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Instructions for Use

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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 2 l/s 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.

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, do not use bare hands to handle components which will be exposed to vacuum. Always use 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.

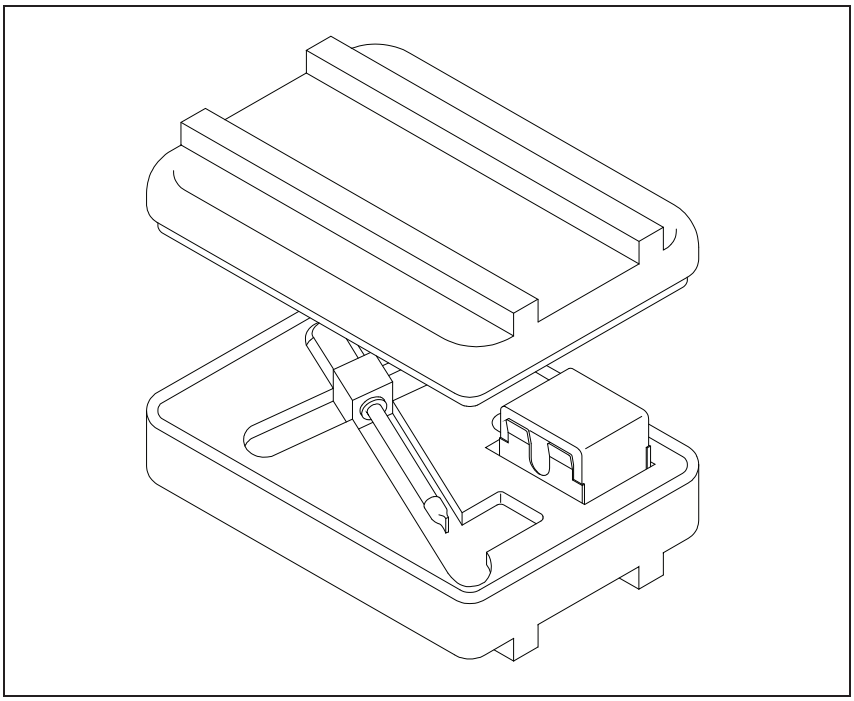


Figure 1

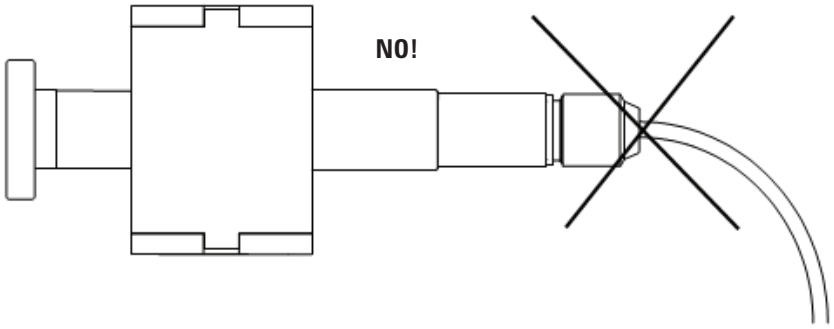
Installation

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.

CAUTION! The pump should be kept sealed 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 the special Agilent MicroVac controller only.

CAUTION! The safety specifications agreement using the pump is guaranteed using the Agilent controller and cable only.

CAUTION! The High Voltage cable feedthrough is designed for use with cable Agilent (P/N 929-0706) in conjunction with Agilent MicroVac controller (P/N 929-0200 or 929-0201).
Only in this case the “H.V. Cable Safety Interlock” function is available. This function switch off the high voltage when the relevant cable is disconnected from the pump.

The pump can be installed in any position. For convenience, a pump is usually mounted vertically with the inlet up, or placed horizontally.

Pumps can be supported by the mounting flange in any position.

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

Use

All the instructions for the correct use of the pump are contained in the control unit manual.

Read the manual carefully before using the pump.

Rough pumping down to $1x10^{-4}$ mbar is recommended for the most rapid starting. Roughing with an oil-sealed mechanical pump is not desirable, but when used, a trap in the roughing line is recommended to reduce pressure due to water vapor and oils from the mechanical pump. Be careful to minimize the time that this pump is open to the system and ion pump, since mechanical pump vapors will start diffusing into the system at pressures below $1x10^{-1}$ mbar and cause contamination. In systems where oils must be completely eliminated, turbopump roughing pumps should be used.

Hygroscopic deposits and hydrogen absorption into titanium may cause starting times to increase with age. During exposure to air, the deposits of titanium compound absorb water vapor. In subsequent start ups, pump heating causes release of the water vapor and some previously pumped hydrogen; thus, the starting time may be lengthened.

Operating Procedure

Refer to the MicroVac control unit instruction manual and follow the procedure below when operating the pump:

1. With a clean roughing pump, establish a roughing pressure of $1x10^{-4}$ mbar or lower in the vacuum system.
2. Plug the control unit into a suitable power source and switch the power ON.
3. When the start-up is at a pressure higher than $1x10^{-4}$ mbar, MicroVac controller will show an High Load condition.
4. Allow the roughing valve to remain open after turning on the ion pump until an adequate starting pressure is reached. If the ion pump voltage drops after closing the roughing valves, reopen the valve for additional rough pumping. As the pressure decreases, the voltage again will rise, and the roughing valve should be closed.
5. When venting the pump, use dry nitrogen. This will avoid water vapor absorption on the pump walls.

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 presence of explosive gases.

CAUTION! Do not put any electronic device near the pump otherwise the magnetic field around it may cause a device malfunctioning.

Maintenance

The 2 l/s series pumps do 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.

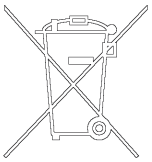
Disposal

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.



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Original Instructions

Description of the Pump

The Agilent VacIon 2 l/s pumps are ion pumps and are available in the following versions:

Tab. 1

PART NUMBER	MODEL
919-0520	2 l/s pump mini CFF
919-0521	2 l/s pump ¾" O.D. 180 ° SST tube
919-0522	2 l/s pump 3/8" O.D. 180 ° copper tube
919-0523	2 l/s pump ¾" O.D. 180 ° SST tube vacuum proc.
919-0524	2 l/s pump¾" O.D. 90 ° SST tube tee style

NOTE The part numbers in the table are relevant to the pump without the magnet. The magnet part numbers is 919-0038.

The 2 l/s pump is a pump which operates on the principle of ion gettering in the pressure range from 10^{-4} to less than 10^{-9} mbar. A roughing pump is needed to lower the system pressure from atmosphere to below 10^{-4} mbar.

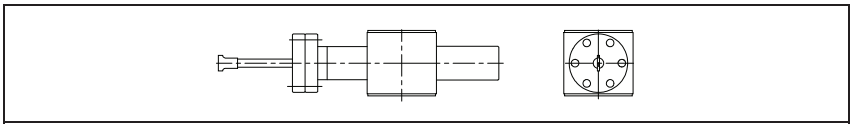

Figure 2 Model 919-0520

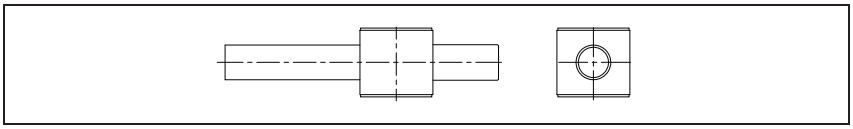

Figure 3 Model 919-0521

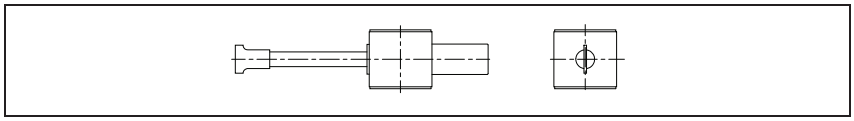

Figure 4 Model 919-0522

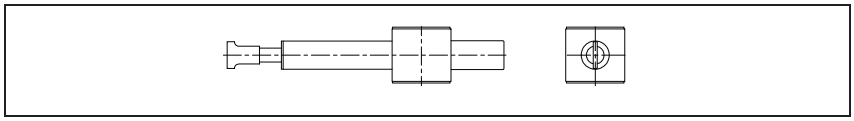

Figure 5 Model 919-0523

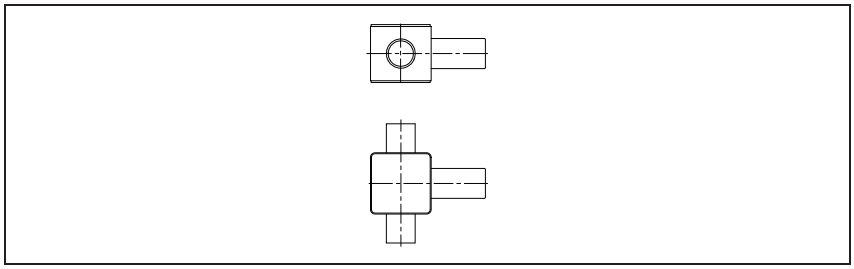

Figure 6 Model 919-0524

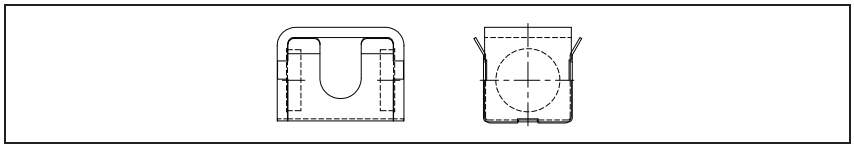

Figure 7 Magnet model 919-0038

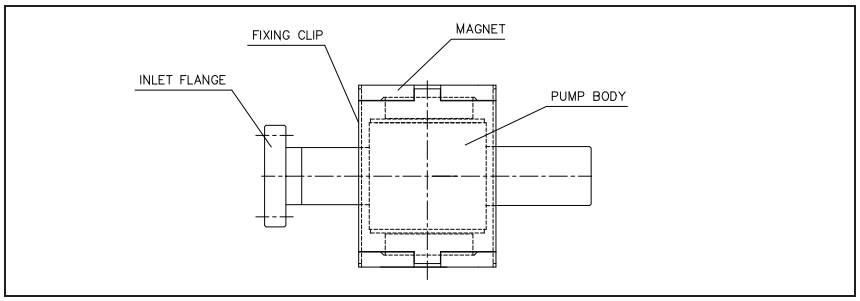

Figure 8 Pump main assemblies

Operating Notes

VacIon pumps operate as a single-cell Penning discharge. A potential of about 3 kV is applied to the anode cell; the cathodes are at ground potential. Electrons are constrained from going directly to the anode by the presence of an axial magnetic field of about 1200 gauss. A self-shielding insulator isolates the anode from ground potential. When the VacIon pump is operating properly (with magnet installed), the current drawn is proportional to pressure (see the figure in the following page).

After the system is rough-pumped to below 10^{-4} mbar, the pump can be started by simply switching on the VacIon pump control unit. A current draw on the control unit will indicate that the pump discharge has started.

The pump can operate in any position and can be supported on the mounting flange.

NOTE Always wait at least 30 seconds after turning off the high voltage switch before disconnecting the power supply leads. This should allow the power supply output capacitor to discharge adequately.

Technical Specification

The following table details the main technical specifications of the 2 l/s Ion Pump.

Tab. 2

Nominal pumping speed for Nitrogen (l/s)	2
Operating life at $5x10^{-6}$ mbar (hours)	8000
Operating voltage	+3300 Vdc +/- 10 %
Maximum starting pressure (mbar)	$1x10^{-4}$
Ultimate pressure (mbar)	10^{-9}
Internal volume (litres)	0.064
Maximum baking temperature (°C)	400 (without magnet) 150 (with magnet)
Material: Body Cathode Anode Magnet	AISI 304 Titanium AISI 304 Sm-Co
Weight, (kg)	0.3 net 0.6 with magnet

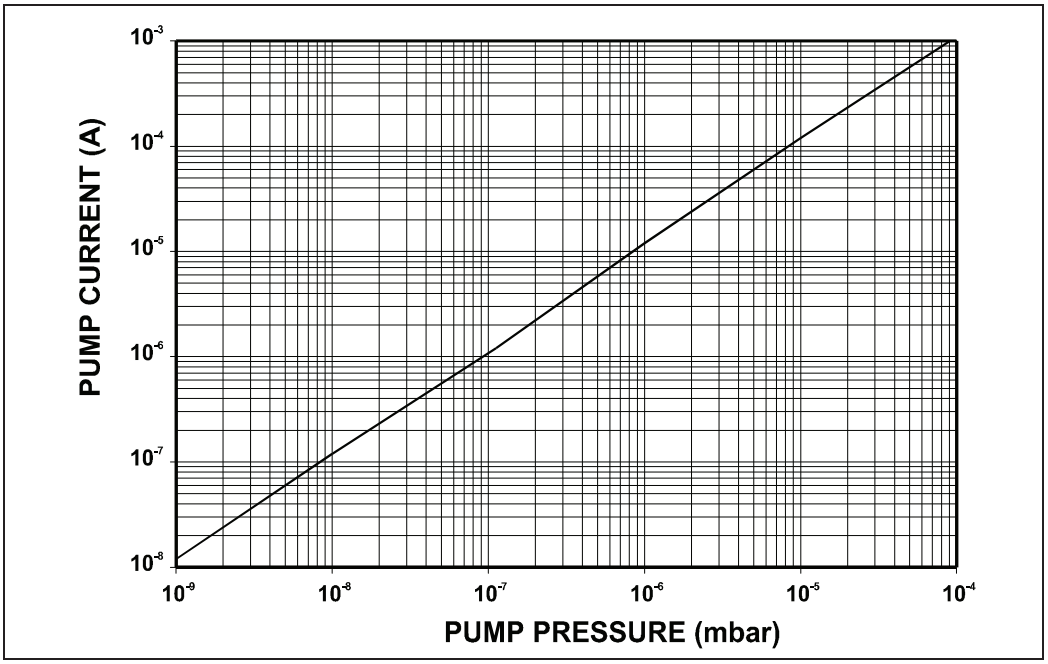

Figure 9 Pressure vs Current curve

Outline Drawing

The following figure shows the outline drawing for the 2 l/s pump and the magnet (all dimensions are in inches [mm]).

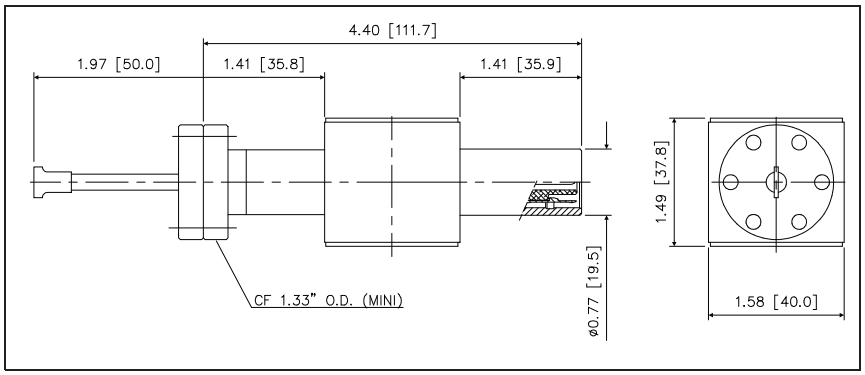

Figure 10 Model 919-0520

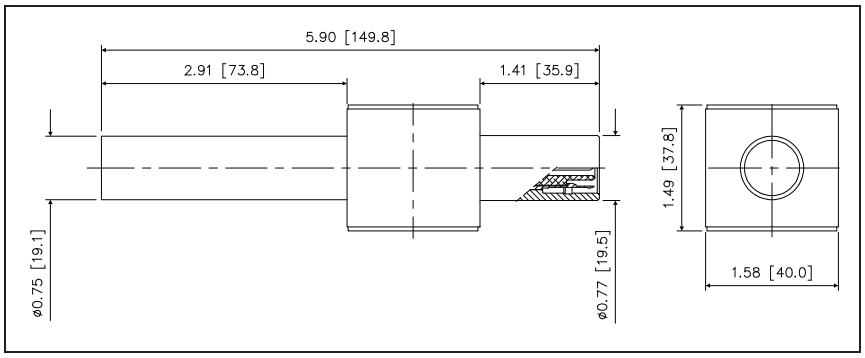

Figure 11 Model 919-0521

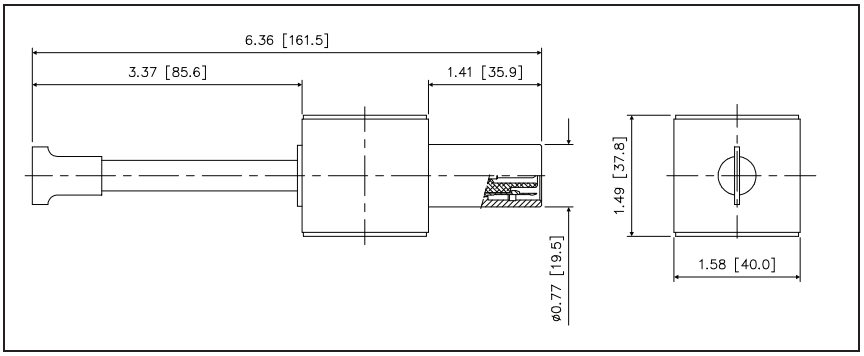

Figure 12 Model 919-0522

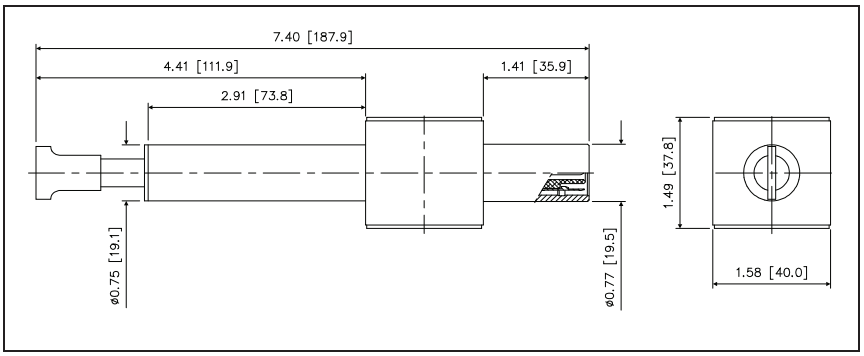

Figure 13 Model 919-0523

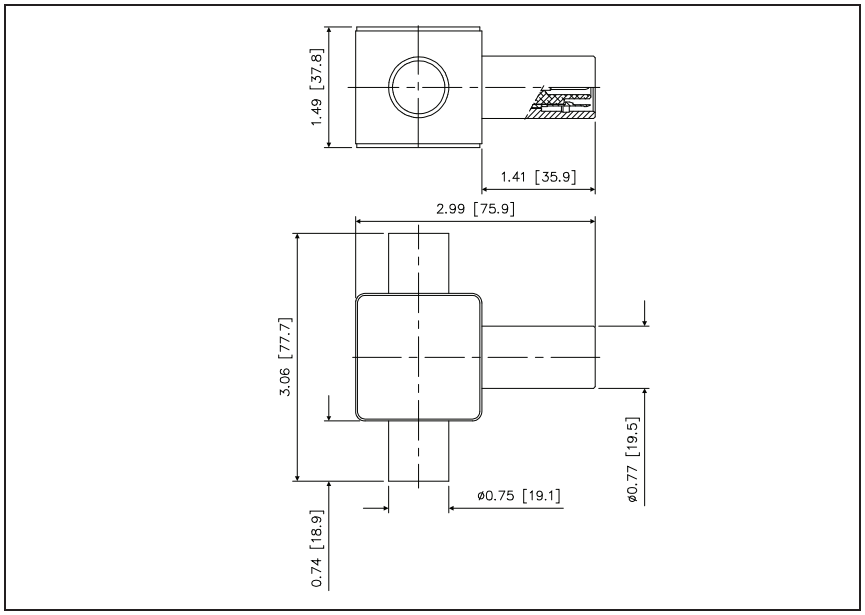

Figure 14 Model 919-0524

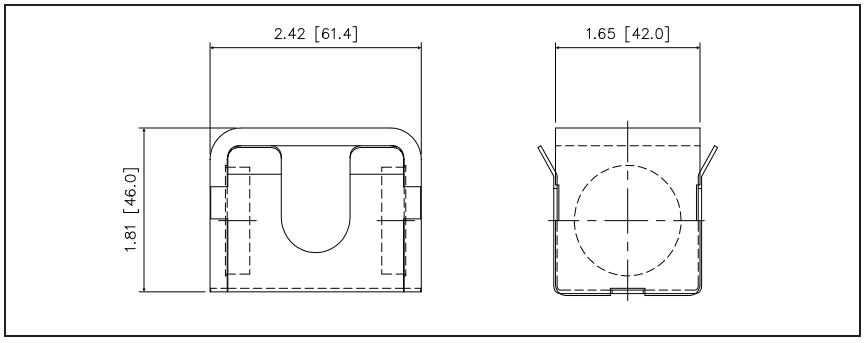

Figure 15 Magnet model 919-0038

Installation

Pump Assembling

Before installing the pump into the system, the pump must be assembled.

To assemble the pump, proceed as follows (see the following figure):

1. Remove the pump parts from the packaging.
2. Remove the fixing clip (3) from the magnet (2).
3. Insert the pump (1) into the magnet.
4. Fix the pump to the magnet by means of the fixing clip.

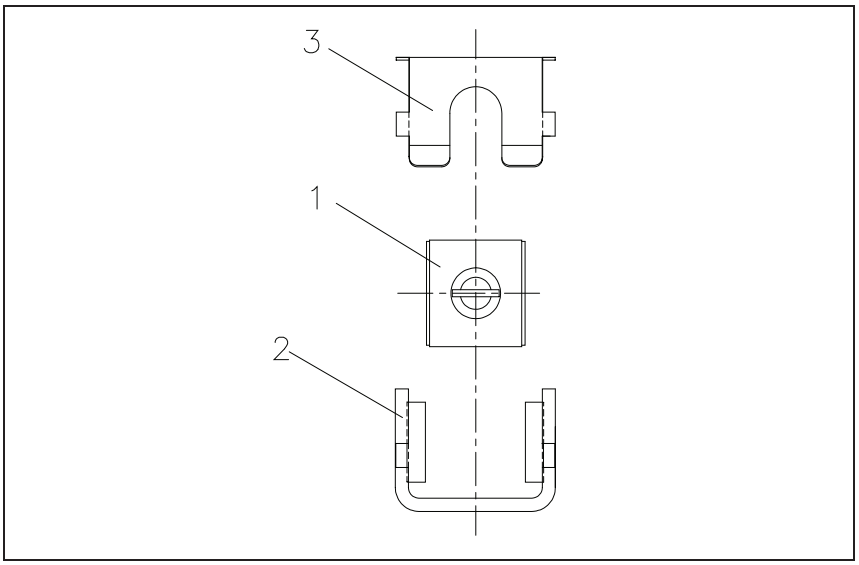

Figure 16 Pump assembly

Pump Installation

To install the pump into the system proceed as follows:

1. During installation, keep the pump and system clean. Avoid touching surfaces which will ultimately be under vacuum. When the VacIon pump is open to the atmosphere, take care to avoid introducing foreign particles, oil, solder flux, or any volatile substances. Before attaching the pump, clean the system thoroughly. Chemical cleaning is the most complete cleaning method for the vacuum system; however, do not attempt it when pockets and crevices exist that will prevent thorough rinsing. Degreasing with an acetone or methanol followed by water-rinsing is usually sufficient.
2. To achieve maximum pumping speed, connect the pump to the system with a tube that has the shortest length and the largest diameter possible.
3. For ultrahigh vacuum work, joints should be tungsten inert gas welded, hydrogen brazed, or vacuum brazed. Do not use flux in making joints for ultrahigh vacuum.
4. Gaskets in the system should be of soft metal such as annealed copper, aluminum, or gold.
5. After the pump is sealed in place, leak-check the entire system.
6. Assemble the magnet to the pump.

Control Unit Connection

WARNING!

The high voltage present 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 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.

Connect the control unit to the ion pump with the coaxial high voltage cable assembly as follows:

1. Push the female end of the cable connector over the high voltage feedthrough.
2. Push the male end of the cable connector into the socket on the control unit rear panel. (Refer to the control unit instruction manual).

WARNING!

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.

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.

Bakeout

When a 2 l/s ion pump does not reach the desired base pressure, and there are no leaks, it is necessary to bake the system. This can be done by heating the pump and all the components in the system, and is generally required to achieve less than 10^{-8} mbar base pressures.

- The pump body can be baked up to 400 °C if the magnet and the H.V. cable connector have been removed.
- If the bakeout is done with magnets and H.V. cable connected, the maximum allowable temperature is 150 °C and the pump control unit can be left on in order to be able to monitor the pressure variations. During the bakeout cycle the pressure must not increase above $5x10^{-5}$ mbar, if this value is reached, turn the bakeout off and then on again when low pressure is restored.
- Bake the 2 l/s pump for 24 hours. Longer bakeout periods are recommended when the pump has been used with heavy gas load applications.
- Wait until the pump cools down to room temperature and recovers its initial pressure before using it in the application.

Unusual Operating Conditions

If the pump current reads lower than normal for the pressure, the discharge may have been extinguished.

To check for the pump being "out of strike" (discharge extinguished), remove the magnet and observe the residual current. If the current is the same with and without the magnet in place, no discharge exists in the pump.

1. To restart the discharge, tap the pump body with a penny held between the thumb and forefinger, or heat the pump body locally with a small soldering iron. This should liberate surface gas within the pump and restart the discharge. NEVER strike the pump with hand tools.
2. If the magnet strength is below its rated level, the pump discharge and speed will be reduced and the discharge may extinguish at a pressure below 1×10^{-7} mbar.

Pump Troubleshooting

In the event of a power failure (momentary or long period) the controller is switched off. When power is restored, the controller will automatically restart.

Tab. 3

SYMPTOM	POSSIBLE CAUSE	CORRECTION PROCEDURE
1. 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.
2. 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 are very difficult to remove, even by baking.	Heat the system walls, thereby accelerating the desorption process. Baking mobilizes the vapours so they can be cracked and pumped by discharge.
3. Slow starting or slow pump-down.	High voltage feedthrough is leaking.	Replace the feedthrough.
4. Current higher than expected at any given pressure.	Ion pump leakage current causing higher pressure reading.	Highpot the pump.

2 l/s Pump Replacement Parts and Accessories

Tab. 4

	PART NUMBER				
Basic pump	919-0520	919-0521	919-0522	919-0523	919-0524
Magnet Samarium-Cobalt			919-0038		
CABLES					
HV Bakeable cable, radiation resistant, 13' (4 m) long with safety interlock	929-0706				

For a complete overview of Agilent's extensive vacuum product line, please refer to the Agilent Vacuum Catalogue.

Agilent Technologies

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.

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 Leinì (TO) – Italy

E-MAIL: vpd-qualityassurance_pdl-ext@agilent.com

NAME	COMPANY	FUNCTION

ADDRESS:

TEL. N° : _____ FAX N° : _____

E-MAIL: _____

PROBLEM / SUGGESTION :

REFERENCE INFORMATION (model n°, serial n°, ordering information, time to failure after installation, etc.):

DATE _____

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.)

Agilent Technologies

Agilent Technologies

Vacuum Products Division
Instructions for returning products

Dear Customer:

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

1) Complete the attached Request for Return form and send it to Agilent Technologies (see below), taking particular care to identify all products that have pumped or been exposed to any toxic or hazardous materials.

2) 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).

3) **Important steps for the shipment of returning product:**
   - Remove all accessories from the core product (e.g. inlet screens, vent valves).
   - Prior to shipment, 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.
   - Agilent Technologies is not responsible for returning customer provided packaging or containers.
   - **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.

4) Return only products for which the RA was issued.

5) **Product being returned under a RA must be received within 15 business days.**

6) **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.

7) Return shipments must comply with all applicable **Shipping Regulations** (IATA, DOT, etc.) and carrier requirements.

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

EUROPE:	**NORTH AMERICA:**	**PACIFIC RIM:**
Fax: 00 39 011 9979 330		
Fax Free: 00 800 345 345 00	Fax: 1 781 860 9252	please visit our website for individual
Toll Free: 00 800 234 234 00	Toll Free: 800 882 7426, Option 3	office information
vpt-customercare@agilent.com	vpl-ra@agilent.com	http://www.agilent.com

Agilent Technologies

Vacuum Products Division
Request for Return Form
(Health and Safety Certification)

Please read important policy information on Page 3 that applies to all returns.

1) CUSTOMER INFORMATION

Company Name:	**Contact Name:**
Tel: **Email:**	**Fax:**
Customer Ship To:	**Customer Bill To:**
Europe only: **VAT reg. Number:**	USA/Canada only: ☐ **Taxable** ☐ **Non-taxable**

2) PRODUCT IDENTIFICATION

Product Description	Agilent P/N	Agilent S/N	Original Purchasing Reference

3) TYPE OF RETURN (**Choose one from each row** and supply Purchase Order if requesting a billable service)

3A. ☐ Non-Billable ☐ Billable ➡ New PO # (hard copy must be submitted with this form):

3B. ☐ Exchange ☐ Repair ☐ Upgrade ☐ Consignment/Demo ☐ Calibration ☐ Evaluation ☐ Return for Credit

4) HEALTH and SAFETY CERTIFICATION

AGILENT TECHNOLOGIES CANNOT ACCEPT ANY PRODUCTS CONTAMINATED WITH BIOLOGICAL OR EXPLOSIVE HAZARDS, RADIOACTIVE MATERIAL, OR MERCURY AT ITS FACILITY.
Call Agilent Technologies to discuss alternatives if this requirement presents a problem.

The equipment listed above (check one):

☐ **HAS NOT** pumped or been exposed to any toxic or hazardous materials. OR
☐ **HAS** pumped or been exposed to the following toxic or hazardous materials. If this box is checked, the following information must also be filled out. Check boxes for all materials to which product(s) pumped or was exposed:

☐ Toxic ☐ Corrosive ☐ Reactive ☐ Flammable ☐ Explosive ☐ Biological ☐ Radioactive

List all toxic/hazardous materials. Include product name, chemical name, and chemical symbol or formula:

_____

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.

Print Name: **Authorized Signature:** ..... **Date:**

5) FAILURE INFORMATION:

Failure Mode (REQUIRED FIELD. See next page for suggestions of failure terms):
Detailed Description of Malfunction: (Please provide the error message)
Application (system and model):

I understand and agree to the terms of Section 6, Page 3/3.
Print Name: **Authorized Signature:** ..... **Date:**

Agilent Technologies

Vacuum Products Division
Request for Return Form
(Health and Safety Certification)

Please use these Failure Mode to describe the concern about the product on Page 2.

TURBO PUMPS and TURBO CONTROLLERS

APPARENT DEFECT/MALFUNCTION		POSITION	PARAMETERS	
- Does not start	- Noise	- Vertical	Power:	Rotational Speed:
- Does not spin freely	- Vibrations	-Horizontal	Current:	Inlet Pressure:
- Does not reach full speed	-Leak	-Upside-down	Temp 1:	Foreline Pressure:
- Mechanical Contact	-Overtemperature	-Other:	Temp 2:	Purge flow:
- Cooling defective	-Clogging	.....	OPERATING TIME:	

ION PUMPS/CONTROLLERS

- Bad feedthrough	- Poor vacuum
- Vacuum leak	- High voltage problem
- Error code on display	- Other

VALVES/COMPONENTS

- Main seal leak	- Bellows leak
- Solenoid failure	- Damaged flange
- Damaged sealing area	-Other

LEAK DETECTORS

- Cannot calibrate	-No zero/high backround
- Vacuum system unstable	- Cannot reach test mode
- Failed to start	- Other

INSTRUMENTS

- Gauge tube not working	- Display problem
- Communication failure	- Degas not working
- Error code on display	- Other

SCROLL AND ROTARY VANE PUMPS

- Pump doesn't start	- Noisy pump (describe)
- Doesn't reach vacuum	- Over temperature
- Pump seized	- Other

DIFFUSION PUMPS

- Heater failure	- Electrical problem
- Doesn't reach vacuum	- Cooling coil damage
- Vacuum leak	- Other

Section 6) *ADDITIONAL TERMS*

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.

- 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.
- 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.
- A Special Cleaning fee will apply to all exposed products per Section 4 of this document.
- If requesting a calibration service, units must be functionally capable of being calibrated.

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