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Agilent Technologies

564 Ionization Gauge Tube

INSTRUCTION MANUAL

Manual No. 699905564
Revision C
December 2002

564 Ionization Gauge Tube



Preface

Warranty

Products manufactured by Seller are warranted against defects in materials and workmanship for twelve (12) months from date of shipment thereof to Customer, and Seller's liability under valid warranty claims is limited, at the option of Seller, to repair, to replace, or refund of an equitable portion of the purchase price of the Product. Items expendable in normal use are not covered by this warranty. All warranty replacement or repair of parts shall be limited to equipment malfunctions which, in the sole opinion of Seller, are due or traceable to defects in original materials or workmanship. All obligations of Seller under this warranty shall cease in the event of abuse, accident, alteration, misuse, or neglect of the equipment. In-warranty repaired or replaced parts are warranted only for the remaining unexpired portion of the original warranty period applicable to the repaired or replaced parts. After expiration of the applicable warranty period, Customer shall be charged at the then current prices for parts, labor, and transportation.

Reasonable care must be used to avoid hazards. Seller expressly disclaims responsibility for loss or damage caused by use of its Products other than in accordance with proper operating procedures.

Except as stated herein, Seller makes no warranty, express or implied (either in fact or by operation of law), statutory or otherwise; and, except as stated herein, Seller shall have no liability under any warranty, express or implied (either in fact or by operation of law), statutory or otherwise. Statements made by any person, including representatives of Seller, which are inconsistent or in conflict with the terms of this warranty shall not be binding upon Seller unless reduced to writing and approved by an officer of Seller.

Warranty Replacement and Adjustment

All claims under warranty must be made promptly after occurrence of circumstances giving rise thereto, and must be received within the applicable warranty period by Seller or its authorized representative. Such claims should include the Product serial number, the date of shipment, and a full description of the circumstances giving rise to the claim. Before any Products are returned for repair and/or adjustment, written authorization from Seller or its authorized representative for the return and instructions as to how and where these Products should be returned must be obtained. Any Product returned to Seller for examination shall be prepaid via the means of transportation indicated as acceptable by Seller. Seller reserves the right to reject any warranty claim not promptly reported and any warranty claim on any item that has been altered or has been returned by non-acceptable means of transportation. When any Product is returned for examination and inspection, or for any other reason, Customer shall be responsible for all damage resulting from improper packing or handling, and for loss in transit, notwithstanding any defect or non-conformity in the Product. In all cases, Seller has the sole responsibility for determining the cause and nature of failure, and Seller's determination with regard thereto shall be final.

If it is found that Seller's Product has been returned without cause and is still serviceable, Customer will be notified and the Product returned at its expense; in addition, a charge for testing and examination may be made on Products so returned.

3/1/00

Hazard and Safety Information

This manual uses the following standard safety protocols:

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.

Operators and service personnel must be aware of all hazards associated with this equipment. They must know how to recognize hazardous and potentially hazardous conditions, and know how to avoid them. The consequences of unskilled, improper, or careless operation of the equipment can be serious. This product must only be operated and maintained by trained personnel. Every operator or service person must read and thoroughly understand operation/maintenance manuals and any additional information provided by Varian Vacuum Technologies. All warning and cautions should be read carefully and strictly observed. Consult local, state, and national agencies regarding specific requirements and regulations. Address any safety, operation, and/or maintenance questions to your nearest Varian Vacuum Technologies office.

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 and 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 (Varian Part Number 695400004).

Contacting Varian Vacuum Technologies

In the United States, you can contact Varian Vacuum Technologies Customer Service at 1-800-8VARIAN.

Internet users:

- ☐ Send email to Customer Service & Technical Support at vpl.customer.support@varianinc.com
- ☐ Visit our web site at www.varianinc.com/vacuum
- ☐ Order on line at www.evarian.com

See the back cover of this manual for a listing of our sales and service offices.

Introduction

The Varian 564¹ Ionization Gauge Tube is designed specifically to be as rugged and reliable as the state of the art will permit². Careful adherence to manufacturing techniques and standards ensures close agreement between gauges. Initial calibration is done against closely checked McLeod gauge standards.

The 564 has high-pressure capability and a low X-ray limit, and thus the 564 tube is usable to 1×10^{-1} Torr in argon and 6×10^{-2} Torr in air. This is accomplished by the smaller geometry of the tube elements and the use of a conductive platinum coating on the inside of the glass envelope which improves gauge tube performance.

In high and ultra-high vacuum ranges, a platinum shield prevents external electrical fields from affecting the low ion current. In higher pressure ranges where the number of ions produced is much greater, the platinum conductive coating drains off the static charge which can build up on the inside of the glass tube. Thus, the 564 tube gives superior performance in stressful environments.

It is important to understand the limitations of any ionization gauge for the longest service and most meaningful results.

WARNING



Placement of a ground wire between the vacuum chamber and the controller chassis is not safe; large continuous currents could flow through it.

Personnel could be killed by high voltages (160 to 1000 V) which may be present in an improperly grounded system.

Check that your Ion Gauge Controller and vacuum system are separately grounded to a common ground.

1. US Patent 3153744.

2. See: "A Detailed Examination of the Principles of Ion Calibration", W.B. Nottingham and F.L. Tomey, Jr. Vacuum Symposium Transactions, 1960, p.117.

Electrical Connections

Ensure that your vacuum system is grounded as shown in Figure 1.

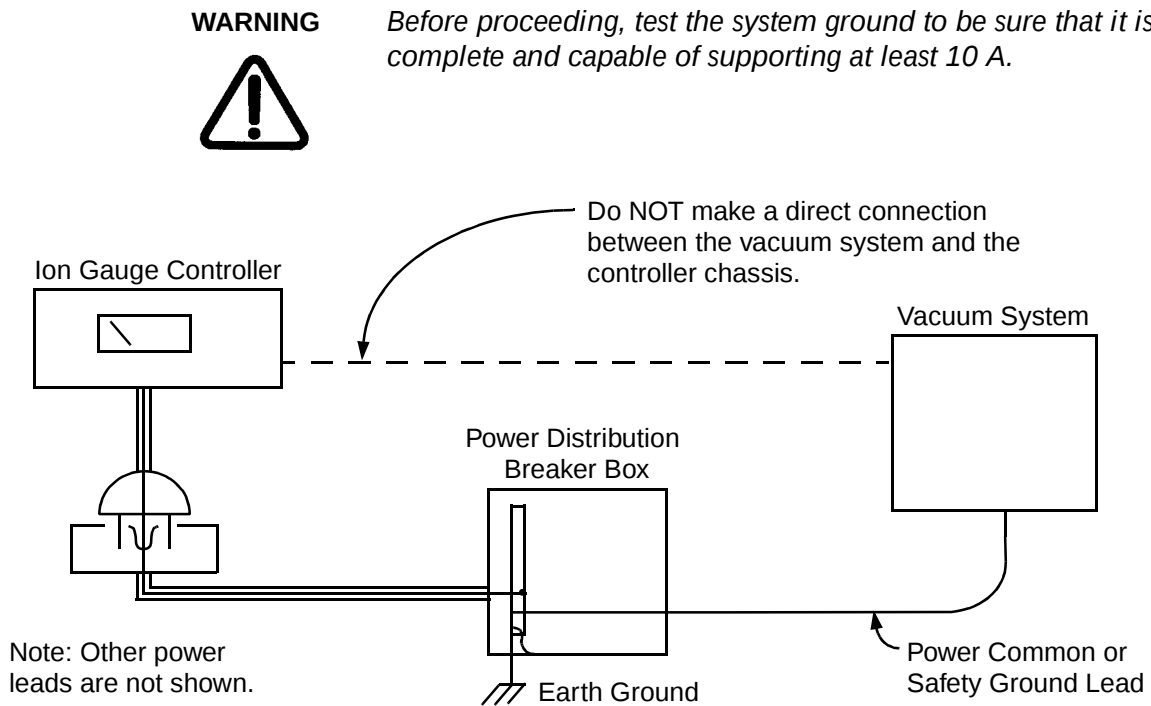


Figure 1 Electrical Connections

An independent agency has determined that all vacuum chambers, regardless of manufacture, can possibly become charged to lethal voltage levels under certain conditions if they are not grounded with a quality, common ground with the controller of their ionization tube.

WARNING



After each maintenance/service procedure and before operating the controller and vacuum system, verify the integrity of the ground of both units.

Equipment utilizing these controls should be designed to prevent personnel contact with high voltages.

Always break the primary circuit when direct access to the control unit is required.

Operation

The 564 Ionization Gauge Tube can be used with a variety of commercial controls which are equipped for resistance degassing.



It is particularly important to determine if a control will exceed any of the maximum ratings noted in this manual. For this reason, it is recommended that this gauge tube be operated with an Ionization Gauge Control which has been specifically designed for it and thus can take advantage of its broad range.

The thoria-coated iridium filament resists burnout from accidental exposure to atmosphere. When used in argon, the tube can operate continuously at 1×10^{-1} Torr with no effect on filament life. Tube life in air may be shortened above 1×10^{-3} Torr.

Sensitivity

The sensitivity of an ionization gauge is defined as the ion current per unit of pressure at a specified grid (electron) current. Since all ionization gauges are sensitive to the type and pressure of a gas, the gas composition must be known to correctly establish the pressure reading. Table 1 gives the 564 Ionization Gauge Tube sensitivities for helium, nitrogen and air.

Table 1 Gas Sensitivity Parameters

Gas	Gauge Constant S $S = i^+ / i^- \times 1/P$	Emission Setting for 0.01 A/Torr sensitivity (10 uA/micron)
Helium	1.5 per Torr	6.7 mA
Nitrogen	10 per Torr	1.0 mA
Air	8 per Torr	1.0 mA

where:

S = Sensitivity, Torr⁻¹

i⁺ = Ion current, Amps

i⁻ = Grid (electron) current, Amps

P = Partial pressure of the gas, Torr

Specifications

Table 2 Vacuum Specifications

Range	1×10^{-1} to 4×10^{-10} Torr*
Maximum Operating Pressure	1×10^{-1} Torr (argon); 6×10^{-2} Torr (air)
Pumping Speed, ionic	0.06 liters/sec (Nitrogen) (1mA)
X-ray Limit*	Approximately 4×10^{-10} Torr (Nitrogen)

* See Section "X-ray Limit" on page 9

** Calibration of production standards only.

Table 3 Physical Specifications

Envelope	Nonex (all models)
Grid	Tungsten "Non-Sag", 0.025" diameter
Filament	Hairpin thoria-coated iridium
Collector	Tungsten, 0.010" diameter
Base Leads	Soft nickel, 0.060" diameter
Collector Lead	Soft nickel, 0.040" diameter
Shipping Weight	3 lbs. (6.6 kg)
Internal Volume	220 cc (not including tubulation)

Table 4 Operating Ratings

Collector	0 VDC (ground)*
Grid	+180 VDC to ground
Filament Bias Voltage	+30 VDC to ground
Filament Voltage	4.0 VAC nominal
Filament Current	Approximately 3.5 A AC (1 mA grid current)
Filament Voltage, absolute maximum	6.0 VAC
Filament Current, absolute maximum	6.0 A AC
Grid Current, absolute maximum	100 mA
Filament Temperature, absolute maximum	1400 °C

* Collector operated at ground potential through electrometer circuit to reduce noise pickup and leakage currents.

Table 5 Degassing Ratings

Resistance Heating*		Electron Bombardment	
Grid Voltage	6.3 VAC	Grid to Filament Voltage	+700 VDC
Grid Current	8.7 A	Grid Current	100 mA DC
Grid Temperature	1200 °C	Grid Temperature	1200 °C max
		Filament Temperature	1400 °C

* All values in the Resistance Heating column are absolute maximum ratings. If these values are exceeded, sagging of the grid can occur.

Mounting

The 564 Ionization Gauge Tube mounts in either a vertical or horizontal position and may be operated and degassed in either position for prolonged periods. An outline drawing of the tube is shown in Figure 2.

Any ionization gauge using a hot filament can show pronounced pumping (gauge pressure lower than system pressure) if the conductance of the pipe connecting it to the system is too low. In general, the gauge tube should be mounted as close as possible to the desired location through a large tubulation (1" OD recommended). This effect becomes of particular concern when pressures below 10^{-8} Torr are to be measured.

564 Ionization Gauge Tube

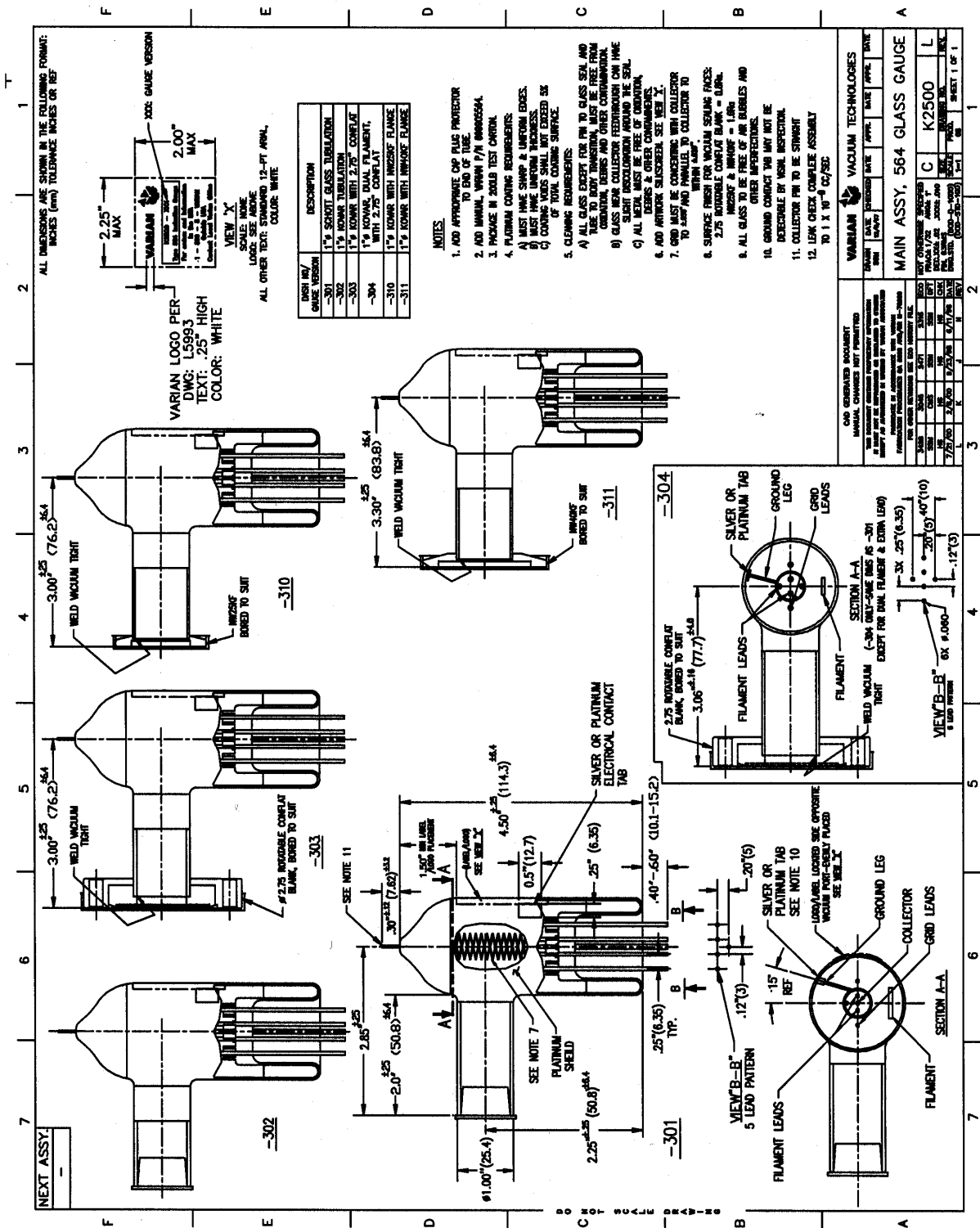


Figure 2 564 Ionization Gauge Tube Outline Drawing

Use of the Gauge Tube

The 564 Ionization Gauge Tube may be used to measure equivalent pressures of gases from 10^{-1} Torr down to the X-ray limit of the gauge. All ionization gauges are composition-sensitive and pressure readings derived from these gauges can only be expressed in terms of equivalent pressure of one gas, usually nitrogen.

Because Bayard-Alpert gauges contain hot filaments, degassing of residual gases in the glass and metal parts of the gauge will occur from the time it is first turned on. It is, therefore, very important to keep the gauge as free from contaminating vapors as possible (diffusion pump fluids, mercury and water vapor, etc.). High temperature baking of the gauge should not be attempted at pressures above 10^{-5} to avoid oxidation of the gauge elements which can make it very difficult to attain ultrahigh vacuum pressure readings. Conversely, ionization gauges cannot be expected to reach low ultimate pressure if the gauge and its connection are not thoroughly degassed.

Degassing

Degassing of the metal parts and glass walls of the gauge can be done by direct resistance heating of the grid or by electron bombardment of the grid by electrons supplied from the filaments of the gauge. In either case, it is important to use the values of grid voltage and current recommended to prevent damage to the gauge (see Table 5 on page 5). The standard Varian controls provide resistance degassing. In general, electron bombardment will result in a faster cleanup of a Bayard-Alpert gauge, but it must be carefully employed and watched to be efficient and non-hazardous to the gauge. Prolonged degassing at pressures above 10^{-7} Torr is usually unnecessary and of little value since the time to re-absorb common gases at this pressure is very short.

WARNING



If electron bombardment degassing is employed, high voltages (up to 700 VDC maximum) will be applied to the grid connections; such high voltages can kill. Observe all appropriate precautions.

Degassing the gauge by resistance heating will typically require one-half hour or more in the high vacuum range, such as 10^{-9} Torr, depending on cleanliness of the vacuum system and its past history. Degassing should proceed until the pressure during degas has reached a peak, then dropped asymptotically to a lower equilibrium pressure. Allowing the gauge to degas overnight will usually insure this if pressures below 10^{-8} Torr are to be measured.

X-ray Limit

In ionization gauges, X-rays generated by the ionizing electrons hitting the grid produce a photoelectric emission at the ion collector. This causes a lower limit of pressure readings known as the X-ray limit, (about 4×10^{-10} Torr in the 564 tube. Degassing effects of the gauges are often mistaken for the X-ray limit. Only careful investigation can determine which is the real cause. A second assumption often made is that the X-ray limit is always constant. Among other things, this limit depends on the photoelectric efficiency of the collector surface which, in turn, depends on the amount and type of absorbed gas, etc.

Therefore, as the X-ray limit is approached, readings should not be considered unequivocal.

Mounting and Flange Availability

Table 6 Ordering Information

Varian Part No.	Description
K2466301	1" Nonex
K2466302	1" Kovar
K2466303	2 ^{31/44} " Kovar ConFlat® Flange
K2466304	^{31/44} " Nonex
K2661305	^{31/44} " Kovar
K2471311	NW40 KF Flange

Gas Correction Factors

Gas correction factor tables are only reproduced for the convenience of the user and do not imply that use with other gases will be safe with hot filament gauge controllers. Table 7 lists relative gauge gas correction factors for various gases. The values are derived by empirical methods substantiated by measurements reported in literature. This table was 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.

Table 7 Gas Correction Factors

Substance	Formula	Relative Ionization Gauge Gas Correction Factor	Substance	Formula	Relative Ionization Gauge Gas Correction Factor
Acetaldehyde	C ₂ H ₄ O	2.6	Carbon Disulfide	CS ₂	5.0 4.7 4.8
Acetone	(CH ₃) ₂ CO	3.6 4.0 3.6	Carbon Monoxide	CO	1.05 1.05 1.1
Acetylene	C ₂ H ₂	1.9 2.0	Carbon Tetrachloride	CCl ₄	6.0 6.3
Air		1.0 0.98	Cesium	Cs	4.3 2.0 4.8
Ammonia	NH ₃	1.3 1.2 1.3	Chlorine	Cl ₂	0.68 2.6 1.6
Amylene: ISO· cyclo·	ISO·C ₅ H ₁₀ CY·C ₅ H ₁₀	5.9 5.8	Chlorobenzene	C ₆ H ₅ Cl	7.0
Argon	Ar	1.3 1.1 1.2 0.9	Chloroethane	C ₂ H ₅ Cl	4.0
Benzene	C ₆ H ₆	5.9 5.8 5.7 5.9 6.0	Chloroform	CHCl ₃	4.7 4.8 4.8
Benzoic Acid	C ₆ H ₅ COOH	5.5	Chloromethane	CH ₃ Cl	2.6 3.2 3.1
Bromine	Br	3.8	Cyanogen	(CN) ₂	2.8 3.6 2.7
Bromomethane	CH ₃ Br	3.7	Cyclohexylene	C ₆ H ₁₂	7.9 6.4
Butane: n· ISO·	n·C ₄ H ₁₀ ISO·C ₄ H ₁₀	4.9 4.7 4.6 4.9	Deuterium	D ₂	0.35 0.38
Cadmium	Cd	2.3 3.4	Dichlorodifluoromethane	CCl ₂ F ₂	2.7 4.1
Carbon Dioxide	CO ₂	1.4 1.4 1.5 1.5 1.4	Dichloromethane	CH ₂ Cl ₂	3.7
			Dinitrobenzene o· m· p·	C ₆ H ₄ (NO ₂) ₂	7.8 7.8 7.6
			Ethane	C ₂ H ₆	2.6 2.8 2.5
			Ethanol	C ₂ H ₅ OH	3.6 2.9
			Ethyl Acetate	CH ₃ COOC ₂ H ₅	5.0

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Table 7 Gas Correction Factors, continued

Substance	Formula	Relative Ionization Gauge Gas Correction F5tor	Substance	Formula	Relative Ionization Gauge Gas Correction Factor
Ethyl ether	(C ₂ H ₅) ₂ O	5.1 5.1	Naphthalene	C ₁₀ H ₈	9.7
Ethylene	C ₂ H ₄	2.3 2.4 2.2 2.2 to 2.5	Neon	Ne	0.30 0.31
Ethylene oxide	(CH ₂) ₂ O	2.5	Nitrobenzene	C ₆ H ₅ NO ₂	7.2
Helium	He	0.18 0.15 0.13 0.12	Nitrogen	N ₂	1.0
Heptane	C ₇ H ₁₆	8.6	Nitrotoluene (o-, m-, p-)	C ₆ H ₄ CH ₃ NO ₂	8.5
Hexadiene:			Nitric Oxide	NO	1.3 1.2 1.0
1.5- cyclo-	1.5-C ₅ H ₁₀ CY-C ₆ H ₁₀	6.4 6.0	Nitrous Oxide	N ₂ O	1.5 1.7 1.7 1.3 to 2.1
Hexane	C ₆ H ₁₄	6.6	Oxygen	O ₂	1.0 1.1 0.9 0.9
Hexene:			Pentane		
1- cyclo	1-C ₆ H ₁₂ CY-C ₆ H ₁₀	5.9 6.4	n-	n-C ₅ H ₁₂	6.2 6.0 5.7 6.0 5.7
Hydrogen	H ₂	0.46 0.38 0.41 0.45 0.44	ISO- neo-	ISO-C ₅ H ₁₂ (CH ₃) ₄ C	6.0 5.7
Hydrogen Bromide	HBr	2.0	Phenol	C ₆ H ₅ OH	6.2
Hydrogen Chloride	HCl	1.5 1.6 2.0 1.5	Phosphine	PH ₃	2.6
Hydrogen Cyanide	HCN	1.5 1.6	Potassium	K	3.6
Hydrogen Fluoride	HF	1.4	Propane	C ₃ H ₈	4.2 3.7 3.7 to 3.9 3.6
Hydrogen Iodide	HI	3.1	Propene oxide	C ₃ H ₆ O	3.9
Hydrogen Sulfide	H ₂ S	2.2 2.2 2.3 2.1	Propene:		
Iodine	I ₂	5.4	n-	n-C ₃ H ₆	3.3 3.2 to 3.7 3.6
Iodomethane	CH ₃ I	4.2	cyclo-	cy-C ₃ H ₆	
Isoamyl Alcohol	C ₅ H ₁₁ OH	2.9	Rubidium	Rb	4.3
Isobutylene	C ₄ H ₈	3.6	Silver perchlorate	AgClO ₄	3.6
Krypton	Kr	1.9 1.7 1.7	Sodium	Na	3.0
Lithium	Li	1.9	Stannic iodide	SnI ₄	6.7
Mercury	Hg	3.6	Sulphur Dioxide	SO ₂	2.1 2.3
Methane	CH ₄	1.4 1.5 1.6 1.4 to 1.8 1.5 1.5	Sulphur Hexafluoride	SF ₆	2.3 2.8
Methanol	CH ₃ OH	1.8 1.9	Toluene	C ₆ H ₅ CH ₃	6.8
Methyl Acetate	CH ₃ COOCH ₃	4.0	Trinitrobenzene	C ₆ H ₃ (NO ₂) ₃	9.0
Methyl ether	(CH ₃) ₂ O	3.0 3.0	Water	H ₂ O	1.1 1.0 0.8
			Xenon	Xe	2.9 2.2 2.4
			Xylene:		
			o-	o-C ₆ H ₄ (CH ₃) ₂	7.8
			p-	p-C ₆ H ₄ (CH ₃) ₂	7.9

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Request for Return Health and Safety Certification



1. Return authorization numbers (RA#) **will not** be issued for any product until this Certificate is completed and returned to a Varian Customer Service Representative.
2. Pack goods appropriately and drain all oil from rotary vane and diffusion pumps (for exchanges please use the packing material from the replacement unit), making sure shipment documentation and package label clearly shows assigned Return Authorization Number (RA#). VVT cannot accept any return without such reference.
3. Return product(s) to the nearest location:

North and South America

Varian Vacuum Technologies
121 Hartwell Ave.
Lexington, MA 02421
Fax: (781) 860-9252

Europe and Middle East

Varian S.p.A.
Via F.lli Varian, 54
10040 Leini (TO) – ITALY
Fax: (39) 011 997 9350

Asia and ROW

Varian Vacuum Technologies
Local Office

For a complete list of phone/fax numbers see www.varianinc.com/vacuum

4. If a product is received at Varian in a contaminated condition, **the customer is held responsible** for all costs incurred to ensure the safe handling of the product, and **is liable** for any harm or injury to Varian employees occurring as a result of exposure to toxic or hazardous materials present in the product.

CUSTOMER INFORMATION

Company name:	
Contact person: Name:	Tel:
Fax:	E-mail:
Ship Method: Shipping Collect #: P.O.#:	
<u>Europe only:</u> VAT Reg. Number:	<u>USA only:</u> ☐ Taxable ☐ Non-taxable
Customer Ship To:	Customer Bill To:
.....	
.....	

PRODUCT IDENTIFICATION

Product Description	Varian P/N	Varian S/N

TYPE OF RETURN (check appropriate box)

☐ Paid Exchange	☐ Paid Repair	☐ Warranty Exchange	☐ Warranty Repair	☐ Loaner Return
☐ Credit	☐ Shipping Error	☐ Evaluation Return	☐ Calibration	☐ Other

HEALTH and SAFETY CERTIFICATION

VARIAN VACUUM TECHNOLOGIES CANNOT ACCEPT ANY BIOLOGICAL HAZARDS, RADIOACTIVE MATERIAL, ORGANIC METALS, OR MERCURY AT ITS FACILITY. CHECK ONE OF THE FOLLOWING:

- ☐ I confirm that the above product(s) has (have) **NOT** pumped or been exposed to any toxic or dangerous materials in a quantity harmful for human contact.
- ☐ I declare that the above product(s) has (have) pumped or been exposed to the following toxic or dangerous materials in a quantity harmful for human contact (Must be filled in):

.....

Print Name: Signature: Date:/...../.....

PLEASE FILL IN THE FAILURE REPORT SECTION ON THE NEXT PAGE

Do not write below this line

Notification (RA)#: Customer ID#: Equipment #:

FAILURE REPORT (Please describe in detail the nature of the malfunction to assist us in performing failure analysis):

TURBO PUMPS and TURBOCONTROLLERS

CLAIMED DEFECT ☐ Does not start ☐ Noise ☐ Does not spin freely ☐ Vibrations ☐ Does not reach full speed ☐ Leak ☐ Mechanical Contact ☐ Overtemperature ☐ Cooling defective ☐ Clogging	POSITION ☐ Vertical ☐ Horizontal ☐ Upside-down ☐ Other:	PARAMETERS Power: Rotational Speed: Current: Inlet Pressure: Temp 1: Foreline Pressure: Temp 2: Purge flow: OPERATION TIME:
Describe Failure :		
TURBOCONTROLLER ERROR MESSAGE:		

ION PUMPS/CONTROLLERS

☐ Bad feedthrough ☐ Poor vacuum ☐ Vacuum leak ☐ High voltage problem ☐ Error code on display ☐ Other	Describe failure:
Customer application:	

VALVES/COMPONENTS

☐ Main seal leak ☐ Bellows leak ☐ Solenoid failure ☐ Damaged flange ☐ Damaged sealing area ☐ Other	Describe failure:
Customer application:	

LEAK DETECTORS

☐ Cannot calibrate ☐ No zero/high background ☐ Vacuum system unstable ☐ Cannot reach test mode ☐ Failed to start ☐ Other	Describe failure:
Customer application:	

INSTRUMENTS

☐ Gauge tube not working ☐ Display problem ☐ Communication failure ☐ Degas not working ☐ Error code on display ☐ Other	Describe failure:
Customer application:	

ALL OTHER VARIAN PUMPS

☐ Pump doesn't start ☐ Noisy pump (describe) ☐ Doesn't reach vacuum ☐ Overtemperature ☐ Pump seized ☐ Other	Describe failure:
Customer application:	

DIFFUSION PUMPS

☐ Heater failure ☐ Electrical problem ☐ Doesn't reach vacuum ☐ Cooling coil damage ☐ Vacuum leak ☐ Other	Describe failure:
Customer application:	

VPD Service Operation

Returned Material Report

This report must accompany all products returned for repair, replacement, or warranty evaluation. Full information regarding reasons for return of the product will expedite repair or adjustment. Please fill in all blanks below and furnish any other information which will help identify the nature and cause of failure.

Reason for Return (check appropriate box)

- | | | | |
|--|---|--|---------------------------------|
| ☐ Paid Repair | ☐ Advance Exchange | ☐ Shipping Error | ☐ Credit |
| ☐ Warranty Evaluation | ☐ Loaner Return | ☐ Shipping Damage | |

Product Information (use separate forms if more than one model no.)

Varian Model No. _____ Serial No. _____ Quantity _____
Part Description _____

Purchase Information (if product is being returned for warranty evaluation, show your original purchase order number and date purchased)

Varian Sales Order No. (if available) _____ Machine # _____

Original Purchase Order No. _____ Purchase Order Date _____

Company Name _____ Contact _____

Address _____

City _____ State _____ Zip _____

Telephone _____

Failure Report (describe in detail suspected cause or nature of malfunction)

Returned Products

All products returned to Varian/VPD Service Operation for warranty evaluation must be sent **prepaid** and customer must comply with the **warranty replacement and adjustment** provision set forth in the warranty.

Ship directly to: Varian Vacuum Products
Vacuum Products Service Center
121 Hartwell Avenue
Lexington, MA 02421

All products sold by Varian and returned by customer are subject to Varian Vacuum Products standard terms and conditions of sale including, but not limited to, the warranty and damages and liability provisions set forth in the warranty.

Sales and Service Offices

Argentina **Varian Argentina Ltd.**

Sucursal Argentina
Av. Ricardo Balbin 2316
1428 Buenos Aires
Argentina
Tel: (54) 1 783 5306
Fax: (54) 1 786 5172

Australia **Varian Australia Pty Ltd.**

679-701 Springvale Road
Mulgrave, Victoria ZZ 3170
Australia
Tel: (61) 395607133
Fax: (61) 395607950

Benelux **Varian Vacuum Technologies**

Rijksstraatweg 269 H,
3956 CP Leersum
The Netherlands
Tel: (31) 343 469910
Fax: (31) 343 469961

Brazil **Varian Industria e Comercio Ltda.**

Avenida Dr. Cardoso de Mello 1644
Vila Olimpia
Sao Paulo 04548 005
Brazil
Tel: (55) 11 3845 0444
Fax: (55) 11 3845 9350

Canada **Central coordination through:**

Varian Vacuum Technologies
121 Hartwell Avenue
Lexington, MA 02421
USA
Tel: (781) 861 7200
Fax: (781) 860 5437
Toll Free: (800) 882 7426

China **Varian Technologies - Beijing**

Room 1201, Jinyu Mansion
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Xicheng District
Beijing 1000031 P.R. China
Tel: (86) 10 6641 1530
Fax: (86) 10 6641 1534

France and Wallonie **Varian s.a.**

7 avenue des Tropiques
Z.A. de Courtaboeuf – B.P. 12
Les Ulis cedex (Orsay) 91941
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