longer achieved or in case of increased noise level, the pump interior, the diaphragms and the valves must be cleaned and the diaphragms and valves must be checked for cracks or other damage.

All bearings are encapsulated and are filled with long-life lubricant. Under normal operating conditions, the drive system is maintenance free.

In demanding circumstances, it may be efficient to check and clean the pump heads on a regular basis. In normal use, the lifetime of the diaphragms and valves is typically 15,000 operating hours.

- Prevent internal condensation, transfer of liquids or dust. The diaphragms and valves will be damaged if liquid is pumped in significant amount.
- Carry out maintenance frequently if the pump is exposed to corrosive media or in case of deposits.
- Regular maintenance will improve the lifetime of the pump and also protect both users and the environment.

<b>Service kit MZ 2C NT for PC 500 LAN NT</b> .....	<b>696869</b>
<b>Service kit MD 4C NT for PC 600 LAN NT</b> .....	<b>696870</b>
<b>Diaphragm key (width 66 mm)</b> .....	<b>636554</b>

**Tools required (metric):**

- Torx driver T20
- 5 mm wide Allen key
- 2.5 mm wide slotted screwdriver
- Flat pliers
- Diaphragm key width 66 mm



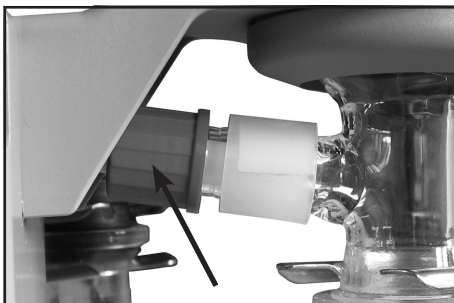
## Cleaning and inspecting the pump heads

The replacement of the diaphragm and the replacement of the valves can be carried out separately.

- ☞ To replace the valves, remove the head covers of one side of the pump along with the assembled valve heads and fittings.
- ☞ To maintain the diaphragms, the valve heads and the fittings need not be disassembled. The head covers can be removed along with the assembled valve heads and fittings.
- ☞ Service only one side of the pump at a time to avoid the mixing of parts.



- Remove catchpots (9) at inlet and outlet (see "Use and operation", pg. 31).



Disassemble the exhaust vapor condenser EK:

- Loosen the union nut at the inlet of the exhaust vapor condenser.



- Remove the 4 screws affixing the counter holder of the exhaust vapor condenser with a Torx driver T10. Remove the exhaust vapor condenser. In doing so pull the PTFE hose out of the inlet of the exhaust vapor condenser.

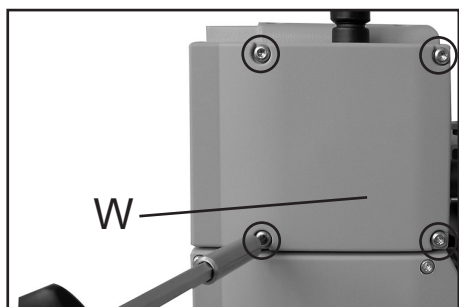


- Loosen the union nut at the vacuum connection of the controller.
- Pull the PTFE tubing off the vacuum connection.

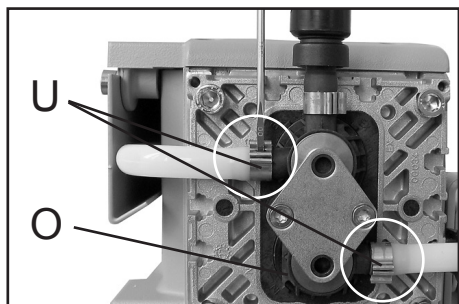
**Replacing the diaphragms and valves is described for a pumping unit with a diaphragm pump MZ 2C NT (PC 500 LAN NT).**

**Replace the diaphragms and valves of pumping units PC 600 LAN NT (with diaphragm pump MD 4C NT) in the same way.**

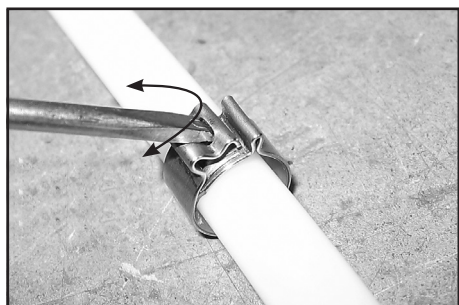
- For maintenance, lay the pumping unit on its side with the pump heads to be maintained at the top. Support the pumping unit appropriately.



- Remove the 4 screws affixing the head cover cowling (W) with a Torx driver T20. Pay attention to the washers under the screws and remove.
- Pull off head cover cowling (W) carefully. Do not tilt.



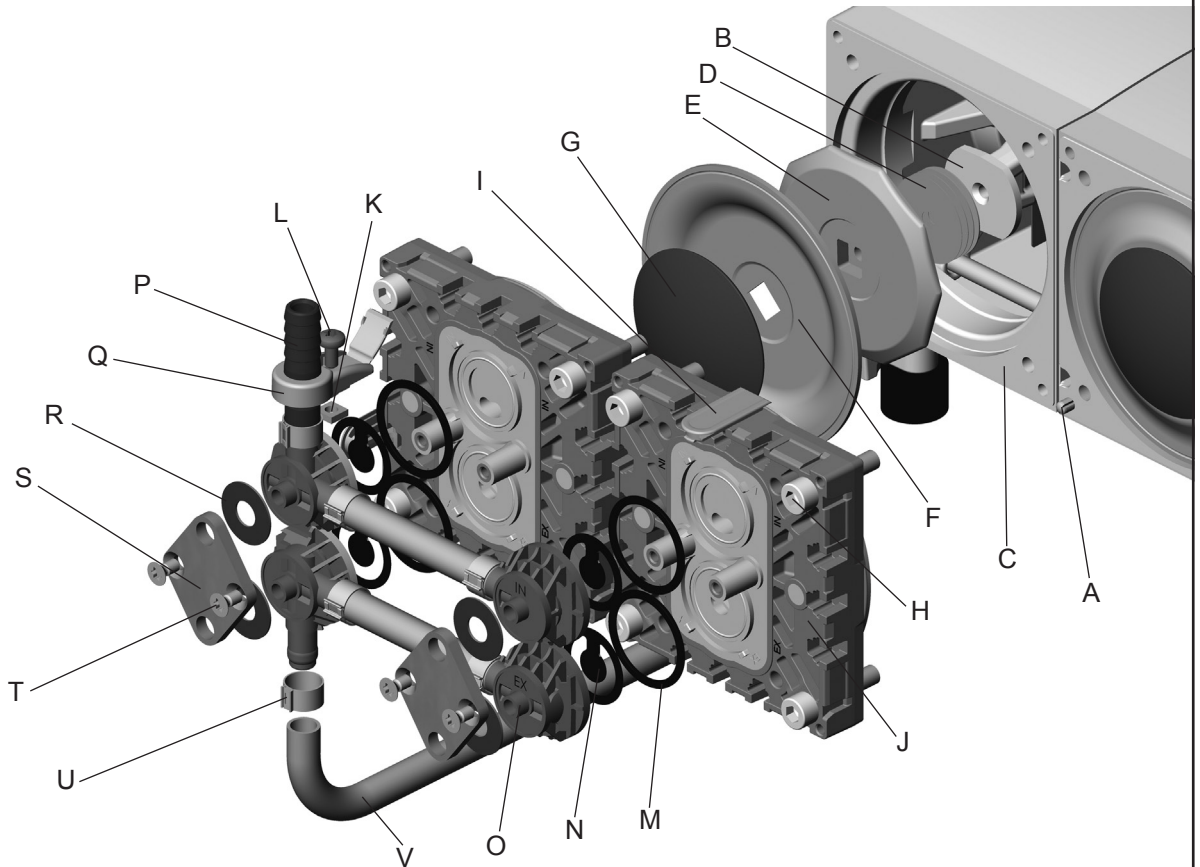
- Detach the coupling of the connection tube (V) to the other side of the pump as well as the hose connection to the inlet/outlet of the vacuum system at the valve head (O).
- Open the hose clip (U) with a slotted screwdriver.
  - Pull the tubing off the hose connector.



- Opening the hose clip:
- Apply slotted screwdriver as shown and turn.

## View of the disassembled pump head parts

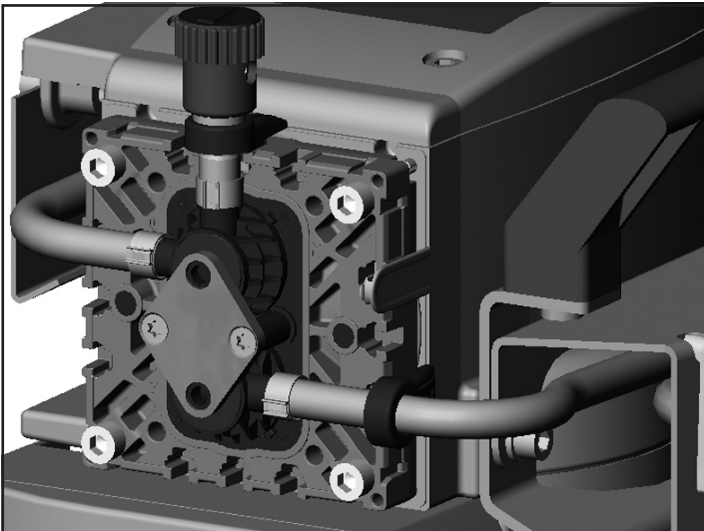
(fig.: MD 4C NT)



- |  |   |
|--|---|
| A: Head alignment pin / mark                         | L: Fillister head screw                     |
| B: Connecting rod                                    | M: O-ring                                   |
| C: Housing   | N: Valve                                    |
| D: Washer  | O: Valve head                               |
| E: Diaphragm support disc                            | P: Hose nozzle                              |
| F: Diaphragm   | Q: Connection fastener<br>with hinged cover |
| G: Diaphragm clamping disc<br>with square head screw | R: Disc spring                              |
| H: Allen screw                                       | S: Clamping bracket                         |
| I: Cap   | T: Countersunk screw                        |
| J: Head cover  | U: Hose clip                                |
| K: Square nut  | V: Connection tube                          |

This labeling is used throughout the following pages.

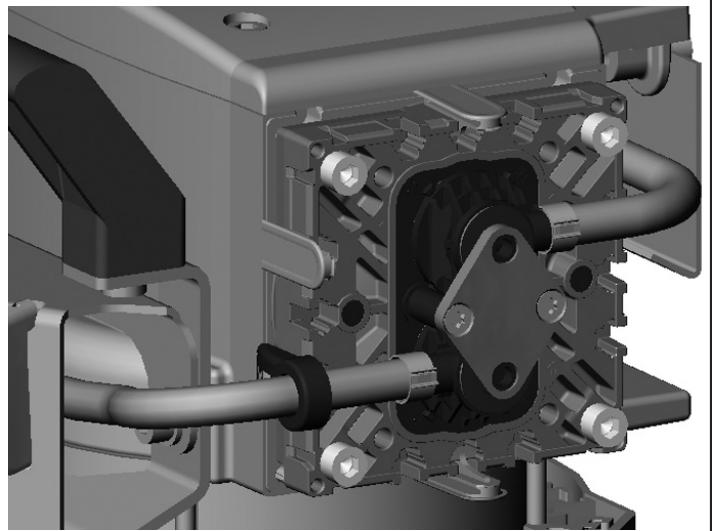
## Fittings and tubing of the different pump models:



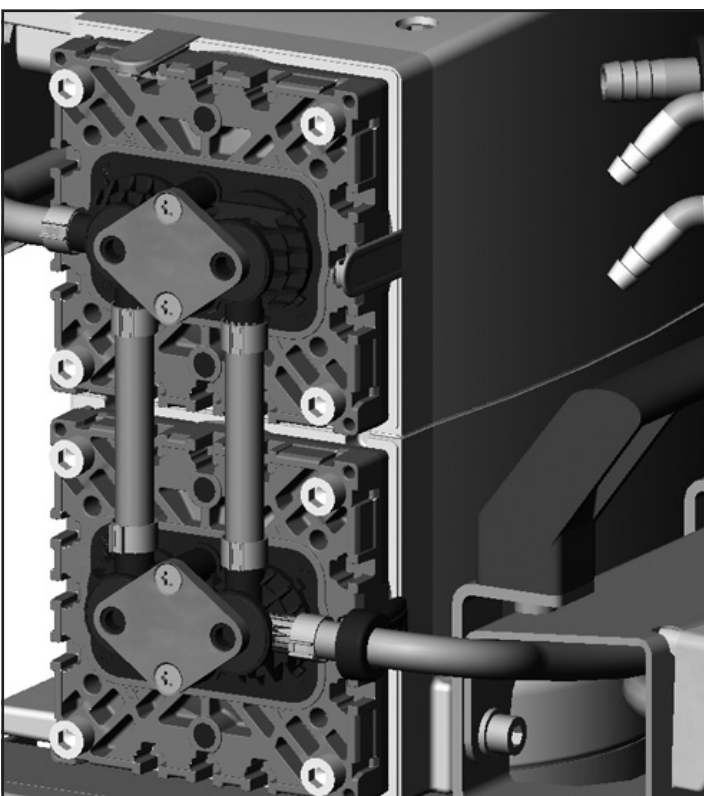
**PC 500 LAN NT,  
inlet side**



**PC 500 LAN NT,  
outlet side**

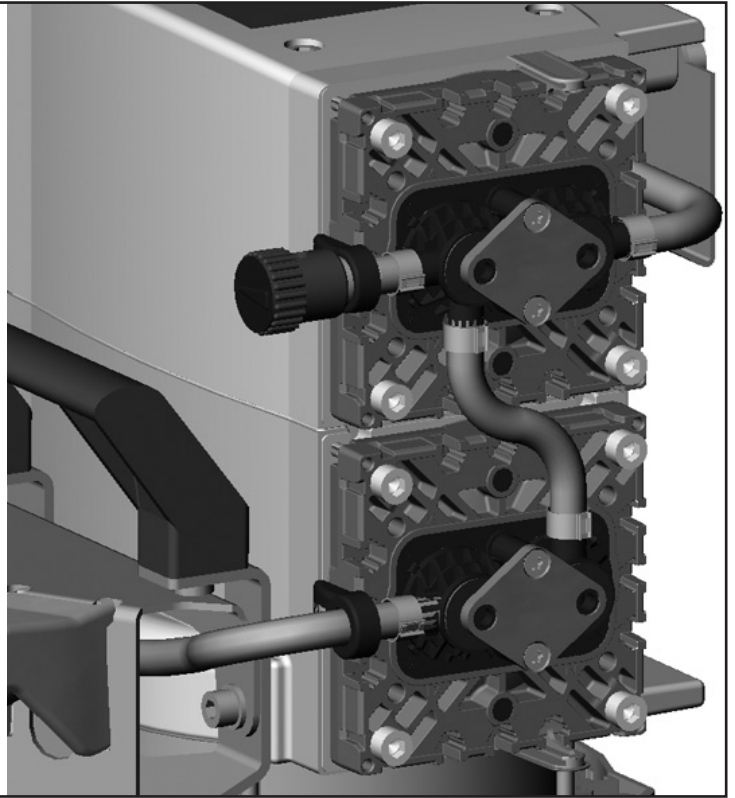


**PC 600 LAN NT,  
inlet side**

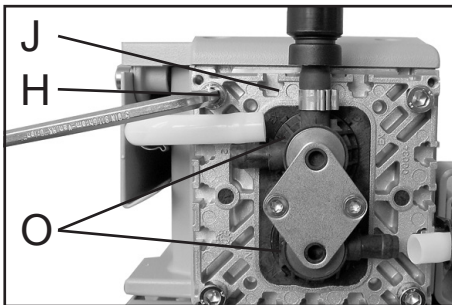




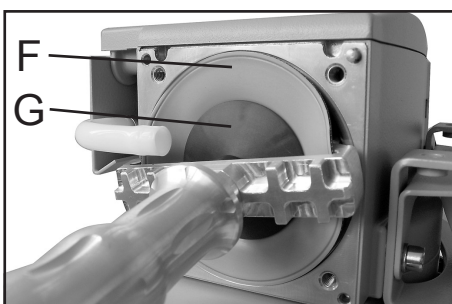
## PC 600 LAN NT, outlet side



### Replacing the diaphragm

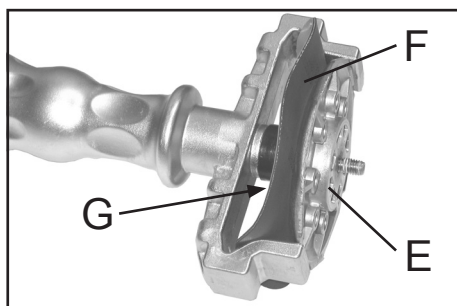


- Disassemble head covers (J) to check the diaphragm (F).
- Unscrew four (pump with two heads) or eight (pump with four heads) Allen screws (H) with a 5mm wide Allen key. Remove both head covers (J) (pumps with two heads: only one head cover) together with valve heads (O) and connections.
- ☞ It is not necessary to disassemble the valve heads (O), the connection fasteners (Q), or the hose connection between the adjacent head covers (pumps with four heads).



- ☞ Check diaphragm (F) for damage and replace if necessary.
- Lift diaphragm carefully sidewise.
- ☞ Never use a pointed or sharp-edged tool to lift the diaphragm.
- Use the diaphragm key to grip the diaphragm support disc (E) below the diaphragm.

- ➔ Unscrew diaphragm support disc (E) with diaphragm (F) and diaphragm clamping disc (G).
- ➔ Check for washers (D) between the diaphragm support disc (E) and the connecting rod (B). Do not mix the washers from the different pump heads, since these are set at the factory to ensure proper pump performance. Make sure that the original number is reassembled at the individual pump head.
- ☞ Too few washers: The pump will not attain vacuum specification. Too many washers: Diaphragm clamping disc will hit head cover, causing noisy operation and possibly causing the pump to seize up.
- ☞ If the old diaphragm is difficult to separate from the diaphragm support disc, immerse assembly in naphtha or petroleum ether. Do not inhale vapors!



- ➔ Position new diaphragm (F) between diaphragm clamping disc with square head screw (G) and diaphragm support disc (E).
- ☞ Note: Position diaphragm with pale side towards diaphragm clamping disc (facing pump chamber).

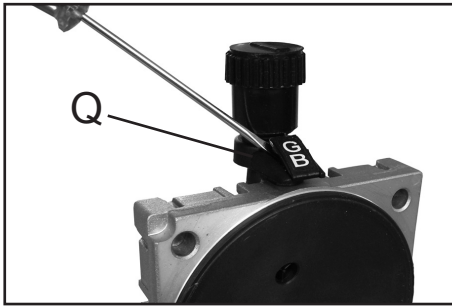
- ☞ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.
- ➔ Lift the diaphragm at the side. Place the diaphragm carefully together with diaphragm clamping disc and diaphragm support disc in the diaphragm key.
- ☞ Avoid damage of the diaphragm: Do not excessively bend or crease the diaphragm.



- ☞ Assemble the original number of washers (D) between diaphragm support disc (E) and connecting rod (B).
- ➔ Screw diaphragm clamping disc (G), diaphragm (F), diaphragm support disc (E), and washers (D) to connecting rod (B).

- ➔ Optimum torque for the diaphragm support disc: 4.4 ft·lb<sub>f</sub> (6 Nm), it is recommended to use a torque wrench. Attach torque wrench to diaphragm key (hexagonal bolt 6 mm wide).  
Note: Never use the diaphragm key with any additional tools like tongs or Allen keys without appropriate torque limitation.

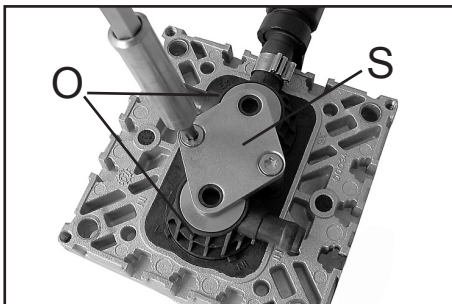
## Replacing the valves



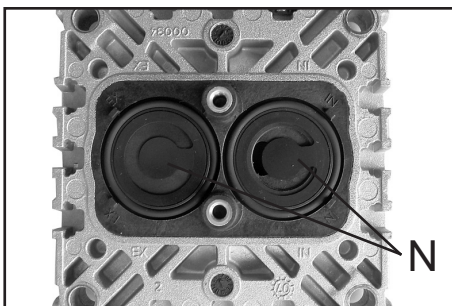
- ➔ Open the hinged cover of the connection fastener (Q) with a slotted screwdriver.



- Loosen connection fastener slightly.
- ➔ Turn the fillister head screw (L) with a Torx driver T20 at most one turn.
- ☞ Do not detach the fillister head screw from the square nut (K).



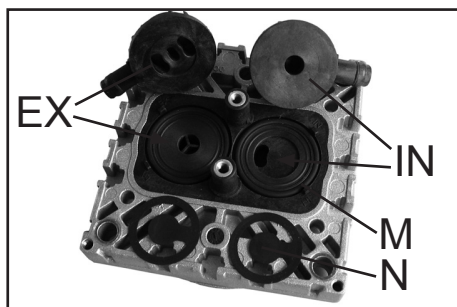
- Loosen the clamping brackets (S) on the valve heads (O).
- ➔ Unscrew at each clamping bracket the two countersunk screws with a Torx driver T20. Remove the clamping brackets.



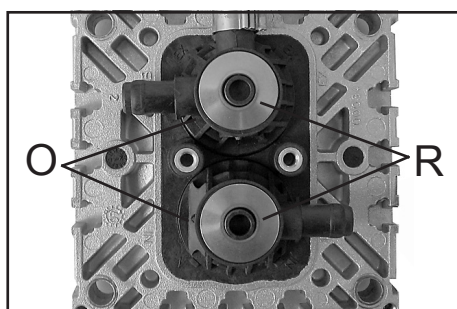
- ➔ Remove valve heads (O) along with the disc springs (R), connection tube if applicable, and connection fasteners (Q) or move the valve heads carefully aside. Note position and orientation of the valve heads.
- ☞ Note position and alignment of valves (N).

- ➔ Check valves (N) and O-rings (M) for damage and soiling.
- ➔ Replace valves or O-rings if necessary.
- ➔ Use petroleum ether or other industrial solvent to remove deposits. Do not inhale vapors.





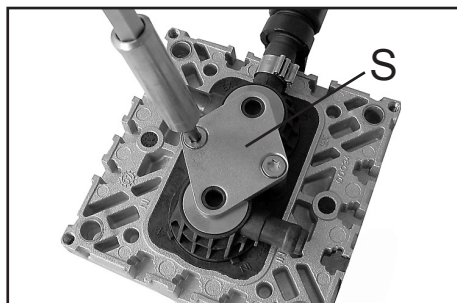
- Insert O-rings (M) and valves (N). See figure for the correct position of the valves:
- ☞ Inlet side (IN):  
Marked "IN" next to the valve seat. The valve tongue points at the kidney-shaped orifice in the valve seat.
- ☞ Outlet side (EX):  
Marked with "EX" next to the valve seat. The valve is oriented the same direction as the valve at the inlet side.



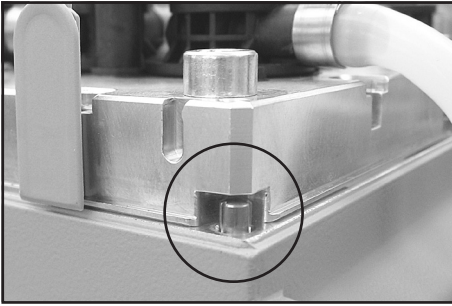
- Position valve heads (O), with connection tube or connection fastener (Q), and disc springs (R) on the valve seats. Position disc springs with large opening downwards. Pay attention to the correct orientation of the valve heads.
- ☞ Center the valve head with respect to the valve seat. The valve head must lie flat on the valve seat.

#### Valve head with gas ballast connection:

- Insert square nut (K) in the groove of the head cover (J) or position square nut in the groove and then screw on connection fastener.
- ☞ Loosely fasten fillister head screw (L).



- Position clamping bracket (S) with countersunk bores facing upwards.
- Align the countersunk bores with the threaded pegs.
- Loosely fasten the countersunk screws and correct the alignment of the valve heads if necessary.
- Tighten countersunk screws with Torx screwdriver T20.
- ☞ Torque: 2.2 ft·lb<sub>f</sub> (3 Nm).

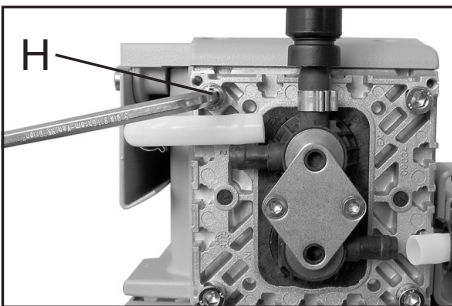


- Bring the diaphragms (F) into a position, in which they are in contact with the housing (C) and centered with respect to the bore.
- Put on head cover (J) with valve heads (O) and connections attached.

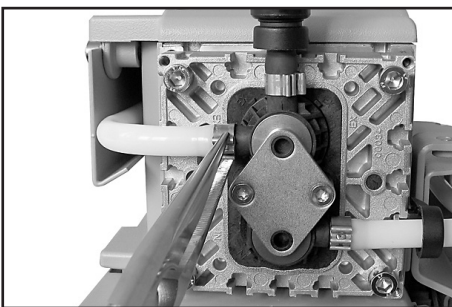
☞ Pay attention to the correct orientation of the head covers:

Housing with head alignment pin: The head alignment pin (A) at the pump housing (C) has to fit into the recess at the head cover (J).

Housing with mark (A): Align the recess at the head cover with the mark at the pump housing.

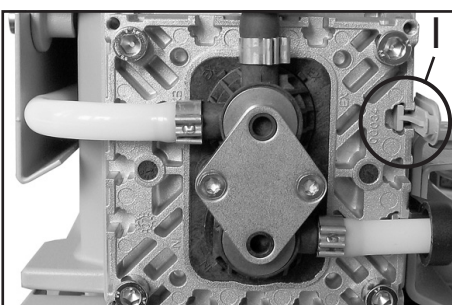


- Loosely screw in the Allen head screws (H) at the head covers diagonally at first slightly with a 5 mm wide Allen key, then tighten.
- ☞ Recommended torque: 8.9 ft·lb<sub>f</sub> (12 Nm).

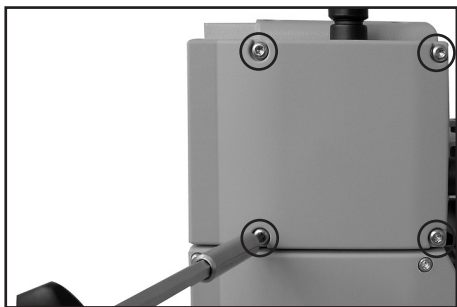


Affix the connection tube (V) to the other side of the pump, as well as the hose connection to the inlet or outlet of the vacuum system at the valve head (O).

- Slip connecting tube (V) onto hose connection of valve head.
- Slide on the tube and the hose clip (U) until touching the nose at the valve head.
- Close hose clip (U) with flat pliers.



- Slide the blinds (I) in the head cover.

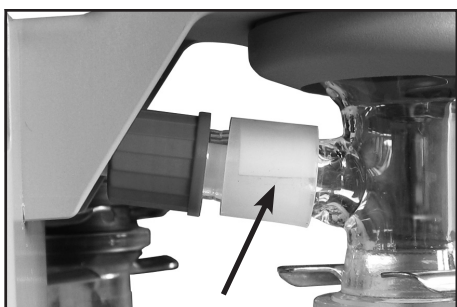


- Put head cover cowling on.
- Slide the head cover cowling in the grooves of the caps (I) and under the connection fasteners (Q).
- Install the washers. Use a Torx driver T20 to attach the 4 screws holding the head cover cowling.



- Tighten the fillister head screws (L) of the connection fasteners (Q) with a Torx driver T20.
- Close the hinged covers.

## Replace diaphragms and valves of the opposite side of the pump in the same way.



- Check the overpressure safety relief device at the exhaust waste vapor condenser.
- If necessary, pull off the old pressure relief valve and install the new one. Check for correct position of the PTFE-foil under the pressure relief valve.



- Feed the PTFE hose into the inlet of the exhaust vapor condenser. Mount the condenser with the counter holder (Torx screws T10) to the pump. Fasten union nut.



- Assemble catchpots (9) with joint clips.



- Slip the PTFE tube onto the hose connection of the vacuum connection at the controller. Loosen the union nut at the vacuum connection of the controller.
- Secure with union nut. Tighten the union nut firmly finger-tight.

### **If the pump does not achieve the ultimate vacuum:**

- Whenever the diaphragms and valves have been replaced, a break-in period of several hours is required before the pump achieves its ultimate vacuum.
- In case of an unusual noise, switch off pump immediately and check clamping disc positions.

If the specified ultimate vacuum is not achieved, and if this does not change after the break-in period:

Check hose connectors at pump heads for leaks. If necessary recheck valve seats and diaphragms.

## Replacing the device fuse at the diaphragm pump

**DANGER**



- ➔ **Switch off the pump.**
- ➔ **Disconnect the electrical power cord** before opening the terminal box. After disconnecting from power, **wait five seconds** to allow the capacitors to discharge.

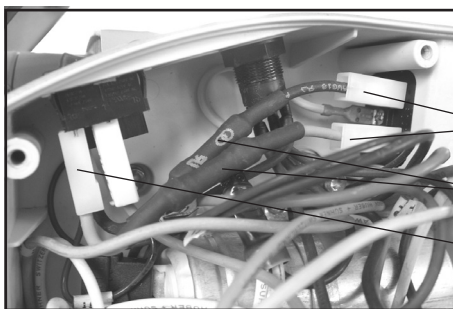
**WARNING**

- ☞ The replacing of the fuse has to be carried out by a trained electrician.
- ☞ After replacing the fuse, the pump must be checked for electric safety (see below)! Identify and eliminate the cause of failure before switching on the pump again.



The pigtail fuses are integrated into wires ((1), black and blue) inside the terminal box. To replace the fuses it is necessary to replace both wires completely (fixed with flat pin bushings (2)).

- ➔ Open the terminal box. Unscrew the four screws with a Torx driver T20. Remove the terminal box cover. Remove both wires with integrated fuses (fixed with flat pin bushings (2), see figure). Mount the new wires (flat pin bushings) and close the terminal box. Fasten the cover with the four screws.



Order-no. Set of fuses NT.....**636542**

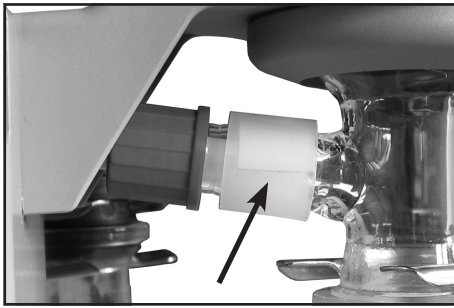
**WARNING**

**Important: Check operability and safety of the pump after repair and after replacing the device fuse.**

Check the electrical safety (protective conductor resistance, insulating resistance, high voltage test) according to IEC 61010 and national regulations.



# Cleaning and replacing components



**Overpressure safety relief device** ..... **638821**  
(at exhaust waste vapor condenser)

- Remove catchpot at outlet.
- Loosen the union nut at the inlet of the exhaust vapor condenser.



- Remove the 4 screws affixing the counter holder of the exhaust vapor condenser with a Torx driver T10. Remove the exhaust vapor condenser. In doing so pull the PTFE hose out of the inlet of the exhaust vapor condenser.
- If necessary, pull off the old pressure relief valve and install the new one. Check for correct position of the PTFE-foil under the pressure relief valve.
- Feed the PTFE hose into the inlet of the exhaust vapor condenser. Mount the condenser with the counter holder (Torx screws T10) to the pump. Fasten union nut.



**Catchpot**  
0.52 qt (500 ml), coated ..... **638497**

**O-ring 28 x 2.5** ..... **635628**  
at the spherical ground joint of the catchpot at the inlet

# Notes on return to the factory

## Repair - return - DAkkS calibration

### **NOTICE**

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”, pg. 100, must be sent to our office fully completed and signed before any equipment is shipped to the authorized service center.

Fax or mail 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 / DAkkS 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 followed.**

### **CAUTION**

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 service center.**

- 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 **repair quotations** only on request and always at the customer's expense. If an order is placed, the costs incurred for problem diagnosis 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 may be returned to you disassembled and at your expense.**

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

For cleaning we use an environmentally friendly water-based process. Unfortunately the combined attack of elevated temperature, cleaning agent, ultrasonic treatment and mechanical stress (from pressurized 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 will also replace parts for cosmetic reasons at your request and at your expense.

## **NOTICE**

Before returning the equipment, ensure that (if applicable):

- Oil sealed pumps: Oil has been drained and an adequate quantity of fresh oil has been filled in to protect against corrosion. Dispose according to regulations.
- Equipment has been cleaned and/or decontaminated (inside and outside).
- All inlet and outlet ports have been capped.
- Equipment has been properly packed, (if necessary, please order original packaging materials at your cost), marked appropriately and the carrier has been notified of any possible contamination.
- The completed health and safety clearance form is enclosed.

We thank you in advance for your understanding of the necessity for these measures that protect our employees, and ensure that your pump is protected in shipment.

**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 your processes. Do not incinerate fluoroelastomer seals and O-rings.

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

# Warranty

VACUUBRAND shall be liable for insuring that this product, including any agreed installation, has been free of defects at the time of the transfer of risk.

VACUUBRAND shall not be liable for the consequences of improper handling, use, servicing or operation of this product 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 this manual.

Claims for defects against VACUUBRAND shall be limited to one year from delivery. The same shall apply to claims for damages irrespective of legal grounds.

For further information on general terms and conditions refer to [www.vacuubrand.com](http://www.vacuubrand.com).

# Health and safety clearance form



Devices will not be accepted for any handling before we have received this declaration. Please read and comply with "Notes on return to the factory".  
Oil filled pumps: Drain oil prior to shipping absolutely!

1. Device (Model): ..... 2. Serial no.: .....  
3. Reason for return / malfunction:

.....

4. Has the device been used in a copper process step (e.g., semiconductor production).  yes  no

5. Substances (gases, liquids, solids) in contact with the device / which have been pumped:  
.....  
.....  
.....

6. Prior to return to the factory the device has been decontaminated.  yes  no  
Description of the decontamination method and the test / verification procedure:

.....

7. The device is free of hazardous, harmful substances.  yes  no

8. Protective measures required for VACUUBRAND employees:  
.....

9. If the paint is damaged, we wish a repaint or a replacement of parts for reason of appearance (repaint and replacement at customer's expense).  yes  no

### 10. Legally binding declaration

We assure for the returned device that all substances, which have been in contact with the device are listed in section 5 and that the information is complete and that we have not withheld any information. We declare that all measures - where applicable - have been taken listed in section "Return to the factory". By our signature below, we acknowledge that we accept liability for any damage caused by providing incomplete or incorrect information and that we shall indemnify VACUUBRAND from any claims as regards damages from third parties. We are aware that as expressed in § 823 BGB (Public Law Code of Germany) we are directly liable for injuries or damages suffered by third parties, particularly VACUUBRAND employees occupied with handling/repairing the product.  
Shipping of the device must take place according to regulations.

Name: ..... Signature: .....

Job title: ..... Company's seal:

Date: .....

Release for repair grant by VACUUBRAND (date / signature): .....



**EG-Konformitätserklärung für Maschinen  
EC Declaration of Conformity of the Machinery  
Déclaration CE de conformité des machines**

Hersteller / Manufacturer / Fabricant:

VACUUBRAND GMBH + CO KG · Alfred-Zippe-Str. 4 · 97877 Wertheim · Germany

Hiermit erklärt der Hersteller, dass die Maschine konform ist mit den Bestimmungen der Richtlinie 2006/42/EG.

Hereby the manufacturer declares that the machinery is in conformity with the directive 2006/42/EC.

Par la présente, le fabricant déclare, que la machine est conforme à directive 2006/42/CE.

Membranvakuumpumpe / Diaphragm vacuum pump / Pompe à membrane:

Typ / Type / Type: PC 500 LAN NT / PC 600 LAN NT

Artikelnummer / Order number / Numéro d'article: 733400, 733401, 2614173 / 737400, 737401

Seriennummer / Serial number / Numéro de série: Siehe Typenschild / See rating plate / Voir plaque signalétique

Die Maschine ist konform mit weiteren Richtlinien / The machinery is in conformity with other directives / La machine est conforme à d'autres directives:

2006/95/EG, 2004/108/EG, 94/9/EG

Angewandte harmonisierte Normen / Harmonized standards applied / Normes harmonisées utilisées:

DIN EN 12100:2004, DIN EN 61010-1:2010 (Ed. 3), DIN EN 1012-2:2011,

DIN EN 61326-1:2006, DIN EN 1127-1:2011, DIN EN 13463-1:2009

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen / Person authorised to compile the technical file / Personne autorisée à constituer le dossier technique:

Dr. J. Dirscherl · VACUUBRAND GMBH + CO KG · Alfred-Zippe-Str. 4 · 97877 Wertheim · Germany

Wertheim, 03.02.2014

ort, Datum / place, date / lieu, date

(Dr. F. Gitmans)

Managing director / Gérant

ppa.

(Dr. J. Dirscherl)

Technical Director / Directeur technique



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