Agilent

Agilent UHV-24/UHV-24p Ionization Gauge

User Manual

Notices

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Safety Notices

CAUTION

A **CAUTION** 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 damage to the product or loss of important data. Do not proceed beyond a **CAUTION** notice until the indicated conditions are fully understood and met.

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.

Contents

1 Instructions for Use

About this manual

Validity

This manual lists the instructions for the users of the UHV-24/UHV-24p Ion Gauge, with particular reference to the notions relating to safety, operation and first level maintenance, limited to maintenance operations for which the user is responsible.

The maintenance operations, illustrated in the specific sections, with specific provisions relating to the higher level of maintenance (personnel specifically trained for maintenance operations) must not be carried out by the user.

NOTE

1. This manual contains useful information so that all personnel using the UHV-24/UHV-24p Ion Gauge can operate it safely and guarantee perfect efficiency, for its entire life span.
2. Keep this manual, together with all the related publications, in an accessible place known to all operators/maintenance personnel.

Definitions and terminology

Definition of Caution, Warning and Note

Some important references of this manual are highlighted and framed in contrasting color.

CAUTION **Caution messages are displayed before procedures which, if not observed, could cause damage to the equipment.**

WARNING **Warning messages draw the operator's attention to a specific procedure or practice which, if not performed correctly, could result in serious personal injury.**

NOTE Notes are intended to call attention to important information and provide more detail regarding specific steps.

Warning Symbols

The following is a list of symbols that appear in conjunction with warnings on the UHV-24/UHV-24p Ion Gauge. The hazard they describe is also shown.

A triangular symbol indicates a warning. The meanings of the symbols that may appear alongside warnings in the documentation are as follows:

Dangerous voltages

Hot surface

Generic hazard

Cutting hazard

European Declaration of Conformity

Waste Electrical and Electronic Equipment

Instructions for Use

The following symbol may be used on warning labels attached to the instrument. When you see this symbol, refer to the relevant operation or service manual for the correct procedure referred to by that warning label.

The following symbols appear on the instrument for your information.

	Production date
	Dangerous voltages
	Hot surfaces
	Generic hazard
	CE certification
	Waste Electrical and Electronic Equipment

Safety

This section contains the information, prescribed by the Low Voltage Directive 2014/35/EU, which is essential for the compliance and observance of the safety regulations both generally and in relation to the specific use of the product.

Failure to comply with these instructions and the other instructions contained in this manual may render the safety conditions envisaged in the design phase inefficient and cause accidents to those operating the product.

Agilent Technologies declines all responsibility for damage to the product or for the physical safety of the operator or third parties deriving from the non-observance of the safety rules indicated in the technical documentation.

Proper use

This manual contains important warnings and safety instructions to be observed in order for the unit to work safely.

The product described in this manual is intended exclusively for the area of application specified in the instructions. The manual also provides indications regarding the essential requirements for the application and operation of the product as well as the safety measures that can be adopted to guarantee regular operation. Agilent Technologies does not provide any guarantee or assume any responsibility for applications other than those described in this manual or in which the essential requirements and safety measures are not respected.

The product must only be used by qualified personnel who are able to take the necessary safety measures under conditions that do not cause damage or injury. Any accessories and equipment used with the product must be supplied or approved by Agilent Technologies.

Any adjustment or maintenance operation must be performed by a professional technician informed about the risks.

Repairs on the product must be carried out exclusively by Agilent authorized personnel.

Improper use

Agilent Technologies declines all responsibility, deriving from the improper use of the UHV-24/UHV-24p Ion Gauge.

Improper use will cause all claims for liability and warranties to be forfeited.

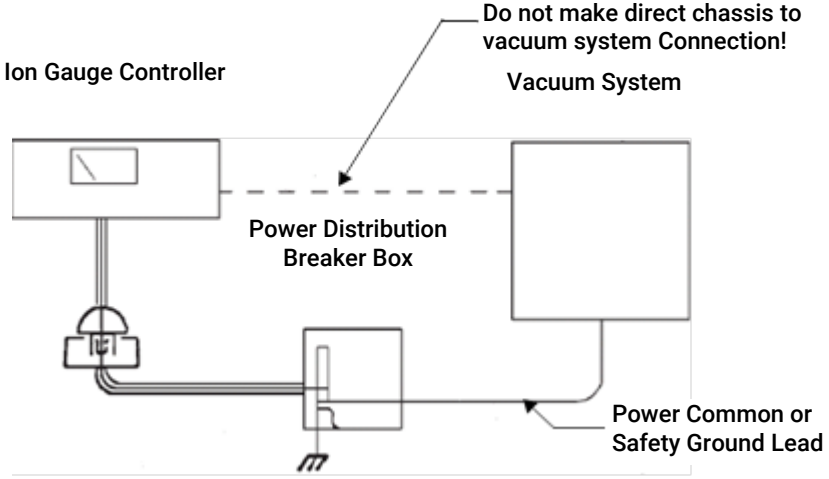
Personnel responsible for pump operation and maintenance must be well-trained and must be aware of the accident prevention rules. The accident prevention precautions contained in this section must be continuously respected during operation and maintenance of the pump to avoid damage to operators and to the pump. These precautions are provided in the form of WARNING and CAUTION notes.

Grounding the Gauge Controller

Be certain that your UHV-24/UHV-24p Ion Gauge Controller and vacuum system are separately grounded to a common ground.

WARNING

- **Do not place a ground wire between the vacuum chamber and the controller chassis; large continuous currents could flow through it.**
- **Personnel can be killed by high voltages (160 to 900 V may be present in an improperly grounded system).**
- **Make absolutely sure that your vacuum system is grounded as shown in Figure 1.**
- **Test the system ground to be sure that it is complete and capable of supporting at least 10 A.**



Note: Other power leads are not shown.

Figure 1 Ion Gauge and Vacuum System Connections

Use with Combustibles and Mixtures

WARNING

As with all Ionization gauges, this device is not intrinsically safe. Exercise extreme care when using this vacuum gauge while pumping or backfilling a system or in any other system condition which contains combustible gases or mixtures. The filament, the end of a hot filament Ion gauge and the high voltage discharge of a cold cathode gauge can be ignition sources.

When such a gas or mixture is present, do not turn on any such vacuum gauge. Failure to follow this instruction could result in serious injury to personnel and damage to equipment.

Vacuum Equipment Cleanliness

Cleanliness is vital when servicing any vacuum equipment.

CAUTION

Do not use silicone oil or silicone grease.

Use powder-free butyl or polycarbonate gloves to prevent skin oils from getting on vacuum surfaces.

Do not clean any aluminum parts with Alconox®. Alconox is not compatible with aluminum and will cause damage.

NOTE

Normally, it is unnecessary to use vacuum grease.

However, if it must be used, do not use silicone types, and use it sparingly. Apiezon® L grease is recommended (Agilent Part Number 695400004).

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.

Figure 2 Logo "WEEE"

For more information refer to:

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

Service

Should a customer need an advanced exchange or repair service, please contact local distributor or directly e-mail to:

vpt-customercare@agilent.com

vpl-customercare@agilent.com

2 Technical Information

Description of the UHV-24/UHV-24p Ionization Gauge

The UHV-24 Nude Ionization Gauge, with an x-ray limit of $2x10^{-11}$ Torr, provides reliable pressure measurement from 1 mTorr down to $2x10^{-10}$ Torr, with reduced performance at pressures lower than $2x10^{-10}$ Torr.

The UHV-24p Nude Ionization Gauge utilizes an extremely thin collector which lowers its x-ray limit to $5x10^{-12}$ Torr. As a result, it can measure pressure from 1m Torr down to $5x10^{-11}$Torr, with reduced performance at pressures lower than $5x10^{-11}$ Torr.

Properly mounted nude gauges, where the grid structure protrudes into the vacuum chamber, offer the lowest error in terms of the local vacuum pressure being the same as the chamber pressure. Both gauges are available with either dual tungsten or yttria-coated iridium filament, which are field replaceable.

Nude gauges are recommended for bakeable, all-metal, ultra-high vacuum systems where maximum exposure to the vacuum gives the highest possible accuracy.

The gauges are designed with replaceable dual filament assemblies.

The UHV-24/UHV-24p Ionization Gauge models are the following:

- X3004-64401 UHV-24 gauge, dual yttria-iridium filaments, 2.75 in DN 40 ConFlat flange.
- X3004-64402 UHV-24p extended range Ion gauge, dual thoria-iridium filaments, 2.75 in DN 40 ConFlat flange.

Operation

The UHV-24/UHV-24p Nude Ionization Gauge contains three elements:

- Filament – The filament serves as a source of electrons.
- Grid – The grid functions as the electron collector operating at a positive potential (typically +150 V) with respect to the filament.
- Collector wire – Along the center of the cylindrical grid structure is a very small diameter ion collector wire operating at a negative potential (typically 28 V) with respect to the filament.

The process is as follows:

1. Electrons from the filament pass through the grid several times, on average, before being collected at the grid. While passing through the interior of the grid structure, the electrons ionize gas molecules at a rate which is proportional to the gas density.
2. The positive ions produced on the inside of the grid structure are accelerated toward and are neutralized at the collector by electrons from the external circuit. The number of ions produced per electron is proportional to gas density, and the positive ion current to the ion collector is used as an indication of pressure. Thus, for a constant value of accelerating voltage in excess of the ionization potential of the gas, the number of positive ions formed should vary linearly with pressure and with electron current. This is described by the relation

$$I_c = S\ P\ I_e$$

where:

- I_c is the Ion current in amperes to the collector,
- I_e is the electron current in amperes to the grid, and
- P is the pressure in Torr.

The sensitivity, S, of a given Ion gauge is the proportionality constant in the basic ionization gauge equation above. Thus,

$$S = \frac{1}{P}\frac{I_c}{I_e}$$

For UHV-24 gauges, S for air (nitrogen) is 25 (Torr)-1. For the UHV-24p, S for air (Nitrogen) is 20 $(Torr)^{-1}$. The normal operating electron current is 4 mA. For the UHV-24, the ion current at a pressure of 10^{-9} Torr is 10^{-10} A.

Installation

The UHV-24 and UHV24p Nude Ionization Gauges can be operated with any ion gauge control unit capable of supplying the necessary operating voltages and currents. Degassing of this gauge is by electron bombardment of the grid.

To install the gauge:

1. Remove the metal sleeve protecting the collector wire.
2. Mount the nude Ionization gauges in any position.

NOTE

Install the gauge in a relatively open space to reduce wall outgassing due to localized heating by the filament.

When the gauges are mounted horizontally, position the filaments to the side of the grid rather than below or above it so that a slight vertical movement of the grid or filament does not change their relative spacing.

Technical Specifications

Table 1 Technical Specifications

Filament Voltage	3 to 4.5 V (AC or DC) - Varies with pressure and emission current
Filament Current	2.5 to 3.5 A - Varies with pressure and emission current
Element Voltages	Collector voltage: $V_c = 0$ Filament voltage: $V_{fil} = 28$ VDC Grid voltage, $V_g = +180$ VDC
Degas Power Requirements (40 W)	Grid Voltage: +600 VDC max Emission Current (total): 67 mA DC Filament Voltage: 7 V
Measurement Specifications	Sensitivity: • 25/Torr (UHV-24), nominal • 20/Torr (UHV-24p), nominal Emission Current: • 4 mA for widest measurement range $5x10^{-10}$ Torr to $1x10^{-4}$ Torr • 10 mA for pressures lower than $5x10^{-10}$ Torr ≤ 0.1 mA for pressure over $1x10^{-4}$ Torr
Materials	Filament: Tungsten or yttria-coated iridium filaments Filament Supports: SST Collector - tungsten: • 0.007" diameter for UHV-24 • 0.002" for UHV-24p Grid: SST Feedthrough: SST, Alumina, Nickel Alloy

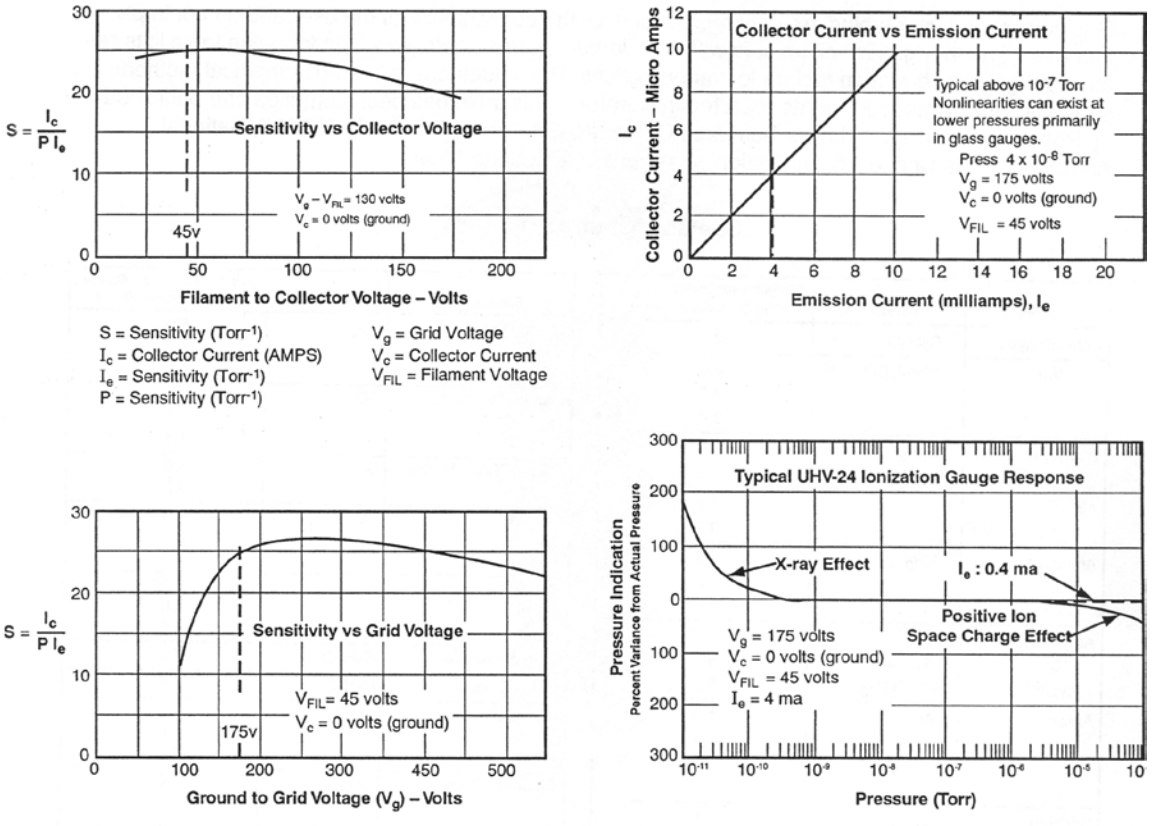


Figure 3 Typical Gauge Characteristics Graphs

Application Notes

Measurement of ultra-high vacuum is not a trivial undertaking. There are many factors that contribute to measurement problems. Some other concerns include that:

- The gauge sensitivity factor is based on nitrogen and very little, if any, nitrogen is present in UHV systems that are leak tight
- There are no convenient primary pressure standards that exist for UHV calibration.
- A grounded conductive wall near the tube raises the sensitivity by as much as 30%. This is typical of gauges mounted in tubulations attached to the system.

However, these three concerns are usually theoretical in nature and most problems fall under the following areas:

- All Ion gauges are pumps, (likewise, all Ion pumps are gauges). The difference is that gauges are designed primarily to measure pressure and have relatively small pumping speeds. However, given the right conditions it is possible for the gauge to pump the gas that being measured, especially if the chamber pump is small.
  Pumping speed for a nude Ion gauge is typically around 0.5 litres/sec. The pumping speed is affected by the emission current. The higher the emission current the higher the pumping speed
- Ion gauge out-gassing occurs by virtue of operating the filament. Even after the gauge is degassed the filaments continue to generate gas when on. The major component is carbon-monoxide, though other gasses may also be liberated. This gas concentration tends to be higher in the vicinity of the gauge and can lead to higher than expected pressure readings. The hotter the filament, the more it out-gasses. Therefore, to minimize out-gassing use yttria-coated iridium filament, which run significantly cooler than their tungsten counterparts, and run them at the lowest emission current that gives good readings.
  However, it is necessary to determine if the benefits of the yttria-coated iridium filament overcome the drawback of higher particle generation and shorter life when exposed to hydrogen and halogen gases. There is a tradeoff between the gauge pumping and the gauge out-gassing that may compensate one for the other.

- Leakage currents are extremely difficult to avoid when using cables of 100 ft or longer. Obviously, the longer the cable the worse the leakage. PTFE is the recommended insulator, but at $5x10^{-11}$ Torr with a UHV-24p operating with 10mA of emission current, the ion current is only 10 pA. And that assumes that the gauge sensitivity factor of 20/Torr is somewhat accurate; most likely, it is lower than that. Only rarely is the sensitivity factor higher than expected, such as when mounted in a tubulation. But then the out-gassing and self-pumping issues get worse.
- When cables move, the capacitance between the shield and the conductor changes. This forces a current to flow either into or out of the electrometer circuit, depending upon the change in capacitance. With a long cable the capacitance is fairly large, and because the impedance is very high (the collector is a virtual current source) this current may take quite some time to settle out. Factors that can cause cable to move are:
  - Air movement from blowers
  - Handling
  - Temperature changes

If the cable is in continuous vibration due to running near a pump or other actuator, there may be a continuous current flowing in the collector lead.

- Noise pick-up is also made worse by long cable lengths. A shielding system that works fine at 25 ft may be inadequate at 150 ft. The cable is an antenna, the longer it is the more signal it picks up. In addition, the Ion gauge has wires sticking out into the vacuum chamber, which also act as antennas. However, even if the cable shielding is adequate, noise inside the vacuum chamber is transmitted to the electrometer due to the high source impedance. This causes errors in the measurement as most electrometer amplifiers used in commercial controllers use logging transistors that tend to rectify high frequency noise into DC offsets. Judicious use of ferrite beads on the cable may help.
- Ground loops can be formed because the chambers are grounded and the controllers are grounded. For safety reasons, never float any controllers that can be touched during operation. Because of the low magnitude of ion currents being measured, it is possible for a ground loop current to overcome the Ion gauge signal, sometimes resulting in a current flowing into the gauge collector. This often happens when the Ion pumps are running on one phase of the AC power system and the instrumentation is operating off another phase. Experimentation is usually the only answer to find and fix this kind of problem.

Degas

All UHV-24 and UHV24p ionization gauges are operated and degassed at the factory before shipment. Whether to degas the gauge after installation depends upon the application. In large systems that take a long time to pump down, such as several days, or will be baked for an extended period of time, degassing the gauge has a negligible affect. Considering that the e-beam degas system used runs at a high emission current, it may not be worth the theoretical reduction in filament life that results from the small reduction in gas load. In small systems, where the gauge is a larger percentage of the system surface area and gas load, there may be benefits to using degas after installation. Gauge degassing is not generally needed unless the goal is to reach pressures below $1x10^{-8}$ Torr. Degas is not intended to clean tube contamination.

If using degas, an approximately 25 minute e-beam degas duration, using Agilent XGS controllers, is all that is needed. Extending the degas interval only serves to heat up the surrounding chamber walls and increases the out-gassing rate from those surfaces. Bakeout is a better way to degas the chamber walls.

Bakeout

A temperature of +450 °C is a safe maximum for repeated or extended bakeout of the nude gauge.

Do not:

- Exceed +450 °C
- Expose the gauge to thermal shock

Maintenance: Filament Replacement

Agilent's nude gauges are equipped with dual filaments. The filament assembly is easily replaced if it is damaged or broken. The replacement filament kit contains two filament assemblies and an Allen wrench.

Tungsten Filament Replacement

This procedure replace the tungsten filament (Part No. 9710018).

To remove and change the damaged filament:

1 Carefully loosen all six set screws and pull the old filament support brackets out.

CAUTION **Handle the gauge only by its ceramic base to prevent damage to the delicate wires. Wear nylon gloves to prevent placing fingerprints on the gauge.**

The oil from fingerprints extends pumpdown time.

2 Insert the long filament support bracket into its collar so that the filament is located 0.050 to 0.070" from the grid structure.

3 Tighten the set screws.

4 Insert the short filament support brackets into their collars, pushing them in as far as they will go before tightening the set screws. This ensures proper tension on the filament.

Yttria-coated iridium filament Replacement

This replacement filament kit (Part No. X3004-64403) contains two yttria-coated iridium filaments stapled to a cardboard backing and packed in a foam-lined plastic box. Each filament also has a stabilizing bar soldered to the base of the filament for rigidity.

To remove and change the damaged filament:

1 Carefully loosen all six set screws and pull the old filament support brackets out.

CAUTION **Handle the gauge only by its ceramic base to prevent damage to the delicate wires. Wear nylon gloves to prevent placing fingerprints on the gauge.**

The oil from fingerprints extends pumpdown time.

2 Carefully remove the stabilizing bar by very carefully cutting between the posts of the yttria-coated iridium filaments.

3 Cut the staples affixing the assembly to the cardboard backing.

4 Insert the long filament support bracket into its collar so that the filament is located 0.050 to 0.070" from the grid structure.

5 Tighten the set screws.

6 Insert the short filament support brackets into their collars, pushing them in as far as they will go before tightening the set screws. This ensures proper tension on the filament.

7 Carefully trim the remainder of the stabilizing bar from each filament post.

Gas Correction Factors

Table 2 lists the relative gauge gas correction factors for various gases.

WARNING

Do not assume that the use of the gases listed in this table are safe with hot filament gauge controllers.

The values in Table 2 are derived by empirical methods substantiated by measurements reported in literature. This table has been compiled and published by Robert L. Summers of Lewis Research Center, NASA Technical Note TND-5285, National Aeronautics and Space Administration, Washington, DC, June 1969.

To automatically convert the UHV-24/UHV-24p readings (normally calibrated for nitrogen):

- Pls refer to XGS instruction manual for gas correction setting.

When the gas constant is entered, the gauge divides the result by the gas correction constant and displays the correct adjusted value.

A proper understanding for the transformation of the result is still, however, required. The correction for different gas species is purely mathematical. The tube sensitivity tube is affected by different gases which, in turn, is responsible for the tube output being manipulated by the pressure equation. In addition, There is loss in resolution of the instrument when gas correction constants are used. The loss in resolution becomes more apparent as the correction constants approach 0.5 from either direction. When the correction constants are 0.1 or 10, the tube output is 1/10 or 10 times normal. This causes the instrument to lose the high vacuum decade or the near atmosphere decade, respectively.

NOTE Some gases have several correction factors listed. In such cases, the top number is the most commonly-used value.

Table 2 Gas Correction Factors

Substance	Formula	Relative Ionization Gauge Gas Correction Factor
Acetaldehyde	C_2H_4O	2.6
Acetone	$(CH_3)_2CO$	3.6 4.0 3.6
Acetylene	C_2H_2	1.9 2.0
Air		1.0 0.98
Ammonia	NH_3	1.3 1.2 1.3
Amylene: ISO· cyclo·	 ISO·C_5H_{10} CY·C_5H_{10}	 5.9 5.8
Argon	Ar	1.3 1.1 1.2 0.9
Benzene	C_6H_6	5.9 5.8 5.7 5.9 6.0
Benzoic Acid	C_6H_5COOH	5.5
Bromine	Br	3.8
Bromomethane	CH_3Br	3.7
Butane: n· ISO·	 n·C_4H_{10} ISO·C_4H_{10}	 4.9 4.7 4.6 4.9
Cadmium	Cd	2.3 3.4
Carbon Dioxide	CO_2	1.4 1.4 1.5 1.5 1.4

Substance	Formula	Relative Ionization Gauge Gas Correction Factor
Carbon Disulfide	CS_2	5.0 4.7 4.8
Carbon Monoxide	CO	1.05 1.05 1.1
Carbon Tetrachloride	CCl_4	6.0 6.3
Cesium	Cs	4.3 2.0 4.8
Chlorine	Cl_2	0.68 2.6 1.6
Chlorobenzene	C_6H_5Cl	7.0
Chloroethane	C_2H_5Cl	4.0
Chloroform	$CHCl_3$	4.7 4.8 4.8
Chloromethane	CH_3Cl	2.6 3.2 3.1
Cyanogen	$(CN)_2$	2.8 3.6 2.7
Cyclohexylene	C_6H_{12}	7.9 6.4
Deuterium	D_2	0.35 0.38
Dichlorodifloromethane	CCl_2F_2	2.7 4.1
Dichloromethane	CH_2Cl_2	3.7
Dinitrobenzene o· m· p·	$C_6H_4(NO_2)_2$	 7.8 7.8 7.6
Ethane	C_2H_6	2.6 2.8 2.5
Ethanol	C_2H_5OH	3.6 2.9
Ethyl Acetate	$CH_3COOC_2H_5$	5.0

Table 2 Gas Correction Factors, continued

Substance	Formula	Relative Ionization Gauge Gas Correction F5tor
Ethyl ether	$(C_2H_5)_2O$	5.1 5.1
Ethylene	C_2H_4	2.3 2.4 2.2 2.2 to 2.5
Ethylene oxide	$(CH_2)_2O$	2.5
Helium	He	0.18 0.15 0.13 0.12
Heptane	C_7H_{16}	8.6
Hexadiene: 1.5· cyclo·	 1.5·C_5H_{10} CY·C_6H_{10}	 6.4 6.0
Hexane	C_6H_{14}	6.6
Hexene: 1· cyclo	 1·C_6H_{12} CY·C_6H_{10}	 5.9 6.4
Hydrogen	H_2	0.46 0.38 0.41 0.45 0.44
Hydrogen Bromide	HBr	2.0
Hydrogen Chloride	HCl	1.5 1.6 2.0 1.5
Hydrogen Cyanide	HCN	1.5 1.6
Hydrogen Floride	HF	1.4
Hydrogen Iodide	HI	3.1
Hydrogen Sulfide	H_2S	2.2 2.2 2.3 2.1
Iodine	I_2	5.4
Iodomethane	CH_3I	4.2
Isoamyl Alcohol	$C_5H_{11}OH$	2.9
Isobutylene	C_4H_8	3.6
Krypton	Kr	1.9 1.7 1.7
Lithium	Li	1.9
Mercury	Hg	3.6
Methane	CH_4	1.4 1.5 1.6 1.4 to 1.8 1.5 1.5
Methanol	CH_3OH	1.8 1.9
Mehtyl Acetate	CH_3COOCH_3	4.0
Mythyl ether	$(CH_3)_2O$	3.0 3.0

Substance	Formula	Relative Ionization Gauge Gas Correction Factor
Naphthalene	$C_{10}H_8$	9.7
Neon	Ne	0.30 0.31
Nitrobenzene	$C_6H_5NO_2$	7.2
Nitrogen	N_2	1.0
Nitrotoluene (o·, m·, p·)	$C_6H_4CH_3NO_2$	8.5
Nitric Oxide	NO	1.3 1.2 1.0
Nitrous Oxide	N_2O	1.5 1.7 1.7 1.3 to 2.1
Oxygen	O_2	1.0 1.1 0.9 0.9
Pentane n· ISO· neo·	 n·C_5H_{17} ISO·C_5H_{17} $(CH_3)_4C$	 6.2 6.0 5.7 6.0 5.7
Phenol	C_6H_5OH	6.2
Phosphine	PH_3	2.6
Potassium	K	3.6
Propane	C_3H_8	4.2 3.7 3.7 to 3.9 3.6
Propene oxide	C_3H_6O	3.9
Propene: n· cyclo·	 n·C_3H_6 cy·C_3H_6	 3.3 3.2 to 3.7 3.6
Rubidum	Rb	4.3
Silver perchlorate	$AgClO_4$	3.6
Sodium	Na	3.0
Stannic iodide	SnI_4	6.7
Sulphur Dioxide	SO_2	2.1 2.3
Sulphur Hexafloride	SF_6	2.3 2.8
Toluene	$C_6H_5CH_3$	6.8
Trinitrobenzene	$C_6H_3(NO_2)_3$	9.0
Water	H_2O	1.1 1.0 0.8
Xenon	Xe	2.9 2.2 2.4
Xylene: o· p·	 o·$C_6H_4(CH_3)_2$ p·$C_6H_4(CH_3)_2$	 7.8 7.9

Accessories and spare parts

Table 3 Accessories and spare parts

Part Number	Description
X3004-64403	Filament replacement kit (yttria-iridium)
9710018	UHV-24 Filament Replacement kit, Tungsten

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.

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:	**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	office information
vpt-customercare@agilent.com	vpl-ra@agilent.com	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.

Agilent Technologies

Vacuum Products Division
Request for Return Form

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

☐ Non Billable ☐ Billable ➡ New PO # (hard copy must be submitted with this form): _____

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

Health and safety

The product has been exposed to the following substances:
(by selecting 'YES' you MUST complete the table to the right)

Substances (please refer to MSDS forms)

* 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	☐ YES ☐ NO				
Harmful	☐ YES ☐ NO				
Corrosive	☐ YES ☐ NO				
Reactive	☐ YES ☐ NO				
Flammable	☐ YES ☐ NO				
Explosive (*)	☐ YES ☐ NO				
Radioactive (*)	☐ YES ☐ NO				
Biological (*)	☐ YES ☐ NO				
Oxidizing	☐ YES ☐ NO				
Sensitizer	☐ YES ☐ NO				
Other dangerous substances	☐ YES ☐ NO				

Goods preparation

If you have replied YES to one of the above questions. Has the product been purged? ☐ YES ☐ NO
If yes, which cleaning agent/method:

Has the product been drained from oil? ☐ YES ☐ NOT APPLICABLE
I confirm to place this declaration on the outside of the shipping box. ☐

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.

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.

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Worldwide Web Site, Catalog and Order On-line:
www.agilent.com/chem/vacuum
Representatives in most countries

Agilent Technologies

In This Book

The manual describes the following:

- Instruction for Use
- Technical information

This information is subject to change without notice.

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