

# Vaclon Plus 200

## Models

X3601-64000, X3601-64018, X3601-64040, X3601-64002,  
X3601-64020, X3601-64042, X3601-64004, X3601-64022,  
X3601-64044, X3601-64001, X3601-64019, X3601-64041,  
X3601-64003, X3601-64021, X3601-64043, X3601-64005,  
X3601-64023, X3601-64045, X3601-64012, X3601-64030,  
X3601-64052, X3601-64014, X3601-64032, X3601-64054,  
X3601-64016, X3601-64034, X3601-64056, X3601-64013,  
X3601-64031, X3601-64053, X3601-64015, X3601-64033,  
X3601-64055, X3601-64017, X3601-64035, X3601-64057

## Manuale di Istruzioni Bedienungshandbuch Notice de Mode D'Emploi Instruction Manual

87-900-151-01(A)

01/2017



**Agilent Technologies**

## Notices

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ITALY

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### CAUTION

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### WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a **WARNING** notice until the indicated conditions are fully understood and met.

## Vaclon Plus 200





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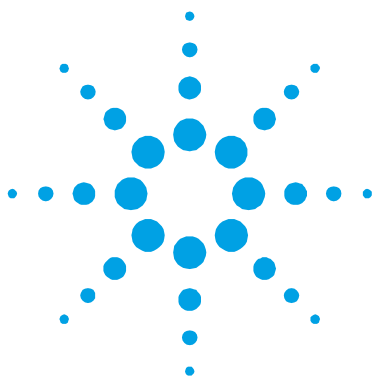
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Traduzione delle istruzioni originali



## Informazioni Generali

Questa apparecchiatura è destinata ad uso professionale. L'utilizzatore deve leggere attentamente il presente manuale di istruzioni ed ogni altra informazione addizionale fornita da Agilent prima dell'utilizzo dell'apparecchiatura. Agilent si ritiene sollevata da eventuali responsabilità dovute all'inosservanza totale o parziale delle istruzioni, ad uso improprio da parte di personale non addestrato, ad interventi non autorizzati o ad uso contrario alle normative nazionali specifiche.

Le pompe della serie VacIon Plus sono pompe ioniche utilizzate comunemente per applicazioni di ultra alto vuoto, grazie alla loro pulizia, capacità di pompare qualsiasi tipo di gas, e del loro funzionamento senza vibrazioni e necessità di manutenzione.

Nei paragrafi seguenti sono riportate tutte le informazioni necessarie a garantire la sicurezza dell'operatore durante l'utilizzo dell'apparecchiatura. Informazioni dettagliate sono fornite nell'appendice "Technical information".

**Questo manuale utilizza le seguenti convenzioni:**

---

### AVVERTENZA!



I messaggi di avvertenza attirano l'attenzione dell'operatore su una procedura o una pratica specifica che, se non eseguita in modo corretto, potrebbe provocare gravi lesioni personali.

---

### ATTENZIONE!

I messaggi di attenzione sono visualizzati prima di procedure che, se non osservate, potrebbero causare danni all'apparecchiatura.



---

### NOTA

Le note contengono informazioni importanti estrapolate dal testo.

---

## Simboli di sicurezza

SIMBOLO	DESCRIZIONE DEI SIMBOLI
	<p>Vietato l'accesso ai portatori di stimolatori cardiaci attivi.</p> <p>L'apparato è contrassegnato da questo simbolo per segnalare che i portatori di stimolatori cardiaci attivi non devono entrare in contatto con l'apparato stesso.</p>
	<p>Pericolo elettricità.</p> <p>L'apparato è contrassegnato da questo simbolo quando l'operatore, in presenza di alta tensione, deve fare riferimento al manuale di istruzioni al fine di proteggersi dai rischi di folgorazione.</p>
	<p>Pericolo campo magnetico.</p> <p>L'apparato è contrassegnato da questo simbolo per segnalare all'operatore la presenza di un campo magnetico.</p>
	<p>Pericolo superficie calda.</p> <p>L'apparato è contrassegnato da questo simbolo quando l'operatore deve evitare il contatto con superfici potenzialmente calde che potrebbero causare ustioni.</p>

## 1 Procedura per l'installazione Immagazzinamento

### Immagazzinamento

Per trasportare ed immagazzinare la pompa ionica occorre osservare le seguenti condizioni ambientali:

- Temperatura: da -20 °C a +70 °C;
- Umidità relativa: da 5 a 95% (senza condensa).

## Preparazione per l'installazione

La pompa viene fornita in un imballo protettivo speciale; se si presentano segni di danni, che potrebbero essersi verificati durante il trasporto, contattare l'ufficio vendite locale. Durante l'operazione di disimballaggio, prestare particolare attenzione a non lasciar cadere la pompa e a non sottoporla ad urti o vibrazioni. Non disperdere l'imballo nell'ambiente. Il materiale è completamente riciclabile e risponde alla direttiva CEE 85/399 per la tutela dell'ambiente.

**ATTENZIONE!** Onde evitare problemi di contaminazione e conseguente degassamento, non toccare con le mani nude i componenti destinati ad essere esposti al vuoto. Utilizzare sempre guanti da alto vuoto o altra protezione adeguata.

---

### NOTA

La pompa non può essere danneggiata rimanendo semplicemente esposta all'atmosfera. Si consiglia comunque di mantenerla chiusa fino al momento dell'installazione sul sistema onde evitare eventuale inquinamento da polvere.

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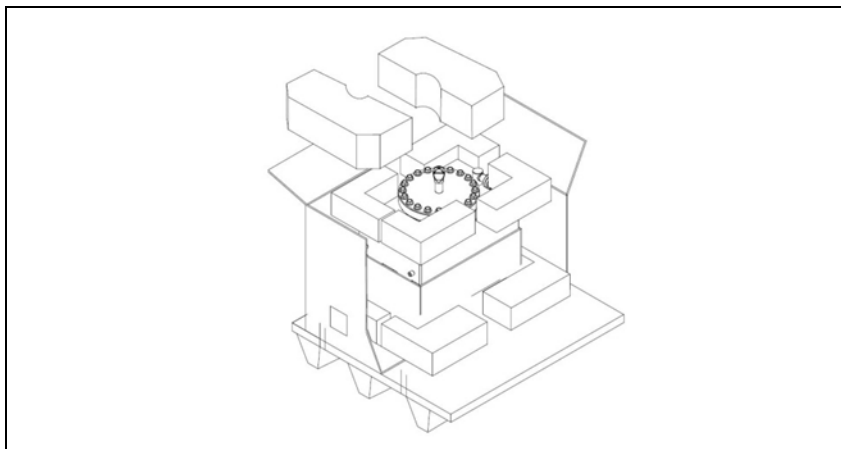
### NOTA

Per effetto del particolare trattamento termico a cui la pompa viene sottoposta (vedere il paragrafo "Description of the Vaclon pump" per maggiori dettagli), la superficie esterna del corpo pompa potrebbe presentare una colorazione non omogenea e con sfumature tendenti al giallo. Questa caratteristica estetica non deve essere considerata un difetto e non pregiudica in alcun modo la pulizia delle superficie delle superfici interne della pompa esposte al vuoto.

---

## 1 Procedura per l'installazione

### Preparazione per l'installazione



**Figura 1** Imballaggio della pompa Vaclon Plus 200.

## Installazione

---

**AVVERTENZA!**



La pompa, a causa del suo peso, deve essere maneggiata tramite appositi attrezzi di sollevamento e spostamento.

---

Non installare e/o utilizzare la pompa in ambienti esposti ad agenti atmosferici (pioggia, gelo, neve), polveri, gas aggressivi, in ambienti esplosivi o con elevato rischio di incendio. Durante il funzionamento, per ottenere le specifiche tecniche dichiarate, la temperatura ambiente deve essere compresa tra 0 °C e +85 °C e l'umidità tra 0% e 95% (senza condensa).

**ATTENZIONE!**

La pompa deve essere tenuta sigillata con il suo tubo di ingresso schiacciato ("pinch-off") finché non è pronta per essere collegata al sistema.

---

**AVVERTENZA!**



Per evitare lesioni alla persona, non collegare l'alta tensione alla pompa prima che sia installata nel sistema e che tutte le flange di ingresso siano adeguatamente collegate o chiuse.

---

Il funzionamento delle pompe è ottimizzato solo con l'uso delle apposite unità di controllo Agilent.

## 1 Procedura per l'installazione Installazione

**ATTENZIONE!** Il rispetto delle normative di sicurezza nell'uso delle pompe è garantito solo con l'uso delle unità di controllo Agilent.

---

La pompa VacIon Plus può essere installata in qualsiasi posizione. Per convenienza normalmente viene montata in posizione verticale con la flangia di ingresso in alto. Per installazioni con posizione diversa dalla verticale, la pompa, dato il suo peso, deve essere opportunamente sostenuta tramite i piedini filettati posti sui lati del corpo pompa, che possono essere utilizzati come punto di aggancio a sbarre o piastre di sostegno, la cui geometria dipende dal tipo di sistema su cui la pompa viene montata.

Per informazioni dettagliate sull'installazione della pompa, vedere l'appendice "Technical Information".



## Uso

Tutte le istruzioni per il corretto funzionamento delle pompe VacIon Plus sono contenute nel manuale dell'unità di controllo. Leggere attentamente tale manuale prima dell'utilizzo.

Si raccomanda di portare la pompa ad una pressione uguale o minore di  $1E-5$  Torr (mbar) per la versione Diode/Noble Diode -  $1E-4$  Torr (mbar) per la versione StarCell - in modo da ottenere un avvio più rapido e prolungare la vita della pompa. Tipicamente questo livello di pressione può facilmente e rapidamente essere raggiunto per mezzo di una pompa turbomolecolare, supportata da una pompa primaria, possibilmente non lubrificata con olio, al fine di evitare rischi di contaminazione legati ai vapori di olio.

In linea di principio la pompa ionica può essere avviata anche a pressioni superiori a quella da noi raccomandata, ma questa pratica, se protratta nel tempo, può ridurre il tempo di vita della pompa. In passato la necessità di avviare la pompa ionica ad alta pressione era legata al bisogno di collegarla direttamente alla pompa primaria; con l'avvento delle pompe turbomolecolari tale necessità è venuta meno.

Depositi igroscopici, che sono naturale conseguenza dell'esposizione della pompa all'aria, e l'assorbimento di idrogeno all'interno dei catodi di titanio, fenomeno connesso al principio fisico di funzionamento della pompa, possono nel tempo provocare l'allungamento del tempo di avvio. Infatti il riscaldamento della pompa che si verifica al suo avvio provoca il rilascio del vapore acqueo e di parte dell'idrogeno pompato precedentemente, rendendo la partenza più lunga.

## Procedure di uso

- 1** Controllare che la polarità dell'unità di controllo sia corretta per la pompa: polarità positiva per le pompe Diode/Noble Diode e negativa per le StarCell. A tale scopo fare riferimento al relativo manuale del controller. Osservare la seguente procedura per l'uso della pompa: tramite una pompa turbomolecolare di pre-vuoto (supportata da una pompa primaria) portare il sistema da vuoto ad una pressione minima di avvio in accordo alla tabella 1. Si raccomanda di installare una valvola a chiusura metallica tra la pompa ionica e la pompa turbomolecolare, in modo da poter successivamente escludere quest'ultima.
- 2** Collegare l'unità di controllo della pompa ad una apposita fonte di alimentazione ed accendere l'unità. Seguendo le istruzioni sul manuale dell'unità di controllo alimentare la pompa ionica.
- 3** Osservare la tensione, la corrente e la pressione sul display dell'unità di controllo. Se l'avvio è avvenuto ad una pressione troppo alta, tipicamente la tensione si attesterà su qualche centinaia di Volt. Se la tensione rimane costante intorno a suddetti valori, per evitare il surriscaldamento della pompa si raccomanda di spegnerla, attendere e di avviarla nuovamente ad una pressione inferiore (vedere il paragrafo "Uso"). Si prega di notare che un valore di corrente prossimo alla corrente di corto circuito dell'unità di controllo è indice dell'esistenza di una perdita nella pompa e nel sistema. Inoltre un temporaneo incremento della pressione di pre-vuoto è normale durante la fase di avvio. Se la pompa ionica è stata avviata alla pressione suggerita (vedere la tabella 1), la tensione raggiungerà in breve tempo il valore pre-impostato sull'unità di controllo (3, 5 o 7 kV). Una volta raggiunta la tensione operativa, la corrente inizierà a scendere. Si raccomanda a questo punto di chiudere la valvola di pre-vuoto, in modo da isolare la pompa ionica e il sistema dalla pompa turbomolecolare. Se la tensione della pompa ionica scende dopo la chiusura della valvola, riaprirla quest'ultima per un pre-pompaggio aggiuntivo. Appena la pressione diminuisce, la tensione cresce nuovamente e la valvola di pre-vuoto può essere chiusa.
- 4** Quando la tensione ha raggiunto il valore operativo pre-impostato, mettere l'unità di controllo nello stato PROTECT. Il sistema sarà così autoprotetto dall'incremento della pressione oltre il valore pre-impostato. Nel caso in cui ci fosse un tale incremento, l'unità di controllo viene spenta automaticamente.

- 5 Se sull'unità di controllo Agilent viene impostato correttamente il tipo di pompa in utilizzo, sul display comparirà anche il valore di pressione ottenuto dalla conversione della corrente, in accordo con il diagramma pressione-corrente illustrato nel paragrafo "Technical Information" di questo manuale. Ricordiamo che l'indicazione della pressione potrebbe non essere corretta nel caso in cui, durante il suo utilizzo, la pompa ionica sviluppi una corrente di dispersione. In tal caso la pressione indicata dal display sarà maggiore di quella reale.

**NOTA**

I gradini nei diagrammi pressione - corrente sono una caratteristica del modo di funzionamento "step" dei controller Agilent. Quando la corrente assorbita dalla pompa raggiunge determinati valori, l'unità di controllo porta il valore dell'alta tensione in uscita ad un valore più basso (nel caso di corrente decrescente) o più alto (nel caso di corrente crescente). Questo avviene al fine di alimentare la pompa, in ogni intervallo di pressione, alla tensione per la quale la sua velocità di pompaggio è massima.

---

- 6 Quando si porta la pompa alla pressione atmosferica, usare azoto secco in modo da evitare l'assorbimento di vapore acqueo da parte delle pareti della pompa. Si raccomanda, una volta spenta la pompa, di attendere il raffreddamento degli elementi al suo interno prima di procedere con l'esposizione alla pressione atmosferica.
- 

**AVVERTENZA!**



Quando la pompa viene utilizzata per il pompaggio di gas tossici, infiammabili o radioattivi, seguire le appropriate procedure tipiche di ciascun gas. Non usare la pompa in presenza di gas esplosivi.

---

## 1 Procedura per l'installazione

### Procedure di uso

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#### **AVVERTENZA!**



Quando è installato il riscaldatore, non toccare la pompa durante le operazioni di riscaldamento e di raffreddamento. L'elevata temperatura può causare lesioni alle persone.

---

#### **ATTENZIONE!**

Non avvicinare dispositivi elettronici alla pompa. Il campo magnetico attorno ad essa può provocare dei malfunzionamenti dei dispositivi stessi.

---

## Manutenzione

Le pompe della serie VacIon Plus non richiedono alcuna manutenzione. Qualsiasi intervento deve essere eseguito da personale autorizzato.

---

### **AVVERTENZA!**



**Prima di effettuare qualsiasi intervento sulla pompa scollegarla dall'alta tensione.**

---

Qualora una pompa dovesse essere rottamata, procedere alla sua eliminazione nel rispetto delle normative nazionali specifiche.

## Smaltimento

### Significato del logo "WEEE" presente sulle etichette.

Il simbolo qui sotto riportato applicato in ottemperanza alla direttiva CE denominata "WEEE".

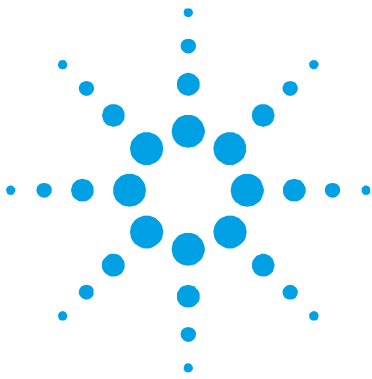
Questo simbolo (**valido solo per i paesi della Comunità Europea**) indica che il prodotto sul quale è applicato, NON deve essere smaltito insieme ai comuni rifiuti domestici o industriali, ma deve essere avviato ad un sistema di raccolta differenziata.

Si invita pertanto l'utente finale a contattare il fornitore del dispositivo, sia esso la casa madre o un rivenditore, per avviare il processo di raccolta e smaltimento, dopo opportuna verifica dei termini e condizioni contrattuali di vendita.



Per maggiori informazioni riferirsi a:

<http://www.agilent.com/environment/product/index.shtml>



## 2

# Anleitung zur Installation

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Übersetzung der Originalanleitungen



## Allgemeine Hinweise

Dieses Gerät ist für den professionellen Gebrauch bestimmt. Vor dem Gebrauch soll der Benutzer dieses Handbuch sowie alle weiteren von Agilent mitgelieferten Zusatzdokumentationen genau lesen. Bei vollständiger bzw. teilweiser Nichtbeachtung der enthaltenen Hinweise, unsachgemäßem Gebrauch durch ungeschultes Personal, nicht autorisierten Eingriffen und Mißachtung der nationalen Bestimmungen übernimmt Firma Agilent keinerlei Haftung.

Die Pumpen der Serie VacIon Plus sind Ionenpumpen, die aufgrund ihrer Reinheit, ihrer Fähigkeit, alle Arten von Gas zu pumpen, und ihres vibrations- und wartungsfreien Betriebes, allgemein für Ultrahochvakuumanwendungen zum Einsatz kommen.

In den folgenden Abschnitten sind alle erforderlichen Informationen für die Sicherheit des Bedieners bei der Anwendung des Geräts aufgeführt. Detaillierte technische Informationen sind im Anhang "Technical Information" enthalten.

**In dieser Gebrauchsanleitung werden Sicherheitshinweise folgendermaßen hervorgehoben:**

---

**WARNUNG!**



Die Warnhinweise lenken die Aufmerksamkeit des Bedieners auf eine spezielle Prozedur oder Praktik, die bei unkorrekter Ausführung schwere Verletzungen hervorrufen könnte.

---

**VORSICHT!**

Die Vorsichtshinweise vor bestimmten Prozeduren machen den Bediener darauf aufmerksam, daß bei Nichteinhaltung Schäden am Gerät entstehen können.

---

**HINWEIS**

Die Hinweise enthalten wichtige Informationen, die aus dem Text hervorgehoben werden.

---



## Sicherheits-Symbole

SYMBOL	ERKLÄRUNG DER SYMBOLE
	<p>Zutritt für Personen mit Herzschrittmachern verboten.</p> <p>Das Gerät ist mit diesem Symbol versehen, um darauf hinzuweisen, dass Personen mit Herzschrittmachern nicht mit dem Gerät in Kontakt geraten dürfen.</p>
	<p>Gefahr von Stromschlägen</p> <p>Wenn das Gerät mit diesem Symbol versehen ist, muss das Bedienungspersonal im Fall von Hochspannung im Handbuch nachschlagen, um die richtigen Schutzmaßnahmen gegen Stromschläge zu ergreifen.</p>
	<p>Gefahr durch Magnetfelder.</p> <p>Das Gerät ist mit diesem Symbol versehen, um das Bedienungspersonal darauf hinzuweisen, dass ein Magnetfeld vorliegt.</p>
	<p>Gefahr durch heiße Oberflächen.</p> <p>Das Gerät ist mit diesem Symbol versehen, um das Bedienungspersonal vor dem Kontakt mit möglicherweise heißen Oberflächen zu warnen, die Verbrennungen verursachen können.</p>

## 2 **Anleitung zur Installation**

### Lagerung

## **Lagerung**

Für Transport und Lagerung der Ionenpumpe sind die folgenden Umgebungsbedingungen herzustellen

- Temperatur: -20 °C bis +70 °C;
- Relative Luftfeuchtigkeit: 5 bis 95% (ohne Kondenswasser).

## Vor der Installation

Die Pumpe wird in einer speziellen Schutzverpackung geliefert. Eventuelle Transportschäden sind der zuständigen örtlichen Verkaufsstelle zu melden. Beim Auspacken vorsichtig vorgehen, damit die Pumpe nicht fällt oder Stößen oder Vibrationen ausgesetzt wird. Das Verpackungsmaterial ist ordnungsgemäß zu entsorgen. Es ist vollständig recyclebar und entspricht der EG-Richtlinie 85/399 für den Umweltschutz.

### VORSICHT!

Um Entgasungsprobleme zu vermeiden, dürfen die Komponenten, die mit dem Vakuum in Kontakt kommen, nicht mit bloßen Händen berührt werden. Verwenden Sie geeignete Sicherheitshandschuhe oder andere Schutzvorrichtungen.

---

### HINWEIS

Die Pumpe kann, wenn sie einfach der Atmosphäre ausgesetzt ist, nicht beschädigt werden. Sie sollte jedoch bis zur Installation an der Anlage geschlossen bleiben, um Verunreinigungen durch Staub zu vermeiden.

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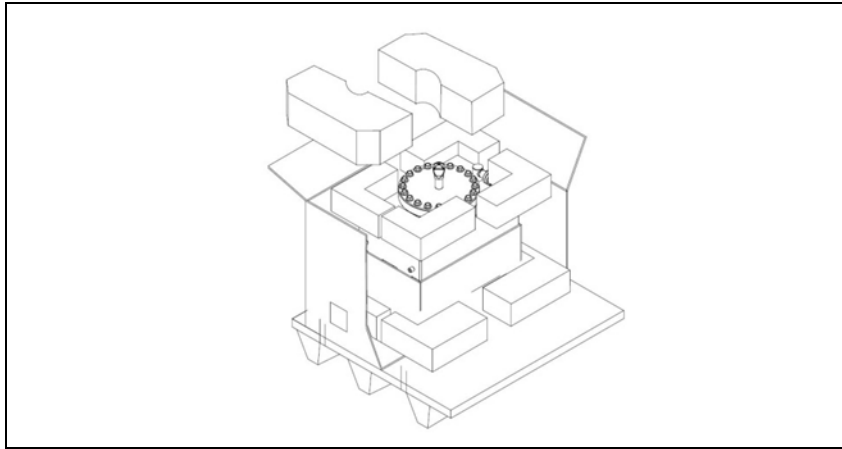
### HINWEIS

Aufgrund der besonderen thermischen Behandlung, der die Pumpe ausgesetzt ist (siehe Abschnitt "Beschreibung der Vakuumpumpe" für weitere Einzelheiten), könnte ihre Oberfläche eine uneinheitliche Färbung mit gelblichen Bereichen aufweisen. Dabei handelt es sich nicht um einen Defekt und die Sauberkeit der dem Vakuum ausgesetzten Innenflächen der Pumpe wird nicht beeinträchtigt.

---

## 2 Anleitung zur Installation

### Vor der Installation



**Abbildung 1** Verpackung der Pumpe Vaclon Plus 200.

## Installation

---

**WARNUNG!**



Die Pumpe kann aufgrund ihres Gewichtes mittels geeigneter Hebe- und Förderzeuge gehandhabt werden.

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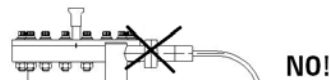
Die Pumpe darf nicht in Umgebungen installiert und/oder benutzt werden, die ungeschützt vor Witterungsbedingungen (Regen, Frost, Schnee), Staub und aggressiven Gasen sind, und in denen Explosions- und erhöhte Brandgefahr besteht. Während des Betriebes soll die Umgebungstemperatur zwischen 0 °C und +85 °C betragen und die Luftfeuchtigkeit zwischen 0% und 95% liegen (ohne Kondenswasser), um die angegebenen technischen Merkmale zu gewährleisten.

**VORSICHT!**

Die Pumpe soll versiegelt und mit flachgedrücktem Eintrittsschlauch gehalten werden („pinch-off“), bis sie für den Anschluß an das System bereit ist.

---

**WARNUNG!**



Um Personenschäden zu vermeiden, darf die Hochspannungsleitung der Pumpe erst angeschlossen werden, wenn die Pumpe im System installiert ist und alle Eintrittsflansche entsprechend angeschlossen oder geschlossen sind.

---

Der Pumpenbetrieb wird nur durch den Einsatz speziell dafür vorgesehener Agilent Steuereinheiten optimiert.

## 2 Anleitung zur Installation

### Installation

#### **VORSICHT!**

Die Einhaltung der Sicherheitsvorschriften beim Gebrauch der Pumpen ist nur bei Verwendung von Agilent Steuereinheiten gewährleistet.

---

Die Pumpe Vaclon Plus kann in einer beliebigen Position installiert werden. Aus praktischen Gründen wird sie in der Regel senkrecht mit nach oben gerichtetem Eintrittsflansch montiert. Wenn die Pumpe in einer anderen als der vertikalen Position installiert werden soll, muss sie wegen ihres hohen Gewichts adäquat abgestützt werden. Verwenden Sie dazu die herausdrehbaren Standfüße an den Seiten des Pumpenkörpers, die auch zur Befestigung an Streben oder Platten verwendet werden können. Die Geometrie hängt von dem System ab, innerhalb dessen die Pumpe verwendet wird.

Detaillierte Informationen zur Installation der Pumpe sind dem Anhang "Technical Information" zu entnehmen.

## Gebrauch

Sämtliche Hinweise für den korrekten Betrieb der Pumpen VacIon Plus sind im Handbuch der Steuereinheit enthalten. Dieses Handbuch ist vor der Inbetriebnahme genau durchzulesen.

Es wird empfohlen, für das Modell Diode/Noble Diode einen Druck von  $1E-5$  Torr (mbar) oder weniger einzustellen und für das Modell StarCell einen Druck von  $1E-4$  Torr (mbar) oder weniger. Auf diese Weise startet die Pumpe schneller und hält auch länger. Üblicherweise kann dieser Druck von einer turbomolekularen Pumpe mit Unterstützung einer Primärpumpe leicht und schnell erreicht werden. Diese sollte am besten eine ölfreie Pumpe sein, um Kontamination durch Öldämpfe zu verhindern.

Grundsätzlich kann eine Ionenpumpe auch mit höheren als den empfohlenen Drücken gestartet werden, allerdings kann sich dabei auf Dauer die Lebensdauer der Pumpe verringern. Früher musste eine Hochdruck-Ionenpumpe direkt an eine Primärpumpe angeschlossen werden. Seit es turbomolekulare Pumpen gibt, ist das nicht mehr unbedingt notwendig.

Hygroskopische Ablagerungen sind eine normale Begleiterscheinung des Betriebs der Pumpe an der Luft und der Absorption von Wasserstoff in den Titankathoden. Das hängt mit dem physikalischen Funktionsprinzip der Pumpe zusammen. Diese Ablagerungen können mit der Zeit dazu führen, dass die Startzeit sich verlängert, weil das Aufheizen der Pumpe beim Start dazu führt, dass Wasserdampf und ein Teil des vorher gepumpten Wasserstoffes freiwird.

## **Bedienungsschritte**

- 1** Es ist zu kontrollieren, daß die Steuereinheit in bezug auf die Pumpe richtig gepolt ist: positive Polarität für die Pumpenmodelle Diode/Noble Diode und negative für das Modell StarCell. Schlagen Sie dazu im Handbuch des Controllers nach. Halten Sie sich beim Betrieb der Pumpe an den folgenden Ablauf: bringen Sie das Vakuumsystem mit einer Turbomolekularpumpe mit Vor-Vakuum (unterstützt von einer Primärpumpe) auf den Mindest-Startdruck gemäß der Tabelle 1. Es wird empfohlen, ein Ventil mit metallischem Verschluss zwischen Ionenpumpe und Turbomolekularpumpe zu setzen, so dass letztere später abgestellt werden kann.
- 2** Schließen Sie die Kontrolleinheit für die Pumpe an eine geeignete Stromquelle an und schalten Sie die Einheit ein. Halten Sie sich an die Instruktionen des Handbuches der Kontrolleinheit für die Stromversorgung der Ionenpumpe.
- 3** Überwachen Sie Spannung, Stromstärke und Druck auf dem Display der Kontrolleinheit. Wenn der Start bei zu hohem Druck erfolgt ist, liegt die Spannung üblicherweise bei einigen Hundert Volt. Wenn die Spannung konstant in der Größenordnung der genannten Werte bleibt, wird empfohlen, die Pumpe abzuschalten, damit sie sich nicht überhitzt. Danach sollte einige Zeit gewartet werden, bevor die Pumpe bei geringerem Druck erneut eingeschaltet wird (siehe Abschnitt "Betrieb"). Beachten Sie bitte, dass eine Stromstärke, die in der Nähe der Kurzschlussstromstärke der Kontrolleinheit liegt, auf eine undichte Stelle in der Pumpe und im System hindeutet. Eine Erhöhung des Drucks für das Vor-Vakuum ist dagegen in der Startphase normal.  
Wenn die Ionenpumpe mit dem empfohlenen Druck gestartet wurde (siehe Tabelle 1), erreicht die Spannung in kurzer Zeit den auf der Kontrolleinheit eingestellten Wert (3, 5 oder 7 kV). Wenn die Betriebsspannung erreicht ist, beginnt die Stromstärke zu sinken. Jetzt sollte das Ventil für das Vor-Vakuum geschlossen werden, so dass die Ionenpumpe und das System von der Turbomolekularpumpe getrennt ist. Wenn die Spannung der Ionenpumpe nach dem Schließen des Ventils absinkt, öffnen Sie das Ventil noch einmal für ein zusätzliches Vorpumpen. Sobald der Druck abnimmt, steigt die Spannung erneut und das Ventil für das Vor-Vakuum kann geschlossen werden.
- 4** Wenn die Spannung den voreingestellten Betriebswert erreicht hat, schalten Sie die Kontrolleinheit in den Status PROTECT. Das System schützt sich dann selbst vor einem Druckanstieg über den voreingestellten Wert hinaus. Wenn es zu einem Druckanstieg kommt, wird die Kontrolleinheit automatisch abgeschaltet.



- 5 Wenn der verwendete Pumpentyp auf der Agilent-Kontrolleinheit korrekt eingestellt ist, erscheint auf dem Display auch der Wert für den Druck, der sich aus der Stromumwandlung ergibt. Das Verhältnis ist in dem Diagramm (Druck – Stromstärke) im Absatz “Technical Information” dieses Handbuchs dargestellt. Wir erinnern noch einmal daran, dass die Druckangabe möglicherweise nicht korrekt sein könnte, wenn während des Betriebs an der Ionenpumpe ein Fehlerstrom auftritt. In diesem Fall ist der auf dem Display angezeigte Wert zu groß.

**HINWEIS**

Die Stufen im Diagramm Druck – Stromstärke ergeben sich aus dem Betriebsmodus (“Step”) der Agilent-Kontrolleinheit. Wenn der von der Pumpe absorbierte Strom bestimmte Werte erreicht, bringt die Kontrolleinheit die hohe Spannung am Ausgang auf einen niedrigeren (bei sinkender Stromstärke) oder auf einen höheren Wert (bei steigender Stromstärke). Das dient dazu, die Pumpe in jedem Druckintervall mit der Spannung zu versorgen, für die die Pumpgeschwindigkeit die maximale ist.

- 
- 6 Wenn die Pumpe auf den atmosphärischen Druck zu bringen ist, verwenden Sie trockenen Stickstoff, um die Absorption von Wasserdampf an den Pumpenwänden zu verhindern. Es wird empfohlen, nach dem Abschalten der Pumpe abzuwarten, bis die innen liegenden Komponenten sich abgekühlt haben, bevor sie dem atmosphärischen Druck ausgesetzt wird.

**WARNUNG!**



Wenn die Pumpe zur Förderung von giftigen, leicht entflammaren oder radioaktiven Gasen benutzt wird, sind die für das jeweilige Gas vorgeschriebenen Vorgänge zu befolgen. Die Pumpe nie bei Vorhandensein von explosivem Gas benutzen.

## 2 Anleitung zur Installation Bedienungsschritte

---

### **WARNUNG!**



Wenn der Heizer installiert ist, darf die Pumpe während der Aufheizung und Abkühlung nicht berührt werden. Die hohe Temperatur kann zu Personenschäden führen.

---

### **VORSICHT!**

Keine elektronischen Geräte in die Nähe der Pumpe bringen. Das darum befindliche Magnetfeld kann zu Funktionsstörungen der Geräte führen.

---

## Wartung

Die Pumpen der Serie VacIon Plus erfordern keine Wartung. Sämtliche Eingriffe dürfen nur von autorisiertem Personal vorgenommen werden.

---

**WARNUNG!**



**Vor Eingriffen an der Pumpe ist diese von der Hochspannungsquelle zu trennen.**

---

Bei eventueller Verschrottung einer Pumpe ist diese entsprechend der einschlägigen nationalen Vorschriften zu entsorgen.

## Entsorgung

### **Bedeutung des "WEEE" Logos auf den Etiketten.**

Das folgende Symbol ist in Übereinstimmung mit der EU-Richtlinie WEEE (Waste Electrical and Electronic Equipment) angebracht.

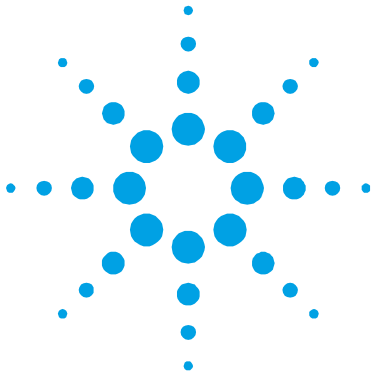
Dieses Symbol (**nur in den EU-Ländern gültig**) zeigt an, dass das betreffende Produkt nicht zusammen mit Haushaltsmüll entsorgt werden darf sondern einem speziellen Sammelsystem zugeführt werden muss.

Der Endabnehmer sollte daher den Lieferanten des Geräts - d.h. die Muttergesellschaft oder den Wiederverkäufer - kontaktieren, um den Entsorgungsprozess zu starten, nachdem er die Verkaufsbedingungen geprüft hat.



Für weitere Informationen:

<http://www.agilent.com/environment/product/index.shtml>



## 3 Procédure pour l'installation

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Traduction de la mode d'emploi originale



## Indications Générales

Cet appareillage a été conçu en vue d'une utilisation professionnelle. Il est conseillé à l'utilisateur de lire attentivement cette notice d'instructions ainsi que toute autre indication supplémentaire fournie par Agilent avant d'utiliser l'appareil. Agilent décline toute responsabilité en cas de non respect total ou partiel des instructions fournies, d'opérations non autorisées, d'utilisation impropre par du personnel non formé ou contraires aux réglementations nationales spécifiques.

Grâce à leur propreté, à leur capacité de pomper tous les types de gaz, à leur fonctionnement sans vibrations et à l'absence d'entretien, les pompes de la série VacIon Plus sont des pompes ioniques généralement utilisées pour des applications de vide ultra poussé.

Les paragraphes suivants fournissent toutes les indications nécessaires à garantir la sécurité de l'opérateur pendant l'utilisation de l'appareil. Des informations plus détaillées sont disponibles à l'annexe "Technical Information".

**Cette notice utilise les signes conventionnels suivants:**

---

**AVERTISSEMENT!**



Les messages d'avertissement attirent l'attention de l'opérateur sur une procédure ou une manœuvre spéciale dont la mauvaise exécution risque de provoquer de graves lésions.

---

**ATTENTION!**

Les messages d'attention apparaissent avant certaines procédures dont le non-respect peut endommager sérieusement l'appareillage.





---

**NOTE**

Les notes contiennent des renseignements importants, extrapolés du texte.

---

## Signaux de sécurité

SIGNAL	DESCRIPTION
	<p>Accès interdit aux porteurs de stimulateur cardiaque actif. Ce signal a été apposé sur l'appareil pour aviser les porteurs de stimulateur cardiaque qu'ils ne doivent pas entrer en contact avec l'appareil.</p>
	<p>Danger électrique. Ce signal a été apposé sur l'appareil pour avertir l'opérateur de la présence de haute tension et l'inviter à se référer à la notice d'utilisation pour se protéger contre les risques d'électrocution.</p>
	<p>Danger champ magnétique. Ce signal a été apposé sur l'appareil pour avertir l'opérateur de la présence d'un champ magnétique.</p>
	<p>Danger surface chaude. Ce signal a été apposé sur l'appareil pour empêcher l'opérateur de toucher des surfaces potentiellement chaudes risquant de causer des brûlures.</p>

### 3 Procédure pour l'installation

#### Stockage

## Stockage

Pour transporter et garder la pompe ionique il faut respecter les suivants conditions ambiantes:

- Temperature: entre -20 °C et +70 °C;
- Humidité relative: entre 5 et 95% (sans condensation).



## Préparation pour l'installation

La pompe est fournie dans un emballage de protection spécial; si l'on constate des signes d'endommagement imputables au transport, contacter aussitôt le revendeur local. Pendant l'opération de déballage, veiller tout particulièrement à ne pas laisser tomber la pompe et à ne lui faire subir aucun choc ni aucune vibration. Ne pas abandonner l'emballage dans la nature. Le matériel est entièrement recyclable et il est conforme à la directive CEE 85/399 en matière de protection de l'environnement.

### ATTENTION!

En vue d'éviter tout problème de dégazage, ne pas toucher à mains nues les éléments devant être exposés au vide. Portez toujours des gants spéciaux pour le vide ou toute autre protection appropriée.

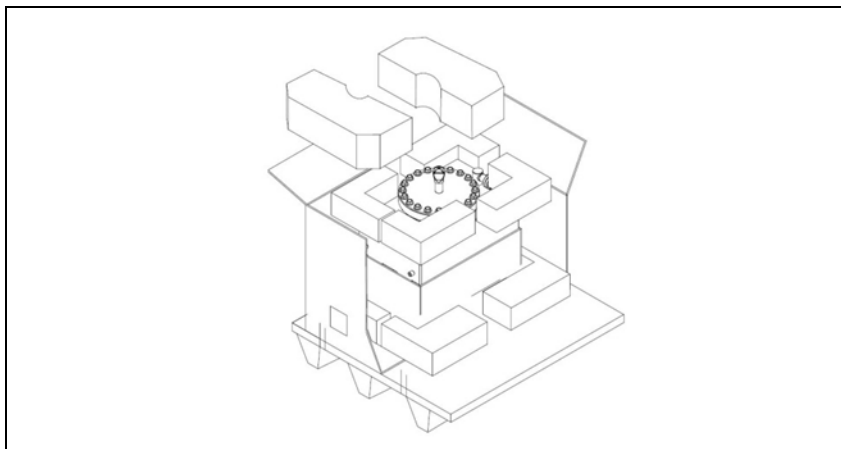
### NOTE

La pompe ne peut être endommagée si elle reste simplement exposée à l'atmosphère. Il est quoi qu'il en soit conseillé de ne pas la retirer de son emballage avant le moment de l'installation, afin d'éviter toute pollution due à la poussière.

### NOTE

Par effet du traitement thermique particulier auquel la pompe est soumise (voir paragraphe "Description de la pompe Vaclon" pour plus d'informations) la surface externe du corps de la pompe peut présenter une coloration non homogène et des nuances tirant sur le jaune. Cette caractéristique esthétique ne doit pas être considérée comme un défaut et n'empêche en aucune manière le nettoyage des surfaces internes de la pompe exposées au vide.

### 3 Procédure pour l'installation Préparation pour l'installation



**Figure 1** Emballage de la pompe Vaclon Plus 200.

## Installation

---

**AVERTISSEMENT!**



À cause de son poids, il est indispensable de se servir des équipements de levage et de manutention pour déplacer la pompe.

---

Ne pas installer et/ou utiliser la pompe dans des milieux exposés à des agents atmosphériques (pluie, gel, neige), à des poussières, à des gaz de combat ainsi que dans des milieux explosifs ou à fort risque d'incendie. Pendant le fonctionnement, pour respecter les spécifications techniques déclarées la température ambiante doit être comprise entre 0 °C et +85 °C et l'humidité entre 0 et 95% (sans condensation).

**ATTENTION!**

La pompe doit être conservée scellée avec son tuyau d'entrée aplati ("pinch-off") jusqu'à ce qu'elle soit prête à être branchée au système.

---

**AVERTISSEMENT!**



Pour éviter toute lésion aux personnes, ne pas brancher la haute tension à la pompe avant que celle-ci soit installée dans le système et avant que toutes les brides d'entrées soient correctement assemblées ou fermées.

---

Le fonctionnement de la pompe n'est optimisé que si celle-ci est utilisée avec l'une des unités de contrôle Agilent spécifiques.

### 3 Procédure pour l'installation Installation

#### **ATTENTION!**

Lors de l'utilisation des pompes, le respect des normes de sécurité est impérativement subordonné à l'emploi des unités de contrôle Agilent.

---

La pompe VacIon Plus peut être installée dans toutes les positions. Par facilité elle est généralement montée en position verticale; en raison de son poids la pompe doit reposer sur les pattes à tige filetée situées sur les côtés du corps de la pompe. Celles-ci peuvent être utilisées comme points de fixation à des barres ou des plaques de support dont la géométrie dépend du système dans lequel elle est installée.

Pour plus de détails sur l'installation de la pompe, consulter l'appendice "Technical Information".

## Utilisation

Toutes les instructions pour le fonctionnement correct de la pompe VacIon Plus sont fournies dans la notice de l'unité de contrôle. Il est conseillé de lire attentivement cette notice avant d'utiliser la pompe.

La pompe doit être amenée à une pression inférieure ou égale à  $1E-5$  Torr (mbar) pour la version Diode/Noble Diode -  $1E-4$  Torr (mbar) pour la version StarCell – pour permettre un démarrage plus rapide et prolonger la durée de vie de la pompe. Ce niveau de pression peut être obtenu rapidement et facilement au moyen d'une pompe turbomoléculaire assistée par une pompe primaire, si possible non lubrifiée par huile, afin d'éviter les risques de contamination liés aux vapeurs d'huile.

En principe, la pompe ionique peut être démarrée à une pression supérieure à celle préconisée par le fabricant, mais cette pratique risque, à la longue, de réduire la durée de vie de la pompe. Auparavant, la nécessité de démarrer la pompe ionique avec une haute pression était liée au besoin de la raccorder directement à la pompe primaire. Avec l'arrivée des pompes turbomoléculaires, cette nécessité a disparu.

Des dépôts hygroscopiques découlant naturellement de l'exposition de la pompe à l'air et l'absorption d'hydrogène à l'intérieur des cathodes en titane, phénomène lié au principe physique de fonctionnement de la pompe, peuvent, avec le temps, provoquer un allongement du temps de démarrage. En effet, le réchauffement de la pompe qui se produit au moment du démarrage entraîne une émission de vapeur d'eau et d'une partie de l'hydrogène pompé précédemment qui allonge le temps de démarrage.

## Procédure d'utilisation

- 1** Contrôler que la polarité de l'unité de contrôle soit correcte pour la pompe: polarité positive pour les pompes Diode/Noble Diode et polarité négative pour les StarCell. Pour cette raison, consultez le manuel du contrôleur. Respectez la procédure suivante pour l'utilisation de la pompe: amenez le système de vide à une pression minimum de démarrage en vous référant au tableau 1 à l'aide d'une pompe turbomoléculaire de pré-vide (assistée par une pompe primaire). Il est conseillé d'installer une vanne de fermeture métallique entre la pompe ionique et la pompe turbomoléculaire afin de pouvoir ensuite exclure cette dernière.
- 2** Raccordez l'unité de contrôle de la pompe à une alimentation électrique et mettez-la sous tension. En suivant les instructions du manuel de l'unité de contrôle, alimentez la pompe ionique.
- 3** Surveillez la tension, le courant et la pression affichés sur l'écran de l'unité de contrôle. Si le démarrage a eu lieu à une pression trop élevée, la tension se stabilisera à une valeur de quelques dizaines de volts. Si la tension reste stable autour de cette valeur, arrêtez la pompe pour éviter la surchauffe, attendez quelques instants et redémarrez-la à une pression inférieure (voir le paragraphe "Utilisation". Notez qu'une valeur de courant proche du courant de court-circuit de l'unité de contrôle indique la présence d'une fuite dans la pompe et dans le système. De plus une augmentation temporaire de la pression de pré-vide est normale pendant la phase de démarrage.  
Si la pompe ionique a été démarrée à la pression suggérée (voir tableau 1), la tension atteint rapidement la valeur programmée sur l'unité de contrôle (3,5 ou 7 kV). Une fois la tension de fonctionnement atteinte, le courant commence à descendre. Fermez alors la vanne de pré-vide pour isoler la pompe ionique et le système de la pompe turbomoléculaire. Si la tension de la pompe ionique descend après la fermeture de la vanne, rouvrez-la pour un pré-pompage supplémentaire. Dès que la pression descend, la tension remonte et la vanne de pré-vide peut être fermée.
- 4** Quand la tension a atteint la valeur de fonctionnement programmée, placez l'unité de contrôle à l'état PROTECT. Le système est ainsi auto-protégé contre les hausses de pression supérieures à la valeur programmée. En cas d'élévation excessive de la pression, l'unité de contrôle s'arrête automatiquement.

- Après avoir correctement sélectionné le type de pompe utilisé dans l'unité de contrôle Agilent, l'écran affiche la valeur de pression résultant de la conversion du courant selon le diagramme pression-courant représenté dans le paragraphe "Informations techniques" de ce manuel. Il est rappelé que l'indication de la pression peut être erronée si la pompe ionique développe un courant de dispersion pendant son utilisation. Dans ce cas, la pression indiquée à l'écran est supérieure à la pression réelle.

**NOTE**

Les paliers du diagramme de pression – courant sont une caractéristique du mode de fonctionnement « step » des unités de contrôle Agilent. Lorsque le courant absorbé par la pompe atteint des valeurs déterminées, l'unité de contrôle porte la valeur de haute tension en sortie à une valeur inférieure (en cas de courant décroissant) ou supérieure (en cas de courant croissant). Ceci afin d'alimenter la pompe, à chaque intervalle de pression, à la tension à laquelle sa vitesse de pompage est maximale.

- Lorsque l'on porte la pompe à la pression atmosphérique, utiliser de l'azote sec de façon à éviter que les parois de la pompe n'absorbent de la vapeur d'eau. Après l'arrêt de la pompe, il est conseillé d'attendre le refroidissement des composants internes avant de l'exposer à la pression atmosphérique.

**AVERTISSEMENT!**



Lorsque la pompe est utilisée pour le pompage de gaz toxiques, inflammables ou radioactifs, suivre les procédures appropriées à chaque gaz. Ne pas utiliser la pompe en présence de gaz explosifs.

**AVERTISSEMENT!**



Lorsque le réchauffeur est installé, éviter de toucher la pompe pendant les opérations de chauffage et de refroidissement. La température élevée peut provoquer des brûlures.

### 3 Procédure pour l'installation Procédure d'utilisation

#### **ATTENTION!**

Ne pas approcher de dispositifs électroniques de la pompe. Le champ magnétique environnant cette dernière peut entraîner des dysfonctionnements desdits dispositifs.

---



## Maintenance

Les pompes de la série Vaclon Plus ne demandent aucun entretien.  
Toute intervention doit être exécutée par un personnel agréé.

---

**AVERTISSEMENT!** Avant toute intervention sur la pompe, la débrancher de la haute tension.



---

En cas de mise au rebut d'une pompe, procéder à son élimination dans le respect des normes nationales en vigueur.

### 3 Procédure pour l'installation

#### Mise au rebut

## Mise au rebut

### Signification du logo "WEEE" imprimé sur les étiquettes.

Le symbole ci-dessous est appliqué conformément à la directive CE nommée "WEEE".

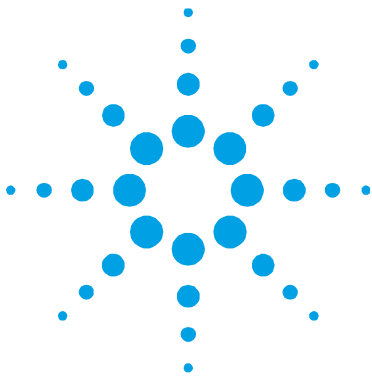
Ce symbole (**uniquement valide pour les pays de la Communauté européenne**) indique que le produit sur lequel il est appliqué NE doit PAS être mis au rebut avec les ordures ménagères ou les déchets industriels ordinaires, mais passer par un système de collecte sélective.

Après avoir vérifié les termes et conditions du contrat de vente, l'utilisateur final est donc prié de contacter le fournisseur du dispositif, maison mère ou revendeur, pour mettre en œuvre le processus de collecte et mise au rebut.



Pour plus d'informations, rendez-vous à l'adresse:

<http://www.agilent.com/environment/product/index.shtml>



## 4 Installation Procedure

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Original Instructions



## General Information

This equipment is destined for use by professionals. The user should read this instruction manual and any other additional information supplied by Agilent before operating the equipment. Agilent will not be held responsible for any events occurring due to non-compliance, even partial, with these instructions, improper use by untrained persons, non-authorized interference with the equipment or any action contrary to that provided for by specific national standards.

The VacIon Plus series pumps are ion pumps commonly used to create ultra-high vacuum, due to their cleanliness, ability to pump different gases, and maintenance- and vibration-free operation.

The following paragraphs contain all the information necessary to guarantee the safety of the operator when using the equipment. Detailed information is supplied in the appendix "Technical Information".

**This manual uses the following standard protocol:**

---

**WARNING!**



The warning messages are for attracting the attention of the operator to a particular procedure or practice which, if not followed correctly, could lead to serious injury.

---

**CAUTION!**

The caution messages are displayed before procedures which, if not followed, could cause damage to the equipment.





---

**NOTE**

The notes contain important information taken from the text.

---

## Safety Symbols

SYMBOLS	SYMBOLS DESCRIPTIONS
	<p>Access denied to active pacemaker's holders. The device is marked with this symbol to indicate that pacemaker holders must not come in contact with the device itself.</p>
	<p>Electric hazard. The device is marked with this symbol when the operator, due to the presence of an high voltage, must refer to the user manual in order to protect himself from electrical shock risks.</p>
	<p>Magnetic field hazard. The device is marked with this symbol to inform the operator about the presence of a magnetic field.</p>
	<p>Hot surface hazard. The device is marked with this symbol when the operator must avoid the contact with potentially hot surfaces which may cause burns.</p>

## 4 Installation Procedure

### Storage

# Storage

During transportation and storage of the ion pump, the following environmental conditions must be respected:

- Temperature: between -20 °C and +70 °C;
- Relative humidity: between 5 and 95% (without condensation).

## Preparation for Installation

The pump is supplied in a special protective packing. If this shows signs of damage which may have occurred during transport, contact your local sales office. When unpacking the pump, be sure not to drop it and avoid any kind of sudden impact or shock vibration to it. Do not dispose of the packing materials in an unauthorized manner. The material is 100 % recyclable and complies with EEC Directive 85/399.

### CAUTION!

In order to prevent outgassing problems due to contamination, do not use bare hands to handle components which will be exposed to vacuum. Always use vacuum-compatible gloves or other appropriate protection.

---

### NOTE

Normal exposure to the environment cannot damage the pump. Nevertheless, it is advisable to keep it closed until it is installed in the system, thus preventing any form of pollution by dust.

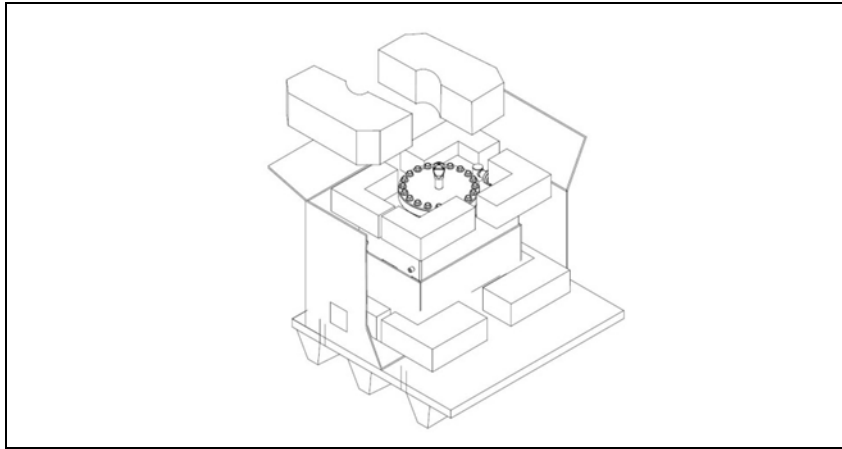
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### NOTE

Due to the peculiar thermal treatment to which the pump is exposed (see the paragraph "Description of the Vaclon pump" for further details), the colour of the external surface of the pump body could be non-homogeneous and yellowish. This aesthetical characteristic is not a defect and it does not compromise the cleanliness of the inner surfaces exposed to vacuum.

---

**4 Installation Procedure**  
**Preparation for Installation**



**Figure 1** Packaging of the Vaclon Plus 200 pump.



## Installation

---

**WARNING!**



The pump is heavy and must be handled by means of suitable moving and handling tools.

---

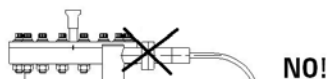
Do not install or use the pump in an environment exposed to atmospheric agents (rain, snow, ice), dust, aggressive gases, or in explosive environments or those with a high fire risk. During operation, to obtain the declared functioning specification, the ambient temperature must be between 0 °C and +85 °C and the humidity between 0 and 95% (without condensation).

**CAUTION!**

The pump should be kept sealed with its pinch-off tube until it is ready for attachment to the vacuum system.

---

**WARNING!**



To avoid injury, never connect the high voltage to the pump before it is installed into the system and all the inlet flanges are properly connected or blanked off.

---

The pump operation is optimized using one of the special Agilent controllers only.

## 4 Installation Procedure

### Installation

#### CAUTION!

The safety specifications agreement using the pump is guaranteed using the Agilent controller only.

---

The VacIon Plus pump can be installed in any position. For convenience, a pump is usually mounted vertically with the inlet up. For mounting other than vertical, due to its weight, the pump must be supported by means of the threaded studs on the sides of the pump body; these studs can be used as hook points between the pump and the support system, whose geometry depends on the type of application.

For detailed information about the pump installation, see the appendix “Technical Information”.

## Use

All the instructions for the correct use of the VacIon Plus pumps are contained in the control unit manual. Read that manual carefully before using the pump.

Rough pumping down to a pressure equal or lower than  $1E-5$  Torr (mbar) for the Diode/Noble Diode version -  $1E-4$  Torr for the StarCell version - is recommended for the most rapid starting and in order to preserve pump lifetime. Typically this pressure level can be easily and quickly achieved by means of a turbomolecular pump, supported by a primary pump, preferably oil free.

The ion pump can in principle be started also at pressure higher than the one we recommend, but this prolonged practice can affect the pump lifetime. In the past the need to start the ion pump at high pressure was due to the fact that it was directly connected to the primary pump; thanks to the invention of turbomolecular pumps, this is no longer necessary.

Hygroscopic deposits - that are natural consequence of exposure to air- and hydrogen absorption into the titanium cathodes - phenomenon connected to the physical working principle of the ion pump - may cause starting times to increase with age. In fact the pump heating that takes place at its start-up causes release of the water vapor and some previously pumped hydrogen; thus, the starting time may be lengthened.

## **Operating Procedure**

- 1** Check that the controller HV polarity is correct for the pump: positive polarity for Diode/Noble Diode pumps and negative for StarCell pumps. Refer to the relevant pump control unit instruction manual and follow the procedure below when operating the pump: establish a minimum starting pressure in the vacuum system per the table 1, by means of a pre-vacuum turbomolecular pump (supported by a primary pump). We recommend to install an all-metal valve between the ion pump and the turbomolecular pump, in order to be able to insulate it at a later stage.
- 2** Plug the control unit into a suitable power source and switch the power ON. Follow the instructions in the manual of the control unit to feed the ion pump.
- 3** Observe the voltage, current and pressure on the display of the control unit. If the ion pump has been started at too high pressure, typically the voltage will be of some hundreds Volts. If the voltage remains constant at these values, in order to avoid pump overheating we suggest to turn it off and start it again at a lower pressure (see the paragraph “Use”). A current value near the short-circuit current of the control unit could indicate that an unconfined flow discharge exists in the pump and system. A temporary rise in roughing pressure will usually be noticed during any starting procedure. If the ion pump has been started to the recommended pressure (the table 1), the voltage will quickly reach the pre-set value (3, 5 or 7 kV). Once at the operating voltage, the current will start to decrease. We recommend at this point to close the roughing valve, in order to insulate the ion pump and the system from the turbomolecular pump. If the ion pump voltage drops after closing the roughing valve, reopen the valve for additional rough pumping. As the pressure decreases, the voltage again will rise, and the roughing valve may be closed.
- 4** When the voltage has reached the pre-set operating value, set the control unit in the PROTECT condition. The system is now automatically protected against pressure increases above the pre-set limit. If such an increase should occur, the control unit will be turned off automatically.
- 5** If the correct pump model is set on the Agilent control unit panel, the controller display will show the pressure value obtained by the conversion of the current value, as per the pressure versus current graph shown in the paragraph “Technical Information” of this manual. It is worth noticing that the pressure indication could be not correct if, during its operation, the ion pump starts to be affected by leakage current. In this case the pressure indicated on the display will be higher than the real one.

**NOTE**

The steps on the pressure – current charts are a characteristic of the step voltage operation implemented in Agilent controllers. When the current drawn by the Vaclon pump reaches the specified values, the controller will change the high voltage output to a lower applied voltage (if the pressure is decreasing) or to a higher applied voltage (if the pressure is increasing). This is in order to feed the ion pump, in every pressure range, at the voltage for which its pumping speed is maximum.

---

- 6 When venting the pump, use dry nitrogen. This will avoid water vapor absorption on the pump walls. After the pump has been turned off, we recommend to wait that its internal elements are cooled down before exposing the pump to atmospheric pressure
- 

**WARNING!**



When employing the pump for pumping toxic, flammable, or radioactive gases, please follow the required procedures for each gas disposal. Do not use the pump in the presence of explosive gases.

---

**WARNING!**



When the heating element is installed, do not touch the pump during the heating and cooling phases. The high temperature may cause a serious damage.

---

**CAUTION!**

Do not put any electronic device near the pump since the magnetic field may cause a device malfunction.

---

## Maintenance

The VacIon Plus series pump does not require any maintenance. Any work performed on the pump must be carried out by authorized personnel.

---

**WARNING!**



**Before carrying out any work on the pump, disconnect it from the High Voltage supply.**

---

If a pump is to be scrapped, it must be disposed of in accordance with the specific national standards.

## Disposal

### Meaning of the "WEEE" logo found in labels.

The following symbol is applied in accordance with the EC WEEE (Waste Electrical and Electronic Equipment)

Directive. This symbol (**valid only in countries of the European Community**) indicates that the product it applies to must NOT be disposed of together with ordinary domestic or industrial waste but must be sent to a differentiated waste collection system.

The end user is therefore invited to contact the supplier of the device, whether the Parent Company or a retailer, to initiate the collection and disposal process after checking the contractual terms and conditions of sale.

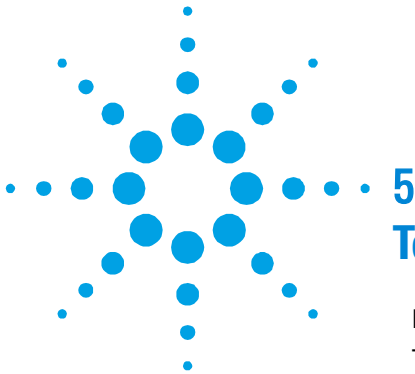


For more information refer to:

<http://www.agilent.com/environment/product/index.shtml>

**4 Installation Procedure  
Disposal**





## 5 Technical Information

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### Disposal

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## Description of the VacIon Pump

The Agilent VacIon Plus 200 pumps are ion pumps and are available in three element versions:

- Diode
- Noble Diode
- StarCell

The inlet ConFlat flange is a CFF 8". Every version is available with/without heaters (110 or 220 Volts), with/without side port (CFF 2"3/4) and with different types of high voltage feedthrough. This is in order to provide a wide portfolio of available configurations. See for reference the orderable part number list at the end of this manual or contact the local Agilent representative.

During the pump manufacturing, all the internal surfaces of the Agilent VacIon Plus 200 pump are exposed to a particular thermal treatment, commonly referred to as "vacuum firing", thanks to which the hydrogen content (e.g. in titanium and stainless steel) is strongly reduced. Thanks to the vacuum firing process performed in a dedicated vacuum furnace, the hydrogen outgassing rate can be effectively reduced, thus allowing a faster pumpdown to the ultimate pressure.

The vacuum firing process, associated to the manufacturing bakeout cycle at 450 °C (vacuum inside the ion pump, nitrogen outside), can produce a non-homogeneous coloring, with possible yellow shading, in the external surface of the pump body. This purely aesthetic phenomenon does not affect in any way the cleanliness of the external surfaces nor the internal surfaces of the pump exposed to vacuum and should not be perceived as a defect.

The magnetic circuit of the VacIon Plus 200 pump has been optimized in order to get a very uniform distribution, in correspondence of the whole anode length and width, of the component of the magnetic field that is parallel to the axis of the cells composing the anodes. Thanks to this homogeneity, the VacIon Plus 200 pumps exhibit an optimized ratio of pumping speed versus volume.

## 5 Technical Information

### Description of the VacIon Pump

VacIon Plus 200 pumps are designed to operate in the pressure range from the recommended maximum starting pressure (10-5 mbar for Diode/Noble Diode or 1E-4 mbar for StarCell) to the ultimate pressure (below 1E-11 mbar). The maximum suggested starting pressure for the StarCell version is one order of magnitude higher with respect to Diode/Noble Diode, because thanks to its design the ions are prevented from bombarding the system and the pump walls while starting. This reduces the pressure rise that can be associated with the starting phase and the consequent temperature increase. As pointed out in the paragraph “Use”, the ion pump can in principle also be started at higher pressure, but this prolonged practice can affect the pump lifetime. Moreover, it is worth noticing that there is not in theory a limit to the achievable ultimate pressure, but the measurement of pressures below 1E-11 mbar (in the eXtreme High Vacuum - XHV - range) by means of a gauge is very difficult, due to the intrinsic limitations of the gauge itself. Moreover the achievement of the ultimate pressure strongly depends on how efficiently the bakeout of the complete system is performed.

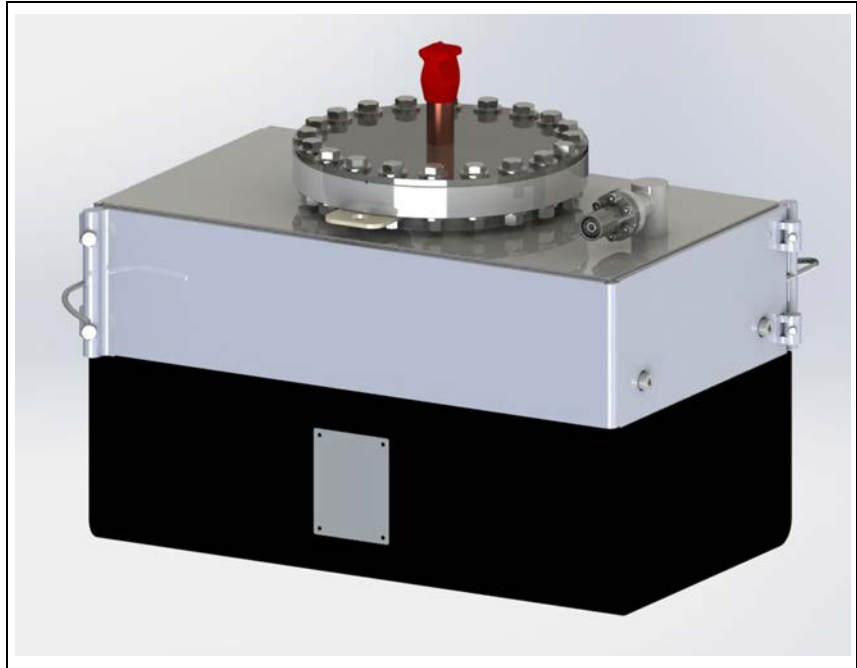
Virtually all gases and vapors can be pumped successfully with the ion pump. The pumping speed will vary depending on the system pressure, the gas type, the pump element (Diode/Noble Diode/StarCell) and the applied operating voltage. The latter can be optimized using Agilent controllers, in order to always feed the pump at the voltage for which the pumping speed is maximized.

For the pumping of noble (or inert) gases, we recommend the use of Noble Diode or StarCell elements.

The Noble Diode is a version of the Diode element in which a tantalum cathode is substituted in place of a titanium cathode. This substitution allows a higher pumping speed and stability for pumping noble gases (mainly argon and helium). The element is otherwise equivalent to the Diode element. The tantalum in the Noble Diode pump enhances the noble gas pumping capacity with respect to Diode, although it somewhat reduces the high pumping speed that the standard Diode pump provides for getterable gas.

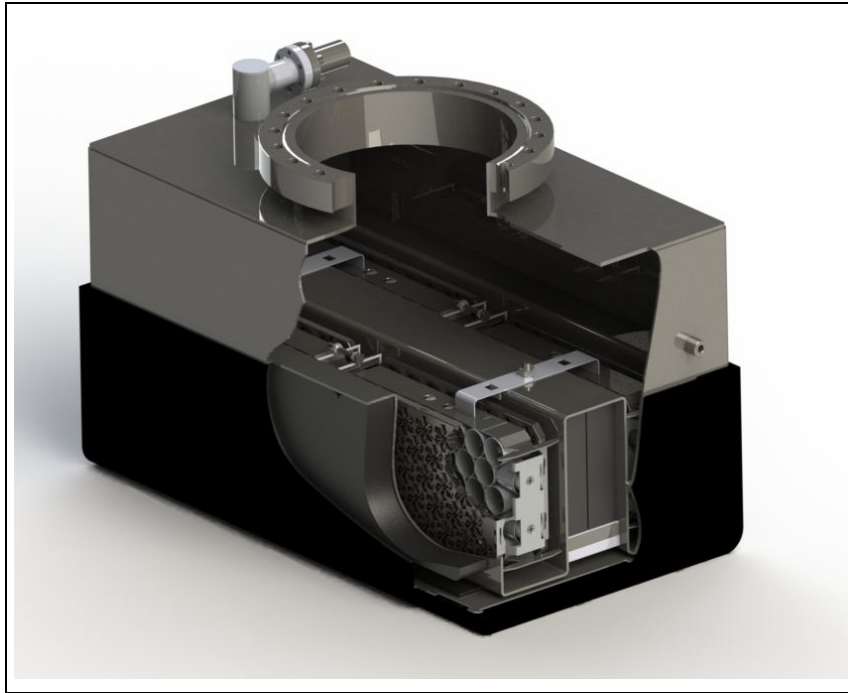
The StarCell is the best-in-class solution for pumping noble gases. It is the latest variation of a triode configuration. Thanks to its engineered design, StarCell pumps can handle a very high amount of noble gases (better than Noble Diode – one order of magnitude more) and hydrogen (comparable to the Diode).

Fig. 2 shows the Vaclon Plus 200 pump, Fig. 3 shows the main assemblies of the pump.



**Figure 2** Vaclon Plus 200 pump  
(the version equipped with heaters is shown).

**5 Technical Information**  
**Description of the Vaclon Pump**



**Figure 3** Cut-away showing the main pump assemblies (the StarCell version is shown).

## Technical Specification

The following table details the main technical specifications of the VacIon Plus 200 pumps.

**Tab. 1**

Specification	Model		
	Noble Diode	Diode	StarCell
Saturated pumping speed for Nitrogen (*) (l/s)	185	200	180
Saturated pumping speed for Argon (*) (l/s)	60	--	63
Operating life at 1E-6 mbar of Nitrogen (hours)	50000	50000	80000
Suggested maximum baking pressure with ion pump on (mbar)	5E-6		
Protect current	50 mA		
Operating voltage (max)	+7000 Vdc +/- 10 %		-7000 Vdc +/- 10 %
Suggested starting pressure (mbar)	≤ 1E-5		≤ 1E-4
Ultimate pressure (mbar)	1E-11		
Inlet flange	8" CFF (NW 160) AISI 304 ESR		
Internal volume (litres)	12.2	14	
Temperature limits (°C):			
Pump with magnets			350
Pump without magnets			450
HV cable			220
Material:	Body	AISI 304L	
	Cathodes	Titanium/ Tantalum	Titanium
	Anodes	AISI 304L	
	Magnets	Ferrite (Ceramic 8)	
	Pole piece	Iron	
Weight without heaters, lbs (kg)	99 (45)		112 (51)

(\*) Tested according DIN28429; see also ISO/DIS 3556-1-1992 (draft ISO norm) for reference.

## 5 Technical Information

### Technical Specification

Figures 4 to 11 show the typical pumping speed vs. pressure diagrams for saturated and unsaturated pumps and the pressure vs. current diagrams. The diagrams are for pumps controlled by means of a 4UHV Agilent controller. Unsaturated curves are given as reference, since the measurement of the pumping speed in the unsaturated state is not described in the norms and may be strongly influenced by the testing conditions. The pumping speed of a new or newly regenerated (i.e. baked) sputter ion pump is typically higher (for nitrogen about 180-190%, depending on the pressure range) than its nominal pumping speed; it decreases during operation until it reaches a stabilized level known as "saturation" (corresponding to the nominal pumping speed). Saturation does not correspond to the end of the pump life. For further explanation on the physics of this phenomenon, please refer to the section "VacIon Plus Pumping Speed" of the ion pump general catalogue. It is worth noticing that to saturate the VacIon Plus 200 pumps, it normally requires an amount of gas of about 6 to 7 mbar-liters (in the case of nitrogen). Consequently, pumps can operate for extended periods of time at low pressures in the non-saturated state, if they are properly conditioned. Moreover, we point out that for the unsaturated curves only the first part of the curve is shown, since during the measurement (carried out from low pressure towards high pressure) the pump starts to move from the unsaturated to the saturated condition, so that in the transient phase it cannot be clearly be classified as unsaturated or saturated. It is also worth noticing that the shown current versus pressure curves are typical and may appear different in the presence of a leakage current. A small deviation from the reported curve may also be due to the intrinsic uncertainty of the gauge reading.



## Vaclon Plus 200 Diode

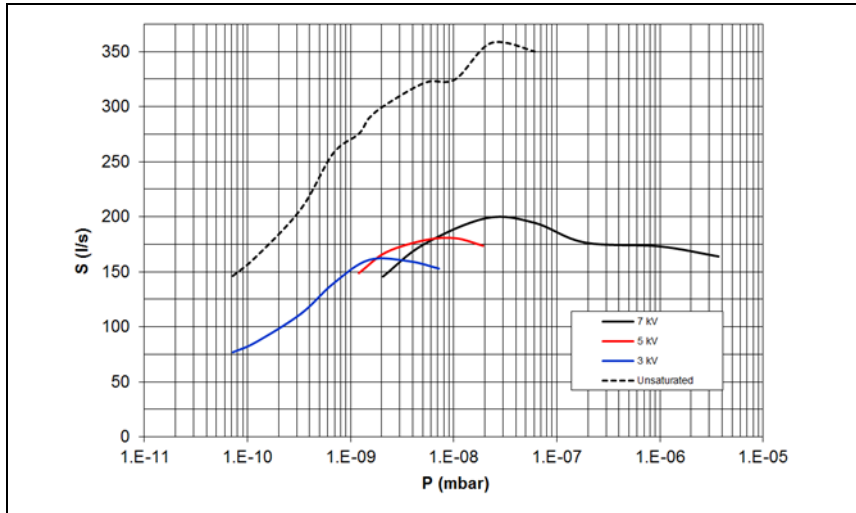


Figure 4 Typical pumping speed vs pressure diagram for Nitrogen (Diode).

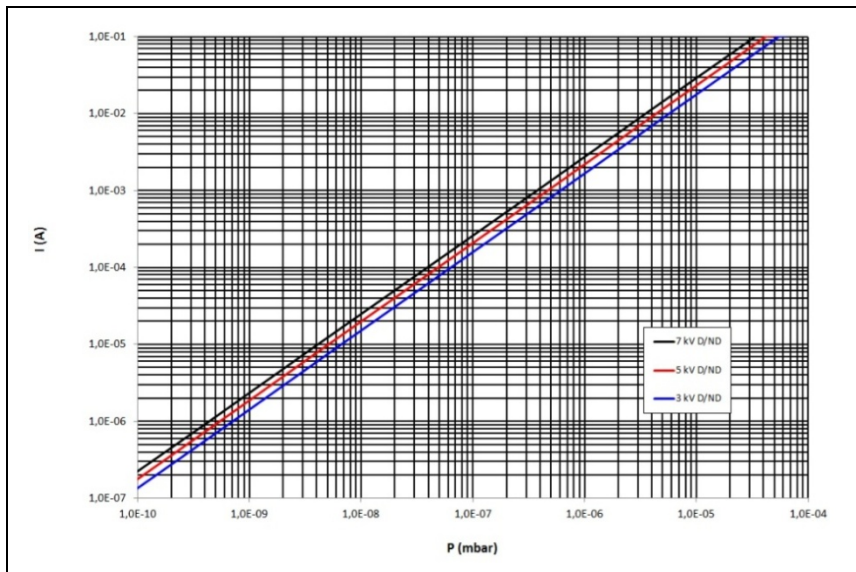
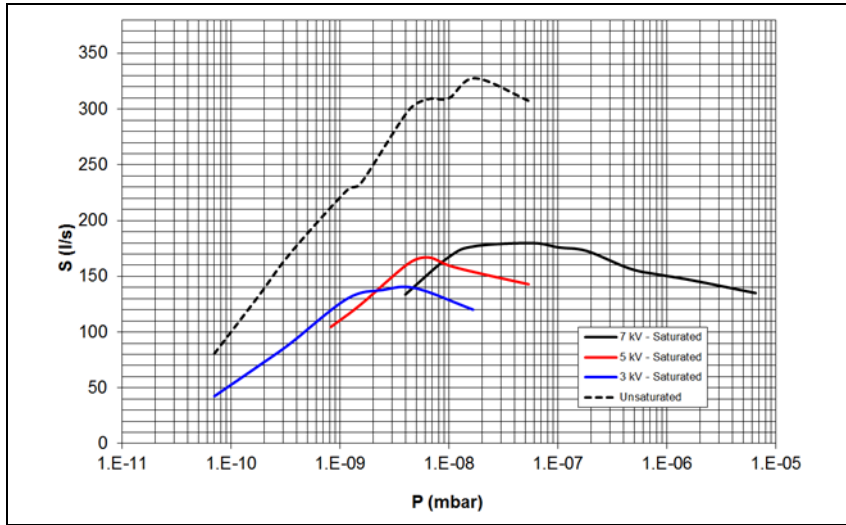
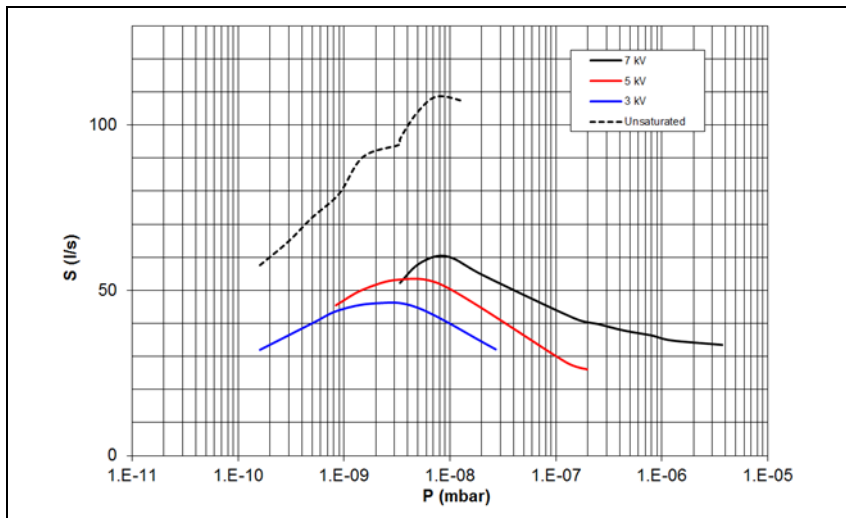


Figure 5 Typical pressure vs current diagram (Diode).

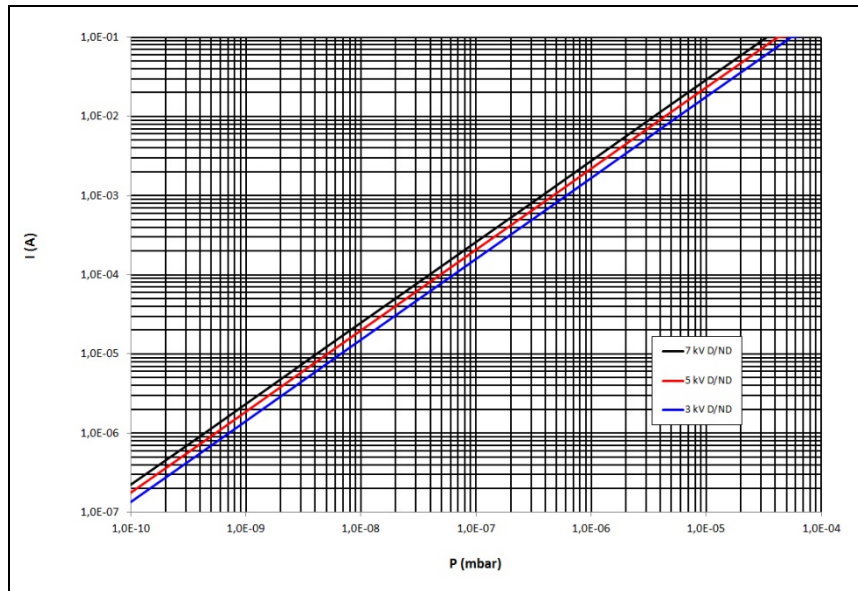
## Vaclon Plus 200 Noble Diode



**Figure 6** Typical pumping speed vs pressure diagram for Nitrogen (Noble Diode).

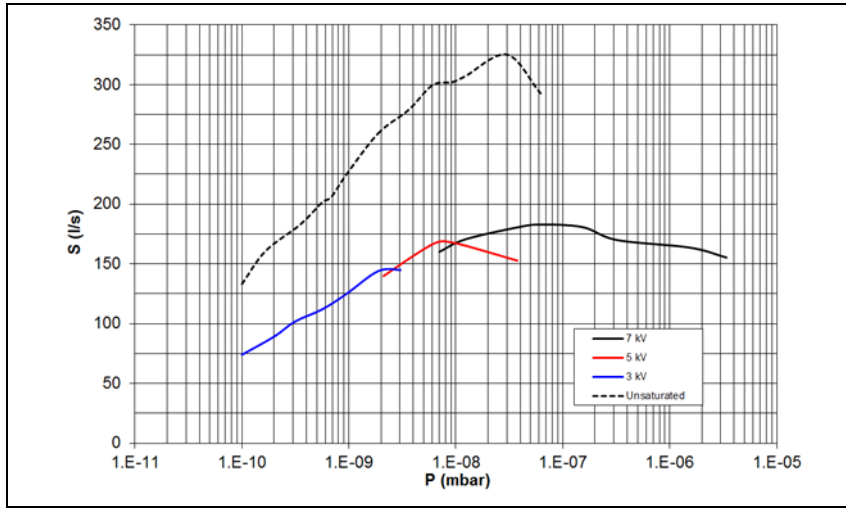


**Figure 7** Typical pumping speed vs pressure diagram for Argon (Noble Diode).

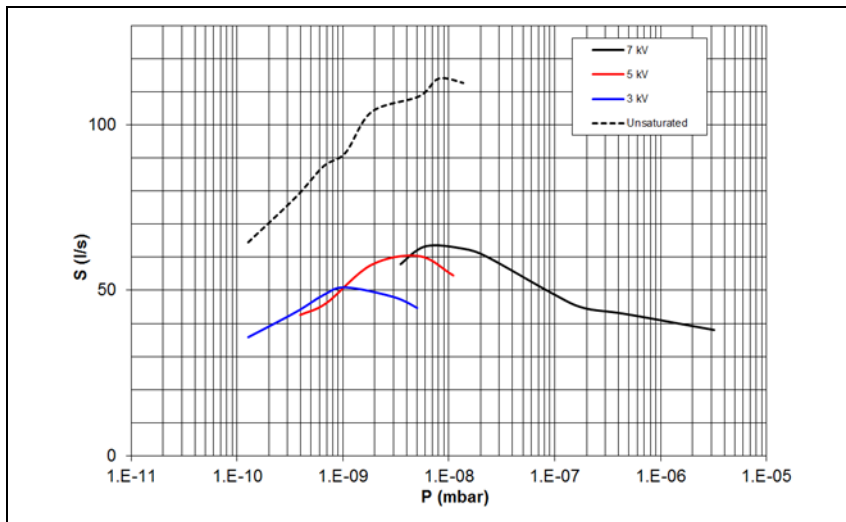


**Figure 8** Typical current VS pressure diagram (Noble Diode).

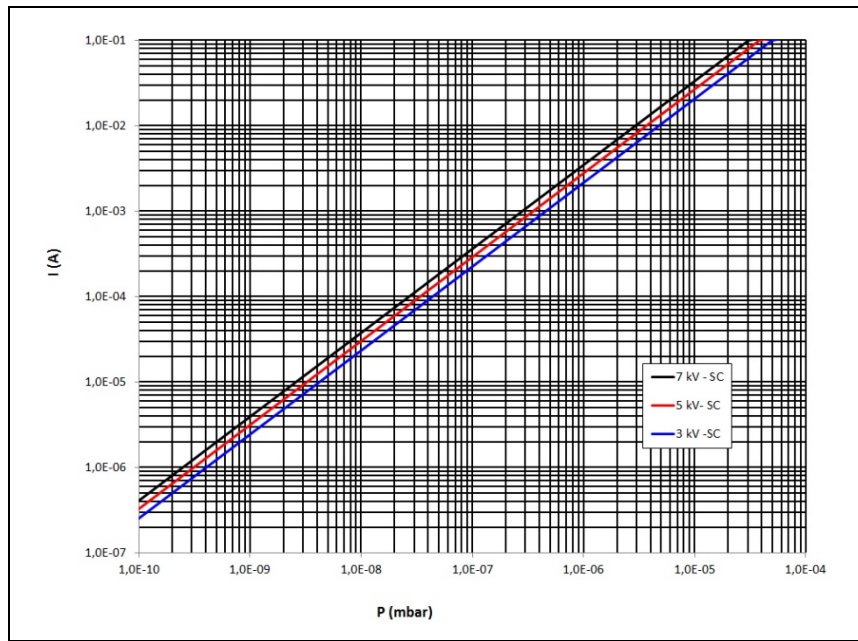
## Vaclon Plus 200 StarCell



**Figure 9** Typical pumping speed vs pressure diagram for Nitrogen (StarCell).



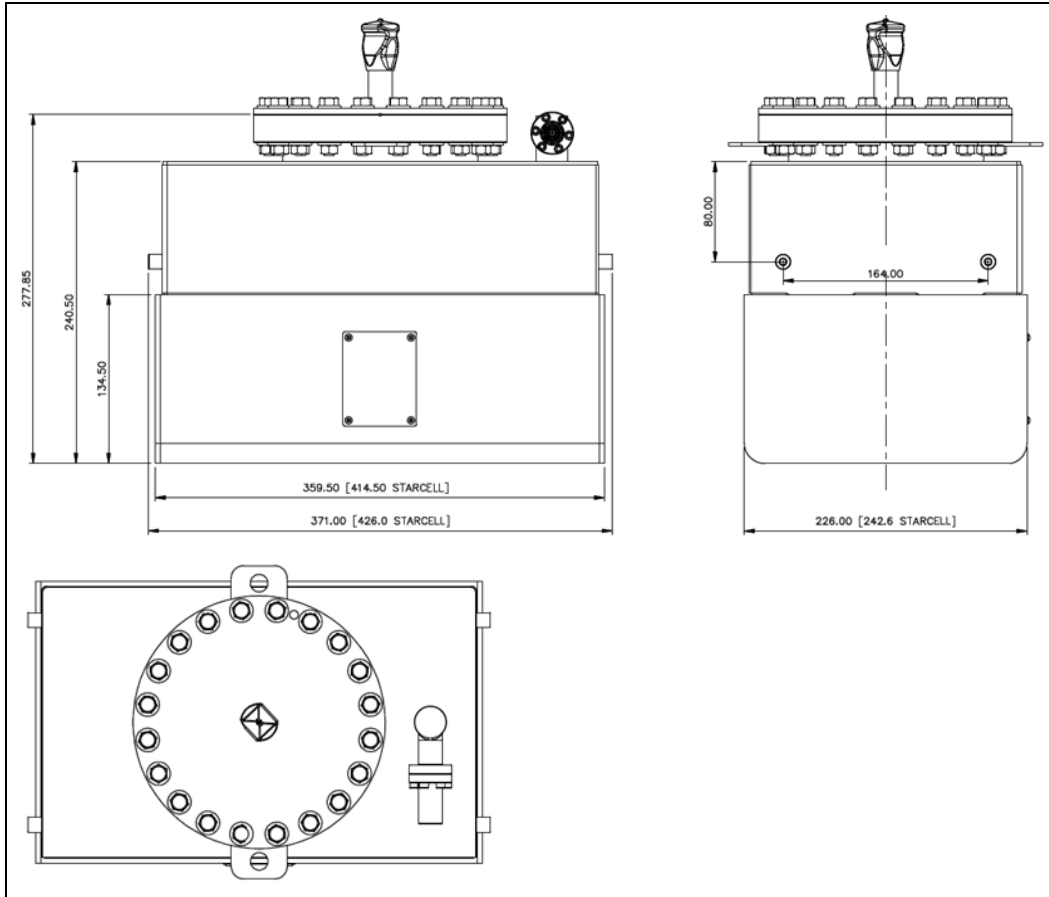
**Figure 10** Typical pumping speed vs pressure diagram for Argon (StarCell).



**Figure 11** Typical pressure vs current diagram (StarCell).

## Outline Drawing

The following figures show the outline drawing for the VacIon Plus 200 pumps, Diode/Noble Diode and StarCell (for this last the values are indicated in square brackets).

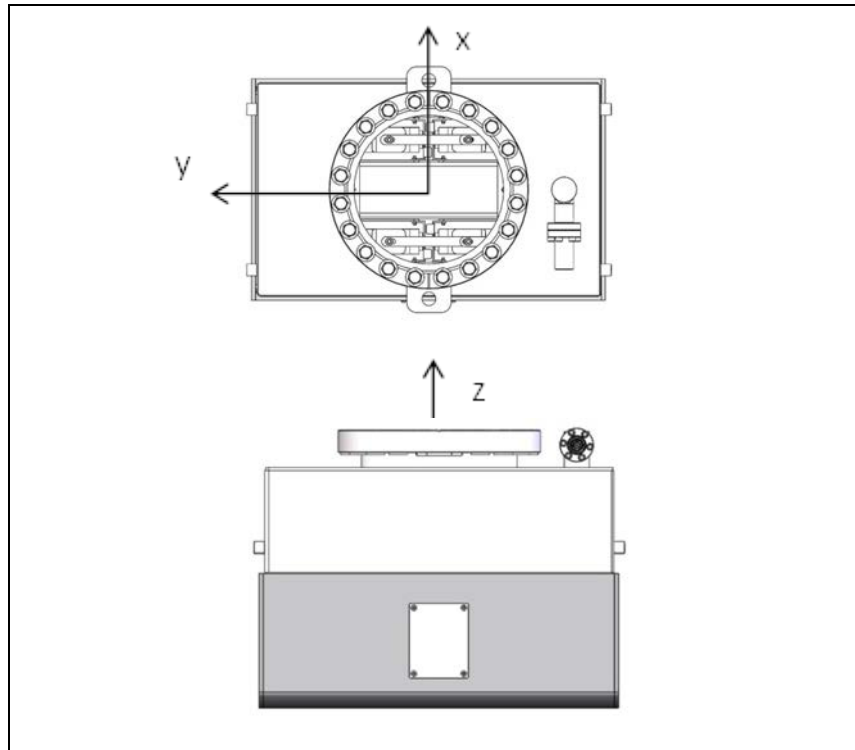


**Figure 12** VacIon Plus 200 outline drawing, showing pump overall dimensions; please note that Diode and Noble Diode versions have the same dimensions, while dimensions for the StarCell are reported in square brackets.

## Stray Magnetic Field

The stray magnetic field of the pump was measured by means of a three-axial probe along several paths. Fig. 13 shows the pump axis identification to which we refer in this paragraph. It is worth noticing that the background contribution due to the Earth magnetic field was subtracted from the measured values.

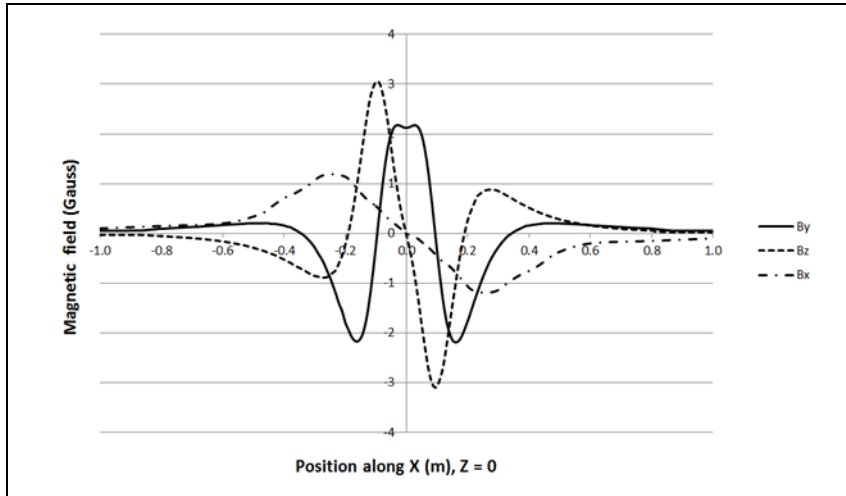
Curves of stray magnetic field strength along the centre line of the pump and in the plane of the flange as a function of distance from the pump are shown in Figs. 14, 15, 16, 17 and 18, where  $B_x$  is the magnetic field along X axis,  $B_y$  is along Y axis and  $B_z$  is along Z axis.



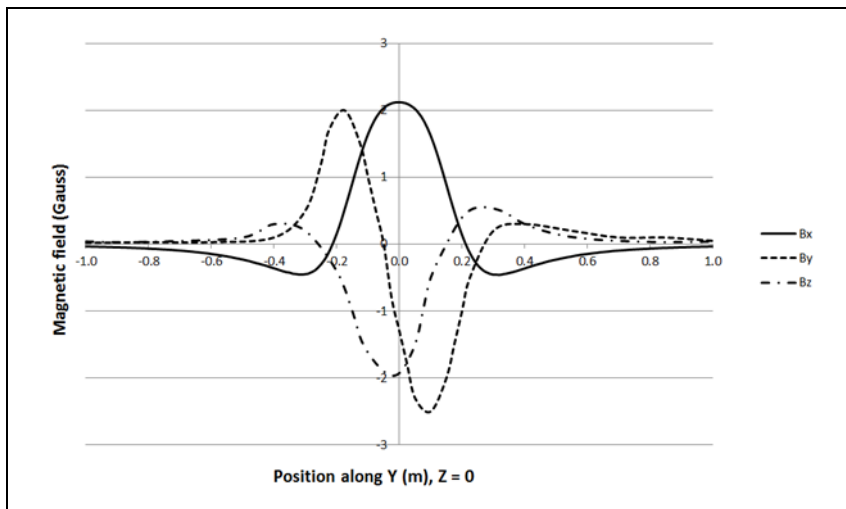
**Figure 13** Pump axis identification.

## 5 Technical Information

### Stray Magnetic Field

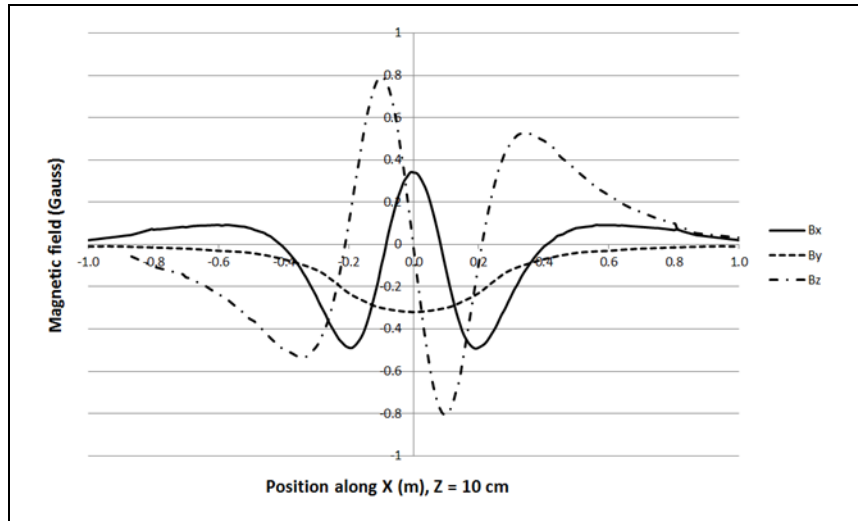


**Figure 14** Typical stray magnetic field from the center of the flange along X axis ( $z = 0$  mm).

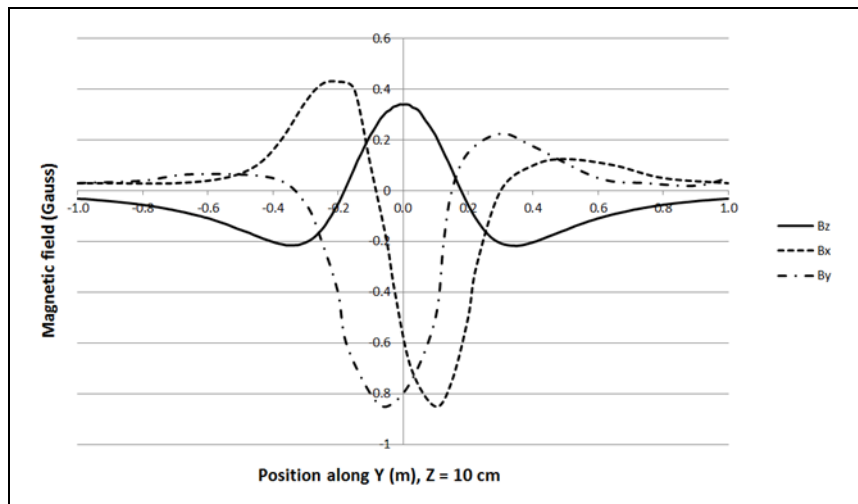


**Figure 15** Typical stray magnetic field from the center of the flange along Y axis ( $z = 0$  mm).





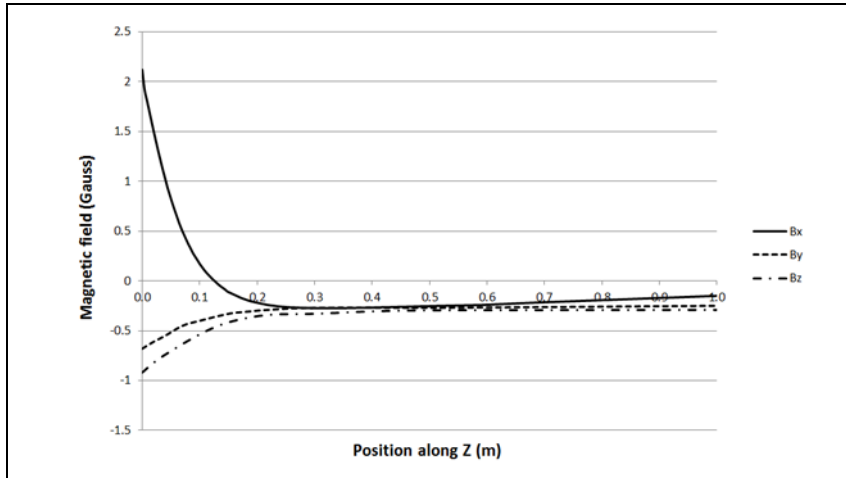
**Figure 16** Typical stray magnetic field from the center of the flange along X axis ( $z = 100$  mm).



**Figure 17** Typical stray magnetic field from flange along Y axis ( $z = 100$  mm).

## 5 Technical Information

### Stray Magnetic Field



**Figure 18** Typical stray magnetic field from flange along Z axis.

As mentioned in the description of the pump, the VacIon Plus 200 pump magnetic field has been optimized with the addition of some magnets in strategic positions. In spite of a number of magnets that is higher with respect to the one foreseen in a traditional magnetic circuit design, it is worth noticing that the design of the pump pole piece, closed on four sides, guarantees a low stray magnetic field.

# VacIon Plus Pump Installation

## Inspection Procedure

VacIon Plus pumps are evacuated, baked out, sealed and leak-checked at below 1E-10 mbar prior to shipping. The following information and procedures can be used to evaluate the vacuum integrity of a VacIon Plus pump before installation.

## Visual Inspection

Inspect the pump and magnet for physical damage which may have occurred during shipment. Inspect the pinch-off seal (that is covered by a rubber cap). If it is open, the pump is at atmospheric pressure.

---

**WARNING!**



**The pinch-off seal is extremely sharp. Be careful when opening. Watch your fingers.**

---

A VacIon Plus pump that has been exposed to atmosphere during shipment, or while in storage, will operate properly if it has not been damaged.

The pump is not harmed by such exposure, although it is good practice to keep it under vacuum when not in use, in order to avoid the dust contamination and the accumulation of water vapor from the environment.

## Vacuum Evaluation

The ion pump is shipped in an evacuated condition. Before removing the shipping flange for installation on a vacuum system, it is recommended to briefly start the pump in order to verify vacuum integrity and proper operation.

To verify the vacuum integrity of the new pump before venting:

- 1 Connect the ion pump to the control unit as described in the instruction manual of the control unit.

---

**WARNING!**



**The high voltage which is applied to the ion pump by the control unit can cause severe injury or death. Be sure that the high voltage cable is properly connected to the ion pump and its power unit. Make sure that the pump is well grounded.**

- 
- 2 With the main power switch in the OFF position, plug the control unit into a suitable power source.
  - 3 Turn the power to ON.
  - 4 Turn the ion pump on by following the instructions on the control unit manual. Observe the reading on the unit display for an indication of one of the following conditions:
    - a If the pump is free of leaks and is at a low pressure, the pressure indication shall quickly fall to or below the 1E-8 mbar range as the volume of gas is pumped.
    - b If the pressure inside the pump is at or near atmospheric level, an arc may strike inside the high voltage feedthrough giving a popping sound and the pump current will fluctuate. If this occurs, turn the power OFF immediately.
  - 5 If the vacuum integrity has been lost, the pump should be leak-checked with a mass spectrometer leak detector before installation on the system.

## Short Circuits

If there is a short circuit between the anode and the cathode or, in the case of the StarCell, between the cathode and the pump body, the short-circuit current of the control unit will be drawn and low voltage will be indicated. If a short circuit exists in the control unit or high voltage cable and connector, low voltage will also be observed when the high voltage connector is disconnected from the pump (refer to the control unit manual).

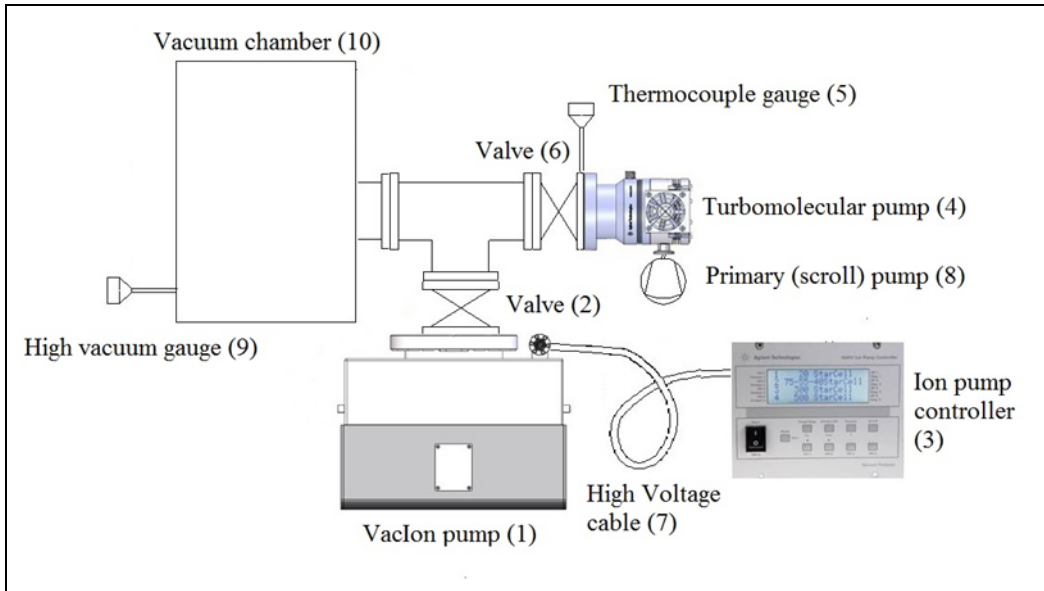
An ohm meter reading on the pump feedthrough may not be effective in finding a short.

Short circuits may be caused by mechanical shock to the pump. If the pump is shorted, contact Agilent.

## **Typical Installation**

A typical installation is shown in the following figure and consists of:

1. VacIon Plus pump.
2. Metallic valve to seal off the pump from the rest of the system (if required).
3. Ion pump control unit.
4. Clean roughing pump (typically a turbomolecular pump).
5. Thermocouple gauge, able to indicate the pressure from atmosphere to 1E-3 mbar range.
6. Metallic valve to seal off the roughing pump from the vacuum chamber. Roughing lines are usually made of stainless steel or copper tubing or other low vapor pressure material.
7. High voltage cable.
8. Primary backing pump.
9. High vacuum gauge (e.g. Agilent UHV24 or UHV24P).
10. Vacuum chamber.



**Figure 19** Typical installation.

## Inlet Flange Connection

The pump should be mounted allowing a sufficient clearance for installation and removal of the high voltage connector.

The pump should be kept sealed with its pinch-off tubulation until it is ready for the connection to the vacuum system. This avoids the accumulation of dust and other undesirable materials. Before breaking the pinch-off seal, consult the inspection procedure (see the previous paragraph).

Vent the ion pump by opening the pinch-off tubulation in a clean area free from smog, dust, pollen, etc. Venting with dry nitrogen gas is strongly recommended. This can be done by placing a clean polyethylene bag over the ion pump flange. Small pumps can be completely placed inside of the bag. Put a pair of pliers inside the bag, too, and purge the bag with clean, dry nitrogen for several minutes; then handle the pliers from outside the bag in order to break the internal pump vacuum, by opening a small leak in the copper tube pinch-off.

### CAUTION!

Do not open the pinch off-seal with a saw or grinder. These methods will cause metal particles to be drawn into the pump by the in-rushing air as the pump is opened.

### WARNING!



The pinch-off seal is extremely sharp. Be careful when opening. Watch your fingers.

Use appropriate procedures to maintain the clean condition of the pump and vacuum system.

Unscrew the main flange bolts and lift the blank flange. Remove the copper gasket plate, that must not be reused. Some particles of copper oxide may adhere to the outer edge of the flange gasket. Be careful not to allow them or any other foreign materials to fall into the pump.



**CAUTION!**

While removing the copper gasket, pay attention in order to not scratch the knife edge of the flange. Do not use a screwdriver or a similar tool in the attempt of lifting the gasket, since you risk to hit the knife edge during this operation.

---

Connect the ion pump to the vacuum chamber with a short length and large diameter pipe in order to retain as much pumping speed as possible. Proceed as follows:

- 1 Inspect the mating flanges for cleanliness and absence of scratches on the knife edge.
- 2 Place a new copper gasket between pump flange and vacuum chamber flange.
- 3 Bolt mating flanges of the pump to the chamber with new screws. For flanges over NW 35 (2.75" o.d.) also mount washers below the nuts and the screw heads.
- 4 Use silver-plated screws or apply high temperature lubricant to the screw threads. Lubrication simplifies sealing and disassembly. A recommended lubricant is Fel-Pro C-100. Take care in order to not contaminate the internal surface of the pump or the vacuum system with the lubricant.

**NOTE**

If the screws are not silver-plated, lubrication is essential to prevent galling of the nut and screw after bakeout. Take care in order to not contaminate with lubricant the surfaces exposed to vacuum.

**NOTE**

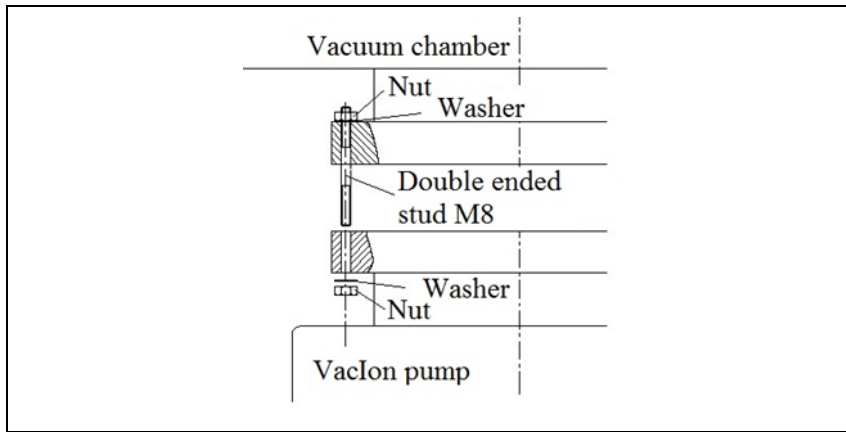
Due to the length of the pump neck, screws must be inserted from the top of the flange. Whenever not possible, it is necessary to use headless studs (see Fig. 20 for reference).

- 
- 5 Attach the nuts and tighten each one to 6 – 11 Nm (4.5 - 8 ft.-lbs) of torque. After tightening a nut, always tighten the opposite nut with respect to the center of the flange. This will partially close the gap between the flange faces.
  - 6 Repeat the sequential tightening for two more cycles.
  - 7 Continue tightening the bolts until the flange faces meet and a pronounced increase in torque is felt.

## 5 Technical Information

### Inlet Flange Connection

Note that it is not possible to install the screws from the lower side, but only from the upper side of the flange. If for any reason screws cannot be installed neither from the upper side, studs must be used (see Fig. 20).



**Figure 20** Stud mounting.

## Control Unit Connection

---

**WARNING!**



The high voltage in the high voltage cable which connects the control unit to the ion pump, can cause severe injury or death. Before connecting the high voltage connector of the cable on the pump high voltage feedthrough, or before removing it, be sure that the main power is removed from the control unit.

---

**WARNING!**



To avoid injury, never connect the high voltage to the pump before it is installed into the system and all the inlet flanges are properly connected or blanked off. Make sure that the pump is well connected to the grounded vacuum system.

---

**WARNING!**



Before removing the high voltage connector of the cable from the control unit, be sure that the main power is removed from the control unit. Wait at least 10 seconds after removing the main power from the control unit, to allow capacitors to discharge completely.

---

To disconnect the coaxial high voltage cable from the controller, slide the safety locking sleeve (very little sleeve travel is required) from the control unit and at the same time pull on the male end of the cable connector to remove it from the socket on the control unit.

## Safety Interlock

The VaClon Plus pump feedthrough in conjunction with the cable P/N 9290705, 0707, 0708 and 0709, when used with the Agilent control units, allows the operation of the “High Voltage Cable Safety Interlock” feature.

When the high voltage cable connector is disconnected from the VaClon Plus pump feedthrough, the high voltage is automatically switched off by the control unit.

## Heater Installation

The heating element (Fig. 21) is composed of two identical “L-shape” parts to be fixed to the pump body. Each half is labelled with a warning “hot surface” with yellow background.

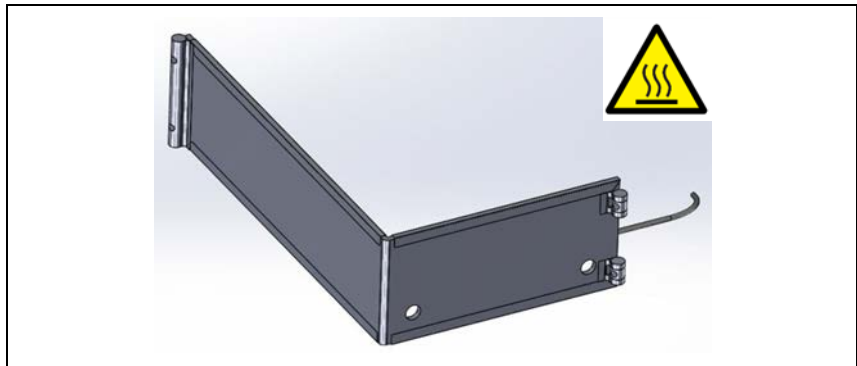
**NOTE**

It is suggested to make a 10 – 15 minutes of initial operation of the heater in a ventilated room to allow the evaporation of residual internal alloying elements.

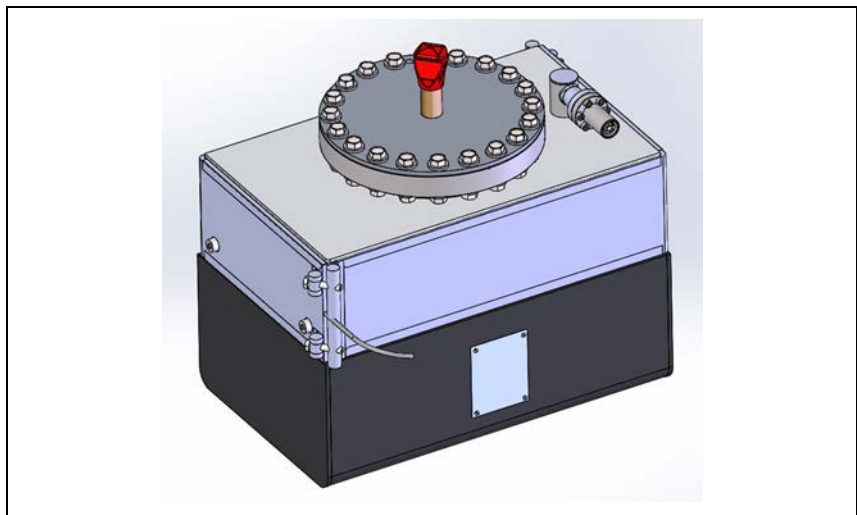
---

To install the element proceed as follows (Fig. 22):

- 1 The two parts of the heater are designed to be placed on the pump body, not inside the pole piece, so it is not necessary to remove the pole piece in order to install or remove the heaters.
- 2 Every half of the couple has its own power cable.
- 3 Place the first half of the heater by matching the two holes on it with the studs on one side of the pump body; then place the second half on the opposite side of the pump.
- 4 Connect the two halves by means of the four screws provided. Take care that the contact between the heater and the pump body is good, by keeping the clearance as small as possible. This is in order to guarantee a good efficiency of the heater elements.



**Figure 21** One of the two identical "L-shape" parts composing the heater.



**Figure 22** Heating element installation.

## **Heater Replacement**

Heater replacement can be performed only when the heater is at room temperature. To replace the heater element proceed as follows:

- 1** Disconnect the pump from the high voltage.
- 2** Disconnect both halves of the heater element from the main supply.
- 3** Remove the screws between the two halves of the heating element.
- 4** Remove the two heater halves from the pump body.
- 5** Install the new heaters as described in the paragraph “Heater Installation”.

## Bakeout Operation

For every ultra-high vacuum (UHV) application, it is necessary to bake the whole vacuum system in order to reach the ultimate pressure. This is done by heating the pump and all the components in the system, and is generally required to quickly achieve base pressure less than 1E-8 mbar.

**CAUTION!**

Do not exceed the temperature limits reported in Table 1.

---

Note that it is possible to perform the bakeout in two ways, that is to say with the ion pump on or off. In the first case (bakeout with the ion pump on):

- 1** Heat the pump body and the vacuum system to temperatures between 150 °C and 220 °C (220 °C is the maximum allowable for most bakeable high voltage cables). This temperature is high enough to degas the pump surfaces of water vapor without damaging the magnet and high voltage connector. Note that the system components must be compatible with the bakeout temperature. The heating must be approximately even on all surfaces or evaporated water will condense on the colder surfaces resulting in an incomplete bakeout and preventing achievement of UHV vacuum pressure.
- 2** Monitor the pump current on the control unit. Agilent recommends that current during the bakeout should not exceed 25 mA; if this value is exceeded, turn the bakeout off and then on again when low current is restored. An automatically controlled relay may be used to control the heaters and to monitor the current limit during the bakeout in automatic mode.
- 3** Bake the VacIon Plus pump for at least 24 hours. Longer bakeout periods are recommended when the pump has been used with heavy gas loads or when UHV pressure (1E-9 mbar or less) is desired.

## 5 Technical Information

### Bakeout Operation

- 4 As the pump and the system cool down to room temperature, a drop in pressure should be observed.

In the second case (bakeout with the ion pump off), an external turbo pump, connected to the system through a bakeable isolation valve, is necessary. The ion pump should be switched on when the system is still at the bakeout temperature, then the turbo pump should be insulated and the system should be kept at high temperature for the final part of the bakeout process, until the ion current begins to decrease. It is worth noticing that this second method gives the best vacuum performance, since the outgassed species are not sorbed by the ion pump (inside which they will remain), but they are removed from the vacuum system by the turbomolecular pump. This helps to preserve the ion pump lifetime.

#### NOTE

It is strongly recommended to degas filaments (e.g. in gauges or residual gas analyzers) when the system is at high temperature. If they are outgassed at room temperature, this operation will compromise the effectiveness of the bakeout.

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## Bakeout of VacIon Pump with the Integral Heaters

- 1 The integral heaters are to be powered with the appropriate voltage. Please refer to the inscription on the heaters to apply the correct voltage.
- 2 The integral heaters are designed to provide in every point of the ion pump a minimum temperature in the range 150-200°C, if the pump is wrapped in a 3-fold aluminum foil.

### NOTE

Keep the high voltage cable out of the aluminum foils in order to not exceed the temperature limits reported in Table 1.

---

- 3 Bakeout the VacIon pump for 24 hours. If the pump is used in heavy gas load applications, it is recommended to bakeout the pump for a longer period.
  - 4 Wait until the pump cools down to room temperature and recovers its base pressure before using it in the application.
- 

### WARNING!



Do not touch the heaters and the ion pump during the heating and cooling phases. The high temperature may cause serious damage.

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### NOTE

It is worth noticing that the bakeout of the ion pump alone is not sufficient to achieve the ultimate pressure. The complete vacuum system must be baked according to the indications in the paragraph "Bakeout operation".

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## **Operating Procedure**

- 1**    Using a clean roughing pump, evacuate the system to the suggested starting pressure (or lower), as stated in the technical specification. To reach this pressure the use of an oil free turbo-molecular roughing pump is recommended.
- 2**    When starting the ion pump, a slight pressure increase is normal, since the internal components are heated and outgassed. Leave the roughing pump connected to the system while starting the ion pump. This will make the startup faster and easier.
- 3**    Connect the ion pump control unit to a suitable power source and switch the controller on.
- 4**    Switch on the high voltage and observe the current and voltage behaviour on the controller display. The fastest starting is obtained using a high applied voltage (e.g. 7 kV). The applied voltage may be reduced later, when the pressure will be lower, in order to optimize the pumping speed. This operation is done automatically by Agilent controllers when set in “STEP” mode.
- 5**    If the ion pump has been started at too high pressure, typically the voltage will be of some hundreds Volts. If the voltage remains constant at these values, in order to avoid pump overheating we suggest to turn it off and start it again at a lower pressure (see the paragraph “Use”). If the ion pump is started at the suggested pressure, the voltage will quickly increase to full voltage as the pump starts operating. The current will start at several milliamps and slowly decrease to microamps or nanoamps as low vacuum pressure is achieved.
- 6**    When starting the ion pump for the first time, if the voltage decreases instead of increasing, switch off the ion pump, keep the roughing pump running and start the ion pump again after a while.
- 7**    When the pump reaches its full operating voltage, the roughing valve can be closed.
- 8**    If the pump does not start after 30 minutes of pumping, see the section PUMP TROUBLESHOOTING.

- 9 Once the pump reaches its base pressure with stable voltage and current, the ion pump and the system may be baked at high temperature as per the indications in the section titled BAKEOUT OPERATION.
- 10 To stop the ion pump, simply switch off the high voltage. The pump surfaces will continue to pump for a few minutes depending on the system pressure.
- 11 When venting the pump use clean, dry nitrogen. This will avoid water absorption on the pump surfaces and make subsequent pump downs easier. Wait that the ion pump is at room temperature before exposing it at the atmospheric pressure.

## Maintenance

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**WARNING!**



**The high voltage in the high voltage cable which connects the control unit to the ion pump, can cause severe injury or death. Before mounting the high voltage connector of the cable on the pump high voltage feedthrough, or before removing it, be sure that the main power is removed from the control unit. Before removing the high voltage connector of the cable from the control unit, be sure the main power is removed from the control unit. Wait at least 10 seconds after removing the main power from the control unit, to allow capacitors to discharge completely.**

---

VacIon Plus pumps are maintenance free. In case of life time expiry or premature failure of the pump, please contact your nearest Agilent sales/service office for repair.

The VacIon Plus 200 pumps are designed with replaceable high-voltage feedthrough and pump elements.

## **Exchange of the Pumping Element**

VacIon Plus 200 pumps are designed to allow the replacement of the pumping elements through the ion pump flange.

Together with the replacement elements, you will receive the instructions to install them inside the ion pump.

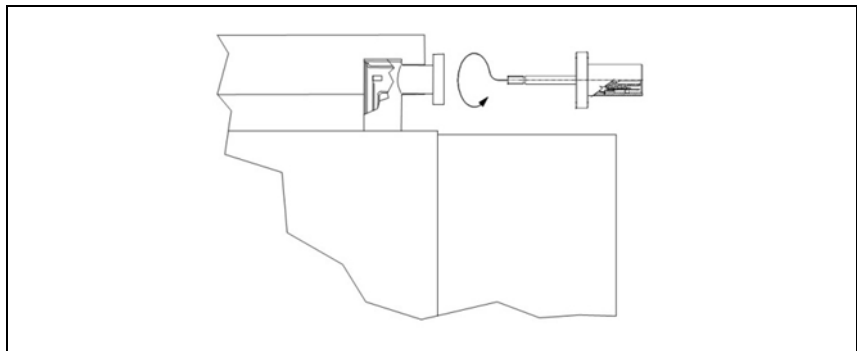
For ordering information (part numbers and quantities to be ordered for each pump), please refer to the local Agilent Technologies representative.

## Exchange of the High Voltage Feedthrough

**CAUTION!**

The high voltage feedthrough contains a ceramic insulator that can be damaged if excessive force is applied in torque, in bending, or in tension. When installing or removing the feedthrough, the applied torque should not exceed 2 Nm. Rotate the feedthrough gently when making the threaded connection to avoid excessive force.

- 1 Remove the 6 bolts of the Mini-ConFlat flange connection (see Fig. 23).
- 2 Remove the cable connection disc (if present, depending on the feedthrough type).
- 3 Gently relieve the feedthrough from the metal gasket connection and turn the feedthrough counterclockwise until it is completely detached from the internal high voltage threaded connection.
- 4 Replace the feedthrough and the copper gasket, making sure that the feedthrough is connected to the pumps internal connector. Check that the feedthrough is not shorted. Put the ion pump and the system under vacuum following the instructions in the paragraph “Operating Procedure”.



**Figure 23** High voltage feedthrough connection.

## **Leakage Current Check**

If the pump current reading is used as a pressure measurement, it is worth checking the pump leakage current as follows:

- 1**   Turn off the pump control unit.
- 2**   Remove the pump pole piece (magnetic circuit). Contact the local Agilent Technologies representative to get indication about how this operation should be carried out.
- 3**   Turn on the pump control unit and wait for current stabilization. The current reading should not be higher than 150 nA. Make sure that the control unit and the high voltage cable leakage current is negligible.
- 4**   If the reading is higher than 150 nA, this indicates that leakage current comes from the pump; in this case you should perform a "high-potting" per the following procedure, then recheck the pump and re-install the pole piece.
- 5**   If it is not possible to "high-pot" the pump, the pressure reading is biased by the leakage current value.

If, for any reason, it is not possible to remove the pole piece, the presence of leakage current can be evaluated by changing the high voltage applied to the ion pump from 7 kV to 3 kV. This reduces exponentially the leakage current, thus confirming that the current reading is affected by leakage.

## High-potting

A constant pump current when no vacuum leak exists is often caused by field emission currents which prevent the use of the pump current as a UHV pressure indicator. To reduce this field emission current, "high-potting" should be performed. "High-potting" is the term used to describe the application of higher than normal operating voltage (8 kV AC, max. 50 mA) for the purpose of burning off "whiskers" (sharp edges) on the pump cathode.

High-potting should be done under vacuum and preferably without pump magnets installed (to reduce the drawn current).

High-potting must be done carefully and in voltage steps since uncontrolled arcing inside the pump can cause permanent damage. Therefore slowly increase the applied voltage and watch the current meter for indication of arcing inside the pump as whiskers are burned away. If arcing occurs wait at this voltage until the current is stable again. Then slowly increase voltage again in steps up to a maximum voltage. The maximum voltage may be applied to the pump for a period of about 15 seconds. This should effectively remove any "whiskers" or sharp edges on the pump cathode.

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**WARNING!**



**Voltages developed in the high-potter power supply are potentially lethal. Use caution during operation and ensure the correct grounding.**

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# Pump Troubleshooting

Tab. 2

Symptom	Possible cause	Correction procedure
1) – Slow starting	Starting vacuum pressure too high.	Reduce the starting pressure to the value recommended in Table 1.
2) – Slow starting (more than 30 minutes).	Air leaks which limit pressure to above $10^{-6}$ mbar and cause longer starting time.	Leak check the vacuum system with a helium leak detector.
3) – Slow pump-down due to long exposure of viton parts to air.	Viton releases considerable gas after long exposure to air. (e.g. A bell-jar system which reached $2 \times 10^{-8}$ mbar in 24 hours after 30 minutes air exposure, will only reach $1 \times 10^{-7}$ mbar in 24 hours after 20 hours air exposure)	With the system under vacuum, pump for several days, or bake at 100-150 °C (minimum) for up to 15 hours.
4) – Slow pump-down due to absorption of vapours on pump and system walls.	Vapours and gases admitted to a system are absorbed on the walls of the system and pump. Subsequent reduction in pressure depends on the rate of depletion of this vapour. Heavy hydrocarbons are most troublesome because of their relative low vapour pressure and they are very difficult to remove, even by baking.	Bake the system walls, thereby accelerating the desorption process. Baking mobilizes the vapours so they can be cracked and pumped by discharge (see the section “BAKEOUT OPERATION”).
5) – Slow starting or slow pump-down.	High voltage feedthrough is leaking.	Replace the feedthrough.
6) – Current higher than expected at any given pressure.	Ion pump leakage current causing higher pressure reading.	Verify that leakage current (see the dedicated paragraph) occurs and then high-pot the pump.
7) – System fails to achieve desired UHV vacuum pressure.	System not fully baked. Water vapor limits the base pressure.	Bake the system walls, thereby accelerating the desorption process. Baking mobilizes the vapours so they can be cracked and pumped by discharge (see the section “BAKEOUT OPERATION”).



Symptom	Possible cause	Correction procedure
8) – System fails to achieve desired UHV vacuum pressure.	System not appropriately cleaned for UHV. Excessive outgassing from walls limits base pressure.	Clean all components for UHV and bake the system again.
9) – System fails to achieve desired UHV vacuum pressure	The pressure indication is not given by a gauge, but it comes from the conversion of the ion pump current, that may be affected by leakage.	Verify that leakage current occurs (see the dedicated paragraph) and then high-pot the pump.
10) Sudden and unexplained pressure (current) increases take place with regular frequency.	Instability for noble gases occurs. It is worth noticing that a small quantity of noble gas (argon) is present in the air composition.	Bake the ion pump and the system with the ion pump off and a turbomolecular pump as support. This should partly remove the noble gases inside the ion pump. Choose the most appropriate pumping element for noble gases (StarCell is recommended).

## Vaclon Plus Pump Replacement Parts and Accessories

Tab. 3

	Part number		
	Diode	Noble Diode	StarCell
<b>Fischer feedthrough</b>			
Vaclon Plus 200 pump	X3601-64000	X3601-64018	X3601-64040
Vaclon Plus 200 pump with heaters 120V	X3601-64002	X3601-64020	X3601-64042
Vaclon Plus 200 pump with heaters 220V	X3601-64004	X3601-64022	X3601-64044
Vaclon Plus 200 pump with side port	X3601-64001	X3601-64019	X3601-64041
Vaclon Plus 200 pump with side port and heaters 120V	X3601-64003	X3601-64021	X3601-64043
Vaclon Plus 200 pump with side port and heaters 220V	X3601-64005	X3601-64023	X3601-64045
<b>SHV feedthrough</b>			
Vaclon Plus 200 pump	X3601-64012	X3601-64030	X3601-64052
Vaclon Plus 200 pump with heaters 120V	X3601-64014	X3601-64032	X3601-64054
Vaclon Plus 200 pump with heaters 220V	X3601-64016	X3601-64034	X3601-64056
Vaclon Plus 200 pump with side port	X3601-64013	X3601-64031	X3601-64053
Vaclon Plus 200 pump with side port and heaters 120V	X3601-64015	X3601-64033	X3601-64055
Vaclon Plus 200 pump with side port and heaters 220V	X3601-64017	X3601-64035	X3601-64057
For part numbers with other feedthrough versions, please refer to your local Agilent representative.			
<b>Cables and heaters</b>			
HV radiation resistant cable, 4 m (13 ft), with interlock (for Fischer feedthrough)	9290705	9290705	9290705
HV radiation resistant cable, 7 m (23 ft), with interlock (for Fischer feedthrough)	9290707	9290707	9290707
HV radiation resistant cable, 10 m (33 ft), with interlock (for Fischer feedthrough)	9290708	9290708	9290708

	<b>Part number</b>		
	<b>Diode</b>	<b>Noble Diode</b>	<b>StarCell</b>
HV radiation resistant cable, 20 m (66 ft), with interlock (for Fischer feedthrough)	9290709	9290709	9290709
Heaters 120V (two items)	X3601-68003	X3601-68003	X3601-68005
Heaters 220V (two items)	X3601-68004	X3601-68004	X3601-68006
Heaters 120V for side port version (two items)	X3601-68007	X3601-68007	X3601-68009
Heaters 220V for side port version (two items)	X3601-68008	X3601-68008	X3601-68010
Fischer feedthrough	9595125	9595125	9595125

For a complete overview of Agilent extensive vacuum product line and for part numbers not included in the above table please refer to the Agilent Vacuum Catalogue.

## **Vaclon Plus Pump Controllers**

The following controller series are available to supply the Vaclon Plus pumps:

- 4UHV Controller

Please refer to the Agilent Vacuum Catalogue to choose the correct controller (polarity and power) for each pump.



## ***Vacuum Products Division***

*Dear Customer,*

*Thank you for purchasing an Agilent vacuum product. At Agilent Vacuum Products Division we make every effort to ensure that you will be satisfied with the product and/or service you have purchased.*

*As part of our Continuous Improvement effort, we ask that you report to us any problem you may have had with the purchase or operation of our products. On the back side you find a Corrective Action request form that you may fill out in the first part and return to us.*

*This form is intended to supplement normal lines of communications and to resolve problems that existing systems are not addressing in an adequate or timely manner.*

*Upon receipt of your Corrective Action Request we will determine the Root Cause of the problem and take the necessary actions to eliminate it. You will be contacted by one of our employees who will review the problem with you and update you, with the second part of the same form, on our actions.*

*Your business is very important to us. Please, take the time and let us know how we can improve.*

*Sincerely,*

A handwritten signature in black ink, appearing to read "Giampaolo LEVI".

**Giampaolo LEVI**

*Vice President and General Manager  
Agilent Vacuum Products Division*

Note: Fax or mail the Customer Request for Action (see backside page) to Agilent Vacuum Products Division (Torino) – Quality Assurance or to your nearest Agilent representative for onward transmission to the same address.

## CUSTOMER REQUEST FOR CORRECTIVE / PREVENTIVE / IMPROVEMENT ACTION

TO: AGILENT VACUUM PRODUCTS DIVISION TORINO – QUALITY ASSURANCE FAX

N°: XXXX-011-9979350

ADDRESS: AGILENT TECHNOLOGIES ITALIA S.p.A. – Vacuum Products Division –

Via F.lli Varian, 54 – 10040 Leini (TO) – Italy

E-MAIL: [vpd-qualityassurance\\_pdl-ext@agilent.com](mailto:vpd-qualityassurance_pdl-ext@agilent.com)

NAME	COMPANY	FUNCTION
<p>ADDRESS:</p> <p>TEL. N° : <span style="margin-left: 200px;">FAX N° :</span></p> <p>E-MAIL:</p>		
<p>PROBLEM / SUGGESTION :</p>          <p>REFERENCE INFORMATION (model n°, serial n°, ordering information, time to failure after installation, etc.):</p>          <p style="text-align: right;">DATE</p>		
CORRECTIVE ACTION PLAN / ACTUATION (by AGILENT VPD)		LOG N°

XXX = Code for dialing Italy from your country (es. 01139 from USA; 00139 from Japan, etc.)



**Vacuum Products Division  
Instructions for returning products**

Dear Customer,

Please follow these instructions whenever one of our products needs to be returned.

Complete the attached **Request for Return form** and send it to Agilent Technologies (see below), taking particular care to include the completed **Health and Safety** declaration Section. No work can be started on your unit until we receive a completed copy of this form.

After evaluating the information, Agilent Technologies will provide you with a **Return Authorization (RA) number** via email or fax, as requested. Note: Depending on the type of return, a Purchase Order may be required at the time the **Request for Return** is submitted. We will quote any necessary services (evaluation, repair, special cleaning, eg).

**Product preparation**

- Remove all accessories from the core product (e.g. inlet screens, vent valves).
- Prior to shipment and if applicable for your product, drain any oils or other liquids, purge or flush all gasses, and wipe off any excess residue.
- If ordering an Advance Exchange product, please use the packaging from the Advance Exchange to return the defective product.
- Seal the product in a plastic bag, and package product carefully to avoid damage in transit. You are responsible for loss or damage in transit.
- Include a copy of the Health and Safety Declaration in the shipping documentation on the outside of the shipping box of your returning product.
- Clearly label package with RA number. Using the shipping label provided will ensure the proper address and RA number are on the package. Packages shipped to Agilent without a RA clearly written on the outside cannot be accepted and will be returned.
- Return only products for which the RA was issued.

**Shipping**

- Ship to the location specified on the printable label, which will be sent, along with the RA number, as soon as we have received all of the required information. Customer is responsible for freight charges on returning product.
- Return shipments must comply with all applicable Shipping Regulations (IATA, DOT, ADR, etc.) and carrier requirements.

RETURN THE COMPLETED REQUEST FOR RETURN FORM TO YOUR NEAREST LOCATION:

**EUROPE:**

Fax: 00 39 011 9979 330

Fax Free: 00 800 345 345 00

Toll Free: 00 800 234 234 00

[vpt-customer@agilent.com](mailto:vpt-customer@agilent.com)

**NORTH AMERICA:**

Fax: 1 781 860 9252

Toll Free: 800 882 7426

[vpl-ra@agilent.com](mailto:vpl-ra@agilent.com)

**PACIFIC RIM:**

please visit our website for individual office information

<http://www.agilent.com>



**TERMS AND CONDITIONS**

**Please read the terms and conditions below as they apply to all returns and are in addition to the Agilent Technologies Vacuum Product Division – Products and Services Terms of Sale.**

- Unless otherwise pre-negotiated, customer is responsible for the freight charges for the returning product. Return shipments must comply with all applicable **Shipping Regulations** (IATA, DOT, etc.) and carrier requirements.
- Agilent Technologies is not responsible for returning customer provided packaging or containers.
- Customers receiving an Advance Exchange product agree to return the defective, rebuildable part to Agilent Technologies **within 15 business days**. Failure to do so, or returning a non-rebuildable part (crashed), will result in an invoice for the non-returned/non-rebuildable part.
- Returns for credit toward the purchase of new or refurbished Products are subject to prior Agilent approval and may incur a restocking fee. Please reference the original purchase order number.
- Units returned for evaluation will be evaluated, and a quote for repair will be issued. If you choose to have the unit repaired, the cost of the evaluation will be deducted from the final repair pricing. A Purchase Order for the final repair price should be issued within 3 weeks of quotation date. Units without a Purchase Order for repair will be returned to the customer, and the evaluation fee will be invoiced.
- Products returned that have not been drained from oil will be disposed.
- A Special Cleaning fee will apply to all exposed products
- If requesting a calibration service, units must be functionally capable of being calibrated.



Customer information		
Company :	Contact Name:	
Address:	Tel:	Fax:
	Email:	

Equipment			
Product description	Agilent PartNo	Agilent Serial No	Original Purchasing Reference
Failure description		Type of process (for which the equipment was used)	

Type of return
<input type="checkbox"/> Non Billable <input type="checkbox"/> Billable <input checked="" type="checkbox"/> New PO # (hard copy must be submitted with this form): _____ <input type="checkbox"/> Exchange <input type="checkbox"/> Repair <input type="checkbox"/> Upgrade <input type="checkbox"/> Consignment/Demo <input type="checkbox"/> Calibration <input type="checkbox"/> Evaluation <input type="checkbox"/> Return for Credit

Health and safety		Substances (please refer to MSDS forms)			
The product has been exposed to the following substances: (by selecting 'YES' you MUST complete the table to the right)		* Agilent will not accept delivery of any product that is exposed to radioactive, biological, explosive substances or dioxins, PCB's without written evidence of decontamination.			
		Trade name	Chemical name	Chemical Symbol	CAS Number
Toxic	<input type="checkbox"/> YES <input type="checkbox"/> NO				
Harmful	<input type="checkbox"/> YES <input type="checkbox"/> NO				
Corrosive	<input type="checkbox"/> YES <input type="checkbox"/> NO				
Reactive	<input type="checkbox"/> YES <input type="checkbox"/> NO				
Flammable	<input type="checkbox"/> YES <input type="checkbox"/> NO				
Explosive (*)	<input type="checkbox"/> YES <input type="checkbox"/> NO				
Radioactive (*)	<input type="checkbox"/> YES <input type="checkbox"/> NO				
Biological (*)	<input type="checkbox"/> YES <input type="checkbox"/> NO				
Oxidizing	<input type="checkbox"/> YES <input type="checkbox"/> NO				
Sensitizer	<input type="checkbox"/> YES <input type="checkbox"/> NO				
Other dangerous substances	<input type="checkbox"/> YES <input type="checkbox"/> NO				

Goods preparation	
If you have replied YES to one of the above questions. Has the product been purged?	<input type="checkbox"/> YES <input type="checkbox"/> NO
If yes, which cleaning agent/method:	
Has the product been drained from oil?	<input type="checkbox"/> YES <input type="checkbox"/> NOT APPLICABLE
I confirm to place this declaration on the outside of the shipping box.	<input type="checkbox"/>

<b>I declare that the above information is true and complete to the best of my knowledge and belief. I understand and agree to the terms and conditions on page 2 of this document.</b>	
Name:	Authorized Signature:
Position:	
Date:	

**NOTE:** If a product is received at Agilent which is contaminated with a toxic or hazardous material that was not disclosed, **the customer will be held responsible** for all costs incurred to ensure the safe handling of the product, and is liable for any harm or injury to Agilent employees as well as to any third party occurring as a result of exposure to toxic or hazardous materials present in the product.

## Agilent Vacuum Products Division/Sales and Service Offices

### United States

#### **Agilent Technologies**

121 Hartwell Avenue  
Lexington, MA 02421 - USA  
Ph. +1 781 861 7200  
Fax: +1 781 860 5437  
Toll-Free: +1 800 882 7426  
[vpl-customer@agilent.com](mailto:vpl-customer@agilent.com)

### Netherlands

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